ABSTRACT

THE EIGHTH BIENNIAL CONFERENCE OF THE INDIAN SOCIETY OF WEED SCIENCE

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DEPARTMENT OF AGRONOMY
INSTITUTE OF AGRICULTURAL SCIENCES
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EFFECT OF WHIP SUPER AND ETHOXYSULFURON ON WEED FLORA AND THEIR IMPACT ON CHLOROPHYLL CONTENT OF LEAVES IN DIRECT SEEDED PUDDLED PADDY

PRATIBHA KATIYAR AND S.S. KOLHE
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The experiment was conducted to find out the effectiveness of herbicides on weed flora and their impact on chlorophyll content of leaves in direct seeded puddled paddy in kharif season in the year 1997.

The frequency and density of *Cyperus rotundus, Splianthus pyrethrum*, and *Commelina diffusa* were highly affected by the treatment Ethoxysulfuron 30 g ha^{-1} at 15 DAS. Although *Borreria* spp. and other weeds (unidentified) were highly affected by the treatment Whip super + Ethoxysulfuron 45 + 10 g ha^{-1} at 15 DAS.

The chlorophyll a, b and total chlorophyll content of leaves was not affected significantly at 21 DAS. However, chl. a, b and total chl. content was significantly affected at 51 days. The chl. b and total chl. content was maximum in the leaves treated with Whip super + Ethoxysulfuron 45 + 10 g ha^{-1} at 15 DAS, followed by hand weeding twice at 20 and 40 DAS and Whip Super at 45 g ha-1 at 25 DAS. The chl a content was maximum in the leaves treated with hand weeding twice 20 and 40 DAS and followed by Whip + Ethoxysulfuron 45 + 10 g ha^{-1} at 15 DAS.

WEED CONTROL IN PUDDLED SEEDED RICE

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A field experiment was conducted during Kharif season of 1997 at Agronomy Research Farm of the University. The dominant weed species found in the experimental field were *E. colonum* and *E. crusgalli* of grassy group, *Cyperus spp.* and *Fimbristylis dichotoma* of sedges group and *Phyllanthus niruri* of broad leaf group. The results revealed that pre-emergence application of butachlor 1.5 kg + anilofos 0.5 kg ha^{-1} (tank mix) was most effective to control the weeds. Pre-emergence application of anilofos 0.3 to 0.4 kg ha^{-1}, butachlor 1.5 kg ha^{-1} and tank mixture of butachlor 1.0 to 1.5 + anilofos 0.2 to 0.4 kg ha^{-1} provided grain yield comparable to hand weeding 20 and 40 DAS. The unchecked weed growth hampered the grain yield by 61% as compared to weed free treatment. Economically, pre emergence applicaiton of anilofos alone 0.4 kg ha^{-1} was the best.

EFFECT OF HERBICIDES ON WEED CONTROL IN IRRIGATED TRANSPLANTED LOW LAND RICE

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Field experiment was carried out during Kharif 1996 at Tamil Nadu rice Research Institute, Aduthurai to evaluate bioefficacy of six herbicide formulations and combination making eleven treatments in controlling weeds of transplanted rice.

Data on grain yield indicated that Anilophos recorded maximum grain yield (5.7 t ha $^{-1}$) comparable to hand weedings (6.04 t ha^{-1}) followed by butachlor + 2, 4-D Na (5.64 t ha $^{-1}$), butachlor 5.52 t ha^{-1}) and argold at 0.075 kg ha^{-1} (5.67 t ha^{-1}). Herbicide Anilophos recorded lowest weed biomass of 0.1 t ha^{-1}.

The data on weed control rating showed that anilophos (2.84) and argold at 0.075 kg ha^{-1} (2.83) recorded higher rate of weed control than other herbicides.

INFLUENCE OF HERBICIDE MIXTURES ON WET SEEDED RICE

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Field experiment was conducted to study the effect of herbicide mixture in direct seeded rice during 1995-96 at Agricultural College & Research Institute, Madurai.The phytotoxicity was high in application of herbicide mixture of pretilachlor with 2,4-DEE and oxyfluorfen with 2,4-DEE which might be due to higher concentration of herbicide as well as higher uptake of herbicides by rice seedlings. Pretilachlor caused slight discolouration in the initial stage which changed in later stage. Application of pre emergence herbicide pretilachlor on 8 DAS coupled with one hand weeding on 30 DAS enhanced the production potential of rice. The effective weed control achieved in this treatment especially on grass and BLW favoured growth and yield attributes resulting in higher grain yield. Hand weeding twice on 30 and 60 DAS and oxyfluorfen plus hand weeding were next to application of pretilachlor plus hand weeding.

RICE MORPHOLOGY AND WEED SUPPRESSION IN TRANSPLANTED *KHARIF* RICE

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With an aim to study the weed suppressing ability of transplanted *kharif* rice varieties and also to determine the desired rice morphological characters effective for weed suppression, experiments were conducted since 1993 to 1997, at I.C.R. Farm, AAU,Jorhat. Local and improved varieties were grown following recommended practices and allowed to compete with the naturally grown weed species. The results revealed that the light interception through the rice canopies at 80 days after transplanting (DAT) has significant positive correlation (0.689) with the weed growth rate (WGR), whereas, leaf area index (60 DAT) was negatively correlated with weed population (30 DAT), weed dry weight (65 DAT) and WGR (-0.668, -0.701 and -0.653, respectively). On the other hand, the population and dry weight of weeds during the critical crop-weed competition period had significant negative correlation with most of the crop morphological characters.Angles of the lower leaves of the rice varieties, which varied from 30° to 33° in the modern semi-dwarf varieties and 40° to 62° in Mahsuri and localvarieties, were found to have significant effect on weed suppression. The dry weight and growth rate of the crop, which had direct effect on grain yield, were negatively correlated with the population and growth of the weeds. Amongst the varieties, Ranjit, Badsabhog, Joya and local varieties had better weed suppressing ability over other tested varieties. Out of the varieties, the improved variety Ranjit yielded comparatively better grain yield (4.9 t ha^{-1}) followed by local variety *Bora* (4.1 t ha^{-1}) in season long weedy condition.

WEED MANAGEMENT WITH HERBICIDES IN TRANSPLANTED RICE

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A field experiment was carried out at CCS HAU Rice Research Station, Kaul during kharif, 96 and 97. Six herbicidal treatments viz. butachlor 1.5 kg, cinmethylin 0.05 kg and 0.075 kg, ethoxysulfuron 0.015 kg, anilofos 0.40 kg and ethoxysulfuron + anilofos readymix (0.015 + 0.375 ha^{-1}) were tested alongwith hand weeding twice (20 & 40 DAT) and non-weeded check. The average reduction in grain yield was 38.5% in unweeded check as compared to hand weeding twice (69.6 q ha^{-1}). Hand weeding twice was found equally effective in reducing weed population and weed dry weight as ethoxysufuron + anilofos mixture during both the years.

STUDIES ON THE CONTROL OF BROAD LEAF WEEDS IN TRANSPLANTED RICE

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Metsulfuron and 2,4-D were tried to control broad leaf weeds particularly *Caesulea axillaris* from transplanted rice from 1995 to 1997 at the experimental farm of Punjab Agricultural University, Ludhiana. Data revealed that post-emergence (25 DAT) spray application of metsulfuron at 10 and 15 g ha^{-1} and 2,4-D (S.S.) at 0.8 kg ha^{-1} provided good control of broad leaf weeds and increased grain yield significantly over standard practice of two hand pullings. On an average of three years, both these herbicide treatments increased grain yield by 30.0 and 81.1% over two hand pulling and unweeded (control) treatments, respectively.

WEED CONTROL IN WET SEEDED RICE IN INDIA - A REVIEW

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Wet seeding (sowing pregerminated rice seed on the puddled soil) is increasing in importance in a number of countries in South and South East Asia including India. *Echinochloa crus-galli* (L.) Beauv., *Echinochloa colona* (L.) Link, *Cyhperus difformis* L., *Cyperus iria* L. and *Ammannia baccifera* L. were the most commonly reported weed species associated with wet seeded rice in India. The yield losses due to weeds as revealed by studies conducted in India ranged from 20.31% to 60.31%. Hence, weed management forms a vital component of wet seeded rice system. The first 20 to 40 days after seeding was the critical period for crop weed competition. Increased seed rate, optimal puddling, appropriate water management, usage of mechanical weeders with supplemental hand weeding and two hand weedings are effective non chemical methods for managing weeds in wet seeded rice. Thiobencarb, butachlor, butachlor+safener, pretilachlor + safener, anilophos, thiobencarb -2,4-D, dichlormate, piperophos and dinitramine alone and in combination with the isopropyl ester of 2,4-D, piperophos-dimethametryne and propanil were effective against weeds in wet seeded rice. Varietal differences in herbicide phytotoxicity is observed. The need for integrated approach for managing weeds in wet seeded rice and future research needs are discussed.

WEED MANAGEMENT IN TRANSPLAANTED RICE

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An experiment, to study the effectiveness of the various herbicides (butachlor, pretilachlor, anilophos, pendimethalin) at different rates was conducted during kharif season of 1996, at G.B. Pant University of Agric. & Tech., Pantnagar. *Echinochloa crusgalli, Fimbristylis dichotoma, Ischaemum rugosum* among grasses, *Caesulia oxillaris* among non-grasses were pre-dominant and contributed major part of the total weed population. Reduction in grain yield was 24% due to weeds in weedy check plots. Highest grain yield (63.75 q ha^{-1}) was recorded in anilophos (0.4 kg ha^{-1} followed by butachlor 1.0 kg ha^{-1} + one hand weeding 30 DAS (63.4 q ha^{-1}). Yield was significantly increased when the rate of butachlor (1.5 kg ha^{-1}) was reduced to 1.6 kg ha^{-1} and one additional weeding at 30 days was given.

CHEMICAL WEED MANAGEMENT IN TRANSPLANTED RICE UNDER LOWLAND CONDITION

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Field experiment was carried out at Tamil Nadu Rice Research Institute, Aduthurai, during Kharif'97 to find out the efficacy of different pre-emergence herbicides under lowland transplanted rice. The herbicide treatments Butachlor 1.5 kg ha^{-1}, lower and higher doses of Cinmethalin at 0.05 and 0.075 kg ha^{-1}, lower and higher doses of Clomazone 0.30 and 0.40 kg ha^{-1}, Ethoxysulfuron 0.015 kg ha^{-1}, lower and higher doses of Rice guard 0.25 + 0.01 and 0.375 and 0.015 kg ha^{-1}, lower and higher doses of Whip super 0.045 and 0.067 kg ha^{-1}, two formulations of Oxadiargyl (6 EC), 0.1 and Oxadiargyl (80 WP) 0.1 kg ha^{-1} were compared with hand weeding twice and unweeded control.

The experimental results revealed that hand weeding twice recorded lowest weed dry matter production (7.42 g/m^2), highest weed control efficiency and higher yield (5.91 t ha^{-1}) over other treatments. The herbicides Rice guard at 0.375 and + 0.015 kg ha^{-1}, Cinmethalin 0.075 kg ha, Rice guard 0.25 + 0.01, Ethoxysulfuron 0.015 kg ha^{-1} and Whip super 0.067 kg ha^{-1} were recorded lesser weed DMP and higher yield as compared to unweeded control.

EFFECT OF AZOLLA ON YIELD AND WEED & SUPPRESSION IN RICE

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Field experiments were conducted at Annamalai University Experimental Farm, Annamalainagar, during Samba (August - January) and Navarai (January - April) seasons of 1995-96 to study the effect of an integrated rice-azolla farming system. Enterprises like rice-azolla culture (*Azolla microphylla* @ 0.5 kg per m^{-2}) was compared with rice alone. The results revealed that the addition of azolla in the system suppressed the weeds of *Echinochloa crusgalli* and *Cyperus difformis* and the degree of suppression increased the per cent of azolla cover and water depth.

EFFECT OF N AND WEED CONTROL SCHEDULING ON GRAIN YIELD OF WET SEEDED RICE VARIETIES

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Field trial was conducted during dry (Rabi) season of 1997-98 at Research farm, Directorate of Rice Research, Hyderabad (ICAR) to study the effect 3 schedules of nitrogen (50% N at basal + 25% N at tillering + 25% N at panicle initiation stage, three equal split of nitrogen at 21, 42 and 56 days after sowing, 75% N + 25% K_2O at basal + 25% N at tillering 25% N + 25% K_2O at panicle initiation stage) and 3 schedules of weed control (unweeded check, two hand weeding at 20 & 40 DAS and butachlor + safener @ 1.5 kg ha^{-1} at 4 DAS) in Nidhi, Krishna Hamsa, Triguna and Vikas cultivar under well levelled puddled conditions. Variety Triguna recorded significantly the highest grain yield of 4.52 t ha^{-1} over mean grain yield of Nidhi (4.29 t ha^{-1}), Krishna Hamsa (4.3 t ha^{-1}) and Vikas (4.33 t ha^{-1}) while differences among Nidhi, Vikas and Krishna Hamsa were non-significant. The grain yield differences among different nitrogen application schedules were non-significant. Two hand weeded treatment recorded maximum grain yield (5.22 t ha^{-1}) followed by butachlor + safener (5.08 t ha^{-1}) and unweeded check recorded significantly lowest grain yield (2.77 t ha^{-1}). Weed dry weight was non-significant under varieties and Nitrogen schedules while significantly maximum weed dry weight of (90.4 g/m^2) was recorded under unweeded check than the mean weed dry weight of hand weeded twice (29.25 g/m^2) and Butachlor + safener (32.04 g/m^2). The weed control efficiency was 63.61 and 59.98% under hand weeded twice and butachlor + safener, respectively.

WEED MANAGEMENT STRATEGY IN DIRECT SOWN RICE UNDER PUDDLED CONDITION

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Field experiment was conducted at Agricultural Research Station, Tamilnadu Agricultural University, Bhavanisagar during *Kharif* 1996 to find out the suitable herbicide for broadcast pre-germinated paddy (cv. ADT 42) seeds under poddled condition. Treatments consisted of pretilachlor 0.3 and 0.4 kg ha^{-1} with safener (3 DAS), thiobencarb 1.0 kg ha^{-1} (8 DAS) and butachlor 1.25 kg ha^{-1} (3 DAS) were compared with unweeded check. Application of Pretilachlor 0.3 kg ha^{-1} with safener reduced the weed population and dry matter taken 25 DAS and increased panicle number, grain and straw yields. Application of butachlor 1.25 kg ha^{-1} indicated symptoms phytotoxicity.

EVALUATION OF COMBINATIONS OF TRICLOPYR AND ANILOFOS FOR WEED CONTROL IN TRANSPLANTED AND DRILLED RICE IN SOUTHERN TRANSITION OF KARNATAKA

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Field studies were conducted during *Kharif* 1997 in Shikaripura, to evaluate the doses and combinations of triclopyr and anilofos for weed management in transplanted and drilled rice. The treatments comprised of combinations of triclopyr at 100 to 500 g ha^{-1} along with anilofos of 300 g ha^{-1}, triclopyr 500 g ha^{-1}, anilofos 400 g ha^{-1}, anilofos 300g + 2,4-DEE 400 g ha^{-1} (ready mix) in relation to handweeding and unweeded control. For transplanted rice cv. IR-64, combinations of anilofos 300 g ha^{-1} + triclopyr 300 g ha^{-1} (3 days after planting) enhanced the spectrum of weed control and resulted in grain yield comparable to hand weeding (twice) and anilofos 300 g + 2,4-D EE 400 g ha-1 (ready mix).The density of weeds like - sedge (*C. iria, C. difformis*), *Echinochloa colona* (grass), *R. verticillairs, Ludwigia parviflora* and *Eclipta alba* (broad leaf weeds) were reduced by application of these herbicides combination. Increasing the dose of triclopyr beyond 300 g ha^{-1} did not increase the grain yield.

In drilled rice cv. IET 1791,combination of anilofos 300 g ha^{-1} + triclopyr 300 to 500 g ha^{-1} (at 12 DAS), anilofos 260 g ha^{-1} + metsulfuron methyl 4 g ha^{-1} + chlorimuron ethyl 4 g ha^{-1} (12 DAS) was better. Inclusion of anilofos with triclopyr enhanced the bioefficacy in controlling weeds and resulted in higher yields.

WEED CONTROL IN DIRECT SEEDED AND TRANSPLANTED RICE CULTURES IN DIFFERENT CULTIVARS UNDER MID-HILL CONDITIONS OF HIMACHAL PRADESH

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Field experiments were conducted at Rice Research Station Malan during *kharif* seasons of 1994 and 1995. Manual weeding and halod was done in direct seeded irrigated paddy crop whereas in transplanted paddy crop, butachlor 1.5 kg ha^{-1} was sprayed. Chemical method of weed control resulted effective control of weeds and significantly increased the grain yield of paddy over farmers method of weed control. Grain yield of paddy was significantly higher in transplanted culture over direct seeded rice culture. RP 2421 significantly outyielded all varieties in 1994 while during 1995 remaining at par with JET 10402 significantly outyielded all the varieties.

PERFORMANCE OF RICE CULTIVARS UNDER VARYING FERTILITY AND WEED MANAGEMENTS IN SUBMERGENCE-PRONE ECOSYSTEM

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An investigation was carried out at Research Farm, Institute of Agricultural Sciences, BHU, Varanasi during wet seasons of 1996 and 1997 to study the effect of fertility and weed management practices under different cultivars in rainfed lowland, submergence - prone rice ecosystem. Predominant weeds were *Echinochloa colonum* (L.), link, *E. crus-galli* (L.) Berav, *Oryza rufipogon*, *Cyperus rotundus* (L.), *Cynodon dactylon* Pers and *Fimbristylis miliaceae* (L.). However, Ipomea aquatica, Sirpuss spp, *Eichhornia crassipes* (Mart) Salmes, Nitella spp, Typha spp and volunteer rice were also found in post-flood environments. Results indicated that pre-emergence application of butachlor + 2,4-D (1.5+0.5 kg ha^{-1}) fb. one hand weeding at 30 DAS and hand weedings twice (30+50 DAS) with applicaiton of 40 + 20 + 20 kg NPK ha^{-1} were equally effective in arresting weed growth and in enhancing the rice grain yield. The grain yield was higher in the treatments where weed control measures were followed as compared to no weed control measures, irrespective of fertiliser applications. Among cultivars, Vaidehi, and Barh Avarodhi proved to be better competitor against weeds and recorded low weed infestation and consequently high crop yield over Madhukar.

WEED MANAGEMENT FOR DIRECT SOWN SEMI DRY RICE UNDER DIFFERENT TIME OF SUBMERGENCE

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Field experiments were conducted at Tamil Nadu Rice Research Institute, Aduthurai during Wet season (1993-94 and 1994-95) with a view to study the Weed management practices under different time of submergence in semi dry rice ecosystem. In general, grass weed populations were more dominant followed by broad leaved and sedges. Population of grasse, sedges and broad leaved weeds were lesser under early submergence (30 and 45 DAS) at different stages of observation. Conversely, these observations on weeds registered higher values with delayed submergence (60 DAS). The degree of infestation of different Weed species also varied with the fields are converted from dry to wet conditions by giving submergence. Application of pertilachlor plus 0.3 kg ha^{-1} as pre-em. was advantageous in eliminating early weed competition as evident from lesser Weed population, DMP and higher weed control efficiency. When it is followed by 2, 4-D Na salt 1.0 kg ha^{-1} as post emergence herbicide supplemented with one hand weeding on 45 DAS was still more effective in checking further weeds growth and reflected on increased grain yield.

EFFECT OF HERBICIDES ON WEED CONTROL AND GRAIN YIELD OF DIRECT SEEDED RICE UNDER PUDDLED CONDITION

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Field experiment was carried out during Kharif 1996 at Tamil Nadu Rice Research Institute, aduthurai to evaluate the bioefficacy of herbicides in controlling weeds in direct seeded rice under puddled condition. The five liquid herbicides (butachlor + safener, ethoxysulfuron, anilophos + 2,4 DEE (Aniloguardplus), cinmethalin (Argold) and Fenoxa Prop - P - Ethyl whipsuper at two doses along with two hand weedings (20 and 40 DAS) and non weeded control. The data on grain yield showed that butachlor + safener at 1.0 kg ha-1 recorded higher grain yield of 5.21 t ha^{-1} which was at par with the grain yields in the range of 4.65 to 4.85 t ha^{-1} under treatments receiving ethoxysulfuron + anilophos (0.02 + 0.375 kg ha^{-1}), ethoxysulfuron alone (0.02 kg ha^{-1}) and argold (0.075 kg ha^{-1}). However, these four herbicides were comparable with two handweedings in terms of grain yield (5.08 t ha^{-1}).

CHEMICAL WEED CONTROL IN DIRECT SOWN RICE UNDER PUDDLED CONDITION

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A field experiment was carried out at Tamil Nadu Rice Research Institute, Aduthurai, during Kharif'97 to find out the efficacy of different pre-emergence herbicides in direct sown rice under puddled condition. The treatments consisted of Butachlor + Safener 1 kg ha^{-1}, Ethoxysulfuron 0.015 kg ha^{-1}, lower and higher doses of Rice guard 0.250 + 0.01 and 0.375 and 0.015 kg ha^{-1}, lower and higher doses of Aniloguard + at 0.70 and 0.93 kg ha^{-1}. Cinmethalin at 0.075 kg ha^{-1}, lower and higher doses of Whip Super 0.045 and 0.067 kg ha^{-1} were tested and these treatments were compared with hand weeding twice and unweeded control. Among the herbicides, Butachlor + Safener 1.0 kg ha^{-1} 21.3 g m^{-2}, Ethoxysulfuron 0.015 kg ha^{-1} (23.2 g m^{-2}, and rice guard 0.250 + 0.010 kg ha^{-1} (22.9 g m^{-2}, recorded lesser weed dry matter production and higher weed control efficiency as well as higher rice grain yield and were on par with hand weeding twice (21.8 g m^{-2}).

EVALUATION OF ALMIX (sulfonyl urea herbicide) FOR THE CONTROL OF WEEDS IN TRANSPLANTED RICE.

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A field experiment was conducted at CCS HAU Regional Research Station, Karnal during Kharif 1995 and 1996 to evaluate the potency of almix applied at different doses and times against barnyard grass in transplanted rice. Field was dominated by *Echinochloa crusgalli*.

Average data of two years study indicated that almix at 6, 12 and 18 q ha^{-1} applied 2,4 and 6 leaf stage of barnyard grass reduced the dry weight by 48 to 77% over weedy check and reduction more in early application (2 leaf stage) as compared to its late application (6 leaf stage). Highest dose (18 g ha^{-1}) of almix proved significantly better than its lowest dose (6 g ha^{-1}).

Sole application of almix at 2 and 4 leaf stage of barnyard grass produced significantly higher grain yield of rice as compared to weedy check during both the years but was significantly inferior to butachlor at 1500 g ha^{-1}, pretilachlor at 1000 g ha^{-1} and weed free treatment. Tank mixture of metsulfuron with almix did not perform better than almix alone in producing rice grain.

INTEGRATED WEED MANAGEMENT IN DIRECT SEEDED RICE UNDER PUDDLED CONDITIONS.

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The field experiment were conducted with treatments viz., Butachlor, Anilofos, Benthiocarb and pretilachlor + Safener) with two doses and lower dose supplemented with one hand weeding alongwith two hand weedings, weed free and unweeded check.

All the weed control treatments produced significantly better grain yield and weed control efficiency than unweeded control (1430 kg ha^{-1}). The highest grain yield (3325 kg ha^{-1}) and weed control efficiency (90.26%) was recorded with two hand weedings at 20 and 40 days after sowing which was at par with weeds free check (3200 kg ha^{-1}) and Benthiocarb @ 1.0 kg ha^{-1} supplemented with one hand weeding (3050 kg ha^{-1}).

NEW HERBICIDE FOR WEED CONTROL IN TRANSPLANTED LOWLAND RICE OF KARAIKAL REGION (PONDICHERRY)

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Field experiments conducted at Pandit Jawaharlal Nehru College of Agriculture and Research Institute, Karaikal to study the efficacy of pretilachlor in controlling weeds of transplanted rice revealed that Pretilachlor 0.500 Kg ha^{-1} applied at 3 days after transplanting (DAT) produced higher grain with weed control efficiency of 67.6 per cent handweeding twice. All the chemically treated plots (except 2,4 DD sodium salt) were supplemented with one handweeding at 30 DAT. The major weed flora in the field were *Echinochloa colonum, E. crusgalli,* under grasses, *Cyperus difformis, Fimbrystylis miliacea,* under sedges, and *Marsilea quadrifoliata* under broadleaved leaves. The yield increase realized over check ranged from 19.1 to 71.4 per cent.

The use of pretilachlor @ 0.500 kg ha^{-1} at 3 DAT plus one handweeding at 30 DAT is recommended as an efficient weed management practice for transplanted rice.

WEED CONTROL IN SPRING RICE UNDER RAINFED LOW VALLEY SITUATION OF KUMAON HILL

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A field study carried out in sandy clay loam soil at Research Station Majhera (Nainital) during spring/kharif season, revealed that *Cyperus rotundus* along caused 60 and 70 per cent reduction grain yield as compared to weed free condition during 1996 and 1997. All adopted weed control approaches effectively controlled the weeds. On average basis Maximum Weed Control efficiency and grain yield (24.8 q ha^{-1}) was obtained by weed free followed by hand weeding twice (20.5 q ha), whereas, it was 20.0, 1.9 and 8.6 q ha^{-1} under butachlor followed by hand weeding, weedy plot and weedy plot (maintaining *cyperus rotundus* only), respectively.

EVALUATION OF THE TIME OF APPLICATION OF HERBICIDE IN DIRECT SOWN PUDDLED RICE.

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Field experiment was conducted at Central Farm, agricultural college & Research Institute, Madurai during 1998 *Kharif* season to find out the ideal time of application of herbicide in direct sown puddled rice. Two herbicides viz., butachlor (1.0 kg ha^{-1}) and pendimethalin (1.25 kg ha^{-1}) and eight time of application starting from first day upto 8_{th} day after sowing were test verified in a Randomized block design replicated three times. The variety MDU 5 a short duration rice type was used in this study. Application of herbicides did not have exhibited any harmful effect on the germination of the paddy seedlings from the first day of the herbicide application. Application of butachlor at 3 DAS had effective weed control efficiency to the tune of 65 per cent and recorded higher grain yield under direct sown puddled condition.

WEED AND NITROGEN MANAGEMENT IN TRANSPLANTED RICE

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Most profitable rate of nitrogen application for rice (Oryza Sativa) variety Mansoori was 96.6 kg ha^{-1}. Herbicidal treatments were more effective in arresting weed dry matter at higher nitrogen level. Thiobencarb was more effective than 2,4-D. However, even the least effective 2,4-D 0.5 kg ha^{-1} was significantly superior to unweeded control. Thiobencarb 1.5 Kg and 2.0 Kg were at par with two hand weedings in recording rice grain yield. Weed control treatments were effective in reducing the most profitable rate of nitrogen application. This implied a thrift in nitrogen use due to better weed management.

WEED CONTROL EFFICACY OF PRE-EMERGENCE HERBICIDES IN LOWLAND TRANSPLANTED RICE IN THE COASTAL SALINE SOILS

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Field experiments were conducted during 1995 and 1996 at Pandit Jawaharlal Nehru college of Agriculture and Research Institute, Karaikal to study the weed control efficacy of pre-emergence herbicides in lowland transplanted rice.The herbicides *viz.*, butachlor (1.25 or 1.50 kg ha^{-1}), thiobencarb (1.25 or 1.50 kg ha^{-1}), fluchloralin (0.75 or 1.00 kg ha^{-1}) and pendimenthalin (0.75 or 1.00 kg ha^{-1}) were applied and their efficacy were compared with two hand weedings at 20 and 40 DAT. The results revealed that thiobencarb was very effective in controlling weed growth and recorded higher weed control efficiency (82.9 to 92.7%) followed by butachlor (81 to 85%) and was comparable with two handweedings at 20 and 40 DAT (83.0 to 87.5%). Among the herbicides thiobencarb 1.50 kg ha^{-1} recorded the maximum yield (4.19 to 4.22 t ha^{-1}).

RELATIVE MERITS OF GLYPHOSATE AND SUMMER TILLAGE AS PRE-PLANT WEED MANAGEMENT IN RICE ECO-SYSTEM

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Field experiments to study the influence of pre-plant tillage in rice based cropping system here carried out during 1993 and 1994 at Agricultural College &Research Institute, Killikulam. Both glyphosate and summer tillage provided effective control of weeds and improved the growth and yield of rice over tillage at planting. The magnitude of the benefit was more with glyphosate application than summer tillage. Uniform spray of glyphosate 1.6 kg ha^{-1} over entire area affected all the weeds present and reduced their regeneration. This would explain the greater efficiency of weed control seen with glyphosate over summer tillage. However, the higher cost of the chemical is a constraint for glyphosate. With the current price of glyphosate at Rs. 410 per litre, the cost of glyphosate application is considerably higher (Rs. 1653.00 ha^{-1} than the expenditure on summer tillage (Rs. 750.00 ha^{-1}. Consequently, the cost-benefit ratio is in favour of summer tillage only.

STUDIES ON EFFECT OF WEED CONTROL MEASURES UNDER DIFFERENT METHODS OF RICE PLANTING

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A field experiment was conducted at research farm B.H.U., Varanasi, during *kharif* season of 1997 to evaluate the efficacy of various weed control practices under different methods of rice cultivation; direct sowing of sprouted seeds, transplanting in unpuddled wet weed bed, transplanting in unpuddled stale wet seed bed, and transplanting after puddling. The most prominant weeds were *Cyperus iria* L., *C. rotunds* L., *C. difformis*, L. *Echinocloa colonum* (L.) L. *C. difformis* L., *Echinochloa colonum* (L.) link and *E. crusgalli* (L.) Beavuv. The application of anilofos at 0.4 kg ha^{-1} alone or in combination with 2,4-DEE at 0.5 kg ha^{-1} caused significant reduction in weed population and their dry weight. However, maximum average grain yield (43.3 q ha^{-1}) was obtained in weed free check followed by anilofos 0.4 kg ha^{-1} as pre-emergence in combination with 2,4-DEE 0.5 kg ha^{-1} (41.96 q ha^{-1}.

EFFICACY OF CYHALOTOP BUTYL TO CONTROL ECHINOCHLOA SPP. ON DIRECT SEEDED PUDDLED PADDY.

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Field experiments conducted at the vishwavidyalaya farm, Kalyani during Kharif and Rabi 1997-98 to study the effect of cyhalotop Butyl applied at 10 DAS during Kharif and 20 DAS during rabi either season in 5 different doses Viz 400,600,800,1600 and 3200 ml ha^{-1} through clincher or integrating 600 and 800 ml ha^{-1} with one hand weeding at 40 DAS to control the *Echinocholoa* spp. sown with paddy seeds in ratio of 1 : 50 revealed that the chemical clincher can significantly control the *Echinochloa Spp.* Higher doses of the chemical clincher 800,1600 and 3200 ml ha^{-1} showed better control of *Echinochloa spp.* The results also revealed that clincher application 800 ml ha^{-1} integrated with hand weeding at 40 DAS recorded higher paddy grain yields. (3240 kg ha^{-1} and 4026 kg ha^{-1} respectively during kharif & rabi.

WEED MANAGEMENT IN DIRECT SOWN RICE UNDER PUDDLED CONDITIONS

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The cost effective herbicides with high bio-efficacy have been tested at the experimental farm of DRR Rajendranagar. Among new herbicides tested, anilophos plus trichioropyr at different doses significantly outyielded (4.7 t ha^{-1}) two hand weedings (3.4 t ha^{-1}) and other herbicides in terms of grain yield. Non-weeded control recorded very poor yields (1.96 t^{-1}). Rest of the herbicides were found at par with two hand weedings.

In weeds flora mainly *echinochloa* species followed by sedges (*Cyperus iria*) predominate the weed spectra. Anilophos-trichloropyr alone recorded significantly lower weed biomass than other herbicides. Next best is Cyhalofopbutyl at higher concentration 80 ml ha^{-1} found effective in controlling weeds as compared to its lower concentration (i.e. 60 ml) under puddled conditions.

In another trial, glyphosate 7.52 - 10 ml/litre of water controlled wide flora of weeds in the state seed bed. It was observed that 10 to 14 days had taken to get total kill of weeds. Thus initial weed control being achieved by glyphosate; later after thorough puddling wet seed was sown. Butachlor applied after 3 or 4 days of seeding, controlled second flush of weed flora and increased the yields significantly. Thus use of glyphosate is recommended before seedling and new molecules of herbicides after seeding would be a good package under direct seeded conditions to manage the weeds.

BIO-EFFICACY OF PROPANIL ON RICE WEEDS

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A field experiment conducted to study the Bio-efficacy of propanil on rice weeds.

Predominant weed species in experimental field were *Echinochloa crusgalli, Leersia hexandra, Cynodon dactylon, Scturia glauca, Cyperus iria, Cyperus rotundus, Fimbristylis miliacea, Ludwigia parviflora, Enhydra fluctuens, Commelina benghalensis, Marsilia quadrifoliata.*

Results clearly showed that hand weeding (20 and 40 DAS) gave the best result in relation to weed control and yield followed by propanil 21 ha^{-1} which gave the maximum yield among all the chemical treatments.

BIO-EFFICACY OF SULFONYL UREA HERBICIDES ON KHARIF PADDY

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A.K.Chattopadhyay, KVK, Kakdwip
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An experiment conducted at the Instructional Farm, Jaguli, B.C.K.V., Nadia, W.B. to study the 'Bio-efficacy of ulfonyl urea herbicides on kharif paddy'.

Almix + Anilophos 8 g + 400 g ha-1 showed the best performance in relation to weed control and weed dry weight. The maximum grain yield was obtained with the treatment Almix + Anilophos 4 + 200 g ha^{-1} which, however, was found statistically at par with Ally + anilophos 4 + 200 g ha^{-1} and Almix + Anilophos 6 + 300 and 8 + 400 g ha^{-1}.

WEED MANAGEMENT IN DIFFERENT RICE GROWING SYSTEMS

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Rice production and weed control are often synonymous. It is impossible to produce rice economically without a well planned weed management programme. As average yield reduction due to weeds in irrigated, rainfed lowland and rainfed upland rice growing ecosystems are 49%, 62% and 96%, respectively. For sustainable rice production, weed management is pre-requisite in each rice growing systems and it should have agronomic feasibility, management capability and economic viability.

In many instances, herbicides offer the most practical, effective and economical means of reducing weed competition, crop losses and production costs. Important herbicides for transplanted rice includes butachlor 1 kg, anilofos 0.4 kg, oxadiazon 0.5 kg, cinmethyline 0.06 kg, pretilachlor 0.75, thiobencarb 1 kg, propanil 2 kg, bensulfuronmethyl 0.06 kg and quinclorae 0.4 kg. Effective weed control has been achieved in dry seeded lowland rice with anilofos 0.6 kg, butachlor 1.5 kg, butachlor + 2,4-D 1.5 + 0.5 kg, pendimethalin 1.5 kg, oxadiazon 0.785 kg, and thiobencarb 1.5 kg. The herbicides that have been reported to control weeds effectively in upland rice includes anilofos 0.6 kg, butachlor 1.5 kg, pendimethalin 1.5 kg, anilofos + 2,4-D 0.4+ 0.6 kg, pendimethalin + 2,4-D 1 + 0.6 kg, thiobencarb + 2,4-D 1+0.6 kg, oxadiazon 0.75 kg, and oxyflouren 0.5 kg. The important herbicides for controlling weeds in wet seeded rice are pendimenthalin 1 kg, anilofos 0.4 kg, butachlor 1.5 kg, oxyfluorfen 0.25, thiobencarb 1.0 kg, butachlor +safener 1+1.5 kg, bensulfuron + metsulfuron 0.0165+0.0035 and thiobencarb+propanil 1+2 kg.Tillage, planting date, seed rate, spacing, planting system and cultivar are very important in relation to weed management but they need to be scheduled according to soils and climatic conditions and, to be integrated with mechanical and chemical methods in order to help to manage the single most important constraint (weed problem) in rice production.

STUDIES ON WEED SHIFT IN DIRECT SOWN SEMI-DRY RICE BASED CROPPING SYSTEM OF CAUVERY DELTAZONE

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Field experiments were conducted during 1992-95 to study the weed dynamics in direct semi-dry rice-groundnut-greengram cropping system of Cauvery new delta zone in Tamil Nadu. *Echinochloa colonum, Cyperus rotundus* and *Trianthema portulacastrum* were found to be the dominant weed flora among the grass, sedge and broadleaved weed community in the cropping system.Thiobencarb 2.0 kg followed by 2,4-D Na Salt 1.0 kg applied to semi-dry rice significantly reduced the population of grasses and sedges in the succeeding groundnutindicating its carry-over effect and resulted in increased pod yield of groundnut (1042 kg ha^{-1}). Pretilachlor plus 0.3 kg effectively controlled the broadleaved weeds in semi-dry rice and the succeeding groundnut too due to better carry-over effect. However, the population of broadleaved weeds increased in greengram indicating the weed shift from sedges to broadleaved weeds. An increasing trend in the dominance of *Echinochloa colonum* was observed in the cropping system while the dominance of *Cyperus rotundus* reduced in the third crop of the cropping sequence viz., greengram.

CORRELATION AND REGRESSION ANALYSIS OF PADDY WEED ECOSYSTEM

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The field experiment was carried out at the Research Farm, College of Agricultural Engineering, JNKVV, Jabalpur (M.P.) during Kharif 1995. The study revealed that the weed biomass had significant positive correlation with weed population (0.995) and energy utilisation by weeds (0.999). There was inverse correlation with weed control efficiency (-0.999). The energy utilization by weeds (-1.0) exhibited highly negative correlation with weed control efficiency. The yield is highly negatively correlated with weed population (-0.946), weed biomass (-0.960) and energy utilization by weeds (-0.958). The regression analysis revealed that the highest reduction in seed yield in due to weed biomass and reduction in the yield could be predicted by 0.96 kg ha^{-1} with increase of one kg of total wed dry weight ha^{-1}. Amongst the different growth and yield parameters with yield indicated that the number of spikelets/panicle had the highest correlation coefficient (0.537). The increase in yield could be predicted by 28.41 kg ha^{-1} with the increase of one spikelet per unit area.

ECONOMICS OF WEED MANAGEMENT THROUGH TILLAGE IMPLEMENTS IN RAINFED UPLAND RICE

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An experiment was conducted during *kharif*, 1992 and 1993 at Central Rice Research Institute, Cuttack to evaluate the economics of weed management through conjunctive use of improved tillage implements (one M.B. ploughing plus two pass of cultivator, one M.B. ploughing plus two pass of disc harrow two pass of cultivator plus two pass of disc harrow and two pass of rotavator) in upland direct seeded rice.

The pooled data of two years indicate that cost of tillage and total variable cost of cultivation were higher in treatment having one M.B. ploughing plus two pass of cultivator followed by one M.B. ploughing plus two pass of disc harrow, two pass of cultivator plus two pass of disc harrow and two pass of rotavator. The cost of weeding was higher in case of two pass of cultivator plus two pass of disc harrow (Rs. 2050 ha^{-1}) followed by two pass of rotavator (Rs. 1950 ha^{-1}), one M.B. ploughing plus two pass of cultivator (Rs. 1825 ha^{-1}) and one M.B. ploughing plus two pass of disc harrow (Rs. 1225 ha^{-1}). But yield, gross net returns and gross return per rupee in vested were higher in case of two pass of rotavator as compared to other conjunctive use of improved tillage implements.

Therefore, use of rotavator may be popularised for tillage operation in rainfed upland rice to minimise the cost of weeding and total cost of cultivation and maximising profit.

EFFECT OF PRE AND POST SOWING WEED CONTROL TREATMENTS ON WEEDS & YIELD OF UPLAND DIRECT SEEDED RICE

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Field experiment with pre sowing control, desiccation of weeds with paraquat 1.0 kg ha^{-1}, desiccation of weeds with glyphosate 1.0 kg ha^{-1} and post-sowing treatments (weedy, H.W. 30 DAS, butachlor 1.5 kg ha^{-1} as pre-em, anilofos 0.3 kg ha^{-1} as pre-em, 2,4-D Na salt 0.5 kg ha^{-1} as post-em) conducted, and results revealed that pre-sowing desiccation of weed with non-selective herbicides paraquat or glyphosate 1.0 kg ha^{-1} provided effective control of weeds and better yield as compared to control treatment. H.W. 30 DAS reduced the weedy dry weight per unit area and enhanced the crop yield. Pre-sowing desiccation of weeds with paraquat or glyphosate followed by post-sowing operation of H.W. 30 DAS was most effective to reduce the weed dry wt. per unit area.

WEED SUPPRESSION STUDIES IN RICE VARIETIES

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A field experiment was conducted to study weed suppression efficiency in transplanted rice varieties grown two consecutive years in kharif season.

Echinochloa colonum, E. crusgalli, Caesulia axillaris, Ischaemum regosum and *Cyperus* spp. showed average reduction in the grain yield of rice varieties Type-3 (23%), Pant Dhan-4 (32.5) and Manhar (48%). Crop-weed competition index was low in case of Type-3 treated with butachlor 1.50 or 0.75 kg ha^{-1} in comparison to Pant Dhan-4 and Manhar.

INTEGRATED WEED MANAGEMENT IN DIRECT SEEDED RICE

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An experiment was conducted during *kharif* seasons of 1995 and 1996 at Rajendra Agril. University, Pusa (Bihar) to evaluate the feasibility of weed control methods involving summer ploughing and use of herbicides for achieving most practical and effective weed control in direct seeded upland rice. The treatments included four cultivation practices, pre sowing desiccation of weeds with Paraquat and glyphosate each @1 kg ha^{-1}, 2 summer ploughings and conventional methods of cultivation in main plots and five weed management treatments viz., butachlor 1.5 kg ha^{-1} anilophos 0.3 kg ha^{-1}; hoeing with DLA weeder (twice); use of smother crop (cowpea) and weedy check. Results indicated that pre-sowing desiccation with glyphosat lowest weed counts and weed dry weight closely followed by Paraquat. Higher dry biomass was recorded with conventional method of cultivation. Both the herbicides (butachlor/anilophos) were significantly superior to other weed control treatments. The improved cultivation practices produced significantly higher grain yield than conventional method of cultivation. Maximum grain yield was recorded under pre-sowing desiccation of weeds with glyphosate followed by paraquat and summer ploughing. Among the weed control treatments, anilophos 0.3 kg ha^{-1} being at par with butachlor 1.5 kg ha^{-1} produced significantly higher grain yield than other weed control treatments. Economic analysis showed that use of chemicals for pre-sowing desiccation of weeds followed by anilophos or butachlor application was beneficial for controlling the weeds in direct seeded upland rice.

INTEGRATED WEED MANAGEMENT IN DIRECT DRILLED UPLAND RICE IN RAINFEED SITUATIONS OF SOUTHERN RAJASTHAN.

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The field experiment was conducted in direct drilled upland rice during rainy seasons of 1995 and 1996 to find out effective systems of controlling complex flora of weeds in rainfed situations. Nineteen treatments (pre and early postemergence (8-10 d.a.s.) application of pendimethalin (1.0 and 1.5 kg ha^{-1}), Oxadiazon (0.5 and 1.0 kg ha^{-1}), Oxyfluorfen (0.1 and 0.2 kg ha^{-1}), pretilachlor with safener (0.225 and 0.375 kg ha^{-1}), manual plus mechanical weedings, weed free check and unweeded check) were tried in a randomised block design replicated thrice. Weed control treatments reduced the weed biomass to as low as 16.4 - 53.4 g/0.5 sqm as against 460.4 g/0.5 sqm in unweeded check. Herbicidal control with respect to weed control efficiency of 91.8% was superior to manual plus mechanical weedings (WCE = 85.4%). Of the four herbicides, preemergence application of Oxyfluorfen 0.2 kg ha^{-1} yielded maximum WCE (96.5%) but maximum grain yield (14.5 q ha^{-1}) was realised at its 0.1 kg ha^{-1}.

WEED MANAGEMENT IN RAINFED UPLAND RICE

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The field experiment was conducted to find out an effective method of weed control in rainfed upland rice (Var. NDR.118) at Agriculture Research Farm, Institute of Agril. Sci., BHU Varanasi during wet season of 1996. *Cyperus rotunous* was dominant weed followed by *Cynodon dactylon* and *Echinocloa sp.* At maximum tittering stage all the weed control treatments except smothering by sannhemp significantly reduced the weed biomass over control. Butachlor fb 2, 4-DNa (1.0 fb 0.6 kg ha^{-1}) was most effective in controlling *Cyperus rotundus*. All the herbicidal combination treatments registered significantly lower weed biomass as compared to their alone application. Lowest *Echinocloa sps* population was recorded with anilofos application (0.6 Kg ha^{-1} at 0-7 DARE). Weed control rating was highest with two hand weedings and comparable with combined herbicide application at tillering but at harvesting stage only butachlor fb 2, 4-D Na was comparable to two hand weedings. Highest grain yield of 2.59 t ha^{-1} was recorded with two hand weedings (20, 40 DAS) which was at par with butachlor fb 2, 4-D Na (2.06 t ha^{-1}).

EFFECT OF SOWING METHODS AND WEED MANAGEMENT ON YIELD OF RICE UNDER MID LAND (Chawar) SITUATION IN SURGUJA, M.P.

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An experiment was carried out during *kharif* season of 1996 and 1997 at IGKV, Zonal Agricultural Research Station, Ambikapur (MP) to study the effect of sowing methods and weed management on rice yield under mid land (Chawar) situation. The lehi method of rice sowing proved significantly superior to direct seeding ie. line sowing in respect of yield and weed dry weight. Butachlor 1.5 kg ha^{-1} pre-emergence + one hand weeding at 30 DAS produced highest grain yield of 3321 and 3688 kg ha^{-1} and lowest weed dry weight of 64.7 and 76.5 g m^{-2} in respective years.

BIOEFFICACY OF CYHALOFOP-BUTYL IN DIRECT SEEDED RICE

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Field experiment conducted during wet season 1997 to evaluate the bioefficacy of cyhalofop-butyl in direct seeded rice, clearly revealed that grain and straw yields under cyhalofop butyl 80 g ha^{-1} and butachlor 1.5 kg ha^{-1} were comparable and were significantly superior to unweeded check.

Post-emergence application of cyhalofop butyl 40 to 80 g ha^{-1} were significantly superior in reducing population as well as dry matter of *Echinochloa* spp. as regard to unweeded check. Cyhalofop butyl 70 and 80 g ha^{-1} was effective as butachlor and anilofos at 4 weeks after spraying, but was superior to butachlor 1500 g ha^{-1} in reducing populaiton and dry matter of *Echinochloa* spp at 8 weeks after spraying and at harvest.

Cyhalofop butyl applied 40 to 80 g ha^{-1}, butachlor 1.5 kg ha^{-1}, anilofos 400 g ha^{-1} and hand weedings at 20 and 40 days after sowing significantly reduced total weed population as well as dry matter of weeds, at 4 as well as 8 weeks after spraying as compared to unweeded check. At harvest, application of cyhalofop butyl 60 to 80 g ha^{-1} and butachlor 1.5 kg ha^{-1} proved equally effective and were superior to weedy check.

CHEMICALWEED CONTROL IN DIRECT SEEDED SHORT DURATION RICE VARIETY

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The field trails were conducted during Kharif season of 1990, 1991 and 1992 at the Agricultural Research Station, Phondaghat. Immediately after sowing, butachlor were applied at the rate of 1.5 kg ha^{-1} while anilophos was spread at 0.25 kg ha^{-1}.

The hand weeding - twice at 15 and 30 DAS gave significantly maximum yield, while anilophos and a paddy straw recorded significantly less yield. The butachlor application at 1.5 kg ha^{-1} was the next effective and profitable weed control measure and proved significantly superior over other weed control measures.

On an average, drilling, dibbing and *rahu* were at par in obtaining grain yield and were significantly superior over broadcast method.

Interaction effect between weed control measures and sowing methods showed that crop sown either by drilling or dibbling and controlling the weeds either by hand weeding or butachlor has yielded statistically equal. *Rahu* under butachlor recorded significantly lesser yield compared to hand weeding. Drilling, *rahu* and broadcast method under paddy straw and anilophos showed about equal performance but were significantly inferior over dibbling with butachlor.

EFFICACY OF PRETILACHLOR, ANILOPHOS, BUTACHLOR AND PENDIMETHALIN IN DRILLED RICE

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An experiment to study the effectiveness of the various herbicides for weed management in drilled rice was conducted at Crop Research Centre of G.B. Pant University of Agriculture & Technology, Pantnagar. Highest grain yield (50 q ha^{-1}) was recorded in weed free plots which was significantly higher than all the treatments, except two hand weedings (20 and 40 days) and Pendimethalin (1.0 kg ha^{-1} + one hand weeding, 30 days). Grain yield increased with increase in the rates of butachlor and pendimethalin. The lower rates of pretilachlor (0.5 kg ha^{-1}) and anilophos (0.3 kg ha^{-1}) were more effective as compared to their higher rates (0.75 and 0.6 kg ha^{-1}).

INTERACTION EFFECT OF PLANTING METHODS AND WEED MANAGEMENT PRACTICES IN DIRECT SEEDED RICE

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Field experiment was conducted to study the effect of planting methods and herbicide mixtures in direct seeded rice during 1995-96 at Agricultural College &Research Institute, Madurai. Weed population and weed DMP were high in wet seeded rice compared to planted rice. Herbicide mixtures was not effective as that of individual herbicides supported with hand weeding and manual weeding twice treatments. Pretilachlor 0.75 kg ha applied on 8 DAS followed by hand weeding on 30 DAS offered favourable condition for growth and yield components resulting in higher grain yield in both direct seeded and transplanted rice.

WEED MANAGEMENT IN DIRECT SEEDED UPLAND RICE

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A field experiment to evaluate the weed control measures in upland rice was conducted at the Agricultural Research Farm of Shri Durga Ji P.G. College, Azamgarh during *kharif* seasons of 1994 and 1995. Ten treatment combinations, no weeding, hand weeding, 15 & 30 DAS, thiobencarb 1.5 kg ha,$^{-1}$ thiobencarb 1.5 kg ha^{-1} + hand weeding 30 DAS, thiobencarb 1.5 kg ha^{-1} + hand weeding 15 DAS, butachlor 1.5 kg ha + hand weeding 30 DAS, butachlor 1.5 kg^{-1} + hand weeding 15 & 30 DAS) were randomly allocated in randomized block design with four replications. Both the herbicides were applied as pre emergence spray.

The dominant weed flora were Echinocloa spp., *Cyperus rotundus, Fimbristylis miliaceae, Agcratam conizoides, Phyllanthus niruri* and *Eclipta alba.* The results reveal that pre emergence application of thiobencarb 1.5 kg ha^{-1} accompanied with two hand weedings at 15 & 30 DAS produced significantly higher effective tillers/m^2, 1000 grain weight, grain yield and benefit cost ratio than other treatments.However, it remained statistically at par with butachlor 1.5 kg ha^{-1} + handweedings at 15 & 30 DAS. Nevertheless, two hand weedings at 15 & 30 DAS was found more remunerative than both the herbicides, applied without handweeding. Herbicides when supplemented with only one hand weeding produced better effects with weeding at 30 DAS.

EFFICACY OF ANILOPHOS IN RICE UNDER SANDY SOILS

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With an objective to find out the efficacy of anilophos and also to find out optimum dose for the control of weeds in rice under sandy soils tracts the experiment was carried out at Agricultural Research Station, Patgtukottai farm during the kharif and rabi seasons of 1994 and 1995. The treatments comprised of anilophos 0.40, 0.45, 0.50 and 0.60 kg ha^{-1}. This was comparable with weed free check. The mean grain yield was also higher (5648 kg ha^{-1}) in the above treatment which was 80.6 per cent more over the unweeded check (3123 kg ha^{-1}).

EFFECT OF SAFENER HERBICIDE (SOFIT) AT GRADED DOSES IN PUDDLED DIRECT SEEDED RICE

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Field experimenets were conducted at Annamalai University, Agricultural experimental farm, Annamalai Nagar during Samba (Aug - Nov. 1994) and Navarai season (Feb - May 1995) to evolve time and dose of sofit applicaiton to control the weeds udner puddled direct sown rice. Among the different doses and time, sofit 0.50 kg ha-1 at 4 DAS plus hand weeding at 25 DAS registered less weed competition which lead to higher yield parameter and grain yield.

TOLERANCE OF WHEAT VARIETIES (*Triticum aestivum* and T. *durum*) TO DOSE AND TIME OF APPLICATION OF 2, 4-D

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Field studies were carried out at the Punjab Agricultural University, Ludhiana during 1996-97 and 1997-98 to evaluate the tolerance of four wheat varieties (PBW 343, WH 542, PDW 233 and PDW 215) to three doses of 2, 4-D (0.5, 1.0 and 1.5 kg ha^{-1}) and two times of application (20 and 40 DAS) on a loamy sand soil. All the four varieties of wheat tolerated 2, 4-D upto 1.0 kg ha^{-1} when applied 40 DAS with marginal reduction in grain yield over that under 0.5 kg ha^{-1}. However, WH 542 exhibited significant reduction in grain yield under 1.0 kg ha^{-1} over 0.5 kg ha^{-1} when applied at 20 DAS. WH 542, PDW 233 and PDW 215 tolerated different doses of 2, 4-D equally under their application at 20 and 40 DAS, whereas PBW produced significantly low yield under 0.5 and 1.0 kg ha^{-1} when applied at 20 DAS as compared to that when applied at 40 DAS. Increase in dose of 2, 4-D from 0.5 kg ha^{-1} on wards caused more depression in grain yield under its early application (20 DAS) than that under late application (40 DAS).

BIOEFFICACY OF NEW HERBICIDES FOR THE CONTROL OF RESISTANT *Phalaris minor* IN WHEAT

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An experiment was conducted to find out the bioefficacy of some new herbicides i.e. clodinafop, fenoxaprop-p-ethyl and sulfosulfuron on the experimental farm of Punjab Agricultural University, Ludhiana during 1996-97 and 1997-98 for the control of isoproturon resistant *Phalaris minor* in wheat. During both years, clodinafop 60 g fenoxaprop-p-ethyl 100 ml and sulfosulfuron 25 g ha^{-1} produced grain yield at par with the recommended herbicides i.e. diclofop methyl and traikoxydim. However, during 1997-98 isoproturon 0.94 kg ha^{-1} produced significantly less grain yield as compared to new herbicides. During 1996-97 and 1997-98 all the tried herbicides showed no phytotoxic effect on wheat and provided cent per cent control of *Phalaris minor*.

EFFECT OF SOWING METHODS AND WEED MANAGEMENT PRACTICES ON YIELD RADIATION USE EFFICIENCY AND NUTRIENT UPTAKE IN WHEAT.

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An experiment was conducted during the *Rabi* season of 1993-94 at Main Experiment station of Kumarganj to study the effect of sowing methods and weed management practices on yield, radiation use efficiency and nutrient uptake in wheat. The treatments comprising 4 sowing methods (unidirectional 22.5 cm., closer 15 cm, criss-cross 22.5 x 22.5 cm and broad cost sowing) and 6 weed management practices (weedy check, pendimethalin @ 1.0 kg ha^{-1} pre-emer., 2, 4-D 1.0 kg ha^{-1}at 35 DAS, two hand weeding at 20 and 40 DAS, pendimethalin 1.0 kg ha^{-1} + one hand weeding at 35 DAS and 2,4-D 1.0 kg ha^{-1} at 35 DAS + hand weeding at 20 DAS).

Weed dry weight was minimum in closer row spacing (15 cm) followed by cris cross sowing at 22.5 x 22.5 cm. The closer row spacing (15 cm) and cris cross sowing (22.5 x 22.5 cm) significantly increased the grain weight by 18.3 and 15.7% during first year and 15.2 and 12.6% during second year, respectively compared with unidirectional sowing (22.5 cm). The straw yield, RUE and nutrient uptake also maintained similar trends.

The pre-emergence application of pendimethalin 1.0 kg ha^{-1} with one hand weeding at 35 days after sowing was at par with two hand weeding at 20 and 45 DAS in reducing the weed dry weight and enhanced the crop yield as well as RUE and nutrients uptake over rest of the weed management practices.

EFFECT OF WHEAT GENOTYPES ON WEED SUPPRESSION

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The field experiment was laid out to study the weed suppression efficacy of wheat genotypes during *rabi* season for two consecutive years at G.B. Pant University of Agriculture and Technology, Pantnagar, situated in Tarai of U.P.

Major weeds were *Phalaris minor, Chenopodium album, Melilotus* spp., *Vicia* spp. and *Anagallis arvensis*. These weeds caused average reduction in the grain yield of wheat genotypes UP 2113 (Tall), UP 2003 (semi dwarf) and HD 2113 (dwarf) 12.8, 20.2 and 28.9 per cent, respectively. In UP 2113 genotype crop-weed competition index was low as compared to the index of other two genotypes. This index was further much lowered by using the isoproturon at 1.0 or 0.5 kg ha^{-1} in all the genotypes.

HERBICIDE RESISTANCE STUDIES IN *Phalaris minor* GROWN ALONE AND IN ASSOCIATION WITH WHEAT

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Twenty-four biotypes of *Phalaris minor* collected from the farmers' fields in various districts of Punjab were grown alone and in association with wheat during *Rabi* 1997-98 at Research Farm of Punjab Agricultural University, Ludhiana. Application of sulfosulfuron 25 g, clodnatop 60 g. fenoxaprop- *p-ethyl* 100 g and tralkoxydim 0.35 kg ha^{-1} gave complete control of all the isoproturon resistant biotypes of *Phalaris*. Dry matter accumulation of all biotypes was drastically reduced in competition with wheat. None of the new herbicides showed any phytotoxic effect on the crop as indicated by statistically similar yield compared with already recommended herbicides.

STUDIES ON GROWTH STAGE SUSCEPTIBILITY OF *Phalaris minor Retz.* TO THE APPLICATION OF ISOPROTURON IN WHEAT (*Triticum aestivum* L.)

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Field studies were carried out at the Punjab Agricultural University, Ludhiana during 1994-95 and 1995-96 to study the effect of dose (0.94 and 1.2 kg ha^{-1}) and time of application of isoproturon at different growth stages of *P. minor* (Pre-em. 1-2 leaf, 3-4 leaves, 5-6 leaves and maximum tilllering stage, corresponding to L 20, 32, 49 and 67 days after sowing wheat). Highest weed control efficiency of 85.7 per cent was obtained under isoproturon 0.94 kg ha-1 applied at 3-4 leaves stage of *P. minor* with decreasing efficiency under delayed application of the herbicide. Higher dose produced no additional weed kill. Herbicide application as pre-em. and at 1-2 leaf stage of *P. minor* exhibited suppression on crop height and number of effective tillers, particularly under higher dose. Isoproturon 0.94 kg ha^{-1} applied at 3-4 leaves stage produced 43.79 q ha^{-1} grain yield of wheat, statistically at par with that under 2 hand weedings (4 and 6 WAS) and herbicide application at all the growth stages of *P. minor*. Higher dose of isoproturon invariably depressed crop yield.

Pot studies indicated highest mortality/susceptibility of *P. minor* (98.4%) under isoproturon 0.94 kg ha^{-1} application at 3-4 leaves stage, with 63.5, 90.4, 56.0 and 41.5 per cent mortality under herbicide application as pre-em, at 1-2 leaf, 5-6 leaves and maximum tillering of weed.

WEED CONTROL STUDIES ON WHEAT THROUGH CULTURAL AND CHEMICAL METHOD

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A field experiment to study the efficacy of three herbicides like isoproturon, 2-4 D (Na-salt) & 2, 4-D EE are compared to two hand weeding, cross sowing and different seed rate of Wheat CV, HP-1209 and HUW-234. The experiment was conducted in *Rabi* season for three years (1994-97) at Regional Research Station Farm, Madhopur of Rajendra Agricultural University, Bihar in split plot design keeping seed rate in main plot and weed control treatment is sub plot.

The experimental data indicated that during all the thee years of experimentation, weed control treatment caused significant reduction in dry matter accumulation of weed (51.99 g/m^2) over unweeded control having 169 g m^2 (Mean of three years). The cross sowing of Wheat produced higher grain yield followed by 2, 4-D (Na-salt) and 2, 4-D EE treated plots as dicot weed mainly lambs quart (*Chenopodium album* L.) was the dominating flora of the experimental plot. Higher seed rate of Wheat to the tune of 175 kg ha^{-1} was also found effective in reducing the dry matter of weeds which fetched a mean yield of 2114 kg ha^{-1}. The treatment combination of 175 kg ha^{-1} seed rate along with cross sowing of wheat produced the maximum grain yield being at par with 2,4-D Na salt and 2,4-D EE in all three years of experimentation.

EFFECT OF ISOPROTURON AND 2,4-D (Na Salt) ON WEEDS AND YIELD OF WHEAT

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A field experiment was conducted during winter seasons of 1996-97 and 1997-98 to evaluate the efficacy of Isoproturon and 2,4-D applied in combination at different time i.e. before and after first irrigation under calcareous soil of North Bihar. Results revealed that all the weed control treatments significantly reduced the weed dry biomass than the untreated control. Maximum weed dry weight reduction was recorded with isoproturon 0.75 kg + 2,4-D 0.5 kg ha^{-1} applied as post-em. 35 DAS. Isoproturon with 2,4-D (both tankmixed/follow on application) resulted in significantly lesser weed dry weight than isoproturon alone. All weed control treatments recorded significantly higher grain yield than unweeded check. Highest wheat grain yield was observed with hand weeding followed by isoproturon + 2,4-D applied 35 DAS. Minimum wheat yield was recorded with 21 DAS irrigated untreated control plot although it was found to be statistically at par with 28 DAS irrigated unweeded control. Higher weed control efficiency was recorded under hand weeding followed by isoproturon 0.75 kg + 2,4-D 1.0 kg ha^{-1} applied before first irrigation given at 21 DAS.

EVALUATION OF TRALKOXYDIM AGAINST ANNUAL GRASSY WEEDS IN WHEAT

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A field experiment was conducted at National research centre for weed science during *rabi* season of 1995-96 and 1996-97. The tralkoxydim was applied at 3 doses *i.e.* 200, 300 & 400 g ha^{-1} at 4 different time of application *i.e.* pre-em, 25 DAS, 30 DAS & 35 DAS. The herbicide was sprayed by dissolving in water applied @ 500 l ha^{-1}. The observation were recorded on weed population/m^2 and dry matter/m^2 at 60 DAS.

The major weed population of experimental plot conisted of *Phalaris minor, Chenopodium album* & *Medicago sp.* Other weed species of minor infestation were *Rumex, Convolvulus arvensis* and *Vicia sativa*. The application of traloxydim as post em. decreased the weed population and dry matter of weeds significantly when compared with its pre-em. application. The lowest weed population and weed biomass was recorded under tralkoxydim @ 400 g ha^{-1} applied at 35 DAS. With regard to time of application post em. application proved superior over pre-em. application. There was not much difference between 30 & 35 DAS. The aforesaid study revealed that control of annual grassy weeds was effective when the weeds were 3-4 leaf stage (30-35 DAS) and control of weeds significantly improved the grain yield of wheat.

INTEGRATED WEED CONTROL IN WHEAT

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Field experiments were conducted during *Rabi* seasons of 1993-94 and 1995-96 at IGKV, Zonal Agricultural Research Station, Ambikapur (M.P.) to find out effective weed control measure for wheat. The experiment was laid out in randomized block design with three replications having 10 weed control treatments.

The soil of experimental field was sandy loam in texture, low in organic carbon, available nitrogen and phosphorus, medium in potash and acidic in reaction with a pH of 5.4. Weed flora observed in experimental field were *Phalaris minor, Chenopodium album, Avana fatua, Vicia faba, Convolvulus arvensis, Medicago denticulata, Anagolis arvensis* and *Cynodon dactilon.*

All the weed control treatments gave significantly higher yield and low weed dry weight than weedy check. Application of isoproturon @ 1.0 Kg ha^{-1} pre-emergence + 2, 4-D, @ 0.75 kg ha^{-1} as post emergence gave significantly higher yield (2507 & 2917 Kg ha^{-1}) and less weed dry weight (51 & 42 g/m^2) than other treatments, whereas, isoproturon @ 1 kg ha^{-1} pre-emergence alone gave yield at par with one hand weeding during both the years.

EFFECT OF FERTILIZER LEVELS AND WEED MANAGEMENT ON YIELD OF WHEAT

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A field experiment was conducted at Research Farm of Rajendra Agricultural University, Bihar, Pusa (Samastipur) during two consecutive *rabi* seasons of 1996-97 and 1997-98. Four levels of fertilizer (F_1 - 0:0:0 kg NPK ha^{-1}, F_2 - 80:40:20 kg NPK ha-1, F_3 - 120:60:40 kg NPK ha^{-1}, F_4- 160:80:60 kg NPK ha^{-1}) and five weed control treatments (W_0 - Weedy check, W_1- Hand weeding (30 DAS), W_2- Isoproturon 1.0 kg ha^{-1} (post em.), W_3- 2,4-D 0.8 kg ha^{-1} (post-em.), W_4- Isoguard 0.5 kg Isoproturon + 0.125 kg 2,4-D (post-em..).

Grain yield significantly increased with increasing levels of fertilizer and was the maximum at F_3 (160:80:60 kg NPK ha^{-1}) level of fertilizer. Weed management practices significantly reduced the weed count and weed dry biomass than weedy check. All the weed control treatments recorded significantly higher grain yield than weedy check. Isoguard was equally effective for controlling the weeds and producing the grain yield as the other herbicides. In both the years, the yield obtained at each lower level of fertilizer under weed control treatments was significantly higher than the yield obtained even at higher level of fertilizers under weedy check. Thus with the adoption of weed control practices 40:20:20 kg NPK ha^{-1} could be saved.

ECONOMICS OF ADAPTIVE TRIALS OF WEEDICIDE USE ON WHEAT IN NORTHERN HILL ZONE OF CHHATTISGARH, M.P.

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Rabi fallow is a major problem of northern hill zone of Chhattisgarh. To minimise this wheat cultivation is a suitable substitute with the proper use of available irrigation water. Besides, this have assured production increase in yield and income, weed management is an effective approach. Hence for this during *Rabi* 1994-95 Adaptive trails of weedicide use on wheat crop variety WH 147 was conducted ins even location of four blocks on farmer's field of Surguja district (M.P.). The information obtained from the trails reveals that without weedicide use minimum mean yield of 2381 kg ha^{-1} was obtained which is increased to 2750 kg ha^{-1} with isoproturon and 2830 kg ha^{-1} with 2,4-D. The economics of weedicide use indicates that with the use of isoproturon and 2-4D an additional yield of 369 kg ha^{-1} and 449 kg ha^{-1} with an additional income of Rs. 1415 ha^{-1} and 3403 ha^{-1} is obtained. Thus with the increase of 8.17% cost an additional yield of 15.4% to 18.85% is obtained which increases 34.03 to 47.96% net gain and reduces production cost to 6.47% and 12.29% which is just a loss when weedicide is not used. Hence with this low cost technology farmers of tribal belt like Surguja district can increase their profit and gradually be pushed up to accept and adopt new technology for their upliftment.

EFFECT OF NITROGEN LEVELS, SEED RATES, MULCHES ON WEEDS AND YIELD OF WHEAT (*TRITICUM AESTIVUM*) VARIETIES UNDER LATE SOWN CONDITIONS.

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Field experiments were conducted during *rabi* season of 1987-88 and 1988-89 at Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur in medium black soils. The treatments comprised of nitrogen levels (90, 120 and 150 kg ha^{-1}), seed rates (100 and 150 kg ha^{-1}), mulches (soil mulch, paddy straw 10 t ha^{-1}, and saw dust 6 t ha^{-1}) and varieties Sonalika and Lok-1. The weeds were not controlled by any method and data for weed population and weed biomass were recorded at 60 days after sowing. Variety Lok-1, seed rate of 150 kg ha^{-1}, nitrogen @ 120 kg ha^{-1} and soil mulch were proved significantly superior in reducing the weed population (40.7, 41.0, 41.8 and 39.0/m^2, respectively) and weed biomass (21.2, 20.7, 21.0 and 20.1 g m^{-2}, respectively). Whereas the grain yield was significantly higher under variety Lok-1 (31.79 q ha^{-1}), 120 kg N ha^{-1} (27.78), seed rate 150 kg ha^{-1} (34.42) and paddy straw mulch (29.76).

EFFICIENCY OF DIFFERENT BRANDS OF ISOPROTURON IN CONTROLLING Phalaris minor AND OTHER WEEDS IN WHEAT

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The experiment consisting of six brands of Isoproturon viz., Pestilon, Krishak, Swadeshi, Dhar, Milran and Arelon alongwith control were evalauted in Randomized Block Design with four replications in loam soil at Crop Research Farm, Nawabganj, C.S.A. University of Agriculture and Technology, Kanpur during Rabi 1997-98.

Solutions of each brand of Isoproturon were prepared 0.75 kg ha^{-1} in 800 litre water and sprayer with high volume sprayed at 35 days after sowing. Phalaris minor, Chenopodium album and other weeds were counted before spray. Next counting of weeds was done 15 days after spray to work out the weed mortality.

Pestilon and Arelon controlled more than 90% of *Phalaris minor* whereas other brands controlled between 80-90% of this weed. Similarly all the brands controlled *Chenopodium album* and other weeds effectively.

Arelon recorded lowest dry matter of weeds (240 kg ha^{-1}) as against 5240 kg ha^{-1} in control. Other brands of Isoproturon also reduced dry matter accumulation by weeds.

The grain yield of wheat showed negative correlation with dry weight of weeds i.e. higher the grain yield, the lower was the dry weight of the weeds. Arelon gave maximum grain yield of 30.20 q ha^{-1} and lowest dry matter of weeds. The yield grain by other brands over control ranged from 2.3 to 5.10 q ha^{-1}. None of the various brands caused phyto toxic effect on wheat crop.

EFFECT OF HERBICIDES AND THEIR MIXTURES ON GRAIN YIELD AND ASSOCIATED WEEDS OF WHEAT

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A field experiment was conducted at CCS Haryana Agricultural University, Hisar, India during the winter season of 1996-97 to study the effects of fenoxaprop (80, 100 and 120 g ha^{-1}) and metribuzin (100, 200 and 300 g ha^{-1}) alone and their mixtures and isoproturon 1000 g ha^{-1}, hand hoeing (30 and 60 DAS), unweeded and clean weeded checks on the yield of wheat and associated weeds. Hand hoeing and application of herbicides alone and their mixtures controlled grassy, broad leaf weeds and total weeds significantly as compared to weedy check except fenoxaprop which did not control *C. album*. Tank mixture of fenoxaprop + metribuzin was more effective in controlling weeds as compared to their single application. In general, the effect of herbicides or their mixtures was more prominent on weed control with increase in the dose. All the herbicides and hand hoeing gave significantly more grain yield than weedy check. Fenoxaprop did not control *C. album* therefore, produced lower grain yield than other herbicides. Mixture of fenoxaprop + metribuzin at 100+100, 150+150, 67+133 and 100+200 g ha^{-1} produced grain yield more than their single herbicide application. Metribuzin 200 and 300 g ha^{-1} had some phytotoxici effect on the crop just after their application. Among herbicides, the application of fenoxaprop + metribuzin 67+133 g ha^{-1} produced maximum grain yield.

RESPONSE OF ISOPROTURON RESISTANT *Phalaris minor* BIOTYPES TO OTHER HERBICIDES

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Development of resistance in *Phalaris minor* to isoproturon has been shown to be one of the reasons for poor control of this weed with this herbicide. Response of isoproturon resistant biotypes of *P. minor* was seen to alternate herbicides namely tralkoxydim, atrazine, metribuzin, metoxuron, fenoxaprop- *p-ethyl* and clodinafop in a field study. Eight biotypes samples selected were the progenies of 45 samples screened in the previous season. The composite progeny samples were made for susceptible, partially resistant and resistant biotypes. The survivors from the isoproturon susceptible biotypes from previous season showed complete resistance to isoproturon in the following season. The behaviour of the partially resistant and resistant biotypes was same to isoproturon as observed in the previous season. The response of different biotypes to alternate herbicides was different based on population and weed dry matter indicating the phenomenon of development of cross resistance in these biotypes to different herbicides.

In a pot study these biotypes were tested for their reaction to isoproturon (1.0, 2.0, 4.0 kg ha^{-1}). The response of these biotypes was same as observed in the field. Uptake or accumulation of isoproturon was more in susceptible biotypes as compared to partially resistant or resistant biotypes observed at 7 and 15 days. At 15 days, the herbicide was non-detectable in resistant biotypes either because of lesser uptake or faster degradation of both.

SENSITIVITY OF WHEAT VARIETIES TO HERBICIDES UNDER MID HILL CONDITIONS OF N-W HIMALAYAS

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A field experiment was conducted to study the effect of recommended herbicides (pendimethalin, isoproturon and 2,4-D) on germination and crop health (seedling growth, tillering, leaf scorching, plant vigour and ear head characters) and yield of released and newly developed wheat varieties during winter seasons of 1993-94, 1994-95. A set of 36 varieties under timely sowing (15th November) and 14 varieties under the sowing (5th December) during 1993-94 and 41 varieties under timely sowing and 9 varieties under late sown condition during 1994-95 were evaluated against 2,4-D (0.5 kg ha^{-1}), isoproturon (0.75 kg ha^{-1}), pendimethalin (1.00 kg ha^{-1}) and no herbicide application conditions. Isoproturon and 2,4-D were applied at 35 days of swing whereas pendimethalin was used as pre-emergence spray. Wheat variety 'Sonalika' was used as test check. Growth parameters i.e. seedling growth, tillering, leaf scorching, plant vigour and ear head were recorded using 0-10 scale point (ascending order of number represent degree of adverse effect).

Growth observations showed no adverse effect due to isoproturon or pendimethalin application on any variety. Differential ear head deformity in wheat varieties was observed due to 2,4-D spray only. The triticale varieties were not affected adversely due to 2,4-D application. More ear head deformity was recorded in the varieties sown at 5th December than 15th November. Wheat varieties HPW 89, HS 240, HD 2380, Sonalika, HS 317, HPW 42.W HS 344, HS 345, HS 346, VL 616, HS 277, PBW 343, WL 711, HD 2329, DL 803-3, Lok 1, MACS 2694, DWR 162, KRL 1-4 under timely sowing; HS 317, VL 733, HS 295, PBW 352, Sonalika, PBW 226, HD 2285, HDR 77, HD 2624, NI 9947, DL 802-3, HD 2501 and DWR 198 under late sown condition showed susceptibility to 2, 4-D spray during 1993-94. Among these varieties, HPW-89, Sonalika, HS 317, HS 345, HS 277, PBW 343, PBW 352, DL 784-3, Lok 1, DWR 162, KRL 1-4 HS 295 and PBW 352, HS 347, VL 733, NI 9947 and DWR 195 showed fairly high degre of ear head deformity. During 1994-95 wheat varieties which showed ear head susceptibility to 2, 4-D spray were Sonalika, RL 6-3-4, VL 616, HS 277, HS 240, HS 295, PBW 362, PBW 373, WH 904, PBW 378, PBW 299, C 306, HP 1731 and Raj 3858 under timely sowing and HP 1529, HP 1744, HP 1633, C 306 and Sonalika under late sown conditions. Among these WH 904, VL 616, HS 277, HS 240 and Raj 3858 showed more ear head deformity due to 2, 4-D spray than other varieties.

EFFECT OF TILLAGE AND WEED MANAGEMENT ON GROWTH, YIELD ATTRIBUTES AND YIELD OF LATE SOWN WHEAT IN CALCAREOUS SOIL OF NORTH BIHAR

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A field trial was conducted during two consecutive years of 1993-94 and 1994-95 at Pusa Research Farm of Rajendra Agricultural University, Bihar to assess the effect of tillage and weed management on growth and yield behaviour of late down wheat in North Bihar situation. The treatments comprised of three tillage practices, reduced tillage (one M.B. ploughing + one harrowing), normal tillage (one M.B. ploughing + one discing + two harrowing) and more pulverised tillage (one M.B. ploughing + two discing + two harrowing) and two compaction treatments i.e. no compaction and compaciton with medium roller in main plots and four weed control treatments i.e. pendimethalin 1.0 kg ha^{-1} and oxyfluorfen 0.20 kg ha^{-1} as pre-emergence alongwith hand weeding and weedy check. The results revealed that weed counts and weed dry biomass were higher in reduced tillage, although it could not reach to the level of significance. Lowest weed counts and weed biomass were found with more privileged tillage alongwith compaction. Maximum weed indices were associated with weedy check and significantly lower values were recorded in hand weeding and herbicides treated plots in both the years. Significantly higher numbers of effective tillers, numbers of grains and test weight were observed in more pulverised tillage with compaciton, ultimately recorded higher grain yield than normal and reduced tillage practices. Hand weeding gave higher values of these yield attributing indices and grain yield as compared to both the herbicides but all these treatments were significantly superior to weedy check plots in both the years.

EFFECT OF SEQUENTIAL APPLICATION OF ISOPROTURON AND ILLOXON ON WEEDS AND WHEAT

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An experiment was conducted during winter season of 1996-97 and 1997-98 at Pusa Farm of Rajendra Agril. University, Bihar to evaluate the efficacy of sequential application of isoproturon and illoxon at different times in wheat for controlling the weeds and increasing the wheat yields under the agroclimatic condition of North Bihar. The results revealed that all the weed control treatments significantly reduced the weed count and weed dry weight than weedy check. Maximum reduction of weed dry biomass was observed with isoproturon Fb. illoxon @ 1.0 kg each at 20 and 35 DAS. Herbicides combinations produced significantly higher grain yield than weedy check but was found to be at par with single herbicide applied at different doses.Weed free check gave significantly higher grain yield than almost all the weed control treatments except with isoproturon Fb. illoxon @ 0.75 and 0.50 kg ha^{-1} (20 & 35 DAS) in first year whereas with (Iso. Fb. illoxon @ 1.0 & 0.75 kg ha^{-1} 20 & 35 DAS) in second year. Higher w.c.e. was recorded where iso. Fb. illoxon @ 1.0 kg each were applied.

EFFECT OF LEAVES AND TIMES OF ISOPROTURON APPLICATION ON WEED GROWTH, CHLOROPHYLL CONTENT AND YIELD OF LATE SOWN WHEAT

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A field experiment was conducted to study the effect of levels and times of isoproturon application on *Phalaris minor*, L. Retz, on growth, chlorophyll content and yield of late sown wheat at Agricultural Research Farm of Banaras Hindu University during rabi season of 1997-98. Application of isoproturon 1.0 kg ha^{-1} after first irrigation recorded more chlorophyll content and crop dry weight, and minimum weed dry weight. It was on par with application of 0.75 and 1 kg ha^{-1}, pre-emergence and 0.75 kg ha^{-1} after first irrigation at all the growth stages.

The grain yields were maximum in all the pre-emergence treatments, post emergence treatments after first irrigation and 0.75 kg ha^{-1} treatment before first irrigation, and all were on par among themselves. Application of isoproturon 1.0 and 1.25 kg ha^{-1} before first irrigation showed phytotoxic effect and recorded significantly low grain yield as compared to all other treatments, either applied pre- or post-emergence. However, all the treatments were significantly superior to weedy check except isoproturon 1.25 kg ha^{-1} applied before first irrigation.

EFFECT OF LEVELS AND TIMES OF ISOPROTURAN ALONE AND IN COMBINATION WITH 2,4-D Na SALT IN LATE SOWN WHEAT

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A field experiment was conducted at Agricultural Research farm of Institute of Agricultural Sciences, BHU, Varanasi during winter season of 1998. Two levels of isoproturan 1.0 and 1.25 kg ha^{-1} were applied alone and in combination with 2,4-D Na salt 0.5 kg ha^{-1} as pre-emergence, one week before first irrigation and one week after first irrigation. The dominant weeds were *Anagallis arvensis, Chenopodium album, Melilotus alba, Sperguta arvensis, Phalaris minor, Cyperus rotundus,* and *Cynodon dactylon.* All the treatments were effective in reducing weed dry matter and enhancing wheat yield irrespective of levels and application times over weedy check. The efficiency of herbicides were maximum when applied one week after first irrigation. The maximum reduction in dry weight of weeds were observed in the treatment with isoproturan 1.0 kg + 2,4-D Na salt 0.5 kg ha^{-1} applied after first irrigation. This treatment recorded maximum nutrient uptake as well as grain yield and minimum nutrient drain through weeds as compared to other treatments. In single application, isoproturan before and after first irrigation were more effective than pre-emergence. Under uncontrolled condition weeds depleted 28.46, 8.16, 35.86 kg ha^{-1} of N, P, and K, respectively when allowed to grow till the crop harvest.

EFFECT OF METHODS OF SOWING, SEED RATES AND WEED MANAGEMENT PRACTICES ON LATE SOWN WHEAT AND ASSOCIATED WEEDS

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A field trial was laid out at Agronomy Research Farm of the university during rabi 1997-98 in a split plot design replicated thrice keeping 3 methods of sowing viz. (a) Broadcasting, (b) Line sowing in one direction and (c) Criss-Cross sowing and 3 seed rates viz. 125, 150 and 175 kg ha^{-1} in main plots and 3 weed management practices viz. (a) weedy, (b) pendimethalin 1.0 kg ha^{-1} pre-em. and (c) isoproturon 1.0 kg ha^{-1} post-em. in sub plots. Weed density and weed dry weight were recorded at 60 days after sowing.

The results revealed that the crop was infested with 8 weed species out of which *Phalaris minor, Chenopodium album* and *Angallis arvensis* were found predominantly. Cross sowing registered significantly the lowest weed density as well as weed dry weight per unit area and the highest grain yield of crop as compared with broadcasting and line sowing in one direction. Weed density as well as weed dryweight decreased consistently with increasing seed rates from 125 to 175 kg ha^{-1}, while in case of grain yield, 150 kg seed rate was most appropriate to provide significantly higher grain yield than 125 and 175 kg seed rates. Among weed management practices, pre-emergence application of pendimethalin 1.0 kg ha^{-1} was found most effective to reduce both the weed density and weed dry weight per unit area and to enhance the crop yield as compared with weedy check and post emergence application of isoproturon 1.0 kg ha^{-1}. Cross sowing of wheat using 150 kg seed ha^{-1} in conjunction with pre-em. application of pendimethalin 1.0 kg ha^{-1} or post-em. application of isoproturon 1.0 kg ha^{-1} provided significantly higher grain yield than rest of the combinations of all the three factors, while the combination of sowing of wheat by criss-cross method using the highest seed rate of 175 kg ha^{-1} in presence of pre-em. application of pendimethalin 1.0 kg ha^{-1} or post-em. application of isoproturon 1.0 kg ha^{-1} was found promising to reduce the weed dry weight per unit area.

CRITICAL PERIOD OF WEED COMPETITION IN MAIZE HYBRID - CARGILL

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Field experiments were conducted during summer and rabi seasons of 1997 at Annamalai University, Annamalainagar in order to assess the crucial period of weed competition in hybrid maize-cargill. The crop was maintained weed-free and weed infested for the first 15, 30, 45, 60 days and till harvest. The results showed that keeping the maize crop weed-free till harvest recorded the maximum yield (43.10 kg ha^{-1}). The competition offered by weeds after 45 days of sowing did not significantly reduce the yield of maize. Similarly the weed infested condition upto 15 days of sowing did not reduce the yield significantly. Weed index was lower (7.9) where weed free condition was maintained for 45 days of sowing. So, it could be concluded that the first 15 to 45 days of crop growth was found to be the Critical Period of Weed Competition for Maize Hybrid - cargill.

EFFECT OF CHEMICAL WEED CONTROL AND NITROGEN LEVELS ON SORGHUM (*Sorghum bicolor* (L.) Moench) PRODUCTION

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A field trial was conducted during kharif 1996 at the Agronomy Farm (Jang-Ki-Bari), Rajasthan College of Agriculture, Udaipur.

The weed control treatments caused significant reduction in number of weeds, weed dry matter and nitrogen uptake by weeds over weedy check. Atrazine at 0.5 kg ha^{-1} + IC treatment was most efficient and gave weed control efficiency to the tune of 84.01 per cent. Application of atrazine at 0.1 kg ha^{-1} + IC registered significantly higher grain and stover yield over all the treatments except weed free. In compared to weedy check (9.10 q ha^{-1}), application of atrazine at 0.25 kg ha^{-1}, atrazine at 0.25 kg ha^{-1} + IC, atrazine at 0.5 kg ha^{-1}, atrazine at 0.5 kg ha^{-1} + IC and weed free treatments recorded 42.86, 97.80, 95.38, 151.20 and 150.21 per cent significantly higher grain yield of sorghum.

The maximum total weed dry matter at all the crop growth stages was recorded under 120 kg N ha^{-1}. Crop fertilized with 80 kg N ha^{-1} came out superior in all the yield attributing characters and finally gave the highest grain yield (21.28 q ha^{-1}).

The economic analysis showed that atrazine at 0.5 kg ha^{-1} + one inter-cultivation in combination with 80 kg N ha^{-1} was found to be most viable practice as sit fetched the highest net returns of Rs.13263.96 ha^{-1} with B:C ratio of 1.99:1.

STUDIES ON EXTENT OF YIELD REDUCTION DUE TO TYPES OF WEED FLORA INFESTATION IN MAIZE UNDER MID HILLS OF N-W HIMALAYA

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A field experiment was conducted during monsoon season of 1997 to find out the extent of yield reduction in maize due to types of weed flora infestation at experimental farm, Hawalbagh (1250 m amsl) of VPKAS, Almora. A set of eight treatments, consisted of grassy weeds, non-grassy weeds and sedges alone and in combinations were evaluated against weed free and weedy check (all types of weeds) treatments, in randomized block design, replicated trice. The desired types of weed flora as per treatments were maintained by removing others, manually - as and when required. *Echinochloa colomum, Brachiarea ramosa* and *Setaria glauca among grassy weeds, Ageratum conyzoides, Commelina benghalensis* and *Galinsoga parviflora* among non-grassy weeds and *Cyperus rotundus* among sedges were the major weeds which contributed more than 80 per cent of total weed population of respective groups. Allowing all type of weeds to grow throughout the maize growing period reduced yield by 84% compared to weed free condition. Grassy weeds either alone or in combination with non-grassy weeds or sedges offered the highest competition to maize crop than non-grassy weeds or sedges alone or in combination, resulting into the highest reduction in maize yield. The extent of yield reduction due to infestation of grassy weeds, non-grassy weeds and sedges alone were 84.4, 31.7 and 21.5 per cent, respectively, over weed free condition. On the other hand grassy+non -grassy weeds, grassy weeds + sedges and sedges + non-grassy weeds caused 84.8, 84.6 and 34.3 per cent, respectively yield reduction compared to weed free check treatment. Significant reduction in variable magnitude was also observed with respect to growth and yield contributing characters viz., plant height, days to silk, number of cobs, cob length and cob diameter due to type of weed flora infestation compared to weed free situation.

EFFECT OF IRRIGATION REGIMES AND WEED MANAGEMENT PRACTICES IN TRANSPLANTED FINGER MILLET

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Field experiments were conducted at Agricultural College and Research Institute, Killikulam during kharif 1995 and summer 1996 with the objective of studying the response of transplanted finger millet (Co 13) to different irrigation schedules in combination with different irrigation schedules in combination with different weed management practices. Pre-emergence herbicides were sprayed on 3 days after transplanting. The weed flora observed in the experimental field were *Echinochloa crusgalli, Cynodon dactylon, Cyperus rotundus, Cleome viscosa, Eclipta alba, Trianthema portulacastrum, Amaranthus virids, Euphorbia hirta, Phyllanthus niruri* and *Acalypha indica.* Higher irrigation regimes of 0.8 IW/CPE increased the population and dry weight of weeds than lower irrigation regime 0.4 IW/CPE. Irrigation given at higher irrigation regime of 0.8 IW/CPE ratio record higher grain yield but it was on par with irrigation scheduled at 0.6 IW/CPE ratio throughout the crop period during both the seasons. Weed management practice involving pre-emergence application of oxadiazon 0.5 kg ha^{-1} on 3 DAT + one hand hoeing on 30 DAT effectively controlled all the category of weeds and increased the yield during both the seasons.

STUDIES ON RESIDUAL EFFECT OF HERBICIDES APPLIED TO CUMIN CROP ON THE SUBSEQUENT SUMMER PEARLMILLET

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Cumin is a short duration and less irrigation requirement crop. Pearlmillet is also major crop of Gujarat grown in summer season after harvesting of rabi cumin crop wherever irrigation facilities exist. Hence, residual effect of various herbicides applied to cumin by different methods on succeeding summer pearlimillet was studied during 1997. Pendimethalin (0.75 kg ha^{-1}), fluchloralin (1.0 kg ha^{-1}), trifluralin (1.0 kg ha^{-1}), oxadiazon (0.5 kg ha^{-1}) and oxyfluorfen (0.12 kg ha^{-1}) herbicides were applied to cumin crop by different methods viz., pre-plant, herbigation, pre-emergence, 5 and 10 days after sowing. Pearlmillet crop was sown immediately after harvesting of the cumin crop. The lowest plant population (8.0%) and grain yield (604 kg ha^{-1}) of pearlmillet were recorded in the treatment of pendimethalin applied @ 0.75 kg ha^{-1} with irrigtation to cumin crop. Herbicides persisted higher when applied with irrigation water than other mode of application viz., pre-plant, pre-emergence, five and ten days after sowing. Seedlings died after germination which resulted in significant reduction in plant population and yield in herbigation method. These results indicated that pearlmillet can not successfully be taken in cumin-summer pearlmillet crop sequence where pendimethalin or fluchloralin or trifluralin is to be applied with irrigation in cumin crop. Among the herbicides, pendimethalin showed more residual effect on pearlmillet crop than others.

INTEGRATED WEED MANAGEMENT IN BARNYARD MILLET UNDER RAINFED CONDITIONS OF NORTH-WESTERN HIMALAYA

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A field experiment on integrated weed management in barnyard millet was carried out at experimental farm, Hawalbagh of Vivekananda Parvatiya Krishi Anusandhan Sansthan, Almora during kharif seasons of 1996 and 1997.

Two herbicides viz., 2,4-D Na salt (20 DAS) and isoproturon (pre-emergence) were tested @ 0.75 kg/ha alone and in combination with one hand weeding at 40 DAS or mulching (pine needles or *Cannabis sativa*) against hand weeding twice at 20 and 40 DAS and weedy check for controlling weeds in barnyard millet in randomized block design with three replications.

Weeds viz., *Echinochloa colonum, Eleusine indica, Setaria glauca, Paspalum* spp, *Ageratum conyzoides, Galinsoga prviflora, Cyperus rotundus,* and *Brachaeria ramosa* were dominated during the crop seasons. Weeds density and weed dry matter got reduced markedly in treated plots as compared to unweeded check. Hand weeding twice recorded the highest average grain yield (1804 kg ha^{-1}). Application of 2,4-D Na salt and isoproturon each @ 0.75 kg ha^{-1} alone controlled weed effectively thereby enhanced the average grain yield by 59.1 and 104.2 per cent, respectively over weedy check (665 kg ha^{-1}). Integration of manual weeding with herbicide or mulching further enhanced grain yield by 292 to 509 kg ha^{-1} and 74 to 334 kg ha^{-1}, respectively over herbicide alone. However, application of isoproturon @ 0.75 kg ha^{-1} followed by 1 hand weeding at 40 days after sowing proved more effective in controlling weeds in drilled barnyard millet and yielded (1650 kg ha^{-1}) as good as hand weeding twice and registered lowest weed biomass and weed index (8.5%). Season long weed competition reduced the average yield by 63.1 per cent as compared to hand weeding twice.

EFFECT OF DIFFERENT WEED MANAGEMENT PRACTICES ON THE PERFORMANCE OF INBRED PARENTAL LINE-CM 300 OF MAIZE HYBRID

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A field trial consisting of 11 treatments (viz. weedy check, weed free, hoeing at 20 DAS, hoeing at 20 & 40 DAS, alachlor as pre-em, alachlor + hoeing at 40 DAS, atrazine as pre-em, Atrazine + hoeing at 40 DAS, 2,4-D as post-em, alachlor + 2,4-D and atrazine + 2,4 D) was conducted during the winter season of 1997-98 to study their effect on the control of weeds in the cultivation of maize inbred parental line CM 300. It was observed that among the weed control practices atrazine (1.0 kg ha^{-1}) as pre-emergence spray + hand weeding at 40 DAS recorded the most efficient weed control (15.60 g weed dry matter/m^2) and maximum grain yield (15.66 q ha^{-1}) followed by atrazine (1.0 kg ha^{-1}) as pres-emergence spray with 2,4-D (1.0 kg ha^{-1}) as post-emergence spray (14.09 q ha^{-1}). Minimum yield (6.68 q ha^{-1}) was found with hand weeding at 20 DAS, while quite expectedly it was maximum (17.50 q ha^{-1}) with the weed free check.

INTEGRATED PRACTICES FOR WEED CONTROL IN RAINFED CORN (*Zea mays* L.)

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Hand weeding twice and pre emergence spray of atrazine-HW registered significantly minimum weed density and biomass at 60 DAS, as compared to other weed control treatments. Mechanical weeding either with power tiller drawn sweep weeder or dryland long-handle weeder with a follow-up HW could also restrict weed growth satisfactorily, but, mechanical weeding without HW was not effective. Comparatively weed free environment provided by atrazine-HW resulted better crop growth and yield (2881 kg ha^{-1}), and HW twice also gave comparable yield (2777 kg ha^{-1}). Integration of mechanical weeding with power drawn sweep weeder and HW produced 2671 kg ha^{-1}, which is at par with HW twice. Manual weeding or mechanical weeding with tools/implements without HW did not prove effective as evident from an yield loss of 15.2 to 25.2%. Being cost effective with better WCE, atrazine + HW resulted maximum B:C ratio (2.43) as compared to 2.09 with HW twice. Though, maize yields are marginally lower with power tiller drawn sweep weeder with or without HW, B:C ratios were higher (2.20 and 2.12, respectively) compared to HW twice (2.09). As manual weeding is labour intensive and chemical weeding cause environmental concern, power drawn machine weeding could prove not only cost effective, but also an alternative non-chemical method of weeding in rainfed maize.

INTEGRATED WEED MANAGEMENT IN DRILLED FINGER MILLET UNDER RAINFED CONDITIONS OF NORTH-WESTERN HIMALAYA

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A field experiment was conducted at experimental farm, Hawalbagh (1250 m amsl.) of Vivekananda Parvatiya Krishi Anusandhan Sansthan, Almora during kharif 1995 to study the effect of cultural and chemical methods of weed control on direct seeded finger millet under rainfed conditions of North-Western Himalaya.

The predominant weed species were *Ageratom conyzoides, Comelina benghalensis, Brachaeria ramosa, Cyperus rotundus, Setaria glauca, Galinsoga parviflora, Eleusine indica* and *Paspatum* spp.

The yield was reduced (91.92 per cent) when no cultural measures were used. Among the chemicals evaluated isoproturon 0.5 kg ha^{-1} produced the higher mean yield of 1007 kg ha-1 which was 42.6 and 15.3 per cent higher than no chemcals and 2,4-D Na salt, respectively. Among the cultural measures tried, hand weeding twice gave the highest grain yield (1485 kg ha^{-1}) which was 97.2 and 36.4 per cent higher than the yield obtained under two intercultivations and two intercultivations + one hand weeding, respectively. The highest mean yield (175 kg ha^{-1}) and lower weed dry weight were obtained with application of isoproturon 0.5 kg ha^{-1} followed by hand weedings twice. This treatment has registered maximum gross returns of Rs.11153 ha^{-1}. The maximum weed dry weight of 396 gms/m^2 was recorded where no herbicide and cultural measures were adopted.

REDUCTION IN COST OF PRODUCTION OF MAIZE BY ATRAZINE IN BIHAR PLATEAU

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An experiment was laidout in randomised block design in a sandy loam soil having poor fertility, replicated four times and conducted for four years, with 50, 75 and 100% recommended dose of NPK fertilizers in combination with two manually operated Doutch hoe interculturings (15 and 30 days after sowing), pre-emergence application of atrazine @ 0.5 kg ha^{-1} plus one interculturing by Doutch hoe (25 DAS), pre-emergence atrazine @ 1.0 kg ha^{-1} alone and control (No fertilizer, no interculturing).

The pooled yield data of four years of experimentations revealed that 100% NPK (costing Rs 2000/ha) with pre-emergence application of atrazine @ 1.0 kg ha^{-1} (Rs. 200/ha) produced (32.36 q ha^{-1}) was statistically similar when compared to 100% NPK (Rs 2000/ha) with two interculturings with Doutch hoe (Rs 900/ha) at 15 and 30 DAS (26.08 q ha^{-1}) or 75% NPK (Rs 1500/ha) with atrazine @ 0.5 kg ha^{-1} plus one interculturing by Doutch hoe (Rs 550/ha) at 25 DAS (28.93 q ha^{-1}) or 75% NPK (Rs 1500/ha) followed by atrazine @ 1.0 kg of fertilizer and weed management combined) were higher in the treatments receiving atrazine alone @ 1.0 kg ha^{-1} or in combination with Atrazine @ 0.5 kg ha^{-1} with one interculture as compared to 100% NPK with two inter cultivation.

EFFECT OF DIFFERENT WEED CONTROL METHODS ON THE PERFORMANCE OF SORGHUM AND SOIL HEALTH

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Field experiment was conducted during 'Kharif 94-95 at Experimental farm, annamalai University, Annamalai Nagar to Study the effect of butachlor and atrazine on the control of weeds in Sorghum. *Trianthema portulocastrum, Dactyloctenium aegpticum, Cynodon dactylo*n were dominant weeds. The treatments comprised of application of butachlor 1.5 a.i. ha^{-1}, atrazine 1.5 kga.i ha^{-1}, butachlor 0.75 kg a.i + atrazine 0.75 kg a.i ha^{-1} alone and in combination with hand weeding respectively along with weedy check and twice hand weding. Results revealed hat applicationof butachlor + artazine as tank mixture along with one hand weeding at 45 DAS controlled the weeds greatly resulting in the highest yield of sorghum. Soil residue analysis clearly showed the presistant nature of atrazine in the soil but butachlor has no residues.

EFFECT OF WEED MANAGEMENT PRACTICES ON NUT SEDGE IN RAINFED MAIZE

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A field experiment was conducted at crop Research Station, Bahraich of Narendra Deva University of Agriculture and Technology for two consecutive yeras of kharif 1995 and 1996.Weedy, weed free except *Cyperus rotundus*, weed free (complete), atrazine @ 1.0 kg ha^{-1} as pre-em., 2, 4-D Na salt @ 0.5 kg ha^{-1} at 25 DAS, glyphosate 0.8 kg ha^{-1} at 25 DAS, oxyfluorfen @ 0.15 kg ha^{-1} at 25 DAS, paraquat @ 0.5 kg ha^{-1} at 25 DAS, HW 25 DAS + atrazine @ 1.0 kg ha^{-1} as post-em. HW 25 DAS + 2, 4-=D @ kg ha^{-1} as post em., atrazine @ 1.0 kg ha^{-1} as pre-em.+glyphosate 0.8 kg ha^{-1} at 25 DAS, pendimethalin @ 1.0 kg ha^{-1} as pre-emergence. Infestation of *Cyperus rotundus* observed at 60 DAS in weed free except *C. rotundus* plot was 26.13 per cent of total weed density noted in weedy plot. Pre-emergence application of atrazine @ 1.0 kg ha^{-1} followed by post emergence aplication of gylphosate @ 0.8 kg ha^{-1} at 25 DAS was found weeds and *C. rotundus* per unit area and it suppressed *C. rotundus* by 78.13 per cent. *C. rotundus* alone registered yield reduction in rainfed maize by 26.37 and 28.17 per cent during first and second years, respectively. All the weed control treatments produced significantly higher grain yield than control. The highest grain yield of maize was obtained under complete weed freeconditions being statistically at par with the application of atrazine @ 1.0 kg ha^{-1} as pre-emergence followed by post-emergence application of glyphosate @ 0.8 kg ha^{-1} at 25 DAS.

EVALUATION OF TILLAGE AND CULTURAL PRACTICES FOR DRY LAND FINGER MILLET (*Eleusine corocana* (L) *gartn*)

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An investigation carried out at Regional Research Station, GKVK, of the University of Agricultural Sciences, Bangalore, during Kharif season of 1994-95 to study the method of seedbed preparation and subsequently followed by different methods of intercultivation under rainfed. Finger millet cultivation indicates that, use of power tiller rotovating and culltivating proved superior for seedbed preparation than conventional ploughing. The combination of wooden ploughing followed by power tiller rotovating or cultivating weed bed preparation and subsequently intercultivation done by improved bent tyne Sweephoe proved superior to achieve higher yields of dryland finger millets than conventional methods of seed bed preparation by bullock ploughing subsequently followed by intercultivation with local hoe called chipkunte.

EVALUATION OF SUITABLE HERBICIDE FOR CONTROL OF WEEDS IN PEARLMILLET (*Pennisetum glaucum*)

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A two year field was conducted at Research Farm of CCS Haryana Agricultural University, Hisar during kharif seasons of 1997 and 1998. Fifteen treatments including application of atrazine at 0.50 kg ha^{-1} as pre-emergence and post-emergence application (10 DAS) of atrazine at 0.375 and 0.50 kg ha^{-1}, alachlor at 0.75 and 1.0 kg ha^{-1}, acetachlor at 1.0 and 1.5 kg ha^{-1} and tank mixture of atrazine at 0.375 with acetachlor and alachlor each at 0.50, 0.75 and 1.0 kg ha^{-1} were compared with weed free and weedy check treatments in randomised block design replicated thrice. The field was infested mainly with *Trianthema portulacastrum, Echinochloa crusgalli, Cynodon dactylon, Cyperus rotundus, Digeria arvensis* and *Dactyloctenium aegyptium.*

All the herbicidal treatments significantly reduced the density and dry weight of weeds during both the crop seasons. Both alachlor and acetachlor applied alone did not control any of the weds except. *Trianthema protulacastrum* and *Echinochloa crusgalli* and that too only upto 50-70 per cent. However, acetachlor was better than alachlor against the prevailing weed flora. Performance of atrazine was superior when it was tank mixed with alachlor as compared to acetachlor. Among herbicides, atrazine + alachlor at 0.375 + 0.75 or 0.375+ 1.0 kg ha^{-1} applied at 10 days after sowing were at par and found to be most effective against weeds in pearlmillet. This treatment was at par with atrazine at 0.50 kg ha^{-1} applied as pre or post emergence and also to weed free check both in respect of weed control and grain yield of pearlmillet.

EFFECT OF WEEDY AND WEEDFREE CONDITIONS ON THE GRAIN YIELD OF RABI (Winter) MAIZE (*Zea mays* L.)

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A field trial was conducted to study the effect of weed competition in rabi maize during 1987-88 and 1988-89, at the Research Farm, Banaras Hindu University, Varanasi. Weed competition upto 50 DAS caused significant reduction in grain yield of maize. Keeping the crop under weedy condition after 50 DAS reduced the maize yield linearly, but it failed to have significant reduction over this treatment. Weed free upto 25 DAS showed no favourable effect on growth and yield of maize, and it was on par with weedy check. Weed free between 25-50 DAS enhanced the crop growth and produced the grain yield at par with weedfree during entire growth period. Average over two years, losses in grain yield was 50.1 per cent due to weed infestation during entire crop season. Thus, the critical period of weed competition in rabi maize (Winter season) emerged between 25-50 days of sowing.

CHEMICAL WEED CONTROL IN SOYBEAN (*Glycine max* (L;) Merill))

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A field experiment ws conducted during *Kharif* seasons of 1995 and 1996 on an alluvial soil to study the effect of different herbicides and cultural practices on weed growth, yield and yield attributes of soybean (*Glycine max* (L.) Merill). The pre-emergence application of alachlor and pendimethalin 1.50 kg/ha was comparable with two hand weedings (20 and 35 DAS) in reducing weed density, weed biomass and increased the weed control efficiency as well as number of pods per plant and weight of pods. Leaving aside the weed free treatment next in higher order was the treatment two hand weedings, which gave maximum seed yield (12.45 q ha^{-1}) followed by alachlor 1.5 kg ha^{-1}.

CHLORIMURON ETHYL : A PROMISIING HERBICIDE AGAINST SEDGES AND BROAD-LEAVED WEEDS IN SOYBEAN

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Efficacy of chlorimuron ethyl at different rates and time of application was tested in soybean during rainy seasons of 1997 and 1998 at J.N.K.V.V., Zonal Agricultural Research Station, Powarkheda.

Echinochloa crusgalli, Dinebra arabica, Rottboellia constituted major part of the weed flora. Chlorimuron ethyl gave an efficient control of sedge and all broad-leaved weeds. The grasses excepting *Rottboellia* sp., proved to be tolerant to this herbicide. The seed yields of soybean under all the treatments were significantly higher than that under control (657 kg ha^{-1}) where early application of chlorimuron ethyl proved superior but the doses of the herbicide could not have remarkable effect. Seed yield with two hand weedings were maximum (1828 kg ha^{-1}). Amongst herbicidal treatments application of chlorimuron ethyl at 3 days after sowing 6.0, 9.0 and 12.0 with the yield of 1259, 1284 and 1379 kg ha^{-1} proved superior over subsequent timings and the pendimethalin 1.0 kg ha^{-1}. Incremental net returns were maximum with two hand weedings (Rs.7289 ha^{-1}) followed by chlorimuron ethyl 12.0 g ha^{-1} (Rs.4808 ha^{-1}), 6.0 g ha^{-1} (Rs.7289 ha^{-1}) and 9.0 g ha^{-1} (Rs.4313 ha^{-1}), while the incremental benefit: cost ratio was the highest with chlorimuron ethyl 6.0 g ha^{-1} at 3 days after sowing (4.59).

INTEGRATED WEED MANAGEMENT IN SOYBEAN (*Glycine max* (L.) *Merrill*) UNDER GARDEN LAND CONDITION

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Field experiments were carried out at Tamil Nadu Agricultural University, Coimbatore during summer and kharif, 1994 to find out the suitable integrated weed management practice for soybean. The experiment was laid out in split plot design with three replications. Two levels of irrigation (0.40 and 0.60 IW/CPE ratio), three levels of plant densities (3.33, 4.44 and 6.66 lakh plants ha^{-1}) were tried as main plot treatments. The sub-plot treatments were three herbicides viz., pendimethalin, alachlor, and oxyflourfen in combination with one manual weeding at 40 days after sowing (DAS) compared with farmers practice of two hand weeding (20 and 40 DAS) and an unweeded check. Broad leaved weeds dominated the weed population followed by grasses and sedges in both the seasons. *Trainthema portulacastrum* is the dominant weed present in the plot. Alachlor 1.25 kg ha^{-1} + hand weeding (HW), HW twice and oxyflourfen 0.02 kg ha^{-1} + HW recorded higher yields accounting for 56.6, 56.7 and 47.3 per cent in summer and 60.8, 59.5 and 42.9 per cent in kharif over unweeded check. Adopting a population of 4.44 lakh plants ha^{-1} (30 x 7.5 cm) and irrigating at 0.60 IW/CPE ratio with per-emergence application of alachlor 1.25 kg $ha^{-1}$was the most effective integrated weed management practice for soybean.

INTEGRATED WEED CONTROL IN SOYBEAN

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Field experiments were conducted during kharif seasons of 1993-94 and 1994-95 at IGKV, Zonal Agricultural Research Station, Ambikapur (M.P.). The experiment was laid out in randomized block design with three replications having 9 weed control treatments.

Application of alachlor (emulsion or granules) 1.00 kg ha^{-1} + one conventional weeding (weeding by spade) at 25 DAS recorded the highest seed yield (mean yield 21.75 q/ha) and lowest weed dry weight (50 gm/m^2), though it was statistically at par with alachlor 1 kg ha^{-1} (G or E) + one hand weeding at 25 DAS (mean seed yield 1935 and mean weed dry wt. 80 g/m2). Conventional weeding at 25 DAS and pre-emergence application of alachlor 1 kg ha^{-1} (G or E) recorded seed yield and weed dry weight at par and significnatly superior to one hand weeding.

WEED CONTROL EFFICACY OF ACETOCHLOR IN SOYBEAN

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To evaluate the efficacy of acetolachlor against various annual grasses and some broad leaved weeds in soybean, an experiment was conducted at NRC-WS, Jabalpur during kharif 1997. Eight treatments comprised of acetochlor @ 0.9, 1.35, 1.80 and 3.6 kg ha^{-1} as pre-em. and alachlor 2.0 kg ha^{-1} compared with metolachlor @ 1 kg ha^{-1}, weed free and weedy check were laid out in a randomized block design.

The experimental field was infested with *Echinocloa colonum, E. crusgalli, Alternanthera sp., Commelina communis, Cichorium intybus, Cyperus rotundus, Corchorus olitorius, Ageratum conyzodies* etc. Pre-emergence application of acetochlor at all the rates reduced the population of weeds. Metolachlor @ 1 kg ha^{-1} was also effective to control these weeds. The effectivity of metolachlor and acetochlor was almost similar. The weed biomass recorded at 60 DAS revealed that acdetochlor @ 3.6 kg ha^{-1} restricted the weed growth to a significant levels and the highest weed control efficiency was observed under acetochlor at higher rate. The highest grain yield under the herbicidal application was observed with acetochlor @ 3.6 kg ha^{-1} followed by metolachlor @ 1.0 kg ha^{-1}.

EFFICACY OF HERBICIDES AND THEIR FORMULATIONS ON WEED MANAGEMENT IN SOYBEAN

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A field experiment was carried out under All India Coordinated Research Programme on Weed Control. Indira Gandhi Krishi Vishwavidyalaya during kharif 1995 and 1996 to study the comparative performance of granular and liquid formulation of anilofos, butachlor and pendimethalin in soybean. *Commelina benghalensis, Cynotis axillaris, Cynodon dactylon, Echinochloa colona. Seccharum spontaneum, Brachiaria reptans. Dinebra retroflexa as monocot weeds; Phyllanthus niruri, Euphorbia hirta, E. geniculata, Physalis minima,* Digera arvensis as dicot seeds; and Cyperus rotundus as sedge were observed in experimental field. The weed control efficiency was higher under liquid formulation than granular formulations. Granular or liquid formulations of anilofos @ 0.5 kg ha^{-1}, butachlor @ 1.0 kg ha^{-1} and pendimethalin @ 1.0 kg ha^{-1} were found equally effective in enhancing seed yield of soybean.

IMPACT OF DIFFERENT MOISTURE REGIMES, POPULATION DENSITIES AND WEED MANAGEMENT IN SOYBEAN (*Glycine max* (L.) Merrill)

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Two successive field experiments were conducted during summer and kharif seasons of 1994 at Tamil Nadu Agricultural University, Coimbatore to study the response of soybean (cv. CO1) to varying levels of irrigation with population densities and weed management methods. The experiments were laid out in split plot design with three replications. Treatment combinations of two moisture regimes viz., irrigation at 0.40 and 0.60 IW/CPE ratio and three population densities of 3.33, 4.44 and 6.66 lakh plants ha^{-1} were assigned to the main plot. The sub-plot comprised of five weed management treatments viz., unweeded check, hand weeding twice (20 and 40 DAS), pendimethalin 0.75 kg ha^{-1} + hand weeding (40 DAS), alachlor 1.25 kg ha^{-1} + hand weeding (40 DAS) and oxyflourfen 0.2 kg ha^{-1} + hand weeding (40 DAS). Broad leaved weeds dominated the total weed population (83.5 and 82.4 per cent) followed by grasses (13.7 and 14.4 per cent) and sedges (2.6 and 3.1 per cent) in summer and kharif, respectively. Moisture regimes influenced the population of broad leaved weeds, grasses and sedges. Total weed number per unit area and weed DMP was significantly higher in the high moisture regime (0.60 IW/CPE ratio). For soybean a plot density of 4.44 lakh plants ha^{-1} in 30 x 7.5 cm spacing and irrigating the crop at 0.60 IW/CPE ratio was effective in controlling weeds in soybean along with alachlor 1.25 kg ha^{-1} + hand weeding at 40 DAS.

STUDIES ON THE EFFICACY OF HERBICIDES ALONE AND ITS MIXTURES ON YIELD AND ECONOMICS OF SOYBEAN (*Glycine max* (L) Merill)

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A field experiment was conducted during Kharif 1997 at Main Research Station, in the University of Agricultural Sciences, Bangalore to study the effect of herbicides and their mixtures on Soybean yield and economics. The experimental results revealed that alachlor pre-emergence application 2.00 kg ha^{-1} and mixture of chlorimuron ethyl (CME) (0.002 kg ha^{-1}) + alachlor (1.50 kg, ha^{-1}) recorded highest seed yield (30.62 - 31.85 q ha^{-1}) and stock yield (40.85.00 - 4108 ha^{-1}), WCE (89.24 - 90.16%) and thereby resulted in maximum gross return (Rs. 2.26 - 2.33). Least values for the same was recorded in CME and pendimethalin alone.

INTEGRATED WEED MANAGEMENT IN SOYBEAN

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Field experiments were conducted for two seasons during 1994-96 at the National Research Centre for Weed Science, Jabalpur to find out the suitable integrated weed management technology in soybean. The experimental field was infested with *Echinochloa colonum* (31.8%), *Cyperus iria* (26.2%), *Commelina communis* (14.5%), *Alternanthera sessilis* (9.8%), *Euphorbia geniculata* (8.5%) and others (9.4%). All the weed control treatments significantly reduced the population and dry matter of weeds as compared to weedy check. Initially (at 40 DAS), the lowest weed growth was recorded with one hand weeding at 25 DAS but later on (at 60 DAS) fluazifop-p-butyl/sethoxydim at 0.25 kg ha^{-1} each supplemented with one hand weeding proved to be most effective against all weeds. Among the herbicidal combinations, lowest weed growth was recorded with fluazifop-p-butyl (0.50 kig ha^{-1}) + sethoxydim (0.25 kg ha^{-1}). Among different weed control treatments, mixture of fluazifop-p-butyl (0.5 kg ha^{-1}) + sethoxydim (0.25 kig ha^{-1}), being at par with fluazifop-p-butyl + sethoxydim (0.25 + 0.50 kg ha^{-1}) and integration of hand weeding with herbicides yielded significantly higher than rest of the treatments.

EFFECT OF VARIOUS APPLICATION METHODS OF ALACHLOR IN SOYBEAN

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Field experiment was carried out during kharif 1996 at JNKVV, Regional Agricultural Research Station, Sagar (M.P.) in RBD replicated thrice with eight treatments. Results revealed that the experimental field was infested with 34 weed species out of them, 26 broad leaved, 6 narrow leaved and 2 sedges were identified. Pre-emergence broadcasting of granular alachlor was found more effective to control total weeds. Granules of alachlor applied as pre-emergence reduced dry weed biomass significantly (10.23 q/ha) over others including weedy check (49.57 q/ha). Similarly, this treatment proudced significantly the highest grain yield of soybean (14.43 q/ha), followed by ppi application of EC a week prior to sowing (13.53), granular broadcasted through applicator (13.47) and by hand (13.27 q/ha). No phytoloxicity symptoms were noted on crop by applying G and EC alachlor either pre or ppi through various means.

INTEGRATED WEED MANAGEMENT IN SOYBEAN

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An experiment was conducted during 1994-95 at agricultural College farm, Rajendranagar, Hyderabad in alfisol to study integrated weed management in soybean. Six herbicides viz; alachlor, emtolachlor, pendimethalin, fluchloralin, lactofen and oxyfluorfen were evaluated in two doses in soybean.

The results indicated that all herbicides applied at lower doses followed by one interculltivation at 25 DAS gave highest weed control efficiency and highest seed yield. Weedy treatment gave lowest seed yield while two hand weedings recorded more soybean seed yield which was at par with other herbicide treatments. Among the herbicides, lactofen, oxyfluorfen, alachlor and metolachlor were found to be advantageous in controlling weeds in soybean, but lactofen gave some toxicity to soybean crop. However residue studies on sorghum after harvest of soybean did not show any residual effect on sorghum crop.

BIO-EFFICACY AND PHYTOTOXICITY EVALUATION OF ANILOFOS (5 G and 30 EC) IN SOYBEAN

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An experiment was conducted during kharif, 1995 on medium black soils at JNKVV, Regional Agricultural Research Station, Sagar (M.P.). The field trial was arranged in RBD replicated thrice with fourteen treatments to evaluate anilofos (5 G and 3- EC) in soybean for its bio efficacy and phytotoxicity.

Results revealed that the experimental field was invaded by 29 weeds comprised of 21 broad, 6 narrow leaved and 2 sedges at 45 DAS. Pre-emergence use of anilofos does not increase the soybean production by controlling existing weeds effectively but its higher dose (i.e. 2000 & 3000 g/ha) were found as effective as other recommended soybean herbicides. Present study also indicated that liquid form was superior than that of granular one. Alothough, higher doses of anilofos were found slightly phytotoxic to crop at early stage but later on (i.e. 15-20 DAS) recovery was noted.

EFFECT OF PRE-EMERGENCE HERBICIDES ON GROWTH, NODULATION, NODULE ACTIVITY AND N-FIXATION IN SOYBEAN

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Field experiment was conducted to evaluate the interaction of pre-emergence herbicides and rhizobium on legume-symbiosis in soybean (Co.1) for two seasons, *summer* and *kharif* '97 at Tamil Nadu Agricultural University, Coimbatore. The herbicide oxyfluorfen recorded the lowest dry matter accumulation of weeds at 40 DAS in both the seasons (*summer* '97 - 17.199 g/m^2, *kharif* '97 - 5.003 g/m^2) and weed control efficiency was maximum in this treatment (71.35% - 88.17% respectively).

Maximum nodule number and fresh weight of nodule was recorded in pendimethalin during *summer* (96 No./plant, 1.609 g/plant and *kharif* '97 (77 No./plant, 1.390 g/plant). Though number of nodules were less in fluchloralin treatment, nitrogenase activity measured in terms of nitrogen fixing ability was maximum in this treatment (352.01) compared to pendimethalin (337.59).

EVALUATION OF WEED CONTROL MEASURES ON THE PRODUCTIVITY OF SOYBEAN

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With an objective to evaluate the performance of different weed control measures and also to find out suitable herbicide for irrigated soybean, trials were conducted at Agricultural Research Station, TNAU, Pattukkottai farm during the Kharif seasons (June-July) of 1994 and 1995. The soil was of light sandy in nature with a pH of 6.7. The treatments comprised of three herbicides namely Fluchloralin, Pendimethalin and Metolachlor, 1.0 kg ha^{-1} individually and in combination included for evaluation, The soybean variety Co 1 was tested in this experiment. The trial was carried out in Randomised Block Design replicated three times. Weed population was observed less in metolachlor with one hand weeding treatment. The growth and yield attributes viz., plant height, number of branches per plant and number of pods per plant also more favourable in the above treatment. The metalachlor with one hand weeding treatment recorded higher net return of Rs.4670 ha^{-1} followed by hand weeding twice (Rs. 4260 ha^{-1}). Among the herbicide treatments pre emergence application of metalachlor 1.0 kg ha^{-1} with one hand weeding on 20 DAS recorded higher benefit-cost ratio of 1.68 than other treatments.

INTEGRATED WEED MANAGEMENT IN SOYBEAN

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An investigation was undertaken to evaluate the performance of fluchloralin alachlor, pendimethalin, metolachlor, lectofen, oxyfluarfen and metribuzin as pre-emergence alone and lower dose of these herbicides as pre-emergence followed by one manual weeding at 30 days after sowing. These herbicidal as well as herbicide + manual weeding treatments were compared with two weedings alone and weedy check.

Significant differences were observed among different treatments with regard to weed dry matter and soybean yield. Fluchloralin, alachlor, metribuzin, oxyfluorfen and pendimethalin each followed with one hand weeding at 30 DAS were found equally effective and significantly superior to that of these herbicides application alone and two hand weedings given at 30 and 45 days after sowing in respect of seed yield of soybean. These treatments also registered lower dry matter of weeds than application of same herbicides alone at higher rates.

EFFICACY OF VARIOUS HERBICIDES IN SOYBEAN (*Glycine max.* L)

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The field investigation was carried out during rainy season of 1993 at Research Farm of NRC - Weed Science, Jabalpur to evaluate the comparative performance of three herbicides viz. lactofen (100, 150 and 200 g/ha) as post em mertibuzoin (0.5, 0.75 and 1.0 kg ha^{-1}). metolachlor (0.5, 1.0 and 1.5 kg ha^{-1}) as pre-em. along with hand weeding (20 and 40 DAS), weedfree and control. Important weed species were *Commelina communis, Alternathera sessilis, Echinochloa colonum, Cyperus, spp., Lagasia mollis, Corchorus spp.* and *Imopea syndrica*. Herbicides at higher rates provided better weed control then their lower rates of application. All the doses of metolachlor (0.5, 1.0 and 1.5 kg ha^{-1}), higher doses of lactofesn (150 and 200 g ha^{-1}) and metribuzin (0.75 and 1.0 kg ha^{-1}) has markedly lowered weed densityand weed dry weight than weedy check and other treated plots. Uncontrolled weeds caused 39% reduction inthe grain yield of soybean. Weed free treatment led to record maximum grain yield (1565 kg ha^{-1}) followed by metolachlor 1.5 kg^{-1}.

INFLUENCE OF SOIL SOLARIZATION ON WEED MANAGEMENT IN BLACK GRAM

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A field study was conducted during summer 1998 to study the effect of soil solarization on weeds and black gram. The maximum soil temperature increased by 10.2°C and 4.8°C due to solarization with thin transparent polythene (0.05 m) and polyester muster, respectively. Decrease in total wee3d density (13.38 m^{-2}) and total weed dry weight (25.68 g m^{-1}) were noticed with soil solarization for 40 days + hand hoeing on 30 DAS and it was at par with fluchloralin 1.0 kg a.i. ha^{-1} + one hand hoeing on 30 DAS. The effect of soil solarization with polyester muster mulching on weed was inferior than thin clear ploye thylene mulching. Higher vlaues of yield attributes and yield of black gram was obtained in the plot where soil solarized for 40 days + hand hoeing on 30 DAS.

WEED MANAGEMENT IN PIGEONPEA (*Cajanus cajan* L. Mill sp.)

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To evaluate the efficacy of various herbicides for effective weed management in pigeonpea, an experiment during kharif 1996 at Crop Research Centre of G.B. Pant University of Agriculture and Technology, Pantnagar was conducted in randomized block design with three replications. Weed population at 60 days stage was contributed by Eleusine indica (47%), Echinochlos colonum (34.7%), Commelina benghalensis (3.17%) and other weeds species (12.44%). Significantly higher grain yield (23.53 q/ha) was recorded in weed free plots over rest of the treatments. Reduction in yields (57.1%) was recorded due to uncontrolled weeds. Among time of weed removal by hand weeding, hand weeding after 30 days of sowing produced significantly higher yield over 20 days hand weeded plots. Among herbicidal treatments Alachlor @ 2.0 kg/ha produced significantly higher yield (20.33 q/ha) over rest of the treatments.

EFFICACY OF MANUAL WEEDING AS AN ALTERNATIVE TO HERBICIDE SPRAY IN PIGEONPEA (*Cajanus cajan* L. Millsp.)

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The field experiment was conducted at Bahraich during the rainy season (kharif) of 1992-93 and 1993-94. Treatments consisted of 13 weed control methods, viz. unweeded, weed free, two handweeding at 25 and 60 DAS, one hand weeding at 25 DAS + interculture at 45 DAS, pendimethalin @ 1.0 kg ha^{-1} Pre-emer., pendimethalin @ 1.5 kg ha, alachlor @ 1.0 kg ha^{-1} pre-emer., alachlor @ 1.5 kg ha^{-1}, fluchalorin @ 1.0 kg ha^{-1} pre-emer, fluchloralin @ 1.5 kg ha^{-1} pre-emer., Pendimethalin @ 1.0 kg ha^{-1} + interculture at 45 DAS, alachlor @ 1.0 kg ha^{-1} + Interculture at 45 DAS and fluchloralin @ 1.0 kg ha^{-1} + interculture at 45 DAS.

Manual weeding was significantly superior to chemical weed control. The pre-emergence spray of alachlor @ 1.5 kg ha^{-1} proved superior to other herbicides. The higher dose of herbicides increased the seed and stalk yields over lower doses. Two hand weddings at 25 and 60 DAS reduced the density and dry weight of weeds in pigeonpea.

EFFECT OF WEED CONTROL TREATMENTS ON WEED FLORA AND YIELD OF PIGEONPEA (*Cajanus cajan* L.)

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A field experiment was conducted at experimental farm of NUHUSASARD, Medziphema to study the effect of various weed control treatments on weed flora and grain yield of pigeonpea during Kharif, 1992. The various weeds found in the experimental field were *Borreria hispida, Agreratum conzyoides, Setaria glauca, Euphorbia hirta. Cyperus rotundus, Cynodon dactylon* etc. The highest seed yield (1755.55 kg ha^{-1}) was recorded in weed free plots (T2) closely followed by T6 (one hand weeding at 30 days after sowing + Oxyflurofen @ 500 ml ha^{-1}) and T8 (Oxyflourofen @ 1.1 ha^{-1}). Weed density decreased with increase in seed yield. Thus, the use of herbicide (Oxyflurofen) along with one hand weeding at 30 days after sowing is necessary to keep the crop free in early stages for getting higher seed yield of pigeonpea.

PHYSIOLOGICAL SYNERGISM OF HERBICIDES FOR EFFICIENT WEED CONTROL IN MUNGBEAN

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A field experiment was conducted during *summer* '97 to evaluate physiological synergism of herbicide mixtures for pre emergence weed control in mungbean. Results on weed density and weed biomass (20 DAS) revealed that oxyflourfen (8/m^2) and in mixture with metolachlor (7.3/m^2) effectively reduced grass weed density. The broad leaved weeds (BLW) were minimum in oxyfluorfen and clomazone applied singly. At 40 DAS metolachlor had kept both grasses and BLW at a reduced density (29/m^2 and 19.3/ m^2 respectively). Synergism of herbicides mixture pendimethalin + metolachlor (0.5 + 0.5 kg at ha^{-1}) had kept the weeds under check without affecting the mungbean root membrane integrity, resulting higher SLW and CGR and grain yield among herbicide treatments tried.

EFFECT OF CULTURAL AND CHEMICAL MEHODS OF WEED MANAGEMENT IN RABI ARHAR

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A field experiment was conducted during *rabi* seasons of 1995-96 and 1996-97 at Rajendra Agril. University Farm, Pusa to study the effect of plant geometry and weed control treatments on weeds and yield of *rabi* Arhar under the calcareous soil condition of North-Bihar. The treatment comprised of six plant geometry i.e. 25 and 30 cm apart low its double row arrangement and intercropped with urdbean in double row planting alongwith three weed control treatments viz. H.W., dichlophop @ 0.75 kg ha^{-1} and weedy check in split plot design. The result indicated that weed dry biomass was not influenced by plant geometry. However, paird row plantings and intrcrop treatments gave lower weed drybiomass. Hand weeding and dichlophop reduced weed dry biomass significantly over weedy check. All planting geometry proved significantly higher seed yield than closer spacing (25 cm) except 30 cm normal row spacing. Seed yield in double line sowing (pure crop) was at par with double line sown crop intercropped with urd bean. Maximum seed equivalent yield was recorded in double line (20 : 40 x 20 cm) intercropped treatment.

ASSESSMENT OF YIELD LOSSES IN RABI PULSES DUE TO WEEDS

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A field experiment was conducted at Agronomy Research Farm of the University during rabi season of 1997-98 with an object to assess the losses in yield of chickpea, pea, lentil, rajmash and fababean due to infestation of weeds. Weed free and weedy plots were maintained for each crop. *Anagallis arvensis* infested the crop with the highest density followed by *vicia hirsuta* and *Chenopodium album* in each crop. Maximum weed density ($959/m^2$) was noted in fababean followed by chickpea ($912/m^2$), rajmash ($809/m^2$), pea ($715/m^2$) and lentil ($660/m^2$) while weed dry weight was maximum (4554 kg/ha) in rajmash followed by chickpea (4382 kg/ha), fababean (3916 kg/ha), pea (3350 kg/ha) and lentil (2280 kg/ha). Unchecked weed growth caused the highest yield loss by 92.4% in rajmash followed by 90.9% in chickpea, 90.14% in fababean, 73.7% in pea and 69.4% in lentil.

EFFECT OF WEED FLORA ON GROWTH, YIELD AND DRYMATTER PARTITIONING IN CHICKPEA CULTIVARS

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Field experiments were conducted for two consecutive winter seasons (1996-97 and 1997-98) at Agricultural Research Farm, Banaras Hindu University, Varanasi to study the effect of weed flora on growth, yield and drymatter partitioning in chickpea cultivars. The field was infested with two weed species, *Chenopodium album* L. and *Anagallis arvensis* L. at the density of 50, 100 and 200 per cent based on the chickpea population (3.3 lakhs ha^{-1}). The maximum drymatter accumulation was recorded with Avarodhi and minimum with Pant G 114. However, maximum drymatter partitioning in pods was obtained in cultivar Radhey which produced maximum grain yield as compared to Avarodhi and Pant G 114 during both years. Infestation of weed species markedly reduced the drymatter partitioning in leaf, stem and pods and consequently in grain yield compared to weed free treatment. Percent yield loss due to 200, 100 and 50 per cent weed density were 20.38, 15.33, 9.44 in first year and 10.88, 2.22, 1.59 in second year over control, respectively. Cultivar Radhey proved to be most competitive and arrested maximum weed growth and produced maximum grain yield as compared to Avarodhi and Pant G 114.

GROWTH AND YIELD OF FIELD BEAN AS INFLUENCED BY DIFFERENT WEED CONTROL METHODS

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A field experiment was conducted at Main Research Station, University of Agricultural Sciences, Hebbal, Bangalore during Summer 1994. The results indicated that better weed control in hand weeding twice has increased the growth and yield parameters as compared to any other treatments. Among the herbicidal treatment fluchloralin 1.25 Kg ha^{-1} recorded economical feasible leaf area (1529.3 cm^2 $plant^{-1}$), Pods per plant (11.6), Seeds per Pod (1.6), Seed yield (3.9 g/pl), 100 Seed weight (19.5 g $plant^{-1}$), Harvest index (12.1%), Seed yield (512.0 kg ha^{-1}) and Stover yield (3712.3 kg ha^{-1}), respectively.

EFFECT OF CROP GEOMETRY, CULTIVARS ANDWEED MANAGEMENT ON WEED AND GROWTH AND YIELD OF CHICKPEA

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Field experiments were conducted to study the effect of crop geometry, cultivars and weed management on weed and crop growth, and yield of chickpea during winter seasons of 1996-97 and 1997-98 at Agricultural Research Farm, Banaras Hindu University. The weed flora of the experimental field were *Chenopodium album* L., *Anagallis arvensis* L., *Melilotus alba Medic* and *Melilotus indica* All, *Cyperus rotundus* L. and *Phalaris minor* Retz.

Row spacing 45 cm recorded lower plant height and more crop canopy cover and weed drymatter accumulation than 30 cm row spacing. Avarodhi had maximum plant height, canopy cover and minimum weed dry weight than Radhey and Pant G 114. Weedy check recorded more plant height, low canopy cover and more weed drymatter accumulation as compared to weed free treatment. Row spacing 45 cm recorded more grain yield as compared to 30 cm row spacing. The maximum grain yield was recorded in cultivar Avarodhi and minimum in Pant G 114 during both the years. Weed free treatment recorded significantly more grain yield and increased the grain yield 37.89 and 43.05 per cent over unweeded check in first and second year, respectively.

INFLUENCE OF CULTIVARS, SOWING DATES AND WEED MANAGEMENT PRACTICES ON WEED GROWTH AND CHICKPEA YIELD

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Field experiments were carried out to study the interactive effects of cultivars, sowing date and weed control measures on growth of weeds, crop productivity and nutrient removal pattern by weeds and chickpea crop. Treatments consisted of two cultivars (Pusa 256 and Pusa 209), two dates of sowing (25th October and 9th Nov.) and five weed management practices, namely weedy check, weed free check, fluchloralim 0.75 kg ha^{-1} pre-plant incorporation, pendimethalin 1 kg ha^{-1} pre-emergence and isoproturon 0.75 kg ha^{-1} post-emergence.

Results revealed that weed population, dry matter accumulation and nutrient depletion by weeds were greatly reduced in the cultivar Pusa 209. Significantly more primary branches, dry matter production by crop as well as higher number of pods and grains/plant and nutrients uptake were recorded in Pusa 209 compared to Pusa 256.

Weed density was significantly higher in 9th Nov. sowing than 25th October sowing. CDry matter accumulation and nutrient depletion by weeds remained unaffected by sowing dates. Primary branches, number of pods and grains/plant were noted higher in 25th October sowings. Sowing dates had no influence on dry matter production, nodule number and test weight of grains. More grain yield, better harvest index and higher uptake of nutrients were found in 9th Nov. sowing.

The number of branches, dry matter production, nodule number and their dry weight, number of pods and grains/plant, test weight, grain yield, harvest index and nutrient removal by crop, were significantly enhanced in weed free condition and in all herbicide treatments. Cultivar Pusa 209 when sown on 9th November and kept comparatively weed free, appreciably arrested the drain of nutrients by weeds and pushed up the grain production to a significant level.

EFFECT OF DATE OF SOWING AND WEED MANAGEMENT IN CHICKPEA PHENOLOGY AND YIELD

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A field experiment was conducted in winter season of 1996-97 at Agricultural Research Farm of Banaras Hindu University, Varanasi. Treatments consisted of three dates of sowing, Oct. 15, 30 and Nov 15, three cultivars, Avarodhi, Radhey and Pant G 114 and two weed management treatments, weed free and weedy check. The dominant weed species were *Chenopodium album* L., *Melilotus indica* All, *Melilotus alba* Medic, *Cyuperus rotundus* L., *Anagallis arvensis* L. and *Phalaris minor* Retz.

In 15th Oct sown crop, seedling emergence, branching and flowering initiated earlier and took shorter time than 30th Oct and 15th Nov sown crop. Whereas in 15th Nov and 30th Oct sown crop maturity came earlier than 15th Oct sown crop. Plots kept under unweeded check adversely influenced the phenology of crop and brought seedling emergence, branching, flowering and maturity in shorter period than weed free treatments.

Population of weed species, *Chenopodium album* and *Cyperus rotundus* decreased with delayed sowing. Crop sown on 15th Oct recorded significantly more number of *Cyperus rotundus* than 30th Oct. and 15th Nov sown crop. Contrary to this *Phalaris minor* population was significantly higher in 15th Nov sown crop and minimum in 15th Oct crop. On an average total weed population on 30th day of sowing was maximum in 15th Oct sown crop and minimum in 30th Oct sown crop. Cultivar Avarodhi recorded minimum total weed population, whereas maximum was in Pant G 114.

The maximum grain yield (27.60 q ha^{-1}) was recorded in 15th Oct sown crop, which was significantly higher than 15th Nov (15.08 q ha^{-1}) sown crop and was at par with 30th Oct sown crop. Chickpea cultivars failed to have significant difference however, avarodhi had maximum grain yield followed by Pant G 114 and Radhey. Weed free treatment produced significantly more grain yield (25.96 q ha^{-1}) over weedy check (19.82 q ha^{-1}).

INFLUENCE OF HERBICIDES ON THE WEED FLORA IN FIELD BEAN (*LabLab Purpureus* L. Sweet)

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A Field experiment was conducted at main research station, University of Agricultural Sciences, Hebbal, Bangalore, during summer 1994, revealed that hand weeding twice (3rd and 6th week after sowing) recorded lower total weed dry weight (9.70 g/0.25 m^2) and maximum weed control efficiency (84.1%), seed yield (878.4 kg ha^{-1}). and Stover yield (5293.1 kg ha^{-1}). Among the herbicidal treatments, fluchloralin 1.0 kg * 125 kg and metolachlor 0.75 kg ha^{-1}. produced lower total weed dry weight (29.03, 27.86 and 36.56 g/0.25 m^2, respectively and seed yield 507.0, 512.0 and 508.9 kg ha^{-1}, respectively.

EFFECT OF INTEGRATED PEST MANAGEMENT IN CHIKCKPEA (*Cicer arietinum* L.)

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A field trial was conducted on chickpea with the treatments viz. pure cropping of chickpea (Radhey); pure cropping of chickpea (Avarodhi); intercropping of linseed with Radhey in 1:3 row ratio; seed treatment with carbendazim 2.5 g/kg of seed; control of pod borer with endosulfan 0.07%; weed control by pre-emergence application of pendimethalin 1.5 kg ha^{-1}; seed treatment + insect control; seed treatment + weed control; treatment ten + intercropping; treatment eleven + intercropping with Avarodhi.

Among various treatments combined application of herbicide and insecticide proved to be most effective in enhancing grain and straw yields. This treatment resulted in an increased of 6.3 q/ha (38%) and 7.8 q ha^{-1} (34%) more in grain and straw yields over control, respectively. This was followed by the pre-emergence application of pendimethalin which increased the grain and straw yields over control by a margin of 4.65 q ha^{-1} (28%) and 6.44 q/ha (28%), respectively.

STUDIES ON INTEGRATED WEED MANAGEMENT IN RAJMASH (*Phaseous Vulgaris* LINN) UNDER SANGLA VALLEY CONDITIONS OF HIMACHAL PRADESH.

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The present investigation was undertaken at Himachal Pradesh Krishi Vishvavidyalaya, Regional Research Sub Station, Sangla. Ten treatments viz. pendimethalin 1.50 kg ha^{-1}, pendimethalin 0.75 kg ha^{-1} + handweeding (30 DAS), metolachlor 1.50 kg ha^{-1}, metolachlor 0.75 kg ha^{-1} + handweeding (30 DAS), fluchloralin 1.00 kg ha^{-1}, fluchloralin 0.50 kg ha^{-1} + handweeding (30 DAS), handweeding twice (30 & 60 DAS), and unweeded check were tested in randomised block design with three replications. The weed flora that infested the crop during the crop growth period was composed of *Digitaria sanguinalis, Polygnum alatum, Malva rotundifolia, M. Verticillate, Gallinsoga parviflora, Chenopodium album, Cyperus aristatus, Capsella bursapastoris, Fagopyron essulentum* and *F. tataricum.*

RESPONSE OF RAJMASH TO NUTRIENT LEVELS AND WEED MANAGEMENT

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A field trial was conducted at the Research Farm of Rajendra Agril. University, Bihar, Pusa, to study the response of Rajmash to nutrient levels and weed management. The treatments comprised of four nutrient levels viz. (F_1) 80N,(F_2) 80 N + 40 P_2O_5; (F_3) 80 N + 40 P_2O_5 + 20 K_2O kg ha^{-1} and (F4) 75 per cent of the recommended dose applied in (F3) along with four weed management system i.e. H.W. (30 DAS), pre-emg application of alachlor and pretilochlore @ 1.5 and 0.75 kg/ha, respectively and weedy check. The results indicated that increasing nutrient levels increased the seed yield significantly. However, recommended dose of nutrients (80 : 40 : 20 kg N, P_2O_5 and K_2O/ha) was found to be at par with 75 per cent of recommended dose of nutrients. All the weed control treatments, being at apr, significantly surpassed the weedy check. Interaction between nutrient levels and weed management was found to be significant. Seed yield recorded at higher nutrient levels in weeds check was found to be similar to even the lowest fertility level in weed control treatments.

EFFECT OF SOIL MOISTURE AND WEED MANAGEMENT ON RAJMASH

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An experiment was conducted during winter seasons of 1995-96 and 1996-97 at the Research Farm of Rajendra Agril. University, Bihar, Pusa (Samastipur) to study the effect of moisture regimes and weed management on the performance of rabi Rajmash under calcareous soil condition of North Bihar. The treatments comprised of three irrigation levels i.e., one, two and three irrigations and four weed management practices i.e. H.W., pendimethalin @ 1.0 kg ai/ha (Pre-em); diehlopho @ 0.75 kg ha^{-1} (Pre-em.) alongwith weedy check. Moisture regimes did not show any marked effect on weed counts and weed dry biomass whereas, weed management treatments influenced these indices significantly. Hand weeding reduced the weed count significantly but weed dry biomass was found to be at par with chemical.

EVALUATION OF WEED STRESS ON YIELD AND YIELD ATTRIBUTES OF LENTIL (*Lens culinaris* Medic.)

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A field experiment was conducted during 1996-97 to study the competitive impact of weed species viz., *Cichorium intybus, Vicia sativa* and *Phalaris minor* at varying densities (0, 50, 100, 150, 200 and 250 m^{-2}) on yield and yield attributes of lentil. Yield and yield parameters decreased linearly with the successive increase in the population of weed species. Among the weed species *Vicia sativa* caused the maximum stress which was reflected in terms of lower values of yield and yield parameters compared to *Phalaris minor* and *Cichorium intybus*. The weed density of 50 plants m^{-2} resulted in significant reduction in yield compared to weed free plots. The yield was declined by 22, 35, 42, 51 and 63% at 50, 100, 150, 200 and 250 plants m^{-2} due to Vicia sativa while corresponding values for *Phalaris minor* and *Cichorium intybus* were 7, 22, 29, 32, 47% and 8, 11, 19, 25, 38%, respectively.

EVALUATION OF WEED CONTROL EFFICACY AND CROP TOXICITY OF LINURON IN PEAS (*Pisum sativum* L.)

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Field experiments were conducted for two seasons during winter 1994-95 and 1995-96 at Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur in medium black soils. The treatments comprised of linuron @ 0.625, 0.75, 1.0, 2.0 kg ha^{-1} as pre-emergence and compared with pendimethalin 1.0 kg ha^{-1} pre-em, isoproturon 1.0 kg ha^{-1} pre-em, one hand weeding (30 DAS) and a weedy control in randomized block design with three replications. Pre-emergence application of linuron at all the rates effectively controlled almost all the dominant broad leaf weeds viz., *Medicago hispida, Melilotus alba, Trifolium flagiferum, Chichorium intybus* and *Chenopodium album*. Among grassy weeds, *Phalaris minor* was also controlled. The efficacy increased with increase in dose. Weed control efficiency (WCE) was 67.9, 60.7, 44.7 and 28.6% under linuron applied @ 2.0, 1.0, 0.75 and 0.625 kg ha^{-1}, respectively. The WCE under pendimethalin, isoproturon were 27.2 and 17.1%, respectively as against 81.3% under hand weeding.

INTEGRATED WEED MANAGEMENT STUDIES IN GRAIN PEA.

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A field experiment of chemical and manual method of weed control in grain pea was conducted at the experimental farm of Department of Agronomy, HPKV, Palampur for three years during 1994-95 to 1996-97 to find out the effective combination. Twelve treatment combinations of isoproturon (post), linuron (pre), alachlor (pre), pendimethalin (Pre.) and metolachlor (pre) each at 1.5 kg ha^{-1} and their half doses in integration with one hand weeding, hand weeding twice (30 and 60 DAS) and unweeded check were tested. The major weeds of the experimental field were *Avena Fatua*. Phalaris minor, *Lolium temulentum* and *Vicia sativa*. Weeds in unweeded check and hand weeding twice reduced the grain yield of pea by 61.2 and 21.1 percent, respectively. Pendimethalin 0.75 kg ha^{-1} (pre.) + hand weeding being statistically at par with its higher dose of 1.5 kg ha^{-1} alone and metolachlor, alachlor or isoproturon each at 1.5 kg ha^{-1} alone or their half doses in integration with one hand weeding increased the grain yield of pea by effective control of weeds.

EVALUATION OF HERBICIDES FOR WEED MANAGEMENT IN RAJMASH (*Phaseolus vulgaris* L.) UNDER LAHAUL VALLEY CONDITIONS OF HIMACHAL PRADESH

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Due to low rainfall, coarse texture and low water holding capacity of soils, all crops are raised under irrigated conditions resulting in severe weed infestation. Therefore, preemergence herbicides metolachlor and alachlor each at 1.0 and 1.5 kg/ha and pendimethalin at 0.9 and 1.2 kg/ha were evaluated for timely and effective management of weeds in rajmash cv. Triloki for three consecutive seasons at Regional Research Station, Kukumseri.

The major weeds associated with the crop were *Chenopodium album, C. schraderanum Roem* & Schult; *C. bonus - henricus* L., *Althasa ludwigii* L; *Amaranthus* spp and *Digitaria sanguinalis* (L) Scop. The results revealed that the application of pendimethalin at 1.20 kg/ha recorded maximum grain yield (3040 kg/ha) which was significantly higher over metolachlor (1-1.5 kg/ha), alachlor 1.0 kg/ha pendimethalin 0.9 kg/ha, hand weeding and hoeing at 25 and 50 days after sowing farmer's practice (hand weeding and hoeing 30 days after sowing) and weedy check. All herbicides except metolachlor proved significantly better at higher rates than their lower rates of application.

RECENT ADVANCES IN WEED MANAGEMENT FOR GROUNDNUT IN INDIA

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Weed infestation in groundnut is one of the main factors for loss in lds to the tune of 13-80 percent. The magnitude of loss varies with locations, seasons, enotypes, planting patterns and land configuration. Weed infestation during kharif is mo. ompared with *rabi* /summer situations. The genotypic differences for weed smothering ility have also been documented and Virginia roundnut reduced weed growth more and were less susceptible to yield reduction than spanish/valencia types. The weed population decreased with decreasing row spacing and pairing of rows (30-60-30 cm) could decrease the dry matter of weeds by 26.7% compared with single row planting. Alterning land configurative like ridge and furrow, broad bed and furrow and application of mulches gave significantly less weed dry matter and increased pod yield of groundnut. The critical period of crop-wed competition is found to be 40-60 days after groundnut sowing. A number of herbicides have been evaluated in groundnut. Pre-sowing-soil incorporation of Fluchloralin (1.5 kg ha $^{-1}$), pre-emergence application of Pendimethalin (1.5 kg ha^{-1}) and post-emergency application (30 DAS) of Fluazy-fop-p-butyl (0.5 kg ha^{-1}) were found effective in controlling weeds in groundnut irrespective of locations and seasons. However, some herbicides, namely, Metalochlor (pre-emergence @ 1.0 kg ha^{-1}) in Dharward, Raichur and Virddhuachalam regions; Butachlor (pre-emergence @_0.5-0.75 kg ha^{-1}) in Digraj and Viddhachalam regions and Alachlor (pre-emergence @ 1.5 kg ha^{-1}) in Bangalore region have encouraging results for kharif groundnut. In rabi groundnut grown after paddy, pre-emergency application of Butachlor (@ 0.5 kg ha^{-1}) + Pentimethalin (@ 0.75 kg ha^{-1}) were found effective in controlling weeds. Combining these herbicides with one or two intercultural operations increased weed control efficiency and net returns of the system. In groundnut-based intercropping system, the inclusion of groundnut in pigeonpea/sorghum/maize/sunflower intercropping resulted in less number of weeds Similarly, nutrients depleted by weeds in intecropping are less than that of pure crops. Groundnut+sunflower and groundnut+sorghum intercropping only 30 days. Application of Pendimethalin or Fluchloralin @ 1.0 kg ha^{-1} were found suitable in lowering weed density and weed dry matter in intercropping. The residual effect of herbicides not he succeeding crop was also examined. When pre-emergence herbicide viz : 2-4-D, Butachlor, Pendimethalin, Oxidiazon @ 0.75 or 1.0 kg ha^{-1} and post-emergence Oxyflurofen @ 0.5 or 0.25 kg ha^{-1} were applied to rice, no significant determental effect on germination of groundnut were found. Research evidences, though limited, suggested effective weed mangement in groundnut-were found. Research evidences, though limited, suggested effective weed mangement in grundnut-based cropping systems by using suitable herbicides. However, thereis a strong need to reorient weed management programme to develop integrated weed management system combining cultural, mechanical, chemical and possibly biological components for a whole cropping system.

EFFECT OF DINITROANILINE HERBICIDES ON THE CONTROL OF WEEDS IN GROUNDNUT (*Arachis hypogea* L.)

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Results of two years field study (1996 & 1998) on Chemical Control of Weeds in Kharif groundnut conducted at CCS Haryana Agricultural University, Hisar. Trifluralin applied as PPI @ 1.0 & 1.25 Kg ha^{-1} and pendimethalin applied as pre-emergence or PPI @ 1.0 & 1.5 Kg ha^{-1} provided excellent control of Makra (Dactyloctenium aegyptium Beauv.), Carpet weed (*Trianthema portulacastrum* L.), Sawank (*Echinochloa colonum* L.) and Kondhra (*Digera arvensis* L.). None of the herbicides proved effective in controlling *Cyperus rotundus* L. Population and dry weight of weeds were significantly less in trifluralin @ 1.0 & 1.25 Kg ha^{-1} and pendimethalin applied @ 1.0 & 1.5 Kg ha^{-1} as PPI or pre-emergence. WCE calculated on the basis of dry weight of weeds showed that efficiency of trifluralin was slightly more as compared to pendimethalin at both the application rates. Presence of weeds throughout the growing season allowed a yield realisation of only 982 Kg ha^{-1} as compared to 2872 Kg ha^{-1} in weed free plots. Trifluralin and pendimethalin applied alone @ 1.0 Kg ha^{-1} when supplemented with one hoeing at 30 DAS increased the yield significantly from 982 Kg ha^{-1} (Weedy check) to 2313 and 2067 Kg ha^{-1}, respectively which was at par with two hoeings 3 & 6 weeks after sowing.

CHEMICAL WEED CONTROL IN LINSEED WITH SPECIAL REFERENCE TO CUSCUTA

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A field experiment was conducted in clay-loam soil of Jabalpur (M.P.) during winter season 1996-97 to evaluate the performance of different herbicides with special reference to cuscuta in irrigated linseed under berseem based cropping area. *Trifolium flagiferum* (55.6%), *Cichorium intybus* (7.0%), *Cyperus rotundus* (23.9%) and Cynodon dactylon (13.5%) caused their severe infestation in the crop. The appearance of *Cuscuta trifolii* was observed after 25 days after sowing (DAS) in weedy check and some other plots. Pre-emergence application of oxadiazon 0.75 kg ha^{-1}, alachlor 2.0 kg ha^{-1} were equally effective in controlling the associated weeds and they were at par to hand weeding done at 30 DAS. Thus treatments produced higher seed yield than other treatments receiving pre or post emergence application of isoproturon 1.0 kg ha^{-1}, pre-emergence application of metolachlor 1.5 kg ha^{-1}, hand hoeing at 30 DAS and weedy check, control of cuscuta was possible only with pre-emergence application of pendimethalin 1.0 kg ha^{-1}, weed control with the use of effective herbicides proved to be economically more viable than hand weeding at 30 DAS.

INTEGRATED WEED MANAGEMENT IN LINSEED UNDER MID HILL CONDITIONS OF HIMACHAL PRADESH

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A field experiment was conducted during the year 1 992-93 and 1993-94 at the Experimental Farm of Oilseed Section, H.P. Krishi Vishvavidyalaya, Palampur. The experiment was laid out in randomized block design with 3 replications. The investigation consisted of 12 treatments viz., fluchloraline 1.0 kg ha^{-1} PPI, flluchloraline 1.0 kg ha^{-1} (PPI) + one Hand Weeding 35 DAS, pendimethalin @ 0.75; 1.0, 1.25 kg ha^{-1} (Pre.), isoproturon 1.0 kgha-1 (Post), isoproturon 1.0 kg ha^{-1} (Post) + 1HW (60 DAS), isoproturon 0.75 kg ha^{-1} + 2, 4-D 0.5 kg/ha (Post) and hand weeding twice 35 DAS and 60 DAS. The variety Surabhi of linseed was grown during both the years using 50 kg ha^{-1} seed rate.

The predominant weed flora species observed during the crop growth were *Phalaris minor, Avena fatua, Lolium temulentum, Vicia sativa, Coronopus didymus* and *Anagallis arvensis*. The Phalaris minor and Avena fatua constituted major portion of weed infestation during the two years of investigations.

Application of isoproturon 1.0 kg ha^{-1} followed by one hand weeding (Post emergence) recorded significantly higher plant height, yield attributes viz., No. of capsules/plant, seeds per capsule, 1000 seed weight as well as no. of plants per hectare and seed yield of linseed during both years compared to all other treatments. Isoproturon 1.0 kg ha^{-1} post emergence and hand weeding twice was found the next best treatment in this regard. Further, the post emergence application of isoproturon was proved significantly superior to its pre-emergence application. Pre plant incorporation of fluchloraline @ 1.0 kg ha^{-1} either alone or in combination with hand weeding and pendimethalin irrespective of its doses of application (0.75 kg ha^{-1} to 1.25 kg ha^{-1}) though controlled weeds effectively and recorded significantly lower dry weight of weeds in comparison to all other treatments. However, both the chemicals caused phytotoxic effect on the crop which affect the plant population drastically (These chemicals inhibit the germination). The highest weed control efficiency (94.29%) was recorded with the application of pendimethalin @ 1.25 kg ha^{-1}, followed by fluchloraline + one hand weeding 94.2% and isoproturon 1.0 kg ha^{-1} + one Hand weeding.90.5%.

EFFECT OF WEED CONTROL MEASURES AND GENOTYPES ON INDIAN MUSTARD (*Brassica juncea*) UNDER ARID ZONE OF RAJASTHAN.

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An investigation was carried out in Jodhpur district of Western Rajasthan during 1996-97 and 1997-98 to evaluate the effect of weed control measures and varieties on the weeds and seed yield of Indian mustard.

Data recorded on weeds revealed that dominant weed sp. in unweeded plots were *Chenopodium album* L. and *Chenopodium murale* L. during both the years and comprises about 82% of total weed flora. All the weed control treatments significantly decreased weed population and dry matter accumulation as compared to weedy check. However plots receiving pre-emergence application of pendimethalin 0.50 kg ha^{-1} + one traditional weeding at 30 DAS and fluchloralin 0.50kg ha^{-1} + one traditional weeding being at par reduced maximum weed population and dry weight among all the weed control treatments. Application of pendimethalin 1.0 kg ha^{-1}, fluchloralin 1.0 kg ha^{-1} and one traditional weeding alone were inferior to aforesaid treatments.

Yield attributing characters viz Number of sliquae/plant and seeds/siliquae were recorded higher under pendimethalin 0.50 kg ha^{-1} + one traditional weeding and fluchloralin 0.50 kg ha-1 + one traditional weeding. The highest seed yield (18.41 and 17.68 q/ha) were also obtained in pendimethalin 0.50 kg ha^{-1} and fluchloralin 0.50 kg ha^{-1} each suppiemented with one traditional weeding respectively.

Varieties did not have significant response in decreasing weed population as well as dry matter production, but yield attributes and seed yield differed due to varieties. The maximum seed yield of 16.96 and 16.14q ha^{-1} were obtained with cultivar pusa bold and T-59, respectively and were significantly superior over local variety.

The highest net economic return of Rs.4905.00 and Rs. 4525.00 were obtained with pre-emergence application of pendimethalin 0.50 kg ha^{-1} + one traditional weeding and fluchloralin 0.50 kg ha^{-1} + one traditional weeding over weedy check respectively.

EFFECT OF NITROGEN LEVELS, PLANTING GEOMETRY AND HERBICIDES ON WEED GROWTH AND YIELD OF MUSTARD (*Brassica juncea* (L) Czern. and Coss.).

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Field experiments were conducted during winter seasons of 1996-97 and 1997-98 at Jabalpur to study the effect of nitrogen levels, planting geometry and herbicides on weed growth and yield of mustard CV. Pusa Jaikisan. Treatments comprised combinations of 4 N levels (0,40,80 and 120 kg ha^{-1}) and 2 planting geometry (uni and bi-direction) in main plots, while 2 herbicides viz., isoproturon 1.0 kg and oxadiazon 0.75 kg ha^{-1} as pre-emergence were compared with hand weeding at 30 DAS and weedy check in sub plots. Under bi- directional sowing, half of the seed of each plot was sown in north-south direction followed by sowing of remaining half in east-west direction. A basal application of 60 kg P_2O_5 and 40 kg K_2O and half amount of nitrogen as per treatment was done at sowing and remaining amount of N was topdressed at 40 DAS.

Weed population and dry weight of weeds were reduced drastically at 120 kg N ha^{-1} as compared to no nitrogen where as it was not affected due to planting geometry. Both the herbicides significantly reduced population as well as dry matter of weeds over weedy check. Increasing levels of N up to 120 kg N ha^{-1} significantly increased the mustard yield . Bi-directional sowing resulted in higher seed yield than uni-directional sowing. Weeds caused 26.5% reduction in seed yield of mustard. Isoproturon produced the highest seed yield but was at par with oxadiazon. However, these were significantly superior to weedy check.

WEED CONTROL STUDIES IN SESAME

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A field experiment was conducted during *kharif*, 1984, 1985 and 1986 on sandy loam soils to study the effective weed control measure for sesame. The experiment comprised of twelve treatments (pendimethalin at 0.5 kg ha^{-1}, alachlore liquid at 1.5 kg ha^{-1}, alachlore granules at 20 kg ha^{-1}, metalochlore 2.0 kg/ha alone and in combination with one hand weeding (HW) at 30 days after sowing (DAS), HW at 20 and 30 DAS and unweeded check) in randomized block design with four replications.

Three years pooled data revealed that two HW at 20 and 30 DAS (710 kg ha^{-1}), alachlore granules at 20 kg ha^{-1} super imposed with one HW at 30 DAS (713 kg ha-1) and alachlore liquid at 1.5 kg ha^{-1} super imposed with one HW at 30 DAS (670 kg ha^{-1}) gave significantly higher seed yield than compared with unweeded check (289 kg ha^{-1}) and effectively controlled the weeds. These treatments also gave higher net monetary returns (Rs/ha) of 9090, 8697, 8180 and 2491, respectively.

EFFECT OF FERTILIZER LEVELS AND WEED CONTROL MEASURES ON GROWTH AND YIELD ATTRIBUTES OF RAYA (*Brassica juncea* (L.) Czern & Cosson)

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An investigation to study the effect of fertilizer levels and weed control measures on growth and yield attributes of raya on alluvial soil at the Research Farm, College of Agriculture, Gwalior (M.P.) was conducted during *Rabi* 1996. Fertilizer levels: F_3 (100,50,40 as N, P_2O_5, K_2O kg ha^{-1}) produced significantly more primary and secondary branches/plant, test weight, oil content and protein content and proved significantly superior to F_1 (60,30,20 as N, P_2O_5 and K_2O kg ha^{-1}) but was similar to F_2 (80,40,30 as N, P_2O_5, K_2O kg ha^{-1}) in respect of growth and yield attributes. The maximum test weight, protein content, oil content and seed yield (q ha^{-1}) was obtained in S4 (pendimethalin 1 kg ha^{-1} as pre-em). Dry weight of weeds was minimum in S4 (pendimethalin 1 kg ha^{-1}) next followed by S5 (one hand weeding 20 DAS), S3 (metolachlor 1 kg ha^{-1} pre-em), S2 (Isoproturon 0.75 kg ha^{-1} as post-em) and S1 (isoproturon 0.75 kg ha^{-1} as pre-em.).

Application of Pendimethalin 1 kg/ha reduced the population/m^2 of *Asphodelus tenuifolius, Spergula arvensis* and *Cyperus iria* in mustard crop followed by S3 (Metolachlor 1 kg Pre-em). However, application of Isoproturon 0.75 kg ha^{-1} as pre & post em. showed reduced density of *Chenopodium album, Anagallis arvensis* L. and Portulaca oleracia/m^2. There was non-significant effect of fertilizer levels and weed control measures (fxs). Application of pendimethalin 1 kg ha^{-1} as pre-em. initiated more uptake of nitrogen and potash in grain, while uptake of phosphorus in grain was enhanced by isoproturon 0.75 kg ha^{-1} as pre-em, followed by pendimethalin 1 kg ha^{-1} as pre-em. and metolachlor 1 kg ha^{-1} as pre-em. However, application of pendimethalin 1 kg ha^{-1} pre-em. increased uptake of nitrogen, phosphorus and potash in straw. Within the treatment combination F_2 S_4 (80,40,30 as N, P_2O_5 and K_2O kg ha^{-1} + pendimethalin 1 kg pre-em. ha^{-1}) and F3 S$ (100,50,40 as N, P_2O_5, K_2O kg ha-1 + pendimethalin 1 kg pre-em.) proved more beneficial in giving appreciable net income per hectare in order of Rs.17502.75 and Rs.17341.69 per hectare respectively, next followed by F_3 - Si (100,50,40 as N, P_2O_5, K_2O kg ha^{-1} + isoproturon 0.75 kg ha^{-1} as pre-em.), which produced net income of Rs.15842.80 per hectare.

CROP-WEED COMPETITION STUDY IN SESAME

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The critical period of crop-weed competition varies with crop, variety, location, weed species and density. Hence, a field experiment was carried out at Regional Research Station, Vridhachalam, in North eastern zone of Tamilnadu, during Rabi'92. The crop competition with weeds for full crop season at 15 days intervals was studied. The treatments consisted of weed free upto 15, 30, 45, 60, 75 DAS and weed infestation upto 15, 30, 45, 60, 75 DAS was compared with weed free and weed infested upto harvest.

Boerhaavia diffussa and Amaranthus viridis in broad leaved weeds, *Digitaria sanguinallis* and *Dactyloctenium aegyptium* in *grasses* and *Cyperus rotundus* in sedges were the major weed flora of the experimental field. The result of the crop-weed competition experiment revealed that the lowest weed index was (1.12) recorded in weed free condition upto 75 DAS and was followed by weed free condition upto 60 and 45 DAS (1.31 and 3.19 per cent) respectively. The seed yield of sesame was highest in the treatment involving weed free condition upto harvest (1159 Kg ha^{-1}). Which was comparable with weed free condition upto 75 and 45 DAS (1146 and 1138 Kg ha^{-1}). Hence, weed free period from 30 to 45 days is the most critical period of crop-weed competition in sesame.

INTEGRATED WEED MANAGEMENT FOR SESAME (*Sesamum indicum* L.) IN DIFFERENT SOIL TYPES

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Field experiments were carried out during *Kharif* seasons of 1994 to 97 at five locations to findout the effective and economical way of weed control in sesame on different soil types. The pooled results indicated that on Inceptisol at Tikamgarh, weed free check (3 hand weeding) recorded the highest seed yield. On Vertisol at Amreli and Aridisol at Mandore, highest seed yield was obtained with hand weedings (20 and 30 DAS) But on Vertisol at Jalgaon, two hoeings and hand weedings (20 and 30 DAS) resulted in highest seed yield. On Alfisol at Vridhachalam, alachlor granules 2 kg ha^{-1} + one hand weeding (30 DAS) recorded the highest yield. Considering the economics, one hand weeding (20 DAS) at Vridhachalam, two hand weedings (20 and 30 DAS) at Amreli and Mandore, three hand weedings (20, 30 and 45 DAS) at Tikamgarh and two hoeings and hand weedings (20 and 30 DAS) at Jalgaon are recommended for effective weed management during *Kharif* season.

INTEGRATED WEED MANAGEMENT PRACTICES IN IRRIGATED SESAME (*SESAME INDICUM* L.)

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Field experiments were conducted to develop an efficient and economic integrated weed management approach in sesame to increase the productivity of sesame during Rabi'95 and Summer'96 at Agricultural College and Research Institute, Coimbatore. The experiments were laid out in strip-plot design which consisted of three seed bed preparation practices in vertical strips viz.; stale bed preparation, non-stale bed preparation and conventional bed preparation and eight weed control methods in horizontal strips viz.; pre-emergence application of alachlor at 1.5 Kg ha^{-1} by spraying with and without hand weeding (30 DAS), sand mix application of alachlor 1.5 Kg ha^{-1} with and without hand weeding (30 DAS), Hand Weeding. 20 DAS + sand mix application of alachlor 1.0 Kg ha^{-1}, Hand Weeding (20 DAS) + alachlor 1.0 Kg ha^{-1} through irrigation water were compared with hand weeding twice and unweeded check.

The results of the experiment revealed that stale bed preparation in conjunction with sand mix application of alachlor at 1.5 Kg ha^{-1} + 1 HW (30 DAS) or stale bed preparation in combination with spraying of alachlor at 1.5 Kg ha^{-1} + 1 HW (30 DAS) reduced the weed population, weed DMP and removal of nutrients by weeds and thereby significantly increased weed control efficiency, weed control index and yield of sesame (1705 and 1697 kg ha^{-1}) and they were on par with stale bed preparation + hand weeding twice (1789 kg ha^{-1}).

YIELD OF INDIAN MUSTARD [*Brassica juncea* (L.) Czern & Coss]

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A field study was undertaken to assess the efficacy of hand weeding, few herbicides and sulphur levels on chlorophyll content of leaves, oil percentage of seeds and oil yield of Indian Mustard. The experiment was conducted during winter seasons of 1993-94 and 1994-95 at Udaipur. Twenty four treatment combinations consisted of six weed control practices (weedy check, one hand weeding 30 DAS and pendimethalin 0.75, kg/ha pre-emergence) and four S levels (0, 30, 60 & 90 kg/ha).

The chlorophyll content of fresh mustard leaves at 30 DAS remained unaffected by weed management whereas at 60 DAS a slight reduction of chlorophyll was registered with oxyfluorfen. The oil content of mustard seed was not affected significantly during both the years. Oil yield was significantly increased by various weed control practices over weedy check. On pooled basis weed control through oxadiazon produced 693 kg ha^{-1} oil which was significantly superior over all other weed management practices. Hand weeding (640 kg ha^{-1}), oxyfluorfen (638 kg ha^{-1}) and pendimethalin (620 kg ha^{-1}) were statistically at par and stood next in the order of merit behind oxadiazon. Isoproturon (585 kg ha^{-1}) lagged behind other weed control practices but it was significantly superior over weedy check (406 kg ha^{-1}). Application of 90 kg S ha^{-1} tended to increase chlorophyll content over preceding S levels while significantly higher oil content (41.15%) was registered with 60 kg S ha^{-1}. Similarly 60 kg S ha^{-1} increased oil yield significantly by 33.7% over control (486.8 kg ha^{-1}).

EFFECT OF WEED MANAGEMENT ON WEEDS, PEST INCIDENCE AND SEED YIELD OF SESAME (*Sesame indicum* L.)

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The weed intensity and incidence of major pest (*Antigastra cataunalis* Dup.) was recorded before harvest of the crop. Results : Dominant weed species were *Ageratum conzyoides* L., *Cyperus rotundus* L., *Echinochloa crusgalli* (L.) *P.Beauv.*, *Pancium psilipodium* Trin., *Chloris barbata* Swartz., *Cynodon dactylon* pers., *Sataria glauca* Beauv., *Celosia argentea* L., *Amaranthus spinosus* L., *Phyllanthus niruri* L., *Echinops echinatus* DC., *Euphorbia hirta* L., *Eclipta alba* L., *Commelina benghalensis* L. The weed free condition (3 HW at 20, 30 and 45 DAS) significantly reduced the weed intensity and weed biomass. Pre emergence application of herbicides + one hand weeding at 30 DAS showed the weed control efficiency at par with two hand weedings at 20 and 30 DAS and also alone metolachlor 1.0 kg ha^{-1} and alachlor 1.5 kg ha^{-1} application as pre em. The incidence of major pest (*Antigastra catalaunalis* Dup.) in sesame also showed declining trend with decreasing intensity of weeds and resulted lowest (13.3%) capsule damage under weed free condition and also reduction in other treatments. The seed yield of sesame was recorded significantly higher under weed free condition (380 kg ha^{-1}) among all the treatments. Integration of herbicides and one hand weeding at 30 DAS gave at par seed yield with two hand weedings (305 kg ha^{-1}) and alone application of alachloor 1.5 kg ha^{-1} as pre em. Application of metolachlor showed phytotoxic effect on sesame and significantly reduced the seed yield of sesame.

EVALUATION OF INTEGRATED WEED MANAGEMENT PRACTICES IN IRRIGATED GROUNDNUT

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Field experiments were conducted at Agricultural Research Station, Bhavanisagar during summer 1996, 1997 and 1998. The experimental soil was red sandy loam. The treatments constituted pre emergence application of fluchloralin 1.0 kg ha^{-1}, pendimethalin 1.0 kg ha^{-1}, metolachlor 1.5 kg ha^{-1} and alachlor 2.0 kg ha^{-1} compared with peg type weeder, farmer's practice of two manual weedings and unweeded control. A manual weeding at 40 DAS was given in all herbicidal treatments for integration. The pooled analysis of yield data revealed that pendimethalin 1.0 kg ha^{-1} recorded the highest pod yield of groundnut followed by fluchloralin 1.0 kg ha^{-1} and alachlor 2.0 kg ha^{-1}.

EFFECT OF INTEGRATED WEED MANAGEMENT PRACTICES UNDER VARIED POPULATIONS ON WEED CONTROL AND POD YIELD OF GROUNDNUT

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Metolachlor applied as pre-emergence spray 1.0 kg ha^{-1} increased the pod yield of groundnut in an integrated weed management study conducted during summer 1992 in coastal ecosystem of Brahmavar (3874 mm annual precipitation) in Karnataka by 64 percent over unweeded control and by 11 percent over hand weeding treatment. Fluchloralin applied at 1.0 kg ha^{-1} as pre-emergence spray failed to produce similar increase, as it could not successfully control the growth of sedges (61.5 weeds/0.25m^{-1}) as compared to metolachlor applied at same rate. Combination of fluchloratin applied at 0.5 kg ha^{-1} of one hand weeding at 20 DAS could successfully reduce the population of sedges and thus resulted in statistically on par pod yields as compared to similar treatment using metolachlor or application of metolachlor alone at 1.0 kg ha^{-1}. However, application of 0.25kg ha^{-1} fluazifop-p-butyl at 25 DAS in replacement of one handweeding could not produce the desirable level of weed control. Besides, the numerical suppression of sedges by metolachlor applied at 1.0 kg ha^{-1}, the herbicide was successful in reducing the dry weight of weeds at all the stages of growth consistently till harvest as compared to unweeded control.

The Closer spacing of 30cm x 10cm could consistently reduce the weed population and dry weed weight of grasses and sedges at all the stages as compared to wider spacing of 45cmx10cm.

Further, these herbicides did not have any residual detrimental effect on green gram crop raised immediately after groundnut. The study on oxisols indicated that germination percentage, root length, root dry matter, shoot length, shoot dry matter of greengram remained statistically on par till 30 DAS in both treated and untreated plots. The study also indicated that post emergence application of fluazifop-p-butyl @ 0.25 kg ha^{-1} 25 DAS succeeding the pre-emergence application of fluchloralin or metolachlor to groundnut crop also had no detrimental effect on green gram crop till 30 DAS.

WEED CONTROL STUDIES IN SUNFLOWER (*Helianthus annuus* L.) CULTIVARS UNDER DIFFERENT SPACING

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An experiment was carried out for three years in *Rabi* season of 1993-96 at Regional Research Station farm, Madhopur of Rajendra Agricultural University, Bihar to investigate the efficiency of different spacing, hand weeding and pre plant soil incorporation of fluchloralin at 1 kg ha^{-1} in different cultivars of sunflower. The dominant weed flora comprised of lambs quart (*Chenopodium album* L.), Bermudagrass (*Cynodon dactylon* L.) and nut sedge (*Cyperus rotundus* L.).

The result revealed that one hand weeding and pre plant soil incorporation of fluchloralin at 1 kg/ha drastically curtailed the dry matter accumulation of weed to 35.01 and 52.1 g/m^2, respectively over unweeded control (151.10 g/m^2). Pre plant soil incorporation of fluchloralin at 1 kg ha^{-1} registered higher mean seed yield of 1025 kg ha^{-1} (average of three years) over unweeded control (826 kg ha^{-1}) whereas one hand weeding at 30 days after sowing fetched a mean seed yield of 958 kg ha^{-1}. Among the cultivars, AH 3425 which was tested only in the lst year of experiment produced the higher seed yield of 1080 kg ha^{-1} but later MSFH-8 produced 985 kg ha^{-1} (mean of two years) which out yielded MSFH-110)959 kg ha^{-1}). The spacing 60 cm x 20 cm was found superior to spacing 75 cm x 20 cm in all the three years of experimentation in boosting the yield of sunflower.

WEED CONTROL STUDIES IN INDIAN MUSTARD (*Brassica juncea* L.) IN RELATION TO NITROGEN LEVELS.

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A field experiment was conducted at agronomy Research Farm of N.D.University of Agriculture and Technology, Kumarganj, Faizabad, during the winter seasons of 1996-97 and 1997-98 in a 3 replicated split plot design. The study involved 4 nitrogen levels (0,40,80 and 120 kg ha^{-1}) in main plots and 8 weed management practices (Weedy, weed free, H.W.20 and 40 DAS, HW 30 DAS, pendimethalin @ 1.0 kg ha^{-1} as pre-emergence, metholachlor @ 1.0 kg ha^{-1} as pre-em, pendimethalin @ 1.0 kg ha^{-1} as pre-emergence + HW 30 DAS and metolachlor @ 1.0 kg ha^{-1} as pre-em + HW 30 DAS) in sub plots. The pre-dominant weeds in control plot of the experimental field included *Cyperus rotundus, Cynodon dactylon, Anagallis arvensis, Phalaris minor, Chenopodium album, Melilolus indica, Polygronum plebejum* and *Vicia sativa*. Weed density reduced and dry weight increased consitantlywith increasing doses of nitrogen upto 120kg ha^{-1}. H.W.20 and 40 DAS being at par with pre-emergence application of pendimethalin @ 1.0 kg ha^{-1}HW 30 DAS was found most effective to reduce both weed density and weed dry weight per unit area as compared with the remaining weed management practices.l all the weed control treatments registered significantly higher seed yield than control. The highest seed yield of Indian mustard was obtained under weed free conditions which was comparable with H.W.20 and 40 DAS and pendimethalin 1.0 kg ha^{-1} as pre emergence mustard by 47.53 and 47.47 per cent during first and second years, respectively. The interaction effect of 120 N/ha and pendimethalin applied as pre-emergence @ 1.0 kg ha^{-1} supplemented with one hand weeding at 30 DAS being at par with the combinations of HW 20 and 40 DAS and 120 Kg N ha^{-1} showed its superiority over rest of the combinations of both the factors.

EFFECT OF SOIL SOLARIZATION ON WEED CONTROL, GROWTH AND YIELD OF GROUNDNUT

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A field experiment was conducted during 1997-98 to study the effect of soil solarization on weed control and the perfomance of groundnut in sandy loam soils at Agronomy field unit, Main research Station, University of Agricultural Sciences, Bangalore.

The maximum soil temperature was recorded by TPE 0.05 mm for 45 days (52.19_c) and least was in coontrol (37.25°c) in general TPE 0.05 mm recorded higher temperature than TPE 0.10 mm in all the treatments.

The results of the study revealed that there was significant reduction in weed count and dry weight even up to the harvest of groundnut due to soil solarizaiton compared to control. TPPE 0.05 mm for 45 days recorded higehr dry weight of leaves (0.75 to 3.15 g plant^{-1}), stem (0.56 to 4.19 g plant^{-1}_, pod (4.98 to 10.98 g plant^{-1}) and total dry weight (1.31 to 18.32 g palnt^{-1}) followed by alachlor 1.5 kg ha^{-1} and one hand weeding.

All solarized treatments recorded significatly higher pod yield than control. TPE 0.05 mm for 45 days recorded higher pod yield (18.98 q ha^{-1}) compared to TPE 0.10 mm for 45 days (15.06 q ha^{-1}) and which is one par tiwht alachlor 1.5 kg ha-1 (19.40 q ha^{-1}) and one hand weeding (18.99 q ha^{-1}). Twice hand weeding recorded significantly higher yield (23.96 q ha^{-1}) over alll the treatments.

EFFICACY OF FLUAZIFOB-BUTYL (FUSILADE) FOR WEED CONTROL IN RAINFED GROUNDNUT (*Arachis Hypogaea* L.)

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A field study was conducted at Oilseeds Research Station,T N A U, Tindivanam during the rain fed seasons of 1990-91 to find out the efficacy of the new herbicide fusilade for weed control in groundnut. The trial consists of eight treatments viz., Fusilade at two levels 0.125 and 0.250 kg ha^{-1} applied both as pre and post emergence spray, Fluchloralin @ 1.00 kg ha^{-1}, farmers practice (2 Hand weeding on 20 and 45 DAS) weed free check and un weeded check. The dominant weeds of the trial plots were *Cyperus iria* L. and *Cyperus rotundus* L. amongst sedges, Cyanodon dactylon pers and Panicum repens among grasses *Trianthema portulocastrum* L., *Cleome viscosa* and *Phyllanthus niruri* amongst broad leaved weeds. The results of the study indicated that fusilade applied 0.250 kg ha^{-1} (2 lit./ of chemical) as post emergence spray (15 DAS) followed by one hand weeding and earthing up on 45 DAS exhibited good control on annual grasses and recorded higher pod yield (753 kg ha^{-1}).

PRELIMINARY STUDIES ON HERBICIDAL CONTROL OF *Portulaca* Spp. IN YOUNG PLANTATION OF BANANA

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A field experiment was undertaken during kharif 1996 on sandy loam soil at Anand to assess the efficacy of various herbicides and its combination for controlling *Portulaca* spp. (*P. quadrifida* and *P. oleracea*) and other weeds in the young plantation of banana (cv. Basarai). The field was dominated by *Portulaca* spp. *Chenopodium album, Amaranthus spinosus, Phyllanthus niruri, Trianthema monogyna, Elensine indica, Echinochloa crusgali* and *Cyperus rotundus.*

The treatments were pre-emergence spray of diuron (0.5 and 1.0 kg ha^{-1}) and oxyfluorfen (0.12 and 0.24 kg ha^{-1}), post-emergence spray of glyphosate (0.5 and 1.0 kg ha^{-1}), paraquat (0.60 kg ha^{-1}) and its combination with diuron and oxyfluorfen alongwith two manual treatments (four hand weedings and four hand weedings plus light digging) and weedy check. The results indicated that the effect of diuron 1.0 kg ha^{-1} proved significantly superior to other treatment in reducing the dry matter accumulation of *Portulaca* spp. alongwith other weeds upto 150 days after spraying. Manual methods controlled other weeds effectively but failed to control *Portulaca* spp. Fruit yield of banana were higher with all weed control treatments compared to weedy check. Maximum yield was recorded with mechanical treatment i.e. four hand weedings integrated with digging and it was followed by application of diuron 1.0 kg ha^{-1}. The herbicides did not show any phytotoxic effect on crop.

INFLUENCE OF SOIL SOLARIZATION FOR WEED MANAGEMENT IN CHILLI AND CAPSICUM NURSERY

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A field study was conducted at Main Research Station, Hebbal, Bangalore during summer season to study the efficacy of soil solarization as an effective method of weed control in chilli and capsicum nursery. Transparent polyethylene mulch had recorded higher soil temperature of (53.8 Degree Celsius) at 5 cm depth after 30 days of spreading followed by black polyethylene (47.8 Degree Celsius). Transparent polyethylene was found effective in reducing the weed count and weed dry weight as compared to other mulching materials (black polyethylene, pongamia and glyricidia leaves) in both chilli and capsium nursery. Higher dry matter production of seedlings (6gm/plant) and (6.83 gm/plant) was recorded during fourth week after germination in soil solarization with transparent polyethylene for 30 days and found least in unweeded control (2.89 gm/plant) and (3.06 gm/plant) in chilli and capsicum nursery respectively. Soil solarization with transparent polyethylene for 30 days recorded higher B:C ratio (1.82) in chiloloi and (1.69) in capsicum followed by soil solarization with transparent polyethylene for 15 days (1.74) in chilli and (1.59) in capsicum nursery.

STUDIES ON CROP-WEED COMPETITION AND THEIR CONTROL IN ONION (*Allium Cepa* L.)

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Experiments have been in progress at Bihar Agricultural College, Sabour (Bhagalpur) for studying the critical period of weed competition and their control. For that two sets of experiments were conducted. In first set of experiment initial weed free and weed infestation period for 20, 30, 40, 50 and 60 days were maintained. Weedy check and weed free check were also included in the trial. The experiment was conducted during rabi 1996-97 and 1997-98 onh onion CV. Pusa red. The result indicated that the most critical period for weed competition was between 30-40 days after planting onion. In second set of experiment conducted on weed control pre-planting soil incorporation of fluchloralin 1 kg ha^{-1}, pre emergence application of pendimethalin and metalachlor each 1 kg ha^{-1}. superimposed with one hand weeding, two and three hand weeding were included and the result revealed that all the 3 herbicides followed by 1 hand weeding at 40 days after transplanting curtailed the dry matter of the weeds resulting in the higher bulb yield of onion.

BENEFICIAL WEEDS OF MANGO AND GUAVA ORCHARDS

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To two orchards of Mango in GKVK, Bangalore and orchards of Brhamavar and Hessarghatta was surveyed for the predators. The varieties assessed for the predators were 4; Alphoansa, Himayuddin, Banganpalli and Bangalora. The spider predators were the dominant ones in the system to check the leafhopper populations that was seen during the inflorescence blooming periods. The five species of spiders were observed in the mango systems. *Peucetia viridans, Oxyopes sp.*, meadow spider, crab spider and salticid. Among this *P., viridans* dominated. The ecology studies revealed that the spiders harboured the weed species *Hyptis suaveolens* and *Chromlineana odourata.* These weed serve as the alternate hosts for the spider predators and later in the season search for the trees to attack the pest leafhoppers of mango viz., *Idiocerus clypealis, Idiocerus atkinsoni* and *Idiocerus niveosparsus* at the time of flowering.

Five orchards of Guava, in Karnataka state; Mudigere, Mandya, Brhamvar and Hessarghatta were surveyed for the predators, *Peucetia viridans, Argiope aemula, Oxyopes sp., Phidippus sp., Geolycosa sp.* and *Gastrocantha cancriformis* were identified. These prefer the pests like aphids, *Aphis gossypi,* fruit flies, *Dacus dorsalis* and fruit borer, *Dichocrocis punctiferalis.* The lynx spider *P. viridans* was occurring in almost all the locations. Its activity was seen mostly during the months of April, May and June. The two promising varieties surveyed were Allahabad safed and Lucknow - 49. The lynx spider *P. viridans* was occurring in almost all the locations. Its activity was seen mostly during the months of April, May and June. Ecology studies show the preference of the spider, *P. viridans* and *Oxyopes sp.* on two weed species, Hyptis suaveolens (Laminaceae) and *Chromolineana odourata.* Further when disturbed goes to the soil surfaces to hide in grasses of *Brachiaria mutica* and *Cyprus Sp.*

CROP ROTATION-AN EFFECTIVE MEAN TO CONTROL RESISTANT *Jiri* WEED (*Plantago pumlla* WILLD) IN CUMIN (*Cuminum Cyminum* Linn.)

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The field study was undertaken for dleven years (kharif 1984 to rabi 1995) with the aim to find out the effect of crop rotation on infestation and grwoth of *jiri* weed (Plantago pumila lilldd.) in cumin. Ten crop rotations (2 one year i.e. pearlmillet (PM) - cumin, clusterbean (CB)-Cumin; 4 two year i.e. PM-cumin-PM-wheat, PM-cumin-PM-mustard, CB-cumin-CB-wheat, CB-cumin-CB-mustard; 2 three years i.e. MP-Cumin-PM-Wheat-PM-mustard and CB-Cumin-CB-Wheat-CB-Mustard, 2 four yeari.e. PM-Cumin-PM-Wheat-PM-gram-PM-mustard and CB-Cumin-CB-Wheat-CB-Gram-CB-mustard) were evaluated in randomised block design with four replication. Throughout the study one intercultural operation and recommended agro-techniques were folowed in all the crops. Only in the first year of experiment before sowing, 7% seed of *P. pumila* was mixed with cumin.

Four and three year of crop rotations were found very effective to control resistant *P. pumila* in cumin. Wheat and mustard crop successfully reduce the intensity and supress the growth of *P. pumila*. During 4th and 5th year of study there were 81.8 and 89.4% reduction in populatin of *P. pumila* as compared to one year crop rotation. During 11th year of study, 3 and 4 year crop rotatins were almost free from *P. pumila* whereas its infestation was 88.9% in one year crop rotatin. There were 1.6 branches, 1.798 g dry matter and 0.304 g seed yield per plant of *P.pumila* inwheat crop as against 4.5 branches, 5.544 g dry matter and 1.971 g seedyield per plant in cumin crop. Thus, as compaired to cumin crop there were 64.4, 67.6 and 84.6% reductions in branches/plant, dry matter/plant and seed yield/plant of *P.pumila* i wheat crop.

STUDIES ON INTEGRATED WEED MANAGEMENT PRACTICES IN TURMERIC

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Field experiment was conducted at Agricultural Research Station, Bhavanisagar to evaluate suitable integrated weed management practices for turmeric in a red sandy loam soil. The treatments constituted alachlor 1.25 and 2.0 kg ha^{-1}, metolachlor 1.0 kg ha^{-1} oxyfluorfen 0.20 kg ha^{-1}, fluchloralin 1.0 kg ha^{-1}, pendimethalin 1.0 kg hg^{-1}, glyphosate 1.0 kg ha^{-1} with 2% urea compared with hand weeding twice and weedy check. The highest weed control efficiency was observed in fluchloralin 1.0 kg ha^{-1} followed by pendimethalin 1.0 kg ha^{-1} in the initial periods. With regard to turmeric yield, alachlor 2.0 kg ha^{-1} recorded the highest rhizome yield (25.3 t ha^{-1}) followed by post emergence application of glyphosate 1.0 kg ha^{-1} with 2% urea (24.98 t ha^{-1}).

AN IDEAL METHOD OF HERBICIDES APPLICATION IN RAINFED CORIANDER.

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To find out in ideal method of herbicide application in rainfed coriander, field experiments was conducted at Regional Research Station, Aruppukottai farm during 1994-95 rain fed seasons. Four herbicides viz., Butachlor, Fluchloralin, Pendimethalin and Thioben carb, each in two concentrations, 0.5 and 1.0 kg ha^{-1} and two methods of application (pre sowing soil incorporation and pre-emergence spray on 3 DAS were evaluated. The herbicides were compared with dryland weeder (20 and 40 DAS) hand weeding twice (20 and 40 DAS), weed free check and un-weeded control. The trials were conducted in Randomized block design and replicated three times. The soil of the experimental site was medium vertisol with a pH of 8.2. Coriander variety Co3 was used and applied with a fertilizer dose of 40:20:0 kg NPK/ha as basal dressing.

The results of the experiment has indicated that application of Butachlor 1.0 kg ha^{-1} as pre sowing soil incorporation followed by one late hand weeding on 40 DAS was found to be an ideal and economical method of herbicide application for coriander under rainfed vertisol.

WEED MANAGEMENT STUDIES IN FENUGREEK (*Trionella foenumgraecum* L.) SEED PRODUCTION

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An experiment was conducted to study the efficacy of different pre-emergence herbicides viz., alachlor, metolachlor, trifluralin, pendimethalin and fluchloralin applied @ 2.0, 2.0, 1.0, 1.0 and 1.0 kg ha^{-1}, respectively. Each of the pre-emergence treatment was followed by hand weeding at 45 days after sowing alongwith weed free and the weedy check. The dominant weeds were *Parthenium hysterophorus, Anagalis arvensis, Cynodon dactylon, Dinebra retroflexa, Physalis minima, Chenopodium album, Euphorbia geniculata, Cyperus rotundus* and *Sonchus oleraceus*. All the weed control treatments significantly reduced the number and dry weight of weeds in comprison to weedy check at both 30 and 60 DAS. Weed free treatment recorded the lowest number and dry weight of weeds m^{-2} with the result highest number of pods plant^{-1}, seed weight plant^{-1} and seed yield. Pre-emergence application of pendimethalin plus one hand weeding at 45 DAS recorded the lowest number of weeds and their dry weight m^{-2} with highest weed control efficiency (81.2%) at both 30 and 60 DAS. This was reflected in the improvement of yield attributes and the highest seed yield ha^{-1} with lowest weed index (21.50%).

EFFICACY OF METOLACHLOR ON YIELD OF TURMERIC

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Field experiment was conducted at Tamil Nadu Agricultural University Research Station, Bhavanisagar during 1997-98. The treatments comprised of pre-emergence application of metolachlor 1.0, 1.5 and 2.0 kg ha^{-1} compared with preplant incorporation of fluchloralin (1.5 kg ha^{-1}) and weedy check. The experiment was laid out in a randomised block design with four replications. The predominant weed flora of the experimental field were *Digitaria sanguinallis, Echinochloa colonum, Portulaca oleracea, Trianthema portulacastrum, Euphorbia hirta* and *Boerhaavia diffusa.* Application of metolachlor 1.0 kg ha^{-1} with one hand weeding 40 DAS effectively controlled all the dicot weeds and recorded the highest rhizome yield of 25.3 t ha^{-1}. Application of metolachlor @ 1.5 kg ha^{-1} was at par with preplant incorporation of fluchloralin 1.5 kg ha^{-1} next to the metolachlor 1.0 kg ha^{-1}.

EVALUATION OF GLUFOSINATE AMMONIUM (Basta) IN CABBAGE

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Glufosinate ammonium is systemic total killer recently introduced for use in plantation crops. In order to evaluate the bioefficacy of Glufosinate ammonium, field experiment on cabbage was carried out for two consecutive years of 1996-97 and 1997-98 at department of Agronomy, Indira Gandhi Agricultural University, Raipur. The ten treatments comprised of Glufosinate ammonium 300, 375, 450, 500 and 1000 g ha^{-1}, paraquat 600 g ha^{-1}, Glyphosate 1025 g ha^{-1}, hand weedings twice and thrice, and unweeded control. The experiment was laid out in randomized block design with three replications. Cabbage variety Pride of India was grown as test crop. Glufosinate ammonium, paraquat and glyphosate were applied as post emergence directed spray. *Chenopodium album, Melilotus alba, Melilotus indica, Medicago spp., Borreris spida, Echinochloa colonum, Physalis minima* were the pre-dominant weeds in experimental field. Hand weeding thrice was proved to be the best in alleviating the weed competition in terms of dry matter of weeds and enhancing yield of cabbage. Hand weeding twice and Glufosinate ammonium at 1000 g ha^{-1} were found comparable to each other in enhancing yield of cabbage. However, among the herbicides post-emergence directed spray of Glufosinate ammonium was found significantly superior to its application at lower doses in reducing dry matter of weeds and increasing yield of cabbage during 1997-98. During 1996-97, post-emergence directed spray of Glufosinate ammonium 1000 g ha^{-1} was found comparable to its application at 500 g ha^{-1}. Yield reduction to the tune of 84.7% was observed due to weed competition under unweeded control. Glufosinate ammonium when applied as directed spray did not show any phytotoxicity to cabbage.

INTEGRATED WEED MANAGEMENT IN OKRA (*Abelmoschus esculentus* (L) Moench).

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Okra (*Abelmoschus esculentus* (L) Moench) is a main *Kharif* season vegetable crop of Northern Hill zone of Chhattisgarh. Wide spaced crop provides enough opportunity for the weeds to invade and offer a severe competition, resulting in low yields. Alachlor and Fluchloralin alone and in combination with hand weeding were evaluated for weed management of Okra at ZARS Ambikapur. Two years study revealed that weed density and its dry matter production were reduced significantly due to application of herbicides. However, integration of one hand weeding at 45 days after sowing and herbicides-alachlor and fluchloralin resulted in maximum decrease in weed dry weight. Alachlor 1.5 kg ha^{-1} + one hand weeding produced 89.0 q ha^{-1} green fruit yield which was at par with fluchloralin @ 1.0 kg ha^{-1} + one H.W. (85.0 q ha^{-1}) and fluchloralin @ 1.0 kg ha^{-1} alone (81.2 q ha^{-1}). Net returns and cost benefit ratio were also maximum under these treatments.

EFFECT OF VARIOUS WEED CONTROL TREATMENTS ON YIELD AND ECONOMICS OF POINTED GOURD (*Trichosanthes dioica Roxb*)

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The studies on yield and economics of pointed gourd as affected by various weed control treatments were carried out during 1996-97 at main experimental farm of N.D. University of Agriculture and technology, Kumarganj - Faizabad. In this studies, the treatments included were four of herbicidal combinations viz.; metolachlor+paraquat, pendimenthalin+paraquat, metolachlor+glyphosate & pendimethalin+glyphosate, two of integrated types viz; paraquat+two hand weedings and glyphosate + two hand weedings, three types of mulches viz, paddy straw, sugarcane trash & black polythelene mulch and one each of staking, weed free and weedy check treatments. The yield and economics of various weed control treatments were worked out on the basis of results. Maximum yield (149.02 q/ha) was recorded with black polythelone mulch. On the basis of economics, it is concluded that the maximum gross income (Rs.89412/ha) was obtained under block polythelene mulch but due to higher rates of polythelene sheets the net profit was reduced. Moreover higher net profit (Rs.39677/ha) was obtained with the use of paddy straw mulch in comparision to other weed control treatments.

EFFECT OF SOIL SOLARIZATION FOR A PERIOD OF ONE MONTH DURING APRIL TO MAY ON ANNUAL AND PERENNIAL WEEDS IN TOMATO CROP.

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A field experiment was conducted during 1997-98 to investigate influence of soil solarization on weed control and the performance of tomato in sandy loam soils of Agronhomy field unit, Main Research Station, University of Agricultural Sciences, Bangalore, under irrigated conditions. The investigation involved three months (April, May and June) and two thickness of TPE (0.05 and 0.10 mm), laid out in RCBD.

Solarization during April and May months with transparent polyethylene resulted in higher soil temperatures (41.88 to 51.38 c at 5 cm depth and 39.48 to 48.45 c at 10 cm depth). The maximum soil temperature reached 51.38c in TPE 0.05 mm during April month. Solarization with TPE 0.05 mm during April month recorded lower number of monocot weeds (9.50 to 13.50 / m^2), dicot weeds (2.75 to 5.00 / m^2), sedge weeds (38.00 to 40.50 / m^2) and total weeds (50.25 to 59.00 /m^2). Weedy check recorded significantly higher number of weeds than solarized treatments. Data on dry weight of weeds revealed that TPE 0.05 mm during April month significantly reduced the monocots, dicots, sedges and total weed dry weight (3.87 to 4.38, 1.32 to 1.47, 6.06 to 7.28 and 11.25 to 13.13 g / m^2, respectively) at all the crop growth stages. The next best effective treatment was TPE 0.05 mm during May month and TPE 0.10 mm during April month. All solarized treatments recorded significantly higher fruit yield of tomato (13.68 to 15.26 ton ha^{-1}) than control (12.90 ton ha^{-1}). TPE 0.05 mm during April month recorded higher fruit yield (15.26 ton ha^{-1}) followed by TPE 0.05 mm during May month and TPE 0.10 mm during April month).

CHEMICAL WEED CONTROL IN OKRA (*Abelmoschus esculenus* L.)

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Field experiment was conducted for three consecutive years 1994-95, 1995-96 and 1996-97 to develop chemical weed control schedule in okra crop at Vegetable Research Station, Kalyanpur, C.S. Azad University of Agriculture & Technology, Kanpur. Result revealed that weedy conditions throughout crop period caused 50.26 percent reduction in fruit yield of okra. Application of Metalachlor (1.5 kg ha^{-1}) and Oxyfluorfen (0.10 kg ha^{-1}) pre-emergence checked the emergence of weed during the initial stage of crop growth and later on emergence of the weeds. Metalachlor (1.5 kg ha^{-1}) and Oxyfluorfen (0.10 kg ha^{-1}) each followed by manual weeding at 21 and 45 days registered at par yield to that obtained under weed free managed plots.

RELATIVE EFFICACY OF HERBICIDES IN BRINJAL

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An investigation to study the relative efficacy of various herbicides applied to brinjal was carried out for two seasons during Rabi 1996-97 and 1997-98 at College Farm, Rajendranagar, Hyderabad. Different herbicides - pendimethalin 1.5 kg ha^{-1}, metolachlor 1.5 kg ha^{-1}, alachlor 1.5 kg ha-1 butachlor @ 1.5 kg ha^{-1}, oxyfluorfen 0.15 kg ha^{-1} were applied alone and at lower doses in combination with one HW at 40 days after planting (DAP). These herbicide treatments were compared with an unweeded control and hand weeding twice at 20 and 40 DAP.

The weed flora comprised of *Cyperus rotundus, Commelina benghalensis, Panicum sp. Cleome viscosa, Legasca mollis, Parthenium hysterophorus, Digera arvensis, Euphorbia hirta, Amaranthus viridis* and *Celosia argentia*. All the herbicides tried were effective in controlling broad leaved weeds compared to sedges and grasses. Mean percent control of different weed species was high with oxyfluorfen at both levels of application. Significantly lower weed density and dry matter were observed with application of herbicides as compared to that of control. There was 49 and 67% reduction in brinjal fruit yield of brinjal in unweeded control as compared to HW twice at 20 and 40 DAP. Integrated weed management involving application of herbicides at lower doses as Pre-emergence fb one hand weeding at 40 DAP controlled weeds effectively and recorded on par yield to that of twice HW at 20 and 40 DAP.

STUDIES ON BIOEFFICACY OF DAZOMET IN TOMATO NURSERY

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Field experiments were conducted thrice during 1996-97 at TNAU Coimhbatore on a sandy clay loam soil to study the bioefficacy of dazomet in controlling nematodes and weeds. Application of higher dose of dazomet (60g m^{-2}) effectively controlled the rootknot nematode (Keloidogyne incognita) than dazomet 30g m^{-2} and control. The weed flora observed in tomato nursery (*Echinochloa colonum, Trianthema portulacastrum, Gynandropsis pentaphylla* and *Dactyloctenium aegyptium*) were also effectively controlled by dazomet at 60g m^{-2}. The dehydrogenase activity was significantly affected by dazomet treatments at all the three seasons of the study.

WEED CONTROL IN BRINJAL

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Field experiment was conducted for three years 1992-93, 1993-94 and 1994-95 (Azade Hybrid) to know the best chemical for weed control in Brinjal crop at Vegetable Research Station, Kalyanpur, C.S. Azad University of Agriculture and Technology, Kanpur. Three chemicals namely Goal, stamp and basalin were tried at different concentration with and without hand weeding along with weedy check and weed free check as treatments. Experimental result shows that application of fluchloralin @ 1.5 kg . per hactare (PPI) supplemented with one hand weeding at 30 DAP proved to be most effective for weed control in brinjal under Kanpur conditions where it produced 75.8 t ha^{-1} yield and earned Rs. 34,078/ha net profit with 2.50 cost benefit ratio.

DRIP HERBIGATION ON YIELD AND QUALITY OF CASSAVA

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Drip irrigation has proved its superiority over other methods owing to direct application of water in the root zone. In cassava, weeds cause 40 to 90 per cent yield and nutrient losses under irrigated condition. Control of weeds through chemical means is the only alternative owing to the escalated cost of labour and its scarcity due to urbanization and industrialisation. Applying herbicide by spraying may lead to drift in the air and thereby the chemical loss is more leading to reduced effriciency. To overcome this, application of herbicides through irrigation water (herbigation) is a novel techniqe with increases the herbicidal efficiency and reduces the cost of application. Field experiments condeucted at Tamil Nadu Agricultural University, Coimbatore for two years (1995-96) revealed that irrigation through drip with 100 per cent of the surface irrigation water was effective in registdering higher cassava (Manihot esculenta, Crantz) tuber yield (39.1 and 38.3 t ha^{-1} during first and second year of study respectively) because of continuous moisture availability and higher nutrient absorption. Herbigation, hand hoeing and weeding were comparable in registering higher productivity (30.8 and 30.3 per cent and 26.9 and 26.0 per cent increase over unweeded check by hand hoeing and weeding and herbigation respectively during the first and second year of study) and improved the quality of tubers in cassava. The starch and total sugar content of tuber were favourably increased by both drip and surface irrigation under hand hoeing and weeding and herbigation in cassava.

WEED STATUS OF POTATO IN ALLUVIAL BELTS OF WEST BENGAL AND ITS SUITABLE MANAGEMENT

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An on farm survey conducted on some major potato growing districts of alluvial regions of West Bengal revealed that *Chenopodium album, Portuloca oleracea, Melilotus alba* and *Cyperus rotundus* were the dominant weeds. On the basis of this survey a field experiment was conducted during rabi 1995-96 and 1996-97 at the Viswavidyalaya Farm, Mohanpur to find out the suitable control measures of the dominant weed flora found in the alluvial regions. The study revealed that Metribuzin applied @ 0.8 kg ha^{-1} at 3 DAP through Sencor recorded the maximum (24927.0 kg ha-1) and 79.01% higher tuber yield over the Unweeded control (13925.0 kg ha^{-1}). This treatment also recorded higher mean benefit cost ratio (1.52:1) than all the other treatments including the hand weeding twice at 20 and 40 DAP (with an average yield 23842.1 kg ha^{-1} and benefit cost ratio 1.30:1). The other chemical Fluchloralin applied @ 0.7 kg /ha at 3 DAP through Basalin also showed 43.17% higher tuber yield (19937.2 kg ha^{-1}) over unweeded control and benefit cost ratio of 1.19:1. The reasons for higher tuber yield due to application of chemicals may be due to lower weed infestation at the initial stage of the crop-weed competition and higher tuber bulking rate. Farmers may also have no problem to accept the same because of higher benefit cost ratio of the chemicals over the mechanical methods.

STUDIES ON WEED COMPETITION IN BALSAM (*Impatiens balsamina* L.)

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A field trial was conducted at garden of Institute of Agricultural Sciences, Banaras Hindu University during the rainy season of 1997-98 to find out the critical period of weed competition in Balsam in respect to growth and flower production. Weed competition between 24 and 38 days after transplanting was found to be the most critical as weeds interference during this period caused maximum reduction in plant height, branches and leaves per plant, delay in flowering and flower production, while these attributes were maximum and favourably affected when this period was kept without weed competition.

DEGRADATION AND PERSISTENCE OF DAZOMET IN TOMATO NURSERY

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Field experiments were conducted in tomato nursery for three seasons during 1996-97 at TNAU farm, Coimbatore, to evaluate the biocfficacy of dazomet and its degradation and persistence in soils and plants in sandy clay loam soil. The treatments constituted the application of dazomet at 30 and 60 g m^{-2} and were compared with untreated check. The analysis of dazomet residues were optimised using HPLC which gave the recovery of more than 80% indicating the effectiveness of the method. The dazomet residues were dissiplated rapidly in soil and the residues were below detectable levels at 5 DAA in both the nursery soils of tomato. The dazomet residues in tomato seedling collected at transplanting were below detectable levels in both the doses of dazomet and in all the three seasons. Green house studies conducted to study the effect of dazomet treated soils and seedling on the yield and quality revealed that the application of dazomet 60 g m^{-2} was significantly superior in increasing the leaf area and fruit yield. The quality parameters of tomato were unaffected by dazomet application.

WEED MANAGEMENT IN SEED POTATO (*Solunum tuberasum* L.) UNDER HIGH-HILLS DRY TEMPERATE CONDITIONS OF HIMACHAL PRADESH

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The weed flora in the valley includes *Chenopodium album* L; *C.schraderanum* Roem & Schult *C. bonus-henricus* L. *Althasa* ludwigil L. and *Amaranthus viridis* L. among broad leafved weeds and *Digitaria sanguinalis* (L.) Scop. among grassy weeds. The labour source is scarce, costly and it becomes difficult to manage weeds at most critical stages of crop growth, resulting in enormous yield losses. Further, management of weeds with herbicides is important for the production of healthy weed potato.

An experiment was conducted for three consecutive years to find out the efficacy of different herbicides in controlling weeds at Regional Research Station, Kukumseri. Pre-emergence herbicides hand weeding and hoeing at 25 and 50 days after sowing, farmer's practice (hand weeding and hoeing 30 days after sowing) were evaluated. All herbicides except metolachlor proved significantly better at higher rates than their lower rates of application. Uninterrupted weed growth resulted in reduction of yield by 41.4, 37.1 and 34 per cent as compared to application of pendimethalin 1.2 kg alachlor 1.5 kg and metolachlor 1.5 kg ha^{-1}, respectively.

COMPARATIVE EFFICACY OF HERBICIDES TO CONTROL WEEDS IN GLADIOLUS VAR PRISELLA.

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A field experiment was conducted at the experimental farm of Floriculture and Landscape wing of the HPKV, Palampur during summer 1996 and 1997 to find out the comparative efficacy of herbicides to control weeds in gladiolus. The treatments consisted of alachlor, pendimethalin, atrazine metolachlor and butachlor each at 1.5 kg ha^{-1} as pre-emergence, oxyfluorfen 0.1 kg ha^{-1} (pre), dichlofopmethyl 0.75 kg ha^{-1} (post.), isoproturon 1.0 kg ha^{-1} (post.), hand weeding twice (40 and 60 DAS), weed free and unweeded check. The major weeds of the experimental field were *Panicum dichotomiflorum, Euphorbia heterophylla, Setaria glauca* and *Digitaria sunguinalis.* Pre-emergence application of pendimethalin 1.5 kg ha^{-1} being statistically at par with metolachlor 1.5 kg and butachlor 1.5 kg ha^{-1} controlled the weeds effectively and increased the spike number and length and spikelets per spike of gladiolus.

STUDIES ON INTEGRATED WEED MANAGEMENT ON QUALITY YIELD AND ECONOMICS OF POTATO (*Solanum tuberosum* L.)

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A field experiment entitled "Integrated weed management on quality yield and economics of potato (Solanum tuberosum)" was conducted during rabi season 1994-95 with Kufri - Jyothi variety on sandy loam soil at the Main Research Station, in the University of Agricultural Scviences, Hebbal, Bangalore to evaluate efficacy of weed management methods. The treatments were four pre-emergence herbicides (Metribuzin, Oxyfluorfer, Fluchloralin and Pendimethalin) each at with and without earthing up at 35 DAS, one to two hand weeding upto 35 DAS. These were compared with unweeded.control.

Pre-emergence application of metribuzin @ 0.75 kg ha^{-1} with earthing up as 35 DAS recorded the highest tuber yield (38.8 t ha^{-1}), percent increase yield over unweeded control (105%), average weight pre tuber (65.76 g) and weed control, efficiency (98%) compared to other weed management practices, whereas higher number of tubers per plant was recorded in metribuzin 0.75 kg ha^{-1}. All weed management treatments exhibited significantly lower total weed production (9.67 - 73/m^2) and weed dry weight (10-291 /m2) compared to an unweeded control (356/m2 and 487 g/m2). Treatments with earthing up as 35 DAS significantly reduced the green tuber yields (1.06 - 1.99 t ha^{-1}) over treatment without earthing up (2.17 - 6.75 t ha^{-1}). Maximum net return (Rs.43,367/ha) and higher benefit cost ratio (1.03) were observed with mctribuzin 0.75 kg ha^{-1} alongwith earthing up 35 DAS while, marginal benefit cost ratio was obtained with oxyfluorfen @ 0.12 kg ha^{-1} (Rs.17.15).

HERBICIDAL WEED CONTROL IN POTATO (*Solanum tuberosum* L.)

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Field experiments on chemical control of weeds in potato var. Kufri Chandramukhi were conducted at the National Research Centre for Weed Science, Jabalpur during winter season of 1996-97 and 1997-98. Pre-emergence application of oxyfluorfen (0.15, 0.20 & 0.25 kg ha^{-1}), metribuzin (0.30, 0.50 & 0.75 kg ha^{-1}), oxadiazon (0.50, 0.75 & 1.0 kg ha^{-1}), metolachlor (0.50, 1.0 & 1.5 kg ha^{-1}) and isoproturon (0.50, 1.0 & 1.5 kg ha^{-1}) was done just after planting. The major weeds of the experimental field were *Medicago hispida, Chenopodium album, Chenopodium fisifolium, Commelina communis, Vicia sativa* and *Melilotus* spp. Pre emergence application of metribuzin and oxyfluorfen were found most effective for the control of *Medicago hispida, Chenopodium* spp. and other non grassy weeds. Presence of weeds throughout the growing season caused 62 per cent reduction in tuber yield. All the herbicides reduced the population and dry matter production of weeds and produced significantly higher tuber yield as compared to weedy check. Maximum tuber yield was recorded under hand weeding at 20 and 40 days after planting (DAP). Among different herbicides, metribuzin (0.75 kg ha^{-1}) was most effective and yielded at par with hand weeding twice, while metolachlor was least effective.

SOIL SOLARIZATION FOR WEED MANAGEMENT IN TOMATO AND TOBACCO NURSERY

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A field study was conducted with different soil heating materials (transparent polyethylene, black polyethylene, pongamia and glyricidia leaves) for evaluation in relation to weed control. Higher seedling production (180.60/0.25m^2) and seedling dry matter production (7.96 g $plant^{-1}$) in Tomato and (240.43/0.25 m^2) for seedling production and (2.5 g $plant^{-1}$) for seedling dry matter production in tobacco was recorded during fourth week after germination with soil solarization for 30 days in transparent ployethylene as compared to other mulching treatments. Least weed count and weed dry matter production was obtained with soil solarization in transparent polyethylene followed by black polyethylene. Higher B:C ratio (1.88) in tomato and (2.52) in tobacco was recorded in soil solarization with transparent polyethylene for 30 days.

HERBICIDAL WEED CONTROL IN GARLIC (*Allium sativum* L.)

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Field experiments were carried out during rabi 1995-96 and 1996-97 at J.N. Krishi Vishwa Vidyalaya, Jabalpur to evaluate the efficacy of pre-emergence herbicides viz., isoproturon 1.0, pendimethalin 1.0, butachlor 1.0, metolachlor 1.0, oxyfluorfen 0.23 and oxadiazon 0.75 and compared with 1-hand weeding and weedy control in garlic. Dominant weeds viz., Cichorium intybus, Melilotus spp., Trifolium flagiferum, Medicago hispida and other broad leaf weeds were effectively controlled by the application of pendimethalin, oxadiazon and oxyfluorfen. The weed biomass was significantly reduced by these herbicides (11.8 - 49.1%) as against weedy control. The highest weed control efficiency was obtained under hand weeding (54.5%) closely followed by oxadiazon (49.1%), isoproturon (34.8%), pendimethalin (34.1%) and oxyfluorfen (33.0%). No adverse effect of the herbicides was observed on growth and development of garlic. The highest bulb yield was recorded under hand weeding (8052 kg ha-1) followed by pendimethalin (6843 kg ha^{-1}), oxadiazon (6717 kg ha^{-1}) and oxyfluorfen (5623 kg ha^{-1}) and all these were on par to each other, but significantly superior over weedy control (2936 kg ha^{-1}). Uncontrolled weeds reduced seed yield by 63.5 per cent as compared to hand weeding.

EFFECT OF HERBICIDES IN POTATO CROP

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The experiment was laidout at Research Farm, Nawabganj C.S. Azad University of Agriculture & Technology, Kanpur during the year 1989-91 on potato variety Kufri Chandramukhi in Randomilsed Block Design to evaluate the efficacy of different herbicides in controlling weeds in Potato Crop. The experiment was planted in second weed of October every year with the manuring schedule of 150:100:100 NPK per ha. Among the various herbicides tested (eleven) TOKE-25, Lasso Sirmate, Loraz, Stam F-34, Gramoxone, Basalin were sprayed as per their recommended doses besides keeping weed free check, weedy check and one weeding+one earthing as a separate treatment. Result of the experiment shows that both the methods, mechanical and chemical method of weed control were found to be statistically significant over control. Among the various herbicides tested, Stem F-34 @ 2.5 lit. followed by TOKE E-25 @ 4.01 lit. gave the best result in controlling weeds as well as in producing tuber yield.

WEED MANAGEMENT IN POTATO UNDER WEST CENTRAL TABLE LAND ZONE OF ORISSA.

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Field experiments conducted during rabi 1995-96 and 1996-97 at Instructional Farm, college of Agriculture, chiplima of the Orissa University of Agriculture and Technology, revealed that tuber yield of potato was reduced by 46% due to weeds. All the herbicidal treatments significantly reduced the weed density and weed drymnatter accdumulation and increased the tuber yield with a weed control efficiency ranging from 62% to 84%. Among the herbicides tested, paraquat and oxyfluorfen recorded the highest tuber yield and were comparable to weed free check. The next best treatments were fluchloralin and pendimethalin and these were comparable to the farmer's practice of hoeing and earthing up.

INTEGRATED WEED MANAGEMENT IN ONION

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A field experiment was conducted on acid alfisols of a medium fertility status during rabi 1995-96 and 1996-97 at the Experimental Farm of Deptt. of Agronomy, Himachal Pradesh Krishi Vishvavidyalaya, Palampur. In all 12 weed control treatments viz., metolachlor 1.5 kg ha^{-1}, metolachlor + 2 HW, 1.0 kg ha-1, metolachlor + 1 HW, 1.50 kg ha^{-1}, Oxyfluorfen 0.2 kg ha^{-1}, Oxyfluorfen + 2 HW 0.15 kg ha^{-1}, Oxyfluorfen + 1 HW 0.2 kg ha-1; alachlor 1.5 kg ha^{-1}, alachlor + 2 HW 1.0 kg ha^{-1} alachlor + 1 HW 1.5 kg ha^{-1}, handweeding twice (30 & 60 DAT) and handweeding thrice (30, 60 and 90 DAT) and a weedy check were tested in randomised block design with three replications. The onion variety Nasik red was transplanted in first week of January during both the years.

The predominant weed flora observed during crop growth were Phalaris minor, Lolium tempulentum, Vicia sativa, Vicia hirsuta, Avena fatua, Setaria glauca, Coronopus didymus and Gallinsoga parviflora. Lolium temulentum was the most dominant weed species and was followed by Phalaris minor, Avena fatua and Vicia sativa. The results revealed that metolachlor 1.0 kg ha-1 fb 2 handweeding being statistically at par with oxyfluorfen 0.15 kg ha-1 fb. 2 handweeding and alachlor 1.0 kg ha-1 fb 2 hand weedings proved significantly superior in reducing the population and dry weight of weeds and recorded the significantly higher weed control efficiency. Integration of 2 hand weedings with above said herbicides behaving statistically alike also recorded significantly higher bulb yield of Onion.

EFFECT OF FYM AND WEED CONTROL MEASURES ON GROWTH AND YIELD ON ONION BULB

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A field experiment was conducted in the winter season of the year 1995 to 1997 to study the effect of farm yard manure (FYM) and weed control measures on growth and yield of onion. There were 24 treatments comprising of all combinations of three levels of FYM (0, 10 and 20 t ha^{-1}) and eight weed control measure. The major weeds viz., *Chenopodium album, Asphoedlus tenuifolius, Melilotus indica* and *Phyllanthus niruri* were recorded in the field.

Polled results indicated that application of FYM significantly increased weed population and dry weed biomass.The highest weed biomass (1209 kg ha^{-1}) was recorded with application of FYM 20 t ha^{-1} followed by 10 t ha^{-1} (1059 kg ha^{-1}) and no application (887 kg ha^{-1}). Among three herbicides (fluchloralin 1.0 kg ha^{-1}, pendimethalin 1.0 kg ha^{-1} and oxadiazon 0.5 kg ha^{-1}), poor weed control efficacy (42%) was recorded in case of fluchloralin when applied alone. Among the different weed control measures, pendimethalin + one hand weeding (HW) significantly reduced weed dry matter production followed by oxadiazon + HW and fluchloralin + HW and were comparable with twice hand weeded plots. The weed crontrol efficiency of these treatments were ranged from 92 to 97 per cent.

Significant differences were observed in plant height and bulb yield due to application of FYM. The increasing level of FYM increased the hyield of onion bulb from 235 t ha^{-1} (no FYM) to 254 t ha^{-1} (20 t ha^{-1}). The highest bulb yield was recorded in the treatment of oxadiazon 0.5 kg ha^{-1} + HW and the effect was comparable with pendimethalin 1.0 kg ha^{-1} + HW and fluchloralin 1.0 kg ha^{-1} + HW and hand weeding twice.

STUDIES ON CHEMICAL WEED CONTROL IN KAGZI LIME NURSERY

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An experiment conducted during 1997 and 1998 on different herbicides in kagzi lime nursery revealed that application of atrazine 0.5 kg ha^{-1} at 10 days after sowing nursery resulted in the highest reduction in weed population and weed dry weight at 30 DAS. This was reflected in the improvement of growth parameters viz., seedling height, number of leaves/plant and basal diameter best treatment was during 0.5 kg ha^{-1}.

INTEGRATED WEED MANAGEMENT IN ONION.

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An experiment involving integration of herbicidal and manual weed control compared against Farmers Practice in Onion was conducted during winter season of 1996-97 at Central Research Station, O.U.A.T., Bhubaneswar. The herbicides viz. oxadiazon 1.0 kg, alachlor 0.75 kg, pendimethalin 0.75 kg, Oxyfluorfen 0.03 kg and 0.06 kg and Butachlor 2.0 kg ha^{-1} were applied as Pre-emergence at 3 days after transplanting and fluchloralin 0.75 kg ha^{-1} was applied as pre-planting incorporation at 1 day before planting.

Weedy check recorded the maximum weed population (568m^{-2}) and dry weight (148.5 g m^{-2}) at harvest. Oxyfluorfen 0.03 kg ha^{-1} supplemented with hoeing and manual weeding at 30 DAT was 69% efficient in controlling the weeds at harvest and proved the best with the maximum bulb yield of 127/60 kg ha^{-1} and benefit cost ratio of Rs. 3.50 as against 68%, 123/60 kg ha^{-1} and Rs. 3.20 in farmers' practice.

EVALUATION OF HERBICIDES IN ONION (*Allium cepa* L.)

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The experiment was conducted on weed management studies in onion var. Nasik Red at the Vegetable Research Farm and Laboratories of the Regional Research Station Dhaulakuan, Distt. Sirmaur (H.P.) during the rabi season of 1992-1993 and 1993-1994. The experiment comprised three herbicides and all were applied as pre-emergence. The herbicide fluchloralin was applied/incorporated into the soil immediately after its spray by digging the soil with the spade about 2 to 3 inches. In all there were thirteen treatments viz; fluchloralin (1.0, 1.5 and 1.0 + Hand Weeding at 40 Days after Transplanting), Oxyfluorfen (0.25, 0.37 and 0.25 + Hand Weeding at 40 DAT) and pendimenthalin (1.0, 1.5 and 1.0 + Hand Weeding at 40 DAT), Hand Weeding at 40 and 60 DAT, Weed Free and Weedy Check. The experiment was laid out in a randomised block design. The plot size was 3m x 2ma and the seedlings were transplanted at distance of 20 cm x 10 cm between rows and the plants respectively. The spraying of herbicides was done 48hrs. before transplanting of seedlings. All the package of practices were followed as per the recommendations except the weed control. The results revealed that highest yield was obtained from treatment Oxyfluorfen 0.25 kg. ha^{-1} + Hand Weeding at 40 DAT followed by Oxyfluorfen 0.37 kg ha^{-1}.

The same results were obtained when maximum net returns were calculated. However the minimum weed spectrum intensity at all the stages was recorded in Oxyfluorfen applied @ 0.37 kg ha^{-1} followed by Oxyfluorfen @ 0.25 kg ha^{-1}. along with hand weeding at 40 DAT. It was observed that none of the herbicidal treatment was able to control the cotorious weed i.e. *Cyperus rotundus* due to its multiplication through rhizome.

EFFECT OF POST-EMERGENCE HERBICIDES ON GROWTH AND TUBER YIELD OF POTATO

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A field experiment to study the effect of post-emergence herbicides on growth and tuber yield of potato was conducted at Research Farm of CCS Haryana Agricultural University, Hisar. Fifteen treatments including linuron 0.75 and 1.00 kg ha^{-1}, linuron + atrazine (%:1) 0.75 and 1.00 kg ha^{-1}, glufosinate 0.3 and 0.5 per cent, atrazine 0.15 and 0.20 kg ha^{-1}, linuron + metribuzin (2:1), 0.75 and 1.00 kg ha^{-1}, metribuzin 0.44 and 0.55 kg ha^{-1}, two hand weedings (20 and 45 DAP), weedy check and weed free were laid out in randomized block design keeping three replications. All herbicides were sprayed 15 days after planting of potato. The field was infested mainly with *Chenopodium album, Avena ludoviciana, Melilotus alba* and *Rumex maritimus*.

Various growth parameters viz., plant height, leaf area index, haulm growth rate and dry matter accumulation by haulms were significantly superior in all the weed control treatments as compared to weedy check. Linuron + metribuzin 1.00 kg ha-1 and metribuzin 0.55 kg ha^{-1} were significantly better than other weed control treatments and these were statistically at par with weed free treatment. Gluphosinate or atrazine alone were inferior to other herbicidal treatments in respect to growth parameters. Maximum tuber yield of potato was recorded in weed free and minimum in weedy check and there was reduction of 162 quantal in tuber yield under weedy check. Among herbicidal treatments, maximum butler yield was recorded in linuron + metribuzin 1.00 kg ha-1 and metribuzin 0.5 kg ha-1 which were statistically at par with weed free conditions.

INTEGRATED WEED MANAGEMENT IN AMERICAN COTTON THROUGH NON-SELECTIVE HERBICIDES

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American cotton a long duration crop is found infested with number of broadleaf, sedge and grass weeds particularly Trianthema portulacastrum and perennials like Cyperus rotundus and Sorghum halepense. Application of pendimethalin 0.75 kg ha^{-1} (pre-em.) or trifluralin 1.2 kg ha^{-1} ppi) alone does not give a season long control of weeds and these have to be supplemented with one hand weeding. A field study was conducted for 3 years to test the efficacy of directed application of glyphosate / paraquat at 6-8 weeks after sowing and subsequently for two years to test the directed application of a new herbicide glufocinate ammonium to replace the hand weeding or interculture operations.

The study revealed that application of pendimethalin (0.75 kg ha^{-1}) as pre-em. or trifluralin (1.2 kg ha^{-1}) as ppi followed by directed application of paraquat (0.3 kg ha^{-1}), glyphosate (1.0 kg ha-1) or glufocinate ammonium (0.45, 0.75 and 0.90 kg ha-1) in between the crop rows protecting the crop, provided season long control of weeds. *Glyphosate* and *glufocinate ammonium* were better than paraquat as these controlled *Cyperus rotundus* also. These herbicides were safe to the crop and the yields were higher than unweeded control. The use of glyphosate or paraquat has since been recommended for weed control in American cotton in the state of Punjab after the technology was successfully demonstrated at the farmers' fields.

INTEGRATED WEED MANAGEMENT IN SAFFRON (*Crocus sativus* L.)

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Saffron (*Crocus sativus* L.) is a small bulbous, perennial medicinal herb, cultivated for its large scented, blue or lavender flowers. Its cultivation is becoming popular among the farmers of Sangla valley in particular and Kinnour district of Himachal Pradesh inj general. The major limitation in its cultivation is the competition from weeds. The present invedstigation was conducte4d at Himachal Pradesh Krishi Vishvavidyalaya, Regional Research Sub Station, Sangla. The different weeds that were found growing kin association with saffron were, *Digitaria sanquinalis, Malva rotundifolia, Cypeus aristatus, Pertulace eleracea, Gallinsega parviflora, Chenopdoium album, Capsella bursa-pasteris, Stallaris media* and *Eleecharis sp.*

CROP-WEED COMPETITION STUDIES IN PLANT AND RATOON CROPS OF SUGARCANE

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Field experiments were conducted at Karnal to find out the critical duration of weed control in sugarcane crops planted in spring and summer seasons and also in ratoon initiated during spring season. Treatments consisted of weed free condition for the first 30, 60, 90 and 120 days after planting/ratooning and upto harvest which were compared with the weedy check, however, the weed free condition for the first 120 days after planting was not included in case of summer planted sugarcane. The results revealed that keeping the field free from weeds upto 120 days in case of spring planted, upto 60 days in case of summer planted and upto 90 days in case of ratoon crops of sugarcane are critical periods for controlling the weeds for obtaining significantly higher cane yields.

EFFECT OF INTERCROPPING, GEOMETRY AND WEED MANAGEMENT ON WEED CONTROL EFFICIENCIES IN SUGARCANE.

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Sirugamani

Field investigations were carried out at Sugarcane Research Station, Sirugamani, Tamil Nadu Agricultural University, Tamil Nadu to study the effect of intercropping, geometry and different weed management practices on weed control efficiencies in Sugarcane during 1991-92 special season and 1992-93 main season..

With regards to WCE based on weed DMP higher WCE of 84.55 per cent was recorded in oxadiazon fb. hand weeding (W3) at 25 DAP. But on 55 DAP, hand weeding twice (W1) registered the maximum WCE of 87.21 per cent. Oxyflurofen fb. hand weeding (W2) recorded lesser WCE at 55 and 85 DAP. Similar trend of WCE as in the special season was observed during the main season also.

Weed smothering efficiency was low under alternate ridge planting system at all stages compared to ridge planting (M2 and M3) and paired row planting (M4 and M7) systems during the special season. WSE during the main season followed similar trend as in special season.

Weed control smothering efficiency ranged from 66.76 to 68.71 per cent during the special season. Dhaincha intercropping systems recorded slightly higher WCSE than soybean intercropping systems. Higher WCSE was recorded in daincha intercropping in ridge side planting system (68.71 per cent) followed by paired row system (M7) of planting. Alternate ridge planting system resulted in low WCSE. Pre-emergence application of oxadiazon fb. hand weeding (W3) recorded the higher WCSE of 84.15 per cent followed by oxyflurofen fb. hand weeding (W2) and hand weeding twice (W1). Similar results was observed in the main season also.

EFFICACY OF ISOPROTURON (ARELON) IN COMBINATION WITH 2, 4-D AS WEED CONTROL IN SUGARCANE

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Experiments were conducted at the Research Farms of Samarth and Ajinkyatara S.S.K. Ltd., during preseasonal planted sugarcane (variety Co 7219) in the year 1990-91, on medium black soils.

Isoproturon @ 1.0 kg a.i. alone and in combination with 2, 4-D @ 1.0 kg a.i. Isoproturon @ 0.75 kg a.i. + 2, 4-D 0.75 kg a.i. were compared with control i.e. hand weeding 3 times and recommended weedicides viz. Atrazine @ 2.0 kg a.i. 2, 4-D @ 2.0 kg a.i. and paraquat @ 1.0 lit. a.i. The paraquat & 2, 4-D (T5) was sprayed as pre emergence spray.

Spraying of Isoproturon @ 1.0 kg a.i. 2,4-D @ 1.0 kg a.i. pre and post emergence spray (T_2) could suppress the growth of monocot weeds and also control the dicot weeds to the extent of 75-80 per cent.

INTEGRATED WEED MANAGEMENT IN COTTON

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Different pre emergence herbicides in association with intercultivations were tried for control of weeds in cotton (MCH ^{1}) during 1996-97 at College Farm, Rajendranagar, Hyderabad. The herbicides, alachlor, butachlor and metolachlor @ 1.5 kg ha^{-1}, diuron 0.75 kg ha^{-1}, oxyfluorfen 0.15 kg ha^{-1} and fluchlorain @ 1.0 kg ha^{-1} alone and application of these herbicides at lower levels in association with intercultivation thrice at 30, 45 and 60 DAS were tried.

The weed flora comprised of *Cyperus rotundus, Panicum* sp, *Digitaria* sp, *Cynodon dactylon, Commelina benghalensis, Legasca mollis, Trianthema portulacastrum, Parthenium hysterophorus, Digera arvensis* and *Celosia argentia*. The mean percent control of different weed species varied from 56 percent with butachlor @ a.0 kg ha^{-1} to 82 percent with oxyfluorfen @ 0.15 kg ha^{-1}. Higher levels of herbicide applied initially controlled weeds but there was weed emergence subsequently and competed severely with crop resulting in low yield. Lower levels of herbicides application fb Intercultivation (IC) at 30 and 45 DAS resulted less weed competition with crop and thereby there was higher seed cotton yield.

Application of alachlor @ 1.0 kg ha^{-1} fb Intercultivation twice resulted significantly higher seed cotton yield (1332 kg ha^{-1}) owing to reduction in weed dry weight followed by IC thrice at 25, 45 and 60 DAS (1159 kg ha^{-1}) and oxyfluorfen at 0.10 kg ha^{-1} fb IC (1030 kg ha^{-1}).

ROTATION OF HERBICIDES IN CHINA HYBRID TEA IN HIMACHAL PRADESH

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A field experiment was conducted in china hybrid tea (*Camellia sinensis* (L.) O. Ktz.) at the Experimental Farm of the Institute, during 1993-1997 to evaluate the effect of certain sequential treatments, comprising either of a pre-emergence herbicide followed by post-emergence herbicide or vice-versa, on weed control and crop yield. Five treatments were compared with hand weeding. Atrazine 1.25 kg followed by glyphosate 1.03 kg ha^{-1} gave higher yield than pendimethalin 1.13 kg followed by glyphosate 1.03 kg ha^{-1} as compared to hand weeding twice in a year. There was a trend of higher yield with the sequence of a pre-emergence herbicide followed by a post-emergence herbicide as compared to the reverse order.

WEED MANAGEMENT STUDY IN ROBUSTA COFFEE

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A field trial was conducted for three years during 1995-96 to 1997-98 to study the efficacy of weedicides in combination with additives in robusta coffee. The results have revealed that glycel and gramoxome sprayed with adddition of urea have recorded significantly lower weed growth and higher yields compared to treatments where the weedicides were sprayed without additives or manual methods of weeding.

CHEMICAL WEED CONTROL IN PRESEASONAL SUGARCANE (VARIETY CoM 88121)

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An experiment was conducted during suru season of 1995-96 at VSI farm in shallow soils to study the efficacy of Agrodor'96 (Weedor-96) - Mimethyl amine salt of 2, 4-D in sugarcane (variety CoM 88121) cultivation.

Pre and post emergence spray with different concentrations of weedicides were sprayed and were compared with control (hand weeding) and recommended weedicides (*Atrazin* and *Metribuzin*). The results indicated that this weedicide @ 2.5 to 4.0 lit./ha can be sprayed as pre and/or post emergence successfully for control of most of the dicot weeds and suppression of monocot weeds, without affecting the growth and yield of sugarcane crop.

EVALUATION OF AMETRYN FOR WEED CONTROL IN SUGARCANE

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A field experiment was conducted during 1997-98 at the Indian Institute of Sugarcane Research, Lucknow to find out the optimum dose and time of ametryn application for effective control of weeds in sugarcane. Ametryn efficacy was compared with the recommended herbicidal use (Atrazine - 2,4-D) and conventional method of weed control (Three manual hoeings). The major weed species found were *Cyperus rotundus, Cynodon dactylon, Trianthema monogyna, Convonvulus arvensis* and *Chenopodium album.*

Uncontrolled weed growth reduced the sugarcane yield by 42 per cent. The highest cane yield (111.6 t ha^{-1}) was recorded with the conventional weeding (three manual hoeings) which was at par with the recommended practice of chemical weeding (Atrazine-2,4-D). Comparable with the recommended herbicidal weeding (atrazine - 2,4-D), ametryn was effective even at its lower dose (2.0 kg ha^{-1}) when applied at early post emergence (35-45 days after planting). The quality of sugarcane juice was not affected by any of the treatments.

EFFICACY OF TRIAZINE (AMETRYN) IN SURU SUGARCANE (VARIETY Co 8014).

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An Experiment was conducted on suru planted sugarcane variety Co 8014 during the year 1997-98 in shallow soils of Vasantdada Sugar Institute's farm to evaluate triazine (Ametryn) for it's concentration and time of application.

The treatments comprised of spraying of various concentration of Ametryn (2.5, 4.0 and 5.0 kg ha^{-1}) within and after 10 and 15 days after planting along with 2, 4-D and inditron @ 1.5 kg and 300 gms respectively which were compared with hand weeding three times metribuzine @ 1.5 kg ha^{-1} and untreated control.

Spraying of Ametryn at 4 & 5 kg ha^{-1} after 10 days from planting could control most of the dicot weeds, while the growth of monocot weeds is suppressed. The losses due to presence of weeds has been estimated as about 50%. The spraying of ametryn alone and along with other weedicide did not affect the yield and commercial cane content.

CHEMICAL WEED CONTROL IN CAPSULARIS JUTE

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Jute is one of the important fibre crops in India and its yield can be increased if the crop is saved from weed competition. Field experiments conducted for two years at Tamil Nadu Rice Research Institute, Aduthurai to find out the effective weed management practice in Capsularis Jute revealed that pre-emergence application of fluchloralin at 1.0 kg ha-1 followed by one light hand weeding at 4 weeks ago plus two wheel hoeings at 3 and 5 weeks after sowing registered the highest plant height, stem girth and fibre yield of jute with lowest weed dry weight.

WEED MANAGEMENT THROUGH CHEMICAL AND NON-CHEMICAL METHODS IN SUGARCANE RATOON

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The experiment was carried out during 1996-97 to evolve suitable weed management strategy for sugarcane ratoon. Weed control measures viz. blanket and directed spray of glyphosate 0.5 kg ha $^{-1}$, three hoeings, trash mulching, mulching with sugarcane green top and weedy check were tested under two conditions viz., initial ploughing versus no ploughing.

Weedy plots were heavily infested with Cynodon dactylon and Cyperus rotundus for initial 50-60 days with relative densities of 60 and 20%,1 respectively. All the weed control measures and initial ploughing caused significant reduction in weed dry weight as compared to weedy check and no ploughing respectively. The effect of initial ploughing on shoot density 50 DAI and number of millable canes, however, was not significant. The highest ratoon yield (68.85 t ha $^{-1}$) was obtained with three hoeings, however, all the other treatments, except, blanket spray of glyphosate 0.5 kg ha $^{-1}$ recorded statistically similar yields. Juice quality remained unaffected due to various treatments.

EVALUATION OF STAPLE FOR WEED CONTROL IN COTTON

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Field experiments were conducted to test the efficacy of staple on the control of carpet weed (*Trianthema portulacasrum* L.) in cotton during kharif seasons of 1996 and 1997 at Hisar. Staple application alone at 100 g ha $^{-1}$ applied as pre emergence proved highly effective against carpet weed followed by post-emergence application of staple + surfactant (75 g ha $^{-1}$ + 2.25%) treatment. Staple was not effective against barnyard grass. Pre-emergence application of pendimethalin at 1500 g ha $^{-1}$ resulted in good control of other weeds like Barnyard grass and significantly gave higher seed cotton yield than weedy check but was at par with staple treatments.

CROP WEED COMPETITION STUDIES IN COTTON

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Crop weed competition studies in cotton were carried out to determine critical stage of weed control. Treatments comprised of weed competition during initial 30, 60, 90, 120 days after sowing till harvest and weed competition after initial 30, 60, 90, 120 days after sowing and no competition till harvest. The experiment was laid out in randomized block design with four replications.

The major weed species were *Cynodon dactylon, Cyperus rotundus, Cyprum irria, Tarianthema monogyma* with total weed density 262 weeds/m2 and weed dry weight of 213 gm/m^2 recorded at harvest. Weed competition during crop season resulted into yield reduction of 40% in weedy condition even during the first 30 days. Significant increase in yield was noted at initial weed free condition upto 30 days. Increase in the duraiton of initial weed free condition beyond 30 days of sowing had no additional effect on yield showed that the critical stage of crop weed competition in cotton was 30 days.

INTEGRATED WEED MANAGEMENT IN SUGARCANE

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Field experiments were conducted during 1993-94 and 1994-95 at Regional Sugarcane Research Station, Gujarat Agricultural University, Navsari in order to study integrated weed management in sugarcane ratoon crop. Paraquat, 2,4-D Na salt, Atrazine, Metribuzine alone or in combination with sugarcane trash mulch and conventional practice of hoeing and weeding and weedy check were also included.

The results indicated that conventional practices of three hand weeding + hoeing at monthly interval after ratooning, application of Atrazine + 2,4-D Na salt each at 1.0 kg ha-1 and Metribuzine 1.0 kg ha-1 as pre-emergence were comparable in respect to dry weight of weeds, number of millable cane, cane and c.c.s. yield (t ha-1). The cane yield recorded under these treatments were 73.34, 70.00 and 70.78 t ha-1 which were 73.33, 65.55 and 67.28 per cent higher than unweeded control. Though the conventional practices gave highest net return of Rs.37344 ha-1, the higher BCR value (1:2.82) was obtained with Atrazine + 2,4-D Na salt followed by conventional practices (1:2.75) and Metribuzine (1:2.64).

WEED MANAGEMENT IN HYBRID COTTON IN HILL ZONE OF KARNATAKA

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Field studies were made for 2 years (1993-95) on Vertisols at Agricultural Research Station, Mundagod. Pre-emergence application of clomazone (2-(2-chlorophenyl aniline) 1.5 kg at per ha supplemented with cultural operation was very effective in increasing weed control efficiency, seed cotton yield and net returns. Clomazone + cultural method recorded a weed control efficiency of 79.3 per cent as against 61.0 per cent in diuron + cultural method and 33.8 per cent in local method. Full season weed competition reduced seed cotton yield by 86 per cent over weed free check. Application of clomazone increased seed cotton yield to an extent of 76 per cent as compared to diuron application. Net returns were also higher with clomazone + cultural method.

STUDIES ON CHEMICAL AND CULTURAL MANAGEMENT OF WEEDS IN MESTA

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Field experiments were conducted for two years at Tamil Nadu Rice Research Institute, Aduthurai to find out the effective chemcial and cultural weed management practice in mesta. The results revealed that pre-emergence application of fluchloralin at 1.0 kg ha^{-1} followed by two wheel hoeings at 3 and 5 weeks after sowing and one light hand weeding at 4th week recorded the lowest dry weight of weeds (20.2 and 20.8 g/m^2 during the first and second year respectively), highest grain yield (294, 305.3 q ha^{-1}) and fibre yield (15.7, 16.1 q ha^{-1}) of mesta.

PERSISTENCE OF HERBICIDES APPLIED TO COTTON AND THEIR RESIDUAL EFFECT ON SUCCEEDING CROPS

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A field experiment was conducted at College farm, Rajendranagar, to study the persistence of various herbicides applied to cotton (MCH ^{1}) during 1996-97 and their residual effect on succeeding crops. The treatments comprising application of herbicides alachlor, butachlor, fluchlorlin and metolachlor at 1.5 kg ha^{-1}, oxyfluorfen @ 0.15 kg ha^{-1} and diuron @ 0.75 kg ha^{-1} and application of these herbicides at 2/3 dose fb two intercultivations at 30 and 45 DAS.

The persistence studies were carried with ragi bioas-say by collecting soil samples at 0, 20, 40, 60 and 90 DAS. The herbicides persisted upto 60 DAS as measured by germination and dry weight of ragi. None of the herbicides left any toxic residues in the soil which was evident from non-significant differences in germination and dry weight of different crops growth in herbicide treated plots and unweeded check.

INTEGRATED WEED CONTROL IN IRRIGABLE DRY COTTON

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A field experiment was conducted in Kharif 1994-95 and 1995-96 at Regional Agricultural Research Station, Nandyal farm in order to study the effects of different weed control methods in irrigable dry cotton.

Weed control efficiency was maximum with diuron 1.0 kg ha^{-1} + one interculture at 30 DAS (85.4%) followed by alachlor 1.5 kg ha^{-1} + one interculture at 30 DAS (83.9%) and pendemethalin 1.5 kg ha^{-1} + one interculture at 30 DAS (82.6%).

Maximum kapas yield of 1379 kg ha^{-1} was with pendemethalin 1.5 kg ha^{-1} + one interculture at 30 DAS followed by butachlor 2.0 kg ha^{-1} + one interculture at 30 DAS (1306 kg ha^{-1}). Treatments diuron + one I.C. and alachlor + one I.C. could not produce higher yields due to phytotoxity 10% and 6% respectively. Fluchloralin 1.0 kg ha^{-1} + one I.C. and paraquat 0.5 kg ha^{-1} were found ineffective in controlling weeds and producing higher yields. Net returns also followed similar trend as that of kapas yield.

COMPARATIVE EVALUATION OF BENSULFURON METHYL (LONDAX) FOR WEED MANAGEMENT IN TRANSPLANTED RICE-GREEN GRAM SYSTEM

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A field experiment was conducted during kharif 1997 at agricultural research Station, Kathalagere, University of Agricultural Sciences, Bangalore on sandy clay loam soil to know the comparative efficacy of bensulfuron methyl (Londax 30 WP) for control of weeds in transplanted rice Cv. IR-64. Bensulfuron methyl at 20 to 60 g ai/ha was compared with anilofos 0.4 kg ai/ha, butachlor 1.25 kg ai/ha, pretilachlor 0.75 kg ai/ha, metsulfuron methyl; 4 g ai/ha (all as pre-em., 2 days after planting) in relation to hand weeding and unweeded control. The major weed flora were *Cyperus iria, C.difformis, Scirpus sp, Fimbristylis miliacea* (among sedges) *Echinochloa glabrascens, Panicum tripheron, Paspalum dilatatum, E.colana,* (among grasses), *Lindernia veronicaefolia, Ludwigia parviflora, Rotala verticillaris, Alternathera sessalis, Cynotis axillaris* and *Dopatrium junceum*

Bensulfuron methyl at 20 to 60 g ai/ha had no detrimental effect on transplanted rice from the point of growth and grain yield, with very good control of sedges. *C.iria, C.difformis* (less effect on scirpus), *Dopatrium junceum, Lindernia veronicaefolia* (during later stages, >53DAP). Metsulfuron methyl (Ally 20 WP) alone 4 g ai/ha or its combination with anilofos (pre-muix 25.5 WP) at 800 g/ha also resulted in yield comparable to hand weeding (twice), other standard herbicides-butachlor 1.25 kg ai/ha and anilofos 0.4 kg ai/ha, in addition to showing better bioefficacy an sedges and broad leaf weeds. No adverse effect of the residual toxicity was observed in none of the previously applied herbicides to rice on the succeeding green gram.

INTEGRATED WEED MANAGEMENT IN PIGEONPEA + SORGHUM INTERCROPPING SYSTEM

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A field experiment with 11 weed control treatments was conducted during Kharif 1992-93 and 1993-94 in Randomised Block Design at Research Farm, Department of Agronomy, B.H.U. with a view to develop an integrated approach to manage weeds in pigeon pea + sorghum intercropping system.

Effect of various treatments of weed control significantly increased the yield of pigeon pea, sorghum and pigeon pea equivalent yield. Weed free check gave higher yield of pigeon pea and sorghum followed by two hand weeding (at 25 DAS and 50 DAS) and integration of chemical (Pendimethalian 1 kg./ha) + mechanical (1 hand weeding at 30 DAS). The differences in the yield recorded due to two hand weeding (25 DAS and 50 DAS) and pendimethalian (1 kg./ha) + one hand weeding at 30 DAS was not significant.

ECONOMIC VIABILITY OF INTEGRATED WEED MANAGEMENT IN WHEAT+SARSON INTERCROPPING SYSTEM

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A field experiment was conducted during rabi season of 1992-93 and 1993-94 at the Agronomy Research Farm, Himachal Pradesh Krishi Vishvavidyalaya, Palampur to study the effect of integrated weed management on yield and economics of wheat + sarson intercropping system. Hand weeding twice (30 and 60 DAS) remaining statistically at par with pendimethalin 0.75 kg + isoproturon 1.0 kg/ha (pre) resulted in significantly higher wheat equivalent yield on account of weed control efficiency. Pendimethalin 0.75 kg ha^{-1} (pre) fb. isoproturon 1.0 kg/ha (post) and isoproturon 1.5 kg ha^{-1} (post) were next best treatments with 63.9 and 61.2 per cent higher mean yield over weedy check.

Isoproturon 1.5 kg ha^{-1} (post), pendimethalin 0.75 kg/ha (pre) followed by isoproturon 1.0 kg ha^{-1} (post) and pendimethalin 0.75 kg + isoproturon 1.0 kg ha^{-1} (pre) recorded maximum net returns per rupee invested.

DIRECT AND RESIDUAL EFFECT OF HERBICIDES ON SOYBEAN-WHEAT SEQUENCE

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An experiment was conducted in sandy loam soil during *Kharif* and *Rabi* seasons of 1995-96 and 1996-97 at IARI, New Delhi to measure direct and residual effect of herbicides on soybean-wheat sequence. The dominant weed that invade the soybean were *Trianthema portulacastrum* L., *Digera arvensis* Forsk., *Digitaria sanguinalis* (L.) Scop., *Echinochloa colonum* L. and *Dactyloctnium aegyptium* L. While *Chenopodium album* L., *Melilotus indica* L. and *Avena ludoviciana* Dur. were dominant in wheat crop. Metribuzin at 0.5 kg/ha lowered the weed population and weed biomass compared to other herbicidal treatments and brought about similar increase in yield attributing traits viz., branches per plant, number of pods per plants and 1000 grain weight and grain yield of soybean to that of hand weeding twice. Isoproturon (0.75 kg/ha pre) and hand weeding were equally effective in arresting the weed population and increasing the grain yield of wheat. The dicot weed population in wheat was affected due to residual effect of weed control treatments applied to soybean. In soybean-wheat sequence the most productive and profitable weed control combination was hand weeding in soybean and isoproturon (0.75 kg/ha pre) in wheat or metribuzin (0.5 kg/ha pre) in soybean and isoproturon application in wheat.

INTEGRATION OF CULTURAL MANAGEMENT AND CHEMICAL CONTROL OF WEEDS IN TRANSPLANTED RICE-RICE CROPPING SYSTEM

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To compare different puddling methods and to measure the interaction between puddling methods and weed control treatments (manual, chemical and allelopathic) on weed control and yield of rice-rice cropping system, a long-term field experiment is done since Kharif 96 on a clay loam soil of Tamil Nadu agricultural University, Coimbatore. Two puddling methods (using wetland iron plough or tractor drawn cage wheel) as main plot treatments and five weed control treatments (butachlor 1.25 kg + 2,4-DEE 0.5 kg/ha; butachlor 1.25 kg - hand weeding (HW); incorporation of fresh parthenium plant 5 t/ha-HW (allelopathic approach); hand weeding twice; and unweeded control in subplots were compared.

Weed flora change assessed at 50 DAT in unweeded plot revealed that tractor cage wheel puddling reduced grass weeds to 31.0% from the initial population of 36.2% recorded in the first crop (Kharif 96), while such reduction was not evident with iron plough puddling. In contrast, dicot weeds got increased to 60.8% (from initial population of 51.4%) with cage wheel puddling, whereas a small reduction in dicot weeds was observed with iron plough puddling (47.0%).

As such weed biomass (50 DAT) was very much lower with tractor cage wheel puddling, that favoured crop growth and increased yield by 0.29 t/ha and enhanced B:C ratio (2.29) over wetland plough puddling. Pre emergence application of butachlor-HW and HW twice contained the weed biomass to minimum and gave 5.08 and 5.18 t/ha of grain yields, respectively. Though weed growth was relatively more with parthenium incorporation, maximum grain yield (5.38 t/ha) as well as B:C ratio (2.43) were obtained with this treatment, probably due to nutrient contribution to crop as green manure.

INTEGRATED WEED MANAGEMENT IN SOYBEAN + PIGEONPEA INTERCROPPING SYSTEM

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A field experiment was conducted during 1995-1997 to find out a suitable herbicide under soybean + pigeonpea (4 : 2) intercropping system in vertisols. Alachlor (2 kg ha^{-1}), pendimethalin (2 kg ha^{-1}), metolachlor (1 kg ha^{-1}) and oxadiazon (0.5 kg ha^{-1}) were used as pre-emergent spray either alone or in combination with one intercultivation (IC) at 30 DAS and hand weeding (HW) at 40 DAS along with weed free weedy checks. Pooled analysis inferred that in soybean + pigeonpea intercropping system, pre-emergence spray of metolachlor (1 kg ha^{-1}) coupled with on IC & HW ensured weed free condition resulting in higher seed yields & net returns.

EVALUATION OF HERBICIDES FOR SELECTIVITY AND WEED CONTROL IN RAINFED SORGHUM+PIGEONPEA INTERCROPPING SYSTEM

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A field with herbicides alachlor, metolachlor, butachlor, pendimethalin, diclofop methyl and metsulfuron methyl for rainfed sorghum + pigeonpea intercropping system was made to assess the selectivity, bioefficacy for weed control and effect on crop yields and economics, at Tamil Nadu Agricultural University, Coimbatore, during rabi 1995-96.

The herbicides manifested varying degree of selectivity for crops and weed control. Estimates on crop stand reduction showed that diclofop methyl and pendimethalin (each 1.0 kg/ha) caused substantial stand reduction of sorghum (21.1 and 19.7% respectively) while, metsulfuron methyl (3 g/ha) and diclofop methyl (1.0 kg/ha) was very much phytotoxic to pigeonpea, causing plant population reduction of 47.7 and 27.4% respectively. As such alachlor and metolachlor (each 1.0 kg/ha) were selective to both the crops.

In accordance with crop stand and WCE, maximum yield of both sorghum and pigeonpea (1690 and 314 kg/ha respectively) was obtained with HW twice, followed by alachlor + HW or metolachlor + HW. As a result of phytotoxicity resulting in poor crop stand, with other herbicides, the yield loss ranged from 24.7 to 38.9% as assessed by weed index. Though, yields were high with HW twice, better B:C ratio was obtained with alachlor + HW (2.43) due to cost effectiveness as compared to B:C ratio of 2.40 for HW twice. Thus, diverse weed flora in rainfed sorghum + pigeonpea intercropping could be selectively and effectively controlled by pre emergence use of alachlor or metolachlor followed by HW, as alternative methods to HW twice.

STUDIES ON WEED MANAGEMENT IN PIGEONPEA-GREENGRAM INTERCROPPING SYSTEM

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An experiment was conducted on weed management in pigeonpea-greengram intercropping during 1994 and 1995 at Indian Agricultural Research Institute, New Delhi. The data showed that hand weeding at 30 days after planting and weed free treatments along with fluchloralin @ 0.75 lit ha^{-1} applied as pre-plant incorporation reduced the weed population and dry weight and hence increased the grain yield of pigeonpea and greengram significantly over weedy check. Fluchloralin applied as pre-plant inorporation gave higher grain yield of pigeonpea and green-gram than applied and pre-emergence.

WEED CONTROL STUDIES IN MAIZE+ BALCKGRAM INTERCROPPING SYSTEM

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An experiment was conducted at the Agronomy farm of Indian Agricultural Research Institute, New Delhi, to find out the suitable method of intercropping system and weed suppressing effect of blackgram and to evaluate weed control efficiency of alachlor. Treatments comprises of all possible combinations of five cropping systems, solid maize planted at 60 cm apart, solid paried row planting of maize (30/90 cm), maize + blackgram alternate (1:1), maize + blackgram (2:2), maize + blackgram (2:3) and three methods of weed control viz., weedy check, hand weeding twice and alachlor 1 kg a.i./ha (pre-emergence) replicated 4 times in a R.B.D.

Growing three rows of blackgram in paired rows of maize had reduced the weed population (78, 38, 37 pl/0.50 m^2) and dry matter production of weeds (49, 68, 49 g/m^2) to the lowest whereas solid maize paired planting system recorded highest weed population (130, 59, 51 pl/0.50 m^2) and dry matter production (74, 98, 65 g/m^2) at 30, 60 and 90 days after planting respectively. Maximum values for maize yield (25.7 q/ha), total crop productivity or maize equivalent (35.3 q/ha) stover yield (53.9 q/ha), total crop productivity or maize equivalent (35.3 q/ha) stover yield (53.9 q/ha), total nitrogen uptake (71.76 kg/ha), LAI (4.6) and light interception (92) were recorded in paried planting of maize with three rows of blackgram. This system had also given higher no. of pods/plant (19) and maximum test weight (39.4 g) for blackgram. Hand weeding and alachlor 1 kg a.i./ha as pre-emergence increased the total productivity by 44.3% and 33.7%, respectively over unweeded control.

EFFECT OF SOWING SYSTEMS OF COMPONENT CROPS ON WEED GROWTH AND CROP PRODUCTIVITY IN PIGEONPEA + GROUNDNUT INTERCROPPING

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An experiment was conducted for two consecutive years (1996 and 1997) to findout the extent of weed suppression due to differed sowing of component crops in pigeonpea + groundnut intercropping. Two sowing systems viz., simultaneous sowing of pigeonpea + groundnut intercropping during first week of July and differed sowing i.e. pigeonpea during first week of Julyand groundnut sowing during second week of July, were tried under four weed control measures namely unweeded, weeding once, weeding twice, and weedfree. Weed weight could be reduced by 24.52% due to differed sowing of component crops compared to simultaneous sowing of both crops in the sequence. The gain yield of pigeonpea could be improved under differed sowing irrespective of weeding practices adopted on pooled basis. However, the yield of groundnut was found comparatively low under differed sowing.

INTEGRATED WEED MANAGEMENT IN PIGEONPEA + BLACKGRAM INTERCROPPING SYSTEM UNDER DRYLAND CONDITION.

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A field trial was carried out during the rainy seasons of 1989 and 1991 at the Dryland Research Farm, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi on sandy loam soil with low in available nitrogen and medium in available phosphorus and potassium, having a pH of 7.5. The experiment consisted of 10 treatment combinations (Weedy check, two hand weeding - 15 & 30 DAS, Interculture by dryland weeder - 15 DAS, 30 DAS, Pendimethalin - 1.0 & 1.5 kg, Fluchloralin - 1.0, 1.5 kg separately and in combination with intercultures).

Results clearly showed that pre-emergence application of pendimethalin (1.0 kg) along with one interculture (30 DAS) produced maximum yield of component crops and decreased the weed growth in pigeonpea + blackgram intercropping system. Further, combined effect of mechanical with chemical application was found effective as compared to chemical application alone. This practice may substitute manual weeding which otherwise is a costly and non-economical.

LONG-TERM EFFECTS OF HERBICIDE APPLICATIONS ON SOIL MICRO-ORGANISMS IN MAIZE-WHEAT SEQUENCE

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Studies since Kharif 1988 revealed that the population of bacteria (84.5x106g-1 dry soil), fungi ($17.0x10^{6}$ g^{-1} dry soil) and actynomycetes ($5.5x10^{6}$ g^{-1} dry soil) at 30 days after sowing were recorded in the treatment receiving hand weedings but the population of bacteria ($28x5x10^{6}$ g^{-1} dry soil), fungi ($6.0x10^{6}g^{-1}$ dry soil) and actynomycetes ($0.66x10^{5}g^{-1}$ dry soil) were found at the maximum decreased populations receiving pre-emergence pendimethalin @ 0.5 kg ai ha^{-1} + post emergence application of 2,4-D @ 0.5 kg ai ha^{-1} at 30 DAS and in rest of the herbicide treated plots population of bacteria, fungi and actynomycetes were also reduced much below 50% as compared to hand weeded plots or weedy check. The populations of these micro-organisms recovered upto 90-95% in all those treatments receiving herbicides since kharif 1988 with respect of the treatments receiving hand weedings or weedy check.

WEED DYNAMICS UNDER VARYING TILLAGE AND WEED MANAGEMENT PRACTICES IN A RICE-BLACKGRAM CROPPING SEQUENCE

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Field experiment was carried out during rainy and summer seasons of 1993-94 and 1994-95 in rice and blackgram cropping sequence at IIT, Kharagpur to study the distribution pattern of weed species under varying tillage and weed management practices in a rice-blackgram cropping sequence on acid lateritic sandy loam soil. Treatments consisted of four levels of tillage namely one ploughing with mould board plough + one harrowing, one ploughing with mould board plough + two harrowing, one ploughing with mould board plough + three harrowing and two ploughing with country plough + one harrowing; and four weed management practices i.e. unweeded check, hand weeding, mechanical weeding and chemical weed control - butachlor @ 1.5 kg/ha as pre emergence was applied in 1993. An additional treatment of chemical weed control - butachlor @ 1.5 kg/ha as pre emergence + 2,4-D @ 0.5 kg/ha was included during 1994 in rice crop. While in case of blackgram, pendimethalin @ 1.0 kg/ha was used as pre emergence.

The highest summed dominance ratio (SDR) of *Ludhwigia perennis* and *Digitaria sanguinalis* were observed and thereby identified as the most dominant weeds in rice. The SDR value of Digitaria sanguinalis and Enhydra fluctuans weeds were high and showed the high community dominance which reflect less diversity of weeds under chemical weed control.

Cyperus iria, Physalis minima and *Eleusine indica* had lower SDR in one ploughing with mould board plough + three harrowings than other tillage treatments. The dominance of Echinochloa colonum and Digitaria sanguinalis was effectively reduced under hand weeding and chemical weed control. The value of community dominance was high under one ploughing with mould board plough + three harrowing indicating lesser diversity of weed species. However, greater diversity of weed flora was observed under pendimethalin @ 1.0 kg/ha in blackgram. The coefficient of similarity (75%) was highest in weed communities between blackgram and blackgram crop while lowest (20%) between rice and blackgram.

DIRECT AND RESIDUAL EFFECT OF HERBICIDAL WEED CONTROL IN SOYBEAN-MUSTARD CROPPING SYSTEM

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Field experiments were conducted for four seasons during 1995-1997 at Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur on a fixed site in medium black soils. Four main plot treatments viz., alachlor 2 kg/ha pre em. clomazon 1.0 kg/ha pre em. hand weeding (20 DAS) and a weedy control were assigned to soybean and three sub plot treatments viz. isoproturon 1.0 kg/ha pre em. hand weeding (25 DAS) and a weedy control in mustard.

The weed flora in soybean was mainly comprised of *Echinochloa crusgalli, Commelina communis* and *Cyperus rotundus* while *Phalaris minor, Medicago hispida. Trifolium fiagiferum* and *Ciohorium intybus* were the major weeds of mustard. The herbicides were effective to control the weeds in both the crops. The total weed population and weed biomass was significantly reduced under herbicidal treatments and hand weeding compared to weedy control.

The residual effect of isoproturon applied to preceding mustard crop was not observed on weed population, weed biomass and seed yield of soybean. However, alachlor or clomazon applied to soybean exhibited residual effects in terms of reduced weed biomass and increased seed yield compared to weedy control in mustard crop.

STUDY ON EFFECT OF WEED MANAGEMENT PRACTICES ON PRODUCTIVITY OF RICE-RICE CROPPING SYSTEM IN COASTAL ORISSA.

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Field experiments were conducted to study the effect of herbicides against farmers' practice on productivity of rice-rice system at Bhubaneswar during winter season of 1996-97 and rainy season of 1997. The highest weed population of 73 and 52 m^{-2} were recorded in weedy check plot in rabi and *Kharif* rice, respectively. Application of Oxadiazon 1.5 kg ha^{-1} reduced weed population to 15 and 12/m^{-2} in respective seasons. Juxtaposingly, dry matter production by weeds was more in *Kharif* rice. The weed control efficiency values ranged between 55-68% and 39-62% in respective seasons. Farmer's practice recorded the maximum grain yield of 52 kg ha^{-1} and straw yield of 5700 kg ha-1 closely followed by oxadiazon 1.5 kg ha^{-1} with grain yield of 4600 kg ha^{-1} respectively. In *Kharif,* Oxadiazon 1.5 kg ha-*1* gave the maximum grain yield of 4790 kg as against 4450 kg Farmer's practice. Unhindered growth of weeds reduced the grain yield of Rabi and Kharif rice by 37.5 and 46.3% respectively.

INTEGRATED WEED MANAGEMENT IN PIGEONPEA (*Cajanus cajan* L. MILL SP.) + SESAME (*Sesamum indicum* L.) INTERCROPPING SYSTEM UNDER SEMI-ARID TROPICS OF INDIA

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Two field experiments were conducted at Barkachha, Mirzapur research station of Banaras Hindu University, Varanasi, UmP. India during summer monsoom seasons of 1989 and 1990. Ten treatments (weed free and weed infested upto 15, 30, 45, 60 days after sowing and upto maturity) in the pigeonpea + seasame intercropping system were evaluated infirst experiment. The second expperiment comprised of five cropping systems (sole pigeonpea, pigeonpea + 50 per cent seasame, pigeonpea + 75 per cent seasame and pigeonpea + 100 per cent seasame population) and four weed control methods viz., unweeded control, hand weeding twice at 20 and 40 dyas after sowing (farmer's practice), fluchloralin and predimethalin 1.0 kg ha^{-1} each.

The major weeds associated with pigeonpea (*Cajanus cajan* L. Mill sp.) and sesame (*Sesamum orintale* L. (*Sesamum indcum* L.) intecropping system were *Eleusine indica* L. 20%, *Digitaria ciliaris* L. (18%), *Cyperus rotundus* L. (19%) and *Cyperus iria* L. (18%) under semi-arid tropical conditions of India. The yield reduction due to full season competition from weeds was 43.1 and 43.2 per cent in pigeonpea and seasame, respectively. The critical period of crop-weed competition was found between 15 and 45 days after sowing. Sesame population of 75 per cent of the recomended along with normal population of pigeonpea was effective in suppressing the weeds, increasing productivity and net return from the system when Fluchloralin 1.0 kg ha^{-1} was used as weed management practice without differing significantly wigh farmer's practice of two hand weedings at 20 and 40 days after sowing.

INTERACTION EFFECT OF PRE-PLANT TILLAGE AND ROTATIONAL AND CONTINUOUS USE OF HERBICIDES IN RICE BASED CROPPING SYSTEM

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Field experiments to study the effect of pre-plant tillage and post-plant tillage practices inrice based cropping system were carried out during 1993 and 1994 at Agricultural College & Research Institute, Killikulam. The effective weed control through pre-plant tillage such as glyphosate / summer tillage suplemnted the efficiency of various post-plant weed management practices. Grain yield increased with all the post-plant weed management practices was much higher in combination with glyphosate application/summer tillage than with tillage at planting. The grain yield increase with hand weeding twice preceded by glyphosate application or summer tillage was 377-507 kg ha^{-1} and 232-379 kg ha^{-1} more than when precededby tillage at planting. Rotation of thiobencarb with pretilachlor registered higher weed control efficiency of 80.1-86.0 and 76.1-84.8 per cent when precededby glyphosate/summer tillage respectively.This complementary effect on weed control was due to the effective reduction of growth of all categories of weeds with pre-plant tillage practices which enabled the post-plant herbicides to register better weed control. The magnitude of this additive effect of weed control was larger in the control of sedges. Especially when various herbicides were applied continuously pre-plant glyphosate or summer tillage enabled a greater degree of control of sedges.

ACETOCHLOR - A NEW SUITABLE HERBICIDE FOR RICE AND RICE BASED CROPPING SYSTEM

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Field experiments were conduced in the wet lands of Tamil Nadu Agricultural University, Coimbatore with an objective of evaluating the efficacy of different doses and time of application of acetochlor with other integrated weed management practices for "rice (CORH-1) - rice (CO-45) - green gram (KM-2)" cropping system during 1996-97 and 1997-98. Two methods of land preparation (Tractor ploughing with cage wheel by two passes and paraquat @ 1.0 kg ha^{-1} before land preparation + tractor ploughing with cage wheel by one pass as main plot treatments. The subplot treatments include weed control methods viz., acetochlor @ 50 g ai ha^{-1} +at transplanting + HW (40 DAS), acetochlor @ 50 g ai ha^{-1} at 8 DAT + HW, acetochlor @ 75 g ha^{-1} at transplanting, acetochlor @ 75 g ha^{-1} at 8 DAT, *Lantana camara* incorporation @ 5.0 t ha^{-1} + HW, acetochlor @ 50 g ai ha^{-1} at 8 DAT + azolla inoculation @ 2.5 t ha^{-1} as dual culture, butachlor @ 1.25 kg ha^{-1} as pre-emergence + HW, hand weeding twice (20 and 40 DAT) and control. In sequence - I rice crops, grassy weeds (52% in first crop) and broad leaved weeds (42% in second crop) dominated, while in sequence - II broad leaved weeds (42% in first crop) and grassy weeds (45% in second crop) dominated. The land preparation methods did not influence the grain and straw yield of rice. Acetochlor 50 g ai ha^{-1} at 8 DAT + HW gave highest benefit cost ratio in both the sequences. This treatment was closely followed by the non-chemical method of *Lantana camara* incorporation + HW and recommended practice of butachlor 1.25 kg ha^{-1} + HW. The net return was also more in paraquat 1.0 kg ha^{-1} + tractor ploughing with cage wheel by one pass in combination with acetochlor @ 50 g ai ha^{-1} at 8 DAT + HW (40 DAT). The herbicides used (Acetochlor, paraquat and butachlor) did not show any residual toxicity on the succeeding crop of greengram.

WEED MANAGEMENT STUDIES IN SOYBEAN - NIGER INTERCROPPING SYSTEM

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During a field trial on weed management studies in Soybean - Niger intercropping (4:2) system, conducted at RRTTS Semiliguda in Kharif, 1995 to find out the most effective weed control method in this system, it was observed that among twelve treatments studied, significantly higher niger equivalent yield (440 kg ha^{-1}) was recorded under one hand weeding at 4 weeks after sowing as compared to other treatments. When hand weeding was delayed further, the niger equivalent yield was decreased significantly. Weed free period upto 6 weeks after sowing produced maximum niger equivalent yield (351 kg ha^{-1}) which was at par with weed free upto 3, 4, 5 or 8 weeks. The maximum weed dry weight (594 kg ha^{-1}) was recorded under weedy check and the minimum (182 kg ha^{-1}) under weed free upto harvest which was found at a par with weed free upto 8 weeks (267 kg ha^{-1}) and weed free upto 6 weeks (291 kg ha^{-1}).

EFFECT OF TIME OF NITROGEN APPLICATION ON YIELD AND N-UPTAKE BY WEEDS IN RICE-WHEAT CROPPING SEQUENCE

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This experiment was laid out with the objective to study the effect of split application of nitrogen on growth, development and nitrogen uptake by weeds in rice-wheat cropping sequence during 1995-96 and 1996-97 at Jabalpur. An uniform dose of 120 kg N ha-1 was applied as full, two splits and three splits at different times such as basal, 20 DAS (after first weeding) and 45 DAS (after second weeding) under weedy and weed free (2 hand weeding) situations.

The dominant weed flora in rice was *Echinochloa colonum, Commelina communis, Corchorus acutangulus* and *Alternanthera sessilis* while in wheat, *Phalaris minor* and *Chenopodium album* were the dominant weeds. The single application of nitrogen produced significantly higher weed dry matter in both the crops than with split nitrogen application. Application of N in varying amount at a given stage increased the weed biomass at subsequent stage. The lower dry weight of weeds was noticed in weed free (2 hand weeding) than weedy check. Application of nitrogen into three splits gave higher grain yield and N uptake by the crops as compared to single split. On an average the extent of nitrogen loss by weeds under weedy check was 62 per cent higher than that of weed free situation in direct seeded upland rice.

WEED AND FERTILITY MANAGEMENT IN WHEAT AND RAPESEED INTERCROPPING SYSTEM

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A field experiment was conducted during rabi, 1996-97 at Instructinal cum Research farm of the Assam Agricultural University, Jorhat. Treatment comprised of two row ratios (2:1 & 4:1) of wheat and rapeseed, two weed control practices (no weeding & hand weeding at 30 DAS), three fertility levels viz. 50, 100 and 150 per cent of the recommended dose (40:23:21 Kg N, P2O5 & K2O/ha) of wheat along with two sole crops of wheat and repeseed grown with recommended practices. Results showed significant influence of different treatments on weed dry matter accumulation, leaf nitrate reductase activity (NRA) and leaf chlorophyll content of wheat and rapssed, yield of wheat and rapessed as well as wheat equivalnet yield. Intercropping could not show andy significant variation in weed dry weight over their sole cropping; however, weed dry weight was significantly reduced due to different row ratios tested. The lowest weed dry weight was recorded with 4:1 row ratio of wheat and rapeseed. Hand weeding at 30 DAS significantly lowered the weed dry weight at harvestover no weeding. Intercropping showed significant yield advantages over their sole cropping in terms of wheat equivalent yield. Wheat equivalent yield was increased significantly increased only upto recommended dose of fertilizer. Hand weeding (30 DAS) also significantly increased the wheat equivalent yield over no weeding. Leaf nitratereductase activity and leaf chlorophyll content of wheat and repessed increased substantially due to hand weeding (30 DAS) as well as with increasing levels of fertilizers.

BIOEFFICACYOF SOME WEEDFLORA USED AS GREEN MANURE IN TRANSPLANTED PADDY-PADDY CROP SEQUENCE.

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Field experiments conducted to study the substitution of inorganic nitrogen fertiliser by using the naturally occuring weed flora *Polygonum globrum* and *Imomoea carnea* during *kharif* 1997 and *Melilotus alba* and *Lathyrus aphaca* during summer 1998 as green manure crops in a transplanted paddy-paddy crop sequnce. Full doses of NPK (60:30:30 kg ha^{-1}) applying the green twigs of both Polygonum glabrum and Ipomoea carnea @ 10 t ha^{-1} at 21 days before transplanting of kharif paddy the grain yield was 7.45% higher and at par with the grain yield obtained from the full NPK. Substituting 25% N these weed flora when applied as green manure recorded statistically at par yield that was obtained from the full NPK treated plot. The paira sowing of Melilotus alba and Lathyrus aphaca at 7 days becore harvesting of kharif paddy and subsequenctly as green manure crops, incroporating these two weed flora at 45 DAS (3 weeks before trnasplanting of summer paddy) along with full NPK recorded significantly higher grain yields that obtained from the only NPK treated plots (120:60:60 kg ha^{-1}).

In the full crop sequence *kharif* paddy - sumer paddy using of these four weed flora as green manures a substitution of 50% N (25% N in each season) can thus be possible without affecting the normal grain yield of paddy.

EFFECT OF TILLAGE AND WEED MANAGEMENT PRACTICES ON WEED FLORA AND CROP PERFORMANCE IN RICE-BLACKGRAM CROPPING SEQUENCE

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Indian Institute of Technology, Kharagpur 721 302

Field experiments were conducted during 1993-95 at the Experimental FArm of Agricultural and Food Engineering Department, Indian Institute of Technology, Kharaagpur. Study the distribution pattern of weeds in direct seeded rice - blackgram cropping sequence to assess the efficacy of different tillage practices and different methods of weed control. Four levels of tillage viz., tractor drawn mould board plouth (MBP), harrowing once (1HR), MBP-2HR, MBP+3HR and bullock drawn country ploughing twice (2CP) and harroowing once (control) and four weed management practices viz., hand weeding, mechanical weeding, chemical weeding and unweeded check were studied in both rice and balckgram.

Digitaria sanguinalis, *Echinochloa colomum* and *Enhydra fluctuans* were common weed species in both the crops. The population of broad leaf weeds was less under improved tillage than conventional tillage practices. Under high degree of tillage, *Enhydra fluctuans* was effectively controlled in rice field, while *Physalis minima*, *Cyperus iria* and *Eleusine indica* were reduced in balckgram. Improved tillage practices could reduce the weed population by 20.3 to 53.8% in direct seeded riceand from 36.4 to 62.0% in blackgram and the yield increase was from 12.9 to 23.2% in rice and 9.4 to 16.7% in blackgram than the conventioanl tillage practice.

Weed control efficiency showed variations from 59 to 99% in hand weeding, 30 to 40% in mechanical weeding and 32 to 70% in chemical weed control treatments. The summed dominance ratio value suggests that the perennial weed species *Enhydra fluctuans* and *Cynodon dactylon* would be effectively controlled only hand weeding.

SOIL SOLARIZATION FOR WEED MANAGEMENT IN GROUNDNUT - FRENCHBEAN SEQUENCE

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Field experiment was conducted with the objective to know the effect of soil solarization with and without crop resides on weed control, growth and yield of groundnut and frenchbean. for two years during 1995-96 and 1996-97 at the Main Research Station, University of Agricultural Sciences, Bangalore. The treatments comprised of control, Glyrricida 5 t/ha, Pongamia 5 t/ha, TPE 0.050 mm and TPE 0.075 mm with and without crop residues. Before mulching irrigation was given. After 33 days of soil solarization polyethylene sheets were removed and groundnut crop was sown immediately. Frenchbean was sown after the harvest of groundnut without disturbing the soil.

The weed count was drastically reduced by the combination of crop residues + solarization and the effect was noticed upto the harvest of frenchbean after groundnut. Similarly crop residues + solarization was beneficial in increasing the yield of groundnut and frenchbean compared to either crop residues or solarization alone.

BIOEFFICACY OF POST-EMERGENCE HERBICIDES FOR WEED CONTROL (IN SOYBEAN *(GLYCINE MAX (L.) MERRIL)*

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Field experiments were conducted for two seasons during Kharif 1996-97 at Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur in medium black soils. The treatments comprised of grass weed killers viz., fluazifop-p-butyl @ 0.25 kg/ha, sethoxydim 0.375 kg/ha and fenoxaprop-p-ethyl 0.07 kg/ha either alone or tank mixed with broadleaf weed killers viz., lactofen @ 0.12 kg/ha or chlorimuron ethyl @ 0.012 kg/ha as post-emergence (21 DAS) and compared with metolachlor @ 1.5 kg/ha. 1-hand weeding and a weedy control.

Fluazifop-p-butyl @ 0.25 kg/ha or sethoxydim 0.375 kg/ha or fenoxaprop-p-ethyl 0.07 kg/ha (21 DAS) may be used in fields dominaned with grassy weeds onlywhile chlorimuron ethyl @ 0.12 kg/ha (21 DAS) may be tank mixed with fluazifop-p-butyl or sethoxydim for effective control of mixed weed flora in soybean.

BIO-ASSAY STUDIES ON THE PERSISTENCE OF METRIBUZIN IN SOIL

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The residual activity of metribuzin (4-amino-6 tert butyl--3- (Methyl thio)-1, 2,4-triazine-5- (4H)- one) in loamy sand was studied using cucumber and wild oats as indicator plants. The herbicide concentrations tested were control, 0.01, 0.10, 1.0, 5.0 and 10.0 ppm by weight of soil. Metribuzin concentrations, 1.0 5.0 and 10.0 ppm adversely affected the growth of indicator plants. The data indicated that metribuzin degraded to safe level by 63 days at 0.01 & 0.10 ppm and 84 days at higher doses (1.0, 5.0, and 10.0 ppm).

DIRECT AND RESIDUAL EFFECT OF HERBICIDAL WEED CONTROL IN SOYMEAN-MUSTARD CROPPING SYSTEM

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The weed flora in soybean was mainly comprised of *Echinochloa crusgalli*, *Commerlina communis* and *Cyperus rotundus* while *Phalaris minor*, Medicago,hispida. Trifolium fiagiferum and *Ciohorium intybus* were the major weeds of mustard. The herbicides were effective to control the weeds in both the crops. The total weed population and weed biomass was significantly reduced under herbicide treatments and hand weeding compared to weedy control.

The residual effect of isoproturon applied to preceding mustard crop was not observed on weed population, weed biomass and seed yield of soybean. However, alachlor or clomazon applied to soybean exhibited residual effects in terms of reduced weed biomass and increased seed yield compared to weedy control in mustard crop.

STUDIES ON THE PERSISTENCE AND MOVEMENT OF ATRAZINE IN CONTINUOUSLY APPLIED PLOT OF SUGARCANE IN SOUTHERN TRANSITION ZONE OF KARNATAKA

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A field study was conducted during 1996-97 in a clayey soil to study the persistence and movement of atrazine in continuously applied plot of sugarcane for over ten years in a farmer's field of Harakere village in Shimoga district coming under the southern transition zone of Karnataka receiving 1500-2000 mm annual rainfall. Sugarcane is a major crop of this area and atrazine is widely used for control of weeds in sugarcane. Initial soil samples collected from 0-30 and 30-60 cm soil depth were analysed for atrazine residues by HPLC method using acetonitrile as extractant. The procedure was standardised and the recovery of atrazine was 98 percent. Atrazine was applied at 1.00 kg ha^{-1} during December 1996. Soil samples were collected on 0, 15, 30, 45, 60, 90 and 120 days after application and the residues were monitored by HPLC with UV-detector using a reverse phase C-18 column. It has been revealed that no soil residues of atrazine were detected in the initial soil samples and 50 percent of the applied atrazine dissipated within 45 days period in 0-30 cm soil depth (half life-47 days). And on 60th day atrazine was in non-dectable limit by HPLC method. However in 30-60 cm soil depth atrazine residue was detected up to 0.082 ppm on 60th day, beyond which residue could not be detected. It is observed from the study that there was movement of atrazine into the lower soil layer and in 0-60 cm soil depth persistence will be up to 60 days only under this agro-climatic situation.

RESIDUAL EFFECT OF HERBICIDES IN IRRIGATED GROUNDNUT

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Field experiments were conducted at Agricultural Research Station, Bhavanisagar during summer 1997 and 1998 to evaluate integrated weed management practices in groundnut. The residual effect of applied herbicides viz., fluchloralin 1.0 kg ha^{-1}, pendimethalin 1.0 kg ha^{-1}, metolachlor 1.5 kg ha^{-1} and alalchlor 2.0 kg ha^{-1} was evaluated by raising pulses during *kharif* seasons after the harvest of the groundnut, greengram, blackgram and cowpea were sown in the same plots to study the residual effect of herbicides. The germination, plant height and yield of residual crops remain unaffected due to the residual effect of above herbicides.

ACCELERATED DEGRADATION OF METOLACHLOR IN TROPICAL SOIL

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The effect of persistence of metolachlor, a soil applied herbicide was seen in a field experiment involving repeated herbicide application. The filed reveived four applications of metolachlor over a 8 months period which included two cropping seasons. Each crop viz., soybean and tomato, received two sprays of Dual^{R} (50EC) @ 2.0 Kg ha^{-1} at a gap of about two months. There was a trend to more rapid rates of degradation with increasing number of previous treatments with the half-life declining sharply from 18 days during the first spray to 2.4 days following the fourth spray. An effort was made to isolate the microbial population from this field soil acclimated to the herbicide for a long time. A fungal community MF1 isolated from this soil could degrade metolachlor upto 43.78% when the sole nitrogen source supplied in the medium was metolachlor and upto 84.77% when 0.03% of additional nitrogen source was supplied along with metolachor. In the absence of any additional carbon source except metolachlor, the culture could degrade it upto 48.57%. In the presence of both carbon and nitrogen source, 99.5% of the added metolachlor was degraded by this fungal culture. The degradation recorded by a bacterial community BM1, in presence and in absence of an additional carbon source was 81.5% and 59.78% respectively.

The sutdy emphasized faster degradation of metolachlor subsequent each application indicating need for higher application rate of matolachlor year after year for effective weed control. It also revealed that acclimatized microbial population with ability to detoxify metolachlor could be exploited for herbicide residue management at contaminated sites.

MOBILITY OF HERBICIDES IN SOIL IN VARANASI DISTRICT

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The soil thin layer chro matography technique was employed to assess the mobility of two non-ionic herbicides, *viz.*, butachlor [N-butoxymethyl-2-chloro-2'6'-deithyl acetanilide] and pendimethalin (N-(1-ethyl propyl)-3,4-dimethyl-2,6-dinitrobensenamine] in different soils of Varanasi district. Both the herbicides were immobile ($R<0.09$) in soils of Varanasi district. The effects of soil variables, i.e., clay content, organic matter, pH, cation exchange capacity (CEC), density and water holding capacity on mobility were investigated. Soil CEC significantly affected the mobility of the herbicides studies; with increased mobility in soils with lower CEC values, which was attributed to their adsorption over soil colloids. Comparative difference of mobility of the studies herbicides (butachlor > pendimethalin) can be explained with their chemical properties and water solubility, Ksp (mg/L).

IDENTIFICATION OF SUITABLE TECHNIQUE TO EVALUATE HERBICIDE POTENCY

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Experiments were conducted to evaluate herbicide potency in different crops and herbicide resistant progenies using Streibig bioassay techniques. Bioassay materials used were glyphosate resistant progenies of tomato against glyphosate and crops (maize, ragi, cucumber and greengram) against chlorimuron ethyL respectively. Resistant progenies of tomato were developed through male gametophytic selection pressure during pollination and fertilisation. In all bioassays, dose-response curve was adequately described by four parameteric logistic function (linear form of this function was obtained using logit transformed response to respective doses). ED50 & relative potency were used to compare the herbicide potency. Four parameters required for the function are maximum and minimum responses, ED50 & slope around ED50. ED50 (herbicide potency) is the dosage at which mid responSe between maximum response and minimum response. Graphically, ED50 is the position on zero logit line where the linear regression line of dose response intercept by the respective bioassay material. If the herbicide potency is high for the bioassay material, the regression line and the ED50 lay close to response axis ("Y" axis) and vice versa.

Relative potency is the ratio of ED50 of treatment to the control and it indicates that number of times more or less the herbicide potency for the given bioassay material compared to control. Relative potency value depends on type of logit transformation. In this paper, best possible logit transformation has been discussed in order to maximise relative potency expression, identify best bioassay system for a given herbicide and evaluate the herbicide resistance in the selected progenies. Of the crops, greengram was the most sensitive bioassay based on position of the dose-response regression line. Glyphosate resistant tomato progency developed by male gametic selection pressure (20 ppm glyphosate on stigmatic surface) showed increased resistance upto 7 fold higher resistance.

STUDIES ON RESIDUAL EFFECT OF ANILOPHOS APPLIED IN RICE ON WEED DENSITY, WEED DRY WEIGHT AND GRAIN YIELD OF WHEAT

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Field trial was conducted at Agronomy Research Farm of N.D. University of Agriculture & Technology, Kumarganj, Faizabad during *rabi* 1994-95 and 1995-96 with an object to study the residual effect of anilophos applied in rice on the succeeding wheat crop. The results revealed that the applicaiton of anilophos 0.2, 0.3, 0.4, 0.5 and 0.6 kg ha^{-1} 9 DAT to control the weeds in rice did not show its toxic residual effect on the succeeding wheat crop.

PENDIMETHALIN AND FLUCHLORALIN RESIDUES IN GREEN FORAGE LUCERNE PLANT AS AFFECTED BY TIME OF APPLICATION

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Lucerne (*Medicago sativa* L.) is an important rabi forage crop of Gujarat due to dairy farming. *Cuscuta* is a problematic parasitic weed in lucerne crop. Complete control of *Cuscuta* was achieved when pendimethalin sprayed 0.50 kg ha^{-1} between seven and ten days from sowing of lucerne without any phytotoxic effect on crop. Therefore, field experiemnt was conducted during rabi season of 1996-97 at Anand to know whether herbicide absorbed by lucerne plant when applied after emergence of lucerne crop or not. Applicaiton of fluchloralin (0.50 kg ha^{-1}) and pendimethalin (0.50 kg ha^{-1}) were done on one, four, seven and ten days after sowing. Green lucerne samples were collected 55 days after sowing at the time of first cut. Herbicide residues were analysed by using gas liquid chromato graph equipped with ECD. Pendimethalin residues were not detected in any of the samples collected at the time of first cut of lucerne plant, while fluchloralin herbicide residues were present. Fluchloralin residues were 0.043, 0.045 and 0.012 ppm in green lucerne plant when applied at four, seven and 10 days after sowing, respectively. The use of pendimethalin on lucerne 0./5 kg ha^{-1} ten days after sowing is safe.

STUDIES ON RESIDUAL EFFECT OF HERBICIDES APPLIED TO TRANSPLANTED FINGER MILLET ON SUCCEEDING BLACKGRAM

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A field study on residual effect of herbicides applied to transplanted rabi (Co İ3) on succeeding blackgram was carried out at the Agricultural College & Research Institute, Killikulam (T.N.) during summer 1995 and kharif 1996. The black gram (Co 5) were sown in ragi stubbles without any preparatory cultivation. All the three herbicides viz., pendimethalin 0.75 kg a.i. ha^{-1}, oxadiazon 0.5 kg a.i. ha^{-1} and pretilachlor with safener 0.45 kg a.i. ha^{-1} applied as pre-emergence to transplanted ragi on 3 days after transplanting did not show any significant effect on the germination percentage, plant height, dry matter production at 30 days after sowing and yield of succeeding blackgram.

DEGRADATION BEHAVIOUR OF ISOPORTURON IN WHEAT PLANTS AND SOIL

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Degradation behaviour of isoproturon (Flowable) was studied during rabi 1992. Isoproturon was applied @0.75 and 1.5 kg ha^{-1} after 32 days of sowing with sampling on 0, 1, 5, 10, 15, 30 days after treatment and at harvest. Soil samples were collected from two depths i.e. 0-6" and 6-12". Isoproturon residues were extracted by blending green plants with chloroform and with dichloromethane by soxhlet extractionfrom straw and grains. Soil samples were extracted with dichloromethane and activated charcoal. The green plant, straw and grains extracts were cleaned by passing through column of Florisil-activated charcoal and elution withchloroform-ethyl acetate misture. The eluate obtained was concentrated and analysed on gas chromatograph equipped with nitrogen-phosphorus detector and methyl silicon column using nitrogen as carrier gas. The residue data obtained indicates that in plant half life of isoproturon is about 5 d and at harvest straw and grains were free from measurable amounts of isoproturon residues. In soil, residues mostly remained confined to top 6" layer with very small quantities leaching down to 6-12" layer. Observed residue half-life of isoproturon in soil was 11 days. Like straw and grains, at harvest soil samples were free from isoproturon residues thereby indicating that isoproturon can safely be used on wheat crop for controlling weeds.

RESIDUE STUDIES OF TANK MIXED 2,4-D Na SALT AND ISOPROTURON IN POST-HARVESTED SOIL APPLIED IN WHEAT

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Exdperiments were conducted at Agronomy Research FArm as well as in weed science laboratory of the unviersity during winter seasons of 1994-95 and 1995-96 in a Randomized Block Design with four replications. Application of isoproturon 0.75 kg ha^{-1} post-em., 2,4-D Na salt 0.5 kg ha^{-1} post-em. and mixture of isoproturon 0.75 + 2,4-D Na salt 0.5 kg ha^{-1}, isoproturon 0.75 + 2,4-D Na salt 0.25 kg ha-1 and isoproturon 0.5 + 2,4-D Na salt 0.25 kg ha^{-1} (Tank mixed) post-em. did not cause significant variations in germination, plant height and dry matter production of cucumber grown in sampled soil taken after the harvest of wheat crop. Hence, herbicides namely isoproturon and 2,4-D Na salt used either alone or tank mixture at above mentioned doses and time of applicaiton in wheat did not leave their harmful toxic level of residues in post-harvest soil of the experimental field during both the years of study.

RESIDUES OF ISOPROTURON IN SOIL AS AFFECTED BY ITS DOSES AND TIMES OF APPLICAITON IN WHEAT

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Field and laboratory experiemnts were conducted at HPKV, Palampur during *rabi* 1993-94 and 1994-95 to determine the effect of differrent doses and times of applicaiton of isoproturon in wheat on its residues in soil. The soil samples from 0-15 cm depth were collected at 0, 7, 15, 30, 45, 60, 90, 120 days after applicaiton of isoproturon and at post harvest from plots treated with isoproturon at four doses viz. 0.75 kg ha^{-1}, 1.00 kg ha^{-1}, 1.25 kg ha^{-1} and 1.50 kg ha^{-1} and three times of applications viz. Pre, 20 DAS and 35 DAS. The residues of isoproturon in these samples were analysed by using bioassay technique. Root length of oats was used as bioassay parameter. The per cent reduction of root length of oats over control indicated that residues of isoproturon treatments 0.75 kg ha^{-1}, 1.00 kg ha^{-1}, 1.20 kg ha^{-1} and 1.50 kg ha^{-1} were non detectable on 60, 120, 120 days and post harvest samples, resspectively in case of Pre emergence application and 60, 90, 90 and 120 days respectively in case of 20 DAS application and 30, 60, 60 and 90 days, respectively when isoproturon was applied at 35 DAS.

EFFECT OF HERBICIDES ON EARTHWORM POPULATION, GROWTH AND MIGRATION

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Earthworms are important in enhancing soil structure and fertility. Apprehension prevails among farmers that use of herbicides will harm the earthworm. To validate this a study was conducted under laboratory conditions of AICRP on weed control, UAS, Hebbal, Bangalore for 4 weeks with *Pontoscolex corethrurus*, a widely distributed earthworm in tropical countries. Most commonly used pre-emergence herbicides namely atrazine and pendimethalin were used at recommended levels 1.00 kg ha^{-1} in a sandy loam soil. Earthworm growth, population and migration were studied for four weeks at weekly intervals. It is observed that the growth increased from 18-48% in control over the initial weight. Where as in atrazine and pendimethalin treatments it ranged from 36-83% and 18-103% over the initial weight, respectively. The variation in population with respect to control and treatments was only 4%. It can not be attributed to herbicide treatment only. The results indicate that population and migration was not affected due to herbicide application [illegible]. It was found that both the herbicides did not affect the growth, population and migration of earthworms.

EFFECT OF PRE-EMERGENCE HERBICIDES ON THE ACTIVITY OF R-NASE AND D-NASE ENZYME DURING GERMINATION IN PIGEONPEA AND CARPETWEED

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At recommended doses, pre-emergence application of dinitroaniline herbicides do not affect the emergence of crops or their yields, but weeds are adversely affected. The present study was conducted to understand the mode of action of trifluralin and pendimethalin herbicides in pigeonpea (*Cajanus cajan* L.) and carpetweed (*Triathema portulacastrum* L.). Seeds of pigeonpea and carpetweed were placed on filter paper in petridishes separately for germination at 35 + 2°c in B.O.D. incubator. Then 5 ml of aqueous solution of 5, 10, 15 and 20 ppm of trifluralin and pendimethalin was poured in petridishes, separately, while for untreated conrol, 5 ml of distilled water was added. In general the activity of hydrolyzing enzymes (Rnase and Dnase) increased significantly with passage of time during germination in pigeonpea and carpetweed.The application of trifluralin and pendimethalin decreased the activity of Rnase and Dnase enzyme significantly during germination in pigeonpea and carpetweed at all the sampling times. The reduction in the activity of above enzymes increased significantly with increase in the concentrations of both the tested herbicides in both the plant species.

EFFECT OF HERBICIDE APPLICATION TO SOYBEAN ON SOIL MICROFLORA

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Field exdperiment was conducted at Agricultural Colledge Farm, Rajendranagar, Hyderabad during 1996-97 to find out the effect of different herbicides applied to soybean on soil microflora. The treatments studied were pendimethalin @ 1.0 and 1.5 kg ai./ha, metolachlor @ 1.0 and 1.5 kg ai./ha, alachlor @ 1.0 and 1.5 kg ai./ha, oxyflorfen @ 0.10 and 0.15 kg ai./ha, lactofen @ 0.20 kg ai./ha.

The bacterial and fungal populations at 30 DAS and at harvest were estimated from rhizosphere soil of herbicide treated plots by dilution plate method. Both bacterial and fungal populations were significantly lower at 30 DAS in all the herbicides treated plots as compared to that in control and hand weeded plolts. The total bacterial and fungal population were comparatively less at 30 DAS than at harvest.

Greater decline in bacteria population was observed in pendimethalin treated plots and it was followed by that of oxyfluorfen. By harvest time, the bacterial population increased but the fungal population not reached to the level of hand weeding or control plot.

EFFECT OF POLYTHENE MULCHING ON THE PERSISTENCE OF ALACHLOR AND METOLACHLOR AND ITS

INFLUENCE ON WEED CONTROL IN SOYBEAN

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Monitoring of ground water has shown the presence of undesirable pesticide residues. These persistent xenobiotics tend to accumulate in soil or leach down into ground water, and finally find its way into rivers and streams. This contaminated water, when used for consumption, leads to health hazard. Therefore, simple and IPM compatible methods have to be devised for removal of such molecules. An attempt has been made in this direction for decontaminating two herbicides from soil by solarisation.

Both the dicotyledon and monocotyledon weeds were controlled by mulching. This technique is known to increase the temperature and enhance microbial activity in the top layer of the soil. The yield of soybean crop was significantly higher in mulched plots than in non-mulched plots and no residues were detected in soybean at harvest. The study establishes the usefulness of the mulching technique as a non-chemical method for the decontamination of soil.

HERBICIDE RESIDUE IN SOIL AND CROP PRODUCE IN RICE-RICE CROPPING SEQUENCE AS INFLUENCED BY LONG TERM CONTINUOUS APPLICATION OF HERBICIDE

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The effect of continuous long-term application of single herbicide (butachlor or anilofos), sequential application (butachlor or anilofos - 2,4-D) and herbicide rotation (butachlor and anilofos) on the level of herbicide residue build up in rice grain, straw and soil samples in a transplanted rice-rice cropping sequence was studied at Tamil Nadu Agricultural University since Kharif 1996. The quantification of residue level by GC after 6th crop in the sequence (rabi 1997) indicated that butachlor, anilofos and 2,4-D residues were not at detectable levels in grain samples. The anilofos residue in straw sample was 0.0014 ppm. Though the butachlor residue in post harvest soil was detectable at 0.002 ppm after 6th crop, it is well below the maximum residue limit. The anilofos and 2,4-D residues were not detected in soil after 6th crop. Hence, application of butachlor, anilofos and 2,4-D over the years kin rice-rice cropping sequence did not leave hazardous levels of residues in soil, grain and straw.

AN IMPROVED ANALYTICAL METHOD FOR DETERMINATION OF ISOPROTURON RESIDUES IN WHEAT PLANTS

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An analytical method involving improved clean-up step and gas chromatography was developed for determining isoproturon residues in green wheat plants, straw and grains. Isoproturon residues were extracted by blending green plants with chloroform and with dichloromethane by soxhlet extraction from straw and grains. The extracts obtained were subjected to an earlier reported clean-up step which did not give satisfactory through a Florisil-activated charcoal mixture (19:1, w/w) column and elution of isoproturon residues with chloroform-ethyl acetate mixture (3:1, v/v). The eluate obtained was concentrated and analysed on gas chromatograph equipped with nitrogen phosphorus detector and methyl silicone column. The authenticity of the improved step was checked by conducting recovery experiments at the fortification levels of 0.25, 0.50 and 1.0 ppm. The green plants, straw and grain samples were fortified at above said levels of isoproturon and subjected to analytical method described above. The per cent recovery obtained was 84, 86, 86 from green plants, straw and grains, respectively which are satisfactory results from analytical point of view. The reported method has been used for determining isproturon residues in field samples of wheat green plants, straw and grains.

RESIDUAL EFFECT OF HERBICIDES APPLIED FOR WEED CONTROL IN AMERICAN COTTON

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Residual carry over of glufocinate ammonium (0.45, 0.75, 0.90 kg ha^{-1}) and pendimethalin 0.75 kg ha^{-1} followed by glufocinate ammonium (0.45, 0.75, 0.90 kg ha^{-1}) applied post-emergence to cotton crop was studied using cuumber as indicator plant. The data revealed that herbicide applied had no marked effect on emergence count of cucumber. Similarly, plant height and dry weight per plant of cucumber seedlings at all doses of herbicides were at par with control. These herbicides get degraded to safe level by 20 days after application in the field.

EFFECT OF CHLOROTOLURON ON THE ACTIVITY AND CHLOROPHYLL FLUORESCENCE STUDIES ON THE ISOPROTURON RESISTANT AND SUSCEPTIBLE BIOTYPES OF *Phalaris minor.*

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Isoproturon resistance in *Phalaris minor* (littleseed canarygrass) biotypes under rice-wheat rotations has reached a serious proportions in Haryana and Punjab States, affecting the yield of wheat to a great extent Resistance was attributed to enhanced metabolism mediated by cytochrome P450 monooxygenase enzymes as ABT and PBO (mixed function oxidase inhibitors) increased isoproturon mortality in the resistant (R) biotypes and inhibited the degradation of (^{14}C) isoproturon. No difference at target site or in the uptake and translocation of (^{14} C) isproturon were observed in the resistant and susceptible (S) biotypes of *P. minor.* Preliminary studies with herbicides of different modes of action revealed no resistance to chlorotoluron which is structurally related to isproturon.

Several experiments were conducted under controlled environmental conditions in the Bioscience and Biotechnology Department at Strathclyde University, Glasgow (UK) using H-3 & KR-1 (R) and H-2 (S) botypes of P. minor on the activity and chlorophyll fluorescence studies with sioproturon and chlorotoluron. Leaves of plants raised in the pots were detached and incubated in the Hewitt nutrient solution mixed with 0, 0.25 and 0.50 mM concentrations of chlorotoluron or isoproturon. Chlorophyll fluorescence (Fv/Fm ratio) was observed after 4 and 24 h of treatments. Recovery of chlorophyll fluorescence was also observed 24 and 48 h of removal of leaves from herbicide to nutrient solution. Whole plants transferred form soil to nutrient solution and treated with 0, 0.16, 0.32, 0.62, 1.25 and 2.5 uM of isoproturon or chlorotoluron alone or mixed with ABT (75 uM) were subjected to chlorophyll fluorescence studies, 4 days after treatment (DAT). Plants of the three species raised in pots were also sprayed at the 2-3 leaf stage with isoproturon (0, 0.125, 0.25, 0.50, 1.0 and 2.0 kg ha^{-1}) and wee evaluated for chlorophyll fluorescence studies, 14 DAT. Chlorophyll fluorescence studies with whole plants were parallel to the activity studies where fresh and dry weight (FW/DW) were recorded 28 DAT.

Decrease in chlorophyll fluorescence was greater with chlorotoluron than with isoproturon in all the three biotypes of *P. minor.* No significant differences were observed in the R and S biotypes with chlorotoluron contrary to isoproturon where inhibition in chlorophyll fluorescence was more in the S than R biotypes and recovery was much rapid and complete in the R biotypes. Similar trends of chlorophyll fluorescence were observed in the activity studies. Results of these studies will be presented with emphasis on management aspects using herbicides as a vital constituent of the integrated management strategy.

STUDIES ON RESIDUAL EFFECT OF HERBICIDES APPLIED TO CUMIN CROP ON THE SUBSEQUENT SUMMER PEARLMILLET

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Cumin is a short duration and less irrigating requirement crop. Pearlimillet is also major crop of Gujarat grown in summer season after harvesting of rabi cumin crop wherever irrigation facilities exist. Hence, residual effect of various herbicides applied to cumin by different methods on succeeding summer pearlimillet was studied during 1997. Pendimethalin (0.75 kg ha^{-1}), cluchloralin (1.0 kg ha^{-1}), trifluralin (1.0 kg ha^{-1}), oxadiazon (0.5 kg ha^{-1}) and oxyflurofen (0.12 kg ha^{-1} herbicides were applied to cumin crop by different methods viz., pre-plant, herbigation, pre-emergence, 5 and 10 days after sowing. Pearlimillet crop was sown immediately after harvesting of the cumin crop. The lowest plant population (8.0%) and grain yield (604 kg ha^{-1}) of pearlmillet were recorded in the treatment of pendimethalin applied @ 0.75 kg ha^{-1} with irrigation to cumin crop. Herbicides persisted higher when applied with irrigating water than other mode of application viz., pre-plant, pre-emergence, five and ten days after sowing. Seedlings died after germination which resulted indicated that pearlmillet can not successfully be taken in cumin-summer pearlimillet crop sequence where pendimethalin or fluchloralin or trifluralin is to be applied with irrigation in cumin crop. Among the herbicides, pendimethalin showed more residual effect on pearlmillet crop than others.

UTILIZATION OF WATER-HYACINTH (Eichhornia crassipes) FOR MANAGEMENT OF PROBLEMS SOILS

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Water hyacinth is an aquatic weed and is found throughout world. It is also abundantly found in different water resources of eastern U.P. Like leguminous crop it was a C:N ratio of 20:1 to 30:1. Therefore, this aquatic weed may be useful in the improvement of problem soils, specially salt affected soils. In this was this weed can be eradicated from water resources on one hand and applied in problem soils for their improvement on the other hand. Keeping this fact in mind a field experiment was conducted to study the effect of water hyacinth alone and in combination with other amendments on reclamation of a saline alkali soil situated in Saidpur (Gazipur). It was found that all the amendments (water hyacinth alone and its combination with other amendments) have beneficial effect on the improvement of saline alkali soil under study. The pH, ECe, ESP and SAR decreased and hydraulic conductivity, organic carbon, available N,P,K, Cu, Zn and Fe increase considerable by the application of all the amendments. Maximum improvement in physico-chemical condition and fertility status of soil was found with treatment containing hyacinth compost 3 tones + sludge 2 tones + pyrites @ 40% of GR/ha. This treatment combination may profitable be used for reclamation of the salf affected soils of eastern U.P. It is not only able to increase the yield of crops but also improves the quality of grains of paddy and wheat by increasing the content of protein, phosphorus, potassium, copper, zinc and iron.

STUDIES ON YIELD LOSSES IN RABI CROPS DUE TO INTERFERENCE OF PHALARIS MINOR

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A field experiment was conducted to work out yield losses in different *rabi* crops (*viz.* wheat, mustard, gram, field pea lentil and linseed) due to *Phalaris minor* weed. Two treatments, namely weedy and weed free were kept in all the crops. All the weeds except *Phalaris minor* were removed from weedy plots while in case of weed free treatment all the weeds were removed.

The yield data revealed that the presence of *P. minor* in crop plots drastically affect the yield of all the crops. The minimum reduction in yield due to *Phalaris minor* was recorded in mustard (24.2%), followed by wheat (33.4%), field pea (40.7%), linseed (43.1%), gram (70.3%) and lentil (84.4%), respectively.

PRE-EMERGENCE HERBICIDES ON AQUATIC INSECT PREDATORS AND SPIDERS IN LOWLAND RICE ECOSYSTEM

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A field experiment was conducted during kuruvai 1998 using the variety, ADT 42 in randomized block design at Tamil Nadu Rice Research Institute, Aduthurai. The herbicides, butachlor 1.25 and 2.5 kg ha^{-1}, anilofos 0.4 and 0.9 kg ha^{-1}, butachlor 1.0 + 2,4-DEE 0.5 kg ha^{-1} and anilofos 0.3 + 2,4-DEE 0.5 kg ha^{-1} were evaluated in comparison with hand weeding and unweeded control. During the experiment, the incidence of aquatic predators, *Hydrometried* sp., *Microvelia atrolineata* and the spider, *Pardosa pseudoannulate* were observed. The occurrence of green leaf hopper pest was observed only after 14 days of transplanting.The herbicides were applied 7 days after tansplanting.The effect of these pre-emergence herbicides on the population of these predators was assessed on 1, 3, 5, 7 15 and 30 days of herbicide application. The results of the experiment revealed that none of the herbicidal treatments had any adverse effects on the predators even from first day after application under lowland field condition of rice ecosystem.

CHEMICAL CONTROL OF WATER HYACINTH

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The experiment involving application of herbicides, glyphosate, paraquat and 2,4-D sodium salt alone and their combinations was conducted at Bhubaneswar during rainy season of 1997. The herbicides were applied in lush green stage after good canopy development. on 100 DAP. Yellowing of leaves following herbicide application was conspicuous at 6 days after spraying and extent of yellowing increased with advancement of time. Tank mix application of 2-4-D sodium salt + Paraquat (4.0 + 1.0 kg ha^{-1}) at full dose or at a half dose of 2,4-D sodium salt + glyphosate (4.0 + 1.0 kg ha^{-1}) were equally effective in enhancing yellowing symptoms, leading to death and decay. At 35 days, these herbicide combinations caused complete mortality of the weed. Mortality occurred at a lower rate by glyphosate 1.0 kg ha^{-1} or 2,4-D sodium salt 4.0 kg ha^{-1}. Regeneration of the weed was noticed in paraquat 1.0 kg ha^{-1} alone.

HARMFUL WEEDS

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The knowledge of harmful weeds is perhaps as old as human race itself. The poisoning due to these harmful weeds is reported daily all over the world due to the accidental, suicidal, homiaidal as well as adulteration of a much-used cooking medium by uns crupulous traders leading to several tragic deaths. The recent deaths in Delhi due to Argemone poisoning by adulterated mustard oil is a good example.

Some of the poisonous weeds are Satyanashi, Dhatura, Langali, Snuhi Bhana, Arka, Ahiphenum, Gunja, Vastasanabha Khereri etc. In the interest of prevention of problems caused by poisonous weeds is highly essential that the farmers should be educated. Here it is also pertinant to mention that some of the poisonous weeds have also goot medicinal value. The farmers should be educated and inform these aspects of weeds.

EFFECT OF GLUFOCINATE AMMONIUM AND GLYPHOSATE ON CONTROL OF *Cyperus rotundus* AND ITS PROPAGATION POTENTIAL

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The efficacy of glufocinate ammonium (Basta 15 SL) at 0.45, 0.75 and 0.90 kg ha^{-1} was tested for control of *Cyperus rotundus* at three sites and was compared with glyphosate at 1.0 and 1.5 kg ha^{-1}. The field and pot experiments revealed that both herbicides affected significant shoot killing and reduction in tuber population. The split application of herbicides (glyphosate 1.0+1.0 kg ha^{-1} and glufocinate ammonium 0.45 +0.45 kg ha^{-1}) was more effective than single application. Both the herbicides were at par with each other. The pot study further revealed that both herbicides reduced the propagation potential of the weed significantly over control by reducing its shoot population and subsequent fewer tuber formation rather than actual tuber mortality. Glyphosate 1.0 kg ha^{-1} and glufocinate ammonium 0.90 kg ha-1 were more effective than lower doses of glufocinate ammonium (0.45 and 0.75 kg ha^{-1}). These herbicides caused mortality to some basal bulbs but not to the even first and the nearest attached tuber.

MANAGEMENT OF *Phalaris minor* WITH NEEM - I

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Phalaris minor is the most problematic weed in wheat crop. The problem is severe because of its identification difficulty in the earliar stages of growth. Isoproturon, the only sustituted phenyl urea herbicide used for its control is also facing the resistance problem in some parts of Northern India.

Different parts of Neem like leaves, bark, cake, oil and pod cover have been screened for the management of *P. minor.* The bioassay experiments in petri dishes were conducted in laboratory. Preliminary experiments in laboratory showed that cake, dry leaves and pod cover have promisisng inhibitory effect on *P. minor* retaining selectivity to wheat plants. The results were further confirmed by conducting pot expeirments in poly house. The analysis of results is based on germiantion, root & shoot length and fresh weight.

STUDIES ON THE CONTROL OF *Erigeron canadensis* IN SETARIA INTRODUCED GRASSSLANDS IN HIMACHAL PRADESH

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Erigeron canadensis L. a new problematic weed in Himachal Pradesh is posing a serious threat to grasslands and orchards. So far no information is available on the chemical control of this weed, therefore an experiment was undertaken in newly introduced Setaria grassland in the Department of Agronomy, HPKV, Palampur during the summer seasons of 1997 and 1998 in randomised block design with three replications. The herbicide treatments were given when the plants were at 5.8 leaf stage. It was observed that during both the years of study glyphosate 1.0 kg ha^{-1}, 2,4-D (Na) 1.5 kg ha^{-1} and 2,4D(EE) 1.0 kg ha^{-1} completely controlled *Erigeron canadensis* and no plant of this weed was observed in these treatments throughout the year. Similar results were also observed with atrazine 1.5 kg ha^{-1} during 1998, however, during 1997 this was the next best treatment in recording significantly lower plant population, fresh and dry weight of this weed. Gramaxone 1.0 kg ha^{-1} also controlled this weedy initially but after sometime it regenerated in big way. Isoproturon 1.5 kg ha^{-1} and ethoxysulfuron 20 g ha-1 did not cause any effect on this weed and recorded as much weight and number of plants/m2 of this weed as in control. 2,4-D(Na) 1.5 kg ha^{-1} being at par with 2,4-D(EE) 1.0 kg ha^{-1} during both the years and also with atrazine 1.5 kg ha^{-1} during the second year resulted in significantly higher grass yield over remaining treatments. Although glyphosate controlled this weed most effectively but because of higher irrecoverable toxicity on Setaria, the grass yield was reduced tremendously. Gramaxone also caused initial toxicity to the grass but it recovered later on.

CONTROL OF *Cyperus rotundus* and *Cyndon dactylon* BY DIFFERENT LEVELS OF GLYPHOSAYTE AND MULCHING UNDER FALLOW SITUATION

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A field experiment was conducted to study the effect of different levels (1.5, 2.0 and 2.5 kg ha^{-1}) of glyphophate alone or in combination with ammonium sulphate 2% and mulching on *Cyperus rotundus* and *Cynodon dactylon* under non-crop situation during 1997-98 at Tamil Nadu Agricultural University, Coimbatore. Waste aluminium plate and polyester muster from offset press were used for mulching. Glyphosate was sprayed as post emergence (25 days after irrigation) over *Cyperus rotundus* and *Cynodon dactylon* weeds. Lowest weed population (8.06 m^{-2}) and dry weight (1.03 g m^{-2}) these weeds were recorded under application of glyphosate 2.5 kg ha^{-1} + ammuonium sulphate 2% at 30 days after glyphosate application but it was on par with application of glyphosate 1.5 kg ha^{-1} + ammonium sulphate 2% and glyphosate 2.0 kg ha^{-1} + ammunium sulphate 2%. In general, glyphosate in combination with ammonium sulphate was superior than glyphosate alone in controlling these problematic weeds. Higher regeneration of these weeds resulted in polyester muster mulching treatment (98.83 and 91.13 m^{-2} of *Cyperus rotundus* and *Cynodon dactylon* respectively) whereas lowest regeneration of weeds recorded in phosphate 1.5 kg ha^{-1} + 2% ammonium sulphate (18.12 and 14.36 m^{-2} of *Cyperus rotundus* and *Cynodon dactylon* respectively) on 60 days after spraying in herbicide. Application of glyphosate at different dose did not cause any harmful effects on germination, plant height and dry matter production of the succeeding crops viz., maize, soybean and sunflower.

INTERACTIONS BETWEEN CLYPHOSATE AND FIVE ALS-INHIBITING HERBICIDES IN PURPLE NUTSEDGE (*Cyperus rotundus*) AND SICKLEPOD (*Sonna obtusifolia*).

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Green house experiments were conducted during spring and summer of 1998 at the Southers Weed Science Laboratory, Stonoville, Mississippi (U.S.A.) to evaluate potential interactins between glyphosate and chlorimuron, imazaquin, imazamox, pyrithiobec and halosulfuron for the control of pruple nutsedge and sicklped at two growth stages (3 and 6 weeks old). Herbicides were tested alone and in combination with glyphosate at two rates (0.5 and 1x) on 3-wk (Week) old plants and at 1x rate on 6-wk-old plnsts. In purple nutsedge, of the 20 herbicide combinatins, 3 comibnations were antagonistic and 17 combinations were additive in 3-wk-old plants and all five combinations were additive in 6-wk-old plants and all five combinations were antagonistic in 6-wk-old plants and all five combinatins were antagonistic in 6-wk-old plants. Glyphosate alone at 1120 g ha-1 (1x) gave complete control of purple nutsedge and more than 78% control of sickleped regardless of growth stage. In 3-wk-old plants, glyphosate (0.5x) plus imazaquin combination resulted in highest antagonsm in purple nutsedge control (79%) and combination of glyphosate (0.5x) plus imazaamox (0.5x) resulted in highest antagonism in sickleped control (54%). These resultes indicate that mixing five ALLS - inhibiting herbicides with glyphesate didnot increase glyphosate phytotoxicity on purple nutsedge and sickleped and offers no economic benefit.

UNUSUAL OUTBREAK OF IMPORTED BIOAGENT *Zygogramma bicolorata* DURING SUMMER AT VINDHYANAGAR (*Madhya Pradesh, India*) AND COLLAPSING OF PARTHENIUM POPULATION

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A chrysomelie beetle *Zygogramma bicolorata* Pallister (Coleoptera : Chrysomelidae) was imported into India from Mexico to manage of nosious weed *Parthenium hysterophorus* which is well documented and known for its ill effects to human and its livestock. Past study revealed that the adult of this beetle undergo in diapause into soil during winter and summer season to avoid extreme conditions of low and high termperatures. During survey at Vindhyanagar of district Sidhi of Madhya Pradesh where this beetle was released in 1991 to control parthenium, beetle population was seen during last week of March at an appreciable number in a patch of about half km completely covered by *Parthenium hysterophorus*. The occurrence of Mexican beetle adult and large number of freshly laid eggs and that too during summer was considered as an unusual outbreak of *Z. bicolorata*. Further study revealed that due to this beetle whole patch of *P. hysterophorus* was collapsed completely within April-May. Not even a single unattacked plant was recovered at this location. This parthenium patch was located near a water stream. On the bank of this water stream due to sufficient moisture, parthenium grew well in March-April in 1996. Due to suitable microclimatic conditions amidst the high density of parthenium and sufficient moisture loaded soil created such a songenial climate that stray adults of *Z. bicolorata* emerged out during the end of March laid eggs and from these eggs sufficient population buildup occurred in the months of April and May which resulted complete collapse of parthenium population. This study clearly reflects that exotic insect *Z. bicolorata* has immense capacity to work against parthenium throughout the year in this tropical country wherever suitable conditions will be available. This population buildup of *Z. bicolorata* has been discussed in relation to macro and microclimatic conditions of the area.

IMPORTED MEXICAN BEETLE *Zygogramma bicolorata* INVOLVED IN SUNFLOWER FEEDING CONTROVERSY, EMERGED OUT AS A SAFE BIOAGENT AGAINST *Parthenium hysterophorus* IN INDIA.

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Mexican beetle *Z. bicolorata* (Coleoptera : chrysomelidae) imported in India in 1983 to suppress noxious weed *Partghenium hysterophorus* became involved in sunflower feeding controversy after its release of about 7 years. In-depth study carried out at Jabalpur for last three years unequivocally revealed that *Z. bicolorata* is a safe bioagent against *P. hysterophorus*. Comparative rearing study in laboratory on sunflower and parthenium revealed that this beetle could complete continuously 5 generations on sunflower in comparison to 7 on parthenium during May-June 1997 to January 1998, however, survival rate of hatched larvae till zero day beetle emergence was lower in case of sunflower. The rate of survival of sunflower fed larvae was due to extreme care taken during rearing as only very soft leaves of upper portion of 20-30 days old sunflower plants were provided throughout the rearing period. The delayed egg laying by females after emergence was recorded when reared on sunflower as in case of parthenium it varied 6.3 to 51.7 in sunflower fed beetles. Preference test of freshly hatched larvae and 3rd instar larvae (when exclusively reared on sunflower) clearly showed their preference towards parthenium. Aqueous extracts and pure parthenin (isolated from the leaves of parthenium) unequivocally stimulated feeding on treated sunflower leaves than control and established the pollen theory which envisages that feeding on sunflower in field was due to the pollens already felled on sunflower rows adjacent to defoliated parthenium stands. Two compounds ayapin and scopolatin isolated from sunflower when sprayed on parthenium leaves showed antifeedance effect which reflect that due to these compounds. sunflower may not be an attractive host plant for *Z. bicolorata*. All these studies clearly established that although *Z. bicolorata* may complete life-cycle on sunflowers and mahy develop adults but overall effect on sunflower will be very limited and there are remote chances of *Z. bicolorata* being a potential pest on sunflower.

CHRYSOLINA MADRASAE JACKOBY : A POTENTIAL BIO-CONTROL AGENT FOR THE PROBLEMATIC WEED BLUMEA LACERA L.

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Blumea lacera L. locally known as Kukurmatta, is one of the common problematic weeds of Chhattisgarh region (Madhya Pradesh) of India. During rabi season 1993-94 and 1994-95 leaf beetle *Chrysolina madrasae* Jackoby (Chrysomelidae : Cyleoptera) caused 60 to 90 percent damage to the *Blumea lacera* plant. The life cycle and host specifically of this beetle were studies in 1995, 1996 and 1997. The host specificity was tested with the help of 'no choice' and 'multichoice tewst' on more than 40 plants of Chhattisgarh region. Seven generations of beetle were kept with these test plant species. *Parthenium hysterophorus, Cynodon dactylon, Vicoa vestiata, Vicia sative, Triticum aestivum, Cicer arietinum, Sphaeranthus indicus, Cassia tora, Clycine max, Amaranthus virdis* etc. were used as test plants. The study revealed that this nocturnal voracious feeder of Blumea weed was a potential bio-control agen. All the seven generations of the leaf beetle showed negative response on the test plants and no feeding was recorded. The study on life cycle of the beetle revealed that humid weather condition favours the faster development of the deetle, while the activity retards at temperatures below 10_C., The beetles were found active during October to March. The study confirmed the host specificity of *Bhumea* leaf beetle on *Blumea lacera* L.

USE OF FISH SPECIES GRASS CARP (*Ctenopharyngodon idella* (Val.) FOR WEED CONTROL

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Field experiments were conducted at Annamalai University Experimental Famr, Annamalainagar during Samba (August-January) and Navarai (January-April) seasons of 1995-96 to study the effect of an integrated rice-fish farming system. Enterprises like rice-fish culture (grass carp, *Ctenpharyngodon idella* (Val.) @ one fish per m^2, in trenches occupying 15 per cent of rice area). The results revealed that integration of fish culture as component enterprise in rice farming system, performed significantly superior in respect of weed control. The presence of fish resulted in a depression in the densities of sedges and broad leaved weeds in comparison with the controlled plot (Rice alone). Weed control with grass carp was an effective alternative than conventional methods of aquatic weed control. Grass carb controlled weeds and harmful insects by effective eating of grasses, they reduced the number of laborers for weeding.

BIO-DIVERSITY OF SOME WEED FAUNA IN CONSERVATION OF INSECT PREDATORS IN RICE

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A detailed survey of three Agroclimatic zones of Karnataka comprising, dry zone (plains); survey of three Agroclimatic zones; Mangalore regions were made. The weed species monitored in these zones during the surveys were mostly of family Poaceae (Gramineae) followed by cyperaceae. They were viz., *Brachiaria mutica*, (Forsook.) Stapf, *Dactyloctenium aegyptium*, (L.) Beauv., *Echinochloa crugalli*, Sp. Hispidual (Retz.) Honda, *Echinocloa glabrescens, munro ex Hook. F, Leersia hexandra, Sw. Leptochloa schinensis*, (L.) *Nees, Panicum repens*, (L.), *Paspalum scorbiculatum, L., Fimbrystylis littoralis, Gaud* and the cyperaceae family weed species, *Cyprus rotundus*, L., *Cyprus iria*, L., *Cyprus difformis, Eclipta alba, Ageratum conyzoides, Alternanthera sessilis.* In theses there were ten species of spiders of which the potential predators in the zones were, *Tetragnatha maxillosa*, and *Lycosa pseudoannulata.* The other spiders were, *Oxyopes javanus., Phiddipus sp. Plexippus sp., Paradosa birmannica, Atypena sp., Argipoe sp. Araneus* and *Clubiona sp.* Further there were insect predators viz., carabids, *Ophionea nigrofasciata*, staphylinids, *Peaderes fuscipes*, mirids *Cyrthrhinus lividipensis* and damsel flies, *Agriocnemis pygamea.* Among the three zones the hill zone of Mudigere harboured more of the predators with rich sources of the weed species adjacent to the rice fields. The coastal zone were found to harbour low population weed and predatory fauna. In the coastal zone the two predators spider *Lycosa pseudoannulata* and the damsel flies, *A. pygamea* were dominant. The other predators were coccinellids; *Micraspis Sp., Harmonia octomaculata, Menochilus sexmaculta*, carabids, *Ophionea nigrofasciata* Staphylinids, *Paederes fuscipes*, water bugs, *Microvelia sp., Mesovelia sp.* and *Limmogonus sp.*

QUISQUALIS INDICA L. A RELIABLE BIOSUPPRESSOR OF THE PARASITE CHINE DODDER - CUSCUTA CHINENSIS LAMACK.

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The possibility of screening biocontrol agents of the killer holoparasitic china dodder - a virulent plant pest in Guntur and Krishna districts - has been examined using a host range of several weeds, ornamentals and crops. Of these, *Quasqualis indica* L. of Combretaceae - an ornamental climber, suppressed the spread of china dodder which was artificially inoculated on seedlings and shoots of *Q. indica*. The inoculation was done in three ways. 1) direct sowing of H_2SO_4 pretreated seeds in soil close to *Q. indica* seedlings 2) direct implanting of china dodder seedlings on young shoots of *Q. indica* and 3) allowing dodder shoots to infect *Q. indica* from spreading branches of the parasite well established on a compatiblehost *Impatiens balsamina.* Specific recommendations are made for the benefit of the farmers. *Q. indica* has been found not only to be resistant and incompatible but a certain suppresser of china dodder arresting and freezing its spread.

BIOLOGICAL CONTROL OF Parthenium hysterophorus L. by GROWING LEMON GRASS (*Cymbopogon flexsuosus*)

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Several control measures viz., mechanical, cultural and natural bioenemies were also tried and some of them were found effective too. But all efforts are not encouraging as control is obtained for shorter period or one season only and infests in other season by its variable germinability *in situ* or by disseminating agencies. In this direction the cultivation of lemon grass (*Cymbopogon flexuosus*) in the vacant lands at a distance of 100 cm x 50 cm with a population density of 20,000 slips per hectare was found very effective for control is. *Parthenium hysterophorus* L. and other associated weeds for as long as the grass remains in that area. The control of obtained mainly due to smothering effects of this grass and inhibiting further germination of the weed under the dense canopy of the grass. This grass is perennial tall growing (2 to 3 m) having high tillering (100 to 150 tillers/clump) and regeneration capacity after the cuttings/havestings for obtaining the essential oil (0.7 to 0.8%).

The essential oil is valued in perfumery and cosmetic industries through out the world. This grass can be grown in the unirrigated culturable fallow lands during the start of the rainy season by transplanting the slips. It can also be propagated by seeds, under irrigated conditions, it can be planted during any season as it remains active throughout the year under tropical and subtropical conditions. Hence, this grass can be utilized economically for controlling the obnoxious *P. hysterophorus* in the vacant lands and making the best use of these lands as well as earning the money and generating the additional employment.

GROWTH PATTERN AND BIOLOGY OF COMMON VETCH (*Vicia sativa* L.)

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A pot culture experiment on biology of *Vicia sativa* was conducted at the research farm of National Research Centre for Weed science, Jabalpur (M.P.) during winter season of 1993-94. Pots of 30 cm x 30 cm size were uniformly filled with soil, sand and FYM at 2:1:1. Fifty seeds of *V. sativa* were sown in each pots at 8 different dates of sowing viz. 15 September, 30 September, 15 October, 30 October, 14 November, 29 November, 14 December and 29 December. Observations were taken at 30 days interval to note the growth and multiplication of the weed. Biological studies indicated that germination percentages of *V. sativa* increased due to delay in sowing. Maximum plant dry weight was obtained from 15 September sowing which declined consistently with the advance in sowing dates due to decrease in plant growth in terms of plant height and branches/plant. added to this, days to 50% flowering, number of pods, seeds and seed weight per plant were also reduced due to delayed sowing.

SURVEY OF WEED FLORA IN SODIC SOIL OF AZAMGARH REION

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Eastern Uttar Pradesh has a large area occupied by sodic (salt affected) soils.The estimated area under such soils is 97,451 ha. Major crops grown in this region are wheat, barley, lentil, pea, linseed, mustard and berseem in *rabi* and rice, maize, jowar, arhar and sugarcane in *kharif*. A survey of weed flora in this region was made during the two crop seasons on both cultivated and uncultivated waste land sodic soils. A total of 32 weed species were observed, of which 10 species were perennial and 22 species were annual. Among the annuals, 9 weed species were found in *kharif* and 13 species in *rabi*. On cultivated land, intensity of Parthenium sp. was the maximum, followed by *Phalaris minor, Trianthema protulasastrum, Echniochloa sp. Cynodon dactylon Cyperus rotundus* and *Phyllanthus niruri*. On the wastelands, the highest ingtensity was recorded for *Pasthenium sp.* followed by *Saccharum spontaneum, Eragrostis cynosuroides, Achyranthus aspera.*

BIOLOGY AND CONTROL OF *Trianthema monogyna* L. MANT

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A field experiment on biology and control of *Trianthema monogyna* was conducted during 1997 at Anand. The seeds of weed were sown in plots of 1 m x 1 m size at 15 days interval from January to December.

Results revealed that *Trianthema monogyna* emergence continued throughout the year, but maximum germination 97 to 100% was recorded during period of May to October when maximum temperature ranged from 31.1 to 38.1 °C. Maximum plant growth was also obtained during this period. While lowest germination (53.5%) and growth of plant was recorded during December to January at 26 °C.

Flower initiation looked 15 to 33 days after germination. The minimum and maximum days for flowering initiation was recorded during middle of August (31.1 C) and December (26 C) respectively Regarding seed production capacity of the plant, it was found to increase consistently during May (12.6 g/plant) to July (19.8 g/plant) and thereafter become almost static (17.6 to 10.0 g/plant). The lowest seed production (>1.0 g/plant) was obtained during December to January at temperature 26 °C. One gram of Trianthema seed contain about 600-700 number.

In general, maximum germination and growth rate, early flowering and higher seed production of *Trianthema monogyna* was obtained during the period May to October when maximum temperature ranged from 34 to 38 °C. The results further indicated that herbicides viz. fluchloralin, trifluralin, pendimethalin and Oxadiazon each at 0.5 to 1.0 kg ha-1 were highly effective in controlling *Trianthema monogyna* weed species.

SURVEY ON WEED FLORA UNDER DIFFERENT AGRO-ECOLOGICAL SITUATIONS

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A survey on weed flora under different agro-ecological situatins eg. experimental field, farmer's field, near manure pit and road side pasture land, was made in and around Sriniketan, in the Birbhum distrit of West Bengal, during theyear 1993-'94. Based on relative frequency (RF), relative density (RD) and abundance (A) of weeds, it was observed that, *Echinochloa colonum* was present in every situation and in all the seasons, though the intensity was decreased in the *rabi* season. *Cyperus rotundus* and *Alternenthera sessilis* were present in all the situations only in the summer and *kharif* seasons. Except in the pasture land, the weed Chenopodium album was observed in all the situatins in the rabi season. In the pasture land situation, a different type of weed flora was observed *e.g. Tephrosia Pururea, Evolvulus nummulerious* in all the seasons.

STUDIES ON EMERGENCE PATTERN OF *Parthenium hysterophorus* (L.) AND ASSOCIATED WEEDS IN UPLAND RICE

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The major weeds that were present in the upland rice were *Parthenium hysterophorus* (L.), *Cynodon dactylon* (L.) and *Cyperus rotundus* L. as well as there were *Panicum repends* L. and *Echinochloa colona* (L.) Link. was also present in the experimental field. It was observed in the filed trials during 1996 and 1997 that the emergence pattern of the major weeds in the experimental area was almost similar in both the years. The emergence of weeds was maximum at 10 days after sowing (DAS) and then there was a decline in the emergence of weeds with time. The emergence of weeds were lesser in number in hand weeded plots from 20 to 60 DAS. Maximum number of weeds emerged in the unweeded plots between 10 to 60 DAS.

Emergence of *Parthenium hysterophorus* was maximum at 10 DAS in the year 1996 and 1997, but more number of the weed emerged in the year 1997 as compared to that in the year 1996. Emergence of *P. hysterophorus* stopped from 50 DAS in plots treated with post-emergence application of 2, 4-D at 1.0 kg ha^{-1} as well in the plots treated with combination of pre-emergence application of butachlor at 2.0 kg ha^{-1} followed by post-emergence application of 2, 4-D at 1.0 kg ha^{-1}. In both the years of experimentation this effect was more pronounced.

Pre-emergence application of butachlor at 2.0 kg ha-1 restricted the emergence of *Cynodon dactylon* effectively in the year 1996 except at 10 and 30 DAS; whereas in the year 1997 not s single plant of *C. dactylon* emerged due to the treatment between 10 and 80 DAS.

Maximum number of *Cyperus rotundus* emerged at 10 DAS in all the weed control treatments, but then it declined gradually upto 50 to 60 DAS in the year 1996 and 1997 respectively. Maximum number of *C. rotundus* emerged initially in the unweeded and hand weeded plots. The emergence of *C. rotundus* in the herbicidal treated plots were comparatively lesser than the untreated plots. Therefore, it is evident that the herbicidal treatment did restrict the emergence of *C. rotundus* from early stage of crop growth.

STUDIES ON GROWTH OF RICE PLANTS IN *Parthenium hysterophorus* (L.) DOMINATED WEED COMMUNITY UNDER UPLAND CONDITIONS

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In a *Parthenium hysterophorus* (L.) dominated weed community under upland conditions, the Crop Growth Rate (CGR) of rice plants was low at 20 days after sowing (DAS) in the year 1996. In the hand weeded plots, the CGR of rice plants at 20 DAS was second to the highest. Thereafter, at 40 DAS, the CGR of rice plants increased considerably. At 60 DAS, it further increased almost at the same rate attaining maximum CGR. The increment in the CGR of plants between 40 and 60 DAS was linear indicating its grand period of growth. In the year 1997, at 20 DAS, the CGR of rice plants in most of the weed control treatments was low. Plots treated with pre-emergence application of 2,4-D at 0.5 kg ha^{-1} attained maximum CGR at 40 DAS. At 80 DAS, the CGR of plants in hand weeded plots was second highest, and plants kin the plots treated with pre-emergence application of 2,4-D at 0.5 kg ha^{-1} was third in the sequence. The crop growth rate of rice plants in the unweeded plots was minimum as compared to other weed control treatments between 40 and 60 DAS and thereafter it attained the maximum at 80 DAS.

The relative Growth Rate (RGR) of rice plants in *Parthenium hysterophorus* dominated weed community was low in all the weed control treatments except in the hand weeded and unweeded plots in the year 1996. The RGR of rice plants in hand weeded plots reached its maximum at 40 DAS due to crop-weed competition in a *P. hysterophorus* dominated weed community at this stage in the year 1997. Similar trend of RGR of rice plants was observed as in the year 1996. The initial RGR of plants in all the treatments were low at 20 DAS. Later, at 40 DAS, which is which is considered to be the critical stage of crop-weed competition, only hand weeded plants were able to attain maximum RGR, while rest of the herbicidal treatment effects remained below this and the rice plants in unweeded plots had the minimum RGR at 40 DAS.

WEEDFORA IN SOME MAJOR CROPS OF BHU-BICHHIA MUNDLA - M.P.

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A field survey was conducted during July to September 1998. The major weeds were *Andropogon, Eragastic* spp. *Despondium* spp, *Cyperus* spp, *Jucia repence, Partghenium hysterophorus, Cvynoden dactylon* and *Hylundia latibrosa*. In rice and Jowar crops, *Andropogon, Hylundia latibrosa* and *Cyperus* spp. were dominant weeds. Pluses were infested with Ergastic spp. and *Partherium hysterophorus*. In groundnut, Eragastic spp alone. Contributed upto 70% of total weed flora. Soybean crop was severely infested with *Andropogon* (20%), *Hylundia lalibroso* (15%)' and *Desmodium* spp. 15%. Perennial weeds like *Cyperus* spp. and *Cyndon dactylon* were not serous problem in this area.

STUDY OF GROWTH BEHAVIOUR OF WEEDS UNDER DIFFERENT SOIL HABITATS

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Experiment was conducted in complete randomized design with three replications during both rabi and kharif seasons. Normal soils (pH 7.8 and EC 0.21 DS m^{-1}) and saline sodic soils (pH 8.8 and EC 0.92 DS m-1) were placed in separate cement colars of one meter diameter. 100 seeds of each weed species were sown in each cement colar under both the conditions. After germination, percentage germination was recorded and uniform plant population was maintained in each colar to record the growth and yield behaviour of weed plant.

Germination percentages of *Echinochloa colonum* and *Echinochloa crusgalli* under normal soil condition were 57.00 + 2.08 and 35.00 + 3.21 respectively, which were greater than the germination percentages 33.00 + 1.33 and 20.00 + 2.64, respectively recorded under saline sodic soil. Similar trend in germination percentage of *Phalaris minor* and *Vicia sativa* was also found. Germination percentage of *Phalaris minor* and *Vicia sativa* under normal soil were recorded 75.00 + 2.88 and 78.33 + 1.53 respectively, which were greater than germination percentages 40.00 ± 2.88 and 58.33 + 1.53, respectively under saline sodic soil.

Reproductive capacity of *Echinochloa colonum* and *Echinochloa crusgalli* under normal soil were recorded 697.89 and 861.49, respectively, which were greater than reproductive capacities 214.50 and 160.42, respectively under saline sodic soil. Reproductive capacities of *Phalaris minor* and *Vicia sativa* under normal soil were recorded 150.00 and 42.29, respectively which were greater than reproductive capacities 40.00 and 15.70, respectively under saline sodic soil.

IDENTIFICATION OF WEED FLORA OF PADDY FIELDS AND BUNDS IN RAIPUR (CHHATTISGARH) REGION OF INDIA

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A survey was conducted to identify the problematic weeds in paddy fields and bunds of Raipur (Chhattisgarh) rarion of India during the years 1995, 1996 and 1997. The weed flora in more than 15 villages adjacent to Raipur city was observed at 15 days interval. To know the changing weed flora in paddy fields the help of villagers was taken. The survey revealed that out of 71 weed species more than 100 weeds identified as problematic weeds. *Chninocloa colonum* and *E. crussgalli Cyperus rotundus, Sachharum spontaneum* were among the problematic weeds. The weeds were grouped in diffeent categories viz. life cycle, weeds in different land situations, weeds of economical importance etc. The survey also revealed that Aeschynomene and Parthenium have became the problematic weeds of paddy from last one decade. This study would provide a ground to formulate the effective approaches for weed control.

FRUIT/SEED MORPHOLOGY - AN AID IN IDENTIFICATION OF GRASSY WEEDS

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The seed characters like colour, size, shape, surface markings, appendages, etc. are believed to be fairly constant and are of great importance especially for identification of majority of the species. Present studies on grassy weeds are important due to the fact that they pose serious competition to the cereals (also belonging to grass family) because they cannot be distinguished in vegetative phase due to their resemblance with the latter.

Presently 33 species of grasses belonging to 25 genera have been studies. Seed unit in all the grasses is caryopsis which is enclosed in florets. Caryopsis may fall free or in fact from the florets on maturity. It has different colours and ornamentations e.g. in *Arachne recemosa* (*Makra*) and *Eleusine indica*, it is dark brown and bear wavy ridged transverse lines : in *Dactyloctenium aegypticum* (*Madhana*), it is yellowish-brown and rugose; in species of *Eragrostis*, it is reddish-brown and rugose; in species of Eragrostis, it is reddish-brown with smooth surface except in *E. diarhhena* (*Lamp*), where it is rugose and in *E. tremula* (*Dholphulio*), it is microscopically striate.

In the species where entire spikelet/floret behaves as a seed unit, the caryopsis is covered by glumes and palea, each species has characteristic features about these structures. Florets of some species like *Aristida adscensionis* (*Lamp*), *Avena fatua* (*Jangali Javi*), *Dicanthium annulatum* (*Zarga*), *Oplimenus burmanii, Lolium temulentum* (*Machni*), *Perotis indica* and *Polypogon mospeliensis* bear awns whereas rest of species are awnless. Further in *A. fatua* and *D. annulatum hairy* outgrowth is present on the base of florets while in *P. indica, P. burmanii* and *P. monspeliensis* glumes and lemmas have hairy growth. In Brachiaria, Setaria, *Phlaris minor* (*Guli danda, Sitti, Chiriya bajra*), *Sorghum helepense* (*Baru*), *Paspalum distichum* and *Paspalidium flavidum* the spikelets are awnless, the lemmas and paleas are so hard that it is difficult to separate them and also bear ornamentations characteristic for each species. *Panicum, Enhinochloa colonum* (*Dhelari*), *E. crusgalli* (*Samak*), digitaria adscendens, etc. are species which do not bear any orvamentation on hard and stiff lemma and palea. In *Lophochloa phleoides, Alopecurus nepa lensis, Poa annua, Leptochloa panicea, Cenchrus setigerus* and *C. ciliaris* the spikelets are awnless but lemma and palaea are not hard and stiff.

As far as size of the seed is concerned there is lot of variation in it. Weed size ranges from 0.40 x 0.08 to 0.56 x 0.16 mm in *Eragrostis diarhhena* to 9.08 x 2.19 mm in *A. fatua*. In the latter seeds are dimorhpic the larger ones are 9.08 x 2.19 mm and smaller ones are 6.29 x 1.48 mm in size. *Caryopsis is elliptic* or ovate in *Eleusine indiaca* and *Eragrotis pilosa* : oblong to linear - oblong in *Sporobolus diander* and Eragrostis diarhhena; globose to obovoid blobose in *Eragrostis tremula, Dactyloctenium aeqyuptium* and others. It bears sulcus in the middle in *Avena fatua.*

Few species of grasses, namely Eragrostis tenella (24, 763 seeds/plant), *E. tremula* (108, 76 seeds/plant), *E. pilosa* (9,392 seeds/plant), etc.produce very large number of small sized seeds which range between 0.48-058 x 0.26 x 0.43 mm.

'THE FATE OF *Phalaris minor* SEEDS UNDER VARIOUS SOIL CLIMATE, AND CROPPING CONDITIONS'

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The rice-wheat cropping system is the major cropping system contributing more than 70 percent of food grain production in the country. However, in the recent past many problems have cropped up resulting in low profitability of the system. One of the major problems is poor control of *Phalaris minor* in wheat crop. Several reasons have been put forward to explain its dominance in the system. The major factor being its tolerance to anoxia. Its inability to dominate in other systems except rice-wheat could be its susceptibility to relatively high soil temperatures prevailing in the kharif seasons in other systems (e.g. maize-wheat system). The experiments conducted at IARI have revealed that *Phalaris minor* is very susceptible to soil solarization. The puddling operation done in the rice crop may lead to deep placement of the seed and they may be exposed to relatively lower temperatures. The influence of impounded water on reducing the soil temperature is also well known. The increased and prolonged activity of the ADH (Alcohol dyhydrogenase) in *Phalaris minor* is known to play a detoxifying role in anaerobic respiration, hence retaining the viability. The other possible mechanism of anoxia resistance may be the inherent ability of the seed in using NO_3 as an alternate electron acceptor in the ETS, with the help of nitrate reductase activity. To test these hypothesis field and laboratory experiments are being carried out at IARI, New Delhi.

SURVEY OF KHARIF WEEDS IN VINDHYAN REGION OF MIRZAPUR DISTRICT (U.P.)

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A survey on weed flora was conducted during *Kharif* season of 1989 and 1990 in different fields of cereals, pulses, oilseeds and in their predominant mixtures in Vindhyan region of Mirzapur district. Dominant weeds noted in rice field were *Echinochloa colonum, Echinochloa crusgalli, Cyperus* spp., *Cynodon dactylon* and *Dactylaactenium aegyptium.* In sorghum, maize and bajra fields *Cyperus* spp., *Enhinochloa* spp., *Eleusine indica, Panicum* spp. and *Commelina benghalensis* were dominant weeds.

In pigeonpea field *Eleusine indica, Digitaria ciliaris* were most dominant weeds. However, *Cyperus* spp. were also equally distributed over the field. *Eclipta alba, Phyllanthus niruri, Euphorbia hirta, Commelina benghalensis* were found at low frequencies.

Oilseeds generally grown as mixture with cereals and pulses in dryland tract of Mirzapur district. Weed flora was almost similar to pulses and cereals other than rice.

WEED DYNAMICS IN RICE-WHEAT SYSTEM DUE TO CONTINUOUS OR ROTATIONAL USE OF HERBICIDES

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A long term study was initiated in *Kharif* 1993 on weed dynamics in relation to continuous/totational use of herbicides in rice-wheat system. In rice, butachlor 1.5 kg ha^{-1} and anilofos 0.375 kg ha^{-1} were used continuously and alternately with each other. In wheat, these treatments were followed either by isoproturon 0.94 kg ha^{-1} alone or mixed with 2,4-D sodium 0.5 kg ha^{-1}. In 1997, in the paddy unweeded control was replaced by a treatment of rotational use of pretilachlor 0.75 kg ha^{-1} butachlor 1.5 kg ha^{-1} anilofos 0.375 kg ha^{-1}.

The study revealed that in the 3rd season, there was heavy build up of *Cyperus iria* where anilofos was used continuously. In subsequent years, there was build up of *Ischamum rugosum* where butachlor was used continuously but anilofos gave good control of this weed. *Ceasulia exilllaris* a broad leaf weed made its apperance during fifth year and in sixth year it became the major weed along with *Cyperus iria* in anilofos treated plots. Pretilachlor used for the first time in sixth year gave good control of *Cyperus iria* but failed to control *Ceasulia axilaris*.

In wheat not much variation was observed in weed composition due to different treatments. Isoproturon alone or with 2,4-D gave good control of weeds including *P.minor* which was the major weed. However, there was build up of broadleaf weeds in unweeded control and plots with isproturon alone.

SURVEY OF KHARIF WEED FLORA IN HEAVY RAINFALL AREA OF SOUTH GUJARAT ZONE.

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The paddy crop was infested with 42 weed species in which dominant species having higher relative density consisted of *Cyperus rotundus* (20.02), *Echinochloa crusgalli* (12.77), *Echinochloa colonum* (9.33) and *Cyperus esculentus* (8.79). Total 29 species were assoociated with sugarcane. *Cyperus rotundus* was the most dominant having 18.02 relative density followed by *Echinochloa crusgalli* (11.42) and *Portulaca quadrifida* (010.41). In all 21 weed species were found infesting the ragi crop *Cyperus rotundus* and *Echinochloa crusgalli* were found dominant having higher relative dennsity values of 13.53 and 10.23. Sorghum crop was dominated by *Cyperus rotundus* with relative density of 13.99. In niger, 27 species found infesting the crop among which *Cyperus rotundus* (13.21) was most dominant followed by *Dinebra retroflexa* (10.38). Among 24 species recorded in pigeonpea, *Echinochloa crusgalli* and *Cyperus rotundus* were dominant with relative density of 16.25 and 15.0.

Mango and sapota orchards were also found infested by *Cyperus rotundus* with high relative density values of 20.57 and 31.29. Broad leaf weeds viz. *Casia tora, Euphorbia geniclulata, Alternanthera triandra* and *Ageratum conyzoides* were xominant in rochards.

WEED FLORA OF BERSEEM (*Trifolium alexandrinum* L.) IN MADHYA PRADESH

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The weed flora associated with berseem crop was investigated by surveying 11 districts covering almost all crop zones of the state. Based on importance value index (IVI), *Cichorium intybus* was the most competitive weed having the highest value of 91.0. The other weed species associated with berseem crop comprised of *Chenopodium album* (30.4%), *Anagallis arvensis* (19.5%), *Cynodon dactylon* (17.6%), *Cyperus rotundus* (18.0%), *Medicago hispida* (12.2) and *Melilotus alba* (9.0). In many fields a parasitic weed Cuscuta spp. was also frequently infesting the crop and posing a serious problem.

In Raipur, Bilaspur and Jabalpur districts, *Trifolium flagiferum* and *Alternanthera sessilis* were the co-dominant weeds. Among grassy weeds *Polypogan monspeliensis* and *Eragrosils* spp. were the common weed species infesting the berseem fields. In wheat-berseem rotation *Phalaris minor* and *Avena fatua* were noted at Tikamgarh and Jabalpur districts. The rainy season weeds viz, *Echinochloa crusgalli* and *Ageratum conyzoides* were also frequently found in Raipur and Bilaspur. *Caesulia axillaris* was recorded specifically at Sehore, Narsinghpur and Jabalpur districts.

PHYSICAL CHARACTERISTICS OF WEED SEEDS

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Weed competes with crops for moisture, nutrients, light and space and sowing to heavy competitive ability, weeds suppress crops and resulted in heavy reduction in crop yield. The weed competition is due to many factors and weed weed is the major source of weed growth. In order to understand the physical characteristics of weed and crop weeds, the present study was undertaken. In this paper physical characteristics namely test weight, specific gravity, length, breadth and length and breadth ratio of some of the crops and weed seeds have been discussed. This study is useful to estimate the weed seed bank in the soil and to predict the future infestation of weed in particular area.

ALLELOPATHIC EFFECT OF SOME COMMON WEEDS IN WHEAT AND PEA

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Plant materials of seven weed species growing in upland agro-ecosystem of Assam viz., *Ageratum houstonianum* Mil, *Bidens pilosa* L., *Borreria articularis* (L.f.) Will., *Convolvulus arvensis* L., *Mikania micrantha Kunth, Phylanthus urinaria* L. and *Scoparia dulcis* L. were decomposed for 20 days and their allelopathic effect on seedling growth of pea and wheat were evaluated. The decomposed plant materials were mixed with soil in the ratio of 1:10 (plant:soil) and 5 Kg of this mixture was taken in earthen pots. The seeds of pea (var-Rasna) and wheat (var-Sonalika) were sown in separate pots. Observations on plumule and radicle growth were recorded at 10 days after emergence. Results showed that *Mikania micrantha* and *Ageratum houstonianum* inhibited the plumule length in pea seedlings by 11.6% and 18.6% respectively, but radicle growth was not affected. *Bidens pilosa* inhibited the plumule growth by 11.0% but stimulated the radicle growth by 35.8% over control. In wheat seedling, *A. houstonianum* and *M. micrantha inhibited* the radicle growth by 13.3% and 6.6% respectively. *Phylanthus urinaria* inhibited both plumule and radicle growth by 29.0% and 6.6% respectively. In another experiment, the different plant parts of *A. houstonianum,* viz., stem, root, leaf and whole plants were decomposed separately for 20 days and then mixed with soil in the ratio of 1:10 (plant: soil). 5 Kg of this mixture was taken in earthen pots and summer rice variety "Luit" was sown in pots. Observations on plumule and radicle length, tiller number, leaf area index (LAI) and plant dry matter accumulation were recorded at 20 days after sowing (DAS). Among the different plant parts of *A. houstonianum,* whole plant decomposed treatment resulted in highest inhibition in plumule length (18.0%) on summer rice followed by stem incorporated pot (12.3%). However, the maximum reduction in radicle length occurred in the stem decomposition treatment, besides, this treatment also showed reduction in tillers per plant (20.0%); leaf area index (10.7%) and plant dry matter (36.3%) over control. Stem incorporation greatly inhibited all the plant characters studied. This indicated that the allelochemicals mostly released from stem decomposition plays a vital role.

ALLEPATHIC EFFECT OF WEEDS IN GROUNDNUT

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Among all the pests in India, weeds alone are responsible for about one-third loss in crop production. In groundnut the loss in yield ranges from 13-80 percent. Weed affects groundnut through direct competition for light, nutrient and water as well as through allelopathy. The allelopathy is related to production and release of some beneficial or harmful chemicals into the environment by one plant (including microorganism) on another. The harmful effects may be indicated in the form of inhibition of seed germination, reduced rot growth and metabolic activities etc. Aqueous plant extract of goat weed (*Ageratum conyzides*) and wild sedge (*Lantana camera*) had the most severe effect upon groundnut causing significant reduction in germination (54-55%), root length (73-78%), shoot length (75-63%) and delayed germination by 2-3 days. Aqueous extract of root or whole plant of *Cyperus retundus* reduced germinating of groundnut kernel by 24-30%. Similarly, leaf, inflorescence, stem and root extracts of *Digera muricata* (L.) significantly inhibited seed germination of groundnut by 10-30%, root elongation by 22.5-65%, and shoot elongation by 28-54%. Among the plants parts, leaf and inflorescence extracts were more inhibitory than extracts from stem and root. The secretion of roots of the weeds like *Circium arvense, Abutilon indicum* and *Chenopodium album* could also be a serious impediment in the early establishment of groundnut growth. Beneficial effects of some weds through the production of chemical compounds has also been documented. Root, shoot or whole plant extracts of *Amaranthus tricolor* and *trianthema Partulacastrum* significantly increased germination and seedling vigour of groundnut and stimulated growth of *Rhizobium spp.* isolated from the roots of groundnut plants. Microorganism isolated from the rhizosphere of groundnut weeds viz., *Euphorbia birta, E. parviflora, A. tricolar, Llaunear Procumloans, Acanthospermem hispidum* and *Phyllanthus madraspatensis* showed negative effects on *Rhizibium spp.* but had the stimulatory effect on *Aspergillus nidulans, Fusarium emitectrum* and *Trichoderma viride*. Future research will be on i) identification of allelo compounds which may help breeder to develop allelpathic resistant genotypes ii) quantification of allelochemical release and iii) quantification of allelopathic effects of weed, both determental and stimulatory on groundnut specific to the growth stages.

STIMULATORY ALLELOPATHY : I.CROP PRODUCTION

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The term allelopathy refers to all biochemical interactions (stimulatory and inhibitory) among plants, including micro-organisms. In general, Allelopathy is considered as inhibitory effects of a plant on another plants. But many studies conducted all over the world have clearly revealed the existence of stimulatory allelopathy among the plants. Series of experiments conducted at IGFRI and IGAU during 1995-98 have clearly indicated that many obnoxious weeds like *Parthenium hyssterophorus, Lantana camara, Blumea lacera, Ageratum conyzoides* etc. and leaf litter of different tree species including *Mangifera indica* have stimulatory allelopathic effects on germination, seedling vigour and yield of many important crops like rice, wheat, berseem, cowpea, linseed, kodo etc. The study also revealed stimulatory or inhibitory allelopathic effect of weeds on crops depend upon the methods of preparing extracts.

AUTOCOLOGY AND BIOLOGY OF BARNYARD GRASS (E. Spp) IN WETLAND RICE FIELD

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A three years field survey (1993-95) and two years field experiments (1993-94) on ecology of *E Chinochloa* spp. were taken at Agricultural Research Station (ANGRAU), Maruteru, A.P., The results revealed that all the *E. Chinocloa* species i.e., E.Colona, *E. glabrescens* and *E. E. Crusgalli prefers* moist conditions and continues to grow under shallow submerged conditions. Among the three, *E. Crusgalli* and *E. glabrescens* have stouter clums and attained maximum height (130 to 160 cm). The panicles are small in case of *E. Colona* and arrangement was noticed in other two species. The stigma colour of *E. Colona* was blackish purple while white in other species. High crop density (44 hills/m^2) has a discernable effect in reducing the tillers, biomass production of all *EChinochloa* spp but is was more conspricuous in case of E.Colona. The percentage decline in seed production was 67.0, 56.0 & 50.0 in *E. Colona, E giabrescence* and *E. Crus-gakkuk* respectively in closer spacing. Nitrogen fertilisation has a pronounced positive effect on growth of *Echinochola* spp and significantly enhanced biomass and seed production at 40 kg N ha^{-1}.

ALLELOPATHIC EFFECT OF LINSEED RESIDUE ON TRANSPLANTED RICE

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The experiment was conducted for three consecutive years (1993-96) on the satisite to study the alleopathic effect of linseed residue on transplanted paddy.

In the first year of the experiment, the linseed residue did not show any significant inhibitory or stimulatory effect on weed growth but there was significant increase in tillers no m^{-1} and plant dry weight at 60 DAT and grain yield (44.79 q ha^{-1}) as compared to control (41.24 q ha^{-1}). There was considerable reduction in weed dry weight at 30, 60 DAT and at harvest. The occurrence of problem weeds like *Commelina communis, Caessulia axillaris, Echninochloa colonum* were also reduced at higher doses of residue. In the third year of the experiment, the residue treatments exhibited slight toxic effect at 30 DAT by adversely affecting tillers no. m-1 and plant height but this toxic effect was reduced latter as shown by increase in tiller number, plant height, plant dry weight at 60 DAT. There was significant reduction in weed population at 30 DAT and weed dry weight at 30, 60 DAT and at harvest which contributed to higher grain yield (50.26 q ha^{-1}) as compared to control (47.21 q ha^{-1}). The frequency of the dominant weeds like *Cyperus iria, C. communis, E. colanum* and *Monocharia varinalis* were also reduced.

WEEDS OF MEDICINAL VALUE

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Weeds are commonly considered as useless and harmful to the crops and the farmers used to destroy them. But some of them are haivng rich medicianl properties. So there is a need to educate and train the farmers abdout the weeds with medicinal values so that they can use the weeds for the prevention and curing of common ailments and they can sell them to crude drug market and thereby they can earn money.

In the present paper effort has been made to introduce with certain weeds of medicinal values like Punarnava, Apamarga, Chakramarda, Pasugandha, Parpatak, Bhumyamalaki, Bhringaraj, Vishnugandhi, Dronapusphi, Kantakari etc.

HERBAL WEALTH OF FOREST ECOSYSTEM OF JABALPUR M.P.

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Exploration of herbal wealth of forest -ecosystem adjoining to Jabalpur was carried out in view to document the plant species having the virtues of medicinal, aromatic, food, timber and abnoxious weedy characteristic. The area selected was *Amjhar Ghati* and *Ghughri* Compartment of proposed Bargi Right Bank Canal.

The major obnoxious weed was Lantana camara L. which is causing the greater menace.The major species having medicinal and aromatic values comprised of *Abutilon indicum* G. Don., *Achyranthes aspera* L., *Anisomeles indica* (L.) O. Kuntze., *Amorphophallus* spp., *Biophytum snesitivum* D.C., *Boerhaavia diffusa* L., *Cassia tora* L., *Carissa carandas* L., *Celastrus paniculata* Willd., *Chlorophytum arundinaceum.*, *Dioscoria esculenta* (Lour.) Burkill., *Dioscoria* spp., *Curculigo orchiodes* Gaertn., *Desmodium gangeticum* D.C., *Elephantopus scaber* L., *Evolvovulus allsinoides* L., *Euphorbia hirta* L., *Gloriosa superba* L., *Helicteres isora* L., *Hemidesmus indicus* (L.) Schult., *Holostemma rheedii* Wall., *Justicea diffusa* Willd., *Lleucos aspera* Spreng., *Mimosa hamata* Willd., *Peristrophe bicaliculata* Nees., *Phyllanthus niruri* L., *Sida cordifolia* L., *Sida carpinifolia* L., *Triumfetta rotundifolia* Lamk., *Urena labata, Urena cinuta, Vitis setosa* Wall., and *Woodforida fruticosa* (L.) Kurz.

Among tree species having medicinal/food/timber values comprised of Acasia catechu (L.f.) Willd, *Aegle marmelosa* (L.) Corr., *Adina cordifolia* (Roxb.) Hook. f. ex. Brandis., *Albizia lebbeck* (L.) Benth., *Anogeissus latifolia* (D.C.) Wall. ex. Bedd., *Bauhinia racemosa* Lamk., *Bridelia squamosa* Gehrm., *Buchanania lanzan* Spreng., *Butea monosperma* (lamk.) Taubert., *Careya arborea* Roxb., *Cassia fistula* L., *Chloroxylon swietenia* D.C., *Dendrovalamus strictus* (Roxb.) Nees., *Diospyrus melanoxylon* Roxb., *Biospyros montana* Roxb., *Emblica officinalis* Gaertbn., *Flacourtia indica* (Burm. F.) Merr., *Ficus religiosa* L., *Grewia hirsuta, Lagerstroemia parviflora* Roxb., *Limonia acidissima* L., *Madhuca longifolia* (L.) Macb., *Ougenia oojeinensis* (Roxb.) Weight. & Arn., *Terminalia bellirica* Gaertn. and *Terminalia chebula* Retz.

CERTAIN INTERESITNG ASPECTS OF UTILITYOF THE PARASITIC WEED Cuscuta chinensis Lamarck.

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Using qualitative, quantitative and biofractionation methods, a chemical profile of an unassorted sample of china dodder from local populations has been worked out. The identification of significnat quantities of Ascorbic acid, localisasiton of considerable alkaloid fraction and separation of a pleasantly flavoured oil component raised hopes of commercial exploitation of china dodder though to a limited extent.

MEDICINAL WEEDS : A BOON FOR THE FARMERS OF CHHATTISGARH

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An attempt has been made through the ethnobotanical survey of weeds during the years 1992, 1993, 1994,1995, 1996 and 1997 to determine the possible utilization of weeds for medicinal and industrial uses so that farmers can utilize these socalled unwanted plants for economical grains after hand weeding. The medicinal properties of locally abundant weeds were collected with the help of reference literatures of different medicine systems viz. Ayurvedic, Homoeopathy, Yunani, Bach flower remedy etc. The help of native people of Chhattisgarh was also taken to know the existing uses of medicinal weeds.The information regarding the time of availibility of raw material for market, useful parts, quantity and quality parameters, dry matter production, list of possible purchasers of the raw material, seed production capacity of weeds were collected. The study revealed that over 100 medicinal weed species found in Chhattisgarh.Some of these species were having industrial uses also. *Eclipta alba, Xanthium strumarium. Physalis minima, Mucuna pruriens, Cyperus rotundus, Solanum xanthocarpum, Jatropha curcas, Achranthes aspera* etc. were among these useful medicinal weed species. The study alsos revealed that (1). Farmers can recover the cost of hand weeding after selling the different usefull parts of medicinal weeds (2) More than 100 reputed drug manufacturers of India were making 75 reputed drugs using these weed species as main ingradients (3) Over 350 pruchasers fo India and abroad were eager to purchase the medicinal weeds of Chhattisgarh region at very fair rates (4) This target may be achieved through a joint effort of farmers, NGO's and governmental agencies.

CROP WEEDS HAVING ECONOMICAL AND MEDICINAL VALUES

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In kharif crops, *Achyranthus* asperal., *Alternathera sessils* DC. *Biophytum sensitivum* DC, *Boerrhhavia diffusa, Caesulia axilllaris* Roxb., *Cassia tora* L., *Cyperus rotundus* L., *Desmodium diffusum* DC, *Desmodium gangeticum, Eclipta* alba Hassk., *Euphorbia hirta* L., *Indigofera galndulosa* Willd., Impoea nil Roth., Launea aspleniifolia Hook, f. B., *Leucos Aspera* Spreng., *Leucos Cephalotes* Spreng., *Phyllanthus niruri* L., *Phyllanthus simplex* Retz., *Pluchia lanceolates* Spreng., *Phyllanthus niruri* L., *Phyllanthus simplex* Retz., *Pulchia lancelota* L., *Psoralia corylifolia, Sida cordifolia, Solanum nigrum* L., *Tridax procumbens* L., *Trianthema portulacustrum, Tribulis terristeris, Vernonia cineraria* Less. and *Xanthium strumarium* L. are the major weed species found in Madhya Pradesh whch constitute the important indigenous medicines.

Among Rabi crops, *Anagallis arvensis., Argemone mexicana* L., *Chenopodium album* L., *Cichorium intybus* L., *Fumaria parviflora,* Lamk., *Melilotus alba* Desf., *Oxalis corniclulata, Prtulaca oleracea* L. *Solanum surratensis* and *Vollutarella divaricta* were the major weeds which are used in medicines.

The weeds viz. *Corchorus olitorius* L., *Commelina bengalensis* L., *Chenopodium album* L. *Echinochloa crusgalli* Beauv. I*mpooea aquatica* and *Prthulaca oleracea* also have food values. Many of these and other weeds viz. *Echinochloa crusgalli, Schima nurvosum, Phalaris minor* Retz., *Medicago denticulate* Willd., *Trifolium flagiferum* L. etc. have the fodder values.

ALLELOPATHIC STUDIES IN RELATION TO GERMINATION OF WEED SEEDS

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10, 20, 30 and 40 percent extracts of whole plant of *Pluchea lanceolata, Imperata cylindrica* and *Parthenium hysterophorus* were prepared and sprayed on Phalaris minor and Echinochloa colonum seeds sown on filter paper in glass petridisshes arranged in C.R. design. After 10 days germinated seedlings were counted and percentage was calculated.

Extracts of *Pluchea lanceolata* and *Imperata cylindrica* were not effective to check the complete germination of *Phalaris minor* and *Echinochloa colonum* seeds. 40 percent extract of *Parthenium hysterophorus* was effective to check the complete germination of weed seeds.

CROP-WEED DYNAMICS IN CROPPING ZONES OF MADHYA PRADESH

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Survey on weed flora associated with different crops was conducted during *kharif* (13 districts) and *rabi* (22 districts) seasons from 1978-97 in different cropping zones of Madhya Pradesh. The importance value index (IVI) of weed species on the basis of relative density, relative frequency and relative dominance was worked out and expressedd in terms of percentage. The study revealed that grassy, broadleaf and sedge weeds constituted 49.15, 42.2 and 8.65 per cent in *kharif* crops and 10.97, 84.40 and 3.63 per cent in *rabi* crops, respectively. The weed dynamics in rice zone mainlyu compprised of broadleaf weeds sharing 59.03% as against grasses (37.13%) and sedges (3.87%) during *kharif*, and the corresponding values during *rabi* were 79.87%, 15.43% and 3.3%, respectively. In rice-wheat zone, broadleaf weeds were dominant during *kharif and rabi* (52.21 and 86.87%) as compared to grassy (33.08% and 9.92%) and sedge (14.29 and 3.21%) weeds. In wheat zone grassy weeds had higher IVI of 51.03% as compared to broadleaf weeds (41.89%) and sedges (7.08% during kharif wehereas broadleaf weeds (84.84%) dominated in *rabi* crops followed by grasses (11.84%) and sedges (5.54%). In jowar-wheat and cotton-jowar zone, the broadleaf weed flora was dominant during botht he seasons. The IVI values under wheat-jowar zone were 47.43 and 93.62% in *kharif* and *rabi* crops respectively as against 41.83% grassy and 10.74% sedge weeds in *kharif* and 4.337% grassy and 1.97% sedge weeds in *rabi*. In connton-jowar zone broad leaf weeds recorded higher IVI of 55.21% in *kharif* crops and 80.39% in *rabi* crops in comparison to 43.0% grassy and 1.79% sedge weeds in *kharif* and 13.34% grassy and 6.32% sedge weeds in *rabi* seasonc crops.

IDENTIFICATION OF CONSTRAINTS AND ADOPTION OF WEED CONTROL IN KHARIF CROPS AMONG TRIBALS OF SURGUJA

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Northern Hill zone of Chhattisgarh is comprising of Surguja, Raigarh, Shahdol, Mandala, Part of Sidhi and recently formed Korea, Jashpurnagar and Umaria districts of Madhya Pradesh. The zone is almost monocropped and only 8-10 per cent of the total cultivated area is irrigated. The major crops of area i.e. paddy, maize, urd, arhar, moong, horsegram and minor millets were grown in kharif season and wheat, pea, lentil, toria, linseed and mustard were grown in rabi season.

The paper is based on primary information and incorporated with the adoption level of weed control measures with constraint and problems faced by the tribal farmers pertaining to disparate adoption of weed control in kharif crops. The findings of study indicates that the productivity of kharif crops were affected due to heavy infestation of weeds. Tribals were not adopting the chemical weedicide for control of weeds in their existing crops. However, the farmers were using the manual weed control methods followed by mechanical operation. Generally one manual seeding is processed by the farmers in paddy, arhar, moong, groundnut and maize crops. Whereas, the earthing operation was also done by the farmers in groundnut and maize crops and no weeding operations were used by farmers in niger, horsegram, urd and minor millets. The major constraints were identified as lack of knowledge of the farmers about chemical weed control measures followed by improper time of weeding operation in maize crop due to business of farmers in paddy transplanting and shortage of labourers in their locality. Another reasons for non-adoption of recommended weed control measures in crops were identified as poor economic conditions, lack of interest of farmers in weed management and some farmers response were observed that the no economcial gain after adoption of weed control measures in minor millets, horsegram and niger crops.

CONSTRAINTS IN ADOPTION OF TIMELY WEEDING IN MAIZE CROP

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The present study was conducted to verify the constraints in adoption of timely weeding in maize crop. Out of 24 blocks, four blocks, viz. Ambikapur, Pratappur, Ushmi and Shankargrah were selected and two villages in each block were randomly selected for this study. Twenty random maize growers in each village was interviewed for the questionnaire. Thus the study was conducted from 160 maize growers during the year 1995-96.

The study revealed that majority of the farmers were lacking in timely weeding in maize. In general 12 major constraints were identified. Out of them lack of time, lack of labours, poor socio-economic status and lack of awareness about timely weed management were recorded in high range with mean score of 4.70, 4.50, 4.30, and 4.20, respectively.

In medium range constraints un-availability of weedicides, lack of skill for proper use of weedicides, unavailability of improved weeding implements and continuous rainfall were recorded with mean value f 3.85, 3.76, 3.38 and 3.30 respectively.

In low range constraints fodder for animals, lack of money, lack of demonstrations on timely weeding and illiteracy of the farmers were recorded with mean score of 2.95, 2.90, 2.75 and 2.53, respectively.

Therefore special training, demonstration, and farmers day should be organised to increase the knowledge and skill of the farmers for timely weed management for maximum yield and their income.

TRIBAL FARMERS OF CHHATTISGARH (Bastar Plateau) : A STRATEGY FOR WEED MANAGEMENT IN RAINFED RICE ECO-system

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South-eastern part of Madhya Pradesh is one of the biggest tribal division of India. Tribals are fatalism, conservative and resource poor. Rice is the major cereal during *Kharif*, occupies 65% area of total crop land. Area under upland rice is about more than 50% of total rice. The productivity of upland (2-3 q ha^{-1}) and low land rice (10-12 q ha^{-1}) is very low. The average reduction in yield due to weed competition ranged from 50-90% depending upon the species, weed density and method of cultivation. The major causes of low yields are farmers do not remove the weeds at proper time, secondary, farmers of the zone do biasi (Becushening) operation. The uncertainty of rainfall and non-availability of irrigation results in delayed biasi, causing poor growth of rice. Chemical weed control measures are not suitable for resource poor and unskilled tribals. Hence, the adoption of hand weeding at 20-25 and 40-45 days after sowing or mechanical weed control technology with the help of simple weeder is only the practical means, safe and eco-friendly solution.

INTERACTION OF INTERCROPPING ON APHID INFESTATION AND WEED MANAGEMENT IN RABI CROPS

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Field experiments were carried out during the rabi 1996-97 and 1997-98 to study the response of Potato (*Solanum tuberosum*) + Dhania (*CoriaNdrum sativum*) seed crop + Mustard (*Brassica campestris*) with the CVS Kufri Badshah + DM-5 + Pusa bold respectively for aphid (*Lipaphis erysimi*) infestation and weeds (*Cyperus rotundus, Cynodon dactylon, Chenopodium album, Euphorbia hirta* and *Amaranthus viridus*) Competition at the agriculture farm of U.P. Autonomous College, Varanasi in RBD as monocultures and intercrop with triplicates of each others.

The potato was planted in the last week of October at nutritional levels of 150:80:100 Kg NPK ha^{-1}. Dhania and mustard were sown as intercrops simultaneously in the ridges of potato field 30 DAP and earthing. The experimental results show that the intercrops of Dhania and mustard with potato contributes highest return per hectare than monoculture practices without affecting potato yield with only 30 percent cost of cultivation. Also a lesser infestation of aphid and weeds were noted. It is therefore, advocated that Potato +Dhania + Mustard intercrop pattern may successfully be adopted for weed free, rabi seed crop of Dhania and aphid infested free mustard and potato crop in the region.

WEED MANAGEMENT MODEL FOR BERSEEM

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The study was conducted at the Research Farm of J.N. Krishi Vishwa Vidyalaya, Jabalpur (M.P.) during Rabi 1996-97. The sutdy revealed that the correlation coefficient amongst the population of different weed species with weed biomass were significant indicating the more importance of biomass accumulation efficiency of weed species.The *Cichorium intybus* contributed more towards the weed dry weight accumulation (0.674) followed by Medicago danticulata (0.652), *Alternanthera sessilis* (0.593) and *Cyperus rotundus* (0.462).The correlation amongst the population of different weed species indicated that the population of *Medicago danticulata* is positively correlated with the population of *Cyperus rotundus* (0.685) followed by the population of *Cichorium intybus* (0.565). The regression analysis revealed that *Alternanthera sessilis* contributed to the greater extent for weed biomass production and with the increase of one plant, the increase in weed biomass could be predicted by 7.56 kg/ha followed by *Cichorium intybus, Medicago danticulata, Cyperus rotundus* and *Cynodon dactylon*. The increase could be predicted by 5.93, 4.22, 3.94 and 2.34 kg/ha with increase of one plant of each species, respectively The correlation of different growth and yield parameters with green fodder yield indicated that the total dry matter productilon (0.875) had the highest correlation coefficient among different growth parameters followed by leaf:stem ratio (0.647), plant height (0.454) and branches/plant (0.443). The number of leaves/plant had negative association but not significant. Amongst the different parameters the linear increase in green fodder yield was predicted with total dry matter production, leaf:stem ratio, plant height, branches/ plant and leaves/plant, the increase in green fodder yield could be predicted by 5.69, 1387.41, 15.65 and 22.97 kg/ha with the increase of one unit of each parameters. The decline in the green fodder yield could be predicsted by 9.49 kg/ha with the increase in number of leaves/plant by one unit. Hence, the number of leaves/plant could not form the important selection index. The lowest value of residual (0.02) was observed in case of Cyperus rotundus as compasred to other weed species while, it was the maximum (-22.93) in case of Cynodon dactylon. It shows that there is more consistancy in the population of Cyperus rotundus while, in case of Cynodon dactylon there is more inconsistancy in the population.

INTERCEPTION OF WEED SEEDS IN IMPORTED GERMPLASM DURING SEPTEMBER 1989 TO DECEMBER 1991

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The international exchange of seeds and plant materials, which is an important activity of plant genetic resources may pose serious problems with the intrusion of various weed seeds along with the material. A variety of seed materials received at Plant Quarantine Division of NBPGR from different countries, was examined for weed seed contamination. During the period September 1989 to December, 1991, 62, 136 seed samples (ranging from few seeds to 10 kg but averaging 125g), were examined with the help of illuminated magnifier. As a result of the examination, 106 samples which were imported from 14 different countries, showed presence of weed seeds contamination. Weed seeds were identified on the basis of their morphological characters and also with the help of weed seed identification kit. Out of 24 weed species intercepted, 12 species have not so far been recorded in India. These are *Amaranthus blitoides, Carthamus lanatus, Galium tricornutum, Malva parviflora, Phalaris aquatica, Phalaris canariensis, Phalaris paradoxa, Polygonum arifolium, Polygonum convolvulus, Polygonum hydropiperoides, Polygonum patulum* & *Vicia villosa*. All weed seeds were tested for their germination under strict quarantine conditions and 8 exotic weed species were found viable. The observations are indicators that exotic weed seeds can enter in our country as contaminants with the seed materials imported from other countries. All contaminated samples were salvaged by mechanical cleaning and released to the indentors.

MONETARY EVALUATION OF WEED CONTROL MEASURES IN UPLAND RAINFED CROPS

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A study was carried out in the form of Krishi Vigyan Kendra, Ambikjapur during kharif season of year 1997 to assess the monetary advantage of various weed control measures in sesame and urd under upland rainfed condition. Seven weed control measures viz. No weeding, one hand weeding at 20 DAS, one weeding by Ambika kakorra at 20 DAS, two hand weeding at 20 and 35 DAS, two weeding by Ambika kakorra at 20 and 35 DAS, one conventional weeding by spade at 20 DAS and two conventional weeding by spade at 20 and 35 DAS were evaluated in both the crops. On the basis of mean data lowest weed dry weight 42 g and 40 g per m2 at 60 DAS was recorded in sesame and urd crops respectively which was significantly superior over weedy check in both the crops studied. However, it was comparable with two hand weeding at the same dates. Economic evaluation of different weed control measures revealed that two conventional weeding by spade at 20 and 35 DAS was best profitable over others, however two weeding by kakorra was found comparable.

WEED AND WEED MANAGEMENT IN AGRICULTURAL UNIVERSITY COURSE CURRICULUM

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Preveiling thrust of Agricultural University Education on 'general education' is changing. In north-east hill region in shifting cultivation areas, after following different types of weeds are growing. The high rainfall and suitable agro-climatic conditions help a lot to grow different types of weeds, which is directly or indirectly interfere in human welfare and agricultural activities. Not only that it harbours different types of insects and diseases. Therefore, it is necessary to study the weed ecology and their management in respect of different altitude and agro-climatic condition. A detail course curriculum is required at graduate and post graduate level. The details regarding the course content will be discussed.

PROMISING SCOPE OF NEEM CAKE IN WHEAT PRODUCTION

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Field trials were conducted during the year 1996-97 and 1997-98 in three different villages of Barahani Block in district Chandauli (U.P.) to develop an effective package of organic farming for ecofriendly cultivation in Rice-Wheat cropping pattern adopted regions.

The aim of the present investigation was to find out the best possible sustainable atmosphere for balanced nutrition with safest pesticidal and non-phytotoxic herbicidal effects. Under the selected area Montha (*Cyperus rotundus*) is a troublesome perennial weed of rabi season. The study was made with FYM, Neem cake and chemical fertilizers + alachlor (herbicide) to minimise the effective density of the weed and maximise the wheat yield; applied solely and in combinations.

The plots treated with alchlor showed highest significant reduction in dry matter production of *Cyperus rotundus*/m^2 area with phytotoxic effects on wheat also. On the other hand use of neem cake @ 2.5 kg ha^{-1} was also found significant in dry weight reduction of the weed along with effective pesticidal action on termite (*Odontotermus obesus*) infestation as well as a ecofriendly nutritional supplement to the wheat crop. At higher dosage (4.0 q ha^{-1}) neem cake showed significant increase in dry matter yield of wheat.

The area of poor environments (high moisture content, poor drainage and heavy soil texture) likewise the investigated villages can adopt the organic farming package with neem and or other tree oil cakes.

EVALUATION OF PROMETRYN IN POTATO

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An experiment was conducted at National Research Centre for Weed Science, Jabalpur with an objective to find out the efficacy of prometryn in potato. The treatment consisted of prometryn at 0.5 kg ha^{-1}, 0.75 kg ha^{-1} and 1.0 kg ha^{-1} compared with standard check of alachlor 2.0 kg ha^{-1} with earthing treatment and weedy. Prometryn was found effective to control weed population weed dry weight to a greater extent. The treatment consisting of prometryn 0.75 and 1.0 kg ha^{-1} found to decrease weed population and weed dry weight and was at par with alachlor 2.0 kg ha^{-1}. The highest grain yield was observed with treatment problem 1.0 kg ha^{-1} and was at par with alachlor.

INTEGRATED WEED MANAGEMENT IN WHEAT UNDER RICE-WHEAT SYSTEM

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Rice-wheat cropping system in the Indo-Gangetic plains is a highly remunerative cropping sequence. The sustainability of this system has been threatened by the weed known as little seed canary grass (*Phalaris minor*). The integrated weed control studies undertaken at DWR, Karnal revealed that grassy weeds including *Phalaris* can be managed economically through diversification of the rice-wheat system by way of introducing early maturing potato as a third crop in between rice and late sown wheat. Diversification of the system resulted in 91% control of *Phalaris minor* and 75% of broad leaved weeds. Furrow Irrigated Reduced-till Bed Planting System (FIRBS) of wheat cultivation is another option to provide reasonably good control of *Phalaris* but the broad leaved weeds in the furrows were higher compared to other tillage practices. Higher weed density resulted in significant reduction in yield compared to plots where broad leaved weeds were controlled by Isoguard plus. FIRBS with 3 rows and application of Isoguard plut resulted in maximum production (63.92 q ha^{-1}) compared to FIRBS with two rows (60.5 q ha^{-1}), conventional (59.1 q ha^{-1}) and reduced tillage (59.2 q ha^{-1}).

Isoproturon which effectively controlled *Phalaris minor* for about a decade during the eighties is no more effective. Development of resistant biotypes of this weed have been reported from various places in North Western Plains of India. The trial conducted at DWR Karnal also gave only 44% control of *Phalaris minor*. Five new molecules have been found effective against even resistant biotypes of *Phalaris minor*. Out of these two new molecules namely Sencor (Metribuzin) and Sulfasulfuron (Leader) were found effective against both narrow and broad leaved weeds. Judicious use of herbicides alongwith alternate tillage options and diversification of the system can be an effective strategy against the menace of problem weed *Phalaris minor*.

PERFORMANCE OF NEW MOLECULES AGAINST WEEDS IN WHEAT WITH SPECIAL REFERENCE TO *Phalaris*

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Isoproturon effectively controlled *Phalaris* during the eighties but due to development of resistant biotypes a need was felt to have herbicides which can control even the resistant strain of *Phalaris*. The trial with various new candidate weedicides was conducted at the Directorate of Wheat Research, Karnal in the randomised block design with three replications. Variety PBW 343 was sown in lines (18 cm apart) by using Pantnagar seed drill in plots of 15.0 m x 3.4 m size. The recommended package and practices for wheat cultivation were followed. As the farm is almost free of *Phalaris minor* the plots were artificially inoculated with *Phalaris* seed. To maintain uniform *Phalaris* population around 300 seeds per square meter were mixed in the soil before wheat sowing. All the weedicides were sprayed after around 35 days when the field has sufficient moisture except Puma Super which was applied at 40 DAS as desired by the manufacturer. The data on the *Phalaris* and broad leaved weed population were recorded before spray, at 30 DAS, and after spray at around 60 days after seeding. The final weed counts for *Phalaris minor* and broad leaved were taken around 90 days after seeding. Weed dry matter was also recorded to calculate the overall weed control efficiency.

The results showed that among the herbicides tested five were effective against *Phalaris minor* with more than 80 per cent weed control efficiency. TOPIK, Puma super and Grasp were found effective against *Phalaris minor* only whereas application of Sencor 250 q ha^{-1}, Sulphasulfuron (Leader) 33.3 q ha^{-1} controlled all the weeds including *Phalaris minor*. Isoproturon and diflufenican were not effective against *Phalaris*. Leader being a herbicide of wider application window was more effective than Sencor during an abnormal year but its cost per unit area is more than double than Sencor.s