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INDIAN SOCIETY OF WEED SCIENCE

1983

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ABSTRACTS

DEPARTMENT OF AGRONOMY
INSTITUTE OF AGRICULTURAL SCIENCES
BANARAS HINDU UNIVERSITY
VARANASI

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VARANASI

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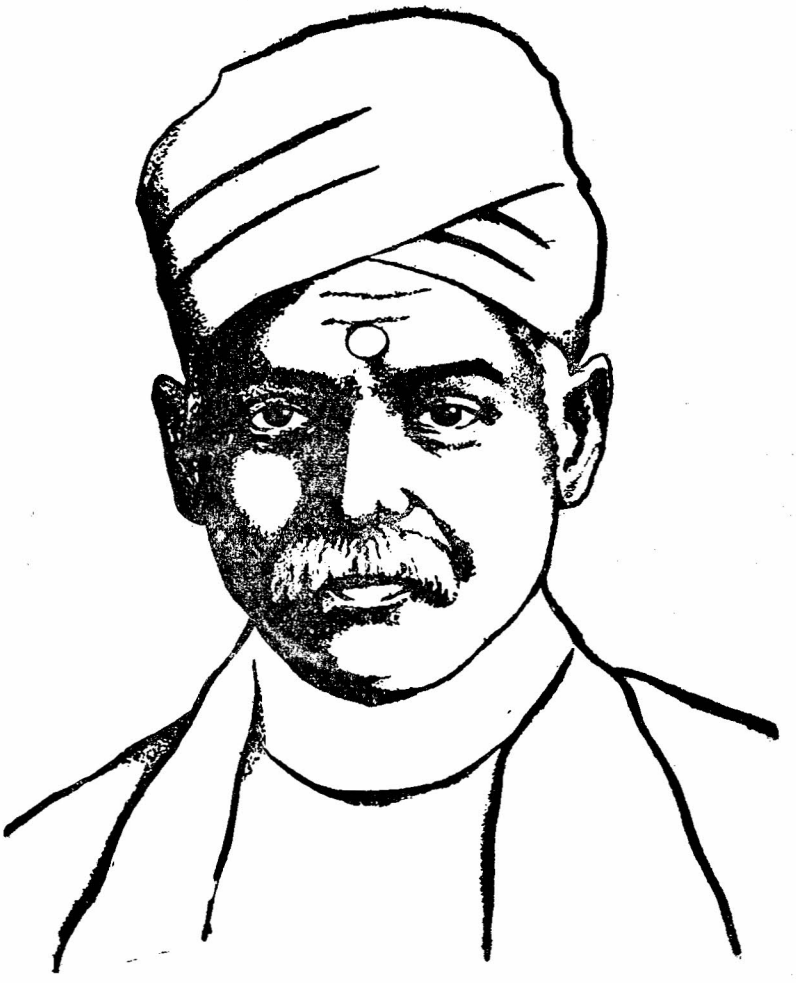

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न त्वहं कामये राज्यं न स्वर्गं नाऽपुनर्भवम् ।
कामये दुःखतप्तानां प्राणि नामार्तिनाशनम् ॥

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Mahatim Singh and Vinod Kumar Srivastava

Department of Agronomy, Institute of Agricultural Sciences
Banaras Hindu University, Varanasi

Field experiments were carried out to study the effect of herbicides on weed growth and nitrogen depletion pattern under varying nitrogen levels in upland rice during kharif seasons of 1979 and 1980. Propanil, Bentazon, Butachlor and 2, 4-D were tried individually as well as in combination alongwith four nitrogen levels 0, 40, 80 and 120 kg N/ha. Increasing levels of nitrogen increased weed population and their dry matter production with stipulated depletion of introgen by weeds. Combined application of herbicides proved superior to their individual application. Butachlor and Propanil applied in combination proved best among combined application whereas individually, Propanil showed marked effectivity over others in controlling weeds and their dry matter accumulation.

WEEDS COMPETITION AND THEIR CONTROL IN UPLAND RICE

S. R. Singh, U. N. Singh, T. K. Singh and Yashwant Singh

Dryland Research Project, Department of Agronomy,
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In rainfed direct seeded rice (*Oryza Sativa* L.) yield reduction due to weed competition ranged from 47 to 60 percent in field experiments conducted under dryland condition of Varanasi. The most critical period of weed competition resulting into severe loss of yield, ranged from 10 to 30 days after emergence. Yield generally continued to increase, however, as the length of weed-free period increased. The most effective herbicide evaluated was a pre-emergence application of butachlor 2.5 kg a. i./ha. Alternatively, two mechanical weedings, first within 30 days of emergence and the second after 15-20 days of the first weeding were found promising. Thiobencarb 1.5 to 2 kg/ha was found to be the most suitable post-emergence herbicide if applied at 2-3 leaf stage of upland rice.

INTEGRATED WEED CONTROL IN DIRECT SOWN UPLAND RICE

S. P. Upadhyaya and A. K. Kaushal

Department of Agronomy, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur

To control weeds under upland paddy an integrated weed control approach has been made under sandy loam soils at Jabalpur. The treatments consisted of weedfree, mechanical weeding, two hand-weeding and five herbicides *viz* 2, 4-D (Na-salt) pre-plant 0.75 kg/ha, fluchloralin 0.80 and 1.20 kg/ha, benthiocarb 2.00 and 3.00 kg/ha pre-emergence, nitrofen 1.50 and 2.00 kg/ha, pre-emergence and propanil 1.50 and 3.00 kg/ha, post-emergence alongwith weedy-check were tested. The lower doses of the weedicides were also combined with one band-weeding at 30 days after sowing and both the doses of benthiocarb were also tested with propanil post-emergence 0.75 and 1.50 kg/ha.

Amongst herbicides alone, nitrofen 1.5 kg/ha pre-emergence gave the economical weed-control while in cultural treatments two hand-weeding was most profitable. In combination of herbicides and cultural practices, nitrofen 1.5 kg/ha pre-emergence + one hand weeding at 30 days after sowing proved to be economical as compared to either herbicides or cultural practices alone.

WEED MANAGEMENT STUDIES IN DIRECT SEEDED UPLAND RICE

V. M. Bhan, R. S. Balyan and R. K. Malik

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Field trial was carried out during 1981 and 1982 with twelve treatments. Four treatments of thiobencarb and 3 treatments of pendimethalin were applied alone and in all possible sequential application, either thiobencarb as post emergence or one with hand weeding at 30 days after sowing, 3 treatments of mechanical weeding with hand, hand hoe and wheel hoe were employed at 15 and 30 days after sowing. Weedy and weed free plots were kept as standard checks.

Pre-emergence application of thiobencarb and pendimethalin with one hand weeding at 30 days after sowing reduced the density and dry matter production of weeds more than when these herbicides were used alone. Hand weeding and hand hoeing 15 and 30 days after sowing proved more effective in controlling weeds as compared to wheel hoe. Grain yields due to herbicides when supplemented with one hand weeding at 30 days after sowing were significantly higher than when these herbicides were used alone.

INTEGRATED WEED CONTROL IN DIRECT SEEDED RICE

S. S. Poonia, R. K. Malik and V. M. Bhan

Department of Agronomy, Haryana Agricultural University, Hissar

Field experiment conducted at Hissar consisted of two main treatments of one and two pre-sowing irrigations and each main treatment consisted of 8 sub treatments *viz.* weedy, weed free, pre-emergence thiobencarb at the rate of 1.5 kg/ha, thiobencarb post-emergence at 2 leaf stage, 4 leaf stage, 2 leaf stage + one interculture, 4 leaf stage + one interculture, respectively at the rate of 1.5 kg/ha and one interculture at 30 days after sowing.

Preparation of stale seedbed by variation in irrigation schedule, did not bring any significant improvement in grain yield of rice. Pre-emergence application of thiobencarb proved effective in controlling weeds in increasing the growth and yield of direct seeded rice. However, for post-emergence application, one supplementary interculture was necessary for achieving higher yields. In direct seeded rice, combination of both chemical and mechanical weed control was found to be the best.

COMPARATIVE STUDY OF THIO-BENCARB IN DIRECT SEEDED RICE

V. P. Singh, R. P. Singh and M. Singh

Department of Agronomy, Institute of Agricultura, Sciences
Banaras Hinu University, Varanasi

Field experiments were conducted to study the comparative efficiency of thiobencarb under varying nitrogen levels in direct seeded rice. Thiobencarb was applied at 1.25 and 1.5 kg. a. i./ha as pre and post-emergence alone and in combination. Other herbicides used for comparision were butachlor at 1.5 kg. a. i./ha as pre—and propanil at 1.25 and 1.5 kg. a. i./ha as post-emergence.

Pre-emergence application of Thiobencarb 1.5 kg. a. i./ha combined with post-emergence application of propanil had minimum weed growth and dry matter accumulation, and maximum grain yield. Amongst the herbicides applied alone, Thiobencarb at 1.5 kg. a. i./ha as pre-emergence was found most effective in minimising weed growth and increasing grain yield. Post emergence application of thiobencarb was found most ineffective among all treatments. Increasing level of nitrogen progressively increased the grain yield and decreased the weed population and their dry matter accumulation.

EFFECT OF WEED CONTROL TREATMENTS IN DIRECT SEEDED RICE UNDER VARYING NITROGEN LEVELS

R. P. Singh and B. G. Reddy

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Banaras Hindu University, Varanasi

Field studies were conducted for two consecutive years to determine the relationship between nitrogen application and methods of weed control on weed number, weed dry matter accumulation and yield in direct seeded rice.

Weed number, weed dry matter accumulation and grain yield increased significantly with the increasing levels of nitrogen at all the stages of crop growth. The maximum yield was obtained in 3 hand weedings which was statistically equal to butachlor application supplemented with one mannual weeding at 30 days after sowing (DAS) or with 2 mechanical weedings with rotatory weeder at 30 DAS and 45 DAS or with propanil at 30 DAS. This treatments had minimum weed number and weed growth as compared to herbicide applied alone, 3 mechanical weedings and one hand weeding 15 DAS in both the years.

EFFECT OF INTEGRATED WEED CONROL TREATMENTS ON WEED GROWTH AND NITROGEN DEPLETION PATTERN IN DIRECT SEEDED RICE

R. P. Singh and B. G. Reddy

Department of Agronomy, Institute of Agricultural Siences
Banaras Hindu University, Varanasi

Field studes were conducted for two consecutive years to determine the relationship between nitrogen levels and methods of weed control on weed growth, dry matter accumulation and nitrogen depletion pattern by weeds in direct seeded rice. Increasing levels of nitrogen increased weed population and their dry matter production with stipulated depletion of nitrogen by weeds. The maximum nitrogen depletion was found in unweeded plot throughout growth stages, whereas minimum in hand weeding (thrice).

Weed control treatments, butachlor+one hand weeding (30 DAS), butachlor + two mechanical weedings (30 and 45 DAT) and butachlor+propanil (30 DAS) had minimum weed number, weed growth aud resulted in the greater reduction in dry matter accumulation in weeds and in checking the drain of nitrogen through weeds at all levels of nitrogen as compared to butachlor applied alone, 3 mechanical weedings and one hand weeding.

LOSSES OF N, P, K BY WEEDS IN DRILLED RICE

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Uptake of nitrogen, phosphorus and potassium by drilled rice under upland condition and associated weeds was estimated. Uncontrolled weeds during the entire crop season removed 107.5 kg N, 58.8 kg K and 66.8 kg P/ha. *Trianthema monogyna* during the first 30 days removed 55.3 kg N/ha, which was 88% of the total N uptake by weeds at this stage. At later stages, *Echinochloa colonum* was the dominating weed which removed 50 kg N/ha at 60 days stage. The total uptake of N, P and K by the crop in weedy and weed-free condition was 13.5 and 8.8, 4.7 and 125.2, 45.7 and 99.5 kg/ha, respectively.

Competition with the weeds during the first 30 days only resulted into the loss of 62.7 kg N/ha by weeds. The loss of P and K during this period was the highest. When competition with the weeds was avoided during first 30 days, uptake of nutrients at later stages was very low. Weeds emerging during the period between 15 days and 90 days removed 50.1 kg N, 41.9 kg P, and 57.0 kg K/ha. One manual weeding at 30 days stage could reduce the loss of the nutrients to 19.3 kg N, 24.1 kg P and 31.0 kg K/ha. Two manual weedings done either at 15 and 30 days or 15 and 45 days after sowing were very effective in minimising these losses.

WEED CONTROL IN DIRECT SEEDED RICE UNDER TILLED AND NON-TILLED SOIL

S. P. Singh and J. M. Singh

Bihar Agricultural College, Rajendra Agricultural University, Sabour

A field trial was carried out with rice Cv. Pusa 33 to study the feasibility of zero tillage with the addition of paraquat at 0.50 kg a.i./ha applied before direct seeding of rice. The weed control treatments comprised of pre-emergence granular application of 2,4-D (Ethyl Ester), butachlor, thiobencarb, pendimethalin applied alone and in combination with propanil as post-emergence.

Among the tillage methods, direct seeding of rice on well ploughed (three ploughings) soil yielded 14.26 q/ha which was significantly superior to seeding of rice on non-tilled soil enforced with paraquat application to paralyse the initial weed growth. The difference in dry matter accumulation by weeds in both the systems was not significant. All the weed control treatments were significantly superior to unweeded check in controlling dry matter accumulation by weeds. The maximum dry matter accumulation by weeds (142.92 g/m^2) was obtained in unweeded control and minimum (25.16 g/m^2) under hand

weeded plot followed by 2,4-D (EE) as pre-emergence and propanil as post-emergence (38.23 g/m^2). Unweeded plot yielded lowest (9.37 q/ha) whereas thrice hand weeded plot gave highest yield to the tune of 15.73 q/ha which was comparable to yield obtained from plots treated with pre-emergence application of 2,4-D (EE) followed by propanil as post emergence, 2,4-D (EE) and thiobencarb applied alone as pre-emergence.

STUDIES ON WEED CONTROL IN DIRECT SOWN UPLAND RICE *(ORYZA SATIVA L.)*

Dayanand

Assistant Agricultural Officer,
Office of the Joint Director Agriculture, Gulbarga

A field experiment involving pre-emergence application of Butachlor, Butralin, Dinitramine, Oxadiazon, Nitrofen, Pendimethelin, X-150 and post-emergence propanil along with handweeded weed free check and unweeded control treatment was conducted with upland rice grown on silty clay-loam at Mugad. Weed population and dry matter accumulation in weeds decreased in the herbicide treated plots. Pre-emergence application of X-150 followed by Oxadiazon reduced the weed population drastically as compared to other treatments. There was negative correlation between dry weight of weeds to that of dry matter production of crop. Application of X-150 and oxadiazon caused slight injury to rice crop in the initial stage. The grain yield was maximum in weed-free treatment (42 q/ha) followed by X-150 (39 q/ha), Oxadiazon (34 q/ha), and hand weeded (33 q/ha). The unweeded control gave the lowest grain yield (21 q/ha). In situ residual study revealed that crops such as Sorghum, Bengalgram, Greengram, Avare and Safflower were susceptible to the residual effect of herebicides.

STUDY ON THE VARIETAL TOLERANCE OF RICE TO BENTAZON UNDER DIRECT SEEDED LOWLAND CONDITION

G. C. Tosh, B. C. Jena and R. K. Nayak

Orissa University of Agriculture and Technoiogy
Bhubaneswar

A field trial was undertaken with a view to know the impact of post-emergence herbicide application on weed growth and grain yield of three high yielding rice cultivars (IR 36, Mahsuri and T 141) in lowland under direct seeded condition. The herbicide bentazon was applied 2.0 kg a. i./ha alone and in combination with amine salt of 2, 4-D 1.0 kg. a. e./ha as directed spray at 15th day following germination of rice.

The result indicated that the herbicide treatments (bentazon and bentazon+2, 4-D) did not exhibit any symptoms of crop injury in all the varieties tested. On 60th day of sowing it was observed that the herbicide treatment with bentazon+2, 4-D recorded maximum and significant control of weeds in plots with varities Mahsuri and T 141 over that of IR 36. This herbicide treatment (bentazon+2, 4-D) also recorded significantly higher grain yield in T 141 over cultural and bentazon treatment. In Mahsuri this treatment (bentazon+2, 4-D recorded grain yield at par with that of cultural treatment. But in IR 36 the cultural treatment of weeding recorded significantly higher grain yield than all the herbicide treatments (bentazon, bentazon + 2, 4-D).

(B) WEED CONTROL IN RICE NURSERY

TIME OF HERBICIDE APPLICATION AND RICE DURATION IN LOWLAND RICE NURSERY

A. Mohamed Ali

ICAR (P. L. 480)—AICRP on Weed Control TNAU, Coimbatore

A trial was conducted in black clay soil twice during 1983 to find out the selectivity and effectiveness of pre-emergence herbicides in low land rice nurseries. Short duration rice var. IR 50 (105 days), medium duration var. CO 43 (135 days) and long duration var. Ponmani (165 days) were formed the main plot treatments. There were nine sub-plot treatments. Four pre-emergence herbicldes *viz.* butachlor 1 kg/ha, benthiocarb 1 kg/ha, oxadiazon 0.5 kg/ha and pendimethalin 1 kg/ha were applicd at two diffeient times (5 and 8 DAS). They were compared with no herbicide application. Both rice seeded and non-seeded plots were maintained for all treatments. Seed rate was 50 kg/1000 sq. m nuisery area. The major weeds were *Echinochloa colonum* and *Echinocloa crusgalli* in annual grass and *Cyperus difformis* in annual sedge.

All the pre-emergence herbicides tried were effective in controlling the major weeds at 5 and 8 DAS. Application of herbicide at 8 DAS was selective to all durations. Pre-emergence herbicides *viz.* butachlor and oxadiazon application at 5 DAS were not selective to short duration rice var IR 50.

A COMPARATIVE STUDY OF THIOBENCARB AND SOME SELECTED HERBICDES FOR BARNYARD GRASS CONTROL IN RICE NURSERY

Verghese Philip, P. A. Sarkar and A. K. Ghosh

Agronomy Department, Allahabad Agricultural Institute, Allahabad

Rice nursery infested with barnyard grass (*Echinochloa* spp) treated with thiobencarb 1.5 kg/ha, at 10 days after sowing (DAS), significantly reduced the number of barnyard

grass in transplanted rice hills in the main field. The result was comparable to that from plots treated with butachlor, 1.0 kg/ha, at 3 DAS. Pendimethalin, 1.0 kg/ha, at 3 DAS, was visually more phytotoxic than thiobencarb and butachlor four days after treatment. However, there was no significant difference in grain yield from plots receiving pendimethalil, thiobencarb and butachlor.

(C) WEED CONTROL IN TRANSPLANTED RICE

EFFECT OF WATER MANAGEMENT PRACTICES ON WEED GROWTH AND YIELD OF RICE

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Field experiments were conducted to study the effect of water management practices on weed growth and Rice yield. Continuous submergence (5±2 cm) was found most effective in minimising the weed number and dry matter accumulation of weeds of all the stages of crop growth during both the years of investigation. The alternate wetting and drying was found most ineffective as weeds number and dry weight of the weeds were maximum in this treatment. The maximum grain yield was obtained in continuous submergence (5±2cm) and minimum in alternate wetting and drying condition. Continuous saturation followed by submergence at tillering and flowering stages were intermediate in controlling weeds and rice grain yield. At early stages of crop growth sedges constituted the mjor part of weed population under all the water management practices, whereas at harvest, the population of sedges was markedly reduced. The population of grasses and broad leaved weeds increased linearly with advancement of crop growth.

STUDIES ON EFFICIENCY OF HERBICIDES UNDER DIFFERENT WATER MANAGEMENT PRACTICES IN TRANSPLANTED RICE

R. K. Singh and R. P. Singh

Department of Agronomy, Institute of Agricultural Sciences
Banaras Hindu University, Varanasi

Studies were conducted to evaluate the performance of different herbicides under varying water management practices. Continuous submergence (5±2 cm) was more effective in controlling weeds and resulted in highest grain yield. The alternate wetting and drying was least effective in this respect. Granular formulation of herbicides, viz. benethiocarb, butachlor and 2, 4.D were more effective under continuous submergence, whereas

liquid formulation of these herbicidee were more effective in rest of the water management practices. All the herbicides irrespective of their formulations found less effective under alternate wetting and drying condition. The maximum rice grain yield was produced by herbicide benthiocarb (L & G) under all the water management practices, followed by butachlor (L & G). Herbicide 2, 4-D (G) was least effective. Performance of herbicides in continuous saturation and flooding at critical stages was an intermediate in respect of weeds control and rice yield.

EFFECT OF THIOBENCARB IN TRANSPLANTED RICE

V. P. Singh and R. P. Singh
Institute of Agricultural Sciences, Banaras Hindu University, Varanasi.

Field Experiments were conducted during the Kharif seasons of 1982 and 1983, to study the relative efficiency of thiotenecarb alone and in combination under different level of nitrogen in transplanted rice. Thiobencarb was applied as pre-and post emergence at 1.25 and 1.5 kg. ai/ha. Other treatments used for comparison were butachlor 1.5 kg ai/ha as pre emergence and propanil 1.25 and 1.5 kg ai/ha as post-emergence application, hand weeding (thrice) and unweeded control.

Pre-emergenue application of thiobencarb 1.5 kg ai/ha with post-emergenee application of propanil 1.5 kg ai/ha reduced the density and dry matter production of weeds more than rest of the herbicidal combinations and herbicides used alone. This treatment also gave maximum grain yield. All the weed control treatments were significantly superior to unweeded control in controlling weeds and producing grain yield. However, none of the herbicidal treatments was as effective as hand weeding (Thrice). Increasing level of niirogen increased the weed population and dry weight of the weeds and grain yield.

PERFORMANCE OF CERTAIN HERBICIDES IN LOW LAND RICE

R. D. Singh and A. K. Ghosh
Allahabad Agricultural Institute, Allahabad

Certain selected herbicides were compared for weed control in low land rice. There was no significant difference in number of *Echinochloa colonum* and *E. crusgalli* due to different treatments. At 35 and 60 DAT number of *Ammannia baccifera* and total number of broad leaf weeds were significantly lower in plots treated with fluchloralin +2, 4-DEE 0.90 or 1.12 kg/ha at 4 DAT and bentazon 0.80 or 1.20 kg/ha, at 30 DAT than hand-weeded plot. At 60 DAT total number of grasses was significantly lower in plots receiving fluchloralin +2, 4-DEE 0.90 kg/ha than unweeded control plot. Total number of sedges as well as total number of weed were significantly lower at 60 DAT in plots treated with bentazon

0.80 or 1.20 kg/ha, fluchloralin 0.66 kg/ha, as pre-plant application + bentazon 0.80 kg/ha at 30 DAT than hand-weeded plots. At 60 DAT dry weight of weeds was significantly lower in plots treated with fluchloralin +2, 4-DEE 0.90 kg/ha, benthiocarb 1.0 kg/ha, at 4 DAT; and hand weeding than that in unweeded control plot. Grain yield of rice was comparable in plots treated with fluchloralin +2, 4-DEE 0.90 or 1.12 kg/ha, bentazon 0.80 kg/ha; benthiocarb 1.0 kg/ha and handweeding.

EFEICIENCY OF GRANULAR HERBICIDES IN SAVING THE MAJOR PLANT NUTRIENTS REMOVED BY WEEDS IN TRANSPLANTED RICE

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Weed Science Laboratory, Palli Siksha Sadana (College of Agricultue)
Visva-Bharati

Granular forms of two esters (isopropyl and ethyl) of 2, 4-D at 1.0 and 1.5 kg. a.i./ha each were compared with Butachlor (G) 2.0 kg, Nitrofen (G) 2.0 kg applied pre em and propanil (EC) + Na-2, 4-D (WP) at 3.0+0.8 kg a.i./ha applied post-em to weeds and the cultural practices namely, hand-weeding (twice), weed-free check and unweeded control for three consecutive *kharif* (Warm-wet) seasons of 1978 to 1980 for their efficiency in saving of major plant nutrients removed by weeds in transplanted rice cv. Pusa 33-30.

Among the weed species, *Oldenlendia dichotoma* L., *Sagittaria sagitifolia* L., *Monochoria vaginalis* Presl., *Ammania baccifera* L. and *Sphenochlea zeylanica* Gaertn. were the heavy feeder of nitrogen while, *S. zeylanica* Gaertn., *Eclipta alba* L., *Aneilema keisak* Hassk. and *M. vaginalis* Presal. were the high Phosphate consumer and *A. keisak* Hassk., *M. vaginalis* Presl., *Ludwigia parviflora* Roxb., *S. zeylanica* Gaertn. and *O. diehotoma* Linn. were the rankad potassium absorber. Weeds removed 2.3 times more nutrients per unit weight of rice crop.

STUDIES ON THE INTER-RELATIONSHIP BETWEEN SYSTEM OF CULTIVATION AND WEED MANAGEMENT IN PUDDLED RICE

B. L. Chandrakar and B. R. Chandrawanshi
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Field trials were conducted to study the inter-relationship between system of rice cultivation and weed management. It was found that direct seeding of pre-germinated rice seeds as dibbling (20×150 m) was at par with the transplanting system. Amongst the different systems of rice cultivation, broadcasting method showed better weed control with cultural and butachlor application, in transplanting method only cultural method of weed control was better while in drilling and dibbling methods, weed control by cultural, butachlor as well as combination of butachlor plus propanil were equally efficient. The usual practice of broadcasting pre-germinated seeds of rice without weed management reduced the productivity of rice significantly.

INTEGRATED WEED CONTROL IN TRANSPLANTED RICE

Z. G. Patel, C. L. Patel, R. B. Patel and R. M. Desai

Department of Agronomy, Gujarat Agricultural University, Navsari

Field experiments were conducted with paddy variety IR-22 during the *Kharif* seasons of 1981 and 1982 in a randomised block design with three replications. Eighteen treatment combinations comprising of five herbicides *viz.*, Oxadiazon (G), Butachlor (G), Benthiocarb (G), Fluchloralin (G) and Propanil (EC) (T_1 to T_5) and each herbicide + one hand weeding at 40 days after transplanting (DAT) (T_6 to T_{10}), weed free condition upto 20, 40 and 60 DAT (T_{11} to T_{13}); weed free upto 20 DAT+hoeing at 20 DAT (T_{14}); weed free condition upto 40 DAT+hoeing at 40 DAT (T_{15}); only hoeing at 20 and 40 DAT (T_{16} & T_{17}) and unweeded control (T_{18}) were included in this trial.

The lowest dry weight of weeds was recorded in weed free upto 40 DAT+hoeing at 40 DAT (T_{15}) treatment which expressed the highest weed control efficiency (W. C. E.), though the applications of herbicides except Propanil+weeding at 40 DAT, weed free upto 40 and 60 DAT and application of Butachlor (G) alone @ 1.25 kg a.i./ha recorded considerably higher W. C. E., the highest dry weight of weeds was recorded under unweeded control plots (T_{18}). Maximum grain and strain yields were obtained by maintaining weed free condition upto 60 DAT (T_{13}), but they were satistically at par with all other treatments except the application of Fluchloralin (G) @ 0.75 kg a.i./ha. Propanil (EC) @ 2.00 lit/ha, hoeing at 20 and 40 DAT and unweeded control.

STUDIES ON THE DELETERIOUS EFFECTS OF CERTAIN CYPERACEOUS WEEDS ON TRANSPLANTED IR20 RICE (*ORYZA SATIVA L.*)

A. R. Lakshmanan, P. Panneerselvam and V. Muthukkumar

Annamalai University, Annamalainagar

A field experiment was conducted to study the deleterious effects of certain sedges *Cyperus rotundus* Linn., *Cyperus haspen* Linn. and *Fimbristylis miliacea* Vahl on low land rice (IR20) and also to know the critical period of crop weed competition. The three sedges were inoculated in IR20 rice transplanted crop at the time of planting (D_1), 15 DAT (D_2), 30 DAT (D_3), 45 DAT (D_4) and 60 DAT (D_5). A weedfree control treatment (D_0) was also included in the experiment. Among the three sedges *C. haspen* was found to be the most deleterious to reduce the crop yield followed by *F. miliacea* and *C. rotundus*. All the growth characters and yield attributes favourably tended to increase under complete weed free condition. The sedges inoculated at the time of transplanting with longest duration of competition adversely affected the growth characters and yield attributes of IR20 rice. The critical period of crop-weed competition in IR20 rice was found to be upto 45 DAT.

STUDY ON THE PERFORMANCE OF THIOBENCARB UNDER VARYING SOIL TYPES IN TRANSPLANTED RICE (*ORYZA SATIVA* L.)

R. K. Chitkara, S. K. Katyal and V. M. Bhan

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In a pot experiment conducted in the Screen House, the treatments consisted of three soils of different physico-chemical properties and varying leaching rates of 0.9 cm, 1.9 cm and 3.1 cm per day, in three formulations of thiobencarb (EC, granule and EC+sel wet 99) and three times of application of thiobencarb that is pre-plant pre-emergence and post-emergence. Pre-emergence application of thiobencarb was the best for efficient weed control and highest grain yield of rice irrespective of soil type and the formulation of thiobencarb. Alternatively, thiobencarb could also be applied as post-emergence up to 3-4 leaf stage of *Echinochloa crussgalli*. Granule formulation of thiobencarb was found effective with regard to the prolonged control of weeds especially in light textured soils and as post-emergence application.

STUDIES ON THE EFFICACY OF HERBICIDES IN TWO RICE CULTIVARS (TELLAHAMSA AND IR-50) UNDER DIFFERENT METHODS OF CULTIVATION

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A field experiment was conducted to study the relative efficacy of certain promising herbicides in two cultivars of rice (Tellahamsa and IR-50) under defferent methods of cultivation *viz.* transplanting and broadcasting.

Transplanting situation effectively minimised weed problems and gave superior grain yield over broadcasting method. Grain yield was improved by 18.5% due to transplanting alone in control plots. Cultivar Tellahamsa smothered the growth of weeds resulting in less density and dry matter of weeds compared to IR-50. Tellahamsa competed better with weeds tthan IR-50 depsite its low yield potential. But response to weed control was more with IR-50 than Tellahamsa for all the weed control treatments. The two cultivars did not differ in their tolerance or susceptability to herbicides.

None of the herbicides was on par with that of hand weeding under broadcasting method. Fluchloralin + 2, 4-D EE combination gave superior grain yield over other herbicidal treatments. Oxadiazon and pendimethalin did not control weeds effectively and were extremely toxic to rice under broadcasting situation. All the herbicides were relatively safer to rice crop under transplanting system and pendimethalin gave excellent control of weeds and were at par with that of hand weeding.

CHEMICAL WEED CONTROL IN TRANSPLANTED RICE UNDER MID-HILL CONDITIONS

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Experiments were conducted to study the efficacy of different herbicides in controlling the weeds in rice. The treatments consisted of weedy check hand weeding—1, hand weeding—2, fluchloralin 1.0 kg, Molinate+2, 4-D (G) (6+2) 2.0 kg, Molinate+2, 4-D (g) (8+2) 2.0 kg, Molinate+2, 4-D (G) (10+2) 1.5 kg and 2.0 kg. thiobencarb (G) 2.0 kg, Pendimethalin (G) 2.0 kg and Oxyfluorfen 0.25 kg/ha. The herbicides were applied 6 days after transplanting. The most common weed species were *Echinochloa crusgalli, E. Colonum, Digitaria Sanguinalis, Cyperus iria, Panicum elatum* and *Setaria glauca.* All the herbicides reduced the density and dry matter of weeds and produced significantly higher grain yield than the weedy check. The application of Molinate+2, 4-D (G) at the rate of 1.5 or 2.0 kg was better in controlling the weeds particularly *Cyper iria.* During 1981 Pendimethalin (G) recorded the highest yield among herbicides while molinate+2, 4-D (g) at 1.5 kg/ha during 1982. Oxyflurfen was effective in controlling the weeds but also caused phytotoxicity of the rice plants.

COMPETITION OF BARNYARD GRASS IN TRANSPLANTED RICE HILLS

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Presence of barnyard grass (*Echinochloa* spp.) in transplanted rice reduced grain yield severely. One barnyard grass in a hill of four rice plants reduced 92%, two bernyard grass in a hill of three rice plants reduced 94%, three barnyard grass in a hill of two rice plants reduced 96%, and four barnyard grass in a hill of one rice plant reduced 97% grain yield. Rice-barnyard grass competition in hills reduced grain yield due to lower plant dry weight, number of productive tillers and filled grains per panicles. The weed free hills yielded 4.1 t/ha.

RESPONSE OF RATES OF BUTACHLOR ON DIFFERENT WEED SPECIES OF TRANSPLANTED RICE IN FARMERS FIELDS

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Results of thirty eight trials conducted from 1974 to 1980 in farmers fields in the major rice growing regions of India show that Butachlor 1.25 to 1.87 kg a.i./ha applied

0 to 4 days after planting of rice effectively control and the grass weed *Echinochloa crusgalli* annual sedges such as *Cyperus iria* and *Cyperus difformis* and broadleaf weeds like *Eclipta alba*, *Sphaeranthus indicus*, *Ludwigia parviflora*, *Sphenoclea zeylanica*. Rates higher than 1.87 kg a.i./ha gave no additional advantage. Rates below 1.25 kg will only give marginal control. Application beyond 4 days after transplanting are not very effective. There was no difference in effectiveness between EC and granules. Butachlor showed better control of weeds is Punjab, Haryana and U. P. than in Karnatak.

WEED CONTROL IN TRANSPLANTED PADDY UNDER SODIC SOIL CONDITIONS OF MADHYA PRADESH

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In tackling the ticklish problem of managing saline alkali soils, weeds pose most specific hinderance in paddy cultivation. About 2000 hectares of such patch lies in the Nimar plains of Narmada trough in Western Madhya Pradesh. Paddy, the most suitable crop under the situation after reclamation abounds with monocot weeds like *Cyperus rotundus*, *Cynodon dactylon*, *Eleusine aegyptica*, *Chloris barbata*, *Dinebra arabica*, *Commelina* spp. and dicot *Trianthema monogyna*, *Eupherbia* spp,, *Cynotis axillaris*, *lagascea* mellis and *Cephalandra indica*.

Out of the twelve treatments included in the weed control study Butachlor 1.5 and Piperophos (Rolof) and Fluchloralin (Basalin) were most effective to keep down major weed growth and to maintain yield levels of paddy in the nabourhood of weed free environment. Eventhough yield recorded Panoxalin, Fluorodifen, Propanil, Oxyfluorfen, Sirmate and Nitrofen treated plots were relatively lower to Butachlor, the levels were invariably higher to the weedy check. Highest grain yield of 35.0 g/ha was noted in weed free conditions, which was about 23.9 g/ha (215%) greater to no weeding treatment.

EFFECT OF ORGANIC WASTE INCORPORATION AND NITROGEN FERTILIZATION ON TRANSPLANTED RICE AND ASSOCIATED WEEDS

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A field experiment was conducted to study the influence of organic waste incorporation and nitrogen fertilization on transplanted flooded rice and weed growth. The treatments included the combinations of four organic wastes (Wheat straw, Lantana, Eupatorium

each applied at the rate of 5 t/ha and no waste i. e. control), four levels of nitrogen (0, 50, 75 and 100 kg N/ha) and two weeding treatments (unweeded check and handweeding). The experiment was laid out in a split plot design keeping organic wastes in main-plots and combination of nitrogen levels and weed control treatments in sub plots with 4 replications. The organic wastes were incorporated at the time of puddling on the basis of their fresh weight.

The weed species in the experimental field were *Cyperus iria, Eehinochloa crussgalli* and *Panicum* spp. Incorporation of Lantana, Eupatorium and wheat straw resulted in 44, 20 and 11 per cent more rice grain yield over control (no incorporation of organic waste), respectively. There was no difference in total weed number and total weed dry weight at any stage of observation due to incorporation of organic wastes.

The grain and straw yields of rice increased significantly and consistently upto 100 kg N/ha. The Plots receiving nitrogen fertilizer resulted in more number and dry weight of weeds as compared to control plots. Hand weeded plots yielded about 101% more rice grain than unweeded check.

MAIZE

ALTERNATIVE HERBICIDES FOR MAIZE ON A VERTISOL

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A trial was conducted to evaluate three herbicides (cyanazine, with and without atrazine, pendimethalin, and metolachlor) in maize (hybrid G-5) *vis a vis* the presently recommended herbicide atrazine (0.5-1 kg/ha).

The field study showed that pre-emergence pendimethalin and metolachlor (1 kg/ha) and post-emergence cyanazine (0.5 kg/ha) formed three very good alternatives to atrazine in maize. In fact, pendimethalin and metolachlor treatments resulted in significantly higher maize yields than atrazine. Post-emergence cyanazine was found at par with atrazine. Its pre-emergence application proved phytotoxic to maize.

EFFICACY OF CERTAIN HERBICIDES ON WEED CONTROL IN MAIZE

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A field experiment was conducted during the kharif seasons of 1982 and 1983 to evaluate the efficacy of herbicides on the control of weeds and yield of maize. The treatments

consisted of 4 herbicides *viz.* atrazine 1.0 kg/ha isoproturon 1.0, 1.5 and 2.0 kg/ha, pendimethalin 1.25, 1.75 and 2.0 kg/ha and cyanazine 0.5, 1 0 and 1 5 kg/ha each applied as pre-emergence, weedy check and weed free conditions. Application of atrazine 1.0 kg/ha was found to be best herbicide followed by cyanazine in controlling weeds resulting in least dry matter production by weeds in maize as compared to remaining herbicides. Cyanazine 1.5 kg/ha, isoproturon and pendimethalin 2.0 kg/ha were found to be more efficient in reducing number and dry matter production of weeds in maize as compared to all other rates of these herbicides. Grain and stover yields were found to be the highest with atrazine 1.0 kg/ha which was closely followed by cyanazine application 1.5 kg/ha. Isoproturon and pendimethalon were found to produce less grain and stover yields as compared to other herbicides. Yield attributes also followed the trend similar to that of yield. The highest grain yield was found under weed free condition. Nonsignificant differences in grain yield was found in weed-free, atrazine and cyanazine treatments.

EFFECT OF HERBICIDES ON MAIZE ASSOCIATED WEEDS AND SUCCEEDING CROP OF WHEAT

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Field trials were conducted during 1980 to 1983 to evaluate the bio-efficacy of pre-emergence application of isoproturon, pendimethalin, cyanazine and cyanazine+atrazine at different rates in kharif maize and their residual effect on the succeeding crop of wheat. *Echinochloa colonum, Dactyloctenium aegyptium, Eleusine indica, Digitaria sanguinalis* and *Cyperus rotundus* were the major weed species. All the herbicides caused significant reduction in the density and dry weight of annual grassy weeds. Degree of weed control increased with the increase in the rate of herbicides.

Uncontrolled weeds resulted into 66.1% reduction in the grain yield of maize. All the herbicides, irrespective of their rates of application, produced grain yields of maize higher than the weedy check. Cyanazine 1.5 kg/ha produced grain yield consistently at par with weed-free treatment. Grain yield of maize did not increase with the increase in the rate of cyanazine in 1982-83. Isoproturon 1.0 and 1.5 kg/ha yielded significantly higher than its application 0.5 kg/ha in all the years. Similar observations were recorded with pendimethalin rates (1.0, 2.0 and 3.0 kg/ha). Combination of cyanazine+atrazine at different rates was as effective as their rates applied separately.

None of the herbicides at any rate of application could show toxic effect on the succeeding crop of wheat.

STUDIES OF ECONOMISING NITROGEN FERTILIZATION IN MAIZE THROUGH WEED CONTROL

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Field trials were conducted with maize CV. Ganga-5 involving a combination of differential nitrogen levels and weed control methods for making an efficient use of high doses of applied nitrogrn and to explore the possibility of economising nitrogen dose keeping the weeds under check in the early stages of crop growth.

Increasing levels of nitrogen reduced significantly the population of grassy as well as broad leaved weeds. Pre-emergence application of atrazine and alachlor proved superior to that of hand weeding treatment in bringing about the reduction in weed population. Alachlor had a slight edge over atrazine in controlling grassy weeds where as broad leaved ones were controlled more effectively by atrazine. The highest grain yield was obtained with 120 kg N/ha which differed significantly from other levels of nitrogen. Atrazine pre-emergence soil application at 1 kg/ha produced significantly higher grain yield over hand weeding and unweeded control. Further, it was observed that a pre-emergence application of either atrazine or alachlor with 60 kg N/ha registered camparable grain yield with 120 kg N/ha in the absence of weed control.

AGRO-PHYSIOLOGICAL EFFECT OF DOSAL CONCENTRATION OF WEEDICIDES ON MAIZE GROWN UNDER WEEDFREE CONDITION

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An experiment was conducted in medium black soils to study the agro-physiological behaviour of dosal concentration of weedicides interaction with three levels of nitrogen on maize grown under weedfree condition. For this purpose, linuron, atrazine and prometryne (0.25, 0.50 and 0.75 kg a.i./ha) were sprayed as pre-emergence with three levels of nitrogen (0, 40 and 60 kg N/ha).

Among three weedicides, pre emergence application of prometryne (0.75 kg a.i./ha) enhanced the green forage yield at the maximum level. The next treatment in the merit were atrazine (0 25 kg a.i./ha) and linuron (0.75 kg a.i./ha). With regard to dry matter yield, atrazine as a whole yielded the best results and then prometryne. In general, nitrogen combination acted as a synergist and further improved the yield. Infact, both prometryne and linuron exhibited better utilization of nitrogen up to 60 kg N/ha levels resulting in good growth and atrazine up to 40 kg N/ha level. Leaf canopy, biolocal assimilation, and photo-synthetic area showed similar trend. Prometryne (0.75 kg a.i./ha) application lengthened the period of maturity, since it reduced the length and number of tassel while other treatments did not.

STUDIES ON WEED CONTROL IN WINTER MAIZE (*ZEA MAYS* L.) THROUGH HERBICIDES

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Efficiency of simazie (pre-emergence 0.25, 0.5 and 0.75 kg/ha), atrazine (pre and post-emergence 0.25, 0.5 and 0.75 kg/ha) and pandimethalin (pre-emergecne 0.75 kg/ha) was studied during 1981-82 and 1982-83 at the Punjab Agricultural University, Ludhiana for controlling weeds in winter maize. Simazine and atrazine as pre-emergence (0.50 and 0.75 kg/ha) and atrazine as post-emergence 30 and 50 days after sowing (0.75 kg/ha) gave a season long control of grasses and broad-leaf annual weeds and produed grain yield higher than three hand hoeings Pendimethalin did not control *Avena ludoviciana*, *Melilotus indica* and *Medicago denticulata*.

HERBICIDE FERTILIZER INTERACTIONS IN MAIZE

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Four herbicides (Simazine, Fluchloralin, 2, 4-D and Penoxalin) at 1.0 kg a.i./ha were tried as pre-emergence applications with three nitrogen levels (40, 80, 120 kg N/ha) to study the weed growth in *rabi* maize at Bhubaneswar during 1978-79. The non-herbicidal treatments of cultivators practice (two hoeings, weedings and earthings) and un-weeded check were also kept for comparison.

While considering herbicide-nitrogen interactions, 2, 4-D with 40 kg N/ha recorded the minimum dry matter accumulation of weeds at all the stages of growth. The weed population interactions, were not significant at the initial stages. At 90 days after sowing, penozalin with 40 kg N/ha recorded the minimum weed population.

Irrespective of weed control treatments (either with herbicides of cultural treaments) tried, there was significant increase in weed population and dry matter accumulation of weeds with each increasing level of N.

Amongst the weed control treatments, 2, 4-D was the best at 30, 60 and 90 days after sowing recording minimum weed number and dry weight of weeds.

STUDIES ON WEED MANAGEMENT IN RAINFED MAIZE UNDER MID-HILL CONDITIONS OF NORTH-WESTERN HAMALAYAS

Kamta Prasad and H. C. Joshi

V. P. K. A. S., Hawalbagh, Almora, U. P.

A field study was conducted to assess the losses due to weeds under different weed management practices and critical period of crop growth for weed competetion in short duration maize (CV VL 16). Treatments were one hand weeding, 10 days after maize emergenne (DAME (T_1), 25 DAME (T_2), 40 DAME (T_3); Two handweedings at 10 and 25 DAME (T), 10 and 40 DAME (T_5), 25 and 40 DAME (T_6); three handweedings at 10, 25 and 40 DAME (T_7); earthing 25 DAME (T_8); $T_1 + T_8$ (T_9); atrazine pre-em 1.25 kg/ha (T_{10}); $T_{10} + T_8$ (T_{11}) and unweeded (T_{12}). Major weed species present in experimental plots in order of prevalance were *Ageratum conyzoides* L., *Galinsoga parviflora* Cav., *Cyperus* spp,, *Oxalis latifolia* and *Digitaria sanquinalis* (L) Scop. The maximum accumulation of weed biomass was observed upto 40 DAME, after which it was of the least importance. Mean reduction in grain yield was 80.45% in unweeded check as compared to the highest attained yield (60.65 g/ha) in T_{11}. This was 21.30 and 21.27 percent higher than the yields obtained in T_{10} and T_7. First 40 days after crop emergence were found critical for weed competetion. Time of first weeding was the most important and delayed first weeding caused drastic yield reductions. Earthing 25 DAME in different treatments (T_8, T_9 and T_{11}) resulted in suppression of weeds and enhancement of maize yields. Use of atrazine was found highly economic and compared to manual weeding.

COMPARATIVE EFFICACY OF HERBICIDES IN CONTROLLING WEEDS IN MAIZE WITH SPECIAL REFERENCE TO *AGERATUM CONYZOIDES*

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Weed control studies were conducted at Himachal Pradesh Krishi Vishva Vidyalaya, Palampur on acidic clay loam soil having high organic carbon with early composite maize variety. Pre-emergence application of Simazine 1.5 kg/ha, Atrazine 1.5 kg/ha and Pendimethalin 1.5/ha effectivcly controlled the weeds in maize and lowered the dry matter of weeds. However, for controlling the *Ageratum conyzoides* (the weed appears in maize at silking/tasselling stages and quickly takes a bushy growth) the usual pre-emergence applications of Atrazine or Simazine 1 5 Kg were also effective. These rates did not leave any residual effect for the succeeding crops. This weed can also be controlled by pre-emergence application of Atrazine/Simazine and Pendimethalin at lower doses followed by post emergence applications of Paraquat or Terbutryne. The dominant weeds were *Echinochloa clonum, Digitaria sanguinalis, Polygonum alatum, Panicum dichotomiflorum, Cyperus esculentus* and *Ageratum conyzoides*.

SORGHUM

STUDIES ON CHEMICAL WEED CONTROL IN SORGHUM (*SORGHUM BICOLOR* L. MOENCH) FOR FODDER AND GRAIN

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A field experiment to study the efficacy of atrazine, simazine, linuron, terbutrya, cynazine each at 0.25 and 0.50 kg/ha and pendimethalin (0.5 and 0.75 kg/ha) and dinitramine (0.5 and 0.75 kg/ha) for weed control in sorghum for fodder and grain was conducted at the Punjab Agricultural University, Ludhiana during *kharif* 1981 and 1982. All the herbicides tested though gave an effective control of weeds and incaeased fodder and grain yields of sorghum but the differences in green and dry fodder yields were non-significant. Only during second year atrazine (0.5 kg/ha), cynazine (0.25 kg/ha), pendimethalin (0.5 kg/ha), linuron (9.25 kg and 0.5 kg/ha), and terbutryn (0.25 and 0.5 kg/ha) produced significantly higher grain yield than control. None of the herbicides at the levels tried was phytotoxic to the crop.

EFFECT OF HERBICIDES ON CONTROL OF STRIGA IN SORGHUM

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A field experiment involving pre-emergence application of Atrazine followed by post-emergence application of 2,4-D, Fluchloralin, Diuron and Alachlor was conducted during 1979-80 under rainfed conditions to study their effect on control of *Striga* in sorghum cv. CSH-1. The results indicate that the *Striga* population was significantly high at all stages of observation in unweeded check treatment The *Striga* population was low in hand weeding and hoeing treatment and it was at par with herbicide applied treatments. The dry weight of *Striga* was significantly reduced due to application of herbicides. Pre-emergence application of atrazine followed by post-emergence application of 2, 4-D at 40 days after sowing has recorded lower dry weight of *Striga* (1.38 g/8 M^2 plot) as compared to hand weeding and hoeing treatment (1.56 g/8 M^2 plot), while the dry weight of *Striga* was highest (9.69 g/8 M^2 plot) in unweeded check. Grain yield of sorghum was higher in weed free check (56.2 Q/ha) and was at par with hand weeding and hoeing (54.6 Q/ha) and 2, 4-D (51.4 Q/ha) treatments. Application of Diuron and Alachlor resulted in reduction in grain yield due to their toxic effect on sorghum.

A STUDY OF CROP-WEED COMPETITION IN HYBRID SORGHUM

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A field experiment on hybrid sorghum consisted of two distinct sets of treatments. In one, the crop was kept weed-free in the beginning but weeds were allowed to grow later till maturity. In the other, the crop was kept weed infested in the beginning and weed-free later till maturity. By comparing these two sets of treatments, the critical period during which weeds must be removed was determined. Witch weed was observed after 40 days from emergence of the crop in 1974-75. No witch weed was observed during 1973-74 season due to continuous rains during crop growth. Maximum crop-weed competition (excluding witch weed) occurred between 10 and 40 days from emergence of the crop. In striga infested crop, weed control beyond 40 days was necessary. Delay in weeding beyond 10 days from crop emergence resulted in a decrease in plant height, dry matter production, stem girth, plant stand, cob weight, and grain and fodder yields. More than two fold and approximately one fold increase in grain yield was obtained under weed-free treatment as compared to weed-infested crop during the first and the second season respectively.

TRACER STUDIES ON UPTAKE AND UTILIZATION OF PHOSPHORUS BY SORGHUM UNDER WEED FREE AND NO WEEDING SITUATION

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A field experiment was conducted on an weakly alkaline black soil, medium in available P_2O_5, with four methods of weeding and three levels of phosphorus application to study the uptake and utilisation pattern by sorghum under weed free and no weeding situation. Increased application of phosphorus from 0-60 kg P_2O_5/ha had increased the grain and straw yields of sorghum irrespective of weeding treatments. Percent P, uptake of P and percent P derived from fertilizer (% Pdff) increased with the increasing levels of phosphorus application both in sorghum and weeds. As the dose of phosphorus application was increased from 30 kg P_2O_5/ha to 60 kg P_2O_5/ha, there was decrease in percent P utilisation by sorghum but increase in % P utilization by weeds. Application of 30 kg P_2O_5/ha with physical or chemical weeding gave almost equal yields of grain and straw as compared to application of 60 kg P_2O_5/ha without weeding. Weeds appear to be competing with sorghum for applied phosphorus. Applied phosphorus was better utilized by sorghum when weeding was done with hand or cultivator or atrazine 1 kg/ha was used as compared to no weeding.

MILLETS

STUDIES ON THE INFLUENCE OF CULTURAL PRACTICES ON THE CONTROL OF WEEDS IN PEARL MILLET (*PENNISSETUM TYPHOIDES*)

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Intercropping of Moong and cowpea with pearl millet under different systems of planting (alternate and paired rows) was tried under weedy, one hand weeding, and weed free situations. The treatments comprised of seven combinations of pure crop and intercrops *viz.* sole pearl millet, sole moong, sole cowpea, pearl millet+moong, pearl millet cowpea in alternate rows and paired rows.

The dry matter produced by weeds at harvest was higher under sole moong and sole cowpea when compared with sole pearl-millet. Under no weeding treatment, intercropping reduced the dry weight of weeds and this reduction was more under paired row system of planting as compared to alternate rows. The grain yields of sole moong and sole cowpea were significantly higher than intercropped with pearl millet. However, the reduction in grain yield due to intercropping under no weeding was comparatively less as compared to one weeding at 4 weeks after sowing and weed free treatment, This indicates that with one hand weeding, intercropping with the aim of weed management has little effect.

STUDIES ON THE EFFECT OF NITROGEN LEVELS AND WEED MANAGEMENT ON WEED COMPETITION IN PEARL MILLET

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Four nitrogen levels (0, 40, 80 & 120 kg/ha) were used to determine the impact of various weed control treatments on growth of weeds and grain yield of pearl millet for two years (1981-82 and 1982-83).

The potential grain yield reduction due to presence of weeds throughout the growing season in weedy check varied from 24.5 to 32.5 and 39.4 to 60.2 percent in 1981 and 1982, respectively. The percent reduction in grain yield due to presence of weeds in weedy check was maximum at 0 kg N/ha and it decreased with the corresponding increase in nitrogen level. The dry matter accumulation in weeds recorded at harvest was more in the second year and in both the years it decreased with increase in nitrogen level. Among the various weed control treatments, atrazine at 0.5 kg/ha being almost equal to weed free check, gave higher yield as compared to all other treatments. Two weedings at 15 and 45 days after sowing with *desi* plough did not control the weeds efficiently and gave lower yields as compared to all other treatments of hand weeding.

EFFECT OF HERBICIDES UNDER OPTIMUM AND SUBOPTIMUM CONDITIONS OF FERTILIZER DOSES ON WEED CONTROL AND YIELD OF PEARLMILLET

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The efficacy of isoproturon (1.0 and 2.0 kg a.i./ha) and atrazine (0.5 and 1.0 kg a.i./ha) at optimum ($80N\text{-}40P_2O_5$ and suboptimum $60N\text{-}30P_2O_5$) levels of fertilizers were tested during the kharif seasons of the years 1982 and 1983.

The results indicated that fertilizer doses and herbicides were not significant during both the years, how wever, levels of herbicides were found significant during the first year only. The results indicated that handweeding treatment had appreiably increased the grain yield as compared to herbicides under both the conditions of fertility Higher dose of atrazine reduced grain yield under lower dose of fertilizer application.

CROP-WEED COMPETITION IN TRANSPLANTED FINGER MILLET VAR. CO. 11

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To fix the optimum weed free period required for transplanted finger millet *(Eleusine coracana)*, an experiment was conducted during the monsoon season of 1983 under irrigated condition in black soils of average fertility. The treatments were weed infested condition upto (15, 30 and 45 days from planting) and weed free condition by manual weeding upto 15 (15), 30 (15 and 30) and 45 (15, 30 and 45) days and was compared with unweeded control. Two seedlings were planted in a hill with a spacing of 15×15 cm in between plants and rows.

The prominent annual dicot weed was the *Trianthema portulacastrum* ($728/m^2$). Other major weeds were *Amaranthus virieis*, *Parthenium hysterophorus*, *Flavaria australasica* in dicots, *Echinochloa colonum*, *Dactyloctenium aesyptium*, *Chloris gayana*, in grasses and *cyperus rotundus* in sedge.

Maintaining weed free condition upto 15 days from planting was sufficient to get higher yield in transplanted finger millet. Allowing weed infestation upto 30 days affected the grain yield particularly when irrigation was delayed. Allowing weed infestation upto 45 days caused lodging resulting into less ear heads per unit area.

WEED CONTROL UNDER CROPPING SYSTEMS IN DRILLED RAINFED FINGERMILIET

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A field experiment was conducted during 1977 and 1978 to screen suitable herbicides for weed control under different cropping systems in drilled fingermillet. The three cropping systems namely fingermillet sole crop, fingermillet-soybean intercrop and fingermillet-farmer's practice (sowing of mixtures of dolichos, niger, fodder jowar and mustard at every 5th or 6th line of fingermillet) were the main plot treatments. The herbicides were the subplot treatments. The herbicides included were pre-emergence application of 2, 4-D at 0.5 kg a. i./ha, neburon at 0.5 and 1.0 kg a. i./ha, nitrofen at 0.5 kg a. i./ha, and post emergence application of 2, 4-D at 0.5 kg a. i./ha, neburon at 0.5 kg a. i./ha, and 1.0 kg a. i./ha, and propanil at 1 L a i./ha. In addition, weed free (hand weeding at 15, 30 and 45 days after sowing) and unweed control were included for comparison. Among the weed control treatments, weed free treatment gave maximum grain yield. Pre-emergence application of neburon at 1.0 kg a. i./ha was the best among the herbicides tried in all the 3 cropping systems.

WHEAT AND BARLEY

CONTROL OF *PHALARIS MINOR* RETZ. AND OTHER WEEDS IN WHEAT WITH PRE-AND POST-EMERGENCE APPLICATION OF HERBICIDES

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Field studies indicated that all weed control treatments significantly reduced the dry matter of weeds in wheat var. HD 2204. Manual weeding proved less effective during 1981-82 under comparativaly higher intensity of *Bhalaris minor* than that during 1980-81. Pre-emergence application of isoproturon at 1.2 kg a.i./ha gave most effective control of all weeds during both the years. As a result of favourable effect on yield contributing characters, weed control treatments resulted in significantly higher grain yield than under weedy check, during both the years. Maximum grain yield (54.02 g/ha) was recorded under pre-emergence application of metoxuron at 1.6 kg a.i./ha during 1980-81, which was 48.6 per cent higher than that under weedy check. During 1981-82, however, post-emergence application of metoxuron at 1.2 kg a.i./ha produced maximum grain yield (49.62 g/ha), 81 3 per cent higher than that under weedy check. Pre-emergence application of herbicides exhibited a little phytotoxic effect on crop during early stages. However, the crop recovered in growth during later stages. Post-emergence application of all herbicides produced comparable efficacy and excellent selectivity on the crop.

EFFECT OF CYANAZINE AND UCIL 75038 ON *PHALARIS MINOR* RETZ. IN WHEAT (*TRITICUM AESTIVUM* L.)

Govindra Singh, Dheer Singh and Bhagwat Singh

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Experiments were conducted to study the effect of pre-and post-emergence application of different rates of cyanazine (0.25, 0.50, 0.75 kg/ha) and UCIL 75038 (1.0, 1.5, 2.0 kg/ha) on *P. minor* in wheat. The density of *P. minor* plants at 60 days stage and their heads at harvest were reduced with the increase in the rates of both the herbicides, irrespective of methods of application. Density as well as dry weight of weeds were always higher in these treatments when compared with methabenzthiazuron (Tribunil at the rate of 1.4 kgai/ha), metoxuron at the rate of 1.6 kg/ha and isoproturon at the rate of 1.0 kg/ha applied at 35 days of sowing. On an average 45% reduction in grain yield of wheat was recorded due to uncontrolled weeds. However, there was no difference amongst weed control treatments in augmenting grain yield.

RATE AND TIME OF APPLICATION OF ISOPROTURON FOR CONTROL OF *PHALARIS MINOR* RETZ IN WHEAT (*TRITICUM AESTIVUM* L.)

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Three rates (0.5, 1.0, 1.5 and 2.0 kg/ha) and four timings of application (21, 28, 35 & 42 days after sowing) of isoproturon were studied for the control of *Phalaris minor* in wheat. Isoproturon at all the rates of application, irrespective of time of application, caused significant reduction in the density of *P. minor* over unweeded check. Density of this weed was decreased significantly with the every increase in the rate of isoprotoron due to application at 21 or 28 days after sowing.

Application at the rate of 1.0 kg/h at 21, 28 or 35 days stages was most effective for grain yield. Grain yield was reduced due to late application (42 days) of isoproturon.

WEED AND NITROGEN MANAGEMENT IN WHEAT UNDER THE MID-HILL CONDITIONS

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Eight weed management practices (Isoproturon at 0.75, 1.0 & 1.25 kg/ha and Methabenzthiazuron at 0.75, 1.25 & 1.75 kg, weed free and weedy check) each receiving

50 and 100 kg N/ha were tested. The herbicides were applied as post emergence at 3-4 leaf stage of weeds.

Isoproturon at 1.25 kg/ha gave a better control of weeds (*Lolium temulentum, Phalaris Minor, Vica Faba & Avena ludoviciana*) than methabenzthiazuron at all the 3 levels. Isoproturon at 1.25 kg/ha significantly reduced the losses of N, P & K than the rest of the treatments. Isoproturon at 1.0 and 1.25 kg/ha as well as weed free treatment produced significantly higher grain yield than Mathabenzthiozuron and weedy check. All the herbicide treated plots gave significantly higher net returns when supplied with 100 kg N over 50 kg N/ha. However, no such differences were observed in case of weedy and weed free plots. This showed that the dose of N can be reduced by 50% if wheat crop is kept completely free of weeds.

WEED CONTROL IN WHEAT THROUGH HERBICIDES

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A large number of herbicides were tried during three crop seasons (1980-81 to 1982-83) to test their efficacy in controlling the weeds associated with wheat. Amongst all the herbicides, the application of isoproturon 1.25 kg/ha, metoxuron 1.5 kg and Dicuron 0.75 kg at 45 days after sowing and methabenthiazuron 1.50 kg as pre-emergence proved to be the most effective one in respect of weed control. This was closely followed by pre-emergence application of Pendimethalin 1.0 kg and Fluchloralin 0,9 kg/ha. No differences were found amongst various formulations of isoproturon. Phytotoxic symptoms were observed in case of Dichlofop, Fluchloralin and terbutryne when applied as post emergence. Isoproturon was most effective among all the herbicides particularly in controlling the *Lolium temulentum* and was on par with two manual weedings. The most common weeds recorded were *Phalaris minor, Lolium temulentum, Avena ludoviciana, Vicia faba. Ranunculus muricatus, Lathyrus aphaca, Lepidium virginicum, Plantago lanceolata, Medicago denticulata, Fumeria Parviflora* and *Anagalis arvensis.*

INTEGRATED WEED CONTROL IN WHEAT UNDER VARYING NITROGEN LEVELS

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In order to find out suitable methods of weed control under varying nitrogen levels in wheat, the herbicides applied alone as pre-emergence, herbicide along with one mechanical

weeding and cultural methods of weed control were tested. Studies were conducted for two consecutive years on wheat Var. HUW-55 (Malviya-55) revealed that the effects of herbicides were better as compared to one hand weeding (30 DAS) in controlling the weeds *viz.*, *Chenopodium album* L., *Melilotus species*, *Trifolium*, *Phalaris minor* Retz., *Cynodon dactylon* (L. C. Rich) pers, *Cyperus rotundus*, L.

Weed number decreased significantly with the increasing level of nitrogen, whereas dry matter accumulation of weeds increased with the increasing level of nitrogen. Combined application of same or different weed control methods had better weed control and grain yield than treatments applied alone. Two hand weedings at 30 and 45 DAS and isoproturon+one mechanical weeding (45 DAS) resulted in more grain yield in both the years (34.23 q/ha and 33.40 q/ha in 1981-82 and 39.8 q/ha and 39.33 q/ha in 1983-83). Both the treatments showed higher weed control efficiency and checked effectively both grassy as well as broad leaved weeds and had minimum total blo-mass under all the levels of nitrogen. Amongst treatments applied alone, isoproturon herbicide proved superior in checking both broad leaved and grassy weeds and resulted in higher yield 32.96 q/ha in 1981-82 and 35.40 q/ha in 1982-83), closely followed by penuxalin (31.96 q/ha in 1981-82 and 34.40 q/ha in 1982-83), 2, 4-D and one hand weeding were found least effective.

EFFECT OF INTEGRATED METHOD OF WEED CONTROL IN WHEAT ON WEEDS, DRY MATTER ACCUMULATION AND NITROGEN DEPLETION

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Field studies were conducted for two consecutive years to determine the relationship between nitrogen levels and methods of weed control on dry matter accumulation and nitrogen depletion by weeds in wheat.

Dry matter production and depletion of nitrogen by weeds increased significantly with the increasing level of nitrogen at all the growth stages. The maximum dry matter of weeds and nitrogen depletion was found in unweeded plot at all the growth stages, whereas the minimum in hand weeding (twice) which was at par with pre-emergence application of isoproturon supplemented with one mechanical weeding (45 DAS). Amongst weed control treatments applied alone, pre-emergence application of isoproturon and penexalin were found more efficient in minimising weed density and dry matter accumulation, and in checking the drain of nitrogen through weeds at all levels of nitrogen than that of post-emergence application of 2, 4-D and one hand weeding (30 DAS).

EFFECT OF WEED CONTROL METHODS IN WHEAT UNDER VARYING PHOSPHORUS LEVELS

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Field experiments in wheat were conducted with weed control treatments, 2, 4-D 1.5 kg a.i./ha, Isoproturon 1.5 kg a i./ha both as post-emergence (35 DAS), hand weeding (once), hand weeding (twice 35 and 50 DAS), mechanical weeding (once 35 DAS) and un-weeded control, and three levels of phosphorus; 30, 60, 90 kg/ha.

The major weeds in the experimental field were *Avena fatua* L, *Chenopodium album* L, *Meliolotus alba* Deser, *Meliolotus indica* All, *Vicia hirusta* Gray, *Vicia Sativa* L, *Anagallis arvensis* L, *Argemone mexicana* L, *Euphorbia draculoides* Lank, *Cynadon dactylon* L, *Cyprus rotundus* L, *Phalaris minor* Retz.

The increasing level of phosphorus decreased the weed density and dry matter accumulation by weeds and increased the wheat grain yield. Isoproturon was found most effective in minimizing weed growth and increasing grain yield, whereas 2, 4-D was least effective in these respect. All the weed control treatments showed syn.rgestic effects with the increasing levels of phosphorus and were more effective in minimizing weed growth and increasing grain yield.

EFFECT OF WEED CONTROL TREATMENTS ON GROWTH OF *PHALARIS MINOR* AND *AVENA FATUA* IN WHETT UNDER VARYING NITROGEN LEVELS

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An experiment was conducted during the rabi season of 1980-81 at Saharanpur to study the comparative efficiency of weed control treatments under varying nitrogen levels on growth of weeds and wheat grain yield. *Phalaris minor* and *Avena fatua* were the major weeds of experimental crop which accounted for 89 3% of total weed dry matter production. The population of *Phalaris minor* and *Aveaa fatua* decreased with the increasing levels of nitrogen and was minimum at 160 kg N/ha. Tribunil was most effective in reducing number and dry matter accumulation of weeds under all the levels of nitrogen. Increasing level of N increased the grain yield. However, the maximum increase was obtained (44.01 q/ha) with Tribunil at 160 kg N/ha which was only 0.22 quintal less than hand weeding.

COMPARATIVE PERFORMANCE OF SOME HERBICIDES FOR THE CONTROL OF *PHALARIS MINOR* RETZ. IN IRRIGATED WHEAT (*TRITICUM AESTIVUM* L.)

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Field studies were conducted in two separate trials during 1979-80 on the comparative bioefficacy of isoproturon, metoxuron, methabenzthiazuron pendimethalin, dichlofop methyl, terbutryn and nitrofan control of *Phalaris minor* Retz. in irrigated wheat. The substituted urea herbicides gave an excellent control of *Phalaris*. Of the three herbicides from this group, isoproturon and metoxuron were more efficient than methabenzthiazuron. Higher rate of post-emergence application of metoxuron (1.6 kg/ha) and methabenzthiazuron (1.6 kg/ha) had a suppressing effect on the grain yield as compared with their lower rate of application (1.2 kg/ha for both). Maximum grain yield of 37.8 q/ha was attained from isoproturon 1.0 kg/ha post-emergence and it was followed by pendimethalin 2 0 kg/ha post-emergence (36.8 q/ha). Dichlofop methyl 1.25 kg/ha post-em. gave inadequate control of *Phalaris* and its grain yield, though cough comparable with that from crop given two hoeings, was significantly inferior to some of the substituted ures herbicids treatments and pendimethalin 2.0 kg/ha. Terbutryn proved inferior to urea herbicides and pendimethalin and showed initial toxicity on young crop. The best herbicide treatment (isoproturon 1.0 kg/ha post-em.) gave 32.8 and 62.2 per cent increase in grain yield over two hoeings and no weeding (control) treatments, respectively.

In the second trial, the bioefficacy of nitrofen for control of *Phalaris* was much inferior to methabenzthiazuron and isoproturon pre-em. and isoproturon post-emergence. However, the bioefficacy of all formulations of nitrofen was comparable among themselves.

WEED CONTROL IN WHEAT (*TRITICUM AESTIVUM*) WITH MIXTURES OF PENDIMETHALIN AND OXYFLUORFEN

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Response of weeds and wheat to pre-emergence treatments of pendimethalin (0.4, 0.8, 1.6 and 3.2 kg/ha) oxyfluorfen (0.04, 0.08, 0.16, and 0.32 kg/ha) and mixtures of pendimethalin and oxyflorfen in the ratio of 9:1 (0 25, 0.50, 1.00 and 2.0 kg/ha) was evaluated in field studies.

Mixture of pendimethalin and oxyfluorfen at 1.0 and 2.0 kg/ha reduced the dry matter of weeds after 60 days equivalent to the post-emergence application of Arelon at 0.75 kg/ha as standard check. Pre-emergence application of oxyfluorfen at 0.16 and 0.32 kg/ha reduced the potential grain yield of wheat by 14.6 e adn 28.6 piecnt and 22.2 and 393

percent in 1981 and 1982, respectively. However, when 0.12 and 0.24 kg oxyfluorfen/ha was mixed with 0.88 and 1.76 kg pendimethalin, the yield losses from potential yield of weed free were reduced to 6 15 and 3.2 percent and 17.9 and 2.6 percent due to reduced toxicite in 1982 and 1983, respectively. Oxyfluorfen at 0.32 kg/ha although gave maximum weed control, but significantly reduced the crop stand and grain yield.

EFFECT OF OXYFLUORFEN ON THE PERFORMANCE OF WHEAT VARIETIES

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Fifteen varieties of wheat (C-306, HD-2009, WH-147, K-227, S-308, WH-157, WL-711, HD-2204, HD-2254, R-1556, WH-310, WH-307, WH-283, R-2005, UP-154) were tested for their tolerance to pre-emergence application of oxyfluorfen at 0.15 and 0.30 kg/ha.

HD-2204, WH-157, K-227, WH-147, C-306, WH-304, and WH-310 were most susceptible varieties to oxyfluorfen at even 0.15 kg/ha. But the mortality percentage on S-308, UP 154 and WH-283 at 0.15 kg/ha was 16.6, 20.0 and 21.6 per cent, respectively, and at 0.32 kg per hectare in these varieties were 58.3, 63.3 and 66.6 percent, respectively. There was no significant reduction in grain yield of S-308, WP-154 and WH-283 when oxyfluorfen was applied at 0.15 kg/ha. However, all the varieties showed significant reduction in yield at 0.32 kg/ha.

EFFECT OF METHOD OF APPLICATION OF ISOPROTURON ON WEED CONTROL IN WHEAT (*TRITICUM AESTIVUM*)

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Four field experiments were conducted at Hissar, Kaul and Karnal to evaluate the influence of different methods of application of isoproturon on weed control and grain yield of wheat during 1981 and 1982. Wettable powder and E. C. formulations of isoproturon at 1.0 kg/ha were applied as pre-emergence, post-emergence with spray, through irrigation, mixed with urea, with sand mix and with splashing. All these treatments were compared with weedy and weed free checks.

The results were not consistant at all the locations. The normally used method of spraying gave consistantly higher grain yield as compared to all other methods. Sand mixing of isoproturon and urea mixing of E. C. formulation of isoproturon although gave lower yields as compared to post-emergence spray but the differences were not significant. Weed control due to post-emergence spray, mixing with sand or urea mixing was found to be almost identical.

MIXTURE OF HERBICIDES FOR WEED CONTROL IN WHEAT

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Field experiments were conducted during the winter seasons of 1980-81 and 1981-82 in order to study the effects of mixture of herbicides on weed control in wheat. The results indicated that the mixture of 2, 4-D with isoproturon or mathabenzuron or metoxuron controlled both grassy and broad leaved weeds effectively. This resulted in significantly higher grain yield in these treatments as compared to weedy check. Metoxuron revealed phytotoxic symptoms on WE-157 variety of wheat which resulted in reduced grain yield than obtained in the isoproturon and methabenzthiazuron treated plots.

ECONOMY OF NITROGENOUS FERTILIZER THROUGH CHEMICAL WEED CONTROL IN WHEAT CROP

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An investigation under replicated field conditions was carried out having main treatments of five levels of Nitrogen viz., 0, 30, 60, 90 and 120 kg/ha with subtreatments of five weed controls viz., weedy check, two hand weedings (30 & 40 DAS), Tolkan 50wp (Isoproturon) 1.0 kg, Dosanex 50 wp (Metoxuron) 1.6 kgs, and Tribunil 70wp (Methabenuzthiazuron) 1.4 kgs a.i./ha, applied as post-emergence 30 DAS of wheat crop.

The experimental results showed that *Phalaris minor*, *Avena fatua* and other broad leaved weeds species did not show significant increase beyond 90 kgs Nitrogen/ha and further Tolkan proved to be the most effective herbicide after 60 DAS in controlling these weeds followed by Tribunil. However, Dosanex controlled *Avena fatua* more effectively than Tribunil.

Nitrogen uptake by weeds showed a significant increase with higher levels of Nitrogen application at all stages of growth except at 30 DAS. Uptake of Nitrogen by weeds was the lowest under Tolkan treatment and Nitrogen removal by weeds was maximum at 30 DAS.

The grain yield showed marked effect of all the levels of Nitrogen, though the maximum grain yield was upto 90 kg Nitrogen/ha level (34.90 q/ha). Under weed control treatments the highest grain yield was recorded with Tolkan (33.82 q/ha) followed by Tribunil, Dosanex, hand weedings and Weedy Check (32.10, 30.95, 24.07 and 19.61 q/ha).

Of all the best combination of Nitrogen and weed control treatments was found to be 90 kg Nitrogen/ha × Tolkan followed by 90 kg Nitrogen/ha × Tribunil. Regarding the economics of Nitrogen and herbicide treatments application, the highest net return (Rs. 3439/ha) obtained was from 120 kg Nitrogen/ha × Tolkan followed by 90 kg Nitrogen/ha × Tolkan and 90 kg Nitrogen/ha × Tribunil (Rs. 3407 and Rs. 3071/ha).

TIME OF UREA APPLICATION AND EFFICIENCY OF ISOPROTURON FOR WEED CONTROL IN WHEAT

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Time of fertiliser application has always been a question in wheat where post emergence herbicides are used for weed coutrol. So, in the present experiment in wheat, nitrogen (urea) 60 kg N/ha has been applied 2 days and one day before and after spraying of herbicide isoproturon (1 kg/ha) as well as same day before and after spray of herbicide and as sand mix of the two. It has been observed that time of Nitrogen application does not affect the efficacy of herbicide with regard to weed control. Statistically no sigificant effects have been observed on yield of wheat by any time of urea application.

CONTROL OF WEEDS IN WHEAT UNDER BARANI CONDITION

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Among the various agronomic practices tried in rainfed wheat under Barani condition to control the weed populstion; weeding by khurpi was found to be the best, followed by the combined mulch of paddy and wheat husk. The grain yield of wheat increased by 44.95% under khurpi weeding and by 34.03% under combined mulch of paddy and wheat husk over control, by not only restricting the weed growth but also by minimising the evaporational losses. This holds a considerable promise in dryland wheat cultivation.

INTEGRATED WEED CONTROL IN WHEAT

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In order to find out suitable methods of weed control in irrigated wheat, the herbicides alone as pre emergence and post emergence and along with one hand weeding were tested. Two seasons, trials conducted on wheat varieties Sonalika and WH 147 revealed that the effects of herbicides were better as compared to one hand weeding in controlling the weeds. Amongst weedicides isoproturon 1.5 kg/ha pre-em. gave the maximum yield followed by methabenzthiazuron 1.5 kg/ha pre-em and terbutryn 0.75 kg/ha pre-em. The pre-emergence application of these herbicides with one hand weeding proved superior to their pre-emergence application alone and methabenzthiazuron 1.5 kg/ha pre-em+one hand weeding and terbutron 0.75/ha pre-em+one hand weeding gave higher grain yield (4952 and 4698 kg/ha).

COMPARATIVE STUDY OF PARAQUAT, IN STALE SEED BED, AND STANDARD WEED CONTROL TECHNIQUES IN WHEAT

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Paraquat 1.0 kg or 2.0 kg/ha, as pre-plant application on stale seed bed, followed by tillage or no tillage operation was compared with isoproturon at two rates and hand weeding at 30 days after sowing in wheat. There was no significant difference among treatments on number of *Phalaris minor*, total number of grasses, number of sedges and dry weight of weeds. The 14 days delay in sowing wheat in stale seed bed gave significantly lower plant height, test weight and grain yield of wheat than those of crop in normal seed bed. There was no significant difference due to the effect of treatments on spike-density of wheat. The grain yield from plots under paraquat was more when treatment was followed by tillage operation, irrespective of its rate, but the difference were non-significant. The grain yield (2.20 t/ha) was significantly higher in plots treated with isoproturon 0.50 kg/ha, at 30 DAS than that in unweeded control plots in normal seed bed.

CONTROL OF WEEDS IN IRRIGATED WHEAT

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A field experiment on control of weeds in irrigated wheat variety HD (M) 1553 was conducted with fourteen treatments. Hand weeding and herbicidal spray separately and in combination reduced the biomass of weeds. Weeds in control plots removed 7.92 kg N/ha as against 1.26 kg N under post-emergence application of 2, 4-D+one weeding. Pre-emergence spray of sirmate 2 1 and 3 1/ha did not adrersely affect the emergence of seedlings. The weed control efficiency was more under post-emergence application of 2, 4-D+one hand weeding as compared to other treatments.

EFFECT OE CERTAIN HERBICIDES ON WEED GROWTH AND YIELD OF BARLEY

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A field experiment was conducted to evaluate the relative performance of some herbicides at Agricultural Research Farm of Varanasi, during the winter season of 1977-78. All the herbiciees produced more grain yied than unweeded control. However, none of the herbicides could produce grain yield equal to weed free treatment, Post emergence application of 2, 4-D was found more effective in minimising weed population and increasing plant growth and grain yield in comparison to other herbicides.

WEED CONTROL IN LEGUMES AND PULSES

SOYBEAN

EFFECT OF WEED COMPETITION ON GROWTH AND YIELD OF SOYBEAN

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Pot and field experiments were conducted to study the weed competition effects on growth, yield components and yield of four promising soybean varieties *viz.*, Bragg, Clark-63, Hampton and Wagne. The pot experiment revealed that all the varieties could tolerate the weed population upto 20% of the crop, beyond which vegetative growth, nodulation, yield components and seed yield of all varieties declined. Under field condition, the infestation of *Panicum antidatale* and *Cyperus rotundus* at 40% weed densities caused reduction in yield by 20% and 30% while at 80% weed density the reduction was 45% and 44%, respectively. The other competitive weeds were *Chloris barbata* Sw., *Erayrostis* spp. *Setaria glauca Beauv.*, *Echinochloa Crusgalli* Beauv., *Themeda Caudata*, *Eclipta alba* Hassk. *Indigofera glandulosa* and *Alysicarpus rugosus* D. C.

CHEMICAL WEED CONIROL IN SOYBEAN

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To manage the weeds in soybean, ten herbicides *viz.*, fluchloralin 1.0, 1.5 kg/ha pre-plant, metribuzin 0.25, 0.5 kg/ha, methabenzthiazuron 1.0 kg/ha, tercbtryn 0.5 kg/ha, oxadiazon 0.5 kg/ha Pendimethaline 1.0 kg/ha, metolachlor 1.0 kg/ha, bentazon 1.0, 1.5 kg/ha, aciluerfen 0.5 and benthiocarb 2.0 kg/ha all as pre-emergence were tested against weedy check and one, two and three hand weeding treatments on medium black soils. The major weeds associated with Soybean were *Echinochloa Crusgslli*, *Cyperus spp.*, *Phyllantus spp.*, *Corchcrus acuianguls*, *Aeschynomene indica* and *Hibiscus micranthus*. Amongst herbicides, the effeciive weed control was noted with metribuzin 0.5 kg/ha, oxadiazon 0.5 kg/ha and fluchlcralin 1.5 kg/ha which gave the seed yield at par to two and three hand weedings and significantly superior to control. The reduction in yield could be predicted by 0.282 kg/ha with an increase of weed biomass by one kg/ha while the increase of one weed plant per m^2 could reduce yield by 2.405 and 5.252 kg/ha at 45 days and at harvest, respectively. With increase of one percent weed control efficiency of the treatments, the increase in yield can be predicted by 2.079 kg/ha.

EFFICACY OF SOME NEW HERBICIDES IN SOYBEAN IN THE VERTISOL OF MADHYA PRADESH

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Infestatlon of perennial and annual grasses in dicot crops is a major problem encounterrd in vertisol of Madhya Pradesh. Intensive study to control such weeds in Soybean *Glicine Max* Merrill, Var. JS 2) was therefore, planned at Ujjain and Indore using some new herbicides like Fluozifop butyl, Dual, Goal, Igran, Basalin and Stomp to compare with weed free and weedy check.

Of the ten treatments, Fluozifap butyl and Dual gave the control of *Cynodon dactylon, Panicum* spp. *Dinebra arabica* and *Paspalum* spp. at both the locations. Broad leaved weeds, however, showed resistance to these chemicals. Goal Igran and Basalin inflicted relatively greater morality to *Euphorbia* spp. *Dismodium* spp, *Lagascea mollis* and *Boerhaavia* spp.

Although highest yields of soybean, 25.1 q/ha at Ujjain and 34.6 q/ha at Indore were recorded in weed free treatment, but these yields were at par with that observed in Dual and Fluozifop butyl applied alone or in combination with Goal or Dual, Single applcatiion of Goal and Basalin, though proved inadequate to give long term weed control the grain yields in treated plots were nevertheless inferior to weedy check. Herbicide Igran and Stomp, however, fell short of their compability when compared with weed free environment.

HERBICIDAL-CUM-CULTURAL WEED CONTROL IN SOYBEAN

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Metribuzin 1.0 kg/ha, fluchloralin 1.0 kg/ha and oxyfluorfen 0.2 kg/ha were compared with half of these rates in combination with one manual weeding at 45 days stage to evaluate whether reducing the rates of these herbicides to half and combining with one manual weeding would provide desired degree of weed control in soybean. The major weed species in the experimental field were *Echinochloa colonum, Dactyloctenium aegyptium, Digitaria sanguinalis* and *Cyperus rotundus.*

Herbicides at both the rates applied alone caused significant reduction in the density and dry weight of weeds when compared with weedy check. Herbicides alone at half the rates provided less weed control than at the full rates. Superimposition of one manual weeding over the reduced rate of herbicides caused further reduction in the density and dry

weight of weeds. An average reduction of 79% in the grain yield of soybean occurred due to weedy condition. There was significant increase in the grain yield due to superimposition of the manual weeding over reduced rate of the herbicides. The grain yields obtained from fluchloralin 1.0 kg/ha and fluchloralin 0.5 kg/ha weeding at 45 days stage during the two years were at par with each other. All the herbicides at half the rate in combination with one weeding produced grain yields similar to the two weedings done at 15 and 45 days stages.

EEFECT OF VARIOUS WEED CONTROL TREATMENTS ON GROWTH AND YIELD OF SOYBEAN (*GEYCINE MAX* (L) MERR)

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An experiment was conducted with fourteen cultural and herbicidal treatments. *Echinochloa colonum* was found to be the most dominating weed in the experimental field. Weed free treatment was most superior in reducing weed population, which was followed by mechanical methods and then methabenzthiazuron, metribuzin and fluchloralin treatments. Highest yield and yield attributes *viz.*, number of pods per plant number of grains per pod, number of grains per plant, test weight and yield per plant, were recorded under weed free treatment, which was closely followed by weeding twice and weeding once. Weedy check treatment proved most inferiof to other treatments. Among the herbicides, only methabenzthiazuron, metribuzin and fluchlorain treatments proved comparatively better.

COMPARATIVE EFFICACY OF SOME HERBICIDES IN CONTROLLING WEEDS IN PURE STAND OF SOYBEAN

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A field experiment was conducted during the *Kharif* season of 1982 with 10 treatments *viz.* weedy check, hand weeding-2, Fluchloralin 1.0 Kg/ha, Oxyfluorfen 0.25 Kg/ha, Acifluorfen 0.25 Kg/ha, Bentazon 1.0 Kg/ha, Pendimethalin 1.5 Kg/ha, Dichlofop 1.0 and 1.5 Kg/ha and terbutryne 1.5 Kg/ha. Bentazon and Acifluorfen were applied as post-emergence and the other herbicides as pre-emergence. The most common weed species were *Echinochloa Colonum, Setaria glauca, Byperus esculentus Digitaria sanguinalis, Panicm dichotomiflorum, Phyllanthus niruri* and *Aeschenomene indica.* Pre-emergence application of Oxyfluorfen, Dichlofop (1.0 kg/ha), Pendimethahalin and post-emergence of Aciflourfen produced grain yield equal to two hand weedings and resulted in minimum dry weight of weeds.

EVALUATION OF FLUAXIROP BUTYL (FUSILADE) FOR THE CONTROL OF GRASSY WEEDS IN SOYBEAN (GLYCINE MAX)

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The new herbicide, Fluazifop butyl (butyl 2–(4–(5–(trifluoromethyl) D–2–pyridinyl) oxy) phenoxy) propanoate is being widely tested in India for the control of annual and perennial grasses in several broadleaved crops including soybean. In a multilocational trial in MP in *Kharif* 1983, Fluazifop butyl has been found to give an excellent control of major grasses in soybean. Fluaxifop applied as post emergence over-the-top at 250 g. a. i./ha two weeks after sowing of soybean provided complete control of *Oynodon dectylon Digitaria sanguinalis, Passpalum* sp and other grasses. The grain yield of soybean was increased by 2 q/ha and 4.3 q/ha by Fluazifop butyl treatment (250 g a. i./ha) over yields obtained from farmer's practice (two interou ltures) and unweeded chech, respectively. Weed control achieved was about 60% of the weeds present in soybean field. The broadleaved weeds however, were not affected by this herbicide. There was no phytotoxic effect on soybean at any stage of growth from the treatment of Fluazifop butyl applied two weeks after sowing. One handweeding or an inter-culture two weeks after fluazifop treatment may improve the overall weed control to a great extent.

MOONG AND URD BEANS

EFFECT OF DIFFERENT RATES OF NITROGEN, FLUCHLORIN AND PENDIMETHALIN WEEDICIDE'S ON GROWTH AND YIELD OF GREENGRAM (*VIGNA RADIATA*) AND WEED CONTROL

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This experiment was conducted to evaluate the influence of different rates of (0,5, 1.0, 1.5 and 2.0 kg a.i./ha) nitrofen, fluchloralin and pendimethalin weedicides on crop growth, yield and weed control. Results indicated that although higher doses of fluchloralin and pendimethalin stunted the plant height, checked the root growth and reduced the dry weight of plant at early stage of crop growth, but they were well tolerated and had no adverse effect at later stages of crop growth. Highest yield was recorded with hand weeded pots followed by fluchloralin 2.0 kg a.i./ha and pendimethalin 1.5 kg a.i./ha. Weed control was fair with higher doses of fluchloralin and pendimethalin, but they failed to control phyllanthus nururi and weed control was comparatively poor with nitrofen.

HERBICIDES FOR WEED CONTROL IN GREENGRAM *VIGNA RADIATA* (L.) WILCZEK

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Field experiment was conducted to select a suitable herbicide for effective weed greengram. The most dominant weed were *Cyperus rotundus* L., *Cynodon dactylon* Pers. and *Trianthema Portulacastrum* etc. Three herbicides each at two rates (butachlor 0.75 and 1.5 kg/ha, fluchloralin 0.62 and 1.25 kg/ha, fluozifop-butyl 0.25 and 0.5 kg/ha) were compared with hand weeding and unweeded compared with hand weeding and unweeded control. Weed population was lowest with fiuazifop-butyl, followed by fluchloralin and butachlor. The favourable effect of herbicides on weed control increased the number of pods per plant leading to high yields. Among the herbicides, fluchloralin 1.25 kg/ha recorded maximum grain yield followed by fluazifop-butyl 0.5 kg/ha while butachlor 0.75 and 15 kg/ha recorded the least. Unweeded control recorded lowest grain yield as compared with herbicides and hand weeding.

EFFECT OF TIME OF WEED REMOVAL ON YIELD OF BLACK GRAM UNDER RAINFED CONDITIONS

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Field experiments were conducted for 3 consecutive *Kharif* seasons of 1978 to 1980 under Dryland conditions of Varanasi to study the effect of weed free and weed infested periods on yield of blackgram. Treatments consisted of weed free and weed infested for 10, 20, 30 and 40 days after sowing alongwith weed free and weed infested till maturity treatments. On the basis of yield of crop and dry weight of weeds, it was found that the period between 20-30 days after sowing was most critical for weed-crop competition. As such the blackgram plots should be kept weed free for the first 30 days after sowing to realise maximum yield.

INTEGRATED WEED CONTROL IN *PHASEOLUS MUNGO* (VAR.) T. 9

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A field experiment was conducted in black gram (Var.) T. 9 with pre-emergence herbicides *viz.* Oxyfluorfen (0.1 and 0.15 kg/ha), isopropuron 10.5 and 0.75 kg/ha,

oxadiagon (10.75 kg/ha), pendimethalin (1.0 kg/ha), fluchloralin (1.0 kg/ha) They were compared with manual weeding twice at 20 and 35 days after sowing and unweeded control. One late weeding on 30th day after sowing was given to all herbicide treatments. In a subsequent trial, lower dosses of oxyfluorfen 0.075 kg/ha, isoproturon 0.25 kg/ha, oxadiazon 0.5 kg/ha, pendimethalin 0.5 and 0.75 kg/ha, fluchloralin 0.5 and 0.75 kg/ha and new pre-emergence herbicide diethatyl ethyl (1.0, 1.5 and 2.0 kg/ha) were also tried.

Pre-emergence isoproturon at 0.5 kg/ha followed by one late weeding recorded the highest grain yield of 1170 kg/ha which was at par with pendimethalin at 1.0 kg/ha (1110 kg/ha). Manual weeding twice recorded 970 kg/ha which was comparable to Oxyfluorfen at 0.1 kg/ha and Oxadiazon (0.75 kg/ha). Unweeded control gave a grain yield of 90 kg/ha. Higher doses of Oxyfluorfen 0.15 kg/ha and isoproturon 0.75 kg/ha reduced the grain yield. In the second trial, pre-emergence application of isoproturon was not selective to crop when the herbicide application was immediately followed by rainfall. Pre-emergence application of oxadiazon and pendimethalin are highly selective and effective on annual grass and dicot weeds except *Flaveria australasica*, and *Datura fastuosa*.

CROP-WEED COMPETITION IN URD BEAN (*VIGNA RADIATA* L.)

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Crop-weed competition studies were carried out in 1980-81 and 1981-82 to find out the critical period of weed control in urd bean during kharif season. *Echinochloa colonum*, *Dactyloctenium aegyptium*, *Eleusine indica* and *Digitaria sanguinalis* were the major weed species in the field.

Competition with the weeds during the entire crop season caused an average reduction of 77.1% in the grain yield of urd bean. The loss in yield increased with the increase in the duration of crop-weed competition. Competition for the first 30 and 45 days resulted into 25.3 and 36.0% reduction in the grain yields, respectively. Competition with the weeds starting 30 days after sowing had no adverse effect on the crop yield. Increase in the duration of weed-free period beyond 30 days of sowing had no beneficial effect on the grain yield.

COMPARATIVE STUDY ON SELECTED HERBICIDES EOR URD (*VIGNA MUNGO* (L) HAPPER)

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The experiment was conducted with ten treatments replicated four times during *kharif*, 1982. Fluchloralin, nitrofen and alachlor, each at two different rate a. i. 1 kg and

2 kg/ha, were applied as pre-emergence. Application of Bentazon (1.0 and 2.0 kg/ha) and hand weeding were done at 30 DAS. The performance of alachlor (2.0 kg/ha), fluchloralin (1.0 and 2.0 kg/ha) and hand weeding was better in terms of total weed number, dry weight of weeds and crop yield. Nitrofen at both rates significantly reduced the crop plant population. At 45 and 60 DAS, plots treated with bentazon (2.0 kg/ha) had significantly lower total number of weeds as well as broad leaf weeds. Bentazon caused temporary curling and scorching of leaves of Urd plant. None of the treatments could significantly reduce the number of sedges. The grain yield (450 kg/ha) of Urd was significantly higher in plots treated with alachlor at 2.0 kg/ha and was comparable to that of plots receiving fluchloralin (1.0 or 2.0 kg/ha) and hand weeding.

COW PEA

IMPACT OF WEED CONTROL TREATMENTS ON THE VARIABILITY OF COMMUNITY STRUCTURE IN COWPEA (*VIGNA UNGUICULATA* (L.) WALP)

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An investigation to assess the impact of weed control treatments on the variability of community structure in cowpea (*Vigna unguiculata* (L.) Walp) was carried out during the Kharif season of 1980. Twelve treatments (Four herbicides *viz.* Tok. E-25, Basalin, Lasso, and Stomp, each with two concentrations, three cultural practices-Hoeing 30 days after sowing, weeding 30 days after sowing, complete weed free and one control were tested. Results revealed that all the weed control treatments had lower weed diversity as compared to control plot and it was minimum in complete weed free plot. Further, the weed diversity decreased with the increase in concentration of herbicides, While weed dominance increased which made the community stable.

WEED MANAGEMENT IN COWPEA

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An experiment was conducted on medium black soils during Kharif, 1980 to evolve suitable approach for weed management in cowpea(Cv42-1). Treatments consisted of five levels of fertilizer (N_0P_0, N_{20} P_{40}, $N4_{40}$ P_{80}, N_{40} P_{80} and N_{40} P_{40} kg/ha), six methods of weed control (weedy check, weed free, hand weeding-two at 15 and 20 days, pre-emergence application of alachlor 1.5, 3.0 and 5.0 L/ha) and their combinations were examined.

Among the various fertilizer treatments and weed control methods, higher level of fertilizers (N_{40} P_{80}), and weed management by hand weeding (15 and 30 days) alone yielded good forage production. These two treatments in combination exhibited synergistic action to each other resulting in maximum forage production through controlling the weed efficiently; although the fertilizer application appeared to be ineffective in weed control. Weed controlling efficiency and maximum forage production were in the order of two weeding (15 and 30 days) treatments and alachlor (3 *l*/ha) followed by alachlor (1.5 *l*/ha). Higher concentration of alachlor (5 *l*/ha) totally supressed the weed flora but showed phytotoxic effect on cowpea and as a result, it yielded poor forage production with due cause of lowest plant stand.

FRENCH BEAN AND PIGEONPEA

STUDIES ON CHEMICAL WEED CONTROL IN FRENCH BEAN *(PHASEOLUS VULGARIS* L.) CV CONTENDER

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An investigation on weed control in French bean (*Phaseolus vulgaris* L.) comprising of pre-sowing and pre-emergence application of fluchloralin and trefluralin each at 0.5, 0.75 and 0.75 *l* a.i. per ha and only pre-emergence application of alachlor at 1.0, 1.5 and 2.0 l a.i. per ha were compared against weed free check and unweeded control.

The investigation pointed out that weed free check recorded maximum pod yield (51.18 q/ha) followed by alachlor (50.68 q/ha) at 2.0 *l* a.i. per ha, alachlor (50.57 q/ha) at 1.5 *l* a.i. per ha and fluchloralin (50.04 q/ha) at 1.0 *l* a.i. per ha. The unweeded control recorded the lowest (39.70 q/ha) yield of pods. Studies on residual toxicity of herbicides indicated no toxic buildup of any of these herbicides to adversely affect the emergence of sorghum (*Sorghum bicolor* (L.) Moench), green gram (*Vigna radiata* (L.) Wilczek) and okra (*Abelmoschus esculentus* L.). The maximum net income (Rs. 5, 794.26) was obtained with alachlor at 1.5 *l* a.i. per ha followed by alachlor at 2.0 *l* a.i. per ha (Rs. 5, 771.24). The unweeded control recorded the lowest net income (Rs. 4, 684.60) per ha. Though the weed free check recorded the maximum gross income (Rs. 6, 039.24) per ha, the net return was low (Rs. 5,421.74) owing to high cost of weeding to keep the plots free of weeds throughout the crop period.

COMPARATIVE EFFICACY OF DIFFERENT METHODS OF WEED CONTROL IN *PIGEON PEA* (*CAJANUS CAJAN* L. MILL SP.)

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Field experiments were conducted during the years 1980 and 1981 to compare the efficacy of different methods of weed control in pigeon pea under Punjab conditions. The treatments included application of herbicides *viz.* fluchloralin, dinitramine, diuron, nitrofen, oxadiazon, isoproturon each at two doses; mechanical interculture with three-tine bullock drawn harrow alone and in combination with manual weeding; inter-cropping with black gram and manual weeding. Among the herbicide treatments, oxadiazon 0.5 kg a.i./ha, fluchloralin and dinitramine 1.0 kg a.i./ha were found to be efficient and comparable with manual weeding twice, Diuron and isoproturon proved phyto-toxic to the crop and photo-toxicity was more pronounced at higher doses, specially in case of diuron. Interculture with three-time bullock drawn harrow twice or interculture with three-tine harrow plus one intra-row manual weeding also hold promise and could be substituted to two manual weeding without any reduction in yield. Inter-cropping of black gram (variety T-9) failed to someother weeds and two rows of black gram in between two rows of pigeon pea adversely affected the pigeon pea yield.

CHICKPEA, PEA ANDLENTIL

EFFICACY OF MECHANICAL AND CHEMICAL WEED CONTROL IN CHICKPEA

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Field studies on mechanical and chemical weed control in chickpea were carried out during 1981-82 and 1982-83. The herbicides tested were : basalih, fusilad (0.5 and 1.0 kg a. i./ha) ronstar and tribunil (0.77 and 1.5 kg a. i./ha). They were compared with two mechanical weed control treatments one at 125 and another 25+45 days after sowing. Treatments with two hand weedings and weed free check produced the grain yield in beet-ween 28 to 29 q/ha which was almost double of the yield obtained under weedy check. Among herbicides, tribunil at 3.75 kg a. i./ha followed by 1.0 kg a. i./ha gave the highest yield. The grain yield under these treatments was 55 and 46 percent higher than weedy check. Basalin proved second best herbicide with an average increase in yield of about 45

percent over weedy check. Fusilad proved to be least effective herbicide. Ronstar at higher rate (1.5 kg/ha) had phyto-toxic effect on crop plants and reduced the yield by about 7 percent. One mechanical weeding at 25 days after sowing increased the yield by 57 percent. Dry weight of weeds at harvest was highest (22 q/ha) under weedy check. All the treatments resulted in reduction in dry weight of weeds. Among the herbicides, the lowest dry weight of weeds was recorded in the treatment with fusilad (1.0 kg a. i./ha) followed by tribunil (0.75 kg a. i./ha).

MECHANICAL AND CHEMICAL WEED CONTROL IN GRAM UNDER HUMID SUBTROPICAL CONDITIONS OF NAINITAL TARAI

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An investigation was carried out to evaluate the performance of some of the newer herbicides as compared to manual weeding in gram (*Cicer arietinum* L.) under humid subtropical conditions of Nainital Tarai. The dominant weeds were *Anagallis arvensis* L., *Chenopodium album* L. and *Cyperus rotundus* L. which reduced the grain yield of gram by about 65 per cent. Fluchloralin at 1.0 kg per ha controlled, on an average, 50, 49, 58 per cent population of *A. arvensis* L., *C. album* L., *C. rotundus* L., respectively whereas oxyfluorfen at the rate of 0.2 kg per ha controlled about 49, 47 and 55 per cent population of *A. arvensis* L., *C. album* L. and *C. rotundus* L., respectively. Amongst the herbicides tested, fluchloralin at 1.0 kg per ha (pre-plant incorporation) and oxyfluorfen at 0.20 kg per ha (pre-emergence) gave yield at par with weed free conditions. Two weedings at 30 and 60 days after sowing were equally effective as fluchloralin (1.0 kg per ha) and oxyfluorfen (0.20 kg per ha). However, the yields obtained under best herbicidal treatment were more than that obtained with two hand weedings at 30 and 60 days after sowing.

CHEMICAL WEED CONTROL IN PEAS (*PISUM SATIVUM* L.)

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An experiment consisting of 12 treatments (fluchloralin 0.9 kg/ha, fluchloralin 0.9 kg/ha+weeding at 45 DAS, methabenzthiazuron 1.6 kg/ha, methabenzthiazuron 1.6 kg/ha+ weeding at 45 DAS, nitrofen 0.37 kg and 0.5 kg/ha, nitrofen 0.37 kg/ha+weeding at 45 DAS, metribuzin 0.5 kg/ha as pre and post, metribuzin 0.5 kg/ha+weeding at 45 DAS,

weed free and weedy check), was conducted during the winter season of 1982. Arkel variety of pea was planted 30 cm apart in rows in the last week of October. Major weed flora observed was *Chenopodium album* L., *Fumaria parviflora* L., *Melilotus indica* (L.). All., *Anagallis arvensis* L. and *Cynodon dactylon* L. (Pers). Metribuzin at 0 5 kg/ha with one weeding at 45 DAS reduced the population of weeds by 73.7%, dry weight of weeds by 77.2% and increased the pod yield by 63.8% over weedy check followed by methabenzthiazuron at 1.6 kg/ha with one weeding at 45 DAS. Keeping field free of weeds till last harvest produced the maximum pod yield (73.3% increase over control).

RATE OF APPLICATION OF HERBICIDES FOR WEED CONTROL IN PEA *PISUM SATIVUM*

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Efficacy of pre-emergence application of methabenzthiazuron, oxyfluorfen, linuron thiobencarb, diclofopmethyl, each at 0.5, 1.0 and 1.5 kg/ha, metribuzin at 1.0 kg/ha and pre-plant incorporation of fluchloralin at 1.0 kg/ha was investigated during 1980 to 1983 for weed control in pea. All the treatments caused significant reduction in the density and dry weight of weeds over weedy check, except methabenthiazuron 0.5 and 1.0 kg/ha in 1980-81. In general, thiobencarb, methabenzthiazuron and diclofop-methyl were less effective than oxyfluorfen, linuron, metribuzin and fluchloralin.

Grain yield was reduced by 45.5 to 86.5% due to competition with uncontrolled weeds in different years. All the treatments, except thiobencarb at all the rates, produced grain yields significantly more than the weedy check. Oxyfluorfen 0.15 kg/ha, linuron 1.0 and 1.5 kg/ha, fluchloralin 1.0 kg/ha and metribuzin 1.0 kg/ha were quite effective and produced more grain yields than other treatments. Linuron 1.5 kg/h a produced grain yield consistently at par with weed-free treatment during all the years.

WEED CONTROL IN FIELD PEA (*PISUM SATIVUM* L.)

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Studies were undertaken to study the efficacy of different herbicides as compared with the cultural methods for controlling weeds in field pea cv. PC-3. Of the herbicides tested, fluchloralin, pendimethalin and methabenzthiazuron were found to have good

prospects for controlling weeds and improving the grain yield of peas. Pendimethalin 0.5 kg ai/ha+hand weeding 30 days after sowing gave the highest grain yield (17.07 q/ha) followed by fluchloralin 0.50 kg ai/ha+hand weeding 30 days after sowing (16.95 q/ha), which were at par with two hand weedings and weed free treatments but all of these were significantly higher than the unweeded control (11.07 q/ha). Fluchloralin and metoxuron at higher doses (1.50 kg ai/ha) proved phytotoxic to the crop. Fluchloralin (at doses 0.5, 1.0 and 1.50 kg ai/ha) and pendimethalin (1.0 kg ai/ha) gave promising control of weed species present in the fiield. Losses in grain yield of peas due to weeds on the basis of yield is the best weed control treatment over the unweeded control worked out to be as high as 44.74%.

CROP-WEED COMPETITION IN LENTIL (*LENS ESCULENTA* L.)

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Investigations were carried out in 1980 to 1983 to find out the critical period of crop-weed competition in lentil. The major weeds in the experimental field were *Chenopodium album, Melilotus alba, M. indica* and *Fumaria parviflora.*

On an average, competition with the weeds during the entire crop-season decreased grain yield of lentil by 66.9% when compared with the weed-free condition for the entire crop season. Grain yield was increased due to the increase in the duration of weed-free period during the first 60 days of sowing. Further increase in the duration of weed-free period beyond 90 days could not bring significant variation in the grain yield. Competition during the first 60 days resulted into an average yield reduction of 47.5%. Competition during 30 days of sowing and harvesting caused 29% reduction in the grain yield.

WEED CONTROL IN OILSEEDS

GROUNDNUT

CHEMICAL WEED CONTROL IN GROUNDNUT (*ARACHIS HYPOGAEA* L.)

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Field experiment was conducted to evaluate the effect of fluchloralin at 0.75 and 1.0 kg/ha as pre-plant incorporation, pendimethalin at 1.0 and 2.0 kg/ha as pre-emergence and fusilade at 0.5 and 1.0 kg/ha as postemergence (30 days after sowing). These herbicides applied alone and alongwith one hand weeding (45 days after sowing) at each rate were compared with weedy and weed free checks.

Pre-emergence application of pendimethalin and pre-plant incorporation of flucchloralin at both doses when supplemented with one hand weeding previded good control of weeds. These treatments gave significantly higher pod yield as compared to lower doses of these herbicides without hand weeding and weedy check. Post emergence application of fusilade with and without hand weeding although gave significantly higher yield as compared to weedy check but its performance as potent weed killer in groundnut was not better than fluchloralin and pendimethalin. The maximum pod yields of 3596 and 3353 kg/ha were produced in weed free check and minimum pod yields of 1347 and 853 kg/ha were obtained in weedy check in 1981 and 1982, respectively.

WEED MANAGEMENT IN SUMMER GROUNDNUT (*ARCHIS HYPOGAEA* L.)

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A field experiment was conducted in summer seasons of 1981-82 and 1982-83 to find out suitable control measures of weeds in groundnut. The treatments included combinations of three herbicides, *viz.* Oxyfluorfen (0.24 kg a. i./ha) pre-planting and pre-emergence, Oxadiazon (0.75 kg. a. i./ha) pre-emergence and fluchloralin (0.96 kg a. i./ha) pre-emergence with one interculturing and hand-weeding 45 days after sowing as well as weed free condition and the unweeded check. The results indieated that when

interculturing and handweeding once at 45 days after sowing was supported with these chemicals then only they gave satisfactory results. Pre-emergence application of oxyfluorfen (0.24 kg a. i./ha)+one interculturing and handweeding, frequent hand-weeding (weed free condition) and oxyfluorfen (0.24 kg a. i./ha) pre-planting+one interculturing and hand-weeding were found to be effective in controlling the weeds and resulting in higher yields of summer groundnut by 79.5, 64.5 and 61.4 per cent over control, respectively.

STUDIES ON CROP-WEED COMPETITION IN GROUNDNUT

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Field studies were undertaken to determine the most critical period of weed competition in groundnut. Two sets of treatments were included in this study. In one set, groundnut crop was kept weed free for 3, 5, 7 and 9 weeks and upto harvest where as in the other set, weeds were allowed to infest the crop for 3, 5, 7 and 9 weeks and upto harvest.

Results revealed that in groundnut weed competition continued for a longer time. Weed free crop till 9 weeks resulted in producing significantly higher pod yield than the crop kept weed free only for seven weeks. Weed infestation even for three weeks after sowing groundnut caused significant reduction in pod yield. Now significant variation existed in the dry matter accumulation of weeds when the crop was kept weed free for three weeks and infested upto havest.

PRESOWING, PRE-EMERGENCE AND POST-EMERGENCE WEED CONTROL METHODS FOR SUMMER GROUNDNUT

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A field experiment was conducted to find out the effect of no weeding, twice and thrice hand weedings, pre-emergence/pre-sowing application of low and high doses of alachlor, terbutryne and fluchloralin. In addition, pre-emergence alachlor and fluchloralin at low doses followed by post-emergence application of bentazon (with and without 2,4-D Na salt) with supplemental hand weeding at 45 days after sowing were tried.

The efficiency of weed control was reflected by maximum number of filled pods with high dose of fluchloralin. The weed population and dry weight were effectively checked by high doses of alachlor or fluchloralin. Nut grass was more effectively checked by alachlor at 4 kg a.i/ha. The pod yield was maximum in low dose of fluchloralin (0.72 kg a.i./ha) followed by high dose of alachlor at 4 kg a.i./ha. The reduction in pod yield was 42.8% due to weed infestation in unweeded check.

HERBICIDE MIXTURES FOR EFFECTIVE WEED CONTROL IN IRRIGATED GROUNDNUT

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Two seasons of field experiments were conducted on sandy loam soils in summer 1979 and 1980 on TMV_2 groundnut under irrigated conditions. The treatments consisted of three herbicides each at three levels *viz.* nitrofen (0, 0.5 and 1.0 kg a.i./ha), fluchloralin (0, 0.36 and 0.72 kg a.i./ha), 2, 4-D amine (0, 0.72 and 1.44 kg a.i./ha) and their mixtures which were compared with no weeding and twice hand weeding. All the herbicides were applied as pre-plant treatments.

Herbicide mixtures comprising of low doses of nitrofen with fluchloralin, high dose of 2,4-D amine with low dose of either nitrofen or fluchloralin were more effective in controlling broad spectrum of weeds than any dose of individual herbicide or a combination of high dose of any two herbicides. There was increased 100 pod weight, 100 kernel weight, filled pods, shelling out-turn and pod yield due to effective weed control achieved due to application of herbicide mixtures.

RELATIVE EFFICACY OF VARIOUS METHODS OF WEED CONTROL AND THEIR EFFECTS ON THE YIELD OF GROUNDNUT

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An experiment to explore the possibility of the use of pre-emergence herbicide Fluchloralin and Terbuteryne at various concentration without cultural treatment was carried out to combat weeds in groundout field.

Timely and perfect weed control can be achieved by pre-emergence herbicide supplimented with earthing, weeding or hoeing. It gave more than 70 per cent control of weeds. Earthing operation is acutely needed in groundnut for higher yield and for economic returns. Weed control with herbicides+weeding, earthing or hoeing was found as effective as cultural methods in controlling weeds and increasing pod yield at reasonable cost. Herbicides alone proved inefficient.

STUDIES ON THE CONTROL OF GRASS WEEDS BY FUSILADE FLUAZIFOP-BUTYL IN GROUNDNUT

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An experiment was conducted to study the effects of Fusilade as post emergence herebicide on control of grass weeds in groundnut at three concentrations (0.125, 0.25 and 0.5 a i. kg/ha at two stages (10 days and 20 days from sowing). The results have indicated that Fusilade 0.5 a. i. kg/ha applied on 20th day after sowing was found to be good and was able to control the grass weeds *viz. Cynodon dactylon, Digitaria sangunialis, Eleusine indica* and *Brachiaria sp.* The control of *Cynodon dactylon* was excellent.

EFFECT OF FLUAZI-FOB-BUTYL ON GRASS WEEDS IN IRRIGATED GROUN DNUT VAR. POL. 2

A. Mohamed Ali

ICAR (P. L. 480)-AICRP on Weed Control TNAU, Coimbatore

An experiment was laid out under irrigated conditions in red sandy soils of low fertility at Bhavanisagar. The treatments consisted of pre-plant application of fluchloralin 1.0 kg/ha. pre-emergence application of pendimethalin 1.5 kg/ha and oxyfluorfen 0.2 kg/ha individually and their lower doses 0.75 kg/ha, 1.0 kg/ha and 0.15 kg/ha respectively in combination with post-emergence fluazi-fob-butyl 0.25 kg/ha with and without manual weeding at 35 DAS. They were compared with farmers practice of manual weeding twice at 15 and 35 DAS and unweeded control.

Application of pre-plant fluchloralin at 0.75 kg/ha and pre-emergence pendimethalin 1.00 kg/ha or oxyfluorfen 0.15 kg/ha followed by post-emergence application of fluazi-fob-butyl 0.25 kg/ha was very effective in controlling the grass weeds. It can be recommended when the major weeds are grasses. Individual application of fluchloralin, pendimethalin and oxyflurofen was effective on annual grass and dicot weeds and not on perennial sedge weeds.

EFFECT OF DITROANILINE, METHYL BENZENE AND TRIAZINE HERBICIDES ON PROTEIN AND OIL PRODUCTION IN *ARACHIS HYPOGAEA* VAR. POL. 2

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U. S. D. A-(P. L. 480)-AICRP on Weed Control TNAU, Coimbatore

Experiments were conducted in red gravel soils of Bhavanisagar. The crude protein content of groundnut kernels were not affected due to herbicides application. 15 to 40 per cent increase in the crude protein and oil production was observed with herbicide application. The oil content in the groundnut kernals was the highest in pre-emergence fluchloralin at 0.75 kg/ha and was comparable with hand weeding twice. However pre-emergence application of pendimethalin at 1.0 kg a. i/ha recorded the lowest oil content (42.0 per cent). The crude protein production was higher with the application of pre-emergence fluchloralin at 0.75 kg a. i/ha and pendimethalin at 1.0 kg a. i/ha followed by pendimethalin at 1.5 kg a. i/ha and hand weeding twice.

CHEMICAL WEED CONTROL IN RAINFED AND IRRIGATED GROUNDNUT FOR ACHIEVING EFFECTIVE CONTROL OF NUT SEDGE (*CYPERUS ROTUNDUS* L.)

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An experiment to control weeds, particularly nutsedge by using herbicides in rainfed and irrigated groundnut in alfisols was conducted in *kharif* 1981 and *rabi* 1981-82. There were ten treatments with different doses of 2, 4-D amine, sodium salt and ester formulations, MSMA, glyphosate and metribuzin either as pre-sowing/pre-planting application or pre-and post-emergence applications to weeds. No weeding and hand weeding twice were the two checks with which the treatments were compared. MSMA and metribuzine were toxic to groundnut, but all forms of 2, 4-D were effective at higher doses provided they were applied to soil a fortnight in advance to groundnut sowing. 2, 4-D amine at 2 kg a.i/ha as pre-plant application not only gave a satisfactory control of weeds in general but also nut grass in particular besides improving the pod yield of groundnut.

STUDIES ON WEEDS ASSOCIATED WITH KHARIF GROUNDNUT AND THEIR SUSCEPTIBILITY TO DIFFERENT HERBICIDES

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Field study on chemical vs. mechanical weed control carried out with three herbicides for two consecutive seasons during 1980 and 1981 revealed that the important Weed Flora comprised of prominent monocot annual grasses like Dinebra arabica, Eragrostis minor, and perennials like Cyperus rotundus. The survey of dicot weeds indicated the dominance of *Acalypha indica, Amaranthus Sp., Commelina bengalensis, Euphorbia Sp., Phyllanthus niruri* and *Physallus minor* etc. Out of three herbicides tested *viz* Basalin (Flucholoralin 48% E. C.), Basagran (Bentazon 48% E. C.) and Illoxan (Dichoro-phynoxy-methy propionate, 36% E. C.), it was found that presowing application of Basalin alone (1 or 2 l/ha) or in combination with Basagran (2 or 4 l/ha) or Illoxan (2 or 4 lit/ha) were equally significantly effective in controlling weeds upto 51 DAS. However, these combinations had no pronounced effect on weed mortality thereafter. The highest weed mortality was observed as 82% and 53% with the combination of Basalin plus Illoxan at their higher concentration in respect of annual grasses and dicot weeds as against 74% and 63% respectively in case of mechanical weed control method.

MANAGEMENT COMPARISON OF GROUNDNUT IN MONOCOT WEED FREE MEDIA THROUGH FLUOZIFOP BUTYL AND OTHER CHEMICAL CULTURAL SOURCES

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J. N. K. V. V., Jabalpur

Management comparison of groundnut *(Arachis hypogaea* L. var. *Jyoti)* was carried out at Khargone and Mandsaur simultaneously during kharif, 1983 in fields having the dominance of *Cynodon dactylon, Cyperus rotundus, Panicum* spp., *Paspalum* spp., *Dinebra arabica, Digitaria* spp. and *Commelina* spp. besides the broadleaved weeds.

Field studies revealed the versatality of Fluozifop butyl 2 *l*/ha and Dual 4 *l*/ha to provide a relatively monocot weed free media to groundnut but exhibited no or extremely weaker response to annual dicotyledone weeds. Broad-leaved weeds were most effectively controlled with Goal, Igran, Stomp and Basalin but over dominance of perennial and annual grasses till the pegging stage of groundnut curtailed the number of pods and pod weight to inflict substantial yields losses. However, performance of Goal remained distinctly superior to the rest of the herbicides.

EVALUATION OF FLUAZIFOP-BUTYL FOR SELECTIVE CONTROL OF *CYNODON DACTYLON* L. IN GROUNDNUT (*ARACHIS HYPOGAEA* L.)

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Bermudagrass (*Cynodon dactylon* L.) is a serious, unsolved problem in groundnut in India. In an attempt to control this grassy weed in groundnut, a field experiment was conducted with fluazifop-butyl at two levels (0.125 kg/ha and 0.25 kg/ha) and two times of its application (15 and 25 days after planting), alongwith weedy and weed-free checks. It was found that postemergence application of fluazifop-butyl at 0.125 kg/ha 15 days after planting groundnut very effectively controlled *C. dactylon* and reduced its dry matter yield from 223.5 kg/ha obtained in control to 83.8 kg/ha. When the application of fluazifop-butyl was delayed to 25 days after planting, higher dose of 0.25 kg/ha was required to obtain similar suppression in the growth of *C. dactylon*. The two fluazifop-butyl treatments increased the pod yield of groundnut by 275.0 to 366.8 kg/ha over check, against an increase of 316.8 kg/ha in the pod yield of groundnut obtained from the handweeded crop.

SUNFLOWER AND RAPESEED

INVESTIGATIONS ON THE CHEMICAL WEED CONTROL IN SUNFLOWER (*HELIANTHUS ANNUS* L.)

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P. A. U., Ludhiana

Field experiments were conducted during spring season of 1976 and 1978 to study the comparative efficacy of different herbicide groups *viz.* dinitranilines, triazines, substituted areas, amides and nitrophenol for weed control in sunflower. All the herbicidal treatments gave a significant reduction in the dry matter of weeds than the control (no weeding). Of the dinitraniline herbicides, trifluralin 1.20 kg, fluchloralin 1.20 kg and dinitramine 0.625 kg/ha gave about 57, 54 and 43 per cent increase in seed yield, respectively over the control. Similar increase in the seed yield was also recorded with the pre-emergence application of alachlor 1.25 kg/ha. Amongst the triazine herbicides, terbutryn 0.5 kg/ha gave 20.0 q/ha, seed yield of sunflower against 15.8 and 20.6 q/ha for two hand weedings and methabenzthiazuron 0.70 kg/ha, respectively. Isoproturon 1.0 kg and linuron 0.375 kg/ha proved phytotoxic to the crop and resulted in marked reductions in seed yield of sunflower.

WEED CONTROL IN RAPESEED (*BRASSICA CAMPESTRIS* L.)

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Field experiment conducted during *rabi* season of 1981-82 showed that pre-emergence application of pendimethalin 1.0 kg/ha, fluchloralin 0.68 kg/ha, oxadiazon 0.5 kg/ha and nitrogen 1.5 kg/ha at one day after sowing controlled the weeds very effectively in the rape-seed field without affecting the normal growth of this crop and ultimately recorded high grain yield which were at par with hand weeding at 30 days after sowing. Application of high dose of oxadiazon (1.0 kg/ha) and Oxyflurofen 0.1 kg/ha at one day after sowing, though controlled the weeds very effectively, but affected the germination of this crop resulting in poor stand of the crop with stunted growth of the plants which ultimately produced low grain yield. Weed infestation resulted in 62% yield reduction of this crop.

WEED MANAGEMENT IN CROPPING SYSTEMS

WEED MANAGEMENT IN MAIZE ALONE AND MIXED WITH LEGUMES

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An experiment was carried out on medium textured soil to find out suitable cropping system and weed control method for maximising fodder production. Four cropping systems (maize alone, maize+soybean, maize+cow pea, and maize+guar) and six weed control methods (control, weed free, weeding at 15 and 30 days of crop stage and alachlor 1.0, 2.0 and 4.0 L/ha) were tried. All the physical and chemical system of weed control and mixed cropping with soybean, cowpea and guar in maize effectively suppress the weeds and consequently resulting in higher yield over weedy check. Amongst the various methods of weed management, two hand weeding (15 and 30 days) and alachlor (2 l/ha) were found promising to suppress the weeds and gave highest fodder production (dry matter) over other methods of weed control. The higher concentration of alachlor (4 l/ha) showed a phytotoxic effect on maize production; although it effectively suppressed the weeds. On the otherhand lower concentration of alachlor (1.0 l/ha) did not control the weeds to desired level and thereby resulting in poor forage yield. Mixed cropping of legumes with maize gave higher yield over maize alone which may be due to higher weed controlling efficiency. Maize+soybeen performad well with respect to forage production and weed controlling capacity and exhibited 10.5 and 13.5 Q/ha more forage yield over maize+cowpea and maize+guar respectively. Minimum weeds population ($26/m^2$) and dry weight of weeds (8 Q/ha) were recorded in maize+soybean cropping system. Hogjest weeds population were recorded in maize alone ($141/m^2$).

WEED CONTROL IN MAIZE and MAIZE SOYBEAN CROPPING SYSTEMS

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Rainfed experiment was conducted on clay loam soil with high available nitrogen and potassium, medium in available phosphorus and acidic in reaction (pH 5.4) during *kharif* 1980 and 1981. The weeds were controlled to the threshold level by the application of alachlor 2.5 kg a. i./ha in maize as well as maize+soybean cropping

systems. Control of weeds either through alachlor or handweeding increased the grain as well as maize equivalent yield significantly over no weed control in both systems. The weed number and their dry weight reduced significantly due to different weed control methods and also by growing soybean in between the two rows of maize.

WEED MANAGEMENT STUDIES IN MAIZE AND SOYBEAN INTERCROPPING SYSTEMS

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Field investigations were carried during *kharif* season in 1982 and 1983. The study was aimed to evolve an appropriate chemical weed management practice in maize+soybean intercropping systems vis-a-vis a pattern of cultivating these crops from yield and economic point of view. Treatments under study were the all possible combinations of 6 intercropping patterns (C_1 – solid maize, C_2 – solid soybean, C_3 – M+S 1:1, C_4 – M+S 1:2, C_5 – M+S 2:2 with normal spacing of maize, and C_6 – M+S 2:2 with 45-75 cm row spacing of maize and accommodating 2 rows of soybean in between 2 rows of maize with increased spacing) and 4 weed management practices (W_0 – unweeded check, W_1 – Hand weeding-twice, W_2 – Pendimethalin, and W_3 – Thiobencarb) in a split plot design, which were replicated 3 times. Pre-emergance application of pendimethalin and thiobencarb was made at the rate of 1.5 kg/ha in 750 lt. water on the following day of sowing.

The results of the two years of experimentation revealed that cultivating maize and soybean in alternate rows proved best in terms of grain yield of maize and land equivalent ratio (LER). Grain yield of soybean was, however, recorded to decrease significantly irrespective of the intercropping systems over its solid stand. Economic analysis in terms of maize equivalent yield also indicated superiority of maize+soybean 1:1 intercropping system over others. The dry weight of weeds at silking stage and harvest of maize was found to be affected significantly in 1983, only, which was reduced with growing of soybean either alone or in different intercropping systems.

Pre-emergance application of pendimethalin or thiobencarb at the rate of 1.5 kg/ha resulted in significant reduction of weed dry weight at both silking stage and harvest of maize/soybean and thus increased the grain/seed yield of maize and soybean, LER and maize equivalent yield, although thiobencarb in 1982 and pendimethalin in 1983 proved better than each other.

STUDIES ON THE EFFECTS OF PLANT DENSITY, PLANTING PATTERNS AND INTERCROPPING IN SORGHUM ON WEED OCCURANCE AND GRAIN YIELD

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Field experiments were conducted for two seasons in a split design to study three plant densities and two planting patterns as main plot treatments and the intercropping as well as weeding as subplot treatments with four replications in CSH-5 Jowar variety on the grain yield and weed occurance.

The plant density, planting pattern and intercropping were having significant effects on the weed dry matter production and its growth. By increasing the plant density the reduction in dry matter production of weeds and increase in grain yield was realised. Intercropping of sorghum with single row of greengram was found to reduce the dry matter production of weeds substantially with benefit of increase in total grain yield per hectare. The sorghum grain yield due to intercrop was reduced in one season. Normal planting pattern of sorghum deereased weed population and its dry matter as compared to paired plants and also resulted in higher grain yield of sorghum.

WEED MANAGEMENT IN SORGHUM BASED INTERCROPPING SYSTEMS

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Field experiments with the objectives to study the crop-weed competition in different sorghum-legume intercropping systems and to select best herbicide for use in these systems were conducted at the Division of Agronomy, IARI, New Delhi during 1980-81 and 1981-82. The treatments consisted of combinations of six intercropping systems (sole sorghum and sorghum intercropped with fodder cowpea, grain cowpea, greengram, groundnut and soybean) in main plots and five methods of weed control (unweeded control, hand weeding, linuron, nitrofen and fluchloralin) in sub-plots. Results show that population count, growth and nutrient (N, P and K) uptake by weeds were appreciably decreased due to intercropping with legumes particularly cowpeas (both for fodder and grain) and greengram. These legumes also increased growth and yield of sorghum. Among herbicide treatments, fluchloralin had excellent check on weed infestation and resulted in better growth, nutrient uptake and yield of sorghum and intercrops and was comparable to hand weeding. All the three herbicides brought down considerably the growth and nutrient removal by weeds compared with unweeded control. Intercropping of fodder cowpea resulted in the highest net returns. From these results it may be concluded that the cost of weed control can be reduced by intercropping with quick growing legumes like cowpeas or greengram.

STUDIES ON INTEGRATED METHODS OF WEED CONTROL IN COTTON (SRT-1) INTERCROPPED WITH BLACK GRAM (T-9) UNDER MARATHWADA CONDITIONS

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Studies on integrated methods of weed control in cotton (SRT-1) intercropped with blackgram (T-9) during *kharif* season of 1982 revealed that there were no significant differences in seed-cotton yield due to different cropping system. All the weed control treatments registered significantly higher seed-cotton yield over control. Recommended cultural practice i. e. weeding and hoeing thrice at 3, 6 and 9 weeks after sowing recorded maximum seed-cotton (1250 kg/ha) and was significantly superior to Fluchloralin, Diuron and Oxadiazon @ 0.50 kg a. i. per ha. Among the herbicidal treatments all were at par in influencing the seed-cotton yield. Recommended cultural practice gave maximum blackgram yield (466 kg/ha) and was significantly superior to all treatmets except weed free upto harvest. Maximum additional profit of Rs. 4021/ha over control was recorded with recommended cultural practice in cotton+blackgram intercropping system.

INTERCROPING GROUNDNUT (*ARACHIS HYPOGAEA* L.) FOR WEED CONTROL IN PIGEONPEA (*CAJNUS CAJAN* MILSP)

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Studies were undertaken during summer season of 1979 and 1980 to evaluate the efficacy of intercropping groundnut in pigeonpea (*Arhar* CVT-21) for controlling weeds. Intercropping one or two rows of groundnut in 75 cm spaced *arhar* rows resulted in a reduction of 27 to 58 per cent in weed dry matter as compared to its pure stands while such a reduction was about 52 per cent in the case of narrowly spaced (50 cm) *arhar* rows intercropped with one row of groundnut. Intercropping also showed marked suppression of weed's growth even in situations where chemical (nitrofen 1.25 kg/ha) and mechanical (two hand hoeings) methods of weed control were undertaken. Such a practice of intercropping of groundnut in *arhar* resulted in an increase of 2 to 3 q/ha in *arhar* yields over t e unweeded control. Under integrated weed control management, one effective way of controlling weeds in *arhar* could thus be to opt for intercropping of *arhar* with groundnut.

WEED CONTROL STUDIES IN WHEAT-MUSTARD INTERCROPPING SYSTEM

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Field studies were taken up to control the weeds in Wheat-Mustard intercropping system. Several promising herbicides viz. fluchloralin (Basalin), pendimethalin (Stomp), isoproturon (Arelon), nitrofen (TOKE-25), metexuron (Dosanex), methabenzthiazuron (Tribunil), metamitron (Goltix) and oxadiazone (Ronstar) were tested for their herbicidal efficacy and selectivity on both wheat and mustard crops.

Fluchloralin at 0.72 kg/ha, pendimethalin and nitrofan at 1 kg/ha, metamitron and oxadiazone at 0.50 kg/ha were found safe on both wheat and mustard where as the other herbicides appeared to be highly phytotoxic to mustard crop. Pre-emergence soil application of pendimethalin, metamitron and oxadiazone proved superior over fluchloralin and nitrofan in controlling the weeds. Highest grain yields of wheat and mustard were obtained from pendimethalin treatment. However these yields did not differ significantly from the yields produced under metamitron and oxadiazone treatments.

WEED CONTROL IN COMMERCIAL CROPS

COTTON

YIELD POTENTIALITY OF UPLAND COTTON GROWN UNDER WEEDY AND WEED FREE REGIMES IN NIMAR TRACT OF MADHYA PRADESH

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Two years field studies were carried out to estimate the yield potentiality of upland cotton (Var. Vikram) in three weed regimes viz., weedy check (W_0), Weed free-I (W_1-Two interculture) and weed free-II (W_2-Hand weeding+two interculture). These were superimposed with single and combined application rates of Basalin, Stomp, Ronstar and Diuron, applied as pre planting, pre emergence and post emergence. Studies revealed the superiority of Stomp and Basalin, applied either all alone or the combination with post emergence Diuron-0.5 kg/ha. diminishing the weed competion by 94 to 97 per cent in the first and 73 to 75 per cent in the second instance and resulting in an increase of 77 to 113 per cent and 50 to 64 percent seedcotton yield respectively. Diuron 0.75 kg/ha was found superior to Ronstar even in W_0 weed regime conditions. In W_2 weed media Stomp in the first year and Diuron in the second year proved most effective. Combinations of two herbicides failed to exhibit any specific advantage over single application under W_1 and W_2 weed regimes. Weed infestation in the W_0 regime allowed a luxurient weed growth (21 to 23 g/ha) and affected the plant development, fruit bearing adversely, and reducing *kapas* yields to the tune of 725 kg/ha in 1981-82 and 500 kg/ha in 1982-83.

SUPPRESSION OF WEEDS IN HYBRID COTTON BY SMOTHERING, CHEMICAL AND CULTURAL MEANS AND THEIR EVALUATION ON ECONOMIC PARAMETERS

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Weed control by herbicides in cotton under rainfed conditions very often causes undue crop mortality because of the weather uncertainty and higher application rates. Smothering of weeds by growing intercrops like black gram (*Vigna mungo* Var. T-9), groundnut (*Arachis hypogaea*, Var. Jyoti) and Soybean (*Glycine Max* Merrill, Var. JS 2) were tried in addition to the straw mulch, diuron 0.75 kg/ha (PRE), Hand weeding and weedy check at the A. I. C. C. I. Project, Indore in 1981-82.

Yield data reveald significant differences between the seven treatments, highest being in hand weeding (19.4 q/ha), closely followed by the wheat mulch (18.5 q/ha), marking an yield increase of 8.94 q/ha (85%) and 8.02 q/ha (77%) over the weedy check. Plant height, boll number and yield per plant as well as boll size also increased correspondingly. Even-though considerable weed suppression took place in the mixed biomass of cotton with intercrops like soybean (63%), black gram (52%) and groundnut (54%), the seed cotton yield remained significantly lower to either hand weeding or straw mulch. Yield levels in these treatments, however, remained distinctly superior to weedy check. Comparing the economics, worked out at the selling prices and cost of cultivation, it was noted that cotton+groundnut was most profitable (Rs. 6600/-) followed by mulch (Rs. 6530/-) and hand weeding (Rs. 6370/-) as compared to no weeding (Rs. 3000/-).

CULTURAL AND CHEMICAL WEED CONTROL IN COTTON (*GOSSYPIUM HIRSUTUM* L.) IN NIMAR REGION OF MADHYA PRADESH

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To manage the weeds in cotton at Khandwa of Nimar region of Madhya Pradesh, an integrated weed management approach was made during 1981-82 and 1982-83. The cultural treatments consisted of two interculture with *Kolpa* followed by two hand weedings at 30 days and 60 days after sowing and weedy check which were kept as main treatments. The sub plot herbicidal treatments were fluchloralin 1.2 kg/ha, Pendimethylene 1.5 kg/ha both as pre plant, oxadiazon 1.0 kg/ha, diuron 0.75 kg/ha as pre emergence and diuron 0.15 kg/ha as post emergence alone. These herbicidal treatments were also tested along with post emergence application of diuron 0.75 kg/ha. Amongst cultural treatments two inter-culture with two hand weedings at 30 days and 60 days gave the best weed control and produced the higher yield of seed cotton (1205 kg/ha). Amongst single herbicidal treatments pendimethylene 1.5 kg/ha pre plant followed by diuron pre-emergence gave better weed control. In combined application diuron pre and post emergence was the best followed by pendimethylene pre plant and diuron post emergence. The yield was maximum in the latter treatment followed by diuron pre+post emergence. Amongst single application, the diuron as pre-emergence and pendimethylene pre plant were also equally effective and produced almost double the yield than the weedy check (492.5 kg/ha). Among the different cultural and herbicidal combinations the highest yield was obtained in two interculture+two hand weeding with pre emergence application of diuron.

CROP WEED COMPETITION STUDIES IN WINTER IRRIGATED *GOSSYPIUM HIRSUTUM* (VAR.) MCU. 9

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An experiment was laid out during the monsoon season, 1982 under irrigated condition in black soil of average fertility at Tamil Nadu Agricultural University, Coimbatore. The effect of weed infested condition (upto 15 (15), 25 (15, 25), 35 (15, 35), 45 (15, 35, 45), 55 (15, 35, 55), 65 (15, 35, 65) and 75 (15, 35, 75) days was studied along with weed free-condition throughout and unweeded control. Weed free condition was maintained by manual weeding. In weed free condition the number given within bracket indicated the manual weeding day and number of manual weedings given to maintain weed free condition. A common fertilizer dose of 30 kg each of N, P_2O_5 and K_2O/ha was applied at the time of sowing in the form of urea, super phosphate and muriate of potash respectively.

Annual dicot weed *Trianthema portulacastrum* was the major weed in winter irrigated cotton (var.) MCU 9 raised in deep black soils of Coimbatore. In weed free condition treatments there was no significant differences between weed free condition upto 15 days and above. Weed infestation maintained for first 15 days only gave higher kapas yield 22.44 a/ha. Drastic reduction in plant stand and kapas yield was noticed when it was maintained beyond 35 days. The required optimum WFC days from sowing can be maintained by giving first weeding on 15th day followed by another weeding of earthing up on 35th day after sowing of delinted cotton seed.

EFFECT OF TILLAGE AND HERBICIDAL METHODS OF WEED CONTROL IN COTTON

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Reduction in yield of cotton due to weeds is ranging from 33.3 to 61.0 percent. During early growth period because of constant rainy days it is difficult to interculture the crop. Under such circumstances herbicidal application might help in controlling weeds. The present experiment was conducted to study the effect of herbicides with and without preparatory tillage under loamy sand soil conditions during the year 1982-83.

The results indicated that application of herbicides, either pre-emergence or supplimented by post-emergence applications, without preparatory tillage (Two ploughing by local plough) was not found conductive as compared to preparatory tillage by local plough followed by pre-emergence application of diuron 1.0 a.i./ha. Handweedings during initial crop growth period followed by wheat straw mulching (5 t/ha) was found effective in getting higher yield of seed cotton as compared to other treatments undetaken in the studies.

TOBACCO AND SUGARCANE

TO FIND OUT EFFECTIVE METHOD OF WEED CONTROL IN BIDI TOBACCO (*NICOTIANA TABACUM*)

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Several intercultivation in bidi tobacco is a common practice followed by the farmers. Under such circumstances, it was imperative to test herbicides efficiency for weed control, without injuring the crop, was deemed essential. Three herbicides *viz. benthio carb oxyflurofen* and *fluchoralin* were tested with and without interculturing. The results revealed that sole application of herbicides did not check weeds and improve the yield but if associated with one or four interculturing found beneficial in obtaining yield of bidi tobacco as compared to frequent weedings.

COMPARATIVE EFFICACY OF ATRAZINE AND METRIBURIN FOR THE PRODUCTION, QUALITY AND WEED CONTROL IN SUGARCANE CROP

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A field trial was carried out during 1982-83 to evaluate the efficacy of two herbicides, namely atrazine (already in use since long) and metribuzin (under the final stage of recommendation) in sugarcane crop. The treatments comprised three doses (1.0, 1.5 and 2.0 kg a.i./ha) of each herbicide alone and in all possible combinations, alongwith conventional weeding and unweeded control. All the herbicidal treatments were given as pre-emergence (within 2 days of planting), and no intercultural operations were done in these plots till harvesting of the crop.

There was no significant variation in germination percentage of sugarcane due to various treatments. The maximum number of tillers and millable canes were recorded with the herbicidal treatment-atrazine at 2.0 kg a.i./ha+metribuzin at 2.0 kg a.i./ha. Just like tillers and millable canes production, this treatment also gave maximum cane yield, which proved significantly superior to lower doses (1.0 and 1.5 kg a.i./ha) of both the herbicides applied singly and unweeded control, but remained statistically at par with rest of the treatments. CCS per cent in sugarcane did not differ significantly due to various treatments.

The dry weight of weeds recorded at the beginning of grand growth period of sugarcane was minimum with conventional weeding (29 g/m^2) and maximum with unweeded control (464 g/m^2). Amongst the herbicidal treatments, the application of atrazine at 2.0 kg

a.i./ha+metribuzin at 2.0 kg a.i./ha proved to be most effective (62 g/m^2), which was found statistically superior over all the three doses of both the herbicides applied singly, and at par with rest of the treatments. Therefore, the combined application of atrazine and metribuzin at any of the three doses (1.0, 1.5 & 2.0 kg a.i./ha) seems to be more effective in controlling the weeds in sugarcane crop than they are applied singly.

JAPANESE MINT, ISABGUL AND CUMIN

EFFECT OF NITROGEN LEVELS AND HERBICIDES ON WEED COMPETITION IN JAPANESE MINT (*MENTHA ARVENSIS* L.)

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A field experiment consisting of four levels of nitrogen (0, 60, 120 and 180 kg/ha) and eight weed control treatments (terbacil, diuron and chloramben herbicides each at 1 and 2 kg a. i./ha, in addition to weedy check and weed free check) was conducted during 1979 and 1980. Application of 180 kg N/ha gave significant increase in fresh herb yield of Japanese mint, weed dry matter, and nitrogen and phosphorus depletion by weeds. Unchecked weed growth caused about 75% reduction in herb yield. Amongst the herbicides terbacil 2 kg a. i./ha was most effective in influencing fresh herb yield, and supressing weed population, dry matter accumulation and nutrient (N, P_2O_5 and K_2O) depletion by weeds.

Increasing levels of nitrogen gave significant increase in fresh herb of Japanese mint under weed free check and terbacil 1 and 2 kg a. i./ha. Similar trend of N on weed dry matter was noted under weedy check and other herbicidal treatments.

EFFICACY OF HERBICIDES FOR WEED CONTROL IN ISABGUL (*PLANTAGO OVATA*)

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Isabgul is usually broadcasted for raising good crop. Thus, weeding at proper stage of growth is always a menace to cultivators. To find out the possibility of using herbicides in this crop this experiment was undertaken during the year 1982-83. Three herbicides viz. *Amiben*, *Isoproturon* and *pendimethalin* at two levels of application i. e. 0.5 and 1.0 kg a.i./ha with two methods of applications were tested. The results revealed that application of Isoproturon 0.50 kg a·i./ha as pre-sowing application was at par with one or frequent handweedings.

EFFECT OF HERBICIDES LEVELS AND THEIR METHODS OF APPLICATION OF WEED CONTROL GROWTH AND YIELD OF *ISABGUL (PLANTAGO OVATA*, FORSK) UNDER MIDDLE GUJARAT CONDITIONS

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Three herbicides viz. alachlor, chloramben and isoproturon at three levels of their applications i.e. 0.50, 0.75 and 1.0 kg a.i./ha with two methods of application were tested in Rabi sesons of 1980-81 and 1981-82. The results revealed that application of isoproturon at any level of its application reduced *chil (chenopodium album)* and other weed population effectively. This herbicide also reduced the dry weight of weeds as compared to other two herbicides. Application of Isoproturon at lower level (0.5 kg/ha) as pre-emergence or applied at the rate of 0.75 kg/ha as pre-sowing application found conducive for obtaining higher yield which was superior over two hand weedings. The pooled yield data revealed that application of isoproturon at the rate of 0.5 kg a.i./ha as pre-emergence method of application increased the ICBR up to 1 : 14.76 as compared to 1 : 5.70 of hand weeding (twice) in the present experiment.

CHEMICAL WEED CONTROL IN CUMIN (*CUMINUM CYMINUM*)

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Broadcasting of cumin seeds for raising the crop, is a comon practice followed by the farmers. Weed control at proper stage of crop is a problem particularly, when labourers are not available. The present experiment was undertaken to find out effective herbicide for weed control in cumin. *Isoproturon* and *oxyflourfen* at different time of application were tested. It was found that hand weeding (twice) treatment was superior in obtaining seed yield due to effective weed control. Among herbicides, oxyfluorfen 0.250 kg a.i./ha as post-emergence application found beneficial in obtaing seed yield of cumin.

CROP WEED COMPETITION IN CUMIN (*CUMINUM CYMINUM*)

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Broadcasting of seeds is a comon practice for sowing this crop. For better weed control through herbicides, it is imperative to know the specific period of weed competition.

The crop was kept weedy or weed free up to 15, 30, 45, 60, 75 and 90 days. The results revealed that in the crop of cumin, period between 15 to 30 days found critical for crop weed competition.

WEED CONTROL IN VEGETABLES

POTATO

EFFICACY OF DIFFERENT HERBICIDES FOR CONTROLLING WEEDS IN POTATO (*Solanum Tuberosum* L.)

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Field experiments were conducted during 1981 and 1982 in autumn planted potato crop in sandy loam soil with variety Kufri Lalima (BS/C 1753). The main weeds in crop were *Cyperns rotandus. Trianthema monogyna, Chenopodium album, Poa annum* and *Sperqula arvensis.* Nine herbicides viz. Lasso (alachlor) 3.0 *l*/ha, Sencor (metribuzin) 1 0 kg/ha, Basalin (fluchloralin) 1.5 *l*/ha, Igran (terbutryn) 1.5 kg/ha, Gesapax (ametryn) 1.5 kg/ha, Tribunil (methabenzthiazuron) 2.0 kg/ha and Goal (oxyfluorfen) 0.6 *l*/ha as pre-emergence and Gramaxone (paraquat) 2.5 *l*/ha and Stam F-34 (propanil) 2.5 *l*/ha as post-emergence were evaluated alongwith control (no weeding and no second earthing up), manual weeding only and no second earthing up and one weeding+second earthing up. All the herbicides significently reduced the weed growth (number and dry weight of monocot and dicot weeds) and increased tuber yield over control during both the years. However, during 1981 yield increased due to different herbicidal treatment was non-significant due to less weed growth. Application of Sencor, Tribunil and Igran as pre-emergence and Gramaxone as post-emergence were found most suitable for controlling weeds in potato crop. None of the herbicides tested left residues in the soil to affect grain production of moong sown after harvesting the potato crop in the first week of March.

CHEMICAL WEED CONTROL IN POTATO

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A field experiment was conducted during the spring season of 1982 with 10 treatments viz weed check, hand weeding-2, Pendimethalin 1.5 and 2.25 kg/ha, Isoproturon 1.0 and 1.5 kg/ha, Oxyflourfen 0.12 and 0.18 kg/ha, Terbutryne 1.0 and 1.5 kg/ha. Pre-emergence application of Oxyfluorfen 0.12 kg/ha gave maximum tubler followed by Oxyfluorfen 0.18 kg/ha. Both levels of Oxyfluorfen were on par. Dry weight of weeds was minimum in plots treated with Pendimenthalin 2.25 kg/ha followed by Oxyfluorfen 0.12 kg/ha.

COMPARATIVE PERFORMANCE OF SOME HERBICIDES FOR WEED CONTROL IN AUTUMN PLANTED POTATO (*SOLNUM TUBERSUM* L.)

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Field studies were conducted during 1981-82 and 1982-83 at the Research Farm of the Punjab Agricultural University, Ludhiana to evaluate the comparative performance of pendimethalin, metribuzin, linuron, methabenzthiazuren, atrazine, simazine, isoproturon metoxuron and paraquat for weed control in autumn crop of potato. Of all the herbicides, pre-emergence application of metribunzin 0.75 kg/ha, linuron 0.5 kg/ha, methabenzthiazuron 1.3 kg and metoxuren 1.3 kg/ha resulted in comparatively less dry matter production of weeds. Minimum dry matter of weeds i. e. 9.1 q/ha was recorded in linuron 0.5 kg/ha. which was about 36 per cent less than the pre-emergence application of simazine 0.25 kg/ha Maximum tuber yield (220.6 q/ha) was obtained from the pre-emergence application of metribuzin and it was closely followed by linuron 0.5 kg and methabenzthiazuron 1.3 kg/ha. Of the triazine herbicides, pre-emergence application of simazine 0.25 kg/ha (after first irrigation) gave about 9 per cent reduction in tuber yield as compared to pre-emergence application of atrazine 0.25 kg/ha. Post-emergence application of paraquat (0.25 kg/ha) at 5 to 10 per cent emergence of crop failed to control later flushes of the weeds and of all the herbicide treatments it resulted in lowest tuber yield (177.4 q/ha).

STUDIES ON WEED MANAGEMENT IN POTATO (*SOLANUM TUBEROSUM* L.) THROUGH HERBICIDES WITH AND WITHOUT EARTHING

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Field investigation was carried out for two years (1980-81 and 182-83) at Student's Instructional Farm of C. S. Azad University of Agriculture and Technology, Kanpur to see whether the practice of earthing could be eliminated through the use of herbicides. The study revealed that application of Paraquat (2.5 l/ha) as early post emergence (5-10% germination of the crop), Methabenzthiazuron (1.5 kg/ha) and Simazine (0.5 kg a.i./ha) both as pre-emergence provided satisfactory control of weeds and resulted into significantly greater production of tubers over unweeded check. Role of earthing was perceptible during first year only by increasing 20.91 q/ha or 8.5% tuber yield over no earthing. However, the practice of earthing could not be able to increase the tuber yield during second year. The differential response of the crop to earthing was attributed mainly to varietal variations in the two seasons. Interaction between weed control measures and earthing was non significant during both the years of investigation.

SOME ASPECT OF WEED CONTROL IN POTATO

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Field experiments conducted at Simla hills in northern Himalaya and Meerut in central plain of India indicated that potato suffers from severe weed competition. Fast growing weeds not controlled within four weeks of planting suppressed growth of potato vine and caused enormous loss of tuber yield. Further, it was revealed that weeds could be effectively controlled by chemical or cultural practices. The two methods were equally effective. But for certain limitation chemical control is inevitable, more so in seed crop of potato. Experimental study at Simla have indicated methbronuron (1.25 kg ai/ha), alachlor (1.25 kg ai/ha) and linuron (0.5 kg ai/ha) as promising herbicides while those in central plain were alachlor (1.25 kg ai/ha), linuron (0.5 kg ai/ha), metribuzin (0.375 kg ai/ha), fluchloralin (1.20 kg ai/ha), methabenzthiazuron (1.4 kg ai/ha) and terbutryne (1.20 kg /ha).

EFFECT OF HERBICIDES WITH AND WITHOUT EARTHING UP IN POTATO

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The present experiment was proposed to ascertain the effect of herbicides on weed control and yield of potato tuber during the year 1982-83.

The effect of fluchloralin, diuron and paraquat were tested with and without earthing up in the crop.

The results indicated that two handweedings (15 and 45 DAP) found superior, however one hand weeding as well as per-planting application of fluchloralin at the rate of 1.0 kg ai/ha also found comparable.

ONION GARLIC AND OKRA

STUDIES ON TIME OF WEED REMOVAL AND NITROGEN LEVELS IN ONION

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The present studies were conducted on 'Hissar-2' variety of onion to find out the optimum time of weed removal and nitrogen level for maximum yield. It was observed that

increasing number of weeding decreased dry matter production of weeds, increased nitrogen uptake by onion plants and bulb yield while, increasing levels of nitrogen increased dry matter of weeds, nitrogen uptake by onion plants and bulb yield. All the nitrogen levels in weed free condition recorded lower dry weight of weeds and increased yield.

EFFECT OF HERBICIDES WITH AND WITHOUT HANDWEEDING ON WEEDS AND CROP YIELD OF ONION

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Interculturing in onion is difficult due to close planting distance. In order to know the efficacy of herbicides in controlling weeds. The present experiment was undertaken during the year 1982-83. Fluchloralin 2.0 kg a. i./ha, Isoproturon 1.0 kg a. i./ha and oxyfluorfen 0.25 kg a. i./ha were applied as either pre-planting or pre-emergence treatment. One supplimentary handweeding in addition to herbicides was also carried out. It was inferred that fluchlorain 1.0 kg a. i./ha found beneficial in obtaining bulb yield of onion.

WEED CONTROL IN ONION IN U. P. HILLS

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The field studies were conducted during 1979-80 and 1980-81 with seven weed control treatments namely, weedy check, four hand weedings 30, 60, 90 and 120 days after transplanting (DAT), three hand weedings 60, 90 and 120 DAT, two hand weedings 60 and 120 DAT, Lasso 2 *l* a. i./ha (Post emergence), Lasso 2 *l* a. i./ha+one hand weeding 30 DAT Tok E-25 at the rate of 2 *l* a. i./ha+one hand weeding 30 DAT for their efficiency of controlling weeds, influencing production and economics of onion.

Highest weed population (160/m^2) and dry matter accumulation by weeds (24.43 q/ha) was recorded under weedy check, whereas the lowest weed population (30/m^2) and dry matter (2.91 q/ha) was found under four hand weeding treatments. No significant differences in weed population and dry matter accumulation were observed among four hand weeding, three hand weeding and lasso 2 *l* a. i./ha+one hand weeding. Highest weed control efficiency (88%) was recorded under four hand weedings followed by three hand weedings (76%).

All the weed control treatments recorded significantly higher bulb yield than weedy check during both the years except Lasso 2 *l* a. i./ha during 1980-81 where the yields were

identical. Four hand weedings produced significantly higher bulbs than all the treatments except three hand weedings during 1280-81 where the yields were statistically same.

The highest net return of Rs. 13992/ha was recorded under four hand weedings, followed by three hand weedings (Rs. 11707/ha). The net returns/ha under lasso and Tok E-25 with one hand weeding were Rs. 8869 and 5449, respectively. Thus, from weed control efficiency and net returns point of view, four hand weedings seem essential in onion.

CHEMICAL WEED CONTROL STUDIES IN GARLIC CV. HG-6

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A field experiment was conducted at the Vegetable Research Farm of Haryana Agricultural University, Hissar during 1979-80 to study the efficacy of different herbicide to control the weeds in Garlic CV. HG-6. Treatments were fluchloralin 0.75, 1.0 kg/ha, nitrofen, 1.5 kg/ha, oxadiazon 9.75, 1.3 kg/ha, metribuzin 0.5, 0·75 kg/ha, simazine 0.25, 0.50 kg/ha, pendimethalin 1.0, 1.5 kg/ha, oxyfluorfen 0.1, 0. kg/ha, methabenzthiazuron 1.0, 1.5 kg/ha weed free, hand hoeing 3 (H. H. 3) and weedy check. Out of weedicides tried in the experiment the application of fluchloralin at 0.75 kg/ha proved beneficial in sprouting of the cloves, maintaining the crop stand and yield as quality of bulbs relating to its size. Except metribuzin at 0.75 kg/ha, simazine at 0.50 kg/ha and oxyfluorfen at 0.1 kg/ha all the weedicides lost the effect in controlliong the growth of weed after 30 days of their application. No weedicide showed the residual effect on the produce i. e. garlic bulbs. Metribuzin was proved detrimental to the sprouting of clove, growth of the plants and yield of the garlic bulbs.

EFFECT OF OXADIAZON AND MULCHES ON WEED CONTROL IN GARLIC

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In garlic the weed control efficiencies of oxadiazon 0.75 and 1.0 kg/ha pre-em. and three mulches *viz.*, saw dust, paddy husk and wheat straw each at the rate of 100 q/ha, alone and in herbicide × mulch combinations were tested against weedy check and one, two and three hand weeding treatments at J. N. K. V. V. Jabalpur. The dominant weeds of the experimental field consisted of *Cyprus rotundus* L., *Chenopodium album* L., *Eragrostis diarrhena* Seh.) Steud., *Langecea mollis* Cav., *Parthenium hysterophorus* L. and *Physalis minima* L. The lowest weed biomass was noted in three hand weeding treatment followed by oxadiazon 1.4 kg/ha + one hand weeding and oxadiazon 1.0 kg/ha + paddy husk. The study concluded that oxadiazon 1.0 and 0.75 kg/ha alongwith one hand weeding and oxadiazon 1.0 kg/ha + paddy

husk proved more economical for controlling weeds in garlic. The correlation studies revealed that weed population and weed biomass were negatively correlated wiih the growth, yield parameters and yield of garlic.

INTEGRATED METHOD OF WEED CONTROL IN OKRA *CBELMOSAHCS ESCULENTUS* (L) MOENCH)

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A field experiment was conducted during summer season of 1982 at Bihar Agricultural College farm Sabour of Rajendra Agricultural University to evaluate the comparative performance of herbicides like fluchloralin, thiobencarb, nitrofen and oxyflorifen applied alone or in combination with one hand weeding. Cultural methods like mulching and repeated hand weeding to make weed free environment were also included in the trial. The predominent monocot weed flora infesting the experimental plots was Cyperus *rotundus* and among major dicot weeds were *Trlanthema monogyna* and *Phyllanthus niruri.* The dry matter accumulation under weedy check was to the extent of 391.50 g/m^2 at 60 days crops growth stage. The data on vegetable pod yield revealed that losses due to uncontrolled weed competition was to the tune of 49.30% in comparison to repeated weeding. All the weed control treatments produced significantly higher pod yield than weedy check. Application of herbicides followed by one hand weeding was significantly superior to herbicides and handweeding applied alone. Vegetable pod yield obtained under preplanting application of the fluchloralin (Basalin) at 2.00 kg/ha followed by one hand weedings and pre-emergence application of nitrofen (Tok-E 25) at 2 kg/ha followed by one had weeding were 84.74 and 82.12 q/ha respectively which was comparable to the yield obtained under repeated hand weeding (87.15 q/ha).

ORCHARD CROPS

GROWTH OF MANGO (*CUNGIFERA INDIUM* L.) SEEDLING AS INFLUENCED BY WEED COMPETITION

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In a pot experiment degree of crop weed competition was evaluated. The experiment conducted duridg to evaluate the extent of weed competition in mango seedlings. Three months old, uniform mango seedlings were planted in black-polythelene bags measuring 30×30×50 cms, filled with the mixture of soil, sand, manure prepared in the ratio of 2:2:1.

Three groups of weeds *viz.* Grasses, broad-leaf weeds and sedges were planted separately with mango seedlings and in a set mixed weed flora was planted. A weed free control set was also maintained by occasional hand pulling of weeds. In general all weed groups affected growth and vigour of mango seedlings, but the significant reduction in stem diameter, total height, leaf number, fresh and dry weight of seedlings was recorded by perennial grasses, namely *Sorghum halepense* (L) Pers, *Cynodon dactylon* (L) Pers. ann weeds in mixed flora, which mostly predominated by *Cynodon dactylon* (L) Pers. Sedges (*Cyperus rotundus* L) and broad leaf weeds did not show any strong competetive influence on growth of young mango seedlings.

APPARENT INFLUENCE OF HERBICIDES AND NITROGEN ON WEED CONTROL IN PLUM ORCHARD

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A field experiment in Santa Rosa plum orchard (*Prunus salicina* Lindl.) was conducted in 1981 and 1982 to evaluate the effect of terbacil or simazine at 3.0 and 4.0 kg/ha respectively coupled with graded levels of nitrogen (250, 500 and 750 g N/tree) on weed population. Weed flora around the trees consisted primarily of *Chenopodium album* and *Oxalis* app. For both years, herbicidal sprays significantly reduced the monocot and dicot weed population. In general a direct relationship was observed to exist between nitrogen levels and weed population irrespective of herbicidal treatments. No phytotoxicity was observed from any treatment.

OBSERVATIONS ON WEED FLORA OF ORCHARDS IN PATIALA DISTRICT, PUNJAB

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Observations on weed flora of orchards of *loquat*, mango, guava, citrus group of fruits, grapes and *ber* were made for ten years (1972 onwards). In quite good number of orchards, interculturing is a usual practice, in such cases weed flora much depends on type of crop grown and cultural practices it receives.

In all as many as 99 species of weeds belonging to 76 genera grouped under 28 families of flowering plants have been observed to grow in orchards. In unmixed orchards of *loquat*, mango, guava, citrus, grapes and *ber* nearly 55, 71, 57, 45, 31 and 15 species of weeds were recorded to grow respectively. Weed flora of *loquat* orchards has 35 species of weeds common with that of mango gardens, 30 species with guava and 27 species common with weed flora of citrus orchards. On the other hand weed flora of mango orchards has 40 species common with that of guava orchards and 39 species common with that of citrus orchards. Citrus orchards have 13 species of weeds common with those of *ber* orchards. On the whole in orchards annual weeds are 68.7% and perennial weed constitute only 31.3%.

WEED ECOLOGY

STUDIES ON CHANGING PATTERN OF WEED FLORA IN DIFFERENT SYSTEMS OF RICE PLANTING

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Observations on weed flora were taken in rice field during *kharif* season from 1979 to 1983 at the Research Farm of Banaras Hindu University to find out the pattern of weed shift under different methods of rice planting. The rice field was infested with grasses *viz.*. *Cynodon dactylon* and *Echinochlos* spp., sedges *viz.*, Cyperus spp. and *Fimbristylis milliaceae* and broadleaved weeds, *viz.*, *Chorchorus acutangulus*, *Ammania baccifera*, *Phylianthus niruri Caesulia axillaris* and *Commelina bengalensis.*

Under direct seeded upland rice, grasses constituted major part of weed flora which varied from 28-65 percent. Next to grasses, sedges were in maximum proportion which varied from 25-55%. The broadleaved weeds were minimum in unmber (10-16%).

The trend of weed flora was just the reverse in case of transplanted rice. During initial years, 1979 to 1981 broad leaved weeds were maximum in number (36-44%) whereas at later years, 1982 and 1983 grasses dominated over the other group of weed flora (39 to 40%). During inital years, broad leaved weeds were followed by sedges which constiututed 28 to 36% whereas, at later years, 1982 and 1983 grasses were closely followed by broad leeaved weeds which had 32 to 34%.

SURVEY ON THE DISTRIBUTION OF BROOM–RAPE (OROBANCHE SPP.) IN DIARA AREAS

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A survey on the occurence and distribution of Broom-rape in *diara* areas of Bihar was conducted during 1911-12. The information on its infestation was collected by visiting parasitic weed infested areas and also by personal contact with the Agril. Extension Officers of five different blocks (Nath Nagar, Sabour, Kahalgoan, Pirpaiti and Rajmahal) of *diara* areas. The survey on broomrape distribution in these areas indicated that degree of infestation was maximum in Rajmahal where tomato is most extensively grown in winter season as rainfed crop during *rabi* season. The host in *diara* areas for this parasitic are

Tomato, Brinjal, Mustard, Rai and Turmeric. Maximum germination takes place during November to February and minimum from April to June. The germination of orobanche takes 15-20 days from sowing of the host plants and emerges from grouud after 20-25 days there after. The drying of stem and dehiscence of Capsules is completed after 90-95 days of sowing of host plants.

FLORISTIC–SOCIOLOGICAL STUDIES ON PADDY CROP WEEDS IN KASHMIR–DISTRICT BARAMULA

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A survey in distt. Baramula of Kashmir has revealed the presence of 108 weed species growing in association with the paddy crop, either along the borders of the fields or within the fields. Of the various representative families; Poaceae contributed the maximum number (19 species) followed by Fabaceae (11 species) and Asteraceae (9 species). The other families were less represented. *Echinochloa crusqalli*, *Ammania* Spp. and *Rotala* spp. behave as "Satellite Weeds" of this principal crop in Kashmir. They have been recorded with a cent percent frequency, growing throughout the cropping period of paddy in valley.

STUDIES ON KAREWA LAND *RABI* CROPS WEEDS IN KASHMIR

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The occurrence of weeds in two different *rabi*. crops *viz*. sarson (*Brassica compestris*) and flaz (*Linum usitatissimum*) grown under temperate agroclimatic conditions in Pampore karewas have been investigated. During this survey 69 weed species belonging to 22 angiospermic families were collected. Considerable differences were recorded in floristic composition and sociology of weeds in the two crops. Only eight weeds were common to both crops. Distribution pattern of weeds in the two crops along with their phenology and other ecological characteristics have also been discussed.

HERBICIDE RESEARCH IN RICE AND GROUNDNUT AT FIPPAT

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Several field studies were conducted at FIPPAT in 1982 and 1983 to determine the bioefficacy of trifluralin (oC, oC, oC-trifluoro-2, 6-dinitro-*N*; *N*-dipropyl-*p*-toluidine) and

butachlor+2, 4-D combination in transplanted rice (cv. Ponni) and terbutryne (2-tert-butylamino)-4-(ethylamino)-6-(methylthio)-*s*-triazine) in groundnut (cv. TMV 2). In one set of experiments, trifluralin (48 EC) was incorporated into the soil at 0.5, 1.0, 1.5 and 2 kg ai/ha one day, three days and five days before transplanting (TP) rice seedlings. The results showed that soil incorporation of trifluralin at 1 kg ai/ha, one day prior to TP was very effective for a better weed control and higher grain yield than other treatments. No additional benefit could be derived at higher dosaes.

In another study the tank mix combination of butachlor, (1 kg ai/ha) and 2, 4-D ethyl ester (EE) (0.75 to 1.0 kg ai/ha) effected greater preemergence weed control efficacy and grain yield than when butachlor (50 EC) or 2, 4-D EE (34 EC) was applied alone.

In separate experiments, the pre-emergence (2 days after sowing) application of terbutryne showed good selectivity to groundnut while postemergence (20 DAS) application did not. Preemergence, terbutryne at 1.5 and 2.0 kg ai/ha showed greater herbicidal activity on annual grasses and broadleaf weeds and obtained higher pod yield than all other treatments.

EFFECT OF METRIBUZIN ON THE ANATOMY AND PHYSIOLOGY OF BLACK NIGHT SHADE (*SOLANUM NIGRUM* L.) AND CHAURAI (*AMARANTHUS VIRIDIS* L.)

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Growth chamber studies were conducted at the Institute of Agricultural Sciences, B. H. U. during 1982-83 to evaluate the influence of different doses of metribuzin (0.25 kg/ha, 0.5 kg/ha, 0.75 kg/ha, 1 kg/ha and 1.25 kg/ha) on the anatomy and physiology of Black night shade (*Solanum nigrum* L.) and Chaurai (*Amaranthus viridis* L.). Injury to these weeds was the greatest when they received the higher doses of metribuzin (1 and 1.25 kg/ha). Anatomical studies of leaf and stem also showed that tissue disorganisation, vascular bundle condensation and loss of chlorophyll constant was maximum at these doses. However, lower rate (0.25 kg/ha) did not significantly affect the growth of these weeds. Similar trend was also observed with various physiological parameters viz , chlorophyll content, relative water content, dry wight loss, rate of respiration and visual injury as assessed on visual injury scale.

EFFECTS OF CROP ROOT EXUDATED AND GROWTH REGULATORS ON STIMULATION OF STRIGA SEED GERMINATION

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Experiments were conducted under laboratatory conditions at Dharwar in 1980 by using double pot technique to find out the effect of different crop root exudated (15 crops) and growth regulators (ethrel, kinetin, IAA and GA_3) on stimulation of seed germination of *Striga asiatica* (L.) kuntze. The root exudates of groundnut (51%), maize (50%), redgram (35%) and cotton (34%) recorded higher *Striga* seed germination than susceptible sorghum cv. CSH-1 (33%). Variation in *Striga* seed germination with the root exudates of different varieties of *Sorghum* and cotton was also observed. Among the four growth regulators, kinetin was more effective in stimulating the *Striga* seed germination to an extent of 63 per cənt, while ethrel did not stimulase the germination. The germination of *Striga* was enhanced when kinetin was applied along with GA_3 or IAA.

ALLELOPATHIC INTERACTION BETWEEN CROPS AND WEEDS

V. Thandapani, A. Mohamed Ali and S. Sankaran

Icar (P. L. 480) Aicrp on Weed Control Tnau, Coimbatore

The alleloparhic effect of weeds viz. horse purselane (*Trianthema portulacastrum*) and *Amaranthus* (*Amaranteus viridis*) on germination and seedling growth of crops viz sorghum, maize, pearl millet, finger millet, redgram, mung-bean, blackgram, groundnut, sesamum and cotton was investigated.

ı orsepurselane root reduced the germination of sorghum. The vigour index was also affected (22%) with root and whole weed plant. Horse purselane inhibited the finger millet germination (43%) root length 54% and vigour index (17%). Groundnut germination and seedling characters not affected allelopathically but induced the germination and seedling growth. Mungbean germination was effected to a very little extent (8%) but not the total dry weight and vigour index.

Amaranthus weeds affected the finger millet seedling characters. But germination and vigour index were affected to a little extent. There was no alleolopathic effect of *Amaranthus* weeds on maize and groundnut seeds. Pearl millet germination was affected (14%). It induced the germination and seedling growth of groundnut.

ALLELOPATHIC INTERACTIONS OF SOME TROPICAL WEEDS

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Allelopathic influence of some tropical weeds was studied on the growth and development of wheat, mung, bean, nitrogenase activity and *Rhizobium* culture. It was observed that a few weeds have promotory allelopathic effects and such effects are species specific. *Ahenopodium album* had throughout promotory effects on wheat, mung bean, nitroganase activity and *Rhizoblum* culture. *Aalosia argentea, Rumex dentatus* and *Phalaris minor* also promoted wheat growth and increased grain yield. *R. dentatus* increased the mung bean growth and nitrogenase activity. *Avena ludoviciana* and *Airsium arvense* though increased the growth but depressed the nitrogenase activity. The promotion or inhibition of *Rhizobium* growth depended upon the concentration of the leachates in the medium.

EFFECT OF WEEDICIDES ON PHYNOLOGY OF *SOLANUM XANTHOCARPUM* SCHRAD AND WENDL

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In order to study the effect of different weedicides on phynology of *Solanum xanthocarpum*, spray applications of different concentrations were made at pre-flowering stage (60 day old plants). Range of concentrations of maleic hydrazide and sodium arsenite used were 200, 400, 600, 800, 1000, 1500, 2000, 3000, 4000, 5000, 6000, 7000 ppm. An initiation of flowering was noted with all the sets treated with above concentrations of MH. Sodium arsenite above 1000 ppm concentration suppressed flower initiation in *S. xantho-carpum*. All the concentrations of 2, 4-D above 50 ppm prevented flowering in *S. xantho-carpum*. The plants treated with 25 and 50 ppm 2, 4-D showed flowering after 32 and 48 days of treatment respectively, while control plants flowered after 17 days of treatment (of distilled water). Present investigation proved that 2, 4-D is most effective in suppressing the flowering. Suppression of flowering results in suppression of weed, which is an indirect way of weed control.

EFFECT ON SPRAY APPLICATION OF WEEDICIDES ON THE RATE OF MORALITY OF *SOLUNUM XANTHOCARPUM* SCHRAD. & WENDL. PLANTS

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The present investigation deals with the effect of spray application (made at pre-flowering stage-60 day old plants) of MH, sodium arsenite and 2, 4-D on the rate of mortality of the weed, *Solauum xanthocarpum*.

The weedicides were found to be effective in controlling the vegetative growth of *S. xanthocarpum.* The apical and lateral vegetative growth was inhibited and they were stunted in growth. The stem turned yellowish instead of green. The flowering and fruiting was delayed. The leaves were injured at their margin, apex and at places on the lamina. The injury increased at higher concentrations.

A NEW APPROACH IN THE CONTROL OF *SOLANUM XANTHOCARPUM*

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Solanum xanthocarpum is a very common weed found all over the world. The plants of *S, xanthocarpum* treated with 25 and 50 ppm 2, 4-D showed delayed flowering *viz.* after 31 and 46 days respectively after spray treatment. However, the flowering was completely suppressed in all the sets treated with the higher concentration than those of 50 ppm. Above observations were made with the sets sprayed at the pre-flowering stage (60 day old plants). The sets sprayed at the post-flowering stage (110 day old plants) showed flower development only up to first 4 days after spray treatment in the sets sprayed with 50, 75, 100, 200 ppm 2, 4-D. Even in these cases the initiation of new flower was never detected however, the flower buds which appeared before spray treatment developed to maturity.

It was on the 12th day, all the plants died at 1400 and 1600 ppm, while 40% plants were surviving treated with 1200 ppm. Hence, 1400 ppm confirmed to be the lethal dose. This proves that flowering can be inhibited by very low doses of the weedicide, while killing the weed itself requires very heavy doses that would certainly affect the crop as well.

DORMANCY, VIABILITY AND GERMINATION STUDIES ON HORSE PURSELANE, PERTHENIUM, AMARANTHUS AND ECHINOCHOLA WEEDS

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The experiment was conducted under laboratory condition. The following weed seeds viz. horse purslane *(Trianbhema portulacastrnm),* Parthenium (*Parthenium hysterophorous*) *Amaranthus* (*Amaranthus viridis*) and *Echinochloa* (*Echinochola colonum*) were collected. In the month of July-August, 1982 and stored in two different conditions *viz.*, seeds stored in bottles and kept in laboratory and seeds mixed with soil and burried in soil.

The seeds were drawn and the germination tests were conducted (starting from September, 1982). in petri dishes using filter paper every month, The initial germination perentage was recorded as 23, 60, 4 and 10 for horsepurslane, *Parthenium, Amaranthus* and *Echinochola,* respectively.

As the storage period (in bottle and soil) advanced in the case of horsepurslane, the germination percentage also increased correspondingly indicating the breaking of dormancy and maintenance of viability. In the case of *Parthenium* both bottle and soil stored seeds showed initial high value and continued to maintain the medium value upto five months. There was not much difference in two conditions of storage of *Amaranthus* seeds regarding germintation. The seeds of *Echinochola* stored in bottles gave higher value of germination than the soil stored seeds. There was an increase in value for germination, than the soil stored seeds. There was an increase in germination as the storage period increased.

TRANSLOCATION OF POST-EMERGENCE HERBICIDIES ON *SOLANUM ELAEGNIFOLIUM*

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ICAR (P. L. 480) AICRP on weed control TNAU, Coimbatore

Solanum (white horse neetle) is a problematic perennial dicot weed and is prevalent in Tamil Madu and more in Coimbatore and Preiyar districts. It has deep stem and root systems existing upto 2 to 3 meters in the soil. *Solanum elaegnifoltum* propagation is both by sexual and vegetative. A bit of either stem of root will sprout into plants. Field trial was taken in Farmers' field at Uddukkanapalayam (Pollachi Taluk) under rainfed fallow condition. Post emergence herbicide viz. glyposate (0.6, 1.2, 1.8 kg/ha), dicamba 0.48 kg/ha, dicamba 0.12 kg+2, 4-D 0.24 kg/ha; 2, 4-D Na salt 2 kg/ha and unweed control were formed the treatments.

Diacamba 0.48 kg/ha was effective on solanum whereas the other herbicides had only partial effect. There was no regeneration of weeds when treated with dicamba 0.48 kg/ha alone upto two months, but thereafter regeneration of weeds (20 plants/0.25 sq. m) was there. There was little effect of glyposate on the control of this weed.

Another field experiment was taken up in Farmers field at Caltonpettai (Palladam taluk) under fallow condition with the following treatments. Dicamba 0.96 (1st spray)+0.96 kg/ha (2nd spray); dicamba 0.48 kg+2, 4-D 0.96 kg/ha; dicamba 0.24 kg + 2, 4-D 0.48 kg/ha (1st spray) + dicamba 0.24 kg+2, 4-D 0.48 kg/ha (2nd spray); glyposate 1.6 kg/ha; glyposate 0.8 kg/ha (1st spray) + 0.8/ha (2nd spray); dicamba 0.96 kg+glyposate 0.8 kg/ha (one time) and unweeded control.

Dicamba at 1.92 kg/ha caused damage to the stem or the root below the soil only upto 5 to 7.5 cm besides foliage. Thereafter no damage to these parts was also noted and this resulted in regeneration after two months. Regeneration in dicamba at 1.92 kg/ha was less (6 plants/0.25/m^2) whereas in the control it was 24 plants/0.25/m^2. But the other treatments with dicamba showed little more regeneration (i. e.) 10 plants/0.25 sq. m. Glyposate alone or in combination had only partial destruction of foliage, slight chlorines and more of regeneration of weed ranging from 15 to 20 plants/0.25 m^2.

CORRELATION AND REGRESSION OF GROWTH AND YIELD OF SAFFLOWER IN RELATION TO WEEDS

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The influence of the weeds on growth and yield of safflower was studied through correlation and regression analyses. The weed population at the initial stage and the weed population at initial and harvest were positively correlated with weed biomass at harvest. All these three characters had inverse relation with crop biomass ($r = -0.7648, -0.8175, -0.6060$) and seed yield ($r = -0.8171, -0.8504, -0.5546$). The weed biomass also had negative correlation with crop height, number of filled capsule and branches per plant but the latter was highly significant ($r = -0.8392$). Regression analyses showed linear increase in weed biomass with increase in weed population. The reduction in crop biomass could be predicted by 3.11 kg/ha with increase of one weed plant $-m^2$ and by 1.14 q/ha with increase of one quintal weed biomass/ha. Whereas the reduction in seed yield could be predicted by 440 g and 14.38 kg/ha respectively.

CORRELATION OF WEED PARAMETERS WITH GROWTH AND YIELD OF WHEAT

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The correlation and regression studies were done to find the relationships of weed population and weed biomass with crop growth, yield attributes and yield of wheat. The correlation analyses revealed that weed population at early stage had significant positive association with weed population and weed biomass at harvest ($r = 0.970, 0.963$). These three factors exhibited significant negative correlation with effective tillers/plant (-0.633, -0.583, -0.626), grain weight/ear (-0.642, -0.734, -0.675), 1000-grain weight (-0.506, -0.593, -0.582), crop biomass/ha (-0.707, -0.665, -0.658) and grain yield/ha (-0.848, -0.834, -0.804). However, the correlations with plant hight were positive and with ear length were negative but nonsignificant. The regression analyses predicted that one weed plant $-m^2$ can cause the reduction in grain yield of wheat by 1.574 kg/ha., while the accumulation of one quintal biomass/ha by weeds can reduce the grain yield by 517 kg/ha. The increase of 17.05 kg grain yield can be predicted with increase of one precent weed control efficiehcy of a treatment.

VARIETAL REACTION OF RICE TO BUTACHLORE AND PENDIMETHALIN

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An experiment to study the varietal reaction of rice to butachlor and Pendimethalin was carried out in splits plot design having weed control treatments in main plot and varieties in sup-plots at the University farm of Rajendra Agricultural University during Kharif 1981-82 and 1982-83. Results revealed that reaction of varieties to herbicides was not alike in both the years. In the year 1981-82 none of the varieties reacted either to butachlore or to pendimethalin but in 1982-83, varieties R. D. 201 reacted to both the herbicides, where as, Pankaj to Pendimethalin only. The effect of butachlor was found antagonistic while that of Pendimethalin as synergestic.

EFFECT OF HERBICIDES ON PIGMENT DEVELOPMENT AND YIELD OF WHEAT IN CALCAREOUS SOIL

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An experiment having methabenzthiazuron, pendimethalin, handweeding and control and three levels of nitrogen (0,60 and 150 kg N/ha was carried out during rabi 1982-83. Results revealed that herbicides and nitrogen had significant effect on chlorohhyll development. Higher level of nitrogen did not prove benefical in increasing the chlorophyll content. Weed control treatments helped in higher yield but did not reach the level of significance.

at different dosages. 2, 4-D due to its quick detoxication did not significantly affect the nitrogen transformation processes. Propanil, when used at 150 ppm concentration, resulted in accumulation of NO_2-N, but after 42nd day of incubation, there was no trace of free NO_2-N. However, at lower concentrations, propanil slightly enhanced the nitrification process. Pendimethalin at 10 and 100 ppm caused NO_2-N accumulation on 14th day of incubation and afterwards free NO_2^- ions could not be detected. However, at 100 ppm, Pendimethalin drastically reduced the nitrification process. Though at lower concentrations Stomp and Propanil do not have any deleterious effect, they do reveal potential effect on N-transformations at higher concentrations.

STUDIES ON EFFICACY OF SOME HERBICIDES AGAINST *FUSARIUM MONILIFORME* SHELD. AND *MACROPHOMINA PHOSEOLINA* (TASSI) GOID

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Experiments were laid out both *'in vitro'* and in sterilized soil to study the efficacy of five herbicides (ametryne, atrazine, alachlor, simazine 22, 4-D) against the stalk rotting fungi of maize viz., *Fusarium moniliforme* sheld. and *Macrophomina phaseolina* (Tassi) Goid.

On *Fusarium moniliforme* : 4000 ppm concentration of ametryne and atrazine gave effective control (53.83 and 42.92 per cent respectively) *'in vitro'*, while the least effective was 2, 4-D (14.55 per cent). In soil atrazine faired well (25.92 per cent) while 2, 4-D was again least effective (3.77 per cent). Ametryne (16.32 per cent) and alachlor (16.00 per cent) did not differ significantly. However, on *Macrophomina phaseolina* : 4000 ppm ametryne was significantly superior over all other chemicals (70.20 per cent)*'in vitro'*, while the next best were simazine and 2, 4-D (31.96 and 29.30 per cent). There was no significant difference between atrazine and alachlor (22.38 and 22.39 per cent respectively). In soil, except ametryne (36.06 per cent) all others were proved to be ineffective against this fungus. The least efficacy was recorded with 2, 4-D (2.56 per cent).

COMPARATIVE BIOEFFICACY OF DIFFERENT HERBICIDES AGAINST *POA ANNUA* L. IN BERSEEM (*TRIFOLIUM ALEXANDRINUM* L.)

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Field studies were carried out during 1978-79 and 1979-80 in which the bioefficacy fluchloralin, trifluralin, methabenzthiazuron and pendimethalin was compared against *Poa*

annua in berseem. Pre-plant application of fluchloralin at 0.6 kg/ha proved most effective and it gave 118.5 kg/ha dry matter of *Poa* as against 1407 kg/ha (average of two years) for unweeded control and was closely followed by trifluralin 0.6 kg/ha. Both fluchloralin and trifluralin at 0.9 kg/ha, however, gave marked reduction in the intensity of *Poa annua* but gave slight reduction in the fodder yield of berseem also due to their phytotoxic effect on the crop. Fluchloralin 0.6 kg/ha gave maximum green fodder as well as dry matter yield of crop (44% over unweeded). During 1978-79, post-emergence application of methabenzthiazuron both at 0.35 and 0.7 kg/ha not only proved ineffective against *Poa annua* but also gave phytotoxic effect on the crop as well. But the tank mix pre-emergence application of methabenzthiazuron 0.35+fluchloralin 0.3 kg/ha gave an effective control of this weed without any phytotoxic effect on the crop.

EFFECT OF PHENOLIC ACIDS TREATMENT AND MIXED CROPPING ON STIGA INFESTATION IN SORGHUM

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A field experiment was conducted on a striga-sick sandy loam soil during *kharif* seasons of 1980, 1981 and 1982 under dryland conditions to study the usefulness of pre-sowing seed hardening of sorghum seeds with three phenolic acids viz. Caffeic, Ferullic and Vanillic acids combined with their supplemental spray to sorghum crop, in reducing striga infestation in sorghum under field conditions. The usefulness of mixed cropping of coriander and roselle with sorghum for the above purpose was also studied. It was found that during all the three years the three phenolic acids used either in pre-sowing seed hardening alone or supplemented with spray to sorghum crop were neither useful in reducing striga infestation nor in increasing sorghum yields. Mixed croppIng of corianer and roselle with sorghum was also not useful either in reducing striga infestation or increasing sorghum yields. The striga infestation was as high as 641 plants/m^2 and the sorghum yield was as low as 0.3 q/ha.

EFFECT OF HERBICIDES ON THE COMPOSITION OF CYANOBACTERIA OF PADDY FIELDS

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Application of herbieides like 2, 4-D, benthiocarp, butachlor and propanil in water-logged paddy fields has been studied to assess the impact of these herbicides on the compo-

sition of cynobacteria, a group of photosynthetic procaryotes which serve as a good source of natural fertilizer (biofertilizer) in paddy fields. Herbicides sensitivity was less marked in non-heterocystous species than heterocystous ones although the data reveal the abundance of heterocystous, nitrogen-fixing forms over unicellular cyanobacteria. In all cases (herbicide-treated plots) there was dominance of *Phormidium* and *Microcystis* species and less abundance of *Cylindrospermum*, *Anabaena variabilis*, and *Fischerella*. However, certain species of *Nostoc* and *Galothix* were present in abundance. A good number of cyanobacterial akinetes (spores) were invariabily found in all samples and most of them showed resemblence to *Nostoc* or *Anabaena* when germinated on agar nutrient. On the basis of average occurrence of cyanobacteria under herbicide stress in field conditions the herbicides were not found inhibitory to cynobacterial growth barring certain sensitive species.

RESIDUAL EFFECTS OF HERBICIDES

STUDIES ON TRIAZINE RESIDUE TOXICITY WITH MASH *(VIGNA MUNGO)* AND COWPEA *(VIGNA SINENSIS)* AS INDICATOR PLANTS

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Bioassay standard curve using *Vigna mungo* (Mash) and *Vigna sinensis* (Cowpeas) as the indicator plants was developed for studies on soil persistence of atrazine. The amount of commercial herbicide required to give a series of soil concentrations from 0, 0.05, 0.10, 0.20, 0.40 and 0.80 ppm by weight of soil was applied. These studies showed that these indicator plants are sensitive enough to monitor herbicide residues as low as 0.3 to 0.8 ppm in soil. The visual injury rating on abnormal growth characteristics showed that dry weight decreased as herbicide concentration increased. The GR_{50} is at 0.3 ppm. A highly significant negative correlation coefficient $r = 0.944$ and $r = 0.916$ existed between concentration and dry weight of the indicator plants.

HERBICIDE RESIDUES IN SOIL

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Green gram (*vigna radiata*) was sown after harvesting wheat, in order to see the persistence of herbicides in soil. The herbicides were applied to wheat at all the six critical growth stages, through contaminated irrigation water after controlling aquatic weeds. The herbicides used were, 2, 4-D, paraquat and diuron at 2.5 and 5.0 ppm concentrations. Only diuron at both concentrations had adverse effect on the growth and yield of wheat. Crown root initiation, late tillering, jointing and upto some extent heading stages have been found to be sensitive to herbicides contaminated irrigation water. Diuron contaminated water applied to wheat, showed a long residual effect as the green gram sown after harvesting wheat, showed significant decrease in pod yield and dry matter production. Water hyacinth plants regenerated in case of paraquat. The 24-D contaminated water applied to wheat at milk and dough stages, also showed phyto toxic effect on mung bean.

HERBICIDES AND DEVELOPMENT

STUDIES ON THE EFFECTIVENESS OF THIOBENCARB ON SOME IMPORTANT KHARIF WEEDS

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Experiments were conducted to investigate the effect of thiobencarb on some important kharif weeds, when applied in different doses (0, 1.0, 1.5 and 2.0 kg/ha) as pre-emergence or at different growth stages of various weed species (1, 2, 3 & 4 leaf stage).

It was found that the sensitivity of the weeds to thiobencarb was in the order of *Echinochloa colonum, Cyperus iria, Dactyloctenium aegypticum* and *Trianthema portulacastrum.* Pre-emergence application of thiobencarb did not inhibited germination but inhibited the development of the young seedlings. When percent mortality was plotted against log concentration of thiobencarb, it was observed that *E. colonum* showed the maximum percent mortality at all concentrations as supported by estimated GR_{50} values. The doses of thiobencarb required to reduce 50 percent growth GR_{50} was lower when it was applied as pre-emergence and it increased with corresponding increase in the age when the herbicide was applied as post-emergence.

EFFECT OF PLANTING DATES ON SEEDLING EMERGENCE AND FLOWERING IN *TRIANTHEMA PORTULACASTRUM L.* AND *DIGERA ARVENSIS FORSK*

Department of Agronomy, H. A. U. Hissar

Seeds of *Trianthema portulacastrum* L. and *Digera arvensis* Forsk. Were planted 1 cm. deep in soil filled in earthen pots on 3rd July, 19th July, 4th August and 19th August 1980. It has been observed that in 3rd July planting seelings took 6 and 7 days for emergence for *T. portulacastrum* and *D. arvensis* respectively. In latter dates of plantlng seedlings emerged in 4 and 5 days for respective weed species. Length of shoot and number of leaves decreased progressively with delay in planting date. Seedlings of 3rd July planting took 18 and 15 days after emergence for flowering in case of *portulacastrum* and *D. arvensis,* respectively while later planted seedlings flowered much earlier. This indicates that later emerging weeds try to complete their life cycle at an early date.

AN ANALYSIS OF POTENCIES OF HERBICIDE MIXTURES

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The experiment was conducted in soil (6.5 percent clay & 2.3 percent organic matter) collected from Research Station of Royal Vety. & Agril University, Tasstrup, Denmark. The soil was treated by adding analytical grade TCA (99 percent), metamitron (99.5 percent) and ethofumesate (96 percent) as well as constant ratios of TCA and ethofumesate (10 : 1) and TCA and metamitron (5 : 2).

The regressions of dry matter on the doses for TCA and ethofumesate and metamitron applied alone showed that the slope of the regression lines on logit scale for ethofumesate (0.760) and TCA (1.085) were not significantly different. The slope of metamitron was significantly greater than those of ethofumesate and TCA. TCA was 24 3 times less active than ethofumesate and 62 times less active than metamitron. Ethofumesate+TCA reduced the dry matter more than the expected response and the effect of metamitron when mixed with TCA was less than the expected response.

MINERAL COMPOSITION OF SOME CROPS AND THEIR ASSOCIATED WEEDS

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With a view to assess the nutrient removal from the soil by different crop plants and several weed species, an investigation was carried out during 1981-82. The analysis of mineral composition of crops and weeds indicated that weeds are more efficient in removing plant nutrients such as N, P and K as compared to crop plants. As the weeds are rich in plant nutrients such as N, P and K, they can be best utilised as green manure or as composting material.

STUDIES ON NITRIFICATION IN FLOODED SOILS AS INFLUENCED BY SOME HERBICIDES

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A laboratory experiment was conducted to study the effect of 2, 4-D, Propanil and Stomp (Pendimethalin) on soil nitrification in stimulated oxidised surface of flooded soil

SOIL RESIDUAL STUDIES OF NORFLURAZON (ZORIAL) HERBICIDE

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Norflurazon (San 9789) (4-chloro-5-(methylamino)-2-(3-trifluorom-tolyl) 3-(2 H)-pyridazinone) herbicide was applied as a pre-emergence treatment for *Sorghum halepense* control at 0.02-0.64g per pot of 30 cm size in Feb., 1982. Eleven months after, the soil residual studies were conducted in these pots by sowing *Hordeum vulgare* (barley), *Triticum vulgare* (wheat) and *Brassica compestris* (mustard) seeds. Seed germination was not affected however, the seedling growth was severely checked depending upon the herbicide concentrations present in the soil. The characteristic symptoms were light mediated formation of white foliage as compared to green foliage of control seedlings.

Residues at 0.32-0.64 g existed in toxic levels at soil surface zone containing the germinating seeds which were devoid of chlorophyll at their early stage of growth and they died within 12-18 days period. At 0.08-0-16 g concentrations residues were present in deeper soil zone due to leaching. Roots of seedlings reaching into these zones absorbed residues and thereby, dechlorophyllised the young green foliage of 12 days old seedlings. The subsequent developing foliage was also white to a variable degree and the foliage once turned white was permanently affected and did not become green although herbicide residues had dissipated at these concentrations during 22-28 days as was evidenced by the formation of complete green leaves. The various growth parameters of seedlings were equally but severely inhibited in *H. vulgare* and *T. vulgare* in comparison to *B. compestris*. The herbicide at 0.02-0.04 g concentrations did not carry any residual effect. The monocots were more susceptible to the residues and thus proved better bioassay material for testing norflurazon residual activity.

HERBICIDAL CONTROL OF WATER HYACINTH AND ITS EEEECT ON CHEMICAL COMPOSITION OF WATER

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The experiment was conducted during 1982 in the circular lined pits to study the effect of herbicides and their minimum possible contact period, on the mortality and regeneration of water hyacinth. 2, 4 – D and glyphosate at 1 and 2 kg/ha controlled water hyacinth effectively, whereas paraquat could not control it due to low doses (0.25 and 0.5 kg/ha). Almost 100 per cent sinking of plants took place, 50 days after spraying of 2, 4 – D and glyphosate. pH of water decreased and E. C. increased after herbicides application. The chemical composition of water in respect of HCO_3, Cl, Ca, Mg, K and Na also altered due to mortality of plants. 2, 4 – D required only 1 to 2 days contact period at higher and lower doses, whereas glyphosate required 4 to 6 days, respectively for 100 per cent mortality of water hyacinth.

RATE OF ABSORPTION OF HERBICIDES AND EFFECT OF TIME INTERVAL OF PLANT WASHING ON MORTALITY OF WATER HYACINTH

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The experiment was conducted at the Aquatic weed section during June 1979 with an idea to know that following the foliar spray, in how much time a particular herbicide is absorbed in sufficient quantity to kill water hyacinth plants completely. The herbicides used were, 2, 4-D, paraquat and glyphosate each at the rate of 2kg a. i./ha. Water hyacinth plants after spraying, were taken out at leight time intervals for plant washing (1/3, 1, 3, 6 and 24 hours and 2, 4 and 8 days). Out of the three herbicides, the rate of absorption of paraquat was most rapid. A minimum of 6 hours of contact period was required in case of paraquat applied at 2 kg/ha for cent per cent killing of water hyacinth plants, whereas atleast 2 days of contact period was required in case of 2, 4-D and glyphosate for obtaining 100 per cent mortality.

GROWTH OF *HYDRILLA VERTICILLATA* (ROYLE) UNDER CLEAN WATER AND AZOLLA COVER

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Growth of hydrilla *(Hydrilla verticillata* Royle) plants was studied under clean water and Azolla cover at Haryana Agricultural University, Hissar during 1982. 10 cm segments of 0.5 g average dry weight of hydrilla were planted in plastic buckets which were placed in the cemented pits of 1000 litre capacity with and without Azolla. Dry weight per plant and average length of hydrilla were measured at 160 days after planting.

Increase in dry weight under clean water receiving full light was 50 times higher than initial dry weight. Under azolla cover the increase in dry weight was 40 times from initial dry weight. Under clean water treatment average length of shoots increased from 10 cm to 121 cm and under Azolla cover the shoot length increased only to 98 cm. Number of tubers per plant recorded after 160 days of planting were 29.2 under clean water and 14.6 under Azolla cover.

EFFICIENT METHOD OF APPLICATION OF 2 ,4-D FOR THE CONTROL OF WATER HYACINTH *(EICHHORNIA CRASSIPES* (MORT.) SOLMS)

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Four separate experiments were conducted on water hyacinth maintained in cemented trenches and plastic tubs during 1983. The mortality of water hyacinth increased with corresponding increase in the length of exposure time. At 1 kg/ha, 16 hr. exposure was necessary to achieve complete mortality of water hyacinth. Application of 2, 4-D through wax with the help of hand rubbing gave 100 percent injury to water hyacinth when whole plant was treated with wax cubes. The treatment of youngest leaf resulted in complete drying of leaves but the fleats of water hyacinth remained green which might help in the regeneration of new leaves. Different concentration of 2, 4-D dissolved in wax and its rubbing on leaves gave 68.3 to 100 percent injury in water tubs and 25 to 90 percent injury in the cemented trenches.

ACQUATIC WEED CONTROL

HERBICIDES FOR CONTROLLING WATER HYACINTH *(EICHHORNIA) CRASSIPES* (MORT), SOLMS

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In 1983 for controlling this weed with herbicides like sodium salt of 2, 4-D and 2, 4-D amine alone, 2, 4-D+paraquat, 2, 4-D amine+wetting agent at different doses. Observations were recorded at 15 days interval upto 60 DAS (days after spraying) and resprouts were counted at an interval of 30 days, upto 90 DAS. Combination of 2, 4-D 4.0+paraquat 0.5 kg/ha recorded maximum mortality (90%) and at 60 DAS 2, 4-D amine 3.60 kg+wetting agent 1.0 l/ha and 2, 4-D 4.0+paraquat 0.5 kg/ha recorded 100 per cent mortality. The persistent action of the herbicide, 2, 4-D amine 5.4 kg/ha remained upto 90 DAS recording only one resprout Per m^2, followed by 2, 4-D 4.0+paraquat 0.5 kg/ha, 2, 4-D amine 3.60 kg+sandovit 1.0 lit/ha recording three resprouts per m^2, where 2, 4-D 8.0 kg/ha and 2, 4-D amine 3.60 kg/ha recorded maximum number of resprouts i. e., 6 per m^2, while in control plot there was an increase in weed population (57.2%).

CONTROL OF *PISTIA STRATIOTES* (LINN). WITH HERBICIDES

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Pistia stratiotes L., water lettuce is a small free floating gregarious plant mostly found in rural tanks and stagnated water spots. Its presence in tanks causes inconvenience to fishing. To control this weed, trials were laidout with 2, 4-D+paraquat, 2, 4-D amine+ wetting agent, 2, 4-D and paraquat alone at different concentrations during 1983 in a drainage channel near Bapatla, Guntur (Dist) of Andhra Pradesh. Results indicated that Sodium salt of 2, 4-D 4.0+paraquat 0.5 kg/ha and paraquat alone 1.0 kg/ha recorded 100 per cent mortality followed by 2, 4-D 4.0+paraquat 0.25 kg/ha recording 90 per cent mortality within 5 DAS (days after spraying). There were no resprouts with 2, 4-D 4.0+paraquat 0.5 kg/ha and paraquat alone 1.0 kg/ha upto 45 DAS, while other herbicide treatments recorded more number of resprouts. For controlling *Pistia* under stagnated water conditions paraquat 1.0 kg/ha or 2, 4-D 4.0+ paraquat 0.5 kg/ha can be recommended.

CONTROL OF *IPOMOEA CARNEA* (JACQ.) WITH HERBICIDES

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Ipomoea carnea Jacq. originally introduced as green manure plant has become a trouble some perennial weed in almost all drainage and irrigation channels as well as on tank bunds. Presence of this weed in irrigation and drainage channels is causing obstruction to free flow of water in the channels. Hence, trials were conducted to test the effect of 2, 4–D+paraquat, 2, 4–D+wetting agent, 2, 4–D+Urea, 2,4–D amine+Urea and 2, 4–D amine alone at different doses on controlling this problematic weed. The herbicides were sprayed on the actively growing weed with a spray solution of 750 l/ha during 1982-83 and 1983-84. Among the herbicides tested, 2, 4–D amine 3.60 kg/ha recorded 100 per cent mortality at 15 DAS (days after spraying), while the rest of herbicide treatments recorded 69.5 to 92 per cent mortality. Combinations of 2, 4–D 4.0+paraquat 0.5 kg/ha, 2, 4–D 3.0 kg/ha+3% urea recorded 100 per cent mortality at 45 DAS. There were no resprouts at 30 DAS with 2, 4–D 4.0+paraquat 0.5 kg/ha and 2, 4–D amine 3 6 kg/ha and the same trend of recording lower number of resprouts was maintained even upto 90 DAS. In unsprayed control plot the population was almost doubled.

For the control of *Ipomoea carnea* in drainage and irrigation channels 2, 4–D amine 3.6 kg/ha can be recommended.