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ABSTRACT OF PAPERS

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CONTENTS

1. INTEGRATED WEED MANAGEMENT STUDIES IN DIRECT SEEDED UPLAND RICE

N.N. Angiras and V.K.Sharma, Department of Agronomy, Himachal Pradesh Krishi Vishvav-Vidyalaya, Palampur-176 062.

Field experiment was conducted at the experimental farm of HPKV, Palampur, during *Kharif* 1991 to 1993 with 16 treatment combinations at two seed rates (100 and 150 kg ha^{-1}), two interculture operations (halod and without halod) and four weed control methods (HW twice at 15 and 30 DAS, butachlor 1.5 kg ha^{-1} at 3 DAS, oxyfluorfen 0.25 kg ha^{-1} at 3 DAS) and pendimethalin 1.5 kg ha^{-1} at 3 DAS arranged in randomised block design with three replications. The oxyfluorfen 0.25 kg ha^{-1} (pre-emergence) alone and in combination with *halod* and higher seed rate of 150 kg ha^{-1} increased the paddy grain yield by reducing the total weeds and weed biomass with a WCE of 70.9 per cent. Butachlor and HW twice twice without *halod* were next best. Halod increased the efficacy of oxyfluorfen and pendimethalin. The gross returns (Rs.11970) were higher in oxyfluorfen 0.25 kg ha^{-1} with *halod*.

2. ALLELOCHEMICALS FOR WEED MANAGEMENT IN RICE CROP

N.Arunachalam, C.Ramaswami and V.S.Shanmugasundaram, Department of Agronomy, Tamil Nadu Agricultural University, Coimbatore - 641 003

The usefulness of pure allelochemicals for weed management in rice was studied at TNAU Farm, Coimbatore with three allelochemicals viz., (i) phloroglucinol (at 100, 200, 300 ppm/m^2) (ii) Caffeic acid (at 50, 100, 150 ppm/m^2) (iii) Wattle tanin (at 300, 600 and 900 ppm/m^2) (iv) fresh neem leaf water extract (at 2.5 lit/m^2) and compared with controls (control 1: paddy alone and control 2: no paddy, no chemical). Results indicated that application of wattle tannin inhibited paddy (IR 20) seed germination at higher concentration, while Caffeic at 100 ppm level reduced *Echinochloa* spp. germination and DMP drastically at 50 ppm level.

3. CHEMICAL WEED MANAGEMENT ON THE SEEDLING VIGOUR OF LOW AND UPLAND RICE NURSERIES

R.Balasubramanian and V.Veerabadran, Agricultural College and Research Institute, Killikulam, Tamil Nadu Agriculture University, Tamil Nadu

Field experiments on weed management in lowland and upland rice nurseries were conducted during kharif, 1993 at ACRI Killikulam, Tamil Nadu. The pre-emergence herbicides viz. thiobencarb, butachlor and pendimethalin were applied at 8 DAS. Pretilachlor in upland nursery (dry seeds) and pretilachlor plus safener (Fenchlorim) in lowland nursery (sprouted seeds) were applied at 4 and 8 DAS. Pretilachlor at 4 and 8 DAS showed very effective weed control and improved the seedling

height, leaf number, leaf area, DMP and chlorophyll content. Use of pretilachlor @ 0.75 kg ha^{-1} at 4 DAS in upland nursery and application of pretilachlor plus safener @ 0.5 kg/ha at 8 DAS in lowland nursery were superior for effective weed control and improved seedling vigour.

4. TIME OF APPLICATION OF HERBICIDES AGAINST *Echinochloa crusgalli* IN TRANSPLANTED RICE

L.S. Brar and U.S.Walia, Department of Agronomy, Punjab Agricultural University, Ludhiana - 141 004, India

Field trials were conducted in the experimental farm of PAU Ludhiana during Kharif 1992 and 1993. The herbicides cinmethalin at 0.08, 0.10 and 0.12 kg/ha, oxyflurofen at 0.3 kg during 1992 and oxadiazon at 0.5 kg/ha during 1993 were applied at 5, 10 and 15 DAT and compared with pre-emergence application of anilofos at 0.3 kg/ha against *Echinochloa crusgalli*. The delayed application of herbicides from 5 to 15 DAT (except oxadiazon) resulted in poor control of *E. crusgalli*. Highest seed yield of 47.6 q/ha was obtained with the application of oxadiazon 0.5 kg/ha applied at 10 DAT followed by anilofos 0.3 kg/ha 3 DAT and cinmethalin 0.10 kg/ha at 5 DAT.

5. EFFECT OF HERBICIDES ON WEED CONTROL AND YIELD OF DIRECT SEEDED RICE UNDER PUDDLED CONDITIONS

M.N.Budhar, P.Muthukrishnan, N.Kempuchetty and T.B.Ranganathan, Tamil Nadu Rice Research Institute, Aduthurai - 612 101

A field experiment was conducted at TRRI Aduthurai during *Kuruvai 1993*, to identify effective herbicides for controlling the weeds of direct sown rice under puddled condition. Three liquid herbicides viz., Anilofos 30 EC @ 0.4 and 0.6 kg ai/ha, Anilofos + 2,4-DEE (24 + 32 EC) @ 0.30 and 0.40 and 0.40 and 0.53 kg ai/ha and Butachlor 50 EC @ 1.0, 1.5 kg ai/ha were evaluated against weedy check and hand weeding treatments. All the herbicides were effective in controlling weeds at varving doses. The pre emergence herbicides viz., Anilofos + 2,4-D, EE at 0.3 and 0.4 kg ai/ha and Butachlor, 1.0 kg ai/ha were effective in increasing the yield.

6. EFFECT OF PLANTING GEOMETRY AND TIME OF APPLICATION OF NITROGEN ON GROWTH AND UPTAKE OF N BY WEEDS IN RICE FIELD

Dr.K.K.Chandragiri, Professor of Agronomy, Sugarcane Research Station, Cuddalore-607 001

Field experiments were conducted at ARS Bhavanisagar in split plot design in two years with two rice varieties (IR 50 & Co 41) to study the effect of planting geometry and time of application of N on growth and

uptake of N by weeds. Varieties did not influence the weed population and DMP. Random planting recorded higher weeds and weed biomass than row planting methods. Single application of N .to rice registered higher weeds and weed biomass than split application of N. Full basal (M1) N application recorded higher N uptake by rice while the split N application favoured higher uptake of N by weeds at 40 DAT. Paired row planting increased the grain yield. Application of N in 4 splits recorded higher grain yield than other timings of N application.

7. WEED MANAGEMENT IN DIRECT-SEEDED LATE *SALI* RICE (*Oryza sativa* L.)

J.K.Choudhary, R.K. Thakuria and G.R.Das, Regional Agricultural Research Station, Assam Agricultural University, Karimganj-788 710

Field trials were conducted during 1992-93 to evaluate a few herbicides in pre-germinated direct-seeded late *Sali* rice (Oryza sativa L.). Anilofos (0.40, 0.60 kg ai/ha), combination of anilofos and 2,4-D EE (0.30 + 0.40 and 0.43 + 0.53 kg ai/ha), butachlor (1.5 kg ai/ha) and pretilachlor (0.50, 0.70 kg ai/ha) proved toxic to pre-germinated rice seeds. In 1992, pretilachlor plus at 0.45 kg ai/ha, combined application of butachlor + pretilachlor at 1.0 + 0.50 kg ai/ha and pretilachlor plus at 0.60 kg ai/ha were significantly superior. In 1993, butachlor at 1.0 kg ai/ha either alone or followed by HW at 20-25 DAS was superior.

8. ECONOMICS OF WEED MANAGEMENT IN TRANSPLANTED AHU RICE (Oryza sativa L.)

J.K. Choudhary, R.K.Thakuria and G.R.Das, Regional Agricultural Research Station, Assam Agricultural University, Karimganj-788 710

A field experiment was carried out during 1992-93 to study the economics of weed management with a few rice herbicides in transplanted *ahu* rice (var. Krishna). Pre-emergence application of 2,4-D Na either at 0.5 or 0.75 kg ai/ha, thiobencarb and butachlor each at 1.5 kg ai/ha were integrated with paddy weeder application at 40 DAT and compared with pre- or post-emergence application of 2,4-D Na either at 0.5 or 0.75 kg ai/ha, hand weeding and paddy weeder application. 1.5 kg ai/ha thiobencarb or butachlor combined with paddy weeder at 40 DAT followed by 0.75 kg ai/ha 2,4-D Na at 20 DAT controlled weeds and increased grain yield. Though the benefit of weed control was higher from thiobencarb application (Rs.3149.95 against Rs.2310.00 from 0.75 kg ai/ha 2,4-D Na 20 DAT), marginal benefit-to-cost ratio was higher with 2,4-D Na at 0.75 kg ai/ha 20 DAT (12.13 against 2.56 from thiobencarb) because of latter's lesser weed control cost.

9. EFFECT OF HERBICIDES ON N UPTAKE BY RICE AND WEEDS

S.C. Deka and A.K. Gogoi, AICRP on Weed Control, Department of Agronomy, Assam Agricultural University, Jorhat-785 013

A field experiment was conducted at the Instructional cum Research farm, Assam Agricultural University, Jorhat during rainy season, 1993 to evaluate the effect of certain pre-emergence herbicides viz. butachlor (1.0 kg/ha), anilofos (0.4 kg/ha) and oxyflourfen (0.1 kg/ha) on N uptake by rice crop and weeds. The N uptake by both rice and weeds was estimated at 45 DAT. The herbicides enabled rice crop to assimilate more N by suppressing the weed growth. The highest uptake of N (37.39 kg/ha) by rice was recorded with butachlor. The unchecked weed growth depleted as much as 38.88 kg/ha. The application of pre-emergence herbicides, increased the N uptake by the rice crop upto 60 to 70% as compared to weedy check crop. Major quantity of nitrogen was utilised by the weeds in transplanted rice.

10. CHEMICAL WEED MANAGEMENT IN RICE NURSERIES UNDER DRY SOWN CONDITIONS

Dharam Pal, R.K.Malik and Samar Singh, CCS Haryana Agricultural University, Regional Research Station, Uchani, Karnal-132 001

Two years field experiments were conducted at Haryana Agricultural University, Regional Research Station, Karnal during 1990 and 1991. *Trianthema portulacastrum* and *Echinochloa crusgalli* were the dominant weed species. The weed control percentage was the same in the rice nursery irrespective of the method of sowing such as line sowing or broadcasting. Seedling injury was greater in broadcast sown nursery than that of line sown nursery. Of the herbicides, pendimethalin provided better weed control and lesser crop injury than butachlor. Dry weight of weeds and rice seedlings were not affected by sowing methods.

11. INTEGRATED WEED MANAGMENT IN DIRECT SEEDED PUDDLED RICE

S.D.Dhiman and D.P.Nandal, CCS HAU Rice Research Station, Kaul- 132 021, Haryana

To identify suitable weed control measures for direct seeded rice under puddled conditions, the study was conducted at CCS HAU Rice Research Station, Kaul during Kharif, 1993 & 1994. A promising herbicide butachlor was applied at 1.5 and 1.0 kg a.i./ha and was compared against hand weeding twice, weed free check and weedy check. The lower dose of herbicide was followed by one HW or application of 2,4-D Na at 30 DAS. Highest grain yield of 53.42 q/ha was recorded with weed free check. However, 5.36 q/ha of grain yield and 920 g/m^2 of weed dry weight was observed under weedy check. Hand weeding twice registered grain yield of 47.68 q/ha and reduced weed dry weight (89.8 g/m^2). Butachlor 1.0 kg/ha followed by one HW

proved as effective as HW twice in reducing weed dry weight (102.3 g/m^2) and increasing rice yield (45.61 q/ha). Highest net return of Rs.12,250/ha due to weed management was obtained with butachlor 1.0 kg/ha in combination with one hand weeding which was followed by hand weeding twice (Rs.11730) and weed free check (Rs.11700 per hectare).

12. SCREENING OF HERBICIDES FOR THE CONTROL OF WEEDS IN TRANSPLANTED RICE (*Oryza sativa* L.)

Eshwarappa,H.R.Shivakumar,T.V.Muniyappa and V.Suresh Babu, Department of Agronomy, University of Agricultural Sciences, Bangalore-560 065

A field experiment was conducted at Main Research Station, UAS, Bangalore during kharif season of 1991, to evaluate the efficacy of different pre-emergence herbicides viz., butachlor (2.5 kg/ha), anilofos (0.5 kg/ha), pendimethalin (1.5 kg/ha), pretilachlor (0.75 kg/ha), oxyfluorfen (0.075 kg/ha) and 2,4-D EE (1.0 kg/ha) alone and in combination (half of the recommended dose) with 2,4-D EE (0.5 kg/ha) for the control of weeds in transplanted rice against conventional method of weed control along with unweeded check were tried in RBD. The application of butachlor at 1.25 kg, pendimethalin at 0.75 kg/ha, pretilachlor at 0.5 kg/ha and each in combination with 2,4-D EE at 0.5 kg/ha have controlled the weeds and weed DMP and increased the grain yield. The conventional methods have emerged with higher grain yields over other treatments.

13. ECONOMICS OF WEED CONTROL IN TRANSPLANTED RICE (*Oryza sativa L.*)

Eshwarappa, H.R.Shivakumar, T.V.Muniyappa and V.Suresh Babu, Department of Agronomy, University of Agricultural Sciences, Bangalore-560 065

Field experiment was conducted at Main Research Station, UAS, Bangalore, during the *kharif* season of 1991, to work out the economics of weed control by a few pre-emergence herbicides in transplanted rice. The experiment was laidout in RBD and consisted of butachlor (2.5 kg/ha), anilofos (0.5 kg/ha), pendimethalin (1.5 kg/ha), pretilachlor (0.75 kg/ha) oxyfluorfen (0.075 kg/ha) and 2,4-D EE (1.0 kg/ha) alone and in combination with 2,4-D EE (0.5 kg/ha) besides weed free check and weedy check. The highest return was obtained with weed free treatment (Rs.13016.7/ha) followed by butachlor at 1.25 kg/ha + 2,4-D EE at 0.5 kg/ha (Rs.12917.1/ha), anilofos at 0.25 kg/ha + 2, 4-D ethyl ester at 0.5 kg/ha (Rs.12280.9/ha) and pendimelthalin at 0.75 kg/ha + 2,4-D ethyl ester at 0.5 kg/ha (Rs.11939.4/ha). The higher returns were due to higher grain yield as the result of efficient control of weeds by the herbicides. The highest profit per rupee spent on weed control was obtained in anilofos at 0.25 kg/ha + 2,4-D ethyl easter at 0.5 kg/ha

(Rs.19.2) and anilofos at 0.5 kg/ha (Rs.16.47). which was due to lower cost of weed control and higher grain yields.

14. EFFECT OF VARIETIES, PLANT WASTE AND HERBICIDES ON WEED GROWTH AND YIELD OF SUMMER RICE

A.K.Gogoi, Department of Agronomy, Assam Agricultural University, Jorhat: 785 013, INDIA.

A field experiment was conducted during summer 1992 at AAU, Jorhat to find out the effect of traditional varieties (*Fapori* and *Kolaguni*), Plant waste (sawdust, rice husk and rapeseed stover) and preemergence herbicides (butachlor 1.5 and anilofos 0.40 kg/ha on weed control and yield of direct seeded summer rice. Results revealed that Fapori, a low tillering, stress tollerent, tall variety suppressed weed growth than Kolaguni. Lower weed DMP was recorded in Fapori (195 g/m^2) than Kolaguni (215 g/m^2) with rice husk application followed by one mechanical weeding (twin wheel hoe at 25 DAS as compared to the preemergence application of anilofos 0.4 kg/ha + sawdust. The maximum grain yield was obtained under butachlor 1.5 kg/ha + sawdust (24.8 q/ha) in Kolaguni. In both the varieties grain yield recorded under application of rice husk and rapeseed stover followed by dryland weeder (25 DAS) was at par.

15. EFFECT OF RATE OF APPLICATION OF PRETILACHLOR AND PRETILACHLOR + SAFENER N PHYTOTOXICITY AND WEED CONTROL IN WET-SEEDED RICE

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Two experiments were conducted at the Regional Research Station, Chiplima of OUAT during wet season of 1992 (June to November) and dry season of 1993 (January to May) to evaluate the effect of pretilachlor and pretilachlor + safener - in wet-seeded rice. Pretilachlor caused significant reduction in the rice stand while pretilachlor + safener applied 6 DAS did not reduce the rice stand. Application of pretilachlor @ 0.5 kg ai/ha caused less crop damage, gave better weed control and higher yield compared to application of 0.75 and 1.00 kg ai/ha at 6 DAS. But weed control was superior and yields were greater with the medium (0.60) and high (0.75 kg ai/ha) rates of pretilachlor + safener and butachlor + pretilachlor treatments.

16. USE OF CLOMAZONE IN TRANSPLANTED RICE

V.Jha, S.C.Tripathi, M.S.Mithyantha and K.Sivasankaran, Plot Nos. 21 & 22, Peenya, Phase II, Bangalore-560 058

A field trial was conducted at Talkad, District Mysore during Kharif season of 1994 to study the possible use of CLOMAZONE 50 EC

(COMMAND) in rice variety Sona Masoori, Clomazone 50 EC @ 180, 240 and 300 g a.i./ha was compared with Butachlor @ 1.0 Kg a.i./ha, Anilofos @ 450 g a.i./ha and clomazone @ 300 g a.i./ha with Phorate 1.0 Kg a.i./ha, all applied as sand mix at 3 DAT. Clomazone was not phytotoxic to Rice seedlings. 180 g a.i./ha of Clomazone gave excellent control of *Echinochloa crusgalli*, *Cyperus iria*, *Cyanatis cucullata*, and *Marsilea quadrifolia* in terms of lower weed count and weed dry weight than Butahlor and Anilofos. Clomazone bleached the weeds 4 days after application, indicating its herbicidal activity visually. Safening of rice with Phorate is not required when Clomazone is used @ 300 g a.i./ha as Clomazone alone is safe to rice. Clomazone can effectively and safely be used in transplanted rice.

17. WEED MANAGEMENT STUDIES IN DIRECT SEEDED RAINFED UPLAND PADDY UNDER MID HILL CONDITIONS OF HIMACHAL PRADESH

B.D. Kalia, Himachal Prádesh Krishi Vishvavidyalaya, Rice Research Station, Malan-176 047, H.P.

The field experiment on weed control in direct seeded rainfed upland paddy was conducted at the experimnetal farm HPKV of Rice Research Station, Malan, during Kharif seasons of 1993 and 1994. The treatments consisted of hand weeding, weed free check, butachlor, anilofos and pendimethalin. The results revealed that pre-emergence application of herbicides viz. anilofos @ 0.4 kg a.i./ha, butachlor @ 1.5 kg a.i./ha and pendimethalin @ 1.5 kg a.i./ha applied at 2 DAS resulted in a good rice yield comparable to weed free check. Pre-emergence application of butachlor @ 1.5 kg a.i./ha at 2 DAS gave higher yield than its application at 3 or 4 DAS of rice crop.

18. EFFECT OF TIMING OF HERBICIDE APPLICATION ON THE ECONOMICS OF WET SEEDED RICE PRODUCTION

O.S.Kandasamy and R.Chandrababu, Department of Agronomy, Tamil Nadu Agricultural University, Coimbatore - 641 003

Three trials were conducted at TNAU, Coimbatore during summer 1992, kharif and rabi, 1993. The herbicide treatments consisted of three herbicides viz., thiobencarb, pretilachlor (+ safener) and anilofos as single herbicide and each in combination with 2,4-DEE as herbicide mixtures applied 2 DBS and 4,6 and 8 DAS in split plot design. Reduced crop damage was recorded with herbicide application at 8 DAS (243 plants m^{-2}) or 4 DBS (229 plants m^{-2}). Herbicide mixture anilofos + 2,4-DEE (33.4 per cent) reduced the plant stand substantially. Pretilachlor (+ safaner) recorded the maximum plant stand. In general single herbicide applied at 6 or 8 DAS limited the weed growth. Maximum grain yield of 50.6 q ha^{-1} was recorded at 8 DAS application. Application of pretilachlor (+ safener) enhanced the yield to 54.5 q ha^{-1} and thiobencarb yielding at par (53.1 q ha^{-1}).

The higher B:C ratio was obtained in wet seed rice by applying pretilachlor (+ safener) (2.75) or thiobencarb at 8 DAS each followed by a handweeding.

19. ECO-PHYSIOLOGICAL STUDIES WITH *Caesulia Axillaris* ROXB. AN EMERGING PROBLEM WEED IN TRANSPLANTED RICE

Lakhwinder Singh Brar and Jaspinder Singh Kolar, Department of Agronomy, Punjab Agricultural University, Ludhiana

To know the eco-physiology of *Caesulia axillaris* Roxb., experiments were conducted both under laboratory and field conditions at PAU, Ludhiana, during 1992 and 1993. *Caesulia* seeds germinated only from the shallow soil depth (4 cm). Fresh and two year old seeds showed poor germination, but temperature range of 20-35°C was conducive for the germination of one year old seeds of *Caesulia axillaris*. Continuous submergence under 5 cm deep water checked the germination of seeds. However, emergence started after the drainage of ponded water. Under field conditions majority of seedling emerged within a week after transplanting. *Caesulia* plants suffered poor growth when associating with transplanted rice.

20. EVALUATION OF AROZIN 2% (ANILOFOS) GRANULES FOR CONTROL OF WEEDS IN TRANSPLANTED RICE

S.M.Kondap, N. Narasimha Reddy, N. Venkat Reddy and M.Padmavathi Devi, APAU, Rajendranagar, Hyderabad-30

An investigation was carried out at Raiendranagar, Hyderabad during kharif 1992 and 1993 to study the performance of Arozin (anilofos) 2 % granules at different rates individually and in combination with 2,4-DEE for control of weeds in transplanted rice. Arozin 2% G was evaluated at 0.2, 0.3, 0.4 and 0.5 kg a.i. ha^{-1} and its combination with 2,4-DEE and 0.4 kg a.i. ha^{-1}. Arozin 30% EC at 0.1875 and 0.375 kg a.i. ha^{-1} and its combination with 2,4-DEE at 0.2 and 0.4 kg a.i. ha^{-1} was also tested with Standard checks viz. butachlor at 1.5 kg a.i. ha^{-1} two HW at 25 and 45 DAT. Arozin 2% G (anilophos) at 0.4 kg a.i. ha^{-1} controlled weed effectively and recorded highest rice grain yield. Arozin 2% G at lower rates i.e. 0.2 and 0.3 kg a.i. ha^{-1} failed to control weeds while arozin 2% G at 0.5 kg a.i. ha^{-1} was phytotoxic to rice crop as reflected by rice grain yield. Combination of 2,4-DEE at 0.4 kg a.i. ha^{-1} either with arozin 2% G at 0.2 kg a.i. ha^{-1} or with arozin 30% EC at 0.1875 kg a.i. ha^{-1} controlled weeds well and recorded rice grain yield on par with two HW at 25 and 45 DAT. Butachlor at 1.5 kg a.i. ha^{-1} and Arozin 30% EC at 0.3750 kg a.i. ha^{-1} also controlled the weeds effectively and recorded rice grain yield on a par with two HW. Weed drymatter, weed control efficiency and cost benefit ratio were evaluated.

21. CRITICAL PERIOD OF COMPETITION BETWEEN *Caesulia Axillaris* ROXB. AND TRANSPLANTED

Lakhwinder Singh Brar, Jaspinder Singh Kolar & L.S.Brar, Department of Agronomy, Punjab Agricultural University, Ludhiana

Field trials were conducted at PAU Ludhiana during 1992 and 1993 to work out the critical period of competition between *Caesulia axillaris* Roxb. and transplanted rice. Continuous infestation of Caesulia axillaris in transplanted rice caused 33 per cent reduction in grain yield. The initial period of 40-70 DAT was critical period of competition for *Caesulia axillaris* in transplanted rice. Weed free period for 30 days during the initial crop growth stage was favourable.

22. CHEMICAL WEED CONTROL IN PUDDLED SEEDED RICE

Madhu, M., Nanjappa, H.V. and Ramachandrappa, B.K., Department of agronomy, Agricultural College, GKVK, Bangalore-560 065.

A field experiment was conducted during summer and kharif seasons of 1992 at wetland of Main Research Station, U.A.S., Bangalore to findout the suitable herbicide for control of weeds in puddled seeded rice. The study included the herbicides viz., pendimethalin, butachlor and butachlor safener each at 1.0 and 1.5 kg per ha and anilofos at 0.30 and 0.45 kg per ha, oxyfluorfen at 0.10 and 0.15 kg per ha with HW twice (20 and 40 DAS) and weedy check standards. Results indicated that butachlor safener at the rate of 1.5 kg per ha recorded significantly higher grain yield (3.14 t/ha) compared to oxyfluorfen at the rate of 0.10 and 0.15 kg per ha (1.83 and 2.02 t/ha respectively) and HW twice (2.05 t/ha) treatments. Significantly higher straw yield was recorded with butachlor safener at 1.50 kg per ha (5.48 t/ha) over all the weed control treatments except pendimethalin at 1.0 kg per ha (4.45 t/ha), butachlor at 1.0 kg per ha (4.44 t/ha), oxyfluorfen at 0.10 kg per ha (4.10 t/ha) and unweeded check (2.57 t/ha). However, all the weed control treatments were significantly superior over unweeded check (4.04 t/ha) except oxyfluorfen at 0.10 kg per ha (4.10 t/ha). Correspondingly the yield attributes of rice also recorded positive increase.

23. CROP WEED COMPETITION IN PUDDLED SEEDED RICE

Madhu, M., Nanjappa, H.V. and Maheswarappa, A.P., Department of Agronomy, Agricultural College, GKVK, Bangalore-560 065.

A field experiment was conducted during summer and kharif seasons of 1992 at Wetlands of Main Research Station, U.A.S., Bangalore with sixteen treatments comprising of seven weed free treatments (weed free upto 20, 30, 40, 50, 60, 70 and 80 DAS), seven infestation treatments (weed infestation upto 20, 30, 40, 50, 60, 70 and 80 DAS) weed free

and weedy check standards. The weedfree treatment recorded significantly higher grain yield (4.06 t/ha) and straw yield (6.80 t/ha). Among the weed free and weed infestation periods, weed free upto 80 DAS was favourable for higher yield (3.64 t/ha). Unweeded check recorded lower grain yield (1.60 g/ha) and straw yield (3.26 t/ha). It is concluded that weedfree condition upto 50 DAS is essential to get maximum yield.

24. WEED CONTROL IN TRANSPLANTED RICE

U.V.Mahadkar, S.A. Khanwilkar, S.B.Bhagat and I.A.Bhatkar, Department of Agronomy, Konkan Krishi Vidyapeeth, Dapoli (India)

The field experiment was conducted during rainy season of 1993 to find out the suitable herbicide and its dose to control weeds in transplanted rice. Higher grain and straw yields were recorded in the treatment Arozin + Nomor applied @ 1000 + 625 ml/ha at 8 DAT. Weed control efficiency was highest due to the application of Arozin + Nomor @ 1000 + 625 ml/ha at 8 DAT (45.1 %) followed by Arozin + Nomor @ 625 + 625 ml/ha at 3 DAT (43.9%).

25. WEED CONTROL IN DIRECT SEEDED RICE

U.V.Mahadkar and S.A.Khanwilkar, Department of Agronomy, Konkan Krishi Vidyapeeth, Dapoli. (India)

Field experiment were conducted during rainy season, 1992 and 1993 to study the effect of herbicides on weedflora and yield of rice. Higher grain yield was recorded in the treatment Aniloguard plus @ 1750 ml/ha as compared to other treatments. Relative density of weed was higher in case of Dhur (*Echinochloa* spp.) ranging from 91.5 to 96.16 per cent as compared to other weeds. Weed control efficiency was the highest due to application of Aniloguard plus @ 1750 ml/ha (72.8%) followed by Aniloguard plus @ 1500 ml/ha (72.2%).

26. MONETARY ANALYSIS OF WEED CONTROL MEASURES IN DIRECT SEEDED RICE

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Results of three years (1990 to 1992) experment revealed that the hand weeding twice at 15 and 30 DAS gave significantly higher grain yield of rice over all other weed control measures. Pre- emergence application of butachlor @ 1.5 kg a.i./ha was most effective as compared to anilofos, paddy straw mulch and weedy check. Though, the cost of hand weeding twice was higher its weed control efficiency was more with higher grain yield of rice resulting in highest net profit per hectare. Hand weeding-twice is recommended for effective weed

control, if labour is available cheap. Highest net profit by hand weeding was received in Rahu sown crop followed by drilling, dibbling and broadcast. Use of paddy straw mulch and anilofos are uneconomical.

27. INTEGRATED WEED MANAGEMENT IN DIRECT SEEDED UPLAND RICE

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Field experiment in upland direct seeded rice was conducted to evaluate the weed control efficacy of pendimethalin at 1.0 and 2.0 kg a.i./ha and manual weedings under various seed rates (100 and 150 kg/ha) and methods of sowing (one direction and cross sowing). Weed density and weed biomass significantly reduced due to higher seed rate and cross sowing of paddy over one direction sowing. The combination of higher seedrate and cross row sowing favourably increased the rice grain yield. Two handweeding at 20 and 40 DAS produced higher grain yield at higher seed rate irrespective of method of sowing. Pre-emergence application of pendimethalin at 2.0 kg a.i/ha, irrespective of seed rate and sowing method, resulted in more efficient weed control than 1.00 kg dose. The highest grain yield was obtained due to hand weeding at 20 and 40 DAS under cross sowing at 150 kg seedrate/ha.

28. INTEGRATED WEED MANAGEMENT IN DIRECT-SEEDED RAINFED RICE UNDER MEDIUM LAND ECOSYSTEM

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The field experiment was conducted during wet season of 1991 to evaluate the efficicacy of the farmers practice of weed management called *beusani* along with two herbcides butachlor @ 1.5 kg a.i./ha and pendimethalin @ 1.0 kg a.i./ha in direct-seeded rainfed rice. *Beusani* consists of ploughing the standing crop of rice by a narrow bottomed wooden plough at 30 DAS. Application of butachlor @ 1.5 kg a.i./ha *beusani* at 30 DAS and two HW at 37 and 55 DAS registered the highest grain yield of 3358 kg/ha with a weed control efficiency of 88.7 per cent. This was followed by pendimethalin @ 1.0 kg a.i./ha with *beusani* and one HW at 55 DAS which recorded a grain yield of 3143 kg/ha and a WCE of 86.5 %.

29. CHEMICAL WEED CONTROL IN PUDDLE SEEDED RICE IN DRY SEASON IN COASTAL ORISSA

B.T.S. Moorthy, Division of Agronomy, Central Rice Research Institute, Cuttack, 753 006, Orissar

An experiment was carried out during dry seasons of 1993 and 1994 at Cuttack (coastal alluvial soil) to evaluate different pre- emergence

herbicides at different rates of application for controlling weeds in puddled seeded rice. Among the treatments, thiobencarb (saturn 50 EC) (1.0 kg/ha), pretilachlor plus safener (sofit 30 EC) at 0.45 and 0.6 kg/ha and anilofos (2 G) at 0.4 kg/ha gave higher weed control and grain yield. The hercide anilofos (Aniloguard 30 EC) alone and in combination with 2,4-DEE showed higher degree of phytotoxicity on rice seedlings while granular fomulations of anilofos did not cause any phytotoxicity. During 1994 experiment, anilofos EC (0.4 and 0.6 kg/ha), anilofos + 2, 4-DEE (0.3 + 0.42 kg/ha and 0.4 and 0.53 kg/ha), butachlor (Trapp 50 EC) at 1.0 and 1.5 kg/ha, pendimethalin (1.0 and 1.5 kg/ha) recorded higher yield comparable to weedfree check. The herbicide combination - anilofos + 2,4-DEE at both rates showed slight and recoverable phytoxicitity during this year.

30. SOLFONYL UREA HERBICIDES FOR EFFECTIVE AND SAFE WEED CONTROL IN WHEAT AND RICE

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Three new herbicides metsulfuron methyl 2, 4 and 8 g/ha, chlorimuron ethyl 6, 12 and 24 g/ha and tribenuron methyl 7.5, 15 and 30 g/ha were applied as post-emergence spray along with standard wheat herbicide isoproturon 1000 g/ha both as pre and post emergence in wheat crop. In the rice field same sulfonyl urea herbicides (metsulfuron methyl 2 g/ha, chlorimuron ethyl 6 g/ha and tribenuron methyl 7.5 g/ha) were applied along with rice herbicides butachlor (1500 g/ha), anilophos (400 g/ha) oxadiazon (500 g/ha), oxyflurofen (125 g/ha) and cinmethylin (80 g/ha) as pre-emergence. The sulfonyl herbicides at all *three* doses significantly reduced the weed growth and increased the grain yield both in rice and wheat. The higher dose of chlorimuron ethyl i.e. 24 g/ha was phototoxic to wheat crop but metsulfuron methyl was most effective agaisnt weeds and increased the yield of crop at 8 g/ha dose. The herbicides, butachlor, anilofos and cinmethylin were not effective in controlling broad leaved weeds. Among the herbicidal treatments, metsulfuron methyl with as low dose as 2 g/ha recorded highest grain yield followed by oxadiazon 500 g/ha. Oxyfluorfen at 125 g/ha. was phytotoxic on rice crop.

31. EFFECT 'OF HERBICIDES ON WEED CONTROL AND YIELD OF TRANSPLANTED RICE

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A field experiment was conducted at TRRI, Aduthurai during Kuruvai 1993 in order to identify the effective herbicides for controlling weeds in transplanted rice. Three liquid formulations of butachlor 50 EC @ 1.5 kg a.i/ha, pretilachlor 50 EC @ 0.5 and 0.75 kg ai/ha the combination

product anilophos + 2,4-DEE (24 + 32 EC) @ 0.30 and 0.40 and 0.40 and 0.53 kg ai/ha, granular formulation of anilophos 2 G @ 0.4 and 0.6 ai/ha and wettable power formulation of oxyfluorfen 25 WP @ 0.05 and 1.10 kg ai/ha were evaluated against hand weeded as well s non-weeded control. Considering the weed dry matter, yield attributes and yield, application of Anilophos 0.4 kg ai/ha, Anilophos + 2,4-DEE kg ai/ha + 2,4D, Na 0.40 kg ai/ha, Pretilachlor 0.5 kg ai/ha and Oxyfluorfen 0.05 kg ai/ha were equally effective in controlling the weeds, and increasing the yield.

32. STUDIES ON ANILOFOS PLUS IN DIRECT SOWN PUDDLED RICE

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Field experiment was conducted during kharif 1992-93 with an objective to evaluate the rate, time of application and efficacy of anilofos *plus* in direct sown puddled rice at Agriculture College Farm, Rajendranagar, Hyderabad. Anilofos *plus* which constituted anilofos at 24% EC and 2,4-DEE at 32% EC was evaluated at two rates viz. 0.30 + 0.40 and 0.45 + 0.60 kg a.i/ha of anilofos and 2,4-DEE, respectively along with anilofos (aniloguard 30% EC) at 0.4 kg ai/ha butachlor at 1.5 kg ai/ha, pretilachlor at 1.0 kg ai/ha and 2,4-DEE at 1.0 kg ai/ha, hand weeding at 25 and 45 DAS and unweeded check. Anilofos *plus* was applied at 8, 10 and 12 DAS. All weeds, except *Scirpus* sp. and *Paspalum* sp were controlled by more than 70 per cent. Lower rate of anilofos *plus* at 0.3 + 0.40 kg ai/ha applied at 10 and 12 DAS recorded more grain yield compared to higher rate of anilofos *plus* at 0.45 + 0.60 kg ai/ha since higher rate caused toxicity to rice crop at all dates. The toxicity was highest at 8 DAS. Anilofos *plus* even at lower at 8 DAS were toxic to rice seedlings. Pretilachlor also caused toxicity and recorded low yield. Butachlor at 1.5 kg ai/ha and 2,4-DEE at 1.0 kg ai/ha recorded grain yield at par with two hand weedings. However anilofos *plus* at 0.30 + 0.40 kg ai/ha applied at 10 or 12 DAS in puddled soil appears to be good since no toxicity of rice seedlings was noticed and recorded good control of weeds and higher rice grain yields.

33. ECONOMICS OF WEED CONTROL METHODS IN DIRECT SEEDED RICE UNDER PUDDLED CONDITION

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Field experiment to determine the economical method of weed control in direct seeded rice under puddled condition was conducted during rainy season of 1990 at Agronomy Research Farm N.D.U.A.T., Kumarganj, Faizabad (U.P.) India. Application of pendimethalin @ 1.0 kg/ha as pre-emergence + 2,4-D Na salt @ 0.5 kg/ha as post-emergence proved most economical followed by the application of butachlor @ 1.5

kg/ha as pre-emergence + 2,4-D Na salt @ 0.5 kg/ha as post-emergence. Hand weeding 20 and 40 DAS was not economical as compared to all the herbicide treatments.

34. EFFECT OF HERBICIDE MIXTURES AND SEQUENTIAL APPLICATIONS ON WEED CONTROL IN TRANSPLANTED RICE (*Oryza sativa* L.)

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Field experiment were conducted in transplanted rice to evaluate the efficiency of different herbicide mixtures alone and in sequence with 2,4-DEE application (0.5 and 1.0 kg/ha) at Research Farm, Institute of Agricultural Science, Banaras Hindu University, Varanasi during monsoon seasons of 1991 and 1992. Resutls indicated that pre-emergence application of anilofos 0.2 + 2,4-DEE 0.5 kg/ha supplemented with sequential application of 2,4-DEE 1.0 kg/ha at 23 DAT was as good as HW twice at 20 and 40 DAT in controlling weeds and achieving grain yield. Regression analysis indicated that there was a negative relationship between weed dry weight and grain yield.

35. MANAGEMENT OF WEEDS IN DIRECT SOWN RICE WITH BUTACHLOR-SAFENER MIXTURE COMBINATIONS

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Field trial was conducted for weed control in upland rice at the Agricultural College, Bapatla during *Kharif* 1994-'95 with butachlor-safener mixture (3.0, 4.0 and 4.5 l/ha), butachlor (1.5 kg/ha) and benthiocarb) 1.5 kg/ha) as pre-emergence spray comparing with HW twice (20 and 40 DAS) and unweeded control. Reduced weed biomass was recorded with butachlor-safener mixture at all the three doses compared to butachlor and benthiocarb. The crop growth was good. Maximum grain yield (1653 kg/ha) was recorded in hand weeding twice, followed by butachlor safener mixture @ 4.0 (1620 kg/ha) and 4.5 l/ha (1570 kg/ha).

36. WEED MANAGEMENT IN BROADCAST SOWN RAINFED LOWLAND RICE VARIETIES

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The field experiment was conducted in the rainy season of 1993. Hand weeding 15 days after beaushening (cross ploughing) resulted in greatest reduction of weed density and weed dry weight which increased grain yield by 37 per cent over weedy check and by 31.5 per cent over only beaushening operation. Irrespective of the weed control practices,

CR 1006 significantly outyielded Padmini and was followed by varieties viz., Gayatri, Kabirajsal, Utkalprabha, Manasarovar and Tulasi.

37. WEED CONTROL IN TRANSPLANTED LOWLAND RICE WITH DIFFERENT DOSE AND TIME OF APPLICATION OF PYRAZOSULFURON-ETHYL (NC 311-10% WP)

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Two field experiments were conducted at Annamalai University Experimental Farm to evaluate the optimum dose and time of application for Pyrazosulfuron-ethyl (NC 311) herbicide for weed control in transplanted rice during 1992-'93 seasons with ADT 36 rice. The treatments were T_0-weedy check, T_1-weedfree check, T_2-butachlor 1.5 Kg ai ha^{-1} at 5 DAT, T_3-NC 311 @ 210 g ha^{-1} at a) 5 DAT b) 10 DAT c) 15 DAT and d) 20 DAT, T_4-NC 311 @ 315 g ha^{-1} at a) 5 DAT b) 10 DAT c) 15 DAT and d) 20 DAT and T_5- NC 311 @ 420 g ha^{-1} at a) 5 DAT b) 10 DAT c) 15 DAT and d) 20 DAT. Butachlor was sandmixed and broadcast while Pyrazosulfuron- ethyl (NC 311) was sprayed in water emulsion by Knapsac sprayer. The water level was kept at 2.5 cm depth before herbicide application. Among the treatments, T_5 (c) NC 311 @ 420 g ha^{-1} at 15 DAT and T_4 (c) NC 311 @ 315 g ha^{-1} at 15 DAT were superior. These treatments recorded lesser weed biomass (T_5 c-48.4 Kg/ha, T_4 c-52.4 Kg/ha), higher WCI (T_5c-68% T_4c-67%) and lesser WI (T_5c-2.1%, T_4c-2.3%). The grain yield of ADT 36 was higher (T_5c- 5.24 t/ha. T_4c-5.19 t/ha) due to better weed control.

38. OPTIMUM TIME OF HERBICIDE APPLICATION FOR DIRECT PUDDLE SOWN LOWLAND RICE CV-ADT 36.

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Two field experiments were conducted at Annamalai University experimental farm in 1991-'92 with Adt 36 rice. The treatments T_0-weedy check, T_1-weedfree check, T_2-butachlor 2 DBS, T_3- butachlor at sowing, T_4-butachlor 2 DAS, T_5-butachlor 4 DAS, T_6- butachlor 6 DAS, T_7-butachlor 8 DAS, T_8-oxyfluorfen 2 DBS, T_9-oxyfluorfen at sowing, T_{10}-oxyfluorfen 2 DAS, T_{11}- oxyfluorfen 4 DAS, T_{12}-oxyfluorfen 6 DAS and T_{13}-oxyfluorfen 8 DAS were tested for weed control in direct sown wet seeded lowland rice cv. Adt 36. Butachlor @ 1.25 Kg ai and oxyfluorfen @ 0.15 Kg ai/ha were used as pre-emergence spraying in eacn treatment. The seedrate was 200 Kg/ha. Moisture was kept at saturation level till 8 DAS followed by 2.5 cm water thereafter. Among the treatments, oxyfluorfen 2 DBS (T_8) and butachlor 4 DAS (T_5) proved superior. They recorded lower weed biomass (T_8 - 285 Kg/ha, T_5 - 316 Kg/ha), higher weed control idex (T_8 - 64 %, T_5 - 63%), low weed index (T_8 - 2.2 %, T_5 3.2 %) and higher grain yield (T_8 - 3.9 t/ha, T_5 - 3.8 t/ha) as compared to other treatments.

39. COMPETITION OF SEDGEWEEDS IN TRANSPLANTED RICE

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The sedgeweeds, *Cyperus rotundus* and *Fimbristylis littoralis* were studied for their competition in transplanted rice in three seasons during 1985-'87. The infestation experiment consisted of I_0 weed free check, I_1 - weed infestation at 15 DAT of rice, I_2 - infestation at 30 DAT of rice, I_3 - infestation at 45 DAT of rice, I_4 - infestation at 60 DAT of rice and I_5 - weedy check. In all the treatments 30 % weed infestation level was constant. The earlier infestations at I_5, I_1 and I_2 registered significantly higher weed biomass (1665 Kg/ha, 1639 Kg/ha and 1424 Kg/ha) and higher weed index (40%, 40% and 33%). The grain yield also correspondingly decreased with (I_5) - 3.34 t/ha, I_1 - 3.33 t/ha. This indicates that the late emerging weeds after 45 DAT are less harmful to rice crop. In the weeding experiment with E_0 - weedy check, E_1 - weeding at 15 DAT, E_2 - weeding at 30 DAT, E_3 - Weeding at 45 DAT, E_4 - weeding at 60 DAT and E_5 - weedfree check treatments, the early weeding at 15 DAT (E_1) and 30 DAT (E_2) of rice facilitated the rice crop for higher yield (E_1 - 5.52 t/ha, E_2 - 4.58 t/ha). The weed biomass decreased due to early weeding at 15 DAT and 30 DAT (E_1 - 998 Kg/ha E_2-1643 Kg/ha). Weed Index was also less with E_1 - 9.8 % and E_2 - 26%. Delayed weeding beyond 30 DAT was adverse similar to unweeded crop and resulted in lower grain yield in transplanted rice. Hence early weeding before 30 DAT is essential.

40. CHEMICAL WEED CONTROL OF SEDGEWEEDS IN TRANSPLANTED RICE

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Three field experiments were conducted during 1985-'87 at Annamalai University Experimental Farm to evaluate suitable chemical control measures against sedgeweeds in transplanted lowland rice. The underground rhizomes and rootslips of two sedge weeds viz., *Cyperus rotundus* and *Fimbristylis littoralis* were artificially inoculated in each treatment plot at the time of transplanting the rice seedlings. The chemical weed control treatment consisted of T_0 - weedy check, T_1 - weedfree check, T_2 - butachlor @ 1.5 Kg/ha, T_3 - thiobencarb @ 1.5 Kg/ha, T_4 - 2,4 - D(E) @ 1.5 Kg/ha, T_5 - oxadiazon @ 1.25 Kg/ha, T_6 - Anilofos @ 0.30 Kg/ha, T_7 - butachlor @ 0.75 Kg/ha + 2,4 - D(E) @ 0.75 Kg/ha, T_8 - thiobencarb @ 0.75 Kg/ha + 2,4 - D(E) @ 0.75 Kg/ha, T_9 - Oxadiazon @ 0.625 Kg/ha + 2,4 - D(E) @ 0.75 Kg/ha and T_{10} - Anilofos @ 0.15 Kg/ha + 2,4 - D(E) @ 0.75 Kg/ha. All the chemical treatments were applied as sandmix broadcasting as pre- emergence at 5 DAT. Sand was used @ 50 Kg/ha. Between the two sedges, *F. littoralis* was better controlled by herbicides than *C. rotundus* (biomass -

414 Kg/ha, 428 Kg/ha respectively). The sedge *C. rotundus* wascomparatively tolerant to herbicide because of its persistent underground rhizome. In general, 2,4-D herbicide combination with butachlor / thiobencarb / oxadiazon proved efficient to suppress the sedges and promoted increased growth and yield of rice.

41. EFFECT OF NITROGEN MANAGEMENT ON THE WEED FLORA, GROWTH AND YIELD OF TRANSPLANTED RICE cv ADT 36 (*Oryza sativa* L.)

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A field experiment was conducted to compare the efficiency of different organic manures and graded levels of fertilizer nitrogen in influencing the weedflora, growth and yield of transplanted rice cultivar ADT 36. The different sources of organic manures tried were FYM, pressmud and *Glyricidia maculata* all @ 10 t ha^{-1}. The graded levels of fertilizer nitrogen were 50 and 100 Kg ha^{-1}. Among the different organic manures, pressmud 10 t ha^{-1} was superior and recorded lesser weed count (20.30 m^{-2}) and lesser weed DMP (544 Kg ha^{-1}), higher grain (4.54 t ha^{-1}) and straw yield (9.40 t ha^{-1}). Among the graded levels of N application, 100 Kg ha^{-1} was better, recording reduced weed count (27.31 m^{-2}) dry matter (736.35 Kg ha^{-1}) and increased the crop yield (4.54 t ha^{-1}) than 50 Kg ha^{-1}.

42. EFFECT OF TIME OF APPLICATION OF HERBICIDES ON THE GERMINATION, GROWTH AND YIELD OF SEMI-DRY RICE

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Field experiment was conducted at ACRI, Madurai during 1992-93 to findout the effect of time of application of herbicides on the germination, growth and yield of semi-dry rice. The herbicides viz., pendimethalin (1.5 kg.ha^{-1}), pretilachlor (1.00 kg ha^{-1}) applied at 8 DAS and pretilachlor with safener (0.3 kg ha^{-1}) at 4 DAR and 8 DAR each followed by one manual weeding (MW) on at DAR were tested. Pendimethalin + LMW, Pretilachlor (4 DAR) + 1 MW and pretilachlor (8 DAR) + 1 MW registered high weed control efficiency. Pretilachlor at 4 DAR affected rice seedling due to phytotoxic effect. Plant height, tiller number, DMP and uptake of nutrients (NPK) and grain yield increased with pendimethalin (8 DAR) + 1 MW and pretilachlor (8 DAR) + 1 MW treatments. (DAR: Days after the receipt of first monsoonic rain MW : Manual Weeding).

43. RELATIVE EFFICIENCY OF NEW HERBICIDES ON WEED MANAGEMENT IN MEDIUM LAND RICE

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The study on drill-sown rice (Var. 'Lalat') was carried out at the Central Research Station, Bhubaneswar during the kharif season of 1992-93 to assess the relative efficiency of new herbicides on weed management in medium land rice. The treatments comprised of four herbicides oxyfluorfen, butachlor, thiobencarb and anilofos with varying doses alone and in combination with 'Rotary Weeding'. The other treatments of 'Rotary Weeding', High Seed Rate and 'Unweeded Control' were kept for comparison in three replication. The study revealed that pre- emergence application of oxyfluorfen @ 0.05 kg a.i./ha supplemented with 'Rotary Weeding' effectively controlled the weeds and recorded the lowest weed population and weed weight. Use of Butachlor and thiobencarb @ 1.0 kg a.i./ha each with rotary weeding also controlled the weed population and weed weight and were better to anilofos + rotary weeding. Oxyfluorfen @ 0.05 kg a.i/ha + rotary weeding was most profitable with a maximum net return and benefit cost ratio of Rs.6216.95 and 2.14, respectively.

44. EVALUATION OF NEW HERBICIDES IN LOWLAND WETSEEDED AND TRANSPLANTED RICE

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The efficacy of pretilachlor (with safener) and cinmethylin in wetseeded rice and metsulfuron methyl in transplanted rice was evaluated with other recommended herbicides and HW during kharif and rabi seasons of 1992-93. In wetseeded rice, highest weed control efficiency was achieved through the preemergence application of pretilachlor + safener at 0.45 kg ha^{-1} at 4 DAS followed by one HW at 45 DAS. This practice increased the grain yield of wetseeded rice by 184 to 359 kg ha^{-1} over HW twice. Cinmethylin when applied at 0.06 kg ha^{-1} at 6 DAS was slightly phytotoxic to wetseeded rice. In transplanted rice, metsulfuron methyl at 0.008 kg ha^{-1} at 3 to 9 DAT followed by one HW at 40 DAT recorded high weed control efficiency and grain yield on par with HW twice but superior to anilofos, butachlor and butachlor + 2,4-DEE application. Pretilochlor + safener as well as metsulfuron methyl did not cause any adverse residual effect on succeeding crops of blackgram and sesamum raised after rice.

45. STUDY ON ADOPTION PATTERN AND CONSTRAINTS ANALYSIS FOR WEEDICIDE APPLICATION IN PADDY

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In the present study, gaps between recommended technology and actual level of its adoption in paddy nursery and mainfield application of herbicide have been studied. The study indicated that only 3% of the farmers in Nursery and 18% of the farmers in the mainfield are only using the recommended dosage of weedcide in their fields. Lack of conviction, non-availability of trained labour and complexity of the practice are the major contraints in adoption of weedicide technology. Study suggests mass awareness compaign, organising field trips, conducting method demonstrations, developing a local weedicide application squads and communicating the demonstration plot results through various extension means are some of the means to increase the awareness and adoption of the weedicide technology and thereby increasing the rice yields at farm level.

46. EFFECT OF AZOLLA ON WEED CONTROL IN RICE

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With an objective of studying the effect of azolla as a dual crop with rice on the weed supression, field experiments were conducted during 1993-94 at ACRI, Killikulam. The treatments comprised of different organic and inorganic fertilizers with and without azolla, as dual crop @ 1 t/ha. The strain *Azolla pinnata* was tried. Azolla was inoculated @ 1 t/ha as dual crop in the planted field a 10 DAT of rice. The developed azolla mat was then incorporated into the soil twice at 20 days interval. The results revealed that azolla significantly suppressed the weed growth in rice upto 45 days. The effect was significant on grasses, sedges and broad leaved weeds also. The supressing effect was more at 45th day than at 30th day probably because of the thick mat development at 45th day. Significant supressing effect was evident from the reduction in weed number/m^2, and weed dry weight in azolla applied plots than in uninoculated plots. The supression of weed growth was due to its thick mat formation blocking the sunlight. Among the weeds, *Marselia quadrifoliata* was not supressed by azolla application.

47. EFFECT OF WEED CONTROL MEASURES ON YIELD OF PRE-GERMINATED DIRECT SEEDED RICE ON PUDDLED SOIL

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A field experiment was conducted during rainy season of 1991-92 and 1992-93 to assess the impact of butachlor, thiobencarb, anilofos, pendimethalin and 2,4-D on weed control in pre- germinated direct seeded rice on puddled soil. Application of butachlor @ 1.5 kg ai/ha and anilofos @ 0.5 kg ai/ha reduced the weed population particularly grassy weed viz. *Echinochloa colonum*, significantly and increased grain yield of rice over weedy check. Butachlor @ 2.0 kg ai/ha although recorded the lowest weed population over weedy check, adversely affected the grain yield. 2,4-D @ 1.50 kg ai/ha reduced the broad leaved weeds. Butachlor @ 2.0 kg ai/ha followed by butachlor @ 1.5 ai/ha caused maximum mortality of crop plants and their effect was more pronounced at higher rates.

48. WEED MANAGEMENT IN DIRECT SOWN AND TRANSPLANTED RICE UNDER RAINFED FLOODED CONDITION

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The effect of weed control practices was studied on 'Salivahana' rice (Oryza sativa L.) udner rainfed flooded conditions (0-50 cm water depth) at Kharagpur during 1992 and 1993. Irrespective of the methods of sowing (broadcast or drill sown) or transplanting the dry matter of weeds was reduced significantly when weed control measures were adopted as compared to unweeded control. However, the yield of rice increased significantly with drill sown crop when weeds were controlled by either hand weeding at 20 and 40 days after germination (DAG) or application of Butachlor at 2 kg a.i./ha within a week of germination. Bushening did not show additional advantage over chemical weeding.

49. EFFECT OF TILLAGE ON COST OF WEEDING, YIELD AND BENEFIT COST RATIO IN TRANSPLANTED RICE

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A field experiment was conducted during kharif 1988 and 1989 at CRRI, Cuttack to study the effect of tillage operations on cost of weeding, yield and benefit cost ratio in transplanted rice. The treatments were tractor with disc puddler (three pass) and one M.B. ploughing followed by two desi ploughing. The cost of tillage operation and variable cost were high in case of plough as compared to tractor. The weeding cost was 82.31 per cent higher in case of plough than tractor. The grain yield was 29.56 q/ha for tractor and 27.63 q/ha for plough. The lower yields were due to attack of stemborer during kharif 1988.

50. WEED MANAGEMENT IN RICE-ECOSYSTEM

A. Quayum, K. Prasad and V.C.Srivastava

Field trials were conducted for three years (1989-91) in rice-ecosystem in rainy season in Birsa Agricultural University Farm. The treatments were hand weeding (once and twice), interculturing by Grubber and Dryland Weeder (once and twice by each tool) two levels of benthiocarb (1.0 or 1.5 kg ai/ha), oxyfluorfen (0.15 and 0.25 kg ai/ha), fluchloralin (1.0 and 1.5 kg ai/ha), butachlor (1.5 and 2.5 kg ai/ha) and weedy check control. Grain yield recorded in the treatments were hand weeding once or twice (45.13 or 46.79 q ha^{-1}), oxyfluorfen @ 0.15 or 0.25 kg ai/ha (45.32 or 43.91 q ha^{-1}) and fluchloralin @ 1.0 kg ai/ha (42.86 q ha^{-1}). Weed index were also lower and closer in the above treatments. The cost of weed management was two to three folds higher in hand weeding or using manually operated mechnical tools (Grubber or Dryland weeder) than herbicide applied plots.

51. RELATIVE PERFORMANCE OF CERTAIN SELECTED RICE VARIETIES UNDER DIFFERENT WEED CONTROL METHODS IN RAINFED UPLAND CONDITION

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Field experiments were conducted during the wet seasons (kharif) of 1988 and 1989 to evaluate the relative performance of seven selected early duration cultivars/varieties of rice viz., IET 9820, IET 9823, IET 9830, IET 9975, IET 7566, IET 10514 and Prasanna under direct sown upland conditions with four methods of weed control. Butachlor @ 1.5 kg a.i./ha fb. HW, Benthiocarb @ 1.5 kg a.i./ha fb. HW, hand weeded twice at 20 and 40 DAS and weedy check were the treatments. Butachlor and benthiocarb recorded comparable results. There were no significant differences among the above three treatments in terms of weed biomass (75.00 g/m^2 to 82.99 g/m^2), yield components and or grain yield (21.68 q/ha to 22.92 q/ha) as compared to weedy check. Varietial differences were significant for influencing their associating weed biomass which ultimately reflected in the grain yield of rice. The mean biomass ranged from 113.63 g/m^3 to 129.31 g/m^2. The study points the need for choosing appropriate rice variety to tide over the weed competition.

52. EFFICACY OF HERBICIDE FOR WEED CONTROL UNDER TRANSPLANTED IRRIGATED RICE

S.P.Singh, Directorate of Rice Research, Rajendranagar, Hyderabad-30.

Field trails were carried out to evaluate the efficacy of herbicides at varying time of application in transplanted rice. The mean weed control efficiency ratings of 64.68, 64.16, 66.39 and 72.46 were recorded with

benthiocarb, butachlor, 2,4-D and hand weeded treatments, respectively. The mean dry weight of weeds was significantly lower with herbicide application at 4 and 8 DAT. Herbicide application at 4 and 8 DAT recorded 44.06 and 44.63 per cent more grain yield as compared to delayed application at 12 DAT, suggesting the need for using all such herbicides within 8 DAT. The mean maximum net profit per rupee investment under different weed control treatments averaged to Rs.11.10 under 2,4-D; followed by butachlor (Rs.9.37), benthiocarb (Rs.9.12), hand weeded twice (Rs.2.99) and weed-free (Rs.2.72).

53. EFFECT OF VARIOUS WEED CONTROL TREATMENTS IN RAINFED RICE OF U.P. HILLS

Prem Singh, Subhash Chandra, A.K.Pandey & Ved Prakash, Vivekananda Parvatiya Krishi Anusandhan Shala (ICAR), Almora - 263 601 (UP)

The study was conducted for two kharif seasons of 1992 and 1993 at experimental farm of Hawalbagh of V.P.K.A.S., Almora to find out the viable weed control measure for rainfed rice under hilly conditions. The treatments comprised of butachlor @ 1.50 kg/ha, butachlor @ o 1.0 kg/ha followed by 2,4-D @ 0.60 kg/ha, pendimethalin @ 1.25 kg/ha, pendimethalin @ 0.75 kg/ha followed by 2,4-D @ 0.60 kg/ha, handweeding twice (20 and 40 DAS), weed free and weedy check. Weed control efficiency and weed index varied from 44.0 to 99.9 and 10.8 to 95.5 per cent respectively due to various weed control treatments. The maximum grain yield (26.9 q/ha) was recorded under weed free plots, which was statistically at par with hand weeding twice (24.0 q/ha). Maximum gross income (Rs. 7843/ha) was also obtained with weed free treatment which was about 11.61 per cent higher than handweeding twice, whereas the maximum net returns (Rs.4457/ha) over unweeded check were obtained with the pre-emergence application of pendimethalin @ 0.75 kg/ha when followed by 2,4-D @ 0.60 kg/ha applied at 30 DAS.

54. EFFECT OF TIMES OF N APPLICATION AND WEED CONTROL METHODS IN UPLAND RICE

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A field experiment was conducted to study the effect of times of N application and Weed control methods in upland rice. The treatments were five times of N application and five weed control methods. A recommended dose of 90 Kg N/ha was applied in all the treatments. Application of nitrogen all at sowing had maximum weed density, weed dry weight and nitrogen depletion by weeds, and minimum rice grain yield. Application N in three splits was more effective in minimising weed population, weed dry matter accumulation and N depletion through weeds. Nitrogen applied half at sowing, one fourth at tillering

and one fourth at panicle initiation stage under weed control measure, thiobencarb 1.5 kg/ha pre-em. followed by one hand weeding (20 DAS) proved most effective for weed control and rice yield.

55. EFFECT OF PRE-EMERGENCE HERBICIDES ON PHYTOTOXICITY AND WEED CONTROL IN DRY SEEDED RICE IN KERALA

Susan Lee Thomas and P. Sreedevi, Kerala Agricultural University Trichur, Vellanikkara - 680 654.

A study was undertaken at ARS Manuthy during first crop (Kharif) 1993 to find out the best time of application of herbicides for weed control in rice. The treatments included Pre-emergence application of herbicides such as pendimethalin @ 1.5 Kg ai/ha, thiobencarb @ 1.25 Kg/ha, butachlor @ 1.25 Kg ai/ha and oxyfluorfen @ 0.1 Kg. ai/ha in the sub plots with time of application such as 0, 3, 6 and 9 DAS in the main plots with hand weeding and unweeded control as standards. The weed biomass reduced with Oxyflourfen and pendimethalin applied upto 6 DAS. Highest weed control efficiency was recorded by oxyfluorfen. Pendimethalin and oxyflourfen treated plots giving the highest number of rice tillers/m^2. Yield atributing characters and yield were higher in plots treated with pendimethalin at 3 DAS. Total returns and return per rupee invested were higher in the case of pendimethaline at 3 DAS and oxyflourfen at 9 DAS.

56. INTEGRATED WEED MANAGEMENT IN UPLAND RICE

J.R.Patil, Department of Agronomy, College of Agriculture, Kholapur, Maharashtra

The trials were carried out during 1990-91 to 1993-94 at Agronomy Farm, College of Agriculture, Kolhapur (Maharashtra) using eight treatments. The three treatments, Butachlor 1.5 kg/ha (pre), Benthiocarb 1.5 kg/ha (pre), Dicamba 1.0 kg/ha (early post) and three treatments on integrated weed management (IWM) involving the combination of each herbicide with Hand Weeding (H.W.) at 30 days were compared with normal practice of weeding (Hoeing + Hand weeding) and weedy check. IWM with Butachlor 1.5 kg/ha + H.W. gave efficient weed control and maximum grain (33.51 q/ha) and straw (7.50 q/ha) yield. It was closely followed by Benthiocarb 1.5 kg/ha + H.W. (29.17 q/ha grain and 60.61 q/ha straw). These treatments were also superior from economical point (maximum benefit to cost ratio of 11.87 in Butachlor + H.W.

57. TIME OF HERBICIDE APPLICATION ON WEED CONTROL IN DIRECT SOWN RICE

D.Kalyanasundaram and **Dr.G.Kuppuswamy,** Department of Agronomy, Faculty of Agriculture, Annamalai University, Annamalai Nagar - 608 002

A field experiment was conducted to study the effect of different herbicides and the time of application on weed control and in direct sown rice. Oxyfluorfen was phytotoxic to the emerging seedlings and

reduced the plant population marginally when applied immediately after seeding and 8 DAE. But application of oxyfluorfen 2 days before sowing, caused no phytotoxicity on rice seedlings. Butachlor did not exhibit any ill effect on plant stand at any time of applications compared to oxyfluorfen. However, initial setback in population caused by oxyfluorfen did not have impact on the yield. Application of butachlor @ 1.5 Kg ha^{-1} at 8 DAE followed by one HW at 30 DAS controlled the weeds effectively and was superior to oxyfluorfen in respect of growth and yield of direct sown rice.

58. FERTILIZER AND HERBICIDE INTERACTIONS ON WEED GROWTH IN DIRECT SOWN RICE (cv. ADT 36)

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A field experiment was conducted at Annamalai University, Experimental Farm to study the interaction of fertilizer and herbicide on weed control and yield of low land direct sown rice. The treatments consisted of three levels of N viz. 75, 100 and 125 Kg ha^{-1} and weed control methods viz. Two HW at 20, 40 DAS, Butachlor 1.5 Kg, Benthiocarb 1.75 Kg and Anilofos 0.4 Kg ha^{-1}. The lower weed count, weed biomass and higher grain and straw yield were obtained from hand weeding twice with 125 Kg N ha^{-1}. It was on par with Anilofos 0.4 Kg ha^{-1}. The next best was Butachlor 1.5 Kg ha^{-1} with 125 Kg N ha^{-1}. Benthiocarb 1.75 Kg with 125 Kg N ha^{-1}. Increasing N levels increased the total weed count at 30 and 60 DAS.

59. EFFECT OF SEQUENTIAL APPLICATION OF HERBICIDES ON MICRONUTRIENT UPTAKE BY TRANSPLANTED RICE (*Oryza sativa*) AND ASSOCIATED WEEDS

A.S. Rao and R.P. Singh, I.A.S, BHU, VARANASI-221 005, U.P.

A field experiment was conducted at Research Farm, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi during monsoon seasons of 1991 and 1992 to study the effect of sequential application of herbicides on dry matter production, micronutrients uptake (Fe, Zn, Mn and Cu) by transplanted rice and associated weeds. Results indicated that Fe, Zn, Mn and Cu depletion by weeds was maximum and uptake by crop was maximum with the application of anilofos 0.4 kg/ha followed by 2,4-DEE 1.0 kg/ha which was on par with hand weeding twice.

60. COMPARATIVE WEED CONTROL EFFICIENCY OF METSULFURON (ALLY) AND CHLORIMURON (CLASSIC) IN DIRECT SEEDED UPLAND RICE

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Efficacy of Metsulfuron (ALLY) at 2,4 and 8 g a.i/ha and Chlorimuron (CLASSIC) at 4, and 12 g a.i./ha as well as their combination i.e. ALLY 2g (A_2) + CLASSIC 4g (C_4), A_4 + C_4, A_2 + C_6, A_4 + C_6, A_2 + C_{12} and A_4 + C_{12} a.i/ha were tested for direct seeded upland rice in kharif season at Agricultural and Food Engineering Department Farm, IIT, Kharagpur. Butachlor at 1500 g a.i./ha and Tok E-25 1000 g a.i./ha were used as a standard herbicide along with hand weeded and unweeded control. Major weed flora recorded at 60 DAS consisted of grasses especially *Digiteria sanguinalis.*, sedges, *Cyperus rotundus* and broad leaf weeds *Croton bonplandianus* and *Mimosa pudica.* The weed intensity was considerably reduced when ALLY and CLASSIC were applied in combinations at different doses. ALLY 2 alone was not effective in controlling weeds. However, C_6 and C_{12} were promising when compared with Butahlor and TOK E-25. The grain yield under different weed control treatments increased by 10 to 18% as compared to unweeded check (2.8 t/ha).

61. WEED CONTROL EFFICIENCY OF AZOLLA IN LOW LAND RICE ECOSYSTEM

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A field trial was conducted to evaluvate the weed contol efficiency of Azolla in lowland rice ecosystem during the samba season in the cauvery delta region. Hand weeding without NPK application recorded the lowest weed count of 11.33 $Plot^{-1}$ followed by Handweeding + recommended dose of NPK (18.33 $Plot^{-1}$), weedicide alone (28.33 $Plot^{-1}$), weedicide + NPK (41 $Plot^{-1}$), Azolla alone (47.67 $Plot^{-1}$) Azolla + NPK (53 $Plot^{-1}$), unweeded control (71.33 $Plot^{-1}$) and NPK alone (84.67 $Plot^{-1}$). The two weeds viz: *Cyperus rotundus* and *Echinochloa colonum* were predominent weeds. In general, *Cyperus rotundus* was found to be 3 to 8 times more than the population of *Echinochloa colnum.* The results revealed that the yields obtained in the treatments Handweeding + NPK, weedicide + NPK and Azolla + NPK are comparable. Similarly the yields obtained in the treatment Azolla alone, Handweeding alone, and, weedicide alone comparable. Thus Azolla applicatio alone, weedicide application and Handweeding treatments were at par in respect of grain and straw yield in rice.

62. INTEGRATED WEED MANAGEMENT IN DIRECT SOWN RICE

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Field experiments were conducted at Annamalai University Experimental Farm, Annamalainagar during Samba 92 and Kuruvai 93 to study the influence of off-season land management in combination with various rice weed control measures on direct sown rice. The main treatments comprised 1) ploughing the land twice ii) post emergence spray of glyphosate 1.5 kg/ha and iii) leaving the land fallow, during off-season. The sub treatments consisted of crop weed control measures viz. pre-emergence butachlor 1.5 kg/ha, pyrazosulfuron-ethyl 0.21 kg/ha, pyrazosulfuron-ethyl 0.42 kg/ha, oxyflurfen 0.15 kg/ha, oxyflurfen 0.3 kg/ha, twice handweeding and an unweeded control. Off-season land management with glyphosate spray followed by pyrazosulfuron ethyl 0.42 kg/ha a oxyfluorfen 0.3 kg/ha as premergence proved superior with higher weed control indices and grain yields.

1. CULTURAL AND CHEMICAL METHODS OF WEED CONTROL IN WHEAT

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An investigation was carried out at IARI New Delhi for three years during 1988-89 to 1990-91 to study the relative superiority of planting geometry/methods of sowing wheat in combination with weed control measures on the suppression of weed growth and grain yield of wheat. In this study four methods of sowing viz. normal sowing at 23 cm spacing, closer sowing at 15 cm, criss cross sowing and broadcast of seed, were included. In all the methods, seed rate was kept same. There were six weed control measures namely weedy check, hand weeding, pendimethalin application as pre-emergence at 0.75 and 1.0 kg/ha and isoproturon post- emergence application at 0.50 and 0.75 kg/ha. Results indicated that Criss cross sowing registered the maximum yield followed by closer sowing and normal sowing. The minimum grain yield was obtained in broadcast method. Hand weeding as well as herbicide application made either pre or post-emergence having lower or higher dose produced higher grain yield over weedy check.

2. DICLOFOPMETHYL AND ISOPROTURON COMBINATIONS FOR WIDE SPECTRUM WEED MANAGEMENT IN WHEAT

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Weed control spectrum of diclofopmethyl alone and incombination with isoproturon at various rates of application was studied under pure weed culture and wheat culture systems. *Phalaris minor* and *Avena ludoviciana* were controlled to the extent of 50-100 per cent depending upon the rates of application of two herbicides in tank mixtures. *Chenopodium album*, *Melilotus alba* and *Melilotus indica* were fully controlled at all the rate combinations of the two herbicides, *Medicago denticulata*, *Vicia sativa*, *Vicia hirsuta*, *Lathyrus aphaca*, *Anagallis arvensis* and *Fumaria parviflora*, were not controlled at any combination rates. Grain yields of wheat increased significantly over untreated plots due to various rates of diclofopmethyl applied alone or incombination with isoproturon. Diclofopmethyl at 0.70 and 0.84 kg/ha applied alone yielded less than at 1.12 and 1.40 kg/ha and all the combinations of diclofopmethyl with isoproturon. Combination of isoproturon at 0.5 kg/ha with diclofopmethyl was less effective than that of higher rates of application. Diclofopmethyl at 1.40 kg/ha applied alone and all the tank mixed applications of isoproturon at 0.50, 0.75 and 1.0 kg/ha with diclofopmethyl at 0.70 -1.40 kg/ha, except isoporoturon at 0.50 kg ai/ha + diclofopmethyl at 0.70 kg/ha, produced grain yields at par with weed-free condition.

3. EFFECT OF WEED CONTROL METHODS ON IRRIGATED WHEAT

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Field experiment conducted at Chiplima during winter season of 1991-92 in irrigated wheat (cv. Sonalika) revealed that yield loss due to unchecked weed growth was 53.9 per cent. Application of Isoguard, a commercial formulation of isoproturon + 2, 4-D @ 1250 g/ha registered the highest grain and straw yield of 44.6 g/ha and 67.7 g/ha respectively among the herbicides, with a weed control efficiency of 81 % and was comparable to weed free check. The next best herbicide was mixture of fluroxypyr @ 1.0 kg ai/ha + isoproturon @ 0.5 kg ai/ha applied a day before irrigation. Weedy check recorded the lowest grain yield of 20.8 q/ha.

4. EFFECT OF VARIOUS FORMULATIONS OF ISOPROTURON ON WEED AND YIELD OF WHEAT

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Liquid (Suspension Concentrate) and wettable powder formulations of Isoproturon were similar in their effect in controlling weeds and crop yield was also almost equal. Their application after first irrigation was found safe and better than before irrigation. Combination of 2,4-D and isoproturon did not give any additional benefit. Isoproturon applied alone or in combination either before or after irrigation caused significant increase in grain yield and decrease in Phalaris minor population and its dry weight. Maximum increase in grain yield was due to isoproturon (1 kg/ha) followed by handweeding. Isoproturon eliminated dicot weeds viz. *Chenopodium album. Melilotus indica.* and *Fumaria perviflora.*

5. CROP-WEED COMPETITION FOR NITROGEN IN WHEAT AS INFLUENCED BY IRRIGATION, NITROGEN AND WEED MANAGEMENT VARIABLES

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A field study was under-taken to quantity the effects of weed management practices, irrigation and nitrogen with respect to competition for nitrogen uptake by crop and weeds. Treatments comprised of three irrigation levels (no post - CRI irrigation, 'irrigation at 100 mm CPE' and 'irrigation at 50 mm CPE'), four nitrogen levels (0,50,100 and 150 kg N/ha) and three weed management pratices (no weeding, manual weeding and chemical weeding). The irrigations, each of 60 mm depth, were scheduled after a common irrigation at the CRI

stage. In manual weeding weeds were removed manually and the chemical weeding isoproturon was applied 30-35 DAS. Uptake of nitrogen was, highly influenced by irrigation, nitrogen and weed management practices. The lowest values for crop were recorded with no post-CRI irrigation (56.4 and 85.5 kg/ha during 1986-87 and 1987-88, respectively) which increased appreciably with 'irrigation at 100 mm CPE' and '50 mm CPE' mainly due to enhanced biomass yields. Similar to wheat crop, N uptake by weeds also improved considerably. On account of enhanced contents of nitrogen in grain, straw and weeds, combined with more biomass production, N uptake increased significantly with its application up to 150 kg/ha by the crop and upto 100 kg/ha by weeds.

6. INTERRELATIONSHIP BETWEEN MOISTURE REGIMES AND APPLICATION METHODS ON WEED BIOMASS IN WHEAT

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A green house experiment was carried at NRCWS Farm, Jabalpur during Rabi 1993- '94 to determine the interaction effects of moisture regimes and application methods on crop yield and weed biomass in wheat. Two methods of water application were followed (i) surface application (ii) sub surface application with the help of central hollow plastic tube. In surface water application, increased moisture tension significantly reduced weed and wheat dry matter. The amount of wheat and weed dry matter obtained at 5 bar moisture tension regime were 6.4 and 0.8 g/pot respectively in comparison to 8.5 and 2.4 g/pot at field capacity (0.3 bar). Crop and weed biomass did not have a consistent relation with amount of water when applied at sub surface. However, significantly higher wheat dry matter and lower weed biomass were recorded at 5 bar tension moisture regime over 0.3 bar. At 5 bar tension, sub surface water appliction gave significantly higher wheat and lower weed dry matter in comparison to water application at surface.

7. NUTRIENTS UPTAKE BY WHEAT AND ASSOCIATED WEEDS AS INFLUENCED BY HERBICIDES AND FERTILITY LEVELS

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A field experiment was conducted at CCS, HAU Hisar, during the winter seasons of 1990-91 and 1991-92, to study the effect of herbicides (tribenuron, 2,4-D and tribenuron + isoproturon) and fertility levels (120 kg N, 120 Kg N + 60 Kg P_2O_5, 120 kg N + 60 kg P_2O_5 + 25 kg $ZnSO_4$/ha) on the uptake of nutrients by wheat and associated weeds. The weeds depleted 45.6, 11.3 and 45.6 kg/ha nitrogen, phosphorus and potassium respectively when allowed to grow with the crop till crop harvest. The use of herbicides increased nutrients uptake by wheat and

decreased nutrients uptake by weeds. The uptake of nutrients was higher by wheat and lower by weed when higher dose of tribenuron or mixture of tribenuron and isoproturon was sprayed as compared to lower dose of tribenuron. The application of phosphorus or phosphorus and zinc with nitrogen resulted in higher uptake of nutrients (N, P and K) by the crop and higher phosphorus removal by the weeds as compared to nitrogen applied alone.

8. EFFECT OF DIFFERENT FORMULATIONS OF ISOPROTURON ON THE WEED CONTROL IN WHEAT

R.S. Panwar, R.K. Malik and S.S. Rathi, Department of Agronomy, CCS Haryana Agricultural University, Hisar - 125 004 (Haryana)

Two years field studies on control of weeds in wheat by different formulation of isoproturon conducted during Rabi 1991-92 and 1992-93 at CCS, HAU, Hisar revealed that isoproturon applied at 1.00 kg/ha in flowable or wettable powder formulations provided similar control of weeds both in terms of population and weed biomass. There were more weeds in 1992-93. The yield level was higher in 1991-92. The grain yield of wheat with the application of isoproturon in either form ranged from 5161 kg/ha to 5695 kg/ha in 1991-92 and from 4771 kg/ha to 4854 kg/ha in 1992-93.

9. EFFECT OF ISOPROTURON AND ITS TANK MIXTURE WITH TRIBENURON ON WEED CONTROL IN WHEAT

Samar Singh, R.K. Malik and Vireshwar Singh, CCS, Haryana Agricultural University, Regional Rearch Station, Uchani, Karnal- 132 001

Two years field studies conducted at HAU Regional Research Station, Karnal during 1992-93 and 1993-94 to evaluate the performance of tank mixture of isoproturon and tribenuron revealed that isoproturon at 750 g/ha + tribenuron at 10 g/ha provided better control of Phalaris minor and Melilotus indica compared to isoproturon alone at 750 or 1000 g/ha or tribenuron alone at 10/15 g/ha. Grain yield of wheat in plots treated with isoproturon alone or as tank mixture with tribenuron or 2,4-D were similar. All these herbicides or their combination provided significant increase in grain yield compared to weedy check.

10. EVALUATION OF DICLOFOP METHYL AGAINST PHALARIS MINOR IN WHEAT

Samar Singh, R.K. Malik and N.K. Sangwan, CCS, Haryana Agricultural University, Regional Research Station, Uchani, Karnal-132 001

Effect of diclofop methyl applied alone or with surfactant was evaluated against *Phalaris minor* in a two years field study conducted

during 1992-93 and 1993-94 at HAU Regional Research Station, Karnal. Diclofop methyl applied at 0.375, 0.50, 0.75 and 1.0 kg/ha significantly decreased the dry weight of *Phalaris minor* compared to weedy check. Isoproturon at 0.75 kg/ha or 1.0 kg/ha provided similar control when compared with diclofop methyl at 1.0 kg/ha + 0.1 % surfactant (selvet). Lower doses of diclofop methyl applied without surfactant were less effective than isoproturon. Grain yield of wheat in plots treated with isoproturon at 0.75 kg/ha + surfactant was significantly more than weedy check.

11. INFLUENCE OF DICLOFOP METHYL APPLIED AS TANK MIXTURE WITH ISOPROTURON ON WEED CONTROL IN WHEAT

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Diclofop methyl applied as tank mixture with isoproturon at 0.5 kg/ha was evaluated for two years in a field study conducted at HAU, Regional Research Station, Karnal during 1993-94. Tank mixture of isoproturon at 0.5 kg/ha + diclofop methyl at 0.75 kg/ha applied 20 DAS significantly reduced the dry weight of weeds. The follow up treatment of diclofop methyl at 0.75 kg/ha applied 30 DAS on plots already treath with isoproturon at 0.75 kg/ha applied 20 DAS was most effective in reducing the weed biomass. The grain yield of wheat with isoproturon fb diclofop methyl or isoproturon at 0.5 kg/ha + diclofop methyl at 0.75 kg/ha applied 20 DAS were signficantly more than weedy check and plots treated with diclofop methyl alone at 0.75 kg/ha.

12. EVALUATION OF ISOPROTURON, 2,4-DEE AND THEIR MIXTURE WITH AND WITHOUT SURFACTANTS FOR THE CONTROL OF COMPLEX WEED FLORA IN WHEAT (*Triticum aestivum* L.)

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Field investigation was carried out to find out the efficacy of isoproturon, 2,4-DEE and their mixtures with and without surfactants Triton AE (0.5 % v/v) and Teepol (0.05 % w/v) for the control of complex weed flora in wheat in mid-hills of Himachal Pradesh at Bajaura, during 1991-92 and 1992-93. It was revealed that both the herbicides and their mixtures failed to control *V. persica*. However, grassy weeds and *C. bursa* - pestoria, *C. didymus* and *A. arvensis* were very effectively controlled with isoproturon whereas 2,4-DEE gave good control of *M. denticuleta*; *C. bursa* - pestoris, *C. didymus* and *A. arvensis*. Application of isoproturon + 2,4-DEE (1.0 + 0.5 kg/ha) with Triton AE recorded maximum grian yield (5039 kg/ha) which was significantly higher over 2,4-DEE 0.5 kg/ha with and without surfactants and hand weeding at fully tillered stage.

13. EFFECT OF TIME AND METHOD OF ISOPROTURON APPLICATION ON THE CONTROL OF PHALARIS MINOR IN WHEAT(Triticum aestivum)

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A field experiment was conducted at the research farm of BHU, Varanasi, during winter season of 1993-94 to study the efficacy of isoproturon as broadcast application by mixing with urea and spray before and after irrigation, alone and in combination with 2,4-D and hand-weeding once. Isoproturon applied after irrigation as spray either alone or in combination with hand weeding gave best weed control and these treatments yielded 2081 and 20705 kg/ha, respectively. The yields received in handweeding twice and weedy check were 2648 and 1048 kg/ha, respectively.

14. LIGHT INTERCEPTION, WEED GROWTH AND PRODUCTIVITY OF IRRIGATED WHEAT AS INFLUENCED BY CROP GEOMETRY AND WEED CONTROL METHODS

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The experiment was laid out in split plot design with three replications by keeping combinations of three row directions (N- S, E-W and Bi-directional) and two row spacings (15 cm and 20 cm) plus broadcast sowing in main plots and four weed control treatments (Unweeded check, Isoproturon 0.75 kg/ha, Isoproturon 1.5 kg/ha and HW 30 and 60 DAS) in sub-plots. Bi-directional row orientation increased the light interception and crop growth rate by decreasing the weed growth rate. Consequently it increased the yield attributes and yield of wheat significantly followed by N-S row direction. Closer row spacing (15 cm) reduced the weed growth rate, increased the light interception, crop growth rate, yield and yield attributes over the wider row spacing of 20 cm. Among the weed control treatments, isoproturon 1.5 kg/ha (post) resulted in significantly highest grain yield.

15. IMPACT OF SMALL CANARYGRASS DOMINATED WEED ECOSYSTEM ON WHEAT AND EFFECT OF ISOPROTURON ON SUBSTAINABLE YIELD

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Ten years experimentation in small canarygrass (*Phalaris minor* Retz.) dominated (75%) weed ecosystem comprising of 362 to 1363 weeds/m^2 revealed the reduction in wheat yields from 22.6 to 81.3 as compared to hand weeding. The average yield under small canarygrass infested plots was 2577 kg/ha with an average reduction of 33.99% as

compared to hand weeding (3904 kg/ha). Application of isoproturon 1.0 kg/ha pre-emergence controlled the small canarygrass and toher broad leaf weeds viz. straw berry clover (*Trifolium flagiferum* L.), Chicori (*Cichorium intybus* L.), common purslane (*Portulaca oleracea* L.), white sweet clover (*Melilotus alba Medikus.*), toothed medick (*Medicago hispida* Gaertn.) and common lambsquarters (*Chenopodium album* L.) resulting in sustainable higher yield (4116 kg/ha on par to hand weeding and significantly higher as compared to weed infested plots (2577 kg/ha). Four years expermentation in white sweet clover and common lambsquarters dominated weed ecosystem (275 weed/m^2) revealed non significant reduction in yield as compared to hand weeding (4211) or weeds managed by isoproturon 1.0 kg/ha per-emergence (4166 kg). It was concluded that small canarygrass weed ecosystem caused greater stress on wheat production and control of this weed by isoproturon 1.0 kg/ha pre-emergence resulted economically sustaiable higher yields giving a net return of Rs.7637/ha.

16. ACTIVITY OF N-SUBSTITUTED-2-CYANO-3 (3',4'-DIMETHOXY-1-'PHENYL) ACRYLAMIDES FOR WEED CONTROL IN WHEAT (*Triticum aestivum* L.)

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Laboratory experiments were conducted to study the effect of 2-cyano-3(3',4'-dimethoxy-1-phenyl) acrylic acid, N-[4(2,3-dimethyl-1-phenyl-3- pyrazolen-5- one)]yl-2-cyano-3 (3',4'-dimethoxyl-1'-phenyl) acrylamide, N- cyclohexyl-2- cyano-3(3'4'-dimethoxy-1'-phenyl) acrylamide and N-(tetrahydro-1,4-oxazin)yl-2-cyano-3 (3'4'-dimethoxy-1'-phenyl) acrylamide on the control of wild canary grass (*Phalaris minor* Retz.), wild oat (*Avena ludoviciana* L.) and wild onion (*Asphodelus tenuifolius*) using different concentrations of these compounds (0,100,500 and 1000 ppm). Compounds (I, III, and IV) controlled wild onion but compound (II) controlled wild canary grass, whereas compound (IV) was found effective against all the three weeds.

17. EVALUATION OF TRALKOXYDIM ALONE AND IN COMBINATION WITH ISOPROTURON IN WHEAT

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A field experiment was conducted during the rabi seasons of 1989-90 and 1991-92 at Crop Research Centre of GBPUAT Pantnagar (Nainital), U.P., to evaluate the effects of tralkoxydim at various rates (0.25, 0.30, 0.35, 0.40 kg/ha) applied alone and as tank mixture with isoproturon at 0.50 and 0.75 kg/ha on wheat cultivar "UP 2121 and associated weeds. Isoproturon at 1.0 kg/ha, weedfree and weedy treatments were included for comparison, Herbicides were applied at 28

days after sowing. Tralkoxydim at 0.3 kg/ha provided complete control of *Avena ludoviciana* and *Phalaris minor* but did not control non- grassy weeds. Isoproturon at 1.0 kg/ha provided 47% control of *Avena ludoviciana*, 92% control of *Phalaris minor* and complete control of *Chenopodium album*. Tank mix combination of tralkoxydium at 0.25 kg/ha + isoproturon at 0.50 kg/ha provided complete control of above weeds and produced grain yield comparable to weed free treatment. Tralkoxydim and isoproturon failed to control *Cynodon dactylon*, *Lathyrus aphaca*, *Vicia sativa* and *Cyperus rotundus*.

1. HERBICIDE EFFECT OF ATRAZINE IN WINTER MAIZE

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The field experiments were conducted at IARI, New Delhi to study the effect of atrazine on weed control in maize during 1991-92 and 1992-93. Atrazine @ 0.75 kg a.i./ha was applied alone and supplemented with one HW at 45 DAS. Atrazine at the lower dose of 0.25 kg a.i./ha was sprayed as post-emergence at knee high and tasselling stages of crop preceded with pre-emergence application of atrazine @ 0.75 kg a.i./ha. Pre-emergence application of atrazine (0.75 kg a.i./ha) followed by post-emergence spray at knee high and tesselling stages of maize at 0.25 kg a.i./ha effectivesly controiled the weeds and recorded 70% increased yield.

2. CULTURAL MANIPULATIONS FOR WEED CONTROL IN DIFFERENT KHARIF CROPS

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The experiments conducted at G.B.P.U.A.T, Hill Campus, Ranichauri, Tehri (U.P.) during 1990-1992 revealed that, the mulching with *Eupatorium adenophorum* and pine leaves and close sowing reduced the weeds in soybean. The highest grain and haulm yields of soybean were recorded at close sowing. In fingermillet, all the non chemical methods i.e. mulching, transplanting and cross sowing, reduced the weeds and favoured higher yield. The total grain production was highest under the fingermillet + ricebean system. Similarly, in frenchbean (Rajmah), sowing of crop over ridges effectively reduced the weed population. Integrated approach of close-sowing + pre-emergence spray of oxadiazone at 75% recommended rate (i.e at 0.375 kg/ha) recorded highest grain yield.

3. WEED MANAGEMENT IN FINGER MILLET

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A field experiment was conducted during 'kharif' 1993-94 at Experimental Farm, Annamalai University to study the effect of butachlor on the control of weeds in finger millet. *Trianthema portulocastrum* and *Dactyloctenium aeqptieum* were dominant weeds. Results revealed that butachlor @ 1.5 kg/ha followed by one HW at 30 DAS controlled the weeds greatly resulting in the highest yield of finger millet (3206 kg/ha). Butachlor dose @ 1.25 kg/ha followed by one HW at 30 DAS was also at par with the dose of 1.5 kg/ha indicating that 1.25 kg/ha is optimum dose.

4. WEED MANAGEMENT IN PEARL MILLET

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A field experiment was conducted during 'Kharif' 1993-'94 at the Experimental Farm, Annamalai University to study the effect of atrazine on control of weeds in pearl millet. The dominant weed flora in the experimental crop was *Cynodon dactylon* and *Trianthema portulacastrum*. Results showed that application of atrazine @ 1.00 kg a.i./ha followed by one HW at 30 DAS gave higher weed control efficiency resulting in the highest yield of pearl millet (1926 kg/ha). However, atrazine 0.75 kg a.i./ha followed by one HW at 30 DAS was economical as it fetched a higher net profit (Rs.2045/ha).

5. WEED MANAGEMENT IN PEARLMILLET (*Pennisetum typhoides* L.)

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A field experiment was conducted during kharif season of 1988, 1989 and 1991 at Instructional Farm, Gujarat Agricultural University, Sardar Krushinagar Campus, to evaluate the effective and economical weed management practice in pearmillet 'GHB-30'. Pre-emergence application of atrazine @ 0.5 kg ai/ha and two HW at 16 and 32 DAS were effective in controlling weeds. Maximum grain yield of 1651 kg/ha was recorded by two HW treatment. The next best treatment was pre-emergence application of atrazine @ 0.5 kg ai/ha and recorded the highest net ICBR (1:16:53).

6. EVALUATION OF HERBICIDES FOR WEED CONTROL IN RAGI

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Field experiments were conducted at Bapatla during Kharif 1992- '93 and 1993-'94 with 2,4-D Na salt, 2,4-D EE, pendimethalin (each at 0.50 and 0.75 kg/ha) and anilofos (0.30 and 0.40 kg/ha) HW twice at 15 and 30 DAP and UWC. HW twice at 15 and 30 DAP was superior to reduce the weeds and improved the grain yield of ragi (3409 kg/ha). Among the herbicide treatments, pendimethalin at 0.75 kg/ha recorded maximum grain yield (3330 kg/ha). The lower dose of pendimethalin at 0.50 kg/ha or 2,4-D EE at 0.75 kg/ha was optimum for weed control in ragi with higher yield.

7. UTILISATION OF WATER HYACINTH (*Eichhornia crassipes* Mart.) AS A COMPOST FOR RAGI PRODUCTION

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A field study was carried out at Main Research Station, UAS, Hebbal, Bangalore during 1991, to evaluate the effect of different levels of water hyacinth compost and farm yard manure on growth and yield of ragi. The experiment consisted of three levels of FYM (5, 10 and 15 t/ha), three levels of water hyacinth compost (5, 10 and 15 t/ha) and control (No.FYM/COH). FYM at 10 t and 15 t/ha and water hyacinth compost at 10 and 15 t/ha significantly improved the growth and nitrients uptake and accelerated higher grain yield of ragi. Water hyacinth compost was equally effective as that of FYM for higher yield of ragi.

8. WEED MANAGEMENT IN FINGER MILLET UNDER MID-HILL CONDITIONS OF UTTAR PRADESH

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A field trial was conducted with nine treatments viz., 2,4-D Na Salt 1.0 kg/ha, tribenuron methyl 5.0 and 10.0 g/ha, matsulfuron methyl 2.5 and 5.0 g/ha, chlorimuron ethyl 10.0 and 20.0 g/ha applied as post emergence, HW twice and unweeded check, to control the weeds of finger millet in mid-hill of Uttar Pradesh. HW twice recorded highest mean grain yield (2608 kg/ha). Among the herbicides, tribenuron methyl 10.0 g/ha was more effective to control the weeds with lower weed biomass, higher weed control efficiency and increased the yield.

1. EFFECT OF HERBICIDES AND COMPOSTED COIR PITH ON THE YIELD OF SOYBEAN

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Field experiment was conducted at ACRI, Killikulam during summer season of 1993 to study the effect of herbicides and composited coirpith on weed control and yield of soybean. Application of composted coirpith at 12.5 t/ha reduced the weed density and weed DMP with a weed control efficiency of 50.32 %, 60.04% and 72.16% at 20, 40 and 60 DAS respectively and also increased the grain yield of soybean (1464 kg/ha). Among the herbicides, metolachlor pre-emergence at 0.75 or 1.00 kg/ha followed by one HW at 35 DAS recorded lower weed DMP with a grain yield of 1510 and 1498 kg/ha respectively and no phytotoxic effect was observed on the succeeding ragi crop.

2. NUTRIENT (N, P AND K) REMOVAL IN SOYBEAN FIELD BY WEEDS

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Field experiments was conducted at ACRI, Kumulur to assess the nutrient removal by weeds in soybean crop under various herbicidal treatments. Treatments consisted of three plant densitites viz., 3.33, 4.44 and 5.55 lakh plants/ha in the main plot. The sub-plot treatments had herbicides (butachlor, thiobencarb and pendimethalin) each at 1 kg/ha and herbicides at lower dose (0.5 kg/ha) with manual weeding, HW practice (20 and 40 DAS) and unweeded control. The results revealed that higher crop densities, greatly checked the nutrient (N,P and K) removal by weeds. Nutrient removal was highest by weeds under unweeded conditions of the crop. Higher plant densities (4.44 and 5.55 lakh plants/ha) with pendimethalin 0.5 kg/ha + HW and hand weeding twice effectively checked the nutrient (N, P and K) removal by weeds. The soybean utilised the nutrients Nitrogen, Phosphorus and Potassium very efficiently under 4.44 lakh plants/ha population with pendimethalin 0.5 kg/ha + HW as herbicidal treatments.

3. EFFECTIVE WEED MANAGEMENT PRACTICES FOR SOYBEAN

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The experiments were conducted during summer and rabi seasons of 1991 at ACRI, Kumulur, with three herbicides viz., butachlor, thiobencarb, and pendimethalin each at 1.0 kg/ha, in combination with HW at 20 DAS at lower dose (0.5 kg/ha), and compared with HW twice at 20 and 40 DAS and unweeded control in soybean. The results showed that pendimethalin 0.5 kg/ha + HW, HW twice, butachlor 0.5

kg/ha + HW and thiobencarb 0.5 kg/ha + HW recorded higher yields accounting for 100.8, 95.2, 88.4 and 86.6 per cent in summer and 87.0, 76.7, 71.5 and 68.6 per cent in rabi respectively over unweeded control. These treatments have higher weed control efficiency (WCE), lower weed index (WI) and dry matter and reduced nutrient removal by weeds. The net return was high with pendimethalin 0.5 kg/ha + HW (Rs.14602 and 17402 during I & II seasons) closely followed by HW twice (Rs.14002 and 16066) and butachlor 0.5 kg/ha + HW (Rs.13520 and 15648) as compared to unweeded control (Rs.4886 and Rs.7134 during I and II seasons. For soybean the best weed management practice is pendimethalin 0.5 kg/ha + one hand weeding at 20 DAS.

4. WEED SUPPRESSING ABILITY OF SOYBEAN (*Glycine max* (L.) Merrill)

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Field experiments were conducted at ACRI, Kumulur, Trichirapalli district during summer and rabi 1991, to assess the weed suppressing ability of soybean. The crop, soybean (Co1) was raised with three different spacings viz., 30 x 10 cm (3.33 lakh plants/ha) 30 x 7.5 cm (4.44 lakhs/ha) and 30 x 6 (5.55 lakhs/ha), uner irrigated condition. The results showed that plant densitites, 5.55 and 4.44 lakh plants/ha were effective to control the weeds population. Among the plant densitites, 4.44 lakh plants/ha was optimum in recording higher soybean yield in both the seasonss (2373) and 2550 kg/ha during I and II seasons respectively). The seed protein was more in lesser population density. Highest net return (Rs.14574) and benefit-cost ratio (3.50) were observed in 4.44 lakh plants/ha. So it is concluded that 4.44 lakh plants is the optimum population in soybean to suppress the major weeds and to get more yield and realise higher net return.

5. ECONOMIC ANALYSIS OF INTEGRATED WEED MANAGEMENT IN SOYBEAN

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Field experiments were conducted during summer and rabi seasons of 1991 at Research Farm, Kumulur to work out the relative economics of different management methods in soybean. Three plant densities viz., 3.33, 4.44 and 5.55 lakh plants/ha were tried with herbicides used sinngly and or in combination with HW. Herbicides used include butachlor, thiobencarb and pendimethalin, each at 1.0 kg/ha. These herbicides were integrated with one HW 20 DAS at lower doses (0.5 kg/ha). It is concluded that pre- emergence application of pendimethalin 0.5 kg/ha with one HW at 20 DAS under the plant density of 4.44 lakh plants/ha (30 x 7.5 cm) is most effective and economical integrated

weed management method without any residual effect to the succeeding crops.

6. EFFECT OF TILLAGE MANAGEMENT ON SOYBEAN AND ASSOCIATED WEEDS

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Field trials were conducted at JNKVV Farm, Sagar during 1991-'94 with nine treatments. Zero tillage was supplemented with no weeding (T_1), one HW at 30 DAS (T_2), pre sowing application of glyphosate at the rate of 1 kg/ha a day before sowing (T_3), pre emergence application of butachlor at the rate of 2.5 kg/ha (T_4) and alachlor at the rate of 2 kg/ha (T_5), under tilled conditions one pass of tillage operation without weeding (T_6) and one HW at 30 DAS (T_7) and two pass of tillage operations also were paired without (T_8) and with one HW at 30 DAS (T_9). All the treatments were compared with weedy check (T_1). Tillage operations supplemented with one HW at 30 DAS (T_7 and T_9) recorded significantly lower weed population/m^2. Higher WCE and lower weed index and higher yield of crop biomass was noted undre T_7 (20.83 q/ha) and T_9 (19.33). The maximum gross return was obtained in T_7 (Rs.6994/ha) followed by T_9 (Rs.5740/ha). .pa

7. INTEGRATED WEED MANAGEMENT IN SOYBEAN

M.P. Dubey, JNKVV, Regional Agricultural Research Station, Sagar (M.P.) 470 002

Field experiment was conducted on soybean (*Glycine max* Linn. Merrill) during kharif seasons for two years 1992-93 and 1993-94 to ascertain the economics of different weed control methods in soybean. The treatments consisted of HW T_1, kulpa/dora T_2, desiplough T_3, hand hoeing T_4, each one at 30 DAS, fluchloralin @ 1 kg/ha as ppi T_5, butachlor @ 2.5 kg/ha as pre T_6, classic @ 18 g/ha as post T_7, pre emergence application of butachlor T_6, was super imposed with T_1, T_2, T_3 and T_4 and expressed as T_9, T_{10}, T_{11} and T_{12} respectively and were compared with weedy check. Results revealed that the combination of pre emergence application of butachlor with hand hoeing at 30 DAS recorded significantly higher crop biomass (26.00 q/ha) closely followed by T_9 (25.88 q/ha), T_1 (25.62 q/ha), T_{10} (25.31 q/ha) and T_5 (24.03 q/ha).

8. EFFECT OF CHLORIMURONETHYL ON SOYBEAN AND ASSOCIATED WEEDS

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Chlorimuronethyl at 6, 9 and 12 g/ha, applied 3, 7 and 10 days stages was evaluated for WCE in soybean. The WCE of

chlorimuronethyl increased with increasing rates of application. Delayed application of the herbicides resulted in low WCE at all the doses. Appliction of chlorimuronethyl at 6, 9 and 12 g/ha at 3 days stage provided weed control efficiency ranging from 80-100 %, Cyperus rotundus was controlled to the extent of 95% at 9 and 12 g/ha, irrespective of time of application. Grain yield of soybean significantly reduced due to late application of chlorimuronethyl at 10 days stage as compared to earlier application at 3 and 7 days stages. Grain yield at all the rates when applied 3 or 7 days stages was at par with weed free condition.

9. CRITICAL PERIOD OF WEED COMPETITION IN SOYBEAN (*Glycine max* (L.) Merr)

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In order to assess the crucial period of weed competition in soybean, experiments were conducted during summer and rabi seasons of 1992 at Tamil Nadu Agricultural University, Coimbatore. The crop was maintained weed-free and weed infested for the first 15, 30, 45, 60 days and till harvest. The results showed that keeping the soybean crop weed-free till harvest recorded the maximum yield (1479 kg/ha). The competition offered by weeds after 45 days of sowing of did not significantly reduce the yield of soybean. Similarly the weed infested condition upto 15 days of sowing did not reduce the yield significantly. Weed index was lower (3.3) where weed free condition was maintained for 60 days of sowing. So, it could be concluded that the first 15 to 60 days of crop growth was found to be the critical period of weed competition for soybean.

10. EFFECT OF DOSE AND TIME OF CHLORIMURON METHYL ON WEED AND YIELD OF SOYBEAN

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The weed control treatments resulted in significant increase in grain yield of soybean. HW was superior to all other treatments. Herbicide treatments differed significantly but with almost similar increase in yield. Application of chlorimuron methyl at 30 DAS resulted in slightly higher yield than its appliction at 15 DAS. Chlorimuron-methyl applied at 15 DAS was better to eliminate dicot weeds than 30 DAS application. Elimination of dicot weeds resulted in dominations of grassy weeds. Strong correlation existed between weed dry matter and grain yield of soybean. A quintal decrase in weed dry weight resulted in a quintal increase in grain yield in HW, whereas in herbicide treatments decrease in weed dry weight by 2.5 to 3.0 q/ha brought about a quintal increase in grain yield. Trianthema portulacastrum, Digera arvensis, Digitaria

sanguinalis and Dactyloctenium aegypicum were the pre-dominant weed species in the field. Besides these Acreme resemosa, Leptochloa chinensis, Phyllanthus niruri, Celosia argentia and Cyperus rotundus were also recorded.

11. STUDIES ON CROP-WEED COMPETITION IN SOYBEAN

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A field experiment was conducted during sumer 1992 to asses the optimum weed - free period for irrigated soybean at TNAU farm, Coimbatore. In the experiment, weed - free and weed infested condition upto 15, 30, 45, 60 and 75 days after sowing were compared with the controls of weed-infested and weed-free condition upto harvest. Lower weed index was noticed in weed- free period from 15 to 45 days after sowing. Increased weed- free period reduced the weed biomass, nutrient removal by weeds and improved plant growth characters, yield attributes and yield. A weed-free period from 15 to 45 days after sowing was found adequate for a good growth of the crop, optimum uptake of nutrient, higher number of pods per plant and yield. Weed-free condition beyond 45 days did not significantly increase the yield. The critical period of crop-weed competition in irrigated soybean is found to be 15-45 days after sowing.

12. HERBICIDE TOLERANCE IN GREENGRAM (*Vigna radiata* (L) Wilczek) AND SOYBEAN (*Glycine max* (L) Merr) GENOTYPES

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Field trials were conducted with different elite genotypes of greengram (CO4, CO5, 89047, vamban 1, K51) and soybean (Co1, UGM34, UGM52, Mac 124) to study their response of two levels of different herbicides formulation of oxyfluorfen, 0.125 and 0.250 kg; oxadiazon 0.6 and 1.2 kg and Pendimethalin 1.0 and 2.0 kg/ha for greengram genotypes and oxyfluorfen 0.125 and 0.250 kg; metolachlor 1.0 and 2.0 kg and alachlor 1.00 and 2.00 kg/ha for soybean genotypes. The greengram genotypes 89047 and Co4 were characterised as tolerant and susceptible respectively. The tolerant genotype had higher root membrane integrity (78 per cent) and chlorophyll content (4.08 mg.dm^2) at higher dose of oxadiazon. Similarly higher dose of metolachlor reduced the grain yield to the extend of 2 and 25 per cent as compared to the control in soybean genotypes Mac 124 anc Co1 respectively. This indicated that genotype Mac124 showed its tolerance to herbicide stress by having intact root membrane integrity of 72 per cent and more chlorophyll content (3.64 mg dm^2). The genotype Co1 was found to be sensitive.

13. INTEGRATED WEED MANAGEMENT IN SOYBEAN

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Field experiment was conducted at the Regional Research Station, Chiplima during Kharif season of 1989 to evaluate the efficacy of herbicides alone or in combination with a supplemental hand weeding (HW) at 45 days after sowing (DAS) for controlling weeds in soybean. Glyphosate + one HW at 45 DAS significantly controlled the weeds with a weed control efficiency (WCE) of 89.7 per cent and grain yield of 15.3 q/ha. Hoeing and manural weeding twice (25 and 45 DAS) recorded the highest grain yield of 15.7 q/ha with a WCE of 97.3 per cent. Pendimethalin @ 1.0 kg a.i./ha recorded a grain yield of 9.1 q/ha which was at par with glyphosate (10.2 q/ha) with a WCE of 66.5 per cent. Similar observations were also recorded with respect to growth characters, and pods/plant, pod weight/plant, grain weight/plant and 100 seed weight.

14. EFFICACY OF VARIOUS HERBICIDES TO CONTROL WEEDS IN PEAS (*Pisum stivum* L.)

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An experiment on weed control studies in Peas (*Pisum stivum* L.) was conducted at HPKV, Regional Research Station, Dhaulakuan during the main seas on (Rabi) of 1991-1992. The treatments consisted of three herbicides viz. Alachlor, Glyphosate and Thiobencarb. Each herbicide was applied at three rates i.e. 1.0, 1.5 and 2.0 kg/ha. Weed free and weedy check treatments were kept as control. The herbicides alachlor and thiobencarb were applied as pre-sowing (48 hrs. before sowing) while glyphosate was applied as post-emergence two days of sowing. The results revealed that application of alachlor 2.0 and 1.5 kg/ha was the best treatments in controlling weeds in Peas. Seed yield & yield attributes were higher with alachlor 2.0 kg/ha.

15. INTEGRATED WEED MANAGEMENT IN SOYBEAN (*Glycine max.* (L) MERRIL)

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Field experiments were conducted at the Agricultural College Campus, Bapatla during Kharif 1989-90 and 1990-91 with eight treatments. Three herbicides each at two doses viz., alachlor (1.5 and 3.0), pendimethalin (1.0 and 1.5 kg/ha) as pre-emergence spray and fluchloralin (1.0 and 1.5 kg/ha) as pre-sowing incorporated spray were compared with two hand weedings (at 20 and 40 DAS) and unweeded

control. The lower dose of herbicide treatments was combined with one hand weeding at 25 DAS. The lowest dry weight of weeds was recorded at harvest in hand weeding twice (763.5 kg/ha) followed by herbicide treatments. Among the herbicide treatments, maximum grain yield of 1414 kg/ha was recorded with fluchloralin @ 1.0 kg + HW at 25 DAS next only to hand weeding twice, while the lowest grain yiled was recorded with alachlor at 3.0 kg/ha (1269 kg/ha). The results revealed superiority of herbicides in the order of alachlor (1.5 kg/ha), pendimethalin (1.0 kg/ha) and fluchloralin (1.0 kg/ha) combined with one hand weeding at 25 DAS.

16. STUDIES ON WEED MANAGEMENT IN SOYBEAN

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An experiment was conducted on soybean var. PK 472 to study the effect of weed management practices on weed control and yield of soybean on the farm of Department of Agronomy, Punjabrao Krishi Vidyapeeth, Akola, (M.S) during kharif 1993 with seven weed control treatments. Application of alachlor at 2.0 kg/ha, fluchloralin and pendimethalin each at 1.0 kg/ha as pre-emergence reduced significantly the dry weight of weeds compared to hand weeded treatments and the weedy check. Among the herbicides, alachlor at 2.0 kg/ha gave the highest yield of 7.70 q/ha but was at par with fluchloralin and pendimethalin at 1.0 kg/ha.

17. STUDIES ON INTEGRATED WEED MANAGEMENT IN IRRIGATED PIGEONPEA (*Cajanus cajan* L. Millsp.)

S.Pazhanivelan and O.S.Kandasamy, Department of Agronomy, Tamil Nadu Agricultural University, Coimbatore-641 003

A field experiment was conducted during rabi 1992'93 to evolve an effective and economic method of weed management in irrigated pigeonpea cv. Co.5 (110 days) at Tamil Nadu Agricultural University, Coimbatore. The treatments consisted of four pre- emergence herbicides (oxyfluorfen 0.125 kg, fluchloralin 1.0 kg, pendimethalin 1.0 kg and oxadiazon 0.5 kg/ha 3 DAS), two post- emergence herbicides (bentazon 1.25 kg and fluazifopbutyl 0.25 kg/ha at 20 DAS) each fb. HW twice and unweeded control. Among the herbicidal treatments, pre-emergence herbicides fb. one late HW at 40 das especially pendimethalin 1.0 kg/ha markedly suppressed the weed growth and recorded grain yield (1098 kg/ha) on par with HW twice. Sequential application of pre and post emergence herbicides did not hold promise for weed management in irrigated pigeonpea.

18. STUDIES ON INTEGRATED WEED MANAGEMENT IN RAINFED PIGEONPEA (*Cajanus cajan* L. Millsp.)

S. Pazhanivelan and O.S.Kandasamy, Department of Agronomy, Tamil Nadu Agricultural University, Coimbatore-641 003

A field experiment was conducted during rabi 1992-'93 in rainfed pigenopea cv. Co-5 at Tamil Nadu Agricultural University, Coimbatore. Four pre-emergence herbicides (oxyfluorfen 0.125 kg, fluchloralin, 1.0 kg, pendimethalin 1.0 kg and oxadizon 0.5 kg/ha at 3 DAS, two post emergence herbicides (bentazon 1.25 kg and fluazifopbutyl 0.25 kg/ha at 20 DAS), each fb HW twice and unweeded control. The results revealed that hand weeding twice (20 and 40 DAS) and pre-emergence application of pendimethalin 1.0 kg/ha fb either fluazifop-butyl (post-emergence) 0.25 kg/ha or a late hand weeding (40 DAS) recorded lower weed population and weed dry matter production and higher grain yield.

19. EFFECT OF HERBICIDES ON SOIL MICROFLORA IN BLACKGRAM

J.Prabhakaran, K.Srinivasan and N.Nadarajan, National Pulses Research Centre, Vamban, Pudukkottai - 622 303, Tamil Nadu

An experiment was conducted at National Pulses Research Centre, Vamban, Pudukkottai to study the effect of Fluchloralin and Pendimethalin on the soil microflora of blackgram. Fluchloralin @ 0.75 kg ai./ha and pendimethalin @ 1.0 kg ai/ha were applied to blackgram at 3 DAS. Both the herbicide treated plots recorded significant reduction in microbial counts on fifth day of treatment. The reduction was significant in bacteria. However, fungal and actinomycetes were not significantly affected. However, as time passes the microbes adjust to new edaphic condition and grows normally from 25 DAS.

20. INTEGRATED WEED MANAGEMENT IN SOYBEAN

K.Ponnuswamy, R.Jagannathan, O.S.Kandasamy and N.Balasubramaniam, Department of Agronomy, Tamil Nadu Agricultural University, Coimbatore-641 003.

Field experiment was conducted during summer 1992 at Tamil Nadu Agricultural University, Coimbatore to assess the competition of weeds and their control in soybean. Pre-emergence herbicides viz., pendimethalin 1.0 kg, oxyfluorfen 0.125 kg, dimethazone 1.25 kg and post-emergence herbicides bentazone 1.25 kg, chlorimuron ethyl 9 gm/ha and sethoxydim 1.25 kg were sprayed alone and in combination with hand weeding at lower doses. The results revealed that pendimethalin at 0.75 kg/ha fb HW at 30 DAS and HW twice at 15 and 30 DAS were economical weed control measures in soybean as they recorded low weed index (0 and 1.5) and maximum net return of Rs.5717 and 5568 respectively.

21. EFFECT OF PENDIMETHALIN ON RHIZOBIAL EFFICIENCY IN SOYBEAN (*Glycine max* (L.) MERRILL)

C.S.Praharaj and K.K.Dhingra, Department of Agronomy, Punjab Agricultural University, Ludhiana-141 004

Field experiments were conducted for two years during 1992 and 1993 to study the effect of Pendimethalin at recommended dose on the efficacy of rhizobial nodulation, nitrogenase activity, biological nitrogen fixation (BNF) and growth/yield of soybean cv. PK 416. Results revealed that application of pendimethalin 0.5 kg/ha neither had any adverse effect on the nodulation and nitrogenase activity nor it influenced the efficiency of rhizobial inoculants in terms of BNF in soybean. Rhizobium inoculation irrespective of the mode of weed control (chemical or manual) enhanced the BNF and fixed an additional 66.1 – 74.7 kg N/ha over uninoculated control, thereby, increased the seed yield of soybean significantly by 8.21 and 12.22 per cent during 1st and 2nd year respectively.

22. INTEGRATED WEED MANAGEMENT IN LENTIL (*Lens esculentus* L) IN MID-HILLS OF UTTAR PRADESH

Prem Singh, A.K.Pandey and Ved Prakash, Vivekananda Parvatiya Krishi Anusandhan Shala (ICAR), Almora-263 601, U.P.

Experiment was conducted in two rabi seasons of 1992-93 and 1993- 94 at Experimental Farm Hawalbagh of V.P.K.A.S., Almora to determine suitable weed control measure. There were twelve treatments viz., unweeded and weed free checks, one HW at 30, 45 and 60 DAS, two HW, pendimethalin @ 0.75 and 1.00 kg a.i./ha, oxyfluorfen @ 0.05 and 0.10 kg a.i./ha. Pendimethalin @ 0.75 kg a.i./ha and oxyfluorfen @ 0.05 kg a.i./ha were fb one HW. Maximum grain yield (8.93 q/ha) of lentil was obtained with weed free check which was about 148.7 per cent higher than weedy check. Weed control efficiency and weed index ranged from 21.54 to 97.22 and 8.96 to 59.79 per cent respectively under different treatments.

23. STUDIES ON THE EFFECT OF HERBICIDES ON THE GROWTH, NODULATION AND SYMBIOTIC NITROGEN IN MUNGBEAN, (*Vigna radiata* L.)

S.K.Pahwa and Jai Prakash, Department of Agronomy, CCS, N.A.U., Hissar-125 004

Five healthy seeds of mungbean were sown in earthen pots filled with field soil and farm yard manure (6:1) which were thinned to two plants after germination. Fluchloralin at 0, 0.75, 1.0 and 1.25 kg/ha was incorporated in the soil before sowing. Pendimethalin at 0.75, 1.0 and 1.25 kg/ha was applied as post- emergence spray 15 days after sowing. All the treatments decreased the length of shoot and root

alongwith number of leaves and their dry weights of treated plants at all the stages of samplings. Fluchloralin and pendimethalin increased the number of nodules per plant alongwith their fresh weight upto 1.0 kg/ha and 1.5 kg/ha respectively. But the laghaemoglobin content of nodules decreased in all the treated plants. As a result, the nitrogen fixing efficiency decreased at 30 DAS.

24. ECONOMICS OF SOYBEAN (*Glycine max* L.) MERRILL CULTIVATION UNDER DIFFERENT METHODS OF WEED CONTROL

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An experiment was carried out during kharif season of 1988-89 and 1989-90 at ARS, Jabalpur. Economics of soybean cultivation with various combination of seed rates (80 and 120 kg/ha), three row spacings (20, 30 and 40 cm) in Mainplots and seven weed control treatments (weedy check, hand weeding (20 DAS), ethalfluralin 1.0, 1.5 and 2.0 kg/ha, trifluralin 1.8 kg/ha and fluchloralin 1.0 kg/ha) in subplots. The results revealed that highest weed control efficiency (84.39 %) and grain yield (23.59 g/ha) were recorded in the hand weeding treatment (20 DAS) and realised a higher net return of Rs.12,832/ha during 1988-89 and Rs.10,249/ha during 1989-90 followed by fluchloralin 1.0 kg/ha (Rs.9,505/ha in 1988-89 and Rs.9,395/ha in 1989-90).

25. CROP-WEED COMPETITION IN PIGEONPEA

M.Ramasamy, K.Srinivasan, K.Vairavan and N. Nadarajan, National Pulses Research Centre, Vamban, Pudukkottai 622 303.

A field experiment was conducted for three years, at NPRC, Pudukkottai, to study the crop-weed competition in rainfed pigeonpea. The treatments were, weed free upto 15 DAS, 30 DAS, 45 DAS, 60 DAS, weed free till maturity, weedy upto 15 DAS, 30 DAS, 45 DAS, 60 DAS, and weedy till maturity. The results revealed that the weed growth continued to increase till crop maturity. Weed dry matter decreased with increasing weed free period. Weed free upto 45 and 60 DAS reduced the weed infestation till crop maturity and enhanced the yield of pigeonpea.

26. IRRIGATION AND HERBICIDE USE EFFECTS ON CONSUMPTIVE USE, WATER USE EFFICIENCY AND MOISTURE EXTRACTION PATTERN IN SPRING PLANTED MUNGBEAN

Ram Prasad, Banarasi Lal and Govindra Singh, Department of Agronomy, G.B.Pant University of Agriculture and Technology, Pantnagar, Dist., Nainital-263 145, UP., India.

Irrigation effects on grain yield were non-significant during the first year, while in the second year, three irrigations at 15.0 cm cumulative pan evaporation (CPE) produced significantly higher grain yield than unirrigated crop and the one receiving one irrigation at 4 weeks stage. The consumptive use of water (CUW) by the crop increased and water use efficiency (WUE) decreased with increasing frequency of irrigation. Fluchloralin application @ 1.0 kg/ha produced significantly higher grain yield than weedy plot and methabenzthiazuron treated plots. Fluchloralin and pendimethalin treated plots had similar profile soil moisture extraction, CUW and WUE as weedfree treatment. Methabenzthiazuron was inferrior and at par with weedy check.

27. IRRIGATION AND HERBICIDE EFFECTS ON YIELD AND N UPTAKE BY SPRING MUNG BEAN

Ram Prasad, Banarasi Lal and Govindra Singh, Department of Agronomy, G.B.Pant University of Agriculture and Technology, Pantnagar, India.

Three irrigations (at 15.0 cm CPE) produced significantly higher thousand seed weight and ultimately higher grain yield. The crop receiving irrigation at 15 cm CPE also recorded significantly higher straw yield and N uptake than no post planting irrigation and one irrigation. Fluchloralin treated plots, although being inferior to weed-free plots, gave higher grain yield, higher N uptake by crop and lower N uptake by weeds than weedy check and methabenzthiazuron treated plots.

28. IRRIGATED WEED MANAGEMENT IN SOYBEAN

K.Sankaranarayanan, N.Kemputchetty, A.S.Venkatakrishnan, N.Balasubramanian, and S.Purushothaman Department of Agronomy, TNAU, Coimbatore-641 003

A field investigation was conducted during Summer 1992 to evolve a suitable weed control method for irrigated soybean at TNAU, Coimbatore. The different treatments were pendimethalin (1 kg/ha) oxyfluorfen (0.125 kg/ha) and dimethazone (1.25 kg/ha), chlorimuron ethyl (9 g/ha), sethoxydim (1.25 kg/ha) and mixtures of bentazone with sethoxydim (1.25 kg/ha) and mixtures of bentzone with sethoxydim (0.6 + 0.6 kg/ha). Hand weeding was integrated with reduced dosages of above herbicides and they were compared with HW twice at 15 and 30 DAS and unweeded control. Among the different treatments, HW twice at 15 and 30 DAS, and pendimethalin 0.75 kg/ha with one HW at 30 DAS

were effective in controling the weeds. Sethoxydim 1.25 kg/ha, was effective in contolling grasses. Bentazon 1.25 kg/ha and chlorimuron ethyl 9 g/ha were effective against broad leaved weeds. Highest yield and net return was observed in Pendimethalin 0.75 kg/ha, with hand weeding at 30 DAS(1436 kg/ha).

29. EFFECT OF POST-EMERGENCE HERBICIDES ON THE CONTROL OF WEEDS IN SOYBEAN

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Efficacy of three post-emergence herbicides viz; bentazon (1.0, 1.5 and 2.0 kg/ha), fluazifop-p-butyl (100, 200 and 300 g/ha) and sethoxydim (200, 300 and 400 g/ha) were evaluated to control the weeds in soybean during rainy seasons of 1992 and 1993 at Jabalpur. Bentazon was most effective against broad leaf weeds and sedges, fluazifop-p-butyl against grassy weeds and sethoxydim against grassy weeds and sedges at higher doses. Bentazon at 2.0 kg/ha was most effective in reducing the weed density and weed dry matter followed by sethoxydim at 400 g/ha and fluazifop-p- butyl at 300 g/ha. The maximum grain yield was recorded with bentazon 2.0 kg/ha (23.73 and 20.59 q/ha) followed by sethoxydim 400 g/ha (21.8 and 18.92 q/ha) and fluazifop-p-butyl 300 g/ha.

30. EFFECT OF CULTURAL PRACTICES ON WEED CONTROL IN BLACKGRAM

K.Srinivasan, K.Vairavan, M.Ramasamy and N.Nadarajan, National Pulses Research Centre, Vemban, Pudukkottai-622 303

A field trial was conducted at NPRC Vamban, to find out the effect of different cultural practices on the weed control in blackgram, such as summer ploughing, disc ploughing, cultivator ploughing, harrowing, ploughing with country plough, Disc ploughing + cultivator ploughing, Disc ploughing + harrowing, Disc ploughing + country plough. The results revealed that Disc ploughing + Cultivator ploughing significantly reduced the weeds. The disc ploughing + harrowing and disc ploughing + country ploughing treatments were also at par. Summer ploughing alone, cultivator ploughing alone and harrowing alone were on par. The superiority of disc ploughing + cultivator ploughing might be due to uprooting of the weeds from deeper layer and exposing the rhizomes, underground stems, and seeds from deeper layer to the surface. There was significant difference in weed flora also. Disc ploughed treatments recorded a lower grasses and sedge weeds as compared to undisced treatments.

31. WEED CONTROL THROUGH HERBICIDES IN PEA (*Pisum sativum*)

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With a view to develop an effective and economical weed control schedule in pea, a field experiment was conducted for two consecutive years (1991-92) and (1992-93). Four herbicides, each at two levels viz, oxyfluorfen (0.1 and 0.15 kg/ha), metribuzin (0.25 and 0.50 kg/ha), Pendimethalin (1.0 and 1.25 kg/ha) and isoproturon (0.50 and 0.75 kg/ha) were compared with unweeded and manual weeding twice. Pendimethalin (1.0 kg/ha), metribuzin (0.25 kg/ha), isoproturon (0.5 kg/ha) and oxyfluorfen (0.15 kg/ha) registered 34.10 %, 23.24%, 18.57% and 25.45% more grain yield. The WCE was 73.19% 57.40%, 55.71% and 62.10%. Among the herbicides, the highest net income was recorded with pendimethalin followed by oxyfluorfen.

32. WEED MANAGEMENT STUDIES IN PIGEON PEA

S.S.Tripathi and Vivek, G.B.Pant University of Agricultural & Technology, Research Station, Bulandshahr, U.P. India

Pendimethalin (pre-emergence), fluchloralin (Pre-plant incorporation) each at 0.75, 1.0, 1.25 and 1.5 kg/ha alongwith weedy and HW at 35 DAS treatments were evaluated for their effects on weeds and yield of pigeonpea during kharif season of 1993 and 1994. The total weed density was reduced by more than 70 per cent with the application of pendimethalin at 1.5 kg/ha. Weeds caused more than 33% reduction in grain yield of pigeon pea. Pendimethalin at 1.5 kg/ha, pendimethalin and fluchloralin each at 1.25 kg/ha and HW 35 DAS produced significantly higher seed yield as compared to other treatments.

33. EFFICACY OF DIFFERENT HERBICIDES IN RED GRAM

K.Vairavan, K.Srinivasan, M.Ramasamy and N.Natarajan, National Pulses Research Centre, Vamban, Pudukkottai 622 303

Field trials were conducted at NPRC, Vamban to find out the efficacy of different herbicides in redgram. The treatments were, metalachlor @ 1.0 kg ai/ha, metolachlor @ 1.5 kg ai/ha, pendimethalin @ 1.0 and 1.5 kg ai/ha, Alachlor @ 1.0 and 2.0 kg ai/ha, pendimethalin @ 1.0 kg ai/ha + one hand weeding (HW) at 30 DAS, Alachlor @ 1.0 kg ai/ha + one HW was significantly superior in reducing the weed intensity, weed dry weight and WCE with high yield. All the herbicides, reduced only the broad leaved weeds, leaving grasses and sedges unchecked.

34. INTEGRATED WEED MANAGEMENT IN PEA

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A field study on integrated weed management in pea (*Pisum sativum* L.) was carried out during winter seasons of 1991-92 and 1992-93 at Agronomy Research Farm of N.D.U.A.T. Kumarganj, Faizabad (U.P.) India. Results revealed that pre-emergence application of pendimethalin @ 1.0 kg/ha fb. one HW at 20 DAS gave the highest grain yield and comparable to two HW at 20 and 40 DAS. The unchecked weeds reduced grain yield by 30.7%. The application of pendimethalin @ 1.0 kg/ha as pre-em. and bentazon @ 1.0 and 1.5 kg/ha as post-emergence in pea did not leave residue in the soil.

35. HERBICIDAL EFFECT ON THE NITROGENASE ACTIVITY OF GREENGRAM CULTIVARS

S. Velu and A. Mohamed Ali, Water Technology Centre, Tamil Nadu Agricultural University, Coimbatore-641 003

An experiment was carried out at TNAU, Coimbatore during the year 1991-92 to assess the impact of pre-sowing incorporation as well as pre-emergence application of three herbicides viz., fluchloralin (0.90 kg/ha) thiobencarb (1.25 kg/ha) and metolachlor (1.00 kg/ha) applied separately on the nitrogenase activity of root nodules of three greengram cultivars, Co.4, NARP 1 and Co GG 89407. None of the herbicides had any adverse effect on the cultivars. The enzyme activity was peak at flowering stage and declined subsequently in all the cultivars. Among the herbicides, the pre-emergence metolachlor recorded a maximum activity of 3.82 u moles. NO_2 g^{-1}. The cultivar Co GG 89047 had maximum activity of 3.98 u moles NO_2 g^{-1} dry wt hr^{-1} accounting 13.39% (3.51) and 6.70% (3.73) more activity than CO_4 and NARP 1 respectively. The cultivar CO GG 89047 and higher activity at all stages of crop growth than other two cultivars.

36. PREDICTION OF CRITICAL WEED COMPETITION PERIOD BY CROP MODELING IN GREENGRAM

G.Velu and A.Mohamed Ali, Water Technology Centre, Tamil Nadu Agricultural University, Coimbatore-641 003

Investigations were carried out at TNAU, Coimbatore during 1991-92. Three greengram cultivars viz. CO4, NARP 1 and COGG 89047 with the herbicides fluchloralin (0.90 kg/ha), thiobencarb (1.25 kg/ha) and metolachlor (1.00 kg/ha) incorporated in the soil before sowing (PSI) and applied before the emergence of weeds (PE) were tested. The data on periodicial biomass of individual cultivar in the unweeded control, HW and metolachlor (PE) treatments were fitted into Gompertz, Richards and

Logistic mathematical models to find out the critical weed competition period and its impact on crop growth. The Gompertz model showed high predictability (R^2) ranged between 95.6 and 99.9 per cent in estimating the total dry matter production of cultivars nearer to actual values. Besides the values of chi-square (X^2), RSS, RMSD, the Gompertz model showed better goodness of fit to simulate the crop growth interms of total dry matter production. Among the cultivars, CO4 showed higher value of R^2 for all models at all weed management system with corresponding low values of X^2, RSS and RMSD than other two cultivars. The handweeding and pre- emergence metolachlor application recorded high R^2 values than unweeded control indicating the high efficiency of crop growth with maximum suppression of weed growth thereby maintained higher grain productivity.

37. CHEMICAL WEED MANAGEMENT FOR RICE FALLOW BLACKGRAM

A.S. Venkatakrishnan, T.N.Balasubramanian, P.Gnanamoorthy and N.Balasubramanian
Department of Agronomy, Tamil Nadu Agricultural, University, Coimbatore-641 003

An experiment was conducted in three locations of farmers holding in Kattumannar Kovil and Chidambaram taluks of S.A. District of Tamil Nadu between January and April 1993 to evolve an efficient chemical weed management programme for the rice fallow blackgram. The treatments consisted of pre emergence application of alachlor at 1.5 kg/ha butachlor at 0.75 kg/ha, thiobencarb at 0.75 kg/ha and one control. The results revealed that all the herbicides reduced the weeds in blackgram under both conditions of previous rice crop grown with and without recommended herbicide. Among the herbicides, application of alachlor at 1.5 kg/ha reduced the weed biomass and increased the number of pods/plant and blackgram yield (678 kg/ha). There was also no residue effect of herbicides on the succeeding blackgram.

38. CHEMICAL WEED CONTROL IN KHARIF AND RABI PULSES

Vivek, Chakor, I.S. Sharma, S.K. and Tripathi, S.S.G.B.Pant University of Agriculture and Technology Research Station Bulandshahr (U.P.), HPVK Research Station Dhaulakuan (H.P.)

A field experiment was conducted at Research Farm of HPKV, RRS, Dhulakhan in two kharif and Rabi seasons of 1992-93 with six pulse crops. soybean, mash and moong during kharif and gram, peas and lentil during Rabi. The experiment comprised weedy ckeck control, handweeding, pendimethalin in three doses viz., 1.0, 1.5 and 2.0 kg a.i./ha. The higher dose of pendimethalin showed phytoxicity on crop plants. Pendimethalin 1.5 kg ai./ha as preemergence is recommended as chemical weed control practice for Soybean, Mash and Moong and Rabi pulses like, Gram, Peas, and Lentil under foot hill conditions of Himachal Pradesh.

1. WEED MANAGEMENT IN RAINFED GROUNDNUT

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Results of the field experiments conducted at Birsa Agricultural University Farm, Kanke, Ranchi showed that application of fluchloralin 0.72 kg/ha and oxyfluorfen 0.2 kg/ha at one DAS controlled grasss and broad leaf weeds very effectively and produced high pod yield in groundnut (2125 and 2064 kg/ha respectively). Pendimethalin, butachlor, thiobencarb each at 1.5 kg/ha at one DAS was less effective. Lowest pod yield (818 kg/ha) was recorded from weedy plots which caused 62.7% yield loss due to severe weed infestation in rainfed groundnut.

2. EFFECT OF HERBICIDES ON GROUNDNUT AND ASSOCIATED WEEDS

O.P.Mishra and G.Singh, G.B.Pant University of Agriculture & Technology, Pantnagar, (Nainital)-263 145, U.P.

Field experiment was conducted to evaluate the weed control efficacy of alachlor at 2.0, 2.5 and 3.0 kg a.i./ha, pendimethalin and metolachlor each at 0.5, 1.0 and 1.5 kg a.i./ha, fluchloralin at 1.0 kg a.i./ha along with weed-free and weedy check treatments in groudnut. Weed control efficacy was more at higher rates of herbicides. Alachlor, metolachlor at all the rates, pendimethalin at 1.5 kg a.i./ha and fluchloralin at 1.0 kg a.i./ha, produced significantly more pod yield. Alachlor at 2.5 and 3.0 kg a.i./ha, metolachlor at 0.5 kg a.i./ha and fluchloralin at 1.0 kg a.i./ha were at par with weed-free conditions in regard to yield of groundnut.

3. EFFECT OF DIFFERENT DOSES AND TIME OF APPLICATION OF CHLORIMURON ETHYL (CLASSIC) ON THE PERFORMANCE OF SUMMER AND KHARIF GROUNDNUT

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Field experiments in two seasons were conducted during 1992 and 1993 at the experimental farm IIT, Kharagpur. At early stage (upto 40 DAS), *Digiteria sanguinalis Cyperus rotundus* and *Cynodon dactylon* were predominant during summer. Whereas, during kharif. *Echinochloa cusgalli* and *Ludwigia perennis* were major weeds in groundnut. CLASSIC (Chlorimuron ethyl) at varied doses was tested. This herbicide controlled the weeds more effectively at C_6 (6 g/ha) and C_9 (9g/ha) than at C_3 (3 g/ha) level. Application of CLASSIC at 5 DAS was more effective than at 7 or 10 DAS. Further, inclusion of one HW at 30 DAS alongwith the application of CLASSIC proved highly effective in

controlling the weeds and increasing the crop yield. Use of polythene mulch or application of stomp at 1.0 kg/ha was also effective.

4. EFFECT OF SEED RATE AND WEED CONTROL MEASURES ON THE WEED GROWTH AND YIELD OF GROUNDNUT

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A field experiment was conducted during the rainy seasons of 1992 and 1993 at the ICAR Research Complex, Farm Barapani, Meghalaya to study the effect of seed rate and weed control measures on the growth and yield of groundnut under mid altitude condition. Two seed rates (70 kg & 100 kg), and six weed control measures (control, two HW, butachlor @ 1.0 kg/ha + one HW, pendimethalin @ 1.0 kg/ha + one HW, butachlor @ 1.0 kg/ha + one mechanical weeding, pendimethalin @ 1.0 kg/ha + one mechanical weeding comprised the treatments. Two HW at 20 and 40 DAS reduced the weeds maximum and boosted pod yield of groundnut. Herbicide + HW combination was superior for effective weed control in groundnut. The higher seed rate i.e., 100 kg kernel/ha was superior. The highest net income (Rs.6500/ha) was obtained due to application of pendimethalin at 1.0 kg/ha alongwith one mechanical weeding at 40 DAS.

5. ROOT DEVELOPMENT AND WATER USE EFFICIENCY AS INFLUENCED BY MOISTURE, REGIMES, SEEDING METHODS AND WEED MANAGEMENT IN PEANUT

K.Vairavan and S.Sankaran, National Research Centre for Pulses, Vamban-622 303, Pudukkottai, Tamil Nadu.

Root development and yield in peanut (*Arachis hypogaea*) and its consequent effect on moisture use efficiency under different moisture regimes, seeding methods and weed management practices were studied during summer seasons of 1990 and 1991. Medium moisture regimes of 4.00 cm through line source sprinkler under ridges and furrows method of seeding significantly increased the root growth, yield and water use efficiency (WUE). Pre emergence application of fluchloralin followed by HW at 30 DAS showed beneficial effect on root proliferation, yield and WUE in peanut.

6. EFFICIENCY OF FLUCHLORALIN UNDER DIFFERENT SEEDLING METHODS AND MOISTURE REGIMES IN PEANUT

K.Vairavan and S.Sankaran, National Research Centre for Pulses, Vamban-622 303, Pudukkottai, Tamil Nadu

A field experiment was conducted during 1990 and 1991 to study the effect of fluchloralin under different seeding methods and moisture regimes on weed count and weed weight in summer peanut. (*Arachis hypogaea*). The efficiency of fluchloralin was more under ridges and furrows method of seeding combined with 4.00 cm water through line source sprinkler irrigation. The yield attributes viz., Number of branches, flowers, pods/plant, number of matured pods, double seeded pods/plant and 100 seed weight significantly increased resulting an increased yield by the pre-emergence application of fluchloralin followed by HW at 30 DAS under ridges and furrows method of seeding. Application of 4.00 cm water through line sources increased the yield attributes and yield in peanut.

7. EFFECT OF TIME OF N APPLICATION AND WEED MANAGEMENT PRACTICES ON THE GROWTH AND YIELD OF SESAMUM

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Field experiment was conducted during the summer season of 1992 at Annamalai University experimental farm, Annamalainagar to study the effect of time of N application and weed management practices in sesamum. The treatments comprised of three levels of nitrigen application viz., full basal N, half basal N + half N at 20 DAS and half basal N + 1/4 N at 20 DAS and 1/4 N at 35 DAS in main plots and six weed management practices viz., fluchloralin + one HW at 40 DAS, alachlor + one HW at 40 DAS, butachlor + one HW at 40 DAS, thiobencarb + one HW at 40 DAS, HW twice at 20 and 40 DAS and weedy check in subplots. The study showed that application of nitrogen in two split doses viz., half N basal + half N at 20 DAS and pre emergence application of alachlor at 3 DAS @ 2 Kg/ha supplemented with one HW at 40 DAS registered highest seed yield of 800 Kg/ha and net return of Rs.2.78 per rupee invested and proved most efficient practice to control weeds in sesamum.

8. INTEGRATED WEED MANAGEMENT IN SESAME

P.Sreedevi, Annamma George, Santhakumari and Lalithabai, E.K., Kerala Agricultural University, Therissur

A study was undertaken at the KAU Research Station, at Mannuthy and Chalakudy during 1991 and 1992. The herbicides oxyfluorfen (0.1 kg a.i./ha), pendimethalin (1 kg a.i./ha), fluchloralin (1 kg a.i./ha) and metolachlor (1 kg a.i/ha) were tested as pre- emergence and pre-plant

incorporation, both fb one manual weeding at 25 DAT for weed control in sesame. These were compared with manual weeding at 15 and 30 DAS, and unweeded control. Weed population and biomass at 30 and 60 DAS and the sesame and stover yield were recorded. Pre-plant incorporation of metolachlor @ 1.0 kg a.i./ha, pre-emergence application of fluchloralion @ 1.0 kg a.i/ha and oxyfluorfen @ 1.0 kg a.i./ha were equally effective to control weeds and recorded highest grain yield of sesame.

9. EFFECT OF FLUCHLORALIN APPLICATION ON THE YIELD OF RAINFED SESAME

A.S.Venkatakrishnan, G.Manickam, and N.Balasubramanian, Department of Agronomy, TANU, Coimbatore-641 003

Field experiments were conducted during kharif 1992 and 1993 at RRS Vridhachalam to evaluate the effect of dryland technologies in combination with pre plant incorporation of fluchloralin on the yield of sesame under dryland condition. The results revealed that combination of different dryland technologies with Fluchloralin (PPI) + one HW at 30 DAS significantly reduced the weeds and weed biomass and increased the yield of sesame.

10. NUTRIENT UPTAKE AS INFLUENCED BY NITROGEN AND WEED MANAGEMENT PRACTICES IN SESAMUM

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Field experiment was conducted during the summer season of 1992 at Annamalai University experimental farm, Annamalainagar, to study the nutrient uptake by sesamum as influenced by nitrogen and weed management practices. Three levels of nitrogen application viz., full basal N, half basal N + half N at 20 DAS and half basal N + 1/4 N at 20 DAS and 1/4 N at 30 DAS in mainplots and six weed management practices viz., fluchloralin + one HW at 40 DAS, alachlor + one HW at 40 DAS, thiobencarb + one HW at 40 DAS, HW twice at 20 and 40 DAS and weedy check in subplots. The application of N in 2 split doses recorded highest N,P,K nutrient uptake by crop. Among the weed control practices, alachlor + one HW at 40 DAS recorded highest nutrient uptake by sesame followed by fluchloralin + one HW at 40 DAS.

11. QUANTIFICATION OF SUNFLOWER *Cyperus rotundus* .L COMPETITIVE ABILITY AT VARYING LEVELS OF RESOURCES

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Experiment was conducted by growing sunflower (Hybrid KBSH-1) and *Cyperus rotundus* (Weed) simulataneously at various plant densitites

under different resource levels during summer season. Treatments of weed alone (9, 18, 27, 36 plants/m^2) or mixed with sunflower (9, 12, 15 plant/m^2) were raised in microplots maintained at various levels of moisture (8, 16 mm) and fertilizer (62, 75, 62 and 31, 37, 31 NPK kg/ha). Inverse of weed biomass, tuber number, crop biomass per plant at 100 DAS were regressed with weed and sunflower densitites to quantify competitive ability of sunflowr. Competitive abiity was exprssed by number of weed plants which is equal to one sunflower plant in reducing the weed biomass to the same level. Biomass and other parameters of crop and weed were reduced under limited resources. More reduction was observed in moisture limitation as compared to reduced nutrient level. Competitive ability of sunflower was two times more under reduced nutrient level compared to unlimited resources level, whereas, 2.6 times more in low moisture and recommended NPK level and 5.4 times more in both nutrient and moisture limited coditions were observed.

12. STUDIES ON INTEGRATED WEED MANAGEMENT IN SUNFLOWER (*Helianthus annus* L.)

H.C.Kundra, Makhan Singh, L.S. Brar and S.P. Mehra, Department of Agronomy, Punjab Agricultural University, Ludhiana

Field studies conducted during spring season of 1991 and 1993 revealed that pre-plant application of fluchloralin @ 0.75 kg/ha and pre-emergence application of pendimethalin and linuron each @ 0.75 kg/ha and alachlor @ 1.5 kg/ha gave effective control of weeds and increased the yield in sunflower var. MSFH 8. Highest seed yield of (21.14 q/ha) was obtained under pendimethalin 0.5 kg/ha followed by one HW at 30 DAS. Lower dose of herbicides (0.5 kg/ha of pendimethalin, linuron and fluchloralin and 1.0 kg/ha of alachlor) along with one HW 30 DAS resulted weed control efficiency and seed yield of sunflower comparable to that under higher dose of herbicides or two HW. The oil content in seed was not affected by weed control treatments.

13. CRITICAL PERIOD OF CROP-WEED COMPETITION IN RAINFED SUNFLOWER

A.Muthusankaranarayanan, V.Veerabadran and R.Balasubramanian, Agricultural College and Research Institute, Killikulam - 627 252, Tamil Nadu.

The critical period of crop-weed competition in rainfed sunflower during Rabi season was assessed by imposing treatments involving varying periods of weed free condition and weed infestation during 1985-88. Weed free condition from 15 DAS to harvest recorded the highest yield of 839 kg/ha which was comparable with weed free condition upto 30 DAS and weed free upto 45 DAS. The critical period of crop weed competition in rainfed sunflower was 15 to 30 DAS.

14. IMPACT OF THERMAL TIME ON DRY MATTER PRODUCTION AND THERMAL TIME USE EFFICIENCY IN SUNFLOEWR UNDER WEED MANAGEMENT PRACTICES

T.V.Ramachandra Prasad, SP. Palaniappan, C.Suyambulingom, R.Devendra, Department of Agronomy, Tamil Nadu, Agricultural University, Coimbatore 641 003

Field experiment was conducted under irrigated conditions during 1992 at Tamil Nadu Agricultural University, Coimbatore to know the impact of weed management practices on the relationship of dry matter production (DMP) with cumulative thermal time (TT). Competition of mixed weeds and broad leaf weeds lowerd DMP and thermal time use efficiency by 52 and 38% respectively as compared to pendimethalin. Weed competition did not affect the DMP-TT relationship at different stages. Of the various models, normal and Hoerl models simulated DMP as a function of TT by having higher R^2 (99%), besides having lower error structure. Models varied in TTUE values at different stages. Normal and Hoerl functions simulated TTUE resembling biological progressions. Other models showed increase in TTUE till harvest which did not correspond to biological progressions.

15. EMPIRICAL MODELS FOR PREDICTING YIELD - WEED DENSITY RELATIONSHIP IN SUNFLOWER AND COMPUTATION OF ECONOMIC THERESHOLD LEVELS

T.V.Ramachandra Prasad, SP. Palaniappan, C.Suyambulingam, A.Regupathy and N.Kempuchetty, Department of Agronomy, Tamil Nadu Agricultural University, Coimbatore-641 003

Impact of varying densitites of three contrasting weeds - *Dactyloctenium aegyptium*, *Amaranthus retroflexus* and *Flavaria australasica* on the yield of sunflower was studied using nine empirical models, based on studies conducted at TNAU, Coimbatore on vertisols. Models like polynomidls II to IV order, rectangular hyperbola, Hoerl and quadratic in inverse simulated the yield losses closer to the observed data, besides having lower error structure. Intraspecific weed competition level was similar in polynamials III to IV order and Hoerl functions in these weeds. Between weeds, *D. aegyptium*, *F.australasica* and *A. retroflexus* showed aggressiveness in the order. Economic threshold level varied (0.1 to 12.0 *D. aegyptium* weeds/m^2) depending on the cost of the seed (Rs.4 to 8/kg) and weed management practices (Rs.250 to 500/ha).

16. CRUCIAL TIME OF WEED REMOVAL IN INDIAN MUSTARD

T.N. Barevadia, M.I. Meishuria and B.H.Patel, All India Co- ordinated Research Project on Weed Control, B A College of Agriculture Gujarat Agricultural, University, Anand Campus, Anand-388 110

Field studies were conducted at the College Farm, GAU, Anand during rabi 1991 to 1993 to identify the competition in Indian mustad Cv. Gujarat mustard-1. The results indicated that the seed yield of mustard was reduced by 10.5% due to weeds during the first 30 DAS and 24.9% during the entire crop season. Weeds emerging 30 DAS caused no reduction in the yield and there was no advantage on the yield due to further increase in the initial weedfree duration. Thus, the initial 30 days period is crucial time for weed removal in Indian mustard.

17. USE OF ATRAZINE FOR WEED CONTROL IN *Brassica Napus* cv. GSL-2

A.S.Dhillon, S.S. Banga, M.L.Gupta and G.S.Sandha, Department of Plant Breeding, Punjab Agricultural University, Ludhiana.

The resistant genotype GSL-2 of *Brassica napus* was evaluated in field trials for stability of atrazine resistence and yield performance. In the agronomic trials (1990-91 TO 1992-93), pre and post-emergence doses of atrazine (300 g/ha, 400 g/ha and 500 g/ha) were compared with unweeded and mechanical weed control. While the commercial variety GSL-1 was completely eliminated by atrazine application, no adverse effect of atrazine was noted on GSL-2. Higher yields of atrazine resistant GSL-2 were recorded under application of 400 g atrazine both at pre- as well as post- emergence stage of application. No significant yield depression was recorded due to higher dose of atrazine application. This is for the first time in India that atrazine is being recommended for weed control in an oilseed brassica crop.

18. RESPONSE of MUSTARD (*Brassica Juncea*) TO WEED MANAGEMENT PRACTICES AND NITROGEN LEVELS AND THEIR RESIDUAL EFFECT ON SUCCEEDING SUMMER GREEN GRAM WITH AND WITHOUT NITROGEN

B.B.Kaneria and Z.G.Patel, Department of Agronomy, N.M.College and Agriculture, Navsari Campus, Navsari, Gujarat.

Field experiments were conducted at Agricultural College Farm, Navsari (Gujarat) during *rabi* and summer seasons of 1989-91, to study the response of mustard (*Brassica juncea*) to weed management practices and nitrogen levels and their residual effect on succeeding green gram with and without nitrogen. Ten weed management practices viz., pendimethalin 1.0 kg/ha alone and alongwith one HW at 45 DAS,

alachlor at 1.0 kg/ha alone and supplemented with one HW at 45 DAS, two HW at 25 and 45 DAS, one interculturing at 25 DAS, HW at 45 DAS, one interculturing at 25 DAS alongwith one HW at 45 DAS, weed free condition and unweeded control as main plot and three level of nitrogen i.e., 60, 75 and 90 kg/ha as sub-plot treatments were examined. After mustard crop, the green gram was sown in summer with two level of nitrogen i.e., no nitrogen and 20 kg N/ha. The weed free condition gave highest yields of seed and stover. Pendimethalin as pre-emergence 1.0 kg/ha alone or supplemented with hand weeding at 45 DAS was as good as weedfree condition for Mustard.

19. CHEMICAL WEED CONTROL IN TRANSPLANTED GOBHI SARSON (*Brassica napus* L.).

K.S.Sandhu and R.K.Bhatia, Department of Agronomy, Punjab Agricultural University, Ludhiana-141 004

A field experiment was conducted at PAU Ludhiana for four years during 1989-93 to work out dose and time of application of isoproturon for weed control in transplanted Gobhi sarson (GSL 1). Isoproturon at two doses (0.5 and 0.75 kg/ha) was applied at transplanting before irrigation and 1,3 and 4 weeks after transplanting. Isoproturon at both the doses applied at transplanting or 1 to 4 weeks after transplanting gave effective weed control. Isoproturon application yielded at par with two HW and increased seed yield over control in all the years but significantly during two years. Isoproturon application at transplanting before irrigation was more safe for the crop.

20. CHEMICAL WEED CONTROL IN LINSEED (*Linum usitatissimum* L.)

K.S.Sandhu and R.K.Bhatia, Department of Agronomy, Punjab Agricultural University, Ludhiana-141 004

Studies were conducted for three years from 1990-91 to 1992-93 at PAU, Ludhiana to work out the chemical weed control schedule for linseed. Isoproturon (0.75 and 0.94 kg/ha) applied pre-emergence and post-emergence (before and after first irrigation); 2,4-D sodium salt (0.5 and 0.75 kg/ha) and 2,4-D (0.5 kg/ha) + isoproturon (0.75 and 0.94 kg/ha) were tested. Post emergence application before irrigation was more safe as compared to after irrigation. Isoproturon applied as pre- or post-emergence provided effective weed control of *C.album* and *A.ludoviciana*, the predominant weeds present under the condition and yielded significantly higher than unweeded control. 2,4-D alone or in combination with isoproturon had phytotoxic effect on the crop and yielded lower. The study indicated that isoproturon 0.94 kg/ha as pre-emergence or post-emergence before or after first irrigation could safely be used for weed control in linseed.

1. EFFICACY OF OXYFLUORFEN (GOAL) - A WEEDICIDE IN SUGARCANE CULTIVATION

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Experiments were conducted at research farm of Vasantdada Sugar Institute, Pune for weed control studies in sugarcane with oxyfluorfen. The treatments Oxyfluorfen @ 600 ml. [T_2], 750 ml [T_3] and 1000 ml [T_4] as pre-emergence at 3-5 DAP and repeating the same dose one month after Ist spraying (T_7, T_8 & T_9 respectively) were compared. 3 HW at monthly interval [T_1] and recommended doses of Atrazine, i.e. 2 kg a.i./ha as pre and post [T_5] and promising weedicide sencor @ 1.0 kg/ha as pre-emergency were maintained as standards. The results indicated spraying of Oxyfluorfen @ 750 ml as pre and post emergence or Oxyfluorfen @ 1000 ml/ha as pre emergence only was effective for weed control in sugarcane.

2. HERBICIDE PENDIMETHALIN (STOMP) IN SUGARCANE CULTIVATION

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An experiment was conducted at Vasantdada Sugar Institute Research Farm in sugarcane (var. Co 7219) during summer 1990 to find out suitable dose of stomp (30 E.C.) for weed control. The treatments of pendimethalin spraying as pre-emergence @ 1.0 (T_1), 1.25 (T_2) and 1.50 (T_3) lit/ha along with 2.4-D @ 2.00 kg a.i. (T_7) were compared with recommendations of Atrazine (T_4), 2-4-D (T_5), Paraquat + 2,4-D (T_6) and hand weeding (T_8). The spraying of pendimethalin @ 1.5 lit/ha controlled all the weeds. Use of this weedicide at 1.5 lit/ha had no ill-effect on the quality of cane.

3. WEED-CROP COMPETITION IN SUMMER PLANTED SUGARCANE

Shiv Kumar, CCS HAU, Regional Research Station, Uchani, Karnal - 132 001

The dominant weeds were *Cyperus rotundus*, *Echinochloa colonum*, *Cynodon dactylon*, *Digitaria sanguinalis* and *Trianthema portulacastrum*. The most predominant was *Trianthema portulacastrum*. The study revealed that optimum cane yield could be obtained with weed free period upto 60 days after planting. However the crop can tolerate weed infestation upto initial 30 days after planting. Season long weed-crop competition caused cane yield reduction of 79.4%. The critical period of weed control is 30 and 60 DAP in summer planted sugarcane.

4. INTEGRATED WEED MANAGEMENT IN SUGARCANE RATOON

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A field experiment was conducted during 1992-92 and 1992-93, at the Research farm of U.P. Council of Sugarcane Research, Shahjhanpur to find out suitable cultural cum-chemical control of weeds in ratoon sugarcane. Weeds were reduced by 77.5% in TM in inter-row spaces after OBH, 76.1% in 2,4-D Na salt @ 2 kg a.i./ha 4 WAR + TM, 65.5% in Atrazine 1 Kg a.i./ha + 2,4-D Na salt 1 Kg a.i./ha after IOB and 63.9% in three hoeing, at ratoon initiation. Standard weed control treatment (three hoeing) reduced weeds maximum 61.2% followed by Atrazine 1 Kg a.i./ha + 2,4-D Na salt 1 Kg a.i./ha after IOB (56.3%), Gramoxone @ 0.5 Kg a.i./ha 4 WAR + TM (51.9) and 2,4-D Na salt @ 2 Kg a.i./ha 4 WAR + TM (51.6%), at 90 days after ratoon initiation. The most effective treatment was TM in inter-row spaces after OBH, producing 45.4 per cnt higher ratoon cane yield (62.1 MT/ha) than check (42.8 MT/ha). Another effective treatment was 2,4-D Na salt @ 2 Kg a.i./ha 4 WAR + TM produce 38.7 per cent higher ratoon yield (59.3 MT/ha) over weedy check. [TM - Trash Mulching, WAR-Week After Ratoon Initiation IOB - Irrigation and Off Barring, OBH-Off Barring and Hoeing, HW Hoeing and Weeding].

5. RESPONSE OF SUGARCANE TO VARYING LEVELS OF FERTILIZER AND WEED MANAGEMENT PRACTICES

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Field experiments were conducted at Agricultural College Farm, Navsari (Gujarat) during 1989-90 and 1990-91 to study the response of sugarcane (Saccharum officinarum L.) to varying levels of fertilizers and weed management practices. The treatments comprised ten weed management practices viz. Diuron @ 1.0 kg/ha pre. emergence alone (W_1), with paraquat @ 0.6 kg/ha at 60 DAP (W_2), and with one interculturing at 60 DAP and one hand weeding at 80 DAP (W_3), pendimethalin @ 1.5 kg/ha pre.emergence alone (W_4), with paraquat 0.6 kg/ha at 60 DAP (W_5) and with one interculturing at 60 DAP and one hand weeding at 80 DAP (W_6), paraquat @ 0.6 kg/ha post emergence at 25 and 60 DAP (W_7), one interculturing at 60 DAP and one hand weeding at 80 DAP (W_8), weed free upto earthing up (W_9) and unweeded control (weedy check) (W_{10}) in main plots and three levels of fertilizers i.e. recommended dose of fertilizers @ 250-125-125 Kg N, P_2O_5 and K_2O/ha (F_1), 75 per cent recommended dose (F_2) and 50 per cent recommended dose 62.5 kg (F_3) as sub plot treatments. It is concluded that 75 per cent recommended dose of fertilizers with pendimethalin 1.5 kg/ha pre-emergence and paraquat 0.6 kg/ha at 60 DAP is most suitable to control the weeds in sugarcane.

6. INTEGRATED WEED MANAGEMENT IN COTTON

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A field experiment was conducted at ARS Arabhavi during 1990-92, 1991-92 and 1992-93 to study the integrated weed management in irrigated cotton. The treatments consisted of five weedicides viz., Pendimethalin, Diuron, Fluchloranil, Alachlor and Butachlor, Sprayed as pre-emergent application with alone or in combination with cultural method and compared with weedy check and local method. The results indicated that pendimethalin @ 5 lit/ha + Diuron @ 1.25 kg/ha + cultural method gave the highest yield of 2150 kg/ha followed by pendimethalin + Diuron.

7. RESPONSE OF COTTON TO HERBICIDE CLOMAZONE AND SAFENER PHORATE

V.Jha, S.C.Tripathi, M.S.Mithyantha and K. Sivasankaran, Rallis Agrochemical Research Station, Plot Nos. 21 & 22, Peenya, Phase II, Bangalore - 560 058, India.

Two field trials were conducted at Rallis Agrochemical Research Station. Bangalore and Guntur during kharif season of 1994 to determine the response of Hybrid cotton variety DCH 32 and MESH 138 to CLOMAZONE 50 EC (COMMAND) with Phorate as a Safener. orate was placed in furrow near the seed and Command applied as pre emergence. At Bangalore, Clomazone @ 1.0, 0.75, 0.5 and 0.375 kg a.i./ha with Phorate @ 1.0 Kg a.i./ha was compared with Clomazone alone and Phorate alone. The crop plant density was 12 seed/m^2. Cotton germination was not affected by the treatment. Only 13% of plant survived in command alone plots. First two leaves of 69-76% of plants had phytotoxic symptom till 30 DAS. However at Guntur the treatments were Clomazone @ 0.4, 0.6 and 0.8 kg a.i./ha with phorate 1.0 kg a.i./ha. The crop density was 2 seeds per/m^2. Cotton germination was normal with no detected phytotoxicity. Command was effective in controlling Digitaria, sanguinalis, *Echinochloa crusgalli*, *Amaranthus viridis* and *Partulaca oleracea* and Parthenium. Phorate @ 1.0 kg a.i./ha is able to safen cotton satisfactorily.

8. INTEGRATED WEED CONTROL IN COTTON BASED INTERCROPPING

K.Shanmugham, Central Institute for Cotton Research, Regional Station, Coimbatore-641 003

Manual, mechanical and chemical weed control methods singly and in combination were tried in sole crop of cotton Var. MCU 5 VT and cotton with country onion Var. CO_2, and green gram Var. CO_4 intercrops grown in paired-row planting pattern of 60 x 20/120 cm spacings. Weed growth was abundant and luxuriant in the Sole cotton crop and cotton + Onion intercropped plots while in cotton + green

gram intercropping weed growth was less by 29-36% upto 90 days. Manual weeding and hoeing done twice at 20 and 40 DAS and one manual weeding and hoeing at 20 DAS followed by inter cultivation with tiller at 30 DAS controlled 60-70% of the weeds in sole cotton and cotton + onion intercropped plots and 80% weeds in cotton green gram intercropped plots. Mere application of fluchloralin or pendimethalin herbicides at 1.25 kg a.i./ha was ineffective. An integrated approach consisting of pre- emergent application of any one of the herbicides mentioned above followed by one manual weeding and hoeing on at 30 DAS and intercultivation at 30 DAS controlled 90-92.6% weeds upto 90 days. After harvesting green gram pods, the crop was cut at ground level and spead in-situ on the ground at 100 DAS. The mulching effect of the green gram straw further assured weed free cotton till boll maturity resulting in the production of 2.4t and 0.6 t/ha of seed cotton and green gram grain yields respectively compared to 0.3-1.7 t and 0.1-0.45 t/ha of seed cotton and green gram yileds respectively in other treatments.

9. WEED MANAGEMENT STUDIES IN TEASEL(*Dipsacus fullonum* Linn.)

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The experiment consisted of 13 treatments viz. pre-emergence application of oxyfluorfen 0.2 kg/ha, metolachlor 1.5 kg/ha, pendimethalin 1.5 kg/ha, oxadiazon 0.5 kg/ha, flurochloridone 0.625 kg/ha, fluchloralin 1.0 kg/ha, metribuzin 0.75 kg/ha, thiobencarb 1.5 kg/ha and isoproturon 1.0 kg/ha and post- emergence application of flusifop-p-butyl 0.8 kg/ha and haloxyfop-methyl 0.125 kg/ha with unweeded and hand weeding twice as checks. Results revealed that pendimethalin 1.5 kg/ha (Pre.) was effective in controlling the weeds and produced significantly highest number of brushes. However, during second year oxadiazon (Pre.) and haloxyfo-p-methyl (Post) were at par with pendimethalin with higher number of teasel brushes of more than 7.5 cm length.

10. EFFECT OF CONTINUOUS APPLICATION OF HERBICIDES IN RICE-RICE-PULSE CROPPING SYSTEMS OF THAMBIRAPARANI COMMAND AREA

N.Asokaraja and A.Mohamed Ali, Water Technology Centre, Tamil Nadu Agricultural University, Coimbatore-641 003

Field investigations carried out during 1991 to 1993 at ACRI, TNAU, Killikulam, revealed that pretilachlor at 0.5 kg/ha + 2,4- DEE 0.5 kg/ha mixture with one late manual weeding at 35 DAT showed superior performance with broad spectrum weed control as compared to butachlor and butachlor mixture with 2,4 DEE. There was no residual effect of herbicides applied to previous rice crops on the succeeding

blackgram. Continuous application of herbicides has resulted a shift in weed species from annuals to perennials. There was a build up of *Cyperus iria* in later plantings of rice and perennial nut sedge *Cyperus rotundus* in blackgram. Herbicides reduced the dominance of annual grassy weed but there was an increase in the proportion of *Panicum repens*, a perennial grassy weed.

11. EFFECT OF FERTILIZER AND WEED MANAGEMENT PRACTICES ON WEED DENSITY AND YIELD OF DIRECT-SEEDED RICE AND BALCKGRAM IN A CROPPING SEQUENCE

N.K.Choubey, B.C.Ghosh and R.S.Tripathi, Agricultural and Food Engineering Department, IIT, Kharagpur, West Bengal

Field experiments were conducted during 1993-94 at Agricultural and Food Engineering Department, IIT, Kharagpur, in kharif and summer seasons to study the effect of fertilizers i.e. inorganic source and inorganic + organic source applied at 30:15:15 and 60:30:30 kg of N, P_2O_5, and K_2O/ha and weed management practices i.e. hand weeding, mechanical weeding (IIT WAM-82), chemical weeding (Butachlor at the rate of 1.5 kg ai/ha in rice and Pendimethalin at the rate of 1.0 kg ai/ha in blackgram) and unweeded control. Higher fertilizer dose encouraged weed growth by 50.9% than low fertilizer dose. Combination of inorganic + organic sources increased the weed population by 20% than that of inorganic source. The grain yield of rice and blackgram were maximum under hand weeding which were higher by 1.45 t/ha and 0.55 t/ha followed by 0.90 t/ha and 0.44 t/ha under chemical and 0.51 t/ha and 0.22 t/ha under mechanical weeding respectively over unweeded check. In a cropping sequence hand weeding or chemical weeding proved to be efficient weed control method to combat high weed influx in succeeding crop.

12. EFFECT OF TILLAGE AND WEED MANAGEMENT PRACTICES ON WEED DENSITY AND YIELD OF DIRECT - SEEDED RICE AND BLACKGRAM IN A CROPPING SEQUENCE

N.K.Choubey, B.C.Ghosh and R.S.Tripathi, Agricultural and Food Engineering Department, IIT, Kharagpur, West Bengal

Field experiments were conducted at Agricultural and Food Engineering Department Farm, IIT, Kharagpur during Kharif in Summer seasons of 1993-94 to evaluate the effect of degree of tillage i.e. high tillage level (1 ploughing by mould board plough (MBP) + 3 harrowing), medium (1 ploughing by MBP + 2 harrowing), low (1 ploughing by MBP + 1 harrowing) and farmer's practice (2 ploughing by MBP + 1 harrowing and weed management practices i.e. hand weeding, mechanical weeding, chemical weeding (Butachlor at the rate of 1.5 kg ai/ha. in rice and Pendimethalin at the rate of 1.0 kg ai/ha in blackgram) and unweeded control in a cropping sequence. In rice, high

tillage level with improved implement rsulted considerable reduction in weed population and drymatter of weeds and thereby increased Weed Control Efficiency (WCE) by 66.9 % as against 43.3% and 30.1 % under medium and low tillage levels. Similar trend in WCE was also observed in blackgram. Hand weeding in both the crop fields resulted higher WCE than chemical and mechanical methods.

13. WEED CONTROL IN MAIZE BASED INTERCROPPING SYSTEM

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An experiment was conducted on weed control in maize based intercropping system during kharif, 1988 and 1989 consisting of five cropping system viz. maize alone, maize paired row, maize + black gram 1:1 maize paired row + blackgram (2:2) and maize pairedrow + blackgram (2:3) and four weed control measures viz. weedy check, repeated weedings, fluchloralin and pendimethalin. Maximum yield of maize and black gram was obtained in maize paired row + black gram (2:2) cropping system. Weed DMP was lowest. Maize paired row + black gram (2:2) cropping system recorded 6.40 and 3.07 per cent more grain yield than maize paired row + black gram (2:3) and maize + black gram (1:1) respectively and 4.94 per cent more than maize sole crop.

14. WEED MANAGEMENT IN DIFFERENT RICE CULTURES AND THEIR EFFECT ON WHEAT GROWN IN RICE-WHEAT SEQUENCE

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Experiments at Crop Research Centre of G.B.Pant University of Agriculture and Technology, Pantnagar in split plot design during two consequtive year 1991-92 and 1992-93 were conducted in Kharif (rice) and Rabi (wheat) seasons. Among the three methods of rice cultivation, grain yield was higher in transplanted rice over direct sowing either puddled or non-puddled. The herbicides pendimethalin and butachlor @ 1.5 kg/ha each were equally effective to control the weeds in rice. Grain yield of wheat was not much influenced by methods of land preparation. The herbicides, pendimethalin (Pre-em. @ 1.0 kg/ha) and Isoproturan (Post em., 35 DAS @ 1.0 kg/ha) were equally effective to control weeds in wheat.

15. INTEGRATEED WEED MANAGEMENT IN RAPESEED-SUMMER RICE SEQUENCE

A.K.Gogoi, Department of Agronomy, Assam Agricultural University, Jorhat-785 013

A field experiment was laid out during rabi and summer (1992-93) at AAU, Jorhat, to evaluate an effective integrated method of weed

control in rapeseed-summer rice sequence under rainfed situations. The weed population, dry matter accumulation and yield of rapeseed did not differ significantly due to the seed bed technique (conventional and stale). However, the grain yield of succeeding summer rice was significantly higher in stale seed bed (13.0 q/ha) than conventional (10.2 q/ha) preparation during rapeseed cultivation. The pre-emergence oxyflourfen @ 0.10 kg/ha and methabenzthiazuron @ 0.75 kg/ha covered with rice husk or rice straw decreased weed dry weight and increased rapeseed yield. The effect on succeeding weed growth was maximum when herbicides were covered with rice straw in preceding crop of rapeseed.

16. EFFECT OF HERBICIDES ON WEEDS AND TUBER YIELD OF POTATO (*Solanum tuberosum* L.) AND THEIR RESIDUAL EFFECT ON SUCCEEDING CROP OF SUNFLOWER (Helianthus annuus L.)

V.P. Jaiswal, S.S.Lal and R.C.Sharma, Central Potato Research Station, Jalandhar-144 003 (C.P.R.I. Shimla)

Field experiments were conducted for three years (1991-92 to 1993-94) at CPRS, Jalandhar, to study the effect of metribuzin, oxyfluorfen, atrazine, alachlor alongwith weedfree and weedy check on weed control in potato and their residual effect on sunflower. All the treatments significantly reduced the weed infestation to the extent of 55-88 % and increased the buber yield 15-29 % compared to unweeded control. The highest WCE (88 %) was recorded in oxyfluorfen treated plot closely followed by metribuzin. The dry weight of weeds was negatively correlated with tuber yield at harvest (r = 0.868). The highest tuber yield was recorded with metribuzin closely fb oxyfluorfen. Atrazine tended to lower the tuber yield. Yield of sunflower varied from 26 to 29 q/ha. None of the herbicides had any toxic residual effect on succeeding crop of sunflower.

17. EFFECT OF CONTINUOUS HERBICIDE APPLICATION ON WEED GROWTH AND YIELD OF RICE-RICE PULSE

O.S. Kandasamy, Department of Agronomy, Tamil Nadu Agricultural University, Coimbatore-641 003

Field experiments were conducted to study the effect of continuous application of herbicide on weed growth and yield of rice-rice-pulse cropping sequence over eight cropping seasons. The treatments viz., butachlor 1.25 followed by hand weeding once (integrated weeding) and hand weeding twice (manual weeding) were studied for both the rice crops, while no weed control was done in rice fallow pulse crop. In hand weeded plots *M.quadrifolia* and the annual grass *E.crus-galli* were dominant in the early crops, but *E.crus-galli* dominated in the later crops, with the shift to *M.vaginalis* in dicot. Continous application of herbicides (Chemical method alone) caused a population shift from

dicots to monocots, particularly grasses like Leptochloa chinenise. Integrated weed control practice or manual weeding alone controlled the weeds.

18. WEED MANAGEMENT IN SUGARCANE BASED INTERCROPPING SYSTEM

K.Kannappan and C.Ramaswami, Sugarcane Research Station, Sirugamani, Trichy

Field experiment was conducted with early maturing sugarcane (Cosi.86071) during main season of 1990-91 at sugarcane Experiment station, Sirugamani to investigate the suitability of Isoproturon herbicide for the control of weeds in sugarcane intercropping systems. The inter cropping system did not influence the weed population. However, there was a reduction in weed population to a greater extent in herbicide applied plots. The weed control efficiency was 42 % for Isoproturon followed by HW at 55th day. Soybean intercropping in sugarcane recorded an LER of 1.50 indicating 50% yield advantage over sugarcane + blackgram (1.34).

19. INTEGRATED WEED MANAGEMENT IN SUGARCANE BASED INTERCROPPING SYSTEM

K.Kannappan and C. Ramaswami, Sugarcane Research Station, Sirugamani, Trichy Dt.

Field experiment was conducted to study the effect of pre-emergence herbicides combined with the intercrops under wetland condition of sugarcane cultivation. The results of the experiment suggest that soybean is the best intercrop and the Isoproturon is the best herbicide. The sugarcane + soybean recorded the highest cane yield of 119.3 t/ha irrespective of the herbicides. This is on par with the solecrop of sugarcane indicating that the soybean cultivation did not reduce the main crop yield. Among the herbicides, application of 1 kg ai/ha of Isoproturon recorded the highest cane yield of 123.2 t/ha irrespective of various intercropping systems.

20. INTEGRATED WEED MANAGEMENT FOR PRE-MONSSON SOWN SORGHUM BASED COWPEA INTERCROPPING SYSTEM UNDER RAINFED CONDITION

S.Krishnasamy, A.A.Dason and U.Solaiappan, Agricultural Research Station, Kovilpatti-627 701, Tamil Nadu.

Field experiment was conducted to find out integrated weed management practice for pre-monsoon sown sorghum based cowpea intercropping system at ARS,Kovilpatti for two years during 1992- 93 and 1993-94. The treatments comprised of i) application of herbicides on the day of sowing and ii) application immediately after the receipt of first sowing rain. Herbicide application was followed by one HW at 40

DAS. The herbicides were butachlor, thiobencarb, fluchloralin and pendimethalin @ 0.75 and 1 kg ai/ha respectively. Rotary weeder weeding at 20 and 40 DAS, Farmers method of HW at 20 and 40 DAS and control were mintained as standards.The results revealed that Butachlor at 1.00 kg/ha as pre emergene application at Ist sowing rain followed by one HW at 40 DAS recorded less weeds and weed DMP. However, application of Butachlor 0.75 kg/ha pre emergence at Ist sowing rain followed by one HW at 40 DAS was economical with higher net return.

21. WEED CONTROL IN WHEAT BASED INTERCROPPING SYSTEM

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Five weed control treatments viz. isoproturon @ 1.0 kg/ha, pendimethalin 1.5 kg/ha, oxyfluorfen 0.2 kg/ha, as pre-emergence, hand weeding (20 DAS) and a weedy control were evaluated for weed control in wheat based intercropping of wheat + mustard (4:2), wheat + linseed (4:2), wheat, mustard and linseed alone. during 1992-92 and 1992-93 rabi seasons. The weed biomass was significantly reduced under wheat + mustard (822 kg/ha), wheat + linseed (1168 kg/ha) or mustard (1438 kg/ha) as sole crop. The herbicides pendimethalin and oxyfluorfen were more effective to reduce the weeds than isoproturon. Among the weed control treatments, the highest wheat equivalent yield was recorded with isoproturon (3167 kg/ha) followed by HW (3141 kg), oxyfluorfen (3121 kg) and pendimethalin (2829 kg).

22. WEED MANAGEMENT IN RICE-BLACKGRAM CROPPING SEQUENCE

Loganathan, C. and Rm.Kathiresan, Department of Agronomy, Annamalai University, Annamalai Nagar-608 002, Tamil Nadu

A field experiment was conducted at Annamalai University Experimental Farm, Annamalainagar during 1990-91 with transplanted rice cv. IR-20 and blackgram cv. ADT-3 in sequence. The treatments in rice comprised twice at 20 and 40 DAT, pre- emergence butachlor 1.5 kg/ha along and in combination with a HW supplement at 40 DAT or 0.5 per cent spray of paraquat one week prior to harvest and compared with an unweeded control in a randomized block design. These rice weed control measures were compared for their carryover effect in subsequent blackgram as main treatments of a split plot design. The sub treatments comprised alachlor 1.5 kg/ha, oxyfluorfen 0.15 kg/ha, twice HW at 20 and 40 DAS and an unweeded control in blackgram. Pre emergence butachlor + paraquat spray a week prior to harvest in rice followed by twice HW in blackgram performed superior as a wholistic weed control programme for the cropping system with the highest net return (Rs. 7220 ha^{-1}) and return per rupee invested (Rs.4.04).

23. WEED MANAGEMENT EFFECT ON RELATIONSHIP OF YIELD AND YIELD ATTRIBUTING TRAITS IN RICE UNDER RICE-WHEAT CROPPING SYSTEM

D.P.Nandal, C.M.Singh and B.P.S.Malik, CCS, HAU, Rice Research Station, Kaul-132 021, Haryana.

Correlation studies carried out on direct seeded puddled rice and transplanted rice with weed control treatments indicated a positive relationship of rice yield with its yield attributes. Total weed population and weed dry weight were negatively correlated with rice yield. Path analysis studies revealed that the priority wise characters were harvest index and panicles/m^2 under both the systems of rice cultivation.

24. WEED MANAGEMENT IN MAIZE-WHEAT SEQUENTIAL CROPPING IN MID HILLS OF UTTAR PRADESH

A.K. Pandey, Prem Singh and Ved Prakash, Vivekananda Parvatiya Krishi Anusandhan, Shala (ICAR), Almora-263 601, UP.

Field experiments were conducted to study the effects of weed control treatments on maize and wheat in sequence and associated weeds at experimental farm, Hawalbagh, Almora during four seasons (Kharif, 1992 to Rabi, 1993-94). The treatments comprising four in maize (weedy check, weed free, pendimethalin and atrazine each @ 1.25 kg a.i./ha) and four in wheat (weedy check, weed free, isoproturon and pendimethalin each @ 1.0 kg a.i/ha. Atrazine was effective against, *A. conyzoides* and *G. purviflora*. Pendimethalin proved better against *Echinochloa* sp. and *Brachairea* sp. Both these herbicides were not effective against *C. rotundus*. No residual effect was observed due to weedicide application on the grain yields and associated weeds in the succeeding crops of wheat.

25. WEED MANAGEMENT IN CROPPING SYSTEM OF GROUNDNUT-FINGER MILLET

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Field experiments were conducted at TNAU Coimbatore during 1990-92. to develop weed management practices for groundnut based and to monitor residual toxicity of fluazifop in soil and plant systems. In groundnut-Finger millet system at Coimbatore and Bhavanisagar, 18 treatments were compared in RBD. The pre- emergent herbicides, fluchloralin 0.9 kg, pendimethalin 0.75 to 1.0 kg, metachlor 0.75 - 1.0 kg, oxyflourfen 0.09 kg, Imazethapyr 0.15 kg and post-emergent herbicides Flavuzifop-p-butyl 0.125 to 0.50 kg a.i./ha alone and followed by one HW at 40-45 DAS, two HW alone at 15-20 and 40-45 DAS, one late HW at 35-40 DAS alone and unweeded control were the treatments.

Results indicated that for soils dominated with *Trianthema portulacastrum*, pre- emergent application of pendimethalin 1.0 kg/ha and imazethapyr 0.15 kg/ha alone for groundnut is more effective and remunerative than two HW.

26. CROP-WEED COMPETITION IN MAIZE BASED INTER-CROPPING

V.K.Paradkar, B.M.Goydani and S.D. Sawarkar, JNKVV, Zonal Agricultural Research Station Chhindwara, M.P.

The field studies were takenup to know the crop-weed competition in maize inter cropping system under rainfed condition during kharif 1994 at T.N.K.V.V., Agriculture Research Farm, Chhindwara. The treatments comprised of four inter crops Soybean, Cowpea, Urd and Sesamum with Maize in 1:1 and sole maize as control. The maize + soybean inter cropping system recorded lowest weed density and dry weight followed by maize + cowpea; maize + urd and maize + sesamum respectively.

27. HERBICIDE ROTATION AND CULTURAL PRACTICES ON WEED DYNAMICS IN SORGHUM-COTTON CROPPING SEQUENCE

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The experiment was conducted during 1993-'94 at TNAU, Coimbatore to evaluate a suitable method for weed control and to study the weed shift in sorghum-cotton sequence. Herbicides viz., atrazine (0.25 kg), alachlor (1.25 kg) were included for sorghum along with intercropping of cowpea, hand weeding and unweeded check as other treatments. These plots were subdivided and the treatments Pendimethalin (1.0 kg), fluchloralin (1.0 kg), intercropping (with onion), hand weeding + earthing up were imposed to the second crop of cotton. In the same field the third crop of sorghum was introduced with th treatments of first crop. Atrazine (0.25 kg) - pendimethalin (1.0 kg) - atrazine (0.25 kg) respectively for sorghum-cotton-sorghum cropping sequence was effective to control broad-leaved weeds completely while *Cynodon dactylon* was not suppressed. Alachlor was phytotoxic to sorghum crop. Manual weeding (or) raising intercrops had little effect on the control of weeds. The yields of both the crops increased due to herbicide rotation which kept the weeds under threshhold level.

28. WEED MANAGEMENT, CROP GROWTH FUNCTIONAL MODELLING AND BIOLOGICAL UTILITY UNDER SUNFLOWER BASED CROPPING SYSTEM

T.V.R.Prasad, SP. Palaniappan and K.Annadurai, Department of Agronomy, Tamil Nadu Agricultural University, Coimabore-641 003

Field experiments were conducted at TNAU, Coimbatore, during 1989-1992 to develop weed management practices for sunflower- based cropping system. In sunflower-finger millet system 18 treatments were compared in RBD, involving pre-emergent herbicides, flurochloralin 0.9 kg, pendi-methalin 0.75 to 1.0 kg. metolachlor 0.75 - 1.0 kg, oxyfluorfen 0.09 kg, flurochloridone 0.75 kg and post-emergent herbicide flavazifop-butyl 0.125 to 0.50 kg a.i./ha alone or fb one HW (40-45 DAS), two HW (15-20 and 40-45 DAS), one late HW (35-40 DAS) alone and unweeded control. Crop growth modelling in sunflower was studied under five weed management practices viz., pendimethalin 1.0 (as pre-emergent) fluazifop-p-butyl 0.25 kg ai/ha (as post emergent) alone and fb HW (42 DAS), two HW and unweeded control. Pre-emergent application of pendimethalin 0.75 to 1.0 kg/ha gave effective control of Trianthema. Pre-emergent application of fluchloralin 0.9 kg/ha and metachlor 1.0 kg/ha effectively controlled *Amaranthus retroflexus* and *Dactyloctenium aegyptium* in sunflower based system.

29. WEED DYNAMICS AND CONTROL IN RICE+PULSE INTERCROPPING

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A field experiment was conducted during kharif and summer seasons of 1992-93 to study the influence of different soil moisture regimes on weed dynamics in direct seeded upland rice+blackgram intercropping system. The components included weed control practices and soil moisture regimes. Pre-emergene application of pendimethalin (1.25 kg/ha) followed by one HW at 35 DAS was effective against annual grasses. Continuous use of herbicides resulted in weed shift. Irrigation given at 1.50 IW/CPE ratio effectively suppressed the grasses and increased the rice equivalent yield. Growth, yield parameters and yield were enhanced by better control of weeds. Weed control combined with medium irrigation regime (1.50 IW/CPE ratio) was advantageous.

30. EFFECT OF IRRIGATION AND WEED CONTROL IN RICE+BLACKGRAM SYSTEM

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The field experiment conducted during kharif and summer seasons of 1992-'93 with ADT 36 rice and VBG 1 blackgram (4:1) intercropping

system showed that pre-emergence application of pendimethalin @ 1.25 kg/ha followed by one HW at 35 DAS significantly reduced the DMP and NPK removal by weeds. Irrigation given at 1.50 IW/CPE ratio (medium regime) caused reduction in the DMP of weeds and NPK removal by them compared with the lower regime (1.00 IW/CPE ratio) or rainfed. The reverse was true for direct seeded upland rice as regards DMP and NPK uptake under intercropping system.

31. STUDIES ON WEED MANAGEMENT IN SUGARCANE INTERCROPPING SYSTEM

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A field experiment was conducted at Sugarcane Research Station, Cuddalore during 1989-92 to find out the suitable herbicide for sugarcane based intercropping system. The treatments included three intercrops (Blackgram, Soybean and Groundnut) raised in sugarcane (cv. CoSi 86071) with four weed control treatments (Thiobencarb, 1.25 kg/ha, Alachlor 1.5 kg/ha, Metribuzin 0.5 kg/ha and two HW at 25 and 50 DAS). Experimental results revealed that the pre-emergence application of Thiobencarb 1.25 kg/ha gave the highest weed control efficiency (84.9% in blackgram, 88.3% in soybean and 77.6% in Groundnut) and it was on par with HW practice. In all the intercrops, application of Thiobencarb @ 1.25 kg/ha was economical.

32. EFFECT OF DIFFERENT HERBICIDES USED FOR SOYBEAN ON THE GROWTH CHARACTERS OF SUCCEEDING RAGI CROP

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To study the residual effect of herbicides, bioassay test was carried out with ragi crop in 1992 at TNAU farm, Coimbatore. The residue of Pendimethalin (0.75 and 1 kg/ha), oxyfluorfen (0.1 and 0.125 kg/ha), dimethazone, (1 and 1.25 kg/ha) chlorimuron ethyl (6 and 9 g/ha), sethoxydim (1 and 1.25 kg/ha) and mixtures of bentazone with sethoxydim (0.6 + 0.6 kg/ha) and chlorimuron ethyl with sethoxydim (4.5 g + 0.6 kg/ha) were tested. Significant variations were not observed in seed germination, plant height and DMP of ragi crop due to treatments except with chlorimuron ethyl 9 g/ha. Chlorimuron ethyl caused significant reduction in germination percentage (10%) plant height, (18%) DMP (48%) of ragi crop. But chlorimuron ethyl 6 g/ha rate did not show any phytotoxic effect and hence safe at this dose.

33. WEED MANAGEMENT IN COTTON BASED BLACKGRAM INTERCROPPING SYSTEM IN RAINFED VERTISOLS

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A study was undertaken at ARS, Kovilpatti, TNAU, to evaluate the different weed management practices for cotton based blackgram intercropping system. Four pre-emergence herbicides viz. Butachlor (1.0 kg/ha), pendimethalin (1.0 kg/ha), metolachlor (1.0 kg/ha) and oxadiazon (0.5 kg/ha) were tested individually and in combination with mechanical weeding with TNAU weeder at 40 DAS and compared with unweeded control, conventional method of weed control (two HW at 20 and 40 DAS) and mechanical weeding with TNAU weeder at 20 and 40 DAS. The herbicides were applied as sand mix on the day of first rain. Butachlor (1.0 kg/ha) recorded lowest weed biomass due to highest WCE (81.0%). Regarding the yield of blackgram intercrop, Butachlor registered significantly higher blackgram yield of 2.96 q/ha. The seed cotton yield was 9.07 q/ha. The benefit cost ratio was higher (2.77) with Butachlor application.

34. WEED CONTROL STUDIES IN COTTON BASED CROPPING SYSTEM UNDER IRRIGATED CONDITION

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Field experiment was conducted at ACRI, Killikulam during rabi season of 1991-'92 to study the effect of herbicides in cotton based cropping systems under irrigated condition. Among the various treatments, pre-emergence application of metolachlor at 1 kg/ha followed by one HW at 40 DAS effectively controlled the weeds with WCE of 73.8 per cent. There was no phytotoxicity on cotton and the succeeding sorghum crop.

35. INTEGRATED METHOD OF WEED CONTROL IN RAINFED COTTON

A.K.Giggari, M.B.Doddamani, M.N. Arun and V.R.Koraddi, A.R.S. Dharwad Farm, Dharwad-580 007 (India)

A field experiment was conducted at ARS, Dharwad Farm during 1989-92 to find out an integrated method of weed control in rainred cotton (*Gossypium hirsutum* L.) Cv. Sharada Cultural and chemical methods were tried individually and in combination with pre and post emergent herbicides like pendimethalin, Diuron, Gramoxone and Fluzitop-butyl. Results revealed that Diuron 1 kg ai/ha (PRE) + Fluzitopbutyl 0.75 kg ai/ha gave the highest yield of 1283 kg/ha followed very closely by local method (two hand hoeings + two hand

weeding), with 1238 kg/ha. Next in order were stomp @ 1.00 kg ai/ha (PRE) + one hand weeding (1167 kg/ha).

36. INTEGRATED WEED MANAGEMENT IN FORAGE LUCERNE (*Medicago sativa* L.)

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The field experiment conducted to study the efficacy of herbicides in lucerne during rabi season of 1991-92 and 1992-93 at Navsari. Gujarat (India) revealed that application of oxadiazon, fluchloralin and pendimethalin was superior to HW. Oxadiazon showed a little phytotoxic effect on emerging seedlings of lucerne. Pre-emergence spray of pendimethalin @ 0.5 kg a.i./ha along with HW at 6 days after first cut was better to other weed control treatments and was par with fluchloralin and oxadiazon applied @ 0.75 and 0.5 kg a.i./ha pre-emergence, respectively. Pendimethalin @ 0.5 kg a.i./ha enhanced the green forage of lucerne due to higher WCE.

37. EFFECT OF ATRAZINE ON WEEDS, GROWTH AND FORAGE YIELD OF SORGHUM x SUDAN GRASS HYBRIDS

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The field study was conducted at the Department of Animal Nutrition and Forages, PAU, Ludhiana during kharif 1993. Three sudan hybrids (PSCI, GK905 and KG999) and four levels of atrazie (0.50 and 0.75 kg/ha as pre and post-emergence alongwith HW at 30 DAS and no weeding (control) constituted the treatments. Atrazine at 0.50 and 0.75 kg/ha, as pre and post emergence application significantly reduced the weed population and weed DMP and enhanced green fodder and HCN content and nitrate- nitrogen remained within the safe limits in all the sudex hybrids. Atrazine application increased the protein content of the crop.

1. STUDIES ON WEED CONTROL IN VINEYARDS UNDER DIFFERENT AGROCLIMATIC CONDITIONS OF THE PUNJAB

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Studies were conducted to control weeds in the vineyards using pre and post-emergence herbicides at different locations in the Punjab State. The pre-emergence herbicides i.e. Diuron @ 3 and 3.5 kg per hectare was sprayed during the first fortnight of March. The post-emergence herbicides i.e. Gramoxone and glycel @ 4 litre per hectare were sprayed in the second fortnight of March. Application of Diuron @ 3.5 kg per hectare controlled the broad spectrum of weeds in the Vineyards more effectively. The efficacy of glycel was more effective than paraquat. The fruit yield was higher with diuron @ 3.5 kg and glyphosate @ 4 litre per hectare. The fruit quality did not vary due to treatments. Diuron was more economical.

2. HERBICIDAL WEED CONTROL IN GRAPE NURSERY

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A study on the effect of different herbicides on weed control in grape nursery was carried out at Khalsa College Amritsar during 1993. *Cynodon dactylon, Cyperus rotundus, Sorghum halepense, Amaranthus viridis, Solanum nigrum, Canabis sativa, Chenopodium album,* and *Trianthema monogyna* were the predominant weeds in grape nursery. The treatments consisted of diuron, atrazine, glyphosate, gramoxone @ 1.5, 2, 2.5, 3, 3.5, 4 kg per ha and hand weeding. All the herbicidal treatments were effective in checking weed population. The results of the study revealed that diuron and glyphosate @ 2 kg per ha can safely be used for proper management of grape nursery at Amritsar conditions.

3. CHEMICAL WEED CONTROL IN PEACH ORCHARDS

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Four weedicides diuron, atrazine, glyphosate and gramoxone were tested to control the weeds in peach orchards. Diuron (1.0, 1.5, 2.0, 2.5 kg/ha), atrazine (0.5, 1.0, 2.0 kg/ha) were applied at the pre-emergence stage in the first week of March during 1991 to 1993 while glyphosate (1.0, 1.5, 2.0, 2.5 l/ha) and gramoxone (1.5, 2.0, 2.5, 3.0 l/ha) were used as post emergence. Data on weed populations were recorded after 30, 60, 90 and 120 days of application. Among the pre-emergence weedicides, diuron at 2 kg/ha was best. Atrazine was toxic at higher dose of 2 kg/ha. Out of post-emergence weedicides glyphosate @ 1.5 l/ha gave better control of weeds than gramoxone @

1.5 l/ha. No significant difference in the yield and quality of fruits was observed under any of the treatments.

4. HERBICIDE INFLUENCE ON QUALITY OF MANGO FRUIT

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Field experiment was conducted with different herbicides for weed control in mango at Rajendranagar, APAU during 1992. Oxyfluorfen, glyphostate and paraquat were sprayed at different times in combinations upto 120 days. Mango fruits were collected and analysed for T.S.S., reducing sugars and acidity. The results revealed that appliction of glyphosate at 1.0 kg a.i ha^{-1} with 2 % ammonium sulphate at 30 and 60 day old weeds recorded highest brix and reducing sugars and controled the weeds effectively. It was followed by Glyphosate at 1.0 kg ha^{-1} with 2% ammonium sulphate at 30, 60 and 90 days + Paraquat at the rate of 1.0 kg a.i. ha^{-1} at 120 days.

5. PERFORMANCE OF PENDIMETHALIN AND FLUCHLORALIN WEEDICIDES ON YIELD AND QUALITY COMPOSITION OF POTATO AND MUSTARD CROPS

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A field experiment was conducted at Instructional farm of N.D., U.A.T., Kumarganj, Faizabad (U.P.) in a mixed crop of potato and mustard. Three cropping system, pure potato, pure mustard and intercropping of both mustard and potato were grown in a randomised block design. Pendimethalin at 0.5 kg a.i./ha (H_1), 1.0 kg a.i./ha (H_2) and fluchloralin at 0.5 kg a.i./ha (H_3), 1.0 kg a.i./ha (H_4) were tested. The highest yield of potato 248.82 q/ha was found with pendimethalin 1.0 kg a.i./ha and flucloralin 1.0 kg a.i. The content of carbohydrate, starch and sugars also significantly increased with pendimethlin and fluchloralin in potato. The quantity, quality and composition of fattyacid in mustard oil were higher as compared to control. The composition of fatty acid of mustard oil was higher with herbicide application.

6. STUDIES ON CHEMICAL AND CULTURAL CONTROL OF WEEDS IN AUTUMN POTATO (*Solanum tuberosum* L.)

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In autumn potato var. Kufri Chandermukhi, pre-emergence application of atrazine 0.25 kg/ha, oxyfluorfen 0.2 kg/ha, metolachlor 0.75 kg/ha and post-emergence application of atrazine 0.25 kg + paraquat 0.25 kg/ha and rice straw mulch @ 4 t/ha provided significant control of annual weeds during 1991 and 1992 with higher

tuber yield of potato. Highest tuber yield (201.6 q/ha) was recorded under post-emergence tank mix application of paraquat 0.25 kg/ha + atrazine 0.25 kg/ha which was 53.1 per cent higher than unweeded control. The post-emergence application of oxyfluorfen 0.3 kg/ha exhibited severe toxicity on potato and resulted in lower tuber yield.

7. STUDIES ON INTEGRATED WEED MANAGEMENT PRACTICES IN POTATO (*Solanum tuberosum* L.)

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In an experiment conducted at Kufri (Shimla) during 1992-93, three herbicides viz. alachlor, paraquat and chlortoluron were tested at recommended rate without subsequent earthing up and at reduced rates followed by subsequent earthing up in rainfed potato cv. Kufri Jyoti. The results indicated that alachlor 1.0 kg/ha as pre-emergence and paraquat 0.3 kg/ha at about 5% crop emergence followed by earthing up were better in reducing weed growth and increasing tuber yield of potato. Chlortoluron 1.5 kg/ha with and without subsequent earthing up was least effective in potato.

8. INTEGRATED WEED MANAGEMENT IN CASSAVA

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The experiment was conducted at the Instructional Farm, Vellanikkara, Kerala Agricultural University with 13 treatments. Herbicides oxyfluorfen, pendimethalin, oxadiazon, fluchloralin, diuron and paraquat were tested. Application of all the herbicides except paraquat (dichloride) was followed by either two spade weedings i.e. at 60 DAT and 90 DAT or by a single spade weeding at 60 DAT. Paraquat (dichloride) was applied at 30, 60 and 90 DAT without any spade weeding. The results revealed that the weed biomass at 60 DAT was lowest with paraquat (dichloride) @ 0.4 kg a.i./ha. Further in paraquat application, spade weeding could be avoided making the treatment more economic. The same treatment recorded highest tuber yield. Pendimethalin and oxyfluorfen gave comparable weed control and higher tuber yield.

9. PURPLE NUTSEDGE (*Cyperus rotundus* L.) INTERFERENCE IN TARO (*Colocasia esculenta* L.)

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Experiments were carried out in monsoon season of 1993 and 1994 at the Regional Centre of Central Tuber crops Research Institute,

Bhubaneswar to investigate the effect of competition at varying populations of purple nutsedge (0, 10, 20, 40, 60, 80, 100, 200 and 500 no./m^2 in taro. The purple nutsedge competition was severe in taro. Yield reduction was proportional to the purple nutsedge density upto 200 no./m^2. The relative growth rate and net assimilation rate of taro reduced due to weed infestation. Drastic reduction in root volume (64.2%) and leaf area (21.1%) were observed. Severe weed infestation resulted in decreased tuber bulking rate in taro.

10. INTEGRATED WEED MANAGEMENT IN BRINJAL (*Solanum melangena* L)

R.S.N.Rao & K. Narayana Rao, A.P. Agricultural University, Agricultural College Campus, Bapatla-522 101

Field trials were conducted for weed control in brinjal at the Agricultural College, Bapatla, during 1991-92 and 1992-93 with fluchloralin (1.00 and 1.25 kg/ha) as pre-sowing incorporated spray, pendimethalin (1.00 and 1.50 kg/ha) and alachlor (2.00 and 3.00 kg/ha) as pre-emergence spray and sethoxydim at 0.30 kg/ha as post-emergence spray at 20 DAS, and were compared with HW at 20 and 40 DAS and unweeded control. The lower dose of the herbicides was supplemented with one HW at 30 DAS. The fruit yield of brinjal was highest with HW twice (2479 kg/ha), followed by pendimethalin at 1.0 kg + HW (2459 kg/ha); fluchloralin 1.0 kg + HW (2397 kg/ha) and alachlor 2.0 kg + HW (2395 kg/ha). The lowest fruit yield of 2108 kg/ha was recorded in unweeded control.

11. WEED MANAGEMENT THROUGH MULCHING AND HERBICIDES IN EGG PLANT (*Solanum melongena*)

V.Veerabadran and R.Saravanan Babu, Department of Agronomy, Agriculture College, Tamil Nadu Agricultural University, Killikulam

Mulching with polythene sheet, banana trash and coirpith was compared with the application of preemergence herbicides viz., pendimethalin, metolachlor and metribuzin for effective weed management in egg plant (*Solanum melongena*). Weed control efficiency was higher with banana trash mulch (84 per cent) followed by polythene mulch (82 per cent). Among the herbicides, metolachlor 1.00 kg ha^{-1} at 3 DAP followed by one HW at 60 DAP recorded higher weed control efficiency of 85% at 30 DAP compared with 56% under handweeding twice. Even under unweeded conditions, mulching provided efficient weed control to the extent of 46 to 74% in the early stages. For effective weed management, higher fruit yield and greater monetary returns in egg plant cultivation, mulching with banana trash at 15 t ha^{-1} and preemergence application of metolachlor 1.0 kg ha^{-1} at 3 DAP followed by one HW at 60 DAP is recommended.

12. INTEGRATED WEED MANAGEMENT IN TOMATO

C.Narasimha Reddy, N.Venkat Reddy & M.P. Devi, All India Co- ordinated Research Programme on Weed Control, Rajendranagar, Hyderabad-30.

The experiment was conducted during 1992-93 at College Farm, Rajendranagar, Hyderabad to study integrated weed management involving pre-emergence appliction of herbicides followed by one intercultivation at 25 DAT in tomato. Four herbicides viz. butachlor, metolachlor and pendimethalin each at 1.0 kg a.i./ha followed by one intercultivation at 25 DAT and 1.5 and 2.0 kg a.i./ha as pre emergence and oxyfluorfen at 0.10 kg a.i./ha followed by one intercultivation at 25 DAT and 0.15 and 0.20 kg a.i./ha as pre emergence were evaluated along with two intercultivations at 25 and 40 DAT and weedy check. Integrated weed management involving application of all herbicides at lower rate as pre emergence fb one intercultivation at 25 DAT controlled the weeds well with more tomato yield and cost benefit ratio. Among the herbicides, butachlor was the best followed by metolachlor, pendimethalin and oxyfluorfen for weed control in tomato.

13. INTEGRATED WEED MANAGEMENT IN TOMATO UNDER MID-HILL CONDITIONS OF UTTAR PRADESH

Ved Prakash, K.D.Koranne, Prem Singh and A.K. Pandey Vivekananda Parvatiya Krishi Anusandhan Shala (ICAR), Almora-263 601, U.P.

A field experiment was conducted in three kharif seasons of 1990, 1991 and 1992 at Hawalbagh farm of VPKAS, Almora. The treatments consisting of four herbicides viz., pendimethalin 0.5 and 1.0 kg/ha, alachlor 1.5 and 2.0 kg/ha each followed by one HW at 45 DAT, fluchloralin 1.0 kg/ha, Oxyfluorfen 0.15 and 2.5 kg/ha were evaluated for their efficacy against weedy, weedfree, straw mulch, HW once and twice at 15, 15 and 45 DAT, respectively. The pre-emergence application of pendimethalin 1.0 kg/ha fb one HW at 45 DAT proved more effective and was as good as weed free treatment. Uncontrolled weeds in weedy plots caused more than 75% reduction in fruit yield of tomato. The highest fruit yield was exhibited with weed free (12511 kg/ha) fb pendimethalin 1.0 kg/ha + one hand weeding (11468 kg/ha) and HW twice (10336 kg/ha). the weed control efficiency was more than 72%. The weed index ranged from 8.34 to 66.94% which was minimum in pendimethalin 1.0 kg/ha supplemented with one HW and maximum in weedy check.

14. INTEGRATED ECONOMICAL WEED MANAGEMENT IN CAULIFLOWER

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A field trial was conducted at Instructional Farm, GAU, Navsari during rabi 1990-'91 and 1991-'92. Fourteen weed control treatments

consisting of weedy and weed free check, one HW at 20 or 40 DAP, two HW at 20 + 40 DAP, three herbicides each at two levels viz. pendimethalin (1.0 and 1.5 kg/ha), oxyfluorfen (0.2 and 0.3 kg/ha) and fluchloralin (0.9 and 1.35 kg/ha) and lower level of each herbicide along with one HW at 40 DAP were tested. The results revealed that either fluchloralin @ 0.9 kg/ha or pendimethalin @ 1.0 kg/ha along with one HW at 40 DAP was as good as weed free condition and two HW at 20 + 40 DAP in controlling weeds and producing higher yield of cauliflower. Hand weeding was economical as compared to herbicidal weed control.

15. PERFORMANCE OF FLUCHLORALIN AND PENDIMETHALIN TO CONTROL WEEDS IN CLUSTERBEAN UNDER RAINFED CONDITION

Virendar Kumar, B.D.Yadav and S.K.Aggarwal, CCS, Haryana Agricultural University, Regional Research Station, Bawal-123 501 (Haryana),India

A field experiment conducted at CCS, HAU Regional Research Station, Bawal, to study the performance of pendimethalin and fluchloralin, in rainfed clusterbean during Kharif seasons of 1990 and 1992. It consisted of 10 treatments viz. one HW at 30 DAS, two HW at 30 and 45 DAS, fluchloralin pre-plant incorporation at 1.0 or 1.5 kg. a.i./ha, pendimethalin pre- emergence at 0.5, 0.75, 1.0 or 1.5 kg a.i./ha,weed free and weedy check. Clusterbean variety HG 75 was used. Pendimethalin reduced the cluster bean population at harvest with increasing dose while fluchloralin did not affect the plant population and growth. Pendimethalin recorded poor weed control effeciency of 37.6% to 66.1%. The weed control efficiency was 83.8% and 91.9% with fluchloralin at 1.0 and 1.5 kg a.i./ha, respectively. However, pendimethalin increased the pod number at higher doses in 1992 season. Fluchloralin @ 1.0 or 1.5 kg a.i./ha, recorded yields at par with weed free and handweeding treatments whereas, the yield of clusterbean reduced drastically with increasing doses of pendimethalin.

16. INTEGRATED WEED MANAGEMENT IN CABBAGE

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A field experiment was carried out at N.M.College of Agriculture, GAU, Navsari during *rabi* season of 1988-89 to 1991-92 to find out suitable weed management technology for cabbage crop. Fourteen treatments consisting of weedy and weed free check, one HW at 20 or 40 DAP, two HW at 20 + 40 DAP, three herbicides each at two levels viz, pendimethalin (1.0 and 1.5 kg/ha), oxyfluorfen (0.2 and 0.3 kg/ha) and Fluchloralin (0.9 and 1.35 kg/ha) and lower level of each herbicide along with one HW at 40 DAP were tried. The maximum head yield of 193.1 q/ha) was recorded under weed free plots comparable with two H.W. at 20 + 40 DAP, fluchloralin @ 0.9 kg/ha + H.W at 40 DAP, and pendimethalin @ 1.0 kg/ha + H.W. at 40 DAP. Fluchloralin @ 0.9 kg/ha

or pendimethalin @ 1.0 kg/ha and one H.W were as good as two HW and weed free check.

17. WEED CONTROL STUDIES IN SEED CROP OF RADISH VAR. JAPNESE WHITE

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The experiment was conducted at the vegetable Research Farm and Laboratories of the Regional Research Station, Dhaulakuan, during rabi season of 1991-92 to evolve weed control measures for Radish. The treatments were Alachlor (1.0, 1.5 and 2.0 kg/ha), Thiobencarb (1.0, 1.5, and 2.0 kg/ha) as pre-emergence and Glyphosate (1.0, 1.5 and 2.0 kg/ha) as post-emergence herbicides along with weed free and weedy check. All the weed control treatments were safe to the crop and significantly reduced weed biomass and increased seed yield of radish. Maximum seed yield of radish was recorded with alachlor 1.0 kg/ha fb alachor 2.0 kg/ha and was at par with glyphosate 1.5 kg/ha and weed free.

18. WEED MANAGEMENT IN RADISH

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Field investigation was carried out to evalute the efficacy of various herbicides to control the weeds in radish during *rabi* seasons of 1990-92 at Bajaura. Five herbicides, alachlor, metolachlor, isoproturon, pendimethalin, fluchloralin each at three rates were tested against hand weeded and weedy checks. Unchecked weed growth caused a reduction of 61.7 per cent in yield. Losses in yield due to one plant/m^2 and 1 q/ha weed dry weight were 2,3 and 10.9 q/ha. Herbicides significantly influenced length, diameter and weight of radish roots. Application of pre-emergences metolachlor (1.0 - 2.0 kg/ha), alachlor (1.5 - 2.0 kg/ha), isoproturon (1.0 - 1.25 kg/ha), pendimethalin (1.2 kg/ha) and fluchloralin (0.9 - 1.35 kg/ha) gave higher weed control efficiency and increased yield of radish.

19. WEED MANAGEMENT IN CARROT

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In carrot, a trial was conducted with Fluchloralin (1.0 ml, 2.0 ml, and 3.0 ml/l of water), Pendimethelin (1.0, 2.0 and 2.5 ml/l of water) and Metribusin (0.5, 1.0 and 1.5 g/l of water) to test their weed control efficacy. The results recorded at 45 DAS indicated that Metribusin at 1.0 g/l of water was effective to control the weeds with fifty per cent increase of yield over control. The cost benefit ratio obtained with

Metribusin 1.5 g/l was 6.6 fb Metribusin 1.0 g/l and 0.5 g/l. Metribusin treatment at 1.5 g/l expressed yellowing of leaves.

20. ECONOMICS OF WEED CONTROL IN CHILLI

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The experiment was conducted in rainfed chilli at Vegetable Research Farm, HAU, Hisar during 1990-91. Seven weed management treatments and three nitrogen levels were examined. The results revealed that pre-emergence application of pendimethalin 1.25 kg/ha supplemented with one hoeing at 45 DAT and nitrogen at 80 kg/ha gave highest net return and effective control of weeds. Conventional farmers practice of hand hoeing twice was not sufficient for controlling weeds.

21. WEED MANAGEMENT IN CHILLIES

N.Venkat Reddy, C.Narasimha Reddy & M.Padmavathi Devi, All India Co-ordinated Research Programme on Weed Control, Rajendranagar, Hyderabad-500 030

An investigation was carried out in Alfisol during 1992-1993 at College Farm, Rajendranagar, Hyderabad to study the influence of different herbicides at different rates with or without intercultivation at 30 DAT for control of weeds in Chillies. Four herbicides viz. butachlor, metolachlor and pendimethalin each at 1.0 kg a.i./ha as pre emergence followed by one intercultivation at 30 DAT and 1.5 and 2.0 kg a.i./ha as pre emergence and oxyfluorfen at 0.10 a.i./ha followed by one intercultivation at 30 DAT and 0.15 and 0.20 kg a.i./ha as pre emergence was evaluated along with two intercultivations at 30 and 60 DAT and unweeded check. Application of four herbicides at lower rate fb. one intercultivation at 30 DAT controlled weeds effectively in chillies. On par with two intercultivations at 30 and 60 DAT. Butachlor at 1.0 kg a.i./ha as pre emergence fb one intercultivation at 30 DAT recorded highest chillies yield and it was closely followed by pendimethalin and metolachlor each at 1.0 kg a.i./ha and one intercultivation at 30 DAT.

22. WEED CONTROL IN CORIANDER SEED CROP

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An investigation was carried out at Vegetable Research Farm, HAU, Hisar during the year 1993-94 to study the efficacy of herbicides in Coriander cv. Natural selection. Four herbicides viz. Fluchloralin, Pendimethalin, Isoproturon and oxyfluorfen each at three concentrations. The lower dose of each herbicide was supplemented with one HW at 45 DAS. These treatments were compared with one handweeding, two handweeding, weed free and unweeded control. Pendimethalin at 1.25 kg/ha and at lower rate was effective to control the weeds. Oxyfluorfen

at all the rates was phytotoxic to the crop. Maximum seed yield was recorded in weed free treatment followed by pendimethalin at 0.75 kg/ha supplemented with one HW.

23. CHEMICAL WEED CONTROL IN RAINFED CORIANDER

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Efficacy of four herbicides viz., Butachlor, Fluchloralin, Pendimethalin, and Thiobencerb each at two concentrations (0.5 and 1.0 kg a.i./ha) and two methods of application (pre-sowing incorporation and pre-emergence spray 3 DAS) were examined and compared with dryland weedor (20 and 40 DAS), HW twice (20 and 40 DAS), weed free (every fortnight weeding) and unweeded control treatments during 1993-'94. Herbicides applied at 1.0 kg ai/ha have recorded lesser weed dry matter compared to low concentration (0.5 kg ai./ha). Method of applications did not produce variation. The weed control treatments did not influence the plnat attributes viz., plant height, number of branches/plant, pod number etc. Among the herbicides, pendimethalin performed well in controlling weeds followed by butachlor Grain yield was recorded more in butachlor 1.0 kg ai/ha (711 kg/ha) compared to 0.5 kg ai/ha (650 kg/ha).

24. EFFICACY OF HERBICIDES FOR THE CONTROL OF WEEDS IN ONION

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A field experiment was conducted at Main Research Station, UAS. Hebbal, Bangalore, during kharif season of 1987, to evaluate the alachlor (1.0, 1.5 and 2.0 kg a.i./ha), butahlor (1.0, 1.5 and 2.0 kg a.i./ha), oxyfluorfen (0.15, 0.25 and 0.35 kg a.i./ha), fluchloralin (0.75, 1.0 and 1.25 kg a.i./ha) and pendimethalin (0.50, 0.75 and 1.00 kg a.i./ha) to control weeds in onion. Weed free through out, weed free upto 45 days and weedy check treatmentss were also maintained. The results indicated that, the application of oxyfluorfen at 0.35 kg/ha reduced the weed population and weed biomass significantly. Butachlor at 2.0 kg, oxyfluorfen at 0.25 kg and alachlor at 2.0 kg/ha were safe for higher bulb yields next only to weed free treatment.

25. CROP WEED COMPETITION IN ONION VAR. ARKA KALYAN *Prabha challa*

Indian Institute of Horticultural Research, Hessaraghatta, Bangalore-560 089

Crop-weed competition experiment conducted at Indian Institute of Horticultural Research, Hessarghatta Farm indicated increased bulb yield in weed-free plots upto 60 days and decreased yield in weed infested

plots upto 40 days. The critical weed-free period for good crop of onion was between 60-70 days. The plant growth characters such as plant height and number of leaves decreased with increased number of days of weed infestation.

26. WEED CONTROL IN KHARIF ONION (*Allium cepa* L.) Cv.AGRIFOUND DARK RED

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Investigations were undertaken for weed control in kharif onion at Main Experiment Station of N.D.University of Agriculture and Technology, Kumarganj, Faizabad during 1992-93 and 1993-94. Eight weed control treatments were involved viz, weedy check, weed free, alachlor @ 1.5 kg and 2.0 kg ai./ha, pendimethalin @ 1.0 kg and 1.5 kg ai./ha and metolachlor @ 1.0 kg and 1.5 kg ai./ha. Highest plant height and number of leaves per plant were recorded at 80 days stage of crop under weed free plot followed by pendimethalin @ 1.5 kg ai/ha. Highest number of marketable bulb per hectare, bulb diameter (cm), marketable bulb yield (q/ha) and poor percentage of bolting were recorded under weed free condition followed by higher concentration of pendimethalin @ 1.5 kg ai/ha.

27. COST-EFFECTIVE INTEGRATED WEED MANAGEMENT IN GARLIC (*Allium sativum*) UNDER VERTISOLS OF SOUTHERN RAJASTHAN

M.K. Porwal, Rajasthan Agricultural University, Agricultural Research Station, Banswara-327 001

Field experiment carried out at ARS, Banswara, Rajasthan during 1992-93 and 1993-94 revealed that integrated method of controlling weeds with preemergence oxyfluorfen (0.15 kg/ha) or pendimethalin (1.0 kg/ha) fb one manual weeding at 40 DAS was most cost-effective in garlic.

28. HERBICIDAL SELECTIVITY IN CERTAIN WINTER SPICES AND SUSCEPTIBILITY TO WEEDS

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A field experiment was conducted to evaluate the effects of eight herbicides viz., alachlor, thiobencarb, fluchloralin, pendimethalin, isoproturon, metolachlor, oxadiazon each at 1.0 kg/ha and oxyfluorfen 0.1 kg/ha on five spice crops viz., coriander, fenugreek, ajovan, cress and dilseed and were compared with weed free and weedy ckeck during winter 1990-91 and 1992-92. The study revealed that oxadiazon was effective to control all the weeds, while pendimethalin was effective in controlling weeds except *Gynandropsis pentaphylla*, Fluchloralin failed to

control. *Gynandropsis pentaphyll* and *Phyllanthus niruri.* Isoproturon was good for *Chenopodium album* and *Phyllanthus niruri* but failed to control *Gynandropsis pentaphylla, Elusine indica* and *Eragrostis spp. Gynandropsis pentaphylla* was more tolerant and not controlled by any of the herbicide except oxadizon. Pre-emergence application of isoproturon was phytotoxic to all the crops. Pendimethalin was phytotoxic to fenugreek and oxadiazon to cress crop, while other herbicides were safe to these crops. The highest seed yield of coriander (1321 kg/ha), fenugreek (1358 kg/ha), Ajvan (1358 kg/ha) and dilseed (2616 kg/ha) were obtained under oxadiazon, while the highest yield of cress (1446 kg/ha) was obtained under fluchloralin.

29. CROP-WEED COMPETITION IN ISABGUL (*Plantago ovata*)

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Isabgul (Plantago ovata Forsk) is an important medicinal crop of arid and semi-arid regions of Western Rajasthan and North Gujarat. The present investigation was carried out in field condition with 14 weed management treatments (weed free upto 15, 30, 45, 60, 75 and 90 DAS, season-long weed-free, weedy upto 15, 30, 45, 60, 75 and 90 DAS and season-long weedy) during 1991-92. With increase in weed-free period from 30 to 60 DAS the seed yield significantly increased, whereas, it decreased significantly with an increase in weedy period from 30 to 60 DAS. The per cent reduction in seed yield, biological yield, harvest index, seeds/spike, spikes/plant and plant population at harvest were 95.51, 92.66, 38.70, 75.74, 65.38 and 32.42 respectively.

30. Weed management in Isabgul (*Plantago ovata* Forsk.)

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A field experiment was conducted during rabi seasons of 1988-89, 1989-90 and 1990-91 to find out the economical weed management practice for Isabgul crop. Hand weeding treatments viz. one HW (30 DAS), two HW (20 and 40 DAS) and weed free significantly suppressed the weeds and gave more grain yield of 1316 kg/ha, 1352 kg/ha and 1464 kg/ha respectively compared to weedy check (990 kg/ha). Among the herbicides, isoproturon (Pre-emergence application @ 0.500 or 0.750 kg ai/ha) gave similar control of weed to that obtained with cultural treatment. Further, pre- emergene application of isoproturon at 0.500 kg ai/ha recorded highest net ICBR (1:9.21).

31. STUDIES ON THE EFFICACY OF HERBICIDES IN CONTROLLING WEEDS UNDER LEMONGRASS (CKP-25)

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A field experiment was conducted during 1993 and 1994, at the Field Research Station of Regional Research Laboratory, Jammu to study the efficacy of 2,4-D and Glyphosate herbicides. The experiment consisted of three doses (1.0, 1.5 and 2.0 kg/ha) of sodium and ester salts of 2,4-D, two doses of glyphosate (0.5 and 1.0 kg/ha), one hand weeding and weedy check. Results revealed that significant increase in both, herbage and essential oil yield due to the doses of 2,4-D and hand weeding treatments as compared to weedy check. Glyphosate at both the rates (0.5 and 1.0 kg/ha) of application showed non-selective, as well as phytotoxicity effects on Lemongrass plantation during both the years of experimentation.

32. EFFICACY OF DIFFERENT HERBICIDES FOR WEED CONTROL IN JAPANESE MINT (*Mentha arvensis* L.)

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Field experiments were carried out at experimental farm PAU, Ludhiana during Kharif 1990 on loamy sand soil. Of the various herbicides, pre-emergence application of diuron (0.6 and 0.8 kg), pendimethalin (1.0 and 1.5 kg), terbacil 2.4 kg, isoproturon 0.47 kg, isoproturon 0.37 kg + pendimethalin 0.37 kg, terbutryn 0.5 kg and ethalfluralin 1.0 kg/ha proved effective against annual weeds of Japanese mint. All the treatments produced significantly higher fresh herb and oil yield than unweeded control. Metribuzin (0.8 and 1.2 kg), alachlor (2.0 and 2.5 kg) and atrazine 0.25 kg/ha in combination with either isoproturon 0.37 kg or pendimethalin less herb and oil yield than even unweeded crop.

33. PRELIMINARY STUDIES ON THE WEEDICIDAL PROPERTIES OF PALMROSA OIL

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The palmrosa oil is extracted from the leaves of Cymbopogan martihii var. motia perennial grass. The oil is used extensively in the perfume industry and reported to contain some pesticidal properties including the mosquito repellent action. Attempts were made to study the use of palmrosa oil for controlling the weeds. The preliminary findings of the laboratory studies indicated that palmrosa oil can be used as a preemergent herbicide. The germination of weed seeds of

Trianthema portulacastrum was completely inhibited by palmrosa oil. On the otherhand, the control recorded 95 per cent of weed seed germination. Interestingly, it was observed that the palmrosa oil inhibited the germination of crop seeds also showing that it is non-selective in action. Further research on pot and field experiments are underway.

34. WEED MANAGEMENT IN COFFEE PLANTATIONS

C.T.Abraham, P. Sreedevi and C. George Thomas, Kerala Agricultural University, Vellanikkara, Trichur-680 654

A study was undertaken at the Cardamom Research Station, Pampadumpara for three years from 1990 to 1992 with treatments, Paraquat (dichloride) 0.4 kg ai/ha) two sprayings at monthly interval, tank mix application of Paraquat (0.4 kg ai/ha) + Diuron (1.0 kg ai/ha), glyphosate 0.8 and 1.2 kg ai/ha (tank mix) twice at monthly intervals. Single tank mix appliction of Diuron 1 kg ai/ha with Paraquat 0.4 kg ai/ha or Glyphosate 0.8 hg ai/ha is more economical for weed control in coffee garden.

35. WEED CONTROL IN CHILLIES

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An experiment was conducted at New Vegetable Research Complex, Department of Horticulture, Annamalai University to study the effect of pre-emergence application of fluchloralin 1.5 kg/ha, alachlor 1.5 kg/ha and pendimethalin 1.0 kg/ha on irrigated chilli and these herbicide treatments were compared with an unweeded control and a twice handweeding treatment. The weed flora comprised *Trianthema portulacastrum*, *Euphorbia hirta*, *Panicum repens* and *Cyperus rotundus*. It was observed that pendimethalin recorded the highest weed control efficiency (84%) among the herbicides and performed on par with twice hand weeding. It also resulted in the highest percentage increase of green chilli yield over unweeded control (45%).

1. HERBICIDE CONTROL OF *Eupatorium*

Abraham, C.T., George Thomas, C. and Joseph, P.A, Kerala Agricultural University, Vellanikkara, Thrissur-680 654

Eupatorium (*Chromolaena odorata* or *Eupatorium odoratum*) is a problem weed of plantation crops. A trial was conducted at KAU, Trichur to evaluate different post emergence herbicides for controlling Eupatorium. Spraying Paraquat, 2,4-D and Glyphosate alone at different doses as well as combinations of Paraquat with Diuron or 2,4-D were done in rubber garden against Eupatorium. Paraquat 1.0 kg/ha, 2,4-D 2.5 kg/ha and Glyphosate 0.8 kg/ha were more effective. When the application was done on the regrowth after slashing, 2,-4D at 1.5 kg/ha dose was able to kill the weed completely.

2. CHEMICAL CONTROL OF *Cyperus rotundus* IN NON-CROP SITUATIONS

K.N. Ahuja and N.T.Yaduraju, Division of Agronomy, Indian Agricultural Research Institute, New Delhi-110 012

A field trial was carried out during Kharif 1992 to control *Cyperus rotundus* with glyphosate. Glyphosate 0.75 and 1.5 kg/ha was tried alone or in combination with 2% ammonium sulphate with and without polyethylene (PE) mulching. Repeat application of glyphosate at 0.75 kg/ha was the best treatment with lowest number of Cyperus shoots. Glyphosate sole or in combination with 2% ammonium sulphate significantly checked Cyperus shoots and its regrowthlater. Mulching with PE sheets alone was effective to check the top growth but totally ineffective to check the regrowth of Cyperus.

3. MANAGEMENT OF *Cassia nigricans* - A WASTELAND WEED

R.Balasubramanian, V.Veerabadran, A.Velayutham and A.Muthusankaranarayanan, Department of Agronomy Agricultural College and Research Institute, Killikulam Tamil Nadu Agricultural University, Tamil Nadu.

An experiment to control *Cassia nigricans* with various herbicides was conducted during Rabi, 1993. Sodium chloride, Paraquat, Glyphosate and 2,4-DEE were sprayed as post-emergence. Paraquate @ 10 ml per lit. showed maximum weed control efficiency (54.3%) followed by 2,4-DEE @ 5 ml per lit. (33.9%) and glyphosate @ 10 ml per lit. (32.3%). However, *Cassia nigricans* is capable of lush vegetative growth, producing a biomass of 58 t ha^{-1}. On dry weight basis, it contains 2.6 - 2.8 per cent nitrogen, 0.36 to 0.4 per cent P_2O_5 and 1.56 to 1.68 per cent K_2O and can therefore serve as a green leaf manure in rice culture.

4. DODDER (*Cuscuta refelexa* ROXB.) A SEVERE PARASITIC WEED ON FENNEL (*Foeniculum vulgare* MILL.)

D.S.Bhati, All India Coordinated Spices Improvement, Project SKN College of Agriculture, Rajasthan Agricultural University, Jobner-303 329, Rajasthan.

A survey on weed infestation in fennel (Foeniculum vulgare Mill.) undertaken in Tonk District of Rajasthan (India) during rabi season of 1986-87, indicated that infestation by the parasitic weed *Cuscutta reflexa* was observed in 5 fields out of 11 fields surveyed. In infested fields, 70.70 to 23.04 per cent plants were parasitized. The seed yield was 25.27 to 11.32 g per plant in healthy plants and 10.18 to 4.47 g per plant in infested plants. The reduction in estimated seed yield due to infestation by Cuscuta ranged from 14.04 to 30.07 per cent. 100 per cent infestation reduced the seed yield by 31.21 to 71.52 per cent.

5. STUDIES ON SUSCEPTIBILITY OF COMMON SUMMER WEEDS TO ATRAZINE

R.K.Bhatia and K.S.Sandhu, Department of Agronomy Punjab Agricultural University, Ludhiana 141 004, Punjab

Field studies conducted to assess the susceptibility of common summer weeds to atrazine (0.25 to 2.00 kg/ha) applied as pre-emergence revealed that *Trianthema portulacastrum, Acrachnae racemosa, Tribulus terrestris, Commelina benghalensis, Digitaria sanguinalis, Digera arvensis, Eragrostis tenella* were effectively controlled at 0.50 kg/ha dose of atrazine. *E. tenella, cleome viscosa* and *Digera arvensis* were highly sensitive to atrazine whereas slow build up of population was observed in case of other weeds after 50 days even at 2.0 kg/ha dose. *Cyperus compresus, Eleusine aegyptiacum, Tribulus terrestris* and *Acrachne racemosa,* were found highly tolerant to atrazine. .ls 1

6. EFFICACY OF SOME PRE-EMERGENCE HERBICIDE IN CONTROLLING PREDOMINANT SUMMER WEEDS

R.K.Bhatia and K.S.Sandhu, Department of Agronomy, Punjab Agricultural University, Ludhiana 141 004, Punjab

Field experiments were conducted for two years during 1993 and 1994 to compare the efficacy of different pre-emergence herbicides against natural population of *Trianthema portulacastrum, Acrachne racemosa* and *Cyperus compresus.* Atrazine (0.5, 1.0 and 1.5 kg/ha) gave good control of *T. portulacastrum,* but *A. racemosa* and *C. compresus* were tolerant to atrazine. Metolachlor (0.75 and 1.0 kg/ha), Trifluralin (1.0 and 1.5 kg/ha) Fluchloralin (0.50 and 0.75 kg/ha) and pendimethalin (0.75 and 1.0 kg/ha) were effective against *A. racemosa* and *C.Compresus.* Trifluralin (1.0 and 1.5 kg) and pendimethalin (0.75 and 1.0 kg/ha) gave good control of all the three weeds.

7. BIOEFFICACY OF DIFFERENT HERBICIDES AGAINST *Parthenium hysterophorus* L.

L.S. Brar and Lakhvir Singh, Department of Agronomy, Punjab Agricultural University, Ludhiana

To control the parthenium, three herbicides namely glyphosate, atrazine and 2,4-D applied alone/tank mix at different doses and at different stages of growth of Parthenium (at emergence, before flowering, at flowering and after flowering were tested. Early post-emergence application (active growing stage) of glyphosate 1.0 kg, 1.25 kg, atrazine 1.5 kg/ha and glyphosate 0.75kg/ha + 0.25 % surfactant gave good control of parthenium and their killing potential was maximum when these treatments were applied in the month of September after flowering stage.

8. ALLELOPATHIC EFFECT OF *Parthenium hysterophorus* ON SEED GERMINATION OF SOME RICE CULTIVARS

R.S.Dhawan, Haryana Agricultural University, Regional Research Station, Karnal-132 001, Haryana

Effect of aqueous extracts (10 and 20%) of inflorescence of *Parthenium hysterophorus* on germination of rice cultivars, viz., IR 8, HKR 120, Jaya, HKR 126 and PR 106 was studied. The 10 per cent extract of Parthenium solution inhibited germination percentage in IR 8 and HKR 120, while 20 per cent extract inhibited germination in almost all the cultivars. Ten per cent extract inhibited epicotyl length in HKR 126 and PR 106, while 20 per cent extract inhibited it in all the cultivars. Jaya tolerated 10% extract while PR 106 was affected with poor epicotyl growth. It should be noted that 10 per cent extract did not inhibit epicotyl or radical elongation or dry matter accumulation in cultivar Jaya, it completely inhibited these parameters in cultivar PR 106.

9. ALLELOPATHIC EFFECT OF PARTHENIUM HYSTEROPHORUS ON SEED GERMINATION OF *Echinocloa colonum* AND *Echinocloa crusgalli*

R.S. Dhawan, Haryana Agricultural University, Regional Research Station, Karnal-132 001 (Haryana)

While aqueous extract (1, 5 and 10%) of root and stem of *Parthenium hysterophorus* did not affect germination, leaf and inflorescence extract inhibited germination of *Echinocloa colonum* by 42 and 11 per cent, respectively. The dry matter accumulation was also inhibited by 10 per cent inflorescence extract. Leaf and inflorescence litter also inhibited germination of *Echinocloa colonum*. Such effects could not be seen in *E. crusgalli*.

10. ALLELOPATHIC POTENTIAL OF PADDY SEEDS AND SOME PLANT PRODUCTS ON BANYARD GRASS

Kathiresan, RM and G. Gurusamy, Department of Agronomy, Faculty of Agriculture, Annamalai University, Annamalai Nagar-608 002, TN.

A laboratory experiment was conducted to study the allelopathic potential of paddy seeds and some plant products on germination and growth of *Echinochloa crusgalli*. The treatments comprised overnight soaking along with paddy seeds, sugarcane pressmud, biodigested pressmud slurry, neemcake and a water soaked control. Soaking of *E. crusgalli* seed along with paddy seeds overnight increased the germination percentage and DMP of the weed whereas soaking along with pressmud, biodigested pressmud slurry, neemcake, significantly decreased the germination of weed seed.

11. Monitoring of Zygogramma bicolorata Pallistter (*Coleoptera: chrysomelidae*) on sunflower *Helianthus annus*

S.Douressamy, S.Sankaran, M.Swamiappan, M.Gopalan, C.Loganathan, and O.S.Kandasamy, Department of Entomology, TNAU, Coimbatore - 641 003.

Zygogramma biocolorata Pallister, of Mexican origin, causes large scale defoliation of Parthnium in Coimbatore and surrounding areas of Tamil Nadu. Defoliation by the beetle reduced flower production by the weed, besides encouraging the growth of vegetation formerly suppressed by Parthenium. Reports from Bangalore, indicated that *Z. bicolorata* could feed on leaves of sunflower, growing adjacent to Parthenium stands in drought prone areas. Hence, a detailed monitoring study was carried out in the sunflower growing areas of Coimbatore district, to find out the damage if any, caused by the *Z. bicolorata* which were found feeding on *P. hysterophorus* nearby sunflower crop. The results on the population level of *Z.bicolorata* on the *P.hysterophorus* nearby sunflower and on sunflower crop is discussed.

12. POPULATION BUILD UP OF ZYGOGRAMMA BICOLORATA PALLISTER (COLEOPTERA: *Chrysomelidae*), AN EFFECTIVE NATURAL ENEMY OF *Parthenium hysterophorus* L.(ASTERACEAE)

S.Douressamy, M.Swamiappna, M.Gopalan, and S.Sankaran, Department of Entomology, TNAU, Coimbatore-3

The neotropical weed, *Parthenium hysterophorus* L. (Asteraceae) is a serious weed of pastures, agricultural fields and waste lands in Tamil Nadu and most parts of India. To contain this weed, an exotic biocontrol agent, *Zygogramma biocolorata* Pallister, collected from Tirupathur, North Arcot district was released at few pockets of TNAU campus, Coimbatore during 1991-92. Detailed observation was made on the population build up of the *Z.bicolorata* at fortnightly intervals in selected pockets in and around the TNAU campus. Correlation of the

beetle population with weather parameters was worked out for the period September 1993 - November 1994. The beetle was found feeding on the *P.hysterophorus* continuously during the observation period.

13. PHENOLOGY OF SEXUAL REPRODUCTION OF CHARA IN INDIA

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Six pot experiments and two rice-field surveys were carried out during 1992 and 1993 at Kharagpur and Contai in West Bengal. In pot experiments, Chara was grown from the soil borne oospores in earthen pots filled with water while in rice fields, 50 spots in five different villages were selected for recording the observations. The results show that the nucules turned saffron in *C. zeylanica* and black in *C.fibrosa* at maturity indicating completion of life cycle of the weed. The total time required for this was not fixed and varied widely from 36 to 59 days after germination. The reproductive capacity of the weed was high. The highest number of oospores per plant and also per milligram dry thalli was 395 and 25, respectively for both the species at three months stage of growth. The oospore drop out from these living plants was very low, being at the most, 3.5 per cent only. Implication of such study for controlling this algal weed in waterlogged rice fields has been discussed.

14. EXPORING ECOLOGICAL CONTROL OF CHARA

P.Guha, IIT, Kharagpur 721 302, W.B.

Different ecological parameters were studied in the rice fields and adjacent water bodies during 1983-85 and 1987, to find out the limiting environmental factor(s), if any which can be manipulated for controlling the aquatic algal weed Chara. The survey results indicate that low light condition created by dense crop canopy or turbidity, low pH, traces of phosphorus in water, shallow water depth and frequent wetting-drying of soil after oospore germination are all detrimental to the weed. Exploration of these factors for pollution free ecological control of the weed is discussed.

15. PRODIGIOUS ECOLOGICAL EFFICIENCY OF THE WEED CROWNBEARD

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Crownbeard, *Verbesina encelioides*, a composite is an aggressive, fast growing weed of North India. This annual plant is a prolific seed producer whose seeds exhibit dimorphism and adopt both low and high risk strategies for survival and perpetuation, germinating between 5-20 C under almost all the conditions of light and moisture regimes. Though this weed is an allotetraploid, exhibits perfect bivalency

simulating diploidy. Moreover, it exhibits a high magnitude in genetic variability under diverse ecological habitats in seed number and in shoot and root production. Bivariate, phenotypic, genotypic and environmental correlations reveal intricate, but intimately well- knit interrelationships amongst various metric traits.

16. BIOLOGICAL CONTROL OF WEEDS USING PATHOGENS: SURVEY OF PATHOGENS ASSOCIATED WITH *Parthenium hysterophorus* AND *Eichhornia crassipes*

L.P. Kauraw and V.M. Bhan, National Research Centre for Weed Science, Adhartal, Jabalpur-4, M.P., INDIA

Survey was carried out in and around Jabalpur during the year 1992, 1993 and 1994 in different months in search of disease of *Parthenium hysterophorus* and Water hyacinth. Seven fungi isolated from infected leaves are *Fusarium oxysporum*, *Alternaria alternata*, *Cladosporium Cladosporiodes*, *Myrothecium roridum*, *Curvularia lunata*, *Memnoiella* sp. and *Colletotrichum dematium*. Seven *fungi* were isolated from seeds are *Aspergillus fumigatus*, *Fusarium oxysporum*, *Fusarium Palliaoroseum*, *Alternaria alternata*, *Stachybotrys* sp., *Memnoniella* sp. and some non- sporulating fungi. Two fungi were isolated from infected leaves of Water hyacinth are *Acromonium zonatum* and *Alternaria* sp. The Pathogenicity of these fungi is under testing for evaluation of their potentiality as mycoherbicide.

17. EFFICACY OF CASITTA POWDER TO WATER HYACINTH AND OF MARIGOLD TO *Parthenium* POPULATION

L.P. Kauraw and V.M.Bha, National Research Centre for Weed Science, Adhartal, Jabalpur-4, M.P., India

Dry casitta powder was added @ 50 gm, 100 gm, 150 gm and 200 gm per 10 litre of Water (0.5%, 1% and 2% respectively) and Water hyacinth plants were grown in Plastic tubes. Obervations recorded after five days interval on number of leaves/plants and biomass showed reduction in number of leaves and biomass of water hyacinth. Casitta powder @ 1 to 2% w/v could completely kill the leaves and reduced biomass rastically within fifteen days. The chemicals responsible for killing of Water hyacinth would be analysed. In another experiment, marigold plants were observed to supress Parthenium plants when grown together.

18. HOST SPECIFICITY OF PARASITIC WEED-CUSCUTA IN CROP PLANTS AND WEEDS

R.Mahender Kumar and S.M.Kondap, Department of Agronomy, Directorate of Rice Research, Rajendranagar, Hyderabad-30

Cuscuta commonly known as "dodder" infests most of the economical crop in Andhrapradesh. It was initially found on lucerne and later spread to other crops such as greengram, blackgram. It also infests variety of weeds which are acting as alternate hosts for its survival. Green house studies conducted during 1988 and 1989 revealed that pulse crops were more sensitive besides all dicotyledonous weed species. However, the cereals and monocotyledonous weed species were not infested by the parasite. Hence, the cultivation of grain crops in Cuscuta infested fields would reduce the soil bank of cuscuta.

19. EFFECT OF HERBICIDES ON CUSCUTA-A PARASITIC WEED CONTROL IN BLACKGRAM (*Vigna mungo*)

R.Mahender Kumar and S.M.Kondap, Department of Agronomy, Directorate of Rice Research, Rajendranagar, Hyderabad-30

A field study was carried out during 1987 and 1988 at college of Agriculture, Rajendranagar to evaluate the effect of herbicides on Cuscuta control in Black gram (Vigna mungo). The study indicated that, the pre-emergence application of fluchloralin 1.5 kg/ha and pendimethalin 1.5 kg/ha effectively controlled the parasite and recorded grain yields on par with hand weeding.Application of pronamide @ 1.5 kg/ha although controlled the parasite throughout the period of crop growth, did't record any significant increase in grain yields evidently because of the high degree of phytotoxicity on the crop. Similarly post emergence application of glyphosate 0.05 and 0.07 kg/ha and bentazon 1.5 kg/ha didn't control the parasite effectively.

20. HERBICIDAL SUPRESSION OF BERMUDAGRASS (*Cynodon dactylon* (L) PERS.)

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Clomazone [2(2-Chlorophenyl) methyl] 4,4-dimethyl-3 isoxazolidione, is a soil applied herbicide currently registered for use in many crop plants. The preliminary trial on the effect of this chlorophyll active herbicide on the growth performance of cynodon was conducted in pot culture at TNAU, Coimbatore. The cynodon plants sprayed with clomazone showed better canopy growth with minimum IAA oxidase activity at the initial stage. The chlorophyll status, responsible for photochemical reaction, of treated plants was drastically reduced. The biomass production of clomazone treated cynodon also reduced at 40th

day, coupled with higher partitioning (68 per cent) of shoot mass at the cost of rhizome formation. Total loss of photochemical activity due to herbicide induced chlorophyll bleaching resulted in very low biomass production at latter stage of growth.

21. *Fusarium solani*, a Potential bio control agent for "*Eupatorium gladulosum*

K.Manickam, M.Devanathan, Dr.V.Mariappan, and Dr.S.Sankaran Centre for Plant Protection Studies, Vice-Chancellor, Tamil Nadu Agricultural University, Coimbatore-3

Eupatorium glandulosum (Sprengal, Fam: Aesteraceae) an introduced weed from Mexico, is widely distrbuted in Nilgiris and Western Chats of Tamil Nadu. During September - February, heavy incidence of leaf blight was observed. The pathogen was isolated in pure culture. The greenhouse studies showed that the weed *E.glandulosum* is highly susceptible to this fungus. The leaves and tender part the plants were blighted completely. Among the plant species tested (Compositae and solanaceae) *E.glandulosum* alon was susceptible to this fungus. The fungus was identified as a strain of *Fusarium solani* (Martius) Sacc. by International Mycological Institute, U.K. *E. solani* has potential for use as a biocontrol agent for *E. glandulosum*.

22. EFFICACY OF SULFONYLUREA HERBICIDES FOR CONTROL OF *Parthenium hysterophorus* L.

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Experiments were conducted at Jabalpur during 1993 and 1994 to test two sulfonyl urea herbicides viz. chlorimuron ethyl (20 and 40 g/ha) and metsulfuron methyl (3.5 and 4.5 g/ha) along with 2,4-DEE (1.5 and 2.0 kg/ha), glyphosate (1.0 and 1.5 kg/ha) and atrazine (1.0 and 1.5 kg/ha) against *Parthenium hysterophorus* in non-croppoed area. All the herbicides were applied at 8-10 leaf before flowering. The results revealed that all the herbicides except atrazine were effective against Parthenium. Metsulfuron methyl at 3.5 g/ha and chlorimuron ethyl at 20 g/ha gave good control of Parthenium similar to 2,4-DEE at 2.0 kg/ha and glyphosate at 1.5 kg/ha. Glyphosate at 1.5 kg/ha gave complete killing within 15 days after spray whereas 2,4-DEE at 2.0 kg/ha took 25-30 days for complete drying of the plants.

23. EFFECT OF HERBICIDES ON SEED PRODUCTION CAPACITY IN EUPATORIUM (*Chromolaena odorata* K & R)

U.V. Mummigatti, M.B. Chetti, M.B. Doddamani, Y.C. Panchal and A. Mahadevreddy, Department of Crop Physiology, UAS, Dharwad-5

The rapid invasion of Eupatorium (*Chromolaena odorata* K & R) is due to its abundant capacity to produce millions of small seeds. The effect of herbicides was studied in Eupatorium in an experiment. The herbicides 2,4-D, paraquat and glyphosate each at three concentrations viz., 2000, 3000 and 4000 ppm, was sprayed at flower bud formation and full bloom stages. Increase in the concentration, irrespective of the herbicide resulted in decrease in the number of capitulum, 1000-capitula weight, number of cypsella, 1000-capsella weight and germination per cent. Among the herbicides, paraquat at 4000 ppm was effective followed by 2,4-D and glyphosate at 4000 ppm concentration. Further the foliar spray of herbicides at flower bud stage was most effective as compared to full bloom stage.

24. ROLE OF CARRIERS AND LIGHT IN INCREASING THE EFFICACY OF HERBICIDES IN EUPATORIUM (*Chromolaena odorata* K & R)

U.V.Mummigatti, M.B.Chetti, M.B. Doddamani and Y.C. Panchal, Department of Crop Physiology, UAS, Dharwad-5

A field investigation was conducted at College of Agriculture, UAS, Dharwad to find out the influence of carriers along with different herbicides under both open light and shaded conditions on the membrane integrity and the leaching of anthocyanin pigment in Eupatorium (Chromolaena odorata K & R). Among the herbicides and carriers, glyphosate (2000 ppm) with ammonium sulphate (1%) was most effective followed by paraquat (2000 ppm) with potassium nitrate (1%) in increasing the loss of membrane integrity and leakage of anthocyanin pigment. The carriers were more effective under open light in absorption and translocation of herbicides resulting in good control of Eupatorium.

25. CONTROL OF WATER HYACINTH (*Eichhornia crassipes* Mart.) THROUGH HERBICIDES AND THEIR EFFECT ON FISHES

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The experiment was carried out at Agricultural College, Hebbal, Bangalore, during the summer season of 1991, to evaluate the efficacy of herbicides for the control of water hyacinth and their effect on fishes in water tank. The experiment consisted of 9 treatments viz., 2,4-D ethyl ester (1.0 kg/ha), paraquat (1.0 + 0.9 kg/ha), 2,4-D ethyl ester + Paraquat + Urea (1.0 + 0.9 kg/ha + 1%), Glyphosate + Paraquat + Urea (2.2 + 0.9 kg/ha + 1%), unsprayed check and fishes without water

hyacinth. Water quality parameters like pH and dissolved oxygen content were higher in control treatment i.e. without water hyacinth plants. treatments.

26. MONOCOT HOST RANGE OF CHINADODDER

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While a lot of information on dicot hosts of dodder is available, data on monocot host range is meagre. The paper deals with the same. The present preliminary analysis based on observation of the last two years, showed the host range as 48 species belonging to 40 genera spread over 14 families for china dodder alone. The data are discussed in relation to previous records. Experimental study on the infestion of dodder on one of the world's aquatic weed *Eichhornia crassipes* is in progress.

27. BIOLOGY AND CONTROL OF *Eupatorium odoratum* in WESTERN GHATS

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Laboratory and field experiments have indicated that, Epatorium seeds undergo dormancy for a period of six weeks Dormancy can be broken by the use of GA, KNO_3 and $NaNO_3$. Seeds tolerated drought condition (moisture stress) level -1.92 bars (5% PEG), seeds are autotoxic in nature. Water and alcohol extract (particularly of leaf) has shown the allelopathic effect on the germination of crop seeds of sorghum, bajra, maize, sunflower, greengram and cowpea. The seeds can stand submergence for 3 days. Chemical control of Eupatorium indicated that 2,4-D -diethyl amine and glyphosate at the rate of 2.5 litre 1000 litres of water + teepol before flowering (some time during Aug. to Sept) controlled the weeds. Either, 2,4-D or glyphosate followed by sequential spray of paraquat at 5.0 1/1000 of water would control to an extent of 80-90%. Only paraquat spray kills the shoots and fresh shoots come up after 30 days.

28. INHIBITION OF LEMNA BY PARTHENIUM

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The present study reports herbicidal property of parthenium residue on floating aquatic weed lemna (*Lemna pausicostata* Hegelm.). Possible effects of parthenium residue phytotoxicity on population dynamics and survival of lemna in the vicinity of parthenium stand in a natural ecosystem and its possible implications on the management of the aqutic weed have been addressed. Parthenium flower residue (FR) was

lethal at 0.50%, leaf resiude (LR) was lethal at 1.00%. The stem residue (SR) was inhibitory at 1.00% but non-lethal even at 1.25%, and the root residue (RR) was inhibitory but non-lethal even at the highest concentration of 1.25%.

29. RELATIVE TOXICITY OF ALLELOCHEMICALS TO AQUATIC WEEDS

D.K.Pandey, Physiology Section, National Research Centre for Weed Science, Adhartal, Jabalpur (M.P.) - 482 004

Relative phytotoxicity of twelve alelochemicals on floating aquatic weeds viz., water hyacinth (*Eichhornia crassipes* Mart Solmns), salvinia (*Salvinia zmolesta* Mitchell.), pistia (*Pistia stratiotes* L.), azolla (*Azolla nilotica* Decne.), spirodella (*Spirodella polyrhiza* L. Schleid), lemna (*Lemna pausicostata* Hegelm.), and submerged weeds viz. hydrilla (*Hydrilla verticillata* L.f.Royle), ceratophyllum (*Ceratophyllum demersum* L.) and najas (*Najas graminea* Del.) was studied. p-Hydroxy- benzoic acid was lethal at 50 ppm to all weeds, except for water hyacinth and pistia, which were killed at 100 ppm. Anisic acid was lethal at 50 ppm to azolla, spirodella and lemna, and at 100 ppm to najas, hydrilla, and pistia. Cinnamic acid was lethal at 50 ppm to spirodella, lemna, hydrilla, ceratophyllum and najas, and at 100 ppm to azolla. Salicylic acid was lethal at 50 ppm to spirodella, lemna, hydrilla, ceratophyllum and najas, and at 100 ppm to azolla. Coumaric acid was lethal at 100 ppm to lemna, hydrilla, ceratophyllum and najas. The concentrations below lethal were usally inhibitory. Fumaric acid, tannic acid, gallic acid, chlorogenic acid, vanillic acid, caffeic acid, and ferulic acid were not lethal even at 100 ppm though in some cases inhibitory effect was conspicuous. p_Hydroxybenzoic acid appears to be one of the potent allelochemicals with substantial herbicidal property to all the aquatic weeds studied.

30. NATURAL ENEMIES OF CHRISTMASBUSH WEED, *Chromolaena odorata*, L. *Kind* and *Robinson* (Asteraceae)

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Chromolaena odorata (L.) *Kind and Robinson* (Asteraceae) is a perennial menace weed in plantations of teak, rubber, cardamom, etc. in Tamil Nadu, Kerala and most parts of India. A survey was conducted at Trichur, Kerala to record the insects associated with *C.odorata*. Fourteen insect species were recorded and they caused damage on other economic crops. Among the insects, *Diacrisia obligua* (Wlk.), *Pericallia ricini* (F). and *Pareuchaetes pseudoinsulata* (Rego Barros) were noted, of which *P.pseudoinsulata* was found specific on *C.odorata* weed plant.

31. INVESTIGATION ON THE HOST-SPECIFICITY OF *Pareuchaetes pseudoinsulata* (L. REGO BARROS) (Arctiidae: Lepidoptera), A BIOCONTROL AGENT OF *Chromolaena odorata* L.

A.Ramesh, M.Gopalan, S.Douressamy and M.Swamiappan, Department of Agricultural Entomology, TNAU, Coimbatore-641 003

Chromolaena odorata (Asteraceae) is a perennial weed of plantation crops in Tamil Nadu, Kerala and other parts of India. To control the weed, an exotic biocontrol agent, *Pareuchaetes pseudoinsulata* L. (Arctiidae: Lepidoptera) was released in Tamil Nadu. The larva could be mass cultured in laboratory using the weed host. Studies were carried out on the host-specificity of *P. pseudoinsulata* on 23 crop plants belonging to 16 families. The survival period of newly hatched and ten day old larvae on different test plants were investigated. The observation revealed that no larvae completed its full development and caused damage on any of the test plants. Survival period ranged from 1- 4 days in the test plants. Total mortality of larvae was observed on all plants after 4-5 days.

32. BIOTECHNIQUES IN MANAGING THE PARASITIC WEED-CHINADODDER

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Cuscuta chinensis known as chinadodder is problem weed in green gram and black gram crops in Guntur and Krishna districts of A.P. To control this parastic plant, chemical, mechanical, physical and cultural control methods were tried by several workers with partial success. Hence, an improved biotechnical method was tried which involved growing several vegetables, dicot and monocot weeds, to evaluate the degree of resistance to china dodder spread. Results revaled that (1) cluster bean is attacked by china dodder but soon the parasite gets dwarfed, stunted and perished, (2) the parasite failed to form haustoria on steam, shoots, leaves and other parts though it made an attempt to nutate and twine around in *Hibiscus esculentus*, and 3) the work on Soybean MACS 58 as an inhibitor is in progress.

33. EFFECT OF EUCALYPTUS LEAF LEACHATES ON THE GROWTH OF SILVERLEAF NIGHTSHADE (*Solanum elaegnifolium* Cav.)

S.Sankaran, O.S.Kandasamy, C.Loganathan and N.Balasubramaniam, Scheme on biocontrol of weeds, Department of Agronomy, TNAU, Coimbatore-641 003

A study was conducted to find out the effect of Eucalyptus leaf leachtes on the growth of silverleaf nightshade (*Solanum elaegnifolium*) in large sized pots. Uniform sized, 15 cm length root cuttings were planted in the pots at the rate of four per pot and watered sufficiently. Treatments were imposed after the establishment of root cutting. The

treatments were, 10% fresh leaf leachate. 10% dried leaf leachate, fresh leaf cuttings @ 50 g/pot, dried leaf cuttings @ 25 g/pot and control (water aplication). Measured quantity of leachate (660 ml/pot) was applied to the respective treatments. Among the treatments, dried Eucalyptus leaf leachate applied at 10% concentration significantly suppressed the growth of silverleaf nightshade. in terms of plant height (10.3 cm), number of leaves (18.4), root length (81 cm) root and shoot biomass (2.4 and 6.1 g/plant) as compared to control.

34. CROPPING SYSTEM APPROACH FOR THE MANAGEMENT OF *Parthenium hysterophorus* L.

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A field trial was conducted at TNAU, Coimbatore to evaluate a suitable rainfed cropping system to the management of *Parthenium hysterophorus*. The results indicated that growing of maize, sorghum, sunflower and pearlmillet significantly suppressed the population (8.6, 10.6, 11.0 and 12.0 plants/m^2) as well as dry weight of Partenium (261, 336, 363 and 399 g/m^2) at 75 DAS over control (31 plants/m^2 recorded 1483 g DMP). However, pulses like greengram, blackgram, soybean, redgram, cowpea and oilseeds viz., gingelly and groundnut had little impact on Parthenium, as they are slow growing and short statured in nature. Interestingly, reduced flower number of Parthenium (1058, 1256, 1383 and 1410 flower heads/plant) was also observed with maize, sorghum, sunflower and pearlmillet over control (3237 flower heads/plant). This might be due to smothering effect and reduced biomass production of these crop plants. In drylands, where weeding is not done as required, growing maize or sorghum or sunflower will serve on biological means of Parthenium control.

35. FIELD SURVEY ON INSECTS ASSOCIATED WITH *Parthenium hysterophorus* Linn. in Tamil Nadu

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A detailed survey was made in different districts of Tamil Nadu, to record the insects associated with *Parthenium hysterophorus* Linn. Among the foliage feeders, the Mexican beetle, *Zygogramma bicolorata* was found widespread at Coimbatore and few other districts of the State due to natural spread after introduction from Mexico. This beetle is known to contain the weed build up very effectively. A cerambycid borer, Oberea Sp. was also found to kill this plant. Some of sucking pests were found viz., *Ferrisia virgata* (Coclrell), *Icerya seychellarum* (Westw), *Aphis gossypii* Glover, *Dolycoris indicus* Stal., *Saissetia nigra* Nietn. and *S. coffeae*. Other insects found feeding on the weed were *Monolepta singnata* Ol., *Orthacris simulans* B. and *Tetranychus*

ainnabarinus (Boisduval). Most of these insects except *Z. bicolorata* are known to attack economically important crops. The distribution on the above insects in the different districts are furnished in the map.

36. STUDIES ON THE COMBINED EFFICACY OF THE MEALYBUG, FUNGUS AND STEM GALL NEMATODE AGAINST THE SILVER LEAF NIGHT SHADE, *Solanum elaeagnifolium* CAV.(SOLANACEAE)

S.Sankaran, S.Douressamy, S.Pasupathy, M.Swamiappan, M.Devanathan, B.Anita, V.Mariappan Sivagami Vaidvelu and M.Gopalan, Centre for Plant Protection Studies, TNAU, Coimbatore- 3

Laboratory studies were carried out to find out the combined efficacy of the mealybug, Coccidohystrix insolitus (Gr). (Pseudococcidae, Hemiptera), fungus, Fusarium sp. and the leaf gall nematode, Ditylendchus phyllobia Thorne. (Anguinidae) against the *Solanum elaeagnifolium* Cav. Individual and different combinations of the three agents was tested on the weed. The results on the mortality of the *S. elaeagnifolium* due to the different combinations is discussed in detail.

37. STUDIES ON HERBICIDAL CONTROL OF NUTGRASS (*Cyperus rotundus* L.)

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Field study was carried out at UAS, Hebbal, Bangalore, during Kharif season of 1994, to evaluate the efficacy of post-emergence herbicides for the control of nutgrass. The study consisted of three levels of glyphate (1.5, 2.0 and 2.5 kg/ha), Sethoxydim (0.25, 0.375 and 0.5 kg/ha), chlorimuron ethyl (6, 12 and 24 g/ha) and 2,4-D sodium salt (1.5, 2.0 and 2.5 kg/ha) along with Hand weeding and unweeded check was considered for comparision. The 2,4-D sodium salt @ 1.5, 2.0 and 2.5 kg/ha recorded the lowest nutsedge population and shoot drymatter production at 15 days after herbicide application, whereas at 30, 45, 60, 75 and 90 days after herbicide application glyphosate at 2.5 and 2.0 kg/ha recorded the lowest nutsedge population and shoot drymatter production. The tuber number at 0-15 cm depth recorded low with glyphosate at 2.5 kg and 2.0 kg/ha and at 15-30 cm depth, it was with chlorimuran ethyl at 24 g, Glyphosate at 2.5 kg, 2,4-D sodium salt at 2.5 kg and glyphosate at 2.0 kg/ha. The lowest tuber dry weight was recorded with glyphosate at 2.5 kg and 2.0 kg/ha.

38. CONTROL OF *Imperata cylindrica* UNDER NON-CROPPED SITUATIONS IN MID HILLS OF NORTH WESTERN HIMALAYAS

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A field experiment was conducted under non-cropped situation at HPKV, Palampur during 1991-92. The treatments included five herbicides (Glyphosate, Imazapyr, Dalapon, Paraquat and Gallant) each at two levels and two hand weeding & weedy check). Significantly higher control of Imperate weed was achieved with Imazapyr at both rates (0.5 and 1.0 kg/ha). Glyphosate (0.50 and 1.0 kg/ha) also reduced the population to significant level. Paraquat and Gallant were least effective.

39. CONTROL OF Pennisetum polystachyon IN YOUNG PLANTATIONS OF KERALA

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Pennisetum polystachyon is a perennial grassy weed in plantation crops. To find out an effective herbicidal control, a study was undertaken at the College of Horticulture, Vellanikkara, KAU, during Kharif 1991 & 1992. Paraquat (0.4 & 0.8 kg a.i./ha) Dalapon (4.0 & 0.8 kg a.i./ha), glyphosate alone 0.4, 0.8, 1.2 kg a.i./ha), and in combination with 0.5% Ammonium sulphate, Paraquat + Diuron (0.4 + 1.0 kg a.i./ha), Paraquat + Diuron (0.8 + 1.0 kg a.i./ha) and unsprayed contrl were the treatments. Application of Glyphosate 1.2 kg a.i./ha + 0.5%. Ammonium sulphate recorded *P.polystachyon.* The same combination also gave the lowest drymatter accumulation and regeneration.

40. SEED BANK OF *Trianthema portulacastrum*, LINN. IN DIFFERENT SOIL DEPTHS OF GARDENLAND AT ANNAMALAINAGAR

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An experiment was taken up at Annamalai University to estimate the seed densitites of *Trianthema portulacastrum* in different soil depths of gardenland during September 1994. Uncropped areas of different gardenland blocks wherein no chemical weed control measures were takenup in the previous seasons, were selected for the study. Soil samples were collected at random from different soil depths viz., 5 cm 10 cm, 15 cm and 20 cm from these fields and one kg of composite samples were spread in germination trays and observed for the emergence of *Trianthema portulacastrum.* The soil at normal plough depth (5 cm) showed the highest seed reserve of 42 million per ha.

followed by 10 cm soil depth (32 million). The least seed density of 10 million was recorded in 20 cm soil depth.

41. BIOLOGY AND CHEMICAL CONTROL OF SILVER-LEAF NIGHT SHADE

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Pot culture and yield experiments were conducted during the year 1990 and 1994 at GKVK, Bangalore, to study the biology and comparative efficacy of certain post-emergence herbicides for silver leaf night shade. The growth and spread of weed was slow upto 40th day after planting and this stage was vulnerable for easy chemical control. In field trial, three herbicides (Glyphosate, 2,4-D sodium salt and 2,4-D ethylester each at 1.5 and 2.0 kg/ha) were applied after the application of Ethophon at 200 ppm. The weed mortality was maximum at early stages in 2,4-D sodium salt and 2,4-D ethylester. But with glyphosate, the mortality percentage of weeds increased gradually over a period of time.

42. MECHANICAL CONTROL OF SILVER-LEAF NIGHT SHADE

V.Suresh Babu, T.V.Muniyappa and H.R.Shivakumar, Department of Agronomy, University of Agricultural Sciences, Bangalore-560 065

Pot culture experiments were conducted during 1991 at GKVK, Bangalore, to evaluate the efficicacy of mechanical methods like depth of planting and pruning on the control and regeneration of silver-leaf hight shade. The experiment consisted of different depths (5, 10, 15, 20, 25 and 30 cm) for planting the material and days of interval (10 to 120 days after pruning at 10 days interval) for pruning of the weed. The weed cuttings of 10 cm length of pencil thickness planted at 5, 10 and 15 cm regenerated and rocorded higher weed biomass. But as the depth of planting increased, the decrease in dry weight of cuttings was observed. Thus the deeper ploughing, could be beneficial in minimising the spread of silver-leaf night shade.

43. EFFICACY OF DIFFERENT HERBICIDES FOR THE CONTROL OF *Eichhornia crassipes* UNDER NATURAL GROWTH CONDITIONS

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An experiment under natural lake - like growth condition was conducted during Winter (September-December), 1991 and Spring-sumer (March-June), 1992 to study the effect of herbicides 2,4-D 1.5 and 2.0 kg, paraquat 1.0 and 1.5 kg, lyphosate 2.0 and 3.0 kg and 2,4-D + paraquat 1.0 + 1.5 kg, 1.5 + 1.0 kg and 2.0 + 0.5 kg/ha,

respectively for the control of waterhyacinth. A complete mortality was obtained with post-emergence application of 2,4-D 2.0 kg, glyphosate 3.0 kg and 2,4-D + paraquat 2.0 and 0.5 kg/ha. These treatments recorded weed control efficiency ranging from 73.0 to 78.0 per cent.

44. DISTRIBUTION PATTERN AND EFFECT OF GALLS INDUCED BY THE GALL FLY *Procecidochares utilis* STONE A BIOCONTROL AGENT ON CROFTON WEED *Ageratina adenphora* SPRENG

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Crofton weed, *Ageratina adenophora* (Spreng. K. & R. (Compositae) is a native of Mexico and South America and probably introduced into India as ornamental plant. The weed has spread in the hilly regions of Nilgiris and Kodaikanal. The results of the survey made in Ooty and Kodaikanal areas revealed the presence of the gall fly, *Procecidochares utilis* Stone (Tephritidae: Diptera) on the *A. adenophora*. Besides, the distribution of galls on the plant, effect of galling on the growth and reproduction of the weed was also studied an discussed in detail.

45. STUDIES ON THE GERMINATION, GROWTH AND DEVELOPMENT OF *Ischaemum rugosum* UNDER POT CULTURE CONDITION

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Biology of *Ischaemum rugosum* was studied during Kharif, 1991 in pot culture under glass house conditions. The relative increase in root, shoot, tillers and secondary branches was very slow upto 30th day of sowing. Then onwards it was moderate upto 120 days after planting. Number of tillers, leaves and secondary branches reuced at maturity. About 27 per cent reduction in leaf number noted beyong 120 days. The formation of panicle and seeds started beyong 90 days stage. The seeds collected at 120 days and at maturity showed germination under laboratory conditions at 32°C temperature.

46. CONTROL OF *Parthenium hysterophorus* IN NON CROPPED AREAS

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Field experiment was conducted to study the efficacy of some herbicides for control of *Parthenium hysterophorus* in non cropped areas at College Farm, Rajendranagar, Hyderabad during 1991-92. Six pre-emergence herbicides viz. atrazine, butachlor, imazethapyr, metolachlor, pendimethalin and oxyfluorfen and three post emergence herbicides viz. paraquat, 2,4-D Na and glyphosate were evaluated along with sodium chloride to control *Parthenium hysterophorus*. Atrazine was

evaluated as pre emergence as well as post emergence. Pre emergence application of atrazine even at lower dose of 0.5 kg a.i./ha did not allow Parthenium to germinate. Early post emergence application of atrazine at 0.75 kg a.i./ha killed 100 per cent germinated Parthenium plants and controlled Parthenium for whole kharif season. Sodium chloride at 5 per cent also controlled Parthenium to 70 per cent.

47. *Phalaris minor* RESISTANCE TO ISOPROTURON

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A pot trial was carried out during 1993-94 season to investigate the existence of resistance to isoproturon in *P. minor*. The seed collection made from Haryana, Punjab and Delhi indicated that 2 weed seed collections from Haryana were resistant to isoproturon, while there was total control of the weed at 0.25 to 0.50 kg/ha isoproturon in most of the weed types. The control of resistant types from Haryana varied from 54-63% only even at 1.00 kg/ha. Studies on net photosynthesis made using portable Infra Red Gas Analyser (IRGA) did not record any difference in the rate of photosynthesis between treated and untreated biotypes from Haryana, confirming the existence of resistance to isoproturon in these lines.

48. *Puccinia* RUST ATTACK ON *Cyperus difformis* L.

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In sedge weed competition studies in lowland rice, *C.difformis* was included besides, *C.rotundus* and Fimbristylis littoralis. The sedge *C.difform* is was vigorous and fast growing. It flowered in 20 days and completed the life cycle in 65 days with enormous viable seed production. Around 45 days of its age, it was affected by rust like infection. At the same time the was no infection either on rice or weeds. The symptoms began with pustule formation which soon coalesced and enlarged in necrotic lesions. Laboratory studies showed that primary infection was through the uredospores of Paccinia but in the later stages, secondary infection with Fusarium, Helminthosporium, alternaria and Diplodia spp. pathogens led to total death of the weed. However, the weeds die after the production of seeds. Thus, inspite of the fungus infection, the seed set, propagation and sustenance of this weed are not affected. Hence, studies are necessary to focus on the potential of this biological pathogen effective biological control could be evolved.

49. *Ludwigia parviflora* ROXB - ITS AUTECOLOGY AND POSSIBLE BIO-CONTROL

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Autecological studies of *Ludwigia parviflora* Roxb. was done in three habitats viz. transplanted rice field (low land), late sown direct-seeded rice field (upland) and mango orchard (shude) of the Institute of Agriculture, Visva Bharati Agricultural Farm, Sriniketan, duringthe period from July to December, 1993. Studies indicated that the plant propagates through seeds which germinate from middle of July to early August, flowering, fruiting, seed maturation, seed shedding take place simultaneously with vegetative growth after a certain period of growth. The plant height, number of primary and secondary branches, number of fruits and seeds per plant were higher in transplanted rice field than in other two habitats. Development of polyderm in the basal part of the stem of this weed in water- logged condition is one of its adaptations. Floating of white root tips in transplanted rice field indicated another adaptation which was probably for the respiration of roots. This weed had maximum growth rate during 10-15 days after emergence leads to the point that the control measures should be taken within this period. Halticid beetle (*Halitica cearulea* L.) defoliates the plant completely affecting the fruit and seed production and hence this can be exploited for the biological control of this weed.

50. EVALUATION OF HERBICIDES FOR *Hydrilla verticillata* CONTROL

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A pot experiment was conducted in green house to evaluate herbicides for control of *Hydrilla verticillata.* A randomised complete block design was used with twelve treatments and six replications. The bensulfuron + metsulfuron + quinclorac were found to be most effective in reducing the fresh weight of *H. verticillata* followed by metsulfuron + 2,4-D, glufosinate ammonia and propanil. These herbicides appear to be promising for the control of *H. verticillata.*

51. HERBICIDAL CONTROL OF WATER HYACINTH (*Eichhornia crassipes*) IN DEEP WATER CONDITIONS

U.P.Singh, Department of Agronomy, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi-5

Investigation were conducted during 1989-91 for evaluation of herbicides for controlling water hyacinth in deep pits. 2,4-D Na salt, 2,4-D amine, piperophos/ 2,4-D glyphosate and paraquat in different concentration comprising eight treatments including untreated control

were tested in randomised complete block design with three replications. It was found that the growth of E.crassipes was checked upto 60 days to the extent of 100, 95 and 90% with the application of 2,4-D Na salt @ 2.5 kg, 2,4-D amine @ 1.5 and glyphosate @ 1.5 kg/ha, respectively. However, after 3-4 months some sprouts regerminated and showed regrowth.

1. SURVEY OF WEED FLORA IN PADDY FIELD IN RAE-BARELLI DISTRICT OF UTTAR PRADESH

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A survey of weed flora in rice was conducted during 1994 in Nine blocks i.e., Bachrawa, Harchandrapur, Rahi, Salon, Maharaj Gunj, Shiv Garh, Lal Ganl. Khero and Deeh of Rae-baraelly district. In all 10 weed species were recorded belonging to nine families with the predominance of poaceae and Cyperaceae species. *Echinochloa colonum* was most dominant in all the nineblocks followed by *Ehinochloa crusgalli, Cypers difformis, Cyperus iria, Cyperus rotundus* and *Eclipta alba.*

2. PHYTOSOCIOLOGICAL STUDIES OF SUGARCANE WEEDS IN ASSAM

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Surgarcane weed flora was surveyed in 4 agroclimatic zones of Assam from 1990 to 1994. Altogether 48 species were identified as major weeds. Out of which perennials consisted 54.5, 57.1, 75.9 per cent and grasses 18.2, 21.4, 44.8 per cent in winter, summer and monsoon seasons, respectively. The cumulative IVI values of annual and broadleaved species were 125.8, 74.8 & 56.4 and 218.8 & 131.5 in these three seasons, respectively. The weed DMP was maximum in summer. The Setaria-Paspalum-Panicum complex and Borreria articularis were dominant. Paspalum complex caused damage to the crop during the monsoon. *Ageratum houstonianum.* was, however, highly populated and frequent in all the seasons.

3. SURVEY OF AQUATIC WEEDS IN DISTRIBUTARIES AND RICE FIELDS OF VEERANUM AYACUT

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A survey was conducted at every 5 km distance in five of the major distributaries of Veeranum and IVI values were computed for all the weed species of occurrence. Rice fields were selected at every 7 km distance for the survey and IVI values were computed for the individual weed species. The survey indicated the preponderance of marginal weeds viz., *Leptochloa chinensis* and *Cyperus iria* in all the sampling locations of the distributaries. In rice fields, the weed flora was co-dominated by *Echinochloa* sp., *Cyperus rotundus, Cyperus iria, Leptochloa chinensis* and *Sphenoclea zeylanica.* Evaluation of *Leptochloa chinensis* and Cyperus iria to a co-dominant status with increasing IVI values indicated their rapidity of perpetuation and possibility of dispersal through irrigation water.

4. STUDIES ON THE BIOLOGY OF *Parthenium hysterophorus* L.

Lakhvir Singh and L.S.Brar, Department of Agronomy, Punjab Agricultural University, Ludhiana

Studies were conducted at the PAU Ludhiana during 1991 & 1992 on the biology of *Parthenium*. The data recorded on germination of fresh and one year old seeds reveal that temperature range of 15- 25°C was most favourable for the germination of Parthenium and the germination capacity of old seeds was more compared to fresh seed. The studies on the growth and development of Parthenium indicated that sandy loam soil favoured the growth of this weed in respect of its dry matter, branches, number of flower and seed production compared to loamy sand and silty clay loam soils. Parthenium produced 9470 seeds/plant when grown in sandy loam soils against 8685 and 2105 seeds/plant for loamy sand and silty clay loam respectively. In the competition studies, increased plant population/m^2 exhibited competition among themselves.

5. ANALYSIS OF THE WEED FLORA OF LE CORBUSIER'S CITY BEAUTIFUL

A.K.Mangal, M.P. Sharma and S.P. Khullar, Botany Department, Punjab University,Chandigarh-160 014

The total species used in the analysis are 490 representing 273 genera, belonging to 63 angiospermous families. The ratio of monocot: dicot families is 1:5:3 1:2.84 and species 1:2.42. The poaceae family is the most dominating family among the monocots and Asteraceae is dominant among the dicots. The habit and growth parameters have also been taken into account for the analysis. Out of total taxa included, 31 are shrubs (6.3 %) and 459 are herbs (93.7%). In the growth pattern, it includes 15 annual shrubs (48.38%) and 16 perennial shrubs (51.61%). The annual shrubs are 300 species (63.35%) and perennial herbs are 159 (34.64%).

6. ETHNOBOTANY OF COMMON WEEDS OF RICE, WHEAT, MUSTARD AND POTATO CROP FIELDS

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The weedflora of rice, wheat, mustard, rapeseed and wheat, mustard, rapeseed and potato were studied for their medicinal values in Bankura disttrict of West Bengal during 1993-94. Of the total 27 weed species, 9 weed species were used by people of that region for medicinal purposes. The weeds of medicinal values are *Cynodon dactylon* (used as antihaemorrhagic, in dysentery and nasal bleeding) *Eclipta alba* (prevents hairfall and greyness, as anthelmintic, in whitlow and wounds) *Amaranthus spinosus* in abscess and wounds *Euphorbia hirta* in

ringworm and old wounds *Marsilea minuta* in sleeplessness and insect bites *Heliotropium indicum* in curing conjunctibities, in abscess in joints, Ipomoea aquatica against indigestion *Alternanthera sessilis* in dysentery and *Blumea lacera* to hasten the fall of placenta of cow after calving. The alkaloids and chemicals responsible for curring the diseases with these medicinal value plants need to be identified.

7. SURVEY OF WEED FLORA IN RAINFED CROPS OF SOUTHERN AGRO CLIMATIC ZONE OF TAMIL NADU

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In Kattabomman and Chidambaranar district the weedflora in rainfed, sorghum raised in vertisols comprised. *Vicoa indica, Alysicarpus rugosus, Euphorbia hirta* and *Biophytum sensitivum* in high density (24.7, 15.3, 12.7 and 10.2 per sq.m) with the frequency of 90.9, 68.2, 36.3 and 35.0 per cent respectively. In alfisols, grass weeds *Dactyloctenium aegyptium* and *Cynodon dactylon* dominated (10.7 and 9.8 per sq.m) with the higher frequency of 86.9 and 60.8 %. In rainfed bajra, *Boerhavia diffusa, Euphorbia hirta, Celosia argentia* and *Phaseolus trilobus* dominated (30.4, 16.8, 14.8 and 8.8 per sq.m) with the frequency of 63.6, 53.6, 58.2 and 54.5 per cent in vertisols. Under alfisols, *Digera arvensis* (44 per sq.m) and .pa *Phaseolus trilobus* (20.2 per sq.m) with the frequency of 83.0 and 56.2 per cent respectively occurred. In rainfed cotton (sole cropping and inter cropping) under vertisols, *Cyanotis cucullata, Biophytum sensitivum, Euphorbia hirta* and *Vicoa indica* were dominant while in alfisols, *Digera arvensis* and *Celosia argentia* were dominant. In rainred chilli under vertisols, *Euphorbia hirta, Digera arvensis* and *Cyanotis cucullata* were dominated.

8. WEED-CROP ASSOCIATION AND YIELD LOSS ASSESSMENT DUE TO WEED INFESTATION IN MAJOR RABI CROPS OF U.P. HILLS

A.K.Pandey, Kamta Prasad, Prem Singh and Ved Prakash Scientist, Vivekananda, Parvatiya Krishi Anusandhan Shala (ICAR), Modipuram, Meerut, U.P.

Field experiments were conducted for four rabi seasons from 1988-89 to 1991-92 to assess the yield losses due to weed infestation in wheat, barley, lentil, toria and field pea at experimental farm, Hawalbagh of Vivekananda Parvatiya Krishi Anusandhan Shala, Almora. These five crops were grown under weed free and unweeded conditions. 10-12 weed species were observed in the experimental plots. The weed species *Polygonium* spp., *Phalaris minor, Anagallis arvensis, Stellaria media* and Avena ludoviciana were dominant. These species accounted for 76.8, 3.1, 2.5, 2.6 and 1.6 per cent of total weed counts and 65.2, 5.1, 0.8, 1.5 and 5.5 per cent of total weed dry weight. The highest weed count/m^2 was recorded in toria (1923) followed by wheat (1879),

lentil (1590), barley (1440) and field pea (1334). The weed biomass production (g/,m^2) was highest in lentil (411.21) followed by wheat (335.90), toria (303.09) field pea (291.04) and barley (218.93). No weed-crop affinity was observed. Weeds caused highest yield reduction in lentil (46.6%) followed by wheat (40.6%), toria (40.1%), barley (28.1%) and field pea (24.7%).

9. WEEDS OF WHEAT AND GRAM CROPS AT INDORE AND DHAR DISTRICTS OF MADHYA PRADESH

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A survey of weed flora in wheat (*Triticum aestivum* L.) and gram (Cicer arietinum L.) was conducted during rabi, 1989 in Indore and Dhar districts of Madhya Pradesh. 28 weed species were found infesting the wheat crop. On the basis of IVI, the most dominant broadleaf weeds were *Anagallis arvensis* (37.5), *Melilotus alba* (27.2), *Cichorium intybus* (24.4), *Chenopodium album* (22.4), *Brassica sinensis* (18.0), *Vicia sativa* (15.3), *Convolvulus arvensis* (13.0), *Launaea asplenifolia* (11.2) and *Euphorbia geniculata* (11.1). The predominant monocoty weeds comprised of *Cynodon dactylon* (17.3), *Cyperus rotundus* (8.6) and *Avena fatua* (5.5). In gram crop the weedflora were similar to wheat but infestation was only 50% as compared to wheat. The maximum IVI was recorded by *Euphorbia geniculata* (42.9), *Launaea asplenifolia* (34.4), *Brassica sinensis* (28.6), *Cichorium intybus* (28.4), *Chenopodium album* (22.3) and *Melilotus alba* (21.5) indicots, and in monocots *Cynodon dactylon* (16.1), *Cyperus rotundus* (10.1) and *Avena fatua* (8.6).

10. WEED FLORA OF WHEAT UNDER PLAIN AND PLATEAU ZONE IN SATPURA PLATEAU OF MADHYA PRADESH

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A study was conducted during Rabi 1990-91 and 1991-92 to know the weed flora in the intensive wheat growing area of Chhindwara and Betual district of Satpura Plateau. Fifty five weed species belonging to twenty two families were found in wheat. fields. Among dicots, *Chenopodium album* (65.4), *Vicia hirsuta* (33.0), *Anagallis arvensis* (19.4) *Ageratum conyzoides* (12.3), *Digera arvensis* (10.8) and *Vicia sativa* (10.4) were dominant. Among the monocots, *Cyperus rotundus* (8.3) and *Cynodon dactylon* (6.6) were important weeds of wheat. In plateau region the most dominant weeds among dicots were *Chenopodium album* having highest IVI (57.9), *Galinsoga parviflora* (32.7), *Ageratum conyzoides* (27.3), *Melilotus indica* (16.8), *Vicia hirsuta* (14.4), *Argemone mexicana* (11.9) and *Portulaca oleracea* and in grasses *Eragostis minor* constituted (3.3).

11. WEED FLORA IN KHARIF CROPS OF THE BANASKANTHA DISTRICT OF GUJARAT

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A survey of the weed flora of pearlmillet, sorghum (fodder), castor, clusterbean and groundnut was conducted during kharif 1992 and 1993 in the district of Banaskantha in Gujarat. In the present survey, 81 species representing 16 dicot and 4 monocot families, were recorded in these crops. 12 weed species infested pearlmillet, sorghum, castor, clusterbean and groudnut. The dominant monocot weeds were *Cyperus rotundus* L., *Cynodon dactylon* (L.) and *Cenchrus biflorus.*, Among the dicot weeds, *Digera arvensis, Celosia argentia Acanthosperum hispidum, Vernonia cinerea* and *Tribulus terrestris* were found in kharif crops. Leucas aspera L. is the most conspicuous weed in castor. While in groundnut, *Cyperus rotundus, Echinochloa crusgalli* L. and *Euphoribia hirta* were predominant.

12. WEED FLORA IN RABI CROPS OF THE BANASKANTHA DISTRICT OF GUJARAT

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A survey of the weed flora of wheat, mustard, cumin, isabgul, potato and lucerne was conducted during rabi, 1993 and 1994 in the district of Banaskantha in Gujarat. The Pre-dominant dicot weeds in wheat consisted of *Chenopodium album, Chenopodium murale, Melilotus alba* and *Amaranthus* Spp. Among the monocot weeds, *Cynodon dactylon* (L.) *Cyperus rotundus* L. and *Asphodelus teinufolius* were the most dominant. In mustard besides the above weeds Euphorbia was also noticed. In cumin and isabgul, the occurrence of *Chenopodium* Spp. *Amaranthus* Spp. and *Plantago syllium* (mimicry) weeds were noticed. The dominant weeds of potato crop were, *Chenopodium album, Amaranthus viridis, Euphorbia geniculata* and *Asphodelus teinufolius.* In Lucerne, weed flora is similar to other rabi crops excepting a parasitic weed *Cuscuta refloxa* which was conspicous.

13. WEED FLORA OF RABI CROPS IN HISAR AND JIND DISTRICTS OF HARYANA

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A survey of weed flora of different rabi crops grown under different cropping sequences, was conducted during 1991-1992 in Hisar and Jind districts of Haryana. Among grassy weeds, *Phalaris minor* and *Avena Ludhoviciana* were dominant weeds. *Chenopaium album* L, *Medicago denticulata, Triqonella polvcerata* L, *Fumaria parviflora, Melilotus indica*

and *Lathyrus aphaca* L. constituted major weed flora of broad leaf weeds. Under cotton- wheat rotation, *C. album* L. constituted 43% of the total weed flora followed by *Anagallii arvensis* L. (27.4%) whereas under paddy-wheat rotation, *P. minor* was the major weed comprising 29.6% of the total weed population followed by *Melilotus indica* L. (24.2%). *P. minor* did not appear in wheat fields rotated after pearl millet. Gram crop was mainly infested with *C.album* L. and *Asphodelus tenuifolius*. Significantly more population of *Anagallis arvensis* and *Asphodelus tenuifolius* were recorded in wheat field irrigated with tubewells and canal as compared to fields irrigated with tubewell alone.

14. WEED COMPLEX IN RICE (*Oryza sativa* L.) AS INFLUENCED BY VARIOUS HYDRO-ECOSYSTEMS

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Quantitative analysis of rice weeds was done in Godavari delta during South-West monsoon. Maximum weed biomass (34%) was produced in alternate wet and dry system followed by dry land (31.2%) and low pond potential (27%). High pond potential registered lowest (8%) weed DMP. *Merrimea emerginata*, *Imperata cylindrica* and *cyperus rotundus* were predominant weeds in the dryland system. Highest biomass was produced in alternate wet and dry system wherein *Echinochloa colonum* and *Digitaria sangunalis* were dominant species. *Marsilea minuta* an aquatic fern which is the most trouble some weed in rice-rice cropping pattern recorded the highest IVI but least in biomass production followed by *Echinochloa glabrescens* and *Cyperus difformis*. *Sphenoclea zeylanica*, an aggressive semi-aquatic weed, recorded highest biomass value. In deep water situation, *Monochoria vaginalis* and *Leptochloa chinensis* recorded higher IVI values.

15. WEED SHIFT IN SUNFLOWER FINGERMILLET SYSTEMS UNDER WEED MANAGEMENT PRACTICES

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A field study was undertaken at TNAU, Coimbatore, to know the shift in weedflora due to herbicides application in sunflower fb fingermillet sequence for 536 days during 1990-1992 on vertisol of medium fertility. Initially *Amaranthus retroflexus* L. and *Dactyloctenium aegyptium* dominated, while *Trianthema portulacastrum* L. made emergence from 133 days onwards and became dominant by 360 days. Pre-emregent application of pendimethalin 1.0 kg a.i./ha and imazethapyr 0.1 kg/ha lowered these weeds till 536 days. While fluchloralin 0.45 kg/ha and metolachlor 1.0 kg/ha (as pre-em.) had no effect on Trianthema and paved way for its dominance by lowering other major weeds. Continuous use of graminicide fluazifop-P-butyl 0.25

kg/ha favoured dominance of Trianthema and Amaranthus. Though *Cyperus rotundus* L. was a minor weed throughout, its' density increased by 536 days due to reduced tillage. Thus crops and continuous use of herbicides helped in weed shift.

16. BIOLOGY OF *Malvastrum coromandelianum* WEED

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Malvastrum coromandelianum is a common weed of orchards and field crops. Populations growing in moist shady localities and in open dry exposed areas are designed as pop. i and ii respectively. Analysis of morphological characters revealed that in the former, plants were taller (70 cm) with bigger leaves (5-6.5 x 3.5-4.0 cm) and more total leaf area (15.6 cm^2) as compared to the latter where the plants were 53.8 cm in height, leaves 4-4.6 cm with total leaf area of 7.6 cm^2. Roots develop stronger and longer (18.5 cm^2) in pop. ii as compared to pop. i (15.4 cm). The anthesis time is between 3 PM. to 3.55 PM. with increase in relative humidity the anthesis time gets delayed. The leaves of pop. i have more chlorophyll (0.0035 mgm/gm) and proteins (50.8 mgm/gm) as compared to pop ii where the values are 0.0027 and 43.6 mgm/gm respectively. In fruits and seeds, soluble sugars, starch, proteins and amino acids recorded were 1.07, 18.44, 2.451, 1.762, 27.7, 8.4 and 1.912, 1.834 mgm/gm respectively. Seeds contain 10.15% oil content.

17. EFFECT OF WEED FLORA ON GROWTH AND YIELD OF WHEAT

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A field experiment was conducted during Rabi season of 1991-92 at BHU Varanasi. The relative composition of weed species in unweeded plot at 60 DAS was *Phalaris minor* (18.0 %), *Cynodon dactylon* (8.3%), *Cyperus rotundus* L (11.1%), *Melilotus*, spp. (24.2%), *Chenopodium album* L. (13.8%), *Anagallis arvensis* L. (20.7%) and other species constituted about 4% of weed flora. Among weed species *Phalaris minor* caused maximum reduction in growth and yield attributes of wheat and decreased the crop yield up to 39 per cent. Next important weed species in this respect was *Melilotus* spp. which reduced the crop yield upto 28.5%. The least adverse effect on wheat crop was recorded in *Cyperus rotundus* infested treatment.

18. DOMINANCE OF CARPET WEED IN GARDENLAND CROPS AT ANNAMALAI NAGAR

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The floristic composition of weed flora in gardenland crops were studied during August, 1994. The phytosociological survey of weeds was takenup in three gardenland crops viz., sugarcane, gingelly, and sunflower in selected fields where no weed control measure was taken up till the middle of the crop duration and where the crops were raised under normal care. Importance value indices (IVI) were worked out for all the individual weed species of occurrence in the fields. In sugarcane *Trianthema portulacastrum* predominated with an IVI of 41.05 per cent followed by *Cyperus rotundus* (30.14 per cent). In sunflower also the floristic composition of weeds was dominated by *Trianthema portulacastrum* with an IVI of 43.91 per cent. In gingelly, the dominant weed species was *Cyperus rotundus* (58.47 per cent IVI). However *Trianthema portulacastrum* was also frequent with comparable relative frequency and was observed to be co-dominant with an IVI of 31.92 per cent.

19. Weed Flora In Kharif Pulse Crops of Eastern Uttar Pradesh

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Weeds were surveyed in 15 districts of U.P. during rainy season in pigeonpea, blackgram and moong bean. Pigeonpea was grown mixed with urdbean, moongbean, jowar, bajra, til and mesta. The major weeds found in pigeonpea + blackgram + sorghum + mesta mixture were *Cyperus* spp, *Fimbristylis* spp, *Echinochloa colonum*, *Phyllanthus niruri*, *Alternenthera sessilis*, *Ammannai baccifera* and *Echinochloa crusgalli*. In pigeonpea + rice system *Fimbristylis* spp, *Cyperus* spp and *Echinochloa* colonum were dominant. In pigeonpea + rice + sorghum + mesta mixture, *Cyperus* spp, *Phyllanthus niruri* and *Echinochloa crusgalli* were major weeds. In the pigeonpea + maize + sorghum + mesta stand, *Fimbristylis* spp. *Cyperus* spp and *Echinochloa colonum* were dominant. In the pigeonpea + maize + mesta *Cyperus rotundus* and *Fimbristylis* spp. were the major weeds. In pigeonpea + maize + blackgram + mesta system *Cyperus* spp, *Fimbristylis* spp and *Phyllanthus niruri* were prominent. In pigeonpea + sorghum + blackgram + sesamum system *Fimbristylis* spp, *Cyperus* spp. and *Phyllanthus niruri* were dominant. In blackgram + sorghum + mesta stand *Fimbristylis* spp and *Cyperus* spp were prominant. In blackgram + sawan stand *Cyperus* spp and *Fimbristylis* spp were the major weeds.

20. WEED FLORA IN PULSE CROPS OF EASTERN UTTAR PRADESH

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Survey of weed flora in rabi pulse crops was done in 14 districts of Eastern Uttar Pradesh during winter seasons in, pea, gram and lentil were grown either alone or mixed with mustard and linseed. In pure stand of pea, broad leaved weeds *Anagallis arvensis*, *Vicia hirsuta* and *Melilotus* spp. were predominant. In pure stand of lentil, *Cyperus rotundus*, *Anagallis arvensis* and *Euphorbia dracunculoides* were prominent weeds. The mixed stand of chickpea + linseed, was infested with *Anagallis arvensis*, *Vicia hirsuta* and *Chenopodium album*. In the mixed stand of lentil + mustard, *Anagallis arvensis* and *Chenopodium album* were the dominant weeds. In the mixed crop of 'lentil pea *Vicia hirsuta*, *Chenopodium album* and *Lathyrus sativa* were the prominent weeds. In the lentil + mustard + wheat + system *Chenopodium album*, *Vicia hirsuta* and *Cyperus rotundus* were dominant weeds. In the pea + mustard system *Vicia hirsuta* and *Anagallis arvensis* were major broad leaved weeds. In chickpea + linseed + mustard mixture, *Chenopodium album*, *Vicia hirsuta* and *Euphorbia dracunculoides* were the prominent weeds. In the linseed + mustard mixture *Cyperus rotundus*, *Anagallis arvensis*, *Chenopodium album* and *Melilotus* spp were the major weeds. *Anagallis arvensis* and *Chenopodium album* were dominant weeds in chickpea + mustard mixed crop.

21. STUDIES ON THE PERIODICITY OF EMERGENCE OF VARIOUS WEED SPECIES UNDER FIELD CONDITIONS

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Three grassy weeds,(*Echinochloa colonum*, *Dactyloctenium aeqypticum* and *Ischaemum rugosum*) and three non-grassy weeds *Celosia argentia*, *Trianthema monogyna* and *Caesulia axillaris* were evaluated for the periodicity of emergence to observe the effect of shallow tillage and undisturbed conditions of the soil. The weeds were sown in the first week of August, 1991. Shallow tillage (5 cm) was done at 15 days interval. *Echinochloa colonum* did not emerge beyond 30 days when the soil was subjected to shallow tillage. *Ischaemum rugosum* and *Caesulia axillaris* lost their emergence beyond 15 days after the third shallow tillage, whereas, *Dactyloctenium aegypteum*, *Trianthema monoqyna*, and *Celosia argentia* continued to emerge upto 15 days and there was no emergence beyond 15 days after fourth shallow tillage. Highest emergence of *Echinochloa Colonum* (28.2%) with decreasing trend beyond 30 days after sowing was recorded where the soil was kept undisturbed. *Celosia argentia*, *Dactyloctenium aeqypteum*, *Trianthema monogyna*, *Ischaemum rugosum* and *Caesulia axillaris* continued to emerge upto 45 days after sowing and decreased later on when the soil was not tilled.

22. STUDY OF WEED SURVEY IN IRRIGATED GROUNDNUT OF VRIDHACHALAM BLOCK

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A quantitative analysis of weeds in irrigated groundnut crop was carried out during kharif 1992 through field survey in Vridhachalam block. Relative Abundence, Relative Density, Relative Frequency, Importance value Index and Importance percentage (expressed in percentage) were worked out. *Cyperus rotundus* (26.74%) *Dectyloctenium aegyptium* (17.07%) in grasses and *Boerhaavia diffusa* (15.53%) in broad leaved weeds were found to be the predominant weeds in irrigated groundnut of Vridhachalam block of Tamil Nadu.

1. RESIDUAL EFFECT OF HERBICIDES USED IN SOYBEAN ON THE SUCCEEDING CROPS

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Field experiments were conducted during summer and rabi 1991 with various herbicides viz., pendimethalin, butachlor and thiobencarb each at 1.0 kg ha^{-1} and with HW at low dose of 0.5 kg ha^{-1}. After the harvest of soybean crop in summer and rabi seasons, the field was prepared without disturbing the plots. The crops sorghum (Co.26) blackgram (Co.5), gingelly (TMV 3) and groundnut were raised as test crops. Besides this, soil was collected from each plot and an indicator plant cucumber was raised in pot. Observations on germination at 10th day, plant dry matter and height at 30th day were recorded. The results revealed that there was no significant reduction in germination of crops due to herbicide residue.

2. STUDIES ON RESIDUES OF HERBICIDES IN POST HARVEST SOIL OF PADDY BY BIOASSAY TECHNIQUE

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A field experiment was conducted at Agronomy Research Farm N.D., UAT Faizabad during Kharif 1990 and 1991. Application of pendimethalin @ 1.0 Kg ha^{-1}, butachlor @ 1.5 Kg ha^{-1} as pre-emergence and 2.4 - D Na salt @ 0.5 Kg ha^{-1} as post-emergence with different nitrogen levels (0, 40, 80 and 120 Kg ha^{-1}) did not cause significant variations in germination, plant height and DMP of cucumber grown in sample soil taken after the harvest of paddy crop.

3. HERBICIDE - RESIDUE STUDIES IN RICE ECO-SYSTEM

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Herbicide residue studies were carried out during 1991-1993 in rice-grain, straw and post-harvest soil samples with the continuous use of pretilachlor 0.75 kg/ha, pretilachlor 0.50 kg/ha + 2,4-DEE 0.50 kg/ha mixture, butachlor 1.0 kg/ha, and butacholor 1.00 kg/ha + 2,4-DEE 0.50 kg/ha mixture. The determination of each herbicide residue was done separately using Gas chromatographic technique. When irrigation to rice was given 3 days after disappearance of ponded water, Pretilachlor at 0.75 kg/ha left 0.0053, 0.0174 and 0.0043 ppm in rice grain, straw and soil respectively. Similarly residue of butachlor at 1.25 kg/ha showed 0.0103, 0.0243 and 0.0067 ppm in rice grain, straw and soil samples respectively. 2,4-DEE at 0.50 kg/ha in mixture with pretilachlor and butachlor left very low residue and non- detectable in

some cases. However all the detected residues of herbicides were far below MRL permitted.

4. EFFECT OF CONTINUOUS USE OF HERBICIDES IN SOIL MICROFLORA

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Experiments conducted with continuous use of pre-emergence herbicides (Pretilachlor 0.75 kg/ha, butachlor 1.25 kg/ha) in rice-rice-pulse cropping system showed a little suppression of soil bacteria (14-17 x 10^{-6}) as compared to handweeding (20 x 10^{-6}) in rice post-harvest soil. The effect of herbicides was much pronounced with irrigation on the day of disappearance as compared to increasing intervals of 3 and 6 days after disappearance of ponded water. In blackgram (succeeding pulse) variations in soil microbes (bacteria, fungi and actinomycetes) were narrowed down.

5. STUDIES ON RESIDUE ESTIMATION OF DIFFERENT HERBICIDES BY BIOASSAY TECHNIQUES USING DIFFERENT PULSES CROPS

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The Laboratory experiments were conducted at HPKV Palampur during 1990-'91. Three leguminous crop viz. Mung (*Vigna mungo*), Soybean (Glycine max), and Pea (Pisum sativum), were tested against the residues of different herbicides for the control of I. cylindrical. All the pulse crops (Mung, soybean, and pea) were significantly sensitive to the residues of Imazapyr (0.5 and 1.0 kg/ha), followed by Gallent (0.25 and 0.5 kg/ha) at both the concentrations. Glyphosate (0.5 and 1.0 kg/ha), Dalapon (3.6 and 4.8 kg/ha) and Paraquat (0.5 and 0.75 kg/ha) exhibited no residual effect on any of the pulse crop.

6. STUDIES ON RESIDUE ESTIMATION OF HERBICIDES BY BIOASSAY TECHNIQUES USING DIFFERENT CEREAL CROPS AS INDICATOR PLANT

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Laboratory experiments were conducted HPKV Palampur during 1990- 91. In the soil collection from Pot experiment wherein Glyphosate, Imazapyr, Dalapon, Paraquat and Gallent herbicides each at two doses were applied for the control of *Imperata cylindrica*, all the cereal crops maize wheat Barley and rice were significantly sensitive to the residues of Imazapyr at 0.5 and 1.0 kg/ha, Gallent at 0.25 and 0.5 kg/ha followed by Dalapon at 3.6 and 4.8 kg/ha. Glyphosate (0.5 and

1.0 kg/ha) and Paraquat (0.5 and 0.75 kg/ha) had no residual effect on any of the cereal crop.

7. RESIDUE BEHAVIOUR OF ATRAZINE AND CARBOFURAN IN SOIL AND MAIZE

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Atrazine (Atrataf 50% W.P) was applied @ 1 and 2 Kg a.i./ha at the premergent stage and carbofuran (3 G) at the presowing stage @ 0.6 and 1.2 Kg a.i./ha in maize. The soil samples were collected at various intervals of time at 0, 1, 5, 7, 15, 26 and 56 day, upto a depth of 15 cm. The maize cobs and plant stalk along with soil samples were also analysed for pesticide residue using gas liquid chromatography. The residues of atrazine in soil ranged from 0.21 mg/kg in 0 day to 0.22 mg/kg in 56 day samples, recording 90% dissipation at lower dose of application. The per cent of dissipation was however only 85 for the double dose. Carbofuran residues (0.1 mg/kg) were absent in corn cobs as well as in soil.

8. EFFECT OF SOIL STERILISATION ON PERSISTENCE OF BUTACHLOR AND THIOBENCARB

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Loamy sand texture with organic carbon of 0.43% and E.C. of 0.3 mmhos/cm^2 was sterilized by autoclaving. Butachlor and thiobencarb @ 1.5, 3.0, 4.5 kg/ha were added separately. These treated soils were stored at 25°C, 35°C and under lab. temperature. Samples from these were taken out at 15 days interval upto 90 days for bio assay with *Echinochloa crusyalli* as test plant. Unsterilized soil was also used in similar way. The persistence decreased with time and in sterilized soil.

9. IDENTIFICATION OF BIO-ASSAY TECHNIQUE FOR SULFONYL UREA HERBICIDE-CHLORIMURON (ethyl)

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Sensitive plants like cucumber, setaria, maize and sunflower were tested. Root and shoot inhibition bio-assay was adopted. Among the various sensitives plants tested, cucumber showed wide range of response even to low ED 50 value as compared to other test species. Further a soil bio-assay study was conducted for 14 days. Analysis of different parameters showed that fresh weight of cucumber seedlings

showed wide range of response having low ED 50 value compared to other growth parameters.

10. EVALUATION OF ANILOFOS RESIDUES IN TRANSPLANTED RICE

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A field experiment was conducted at TNAU during Summer, 1992 to determine the anilofos residues (Taguard) along with butachlor and thiobencarb in rice using HPLC. The soil was sandy clay loam in texture having pH 7.5. The soil and plant samples were collected at harvest and analysed for anilofos residues. The residues present in the soil under various herbicidal treatments were at non-detectable levels except thiobencarb. In crop produces (grain and straw) there were no herbicidal residues with lower doses of anilofos (0.75 and 1.0 lit/ha) and traces of residues with anilofos (1.25 lit/ha), butachlor (1.25 kg/ha) and thiobencarb (1.25 kg/ha) were registered. However the levels were below the maximum residues limits (MRL).

11. EVALUATION OF BUTACHLOR RESIDUES IN RICE

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Field experiments were conducted at wetlands, TNAU, Coimbatore during kharif '92 and '93 to study the persistence of butachlor and terminal residues in rice grain and straw using gas chromatography. The treatments comprised butachlor at 1.0 and 2.0 kg/ha along with quinalphos at 1.0 and 2.0 kg/ha and triazophos at 0.25 and 0.5 kg/ha. Butachlor 1.0 kg/ha degraded within harvest, however detectable residues were observed at 2.0 kg/ha. In rice grain and straw the butachlor residues were detected at 0.0062 to 0.0134 ppm in rice grain and 0.0168 to 0.0263 ppm in straw respectively. However, these residues were below the MRL values of 0.5 and 3.0 ppm for grain and straw respectively.

12. INFLUENCE OF CONTINUOUS APPLICATION OF HERBICIDES ON SOIL MICROFLORA IN WETLAND CROPPING SYSTEM

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Six field experiments were conducted to investigate the effect of long term use of herbicides on soil microflora in the wetland cropping system of rice-rice-pulse sequence. The population of soil microflora recorded during the different growth stages of I crop (Late wet season rice 1991-92) and VI crop (Early wet season rice 1993-94) were compared. The data revealed that the bacterial population of rice soil increased at 30th day after application of the herbicides viz., Butachlor + 2,4-D and

Butachlor alone. The bacterial populatin was higher in the plots applied with Butachlor + 2,4-D than Butachlor alone. However, the population of fungi and actinomycetes declined on 30th day after application of herbicides. The results indicated that, though there was an initial suppression of soil microflora due to the application of herbicides, their population build-up recovered once again from 30th day of herbicide application.

13. EFFECT OF CONTINUOUS APPLICATION OF HERBICIDES ON HERBICIDE RESIDUE IN RICE-RICE-PULSE CROPPING SEQUENCE

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Field experiments were conducted at Coimbatore during 1991-'94 to monitor the butachlor and 2,4-D residues continuously applied to rice-rice-pulse cropping sequence (no herbicide for pulses). The residues of butachlor and 2,4-D in soil and rice plant samples were analysed using Gas Chromatograph. The herbicide residue analysis in soil, rice grain and straw after 7th crop revealed the presence of butachlor and 2,4-d residues in the soil. The butachlor residue in soil increased from non detectable level (1st crop) to 0.0188 ppm (7th crop), while, the 2,4-D residue doubled from 0.0160 ppm to 0.0336 ppm. The butachlor residue present in straw samples increased from 0.0023 ppm to 0.0031 ppm, however, it is below the maximum residue limit. However, butachlor residue was below detectable level in grains. The 2,4-D residues were not detectable in both grain and straw samples.

14. STUDIES ON STANDARDISATION OF BIOASSAY TECHNIQUE AND ITS USE IN ESTIMATION OF PENDIMETHALIN RESIDUES IN SOIL UNDER WHEAT + SARSON INTERCROPPING SYSTEM

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Field and laboratory experiments were conducted at HPKV, Palampur during Rabi 1992-'93 and 1993-'94. In a laboratory experiment, among all the tested crops, Oats was most sensitive plant and the regression analysis of the data indicated that semi- lograthmic equation was the best curve fit. Based upon the ED_{50} value calculated by graphical method, root length of oats was found to be the best bioassay for estimation of pendimethalin. The post harvestsoil samples were collected from the plots treated with pendimethalin 1.0 kg/ha (Pre-emergence), Pendimethalin 1.5 kg/ha (Pre-emergence) and pendimethalin 0.75 kg/ha (Pre-emergence) followed by isoproturon 1.0 kg/ha (Post- emergence) in weed control experiment in wheat + sarson intercropping system. The results revealed that only pendimethalin 1.5

kg/ha (Pre-emergence) left 0.001 ppm residues while in other treatments herbicide was at non-detectable limits during both the years.

15. RESIDUES OF BUTACHLOR IN PADDY

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An investigation to study the residues of butachlor applied to paddy was carried out during kharif, 1992 with Tellahamsa as test variety in black soil with clay 22% at College farm, Rajendranagar. Butachlor (50% EC) was applied at the rate of 1.5 and 2.0 kg a.i ha^{-1} at 6 DAT of rice. Grain, straw and post harvest soil samples were collected and analysed in Gas Liquid Chromatograph with Electron capture detector. Butachlor residues at higher level of application at 2.0 kg a.i ha^{-1} registered a residue of 0.002 mg/kg in rice, 0.0004 mg/kg in husk, 0.005 mg/kg in straw and 0.005 mg/kg in soil respectively and the residues detected were far below the maximum residue level of 0.25 mg/kg.

16. PERSISTANCE OF ^{14}C PENDIMETHALIN IN SOME SOUTH INDIAN SOILS

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In order to perdict the persistance/degradation, six soil series were chosen and top soil (0-15 cm) collected for test as per the standard procedure (Jackson, 1973). Pendimethalin used was methyl labelled with sp. activity 25.67 cmi mg^{-1}. When disappearance of Pendimethalin was monitored the most important single factor which influenced the diappearance was found to be the moisture. The calculated half lives from the first order equation was averaged to 84.6, 52.1 and 14.9 days with 100 MPa, 33 KPa and 0.0 tensions respectively. At higher moisture tensions the initial rapid disappearance stops much before 20 days whereas under submergence it ceases much later reducing the half lives. (Table 1). The disappearance kinetics does not strictly obey the first order kinetics thereby giving a slight deviation of half lives from actual values.

17. RESIDUE OF ATRAZINE IN *Gobhi sarson* (*Brassica napus* L.)

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Persistence of atrazine (0.25 and 0.50 kg/ha) applied as pre-emergence for weed control in gobhi sarson - Cv.GSL 2, an atrazine resistant cultivar was studied in soil. Plant and seed, soil samples were taken from 0 - 10 cm depth after 0, 15, 35, 50, 70, 90 and 110 days

after application whereas plants were sampled 10, 30, 45, 60 days after application for herbicide residue analysis. The soil/plant/grain samples were extracted and analysed for the presence of atrazine by UV-Spectrophotometric method. Atrazine degraded to non-detectable limits by 30 days in plants and the seeds contained no herbicide residue. In soil, atrazine degraded to non-detectable limits by 90 days after application.

18. STUDIES ON 2,4-D PERSISTENCE IN SOIL

S.K. Randhawa and K.S. Sandhu, Department of Agronomy, Punjab Agricultural University, Ludhiana-141 004, Punjab

Persistence of 2,4-D (sodium salt) applied as post-emergence (30- 35 days) at 0.50 and 0.75 kg/ha to linseed crop was studied in a loamy sand soil. At 1, 10, 20, 30 and 40 days after application concentration of 2,4-D was 0.12, 0.08, 0.05, 0.02, 0.01 ppm at 0.50 kg/ha and 0.15, 0.10, 0.07, 0.02, 0.01 ppm at 0.75 kg/ha, respectively. The data revealed that the herbicide at both the doses degraded to non-detectable limits by 60 days.

19. ADSORPTION OF METOXURON AND ISOPROTURON ON TWENTY SOILS FROM HYDERABAD

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Adsorption studies were conducted in quadruplicates with Metoxuron (3-[3-chloro-4-methoxyphenyl)-1, 1-Dimethyl urea] and Isoproturon (3-P-Cumenyl-1, 1-dimethyl urea) on ten Alfisols and ten Vertisols of varying soil properties using the initial concentration from 0.50 ug/ml of each herbicide in 20 ml of 10^{-2} M $CaCl_2$. The adsorption data was analysed by the freundilich equation. The soils were slightly acidic to moderately alkaline with low to medium organic carbon content and clay content varied from 12.2 to 46.2. The adsorption isotherms were found to be parabolic in nature with a "S" shaped curvature indicating a stronger initial competition for water molecules to the adsorbent as compared to the herbicide. Analysis of adsorption parameters with soil properties was also carried out. Adsorption maxima values were significantly and positively correlated with organic carbon ($r=0.573^{**}$ for metoxuron and $r=0.596^{**}$ for isoproturon) and clay per cent ($r=0.596^{**}$ for metaxuron and $r=0.602^{**}$ for isoproturon). Similarly freundilich values were significant with organic carbon ($r=0.604^{**}$ for metoxuron and $r=0.601^{**}$ for isoproturon). Positive and significant correlations were obtained between clay + organic carbon and the extent of adsorption ($r=0.768^{**}$ for metoxuron and $r=0.806^{**}$ for isoproturon) suggesting that possible role of clay-organic matter in the adsorption of these two herbicides.

20. GLC ANALYSIS OF CONTAMINANTS AND DEGRADATION PRODUCTS OF ANILOFOS

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Six derivatives (one amine, five amides and one oxi analougue of anilofos) were synthesised in laboratory. Two dimeric impurities were isolated from technical anilofos. 4-chloroaniline and one mercapto derivative was procured. All these compounds were resolved into separate peaks when analysed by GLC using NP detector. The method is simple sensitive and can easily be used for detecting impurities in technical anilofos and degradation/metabolic products in the environmental samples.

21. STUDIES ON RESIDUES OF HERBICIDES IN POST-HARVEST SOIL OF PUDDLED BROADCAST RICE

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Experiments were conducted at Agronomy Research Farm as well as in weed science laboratory of N.D.U.A.T., Kumarganj, Faizabad, during kharif 1990 and 1991 in a randomized block design keeping ten treatments with four replications. Results revealed that the application of butachlor, thiobencarb, pendimethalin and 2,4-D Na-salt alone and as mixture of butachlor + 2,4-D Na Salt, thiobencarb + 2,-4-D Na salt and pendimethalin + 2,4-D Na salt (tank mixed) did not affect significantly the germination, plant height and DMP of cucumber grown in sampled soil taken after the harvest of rice crop.

22. STUDIES ON RESIDUAL EFFECT OF THIOBENCARB APPLIED IN RICE ON SUCEEDING WHEAT CROP IN RICE-WHEAT CROPPING SYSTEM

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Field trails were conducted at Agronomy Research Farm of N.D.U.A.T. Kumarganj, Faizabad, during Rabi 1990-91 and Rabi 1991-92 to study the residual effect of Thiobencarb applied in Transplanted rice on the succeeding wheat crop in a randomised block design taking six treatments with four replications. The results revealed that the different doses of thiobencarb (1.0, 1.5, 2.0, 2.5, 3.0 kg a.i. ha^{-1}) applied in transplanted rice to control the weeds did not show their toxic residual effects on succeeding wheat crop, weed density and weed dry weight.

23. INFLUENCE OF KHARIF WEED RESIDUES ON GERMINATION AND GROWTH OF WHEAT (*Triticum aestivum* L.) AND GRAM (*Cicer arietinum* L.)

D.Swain and V.M.Bhan, National Research Centre for Weed Science, 215, Ravindra Nagar, Adhartal, Jabalpur

The effects of the residues of five kharif weeds viz. (i) *Echinochloa colonum* (L). link., (ii) *Echinochloa glabrascence* L., (iii) *Alternenthera sessilis* R. Br., (iv) *Cyperus iria* L., and (v) *Partheniium hysterophorus* L. on wheat Vr. WH-147 and gram Vr.JG-315 were studied in petridish and pot culture experiments during 1991-92. It was revealed that *E. colonum* and *A. sessilis* residues significantly reduced the germination of wheat and the dry matter accumulation was adversely affected in most weed residue treated pots especially at the dose of 45 g/ha. In case of gram, the germination percentage was low in all weed residue treatments, and the lowest being with that of *C. iria* residue. The height of gram remain unaffected due to weed residues but *E. colonum* residue positively influenced the dry matter accumulation at the rate of 45 g/ha (34.5 g/pot) as compared to control (18.8 g/pot).

24. INVESTIGATION ON THE INFLUENCE OF KHARIF CROP RESIDUE ON WHEAT (*Triticum aestivum* L.) AND ITS ASSOCIATED WEED FLORA

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The effects of the residues of three kharif crops viz. rice, maize and soybean at the rate of 15, 30 and 45 g/ha on wheat Vr. WH-147, were studied in petridish culture and field experiments during the rabi seasons of 1991-92-93. A total of nine weed species were found to be associated with the crop. Occurrence of *Rumex dentatus* L., and *Trifolium flagiferum* Linn. were less frequent in all crop residue treated plots within 30 DAS *Chicorium intybus* L. was abundant in the early stage of crop growth but subsequently reduced by 60 DAS. The frequency of *Chenopodium album* L., and *Medicago denticulata* remained unaffected during crop growth irrespective of the type of residue. The weed dry matter and crop yield were higher in all crop residue treatments as compared to control.

25. RESIDUAL EFFECT OF NITROGEN AND HERBICIDES IN RICE-MAIZE CROPPING SYSTEM

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The field experiment was conducted during rainy season of 1992 and rabi-cum-hot season of 1992-93 to study the residual effect of nitrogen and herbicides in rice-maize cropping system. Application of 50 kg N

through urea placed behind plough along with 50 kg N through green leaf manuring of glyricidia and hand weeding twice (20 and 40 DAT) to rice was more beneficial. Among the herbicides, butachlor @ 1.5 kg a.i./ha and anilofos @ 0.5 kg a.i./ha were more effective. However, there was no residual effect of any herbicide on succeeding maize as well as its weed flora.

26. GR_{50} VALUES AND RATE OF DEGRADATION OF PENDIMETHALIN APPLIED IN WHEAT UNDER DIFFERENT IRRIGATION LEVELS

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An experiment was carried out in split-plot design consisting three irrigation levels viz., two (20, 65 DAS), four (20, 45, 85, 105 DAS), and six irrigation (20, 45, 65, 85, 105, 125 DAS) as main plot treatments and four pendimethalin doses (0.1, 1.0, 2.0 and 4.0 kg/ha applied pre-emergence) as sub-plot treatments with four replications in wheat (Var. WH 283) at CCS HAU, Hisar, in 1987-88. No weed was allowed to grow throughout the crop season. The soil samples were collected from a depth of 0-5 cm of soil surface from different randomly marked spots from each plot at 0, 25, 50, 100 and 200 days after application of pendimethalin in wheat and were stored in defreeze maintained at -4°C. Then sorghum bioassay was conducted in these soil samples in greehouse in 1988-89. The per cent mortality was used for curve fitting and interpretation mortality with the increase in pendimethalin doses from 0 to 4.0 kg/ha. However, it decreased with the corresponding increase in the incubation periods from 0 to 200 days. Loss of pendimethalin, occurred more slowly upto 50 days incubation and it was greater from 50 to 100 days and was maintained upto 200 days. The GR_{50} levels at 200 days incubation were 8.33, 4.03 and 2.74 times more than at zero incubation at the levels of six, four and two irrigations, respectively. After 200 days incubation, 63.5, 75.2 and 88.0 per cent of initial doses of pendimethalin applied in wheat disappeared at the level of two, four and six irrigations, respectively. The half-life of pendimethalin was around 76 days at the level of six irrigations while it took 92 and 122 days to inactivate the herbicide to 50 per cent at the level of four and two irrigations, respectively.

27. SCREENING OF RICE CULTIVARS FOR TOLERANCE TOWARDS BUTACHLOR AND OXYFLUROFEN

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A study was conducted to screen direct sown rice cultivars for tolerance towards the popular rice herbicides viz. butachlor and oxyfluorfen. Forty six different rice cultivars were screened towards the double the recommended dose of butachlor and oxyflurofen under direct

sown cultivation. The results showed that in respect of butachlor, the cultivars ADT 37, ASD 16, CO 43, Chaitanya, IR 20, palguna and TKM 9 were tolerant, and the cultivars ADT 36, PY 3, Giza 172, ADT 38, ADT 40, ASD 8, IET 8580 and Samba mashuri were susceptible. For oxyfluorfen, the cultivars ASD 18, AS 18696, Basumathi, IR 51491, ADT 37, CO 43, Chaitanya and Swarna were tolerant, and the cultivars IR 50, ADT 40, white ponni, PY 3, CSR 13, CSR 18, IR 66, Pakistani mashuri, Giza 172 and Xiang chow were susceptible.

28. STUDIES ON THE EFFECT OF ANILOFOS ON THE HYDROLYTIC ENZYMES DURING GERMINATION OF RICE AND BARNYARD GRASS

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The influence, of 0, 5, 10, 20 and 40 ppm of anilofos given as per-sowing soaking (PSS) and continuous (cont) treatment on the activity of hydrolytic enzymes (- amylase and protease) during germination of rice (*Oryza sativa* L.) and barnyard grass (*Echinochloa crusgalli* L.) was studied to understand the basis of selectivity of herbicide towards weed. The experiment was conducted in petridishes under controlled conditions at 30 ± 2°C in laboratory. Samples were taken out for enzymes analysis at 6, 12, 24, 48 and 72 hours after treatment. Increasing anilofos concentration progressively reduced the activity of α - amylase under both the conditions during germination in rice and barnyard grass. However, the protease activity decreased with the application of anilofos upto 10 ppm in PSS and upto 20 ppm in Cont treatment in rice and then increased afterwards. While the trend was reverse in barnyard grass. Differential response of anilofos in two plant species may be one of the reasons for selectivity of herbicide towards barnyard grass.

29. HERBICIDE USE MANAGEMENT AND PLANNING IN UTTAR PRADESH

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In U.P only a little portion of herbicides is distributed in kharif in comparision to rabi desptie the fact that in kharif seasons intensity and biomass of weeds is quite high. In order to encourage herbicide use in kharif season, more quantity of herbicide and that too in suitable containers and with proper extension approach should go to different sale points in order to reduce the losses due to weeds. The above measures (i.e. distribution pattern, quality control, packaging of herbicides etc.) are some of the policy matters, if taken care of, will certainly help in improving the distribution and use efficiency of herbicide presently being consumed and which in turns will help in managing weeds at proper time by using proper herbicide.

30. EFFECT OF SOIL MOISTURE AND SURFACE COVER ON THE PERSISTENCE OF METSULFURON-METHYL IN SANDY LOAM SOIL

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A field experiment conducted during 1991-92 and 1992-93 revealed carry-over of metsulfuron-methyl residue after 120 days in sandy loam soil (pH 8.0). It increased with its increasing concentration from 0 to 32 g/ha as indicated by the phytotoxicity on the bioassay plant onion at 42 DAT. Persistence of herbicide was more at 25% available soil moisture (ASM) than at 75% ASM. Under 25% and 75% ASM, significant dry weight reductions were discernible at 4 and 8 g/ha dose, respectively. The residues of metsulfuron at 4, 8, 16 or 32 g/ha caused 11.8, 19.1, 35.5 or 46.5 % reduction in dry weight at 25% ASM, and 4.0, 9.3, 19.6 or 31.3% at 75% ASM, respectively. Covering of the plants with black polythene sheets had no effect on the persistence behaviour of the chemical indicating that sunlight does not have any effect on its dissipation.

31. SELECTIVITY OF HERBICIDES TO DIFFERENT RAINY AND WINTER CROP AND WEED SPECIES

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The trials were conducted during rainy and winter seasons of 1992 and 1992-93. Sesamum, soybean, cowpea, gram, pea, tomato, radish, cichory were tolerant to sethoxydim for both pre- emergence and post-emergence application. Rice, cowpea, greengram, blackgram, soybean, maize, gram, pea were tolerant to oxyfluorfen when applied pre-plant incorporation and pre- emergence. Pre-emergence application of oxyfluorfen controlled Foxtails, Barnyard grass, Wrinkle grass, Lambs quarters, canary grass, Rumex and Cichory weeds effectively. Rice, maize, wheat, sorghum, oat, Foxtails, barn yard grass, wrinkle grass and canary grass were tolerant to clopyralid applied as post-emergence. Soybean, rice, sorghum, maize, soybean, wheat, cowpea, Foxtails, Barnyard grass, Wrinkle grass showed tolerance to bentazon. Sesamum, soybean, niger showed tolerance to diuron.

32. HERBICIDE - INSECTICIDE INTERACTIONS IN SORGHUM AND PEARL MILET

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Pot culture experimetns were conducted to study the influence of soil application of phorate 0.6 kg/ha along with the pre-emergence herbicides atrazine 0.3 kg/ha, fluchloralin 1.0 kg/ha on the germination

and stand establishment of sorghum and pearl millet. The results showed that phorate interacted antagonistically with atrazine and metolachlor, reducing the germination and stand establishment of both the crops while no significant injurious interaction was observed between phorate and fluchloralin.