ISWS PRB 249/82-83

# ABSTRACTS

## Annual Weed Science Conference

March 3-4, 1992

*Organised by*

Indian Society of Weed Science

and

Department of Agronomy

# ABSTRACTS

## Annual Weed Science Conference

**March 3-4, 1992**

*Organised by*

**Indian Society of Weed Science and Department of Agronomy**

**Ch. Charan Singh Haryana Agricultural University**
**Hisar-125004, India**

# INDIAN SOCIETY OF WEED SCIENCE

*(Regd. No. MAG (5) PRB 249/82-83*

## Executive Committee

| | | |
|---|---|---|
| President | : | Dr. G. B. Singh, Lucknow |
| Vice-Prerident | : | Dr. K. C. Gautam, Delhi |
| Vice-President (Co-opt.) | : | Dr. V. M. Bhan, Jabalpur |
| Secretary | : | Dr. K. S. Sandhu, Ludhiana |
| Joint-Secretary | : | Dr. A. K. Gogoi, Jorhat |
| Joint-Secretary (Co-opt.) | : | Dr. R. S. Chauhan, Lucknow |
| Treasurer | : | Dr. R. P. Singh, Varanasi<br>Dr. L. S. Brar Ludhiana |
| Business Manager | : | Dr. S. A. Ram, Bombay |

## Organising Committee

*Organising Secretary* : **Dr. R. K. Malik**
Professor (Weed Science)

## Steering Committee

| | |
|---|---|
| Dr. S. P. S. Karwasra, Director of Research | Dr. A. S. Faroda, Professor (Agronomy) |
| Dr. M. S. Kairon, Dir. Extn. Education | Dr. K. S. Panwar, Professor and Head |
| Dr. M. L. Pandita, Dean, COA | Dr. D. P. Singh, Professor |
| Dr. H. C. Sharma, Project Director | Dr. Jai Parkash, Professor and Head |

## Food Committee

| | | | |
|---|---|---|---|
| Dr. S. K. Katyal | Chairman | Dr. S. K. Yadav | Member |
| Dr. R. S. Panwar | Member | Dr. V. S. Kadian | Member |
| Dr. S. S. Pahuja | Member | Mr. H. K. Gulati | Member |

## Transport Committee

| | | | |
|---|---|---|---|
| Dr. D. R. Dahiya | Chairman | Dr. A. C. Malik | Member |
| Dr. B. R. Singh | Member | Dr. S. C. Gupta | Member |
| Dr. L. K. Bishnoi | Member | Dr. S. S. Rathee | Member |

## Accommodation Committee

| | | | |
|---|---|---|---|
| Dr. Surinder Singh | Chairman | Dr. S. N. Singh | Member |
| Dr. Mehar Singh | Member | Dr. Ashok Yadav | Member |
| Dr. S. K. Pahwa | Member | Dr. R. K. Pannu | Member |

## Stage Committee

| | | | |
|---|---|---|---|
| Dr. D. S. Ram Mohan Rao | Chairman | Dr. Som Dutt Jarwal | Member |
| Dr. R. C. Tyagi | Member | Mr. P. K. Legha | Member |
| Dr. B. R. Singh | Member | | |

## Technical Committee

| | | | |
|---|---|---|---|
| Dr. Jai Parkash | Chairman | Dr. V. P. Singh | Member |
| Dr. R. S. Balyan | Member | Dr. R. S. Hooda | Member |
| Dr. I. S. Hooda | Member | | |

## Registration Committee

| | | | |
|---|---|---|---|
| Dr. K. P. Singh | Chairman | Dr. R. S. Panwar | Member |
| Dr. R. S. Balyan | Member | Mr. Samunder Singh | Member |
| Dr. S. K. Pahwa | Member | | |

# Annual Weed Science Conference

## PROGRAMME

### 3-3-1992

| | | |
|---|---|---|
| 9.00 to 10.00 hrs. | | Key note address by<br>Dr. S. K. Mukhopadhayay<br>Professor, Visva Bharti University,<br>Sriniketan, West Bengal |
| 10.00 to 11.00 hrs. | | Session I<br>Weed distribution, Crop-Weed Competition, Allelopathy and Weed Biology |
| 11.00 to 11.30 hrs. | Tea | |
| 11.30 to 13.00 hrs. | | Inaugural Function<br>Inauguration by<br>Dr. A. L. Chaudhary<br>Vice-Chancellor,<br>Ch. Charan Singh<br>Haryana Agricultural University,<br>Hisar |

CONCURRENT SESSION

| | COA Auditorium | COA Committee Room |
|---|---|---|
| 14.00 to 15.00 hrs. | Session II<br>Weed management in rice | Session III<br>Weed management in wheat |
| 15.00 to 16.00 hrs. | Session IV<br>Weed management in oilseed & Pulses | Session V<br>Weed management in coarse grain crops and intercropping systems |
| 16.00 to 16.30 hrs. | Tea | |
| 16.30 to 17.30 hrs. | Session VII<br>Weed management in Vegetables and Horticultural crops | Session VI<br>Weed management in commercial and fibre crops. |

| | |
|---|---|
| 17.30 to 18.30 hrs. | Annual General Meeting–ISWS |

## 4-3-1992

CONCURRENT SESSIONS

| | | |
|---|---|---|
| 9.00 to 10.00 hrs. | Sessions VIII<br>Perennial and aquatic weeds | Sessions IX<br>Physiological and bio-chemical aspects of herbicides |
| 10.00 to 11.00 hrs. | Session X<br>Herbicides mixtures | Session XI<br>Herbicide residues |
| 11.00 to 11.30 hrs. | Tea | |
| 11.30 to 12.30 hrs. | Session XII<br>New herbicides | |
| 12.30 to 13.30 hrs. | Field visit | |
| 13.30 to 14.30 hrs. | Lunch | |
| 14.30 to 15.30 hrs. | Plenary Session | |

# CONTENTS

# 1. WEED DISTRIBUTION

## 1.1 WEED FLORA OF *RABI* AND *KHARIF* CROPS OF BIRBHUM, BURDWAN AND NADIA DISTRICTS OF WEST BENGAL

S. K. Mukhopadhay, D. C. Mondal and A. Hossain
Weed Science Lab. Inst. of Agric., Sriniketan.

Ecological survey of weeds asociated with important *kharif* and *rabi* crops mainly transplanted rice, jute, sugarcane, mustard, wheat and potato was conducted during two consecutive years (1988) and 1989) in Birbhum, Burdwan and Nadia districts of West Bengal and their Importance value Index (IVI) were established. Forty three weed species were found infesting rice and of these *Digitaria sanguinalis* (L.) Scop., *Echinochloa colona* (L.) Link., among grasses ; *Fimbristylis miliacea* (L.) Vahl. among sedges and *Ammania baccifera* L., *Commelina nudiflora* L., *Ludwigia parviflora* Roxb./*perennis* L., among broad-leave weeds were most common. Among 32 weed species infesting jute *Cynodon dactylon* (L.) Pers. *Paspalum distichum* L., *Fimbristylis miliacea* (L.) Vahl. and *Ludwigia perennis* L. were predominant. Sugarcane fields were infested with twenty nine weed species. *Echinochloa colona* (L.) Link., *Fimbristylis miliacea* (L.) Vahl., *Commenlina benghalensis* L. and *Lindernia procumbens* (Krock) Philcox. were most common. *Rabi* crops were infested with 30 weed species, potato being comparatively less infested. *Anagallis arvensis* L., *Chenopodium album* L., *Gnaphalium indicum* L. and *Spergula arvensis* L. were most common.

## 1.2 WEED COMPOSITION OF WHEAT FIELDS IN PUNJAB

Tarlok Singh, K. S. Sandhu and R. K. Bhatia
Deptt. of Agronomy, Punjab Agril. Univ., Ludhiana.

Survey of weed flora of wheat fields conducted during 1980 to 1984 and again during 1984-1990, showed the crop was infested with 45 weed species belonging to 16 families. The predominent weeds associated with the crop were *Phalaris minor*, *Avena ludoviciana*, *Poa annua*, *Melilotus indica*, *Chenopodium album*, *Anagallis arvensis* and *Medicago denticulata*. The other important weeds found in the crop were *Polypogon monspeliensis*, *Lolium temulentum*, *Silene conoidea*, *Rumex dentatus*, *Lathyrus aphaca*, and *Lepidium sativa*. *Circium arvense* and *Convolvulus arvensis* were the perennial weeds found infesting the crop in some parts of the state. During the second survey it was observed that the intensity of *Avena ludoviciana* in the districts of Amritsar, Gurdaspur, Jalandhar, Kapurthala and Bathinda was on the increase. *Phalaris minor* continued to be the most serious weed of this crop in the state.

## 1.3 WEED COMPOSITION IN RICE FIELDS OF PUNJAB

Tarlok Singh, K. S. Sandhu and R. K. Bhatia
Deptt. of Agronomy, Punjab Agril. Univ., Ludhiana.

Survey of weed flora of rice fields conducted from 1980 to 1983 and from 1984 to 1990, revealed the existance of 43 weed species in transplanted rice. The most predominant were *Echinochloa crusgalli*, *Panicum colonum*, *Cyperus iria*, *C. difformis* and *Fimbristylis tenera*. Besides these *Eragrostis japonica*, *Eclipta alba*, *Ammania* spp., *Scirpus tuberosus*, *S. roylei*, *Eleocharis atropurpuria* and *Cyperus rotundus* were also present at certain places. The second survey indicated that *Paspalum distichum* and *Ischaemum rugosum* were assuming serious proportions and intensity of *E. crusgalli* was on the increase. Some new weeds viz. *Ageratum conyzoides*, *Aschynomene indica*, *Phyllanthus fraternus*, *Caesulia axillaris*, *Sphenoclea zeylanica*, *Lindernia pyxidaria*, *Murdannia nudiflora*, *Cyperus kyllingia* and *Sagitaria guyanpensis* were getting established in certain pockets.

## 1.4 SURVEY OF WEED FLORA IN PADDY FIELD IN NORTH-EASTERN PARTS OF HARYANA

Samunder Singh, R. K. Malik and S. S. Poonia
Deptt. of Agronomy, HAU, Hisar.

North-eastern District, the main paddy growing area of Haryana State, was surveyed during Kharif 1989 to know the occurrence of various weed species and their intensity. In all, 28 weed species were recorded belonging to 9 families with the predominance of Poaceae family (39%). *Echinochloa glabrescens* Munro ex Hook. f. was the most dominant weed in all the 9 districts surveyed followed by *Paspalum paspalodes* L; *Eragrostis interrupta* Beauv. *E. colona* (L.) Link. *Cyperus* species, *Eclipta alba* (L) Hask and *Fimbristylis tenera* Roem & Sch. In tropical arid brown soils (average rainfall 750-1000 mm), more number of weeds were found as compared to arid brown soil (Average rainfall 500-750 mm). In tropical arid brown soil *E. glabrescens*, *P. paspalodes*, *Eragrostis interrupta* and *Eclipta alba* were more dominant whereas in arid brown soil *E. glabrescens*, *Eragrostis interrupta*, *E. colona*, *Eclita alba*, *Cyperus* species and *Fimbristylis tenera* were the dominant weeds.

## 1.5 WEED FLORA OF *RABI* SORGHUM IN CENTRAL MAHARASHTRA PATEAU ZONE

V. D. Salunke, R. H. Bhosle, D. K. Shelke and N. S. Jadhav
AICRP-Weed Control, M. A. U., Parbhani.

A detailed survey of weed flora of *rabi* sorghum was undertaken during 1982 to 1987 in Central Maharashtra Plateau Zone. In general it was observed that broad-

leaved weeds were dominant in all the districts of survey. Total 50 weed species belonging to 23 different families were recorded. The density of weed was highest in Parbhani, Jalna and Aurangabad district i.e. 63.5/$m^2$ and least i.e. 7.6 weeds/$m^2$ in Jalgaon and Buldhana districts. The maximum number of weed species i.e. 33 were recorded in Jalgaon and Buldhana districts and least i.e. 16 in Jaikwadi and Purna Command area. The dominant weeds were from Poaceae, Cyperaceae, Asteraceae, Euphorbiaceae, Convolvulaceae and Leguminosae families. Amongst the monocots *Brachiaria eruciformis* (4.56 to 20.33%) was most dominant weed species followed by *Cynodon dactylon* (L) Pers. (7.87 to 11.85%) and *Ischaemum pilosum* (2.36 to 7.42%). In sedges, only *Cyperus rotundus* was noticed and dominant (2.42 to 28.76%) in all the districts. The dominant broadleaved weeds were *Sonchus arvensis* (1.05 to 15.71%) followed by *Convolvulus arvensis* (2.21 to 13.07%), *Phyllanthus maderaspatensis* (0.54 to 11.83%) and *Chrozophora rottleri* (0.26 to 5.12%) noticed in all the districts of zone. *Celosia argentea* (1.15 to 8.87%) and *Amaranthus polygamous* (0.79 to 7.19%) were dominant in Parbhani, Jalna and Aurangabad districts. *Corchorus acutangulus* (2.22 to 9.59%) was dominant in Latur, Jalgaon and Buldhana districts. There were only 7 species noticed at all the locations.

## 1.6 WEEDS ASSOCIATED WITH WHEAT FIELDS IN SIDHI AND SHAHDOL DISTRICTS OF MADHYA PRADESH

N. R. Paradkar, S. P. Kurchania and J. P. Tiwari
Deptt. of Agronomy, J. N. K. V. V., Jabalpur, Madhya Pradesh.

A survey of weed flora associated with irrigated and unirrigated wheat fields was conducted during 1987–88 in Sidhi and Shahdol districts of Madhya Pradesh. *Anagallis arvensis*, *Vicia hirsuta*, *Vicia sativa*, *Chenopodium album*, *Lathyrus aphaca* and *Melilotus parviflora* were the major weeds of irrigated wheat while under unirrigated condition the dominant weeds consisted of *Vicia hirsuta* followed by *Lathyrus aphaca*, *Anagallis arvensis*, *Chenopodium album* and *Vicia sativa*, *Cyndon dactylon* was the predominant weed under both the conditions. The weed density under irrigated wheat was approximately 2.5 times as compared to unirrigated condition.

## 1.7 WEED SURVEY IN *KHARIF* OILSEED CROPS AT DAMOH DISTRICT OF MADHYA PRADESH

N. R. Pardakar, S. P. Kurchania, J. P. Tiwari and K. K. Jain
Deptt of Agronomy, J. N. K. V. V., Jabalpur, Madhya Pradesh.

Weed survey in oilseed crops viz., soybean, groundnut and sesamum was conducted during *Kharif* 1989 in Damoh district of Madhya Pradesh. Seventy four weed species were found infesting the soybean crops, of which *Echinochloa crusgalli* (L.) Beauv was the most dominant having the highest (33.7%) relative density followed by *Digitaria sanguinalis* (L) Scope, *Cynodon dactylon* (L) Pers. *Echinochloa colona*

(L) Link, *Setaria glauca, Digitaria ischaemum* (Sehreb) Muhl; *Phyllanthus niruri* L. and *Phyllanthus simplex.* The density of monocotyledons was three times greater than dicotyledons. Groundnut and sesamum crops were infested with 27 and 25 weeds, respectively, among which Echinochloa *crusgalli, Digitaria sanguinalis, Cynodon dactylon, Eragrostis* spp., *Phyllanthus niruri* and *Phyllanthus simplex* were dominant weeds.

## 1.8 PETROWEEDS IN NAGARJUNANAGAR

P. N. Rao and J. Ashakumari
Deptt. of Botany, Nagarjuna Univ., Nagarjunanagar Guntur, A.P.

The potential liquid fuel source species are categorised into 1. Seed oils, 2. Essential oils and 3. Exudates and Extracts as per Wang and Hauffmann (1982). Locally, the Euphorbiaceous weeds : *Jatropha curcas, J. gossypifolia, J. glandulifera* belong to the first category. The Lamiaceous weeds : *Ocimum americanum, O. gratissimum, Anisomeles malabarica* and *Hyptis suaveolens* fall into the second category. The latex bearing Euphorbiaceae and Asclepiadaceae get into the third category. These local petroweeds are recommended for harnessing arable wastelands on a highly economical basis with minimum inputs for plantational infrastructure. *Ocimum grattissimum* is recommended for cultivation in wastelands for its lemon scented oil found to be a very strong mosquito repellent.

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

A. K. Singh, R. P. Singh and R. A. Singh
Deptt. of Agronomy, Banaras Hindu University, Varanasi.

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

In pigeonpea field *Eleusine indica, Digitaria ciliaris* and *Cyperus rotundus* were most dominant weeds. *Phyllanthus niruri, Ephorbia hirta, Commelina benghalensis* were also found in low frequencies.

## 1.10 NUTRIENT CATEGORISATION OF WEED AND NUTRIENT RECYCLING IN CROP WEED ECOSYSTEMS

A Gitanjali, P. Chandrasekhar Rao, C. N. Reddy, N. V. Reddy and D. Uma Devi
AICRP Weed Control, College of Agri., Rajendranagar, Hyderabad.

Forty one weed species prevalent in APAU, Rajendranagar Campus, were analysed for major and micronutrients. The nutrient composition of many weeds was higher than that of most crop plants. Some weeds contained more than 2% each of N, K and Ca, more than 0.5% each of P, Mg and had higher concentration of micronutrients. The nutrient removal by weeds was found to be four times that of uncultivated lands. The weed species belonging to compositae family i. e., *Acanthospermum hispidum, Lagesca mollis, Parthenium hysterophorus* removed nutrients in higher amounts as compared to weed of other families.

In order to assess the manurial value of weed compost, a pot culture experiment was conducted under glass house condition, using maize (cv. DHM 101) as indicator plant. The crop was harveeted at 40 DAS and its dry matter production was recorded. The results indicated significant improvement in dry matter production and uptake of N, P and K due to the application of composts obtained from different weed species. Composts obtained from *Abutylon indicum* and *Achyranthes aspera* were as effective as fertilizer treatment.

## 1.11 WEED SURVEY OF WHEAT IN HARYANA

Samunder Singh, R. K. Malik, R. S. Balyan and Samar Singh
Deptt. of Agronomy, Haryana Agric. Univ., Hisar.

Survey of weed flora of wheat was conducted during rabi 1989-90. Among 34 known species spotted, more than half (18) were found belonging to Poaceae, Leguminosae and Compositae families. Among grassy weeds *Avena ludoviciana Dur.* and *Phalaris minor* Retz. were the dominant weeds (more than 70% infestation in 8 districts). *Polypogon monspeliensis* Desf. is also increasing fast in irrigated soils. Among broad leaf weeds *Chenopodium album* L. was more in light soils, *Medicago denticulata* Willd. was infested only in heavy soils whereas *Trigonella polycerata* L. was present only in light soils. *Circium arvense* (L.) Scope. and *Carthamus oxycantha* Beib. though more in heavy soily, are on the increase in all areas. The intensity of grassy weeds decreased with decrease in rainfall whereas infestation of *Chenopodium album* L., *Trigonella polycerata* L., *Fumaria parviflora* Lamk., *Asphodelus tenuifolius* Cav. increased in low rainfall areas. The grassy weeds were also more in high and medium available P soils as compared to low P soils, whereas reverse was the trend with *Chenopodium album* L., *Anagallis arvensis* L. and *Asphodelus tenuifolius* Cav. *Melilotus indica* All. Fl. Ped, *Trigonella polycerata* L., *Fumaria parviflora* Lamk. and *Vicia sativa* L. were more in medium available P soils.

*Phalaris minor* Retz. and *Avena ludoviciana* Dur. were more in good to normal quality underground water areas as compared to saline and sodic water soils. *Chenopodium album* L. was more in saline sodic underground water soils than good quality water soils.

## 1.12 EFFECT OF SOIL TYPES ON THE INFESTATION OF WEED IN WHEAT

Samunder Singh, R. K. Malik, Samar Singh and R. S. Balyan
Deptt. of Agronomy, Haryana Agric. Univ., Hisar.

Survey of weed flora of wheat was conducted during the rabi season of 1989-90. Broadly the soils of Haryana have been classified into five great groups based on land use capability viz. Reddish Chestnut, Tropical arid brown, Arid brown, Sierozem and Desert soils.

*Avena ludoviciana* Dur. was the most dominant in raddish chestnut soil followed by *Phalaris minor* Retz. with complete infestation. *Polypogon monspeliensis* Desf. and *Anagallis arvensis* L. were more wide spread but the intensity was less than *Chenopodium album* L. Other important weeds in reddish chestnut soil were *Circium arvense* (L) Scope., *Medicago denticulata* Willd., *Rumex martimus* L., *Coronopus didymus* (L) Sw., and *Polygonum plebijem* R. Br.

Similarly in the arid brown soil grassy weed dominated the flora except *Polypogon* which was relegated to a lower position by *Rumex*. *Melilotus indica* All. Fl. Ped., *Chenopodium album* L., *Medicago denticulata* Willd., *Anagallis*, *Convolvulus arvensis* L., *Polypogon* and *Lathyrus aphaca* L. were other important weeds in decreasing order. *Chenopodium* was dominant in all the other soil types. The weed spectrum was diverse in tropical arid brown, arid brown and sierozen soils. *Asphodelus tenuifolius* Cav., *Trigonella polycerata* L. and *Fumaria parviflora* Lamk. had more occurrence in desert and Sierozen soils with less infestation of grassy weeds.

## 1.13 PATTERN OF WEED GROWTH IN CERTAIN WINTER SEASON CROPS GROWN AFTER RICE

R. P. Singh and S. K. Singh
Deptt. of Agronomy, Banaras Hindu Univ., Varanasi.

Field experiments were conducted during 1988-89 and 1989-90 to find out the pattern of weed growth in wheat, gram and mustard crops grown after upland rice. The weed flora were common in all the crops with marked variation in their density. Data on the component of weed flora indicated that *Cyperus rotundus* decreased in the second year. Cropping pattern, planting time, nutrient status and moisture availability affected the weed flora in two years. *Anagallis arvensis* contributed the major weed in the second year.

## 1.14 IDENTIFICATION OF POSSIBLE BIO-CONTROL AGENTS FOR MAJOR WEEDS IN HIMACHAL PRADESH–A SURVEY

P. Ramesh, R. D. Singh and D. Mukherjee
CSIR Complex, Palampur, H. P.

Surveys were conducted in and around Palampur (Kangra Distt.) Himachal Pradesh for indigenous natural enemies of major weeds viz., *Polygonum* spp., *Lantana camara*, *Bidens pilosa*, *Rumex nepalense*, *Ipomea purpurea* and *Cenicus wallichii*.

A chrysomelid beetle, *Galerucella placida* Baly. was found feeding on *Polygonum hydropiper*; *Lixus* sp. on *P. glabrum*; a tinged bug on *Lantana*; *Altica* sp. on *Rumex nepalense*; and tartoise beetles on *Ipomea purpurea*. The insects appear to be promising to manage these noxicus weeds in Himachal Pradesh.

## 1.15 PHENOLOGY OF SOME BROAD-LEAF *KHARIF* WEEDS OF LATERITIC TRACT OF WEST BENGAL

G. C. De, D. Gupta and S. Patra
Deptt. of Agronomy, Visva Bharti, Sriniketan, West Bengal.

In a phenological survey on broad-leaf *kharif* weeds during June, 1985 to May, 1990 at the Agricultural Farm, Horticultural Farm, Adaptive Research Farm in and around Sriniketan and Ballavpur forest and Goalpara village area adjoining Santiniketan, Birbhum, (West Bengal) rndomly selected 40 species were studied. Emergence of weeds took place from June to September. *Borreria articularis*, *Desmedium triflorum* were early and *Aerva monsonia*, *Xyris pauciflora* were late seasonal weeds. Floral bud and blooming were initiated early in *Evolvulus alsinoides*, *Oldenlandia corymbosa* while late emerging weeds had late initiation of floral buds and blooming. Elongation of shoot was ceased earlier in *E. alsinoides* and *Molluge stricta* while it ceased at the latest in *Melochia corchorifolia*. The earliest commencement of fruiting was in June in *O. corymbosa* while at was as late as November in *A. monsonia*, *Burmannia coolestis*. Seed dispersal commenced in August in *Polygala arvensis* while it was in December in eight other speceies. The earliest death of *Centranthera humifusa* was recorded in September while *E. alsinoides* and *Tophrosia purpurea* died as late as in May. Life period of weeds ranged from two months to twelve months and all the long duration species were nonsynchronous in seed dispersal.

## 1.16 THE PREDOMINANT *KHARIF* AQUATIC WEEDS OF BURDWAN AND HOOGLY DISTRICTS OF WEST BENGAL

D. Swain, M. K. Manna and B. N. Mittra
NRC. Weed Science, Jabalpur, M. P.

Survey of aquatic weeds in two districts of West Bengal viz. Buddwan and Hoogly was carried out during September, 1989. The survey work included collection of data of frequency density index (FDI) of aquatic weeds, their occurance, distribution pattern and modes of propagation in cropped (paddy field) and non-cropped areas (ponds, road side ditched, tanks) of the districts. The most common and

predominant aquatic weeds of rice field of Burdwan district were *Marsilea quadrifolia* L., *Ludwiga prostrata* Roxb., *Panicum repens* L., *Hygrophilia difformis*, and *Ludwigia perennis* L. and their FDI valued are 5.86, 4.97, 2.90, 2.40 and 2.20 respectively. The predominant aquatic weeds in rice fields of Hoogly district were *Najas marina* L., *Hygrophilia difformis Marsilea quadrifolia* L. *Monocharia vaginalis* (Brum. F.) presel and *Panicum repens* L. and their FDI values were 29.79, 8.69, 4.46, 2.09 and 1.72, respectively.

## 11.17 WEED FLORA OF SULTANPUR DISTRICT OF EASTERN PLAIN ZONE-9 AND MAHARAJGANJ AND GORAKPUR OF ZONE-8 OF UTTAR PRADESH IN WINTER CROPS

J. S. Tripathi, R. D. Vaishya, A. H. Khan and S. S. Singh
Deptt. of Agronomy, N. D. Univ. of Agri. and Tech. Kumarganj, Faizabad (U.P.)

The weed flora in winter season crops of 1991 of Sultanpur district of Eastern Plain Zone-9 surveyed and found *Chenopodium album*, *Anagallis arvensis*, *Lathyrus aphaca*, *Vicia* spp, *Melilotus alba*, *Phalaris minor* and *Polygonum plebejem* were the dominant weeds.

Gorakhpur and Maharajganj districts of Eastern Tarai Zone-8 were infested with *Chenopodium album*, *Anagallis arvensis*, *Polygonum plebejem*, *Melilotus alba*, *Vicia* spp, *Desmodium triflorum*, *Phalaris minor*, *Lathyrus aphaca* and *Launea asplenifolia*.

## 1.18 WEED FLORA IN RAINY SEASON CROPS OF DEORIA DISTRICT OE EASTERN TARAI ZONE-8 OF UTTAR PRADESH

J. S. Tripathi, R. D. Vaishya, A. H. Khan & S. S. Singh
Deptt. of Agronomy, N. D. Univ. of Agri. & Tech., Kumarganj, Faizabad, (U. P.)

The survey of weed flora was conducted during rainy season of 1991 of Deoria district of Eastern Tarai Zone-8 of Uttar Pradesh. *Echinochloa colona*, *Phyllanthus niruri*, *Fimbristylis* spp, *Cyperus rotundus*, *Ammania baccifera*, *caesulia axillaris* and *Alternanthera sessilis* were found predominant in different crops of rainy season.

# CROP WEED COMPETITION

# 2. CROP WEED COMPETITION

## 2.1 CROP-WEED COMPETITION STUDIES IN TRANSPLANTED RICE

S. K. Mukhopadhyay, A. Hossain, and Rita Madak
Weed Science Lab. Institute of Agric., Sriniketan.

A field experiment was conducted during *kharif* 1989 under AICRP on Weed Control in Visva-Bharati University Agricultural Farm with a view to determine the critical stages of crop-weed competition in transplanted rice. There were 12 species of weeds of which the predominant weed species were *Echinochloa colona* (L) Link., *Digitaria sanguinalis* (L) Scop. *Eclipta alba* (L) Hassk., *Ludwigia parviflora* Roxb. and *Fimbristylis miliacea* (L) Vah present in the experimental field. Weed free condition up 25 days and weedy situation upto 65 days did not show significant improvement in the grain yield of rice over weedy check. Grain yield of transplanted rice decreased gradually (from 25 days to 65 days) as weeds associated with crop for a long period. The first 25 to 65 days were considered to be the critical for crop-weed competition in the transplanted rice.

## 2.2 COMPETITIVE ABILITY OF WRINKLE GRASS (*ISCHAEMUM RUGOSUM* (SALISB ) FOR NUTRIENTS IN TRANSPLANTED PADDY

Tarlok Singh and J. S. Kolar
Deptt. of Agronomy, Punjab Agric. Univ., Ludhiana.

Nutrient mining ability of wrinkle grass in transplanted paddy was monitored during 1987 and 1988 at Ludhiana. Butachlor at 1.5 Kg/ha gave poor control of wrinkle grass and allowed removal of 10, 2 and 15 Kg/ha of N, $P_2O_5$ and $K_2O$, respectively by wrinkle grass. Wrinkle grass, when competed with paddy for the whole season removed about 74 Kg N, 13 Kg $P_2O_5$ and 131 kg $K_2O$/ha as compared to 174 Kg N, 32 Kg $P_2O_5$ and 287 Kg $K_2O$/ha by paddy under weed free situations. The nutrient removal by wrinkle grass decreased as the weed free period increased from 30 to 70 days after transplanting. At a density of 140 plants/$m^2$, this weed removed almost equal amount of major nutrients to that of paddy.

## 2.3 EFFECT OF *AZOLLA PINNATA* ON WEED SUPPRESSION IN LOWLAND RICE

S. Jeyaraman, K. V. Daniel, A. Balakrishnan and S. Purushothaman
Deptt. of Agronomy, Agric. College and Res. Inst., Madurai.

Field experiments were conducted at Madurai during Kharif 1984-85 and 1985-86 to study the effect of *Azolla* as dual crop in rice and weed suppressor. *Azolla*

*pinnata* as dual crop @ 1 t/ha was applied on 10th day after planting alongwith four levels of nitrogen (0, 50, 75 and 100 Kg/ha). The inoculation of *Azolla pinnata* as dual crop with rice significantly reduced the weed dry weight during early to maximum tillering stage compared to no Azolla inoculation. The suppression of annual grasses was more than aquatic and broad leaved weeds like *Marsilea quadrifoliation*, *Monochoria vaginalis* was partial.

## 2.4 CROP-WEED COMPETITION IN DIRECT SOWN LOWLAND SAMBA RICE VARIETIES

P. Panner Selvam and R. Krishnan
Deptt. of Agronomy, Annamalai University, Annamalainagar.

Field experiment was conducted at Annamalai during September 1989 to February 1990 to study the weedflora and their competition in direct sown low land *samba* rice. Weed free throughout, weed free upto 20, 30, 40, 50 and 60 DAS and weeding on 20, 30, 40, 50 and 60 DAS were compared with an unweeded control. Among the two rice varieties, CR 1009 was superior to record higher grain yield of 3370 Kg/ha. Weed free periods upto 40–60 DAS favoured the direct sown rice crop to utilize the applied inputs resulting into increase in the grain yield upto 4440 Kg/ha with appreciable increase in growth rate and yield components. Delayed weeding extended beyond 40–60 DAS was comparable with unweeded crop in a severe reduction of grain yield of 1980 kg/ha.

## 2.5 WEED SUPPRESSION BY *AZOLLA* IN LOWLAND RICE

M. Thangaraju and S. Kannaiyan
Deptt. of Microbiology and Biotechnology, Agri. College, Madurai.

A field experiment was conducted during Rabi, 1986–1987 at Rice Breeding Station, Coimbatore to investigate the influence of *Azolla* in checking the weeds under lowland rice soil system. *Azolla* (*A. microphylla* was inoculated on 7th day after transplanting at 200 g/m$^2$. Weeds were allowed to grow in all treatments upto 35 days and weeding was done on 35th day after planting. The weed flora comprising *Echinochloa glabrescens*, *E. stagmina*, *E. crusgalli* and *E. colona* have been observed in the plots. Significant reduction in weed growth was observed in plots inoculated with Azolla. The effect of neem cake coated urea and carbofuran coated urea with *Azolla* was better in limiting the weed flora than prilled urea. The suppression of weeds was due to thick mat of *Azoll* layers which probably altered the gas exchange, light penetration and temperature. *Azolla* inoculated treatments also increased the grain and straw yield of rice.

## 2.6 STUDIES ON WEED FREE-ENVIRONMENT UNDER SEMI DRY RICE CONDITION

C. Ramaswami and S. P. Ramanathan
Tamil Nadu Rice Research Institute, Aduthurai

Field investigations were conducted to find out the critical period of crop-weed competition in direct sown semi-dry rice in 1990–91 at Aduthurai. The predominant weeds were *Echinochloa colona, E. crusgalli, Cyperus iria, Cyperus difformis, Fimbristylis miliacea, Panicum repens* and *Eclipta alba.* Amongst them, grassy weeds were more predominant. The results revealed that keeping the semi dry rice fields weed free upto initial six weeks after sowing is most critical and important as this period was found to be vulnerable for crop weed competition resulting in 54% reduction of grain yield. The grain yield in the weed free check was 6100 kg/ha.

## 2.7 WEED COMPETITION IN UPLAND RICE

B. Behera and J. C. Prusty
CRS, Orissa Univ. Agric. and Tech, Bhubaneswar.

The experiment was conducted at Bhubeneswar during *kharif* 1987 and 1989 to know the critical period of weed competition in upland rice. Keeping the crop weed free throughout the growth period was compared with no weeding upto 15, 30 and 45 and weedfree upto 15, 30 and 45 days after emergence. Weedy check plot recorded 1980 and 1160 kg grain/ha during 1987 and 1989, respectively. Keeping the plot weed free throughout the crop season and upto 45 days after emergence were equally efficient in controlling the weeds and produced, on an average, 1627 and 1595 kg grain/ha, respectively. Identical results were also recorded when weeding was withheld upto 15 days. It was evident that 15 to 45 days after emergence was the critical period of crop-weed competition in upland rice.

## 2.8 ASSESSMENT OF COMPETITION BY INDIVIDUAL WEED SPECIES IN TRANSPLANTED RICE

C. Srinivasan, P. Pothiraj and P. Subbian
TN G. D. Naidu Agril. University, Coimbatore.

Field experiments were conducted at Coimbatore, during 1988–89 to assess the competitive ability of major rice weeds. The treatments included transplanting of 30 desired weed species/$m^2$ *(Echinochloa spp., Paspalum paspalodes, Cyperus difformis, Marsilea minuta* and *Eclipta prostrata)* along with rice seedlings. The results revealed that among the weed species tried, *Echinochloa* spp. was the

most competitive in reducing the growth and yield of rice followed by *Marsilea minuta* with the nature of competition being for light and nutrients, respectively. *Eclipta prostrata* was least competitive because of its slow growth and development.

## 2.9 EFFECT OF SEED RATE AND METHOD OF SOWING ON WILD OAT COMPETITION IN WHEAT

S. S. Dahiya, R. K. Malik and S. Kumar
Deptt. of Agronomy, CCS Haryana Agril. Univ., Hisar.

Two years investigations were carried out on sandy loam soil at Hisar to study the competition of wild oat with wheat at different seed rates. Wheat at 100 and 125 kg/ha was sown in normal and cross rows in main plots. Five wild oat densities (0, 40, 80, 160, 320 plants/$m^2$) were maintained at 25 DAS. When averaged over wild oat densities, higher seed rate reduced the dry weight of wild oat. Sowing wheat in cross rows also allowed the competition in favour of crop. The grain yield of wheat was not affected by method of sowing at same seed rate. Wild oat 320 plants/$m^2$ reduced the yield to 2213 kg/ha and 2026 kg/ha compared to weed free plots in 1987–88 & 1988–90, respectively. The grain yield was a function of treatment effects on number of tillers, ear length, number of grains per ear head and 1000 grain weight.

## 2.10 COMPETITION AND CONTROL OF *LATHYRUS APHACA* IN WHEAT

R. K. Malik and R. S. Panwar
Deptt. of Agronomy, CCS Haryana Agric. Univ., Hisar.

Three field experiments were conducted for two years to study the competition and control of wild pea (*Lathyrus aphaca* L.) in wheat. In the experiments, except wild pea other weeds were removed at crop emergence, Nitrogen invariably allowed the competition in favour of crop against wild pea. Competition of wild pea for the whole season reduced the potential yield of wheat by 1723 kg/ha in 1987–88 and 1390 kg/ha in 1988–89. Fluroxypyr at 0.20 or 0.30 kg/ha provided similar control of wild pea to that obtained with 2, 4–D at 0.50 kg/ha. The control of *Chenopodium album* by fluroxypyr was less than 2, 4–D. Fluroxypyr applied 20 days after sowing was more effective as compared to when it was applied 15, 30 or 40 days after sowing.

## 2.11 INFLUENCE OF MELILOTUS COMPETITION ON GRAIN YIELD OF WHEAT

A. J. Lalakiya and C. L. Patel
Deptt. of Agronomy, Gujrat Agric. Univ., Navasari.

Field experiment was conducted at Navasari during the rabi season of 1988-89.

The treatments included were unweeded control, weed free control, removal of all weeds except *Melilotus sp.*, removal of *Melilotus sp.* only and 10, 20, 30 and 40 Melilotus plant/$m^2$. Different weed control treatments were imposed on 2 DAS. Weed free control was maintained with hand weeding at 20 and 45 days after wheat sowing. *Melilotus* sp. was the dominant weed, varing from 75 to 100 plant/$m^2$. The other weed species observed were *Echinochloa colona* (L.) Link; *Physalis minima* L. and *Digera muricata* (L.) Mast. Weed free control gave the highest grain yield (2956 kg/ha); ten plants of *Melilotus* did not reduce wheat yield. Yields in these plots were 139 and 118% higher than the unweeded control. The rest of treatments were statistically identical with unweeded control. Thus, the result clearly brought out that the 10 *Melilotus* plant/$m^2$ was the optimum density in wheat, which has no adverse effect on wheat grain yield.

## 2.12 SOIL MOISTURE AND NITROGEN EFFECTS ON COMPETITIVE ABILITY OF WILD OATS (*AVENA LUDOVICIANA*) AND WHEAT

Sarbjeet Singh and J. Singh Kolar
Deptt. of Agronomy, Punjab Agric. Univ., Ludhiana.

A field experiment was conducted at Ludhiana during 1983–84 and 1984–85 to study the competing behaviour of wheat and wild oats under adequate and limited supply of moisture and nitrogen. Under optimal nitrogen supply of 120 kg N/ha, wheat yield increased by 14.9% and dry matter of wild oats decreased by 7.7% as compared with sub-optimal nitrogen rate of 60 kg N/ha. Wheat had better competing ability as evidenced from relatively increased grain yield of wheat and decreased dry matter of wild oats under limited supply of irrigation. Wheat used nitrogen more efficiently than wild oats under limited moisture situations, whereas under normal irrigations, wild oats made luxuriant growth and posed serious competition to the wheat. The advantage of weed control measures was more under normal irrigation than under limited irrigation.

## 2.13 EFFECT OF CULTURAL AND CHEMICAL WEED CONTROL METHODS ON GROWTH AND DEVELOPMENT OF *PHALARIS MINOR* RETZ. IN WHEAT-*PHALARIS* ECOSYSTEM

S. P. Kurchania, M. L. Patel and J. P. Tiwari
J. N. Krishi Vishwa Vidyalaya, Jabalpur.

The field investigations on integrated weed control in wheat were conducted during 1986-87 and 1987-88. The cultural treatments consisted of three dates of sowing, (Normal, midlate and late) two planting geometry (solid and cross sowing) and six weed control methods viz. isoproturon 1.0 kg/ha applied pre and post emergence, metoxuron 2.0 kg/ha applied post emergence, pendimethalin 1.5 kg/ha

applied pre-emergence, and hand weeding (20 and 40 DAS) and a weedy check. The average of two years data indicated that population of *P. minor* was recorded higher in normal sowing and decreased with delay in sowing. The same trend was noted in height, effective tillers/plant, ear length, LAI and RGR of *P. minor*. The RGR did not show a definite trend while NAR values increased with delay in sowing. The cross row sowing also reduced the growth parameters of *P minor* as compared to solid planting. Post emergence treatment of isoproturon ormetoxuron and two hand weeding reduced the growth and development of *P. minor*.

## 2.14 WEED ASSOCIATION AND YIELD LOSS STUDY IN IRRIGATED *RABI* CROPS UNDER MID-HILLS OF UTTAR PRADESH

Kamta Prasad, Prem Singh and Daya Ram
Vivekananda Parvatiya Krishi Anusandhanshala, Almora, U. P.

A field experiment was conducted during *rabi* 1989-90 at Hewalbagh (Almora) to study the association of different weed species with main crops of the region and to assess the potential yield losses on account of weed infestation. Five crops, viz., wheat 'CPAN 1976', barley 'VLB 1', lentil 'VL Masoor 1', rapeseed 'T 9' and field pea 'VLB 1', were grown under weed free and unweeded environments. The dominant weed flora of the experimental field was (*Polygonum* sp., *Stelaria media, Phalaris minor, Avena ludoviciana* and *Vicia sativa*), *Polygonum* sp. constituted 87% of total weed population and 73% of total weed dry weight. Among different crops, no significant variations for weed species were observed in terms of count as well as dry weight accumulation. Maximum weed density (433/$m^2$) was recorded in wheat but maximum dry weight was observed in lentil. Losses in grain yield due to weed infestation were the highest in wheat (81.4%) followed by lentil (79.1%), barley (74.5), rapeseed (49.1%) and field pea (36.9%).

## 2.15 EFFECT OF ROW ORIENTATIONS, ROW SPACINGS AND WEED CONTROL METHODS ON WEED COMPETITION IN IRRIGATED WHEAT (*TRITICUM AESTIVUM* L.)

N. N. Angiras and Vinod Sharma
Deptt. of Agronomy, HP Krishi Vishvavidyala, Palampur.

The experiment was laid out by keeping combinations of three row direction (N-S, E-W and Bidirectional) and two 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 1.50 kg/ha and hand weeding twice 30 and 60 days after sowing) in sub-plots. *Phalaris minor, Lolium temulentum, Avena fatua* and *Vicia sativa* were dominant weeds. Bidirectional row sowing and 15 cm row spacing allowed the competition in favour of crop and decreased the density and dry weight of weeds.

Maximum grain yield were recorded in the bidirectional sowing and minimum in the East–West sowings. Bidirectional sowings, and 15 cm row spacings assited herbicides for improved weed control in wheat.

## 2.16 CROP–WEED COMPETITION STUDIES IN PIGEONPEA

O. P. Mishra and Govindra Singh
Deptt. of Agronomy, G. B. Pant University Agric. and Tech., Pantnagar.

Crop–weed competition studies in pigeonpea were conducted to find out the critical periods of weed competition· Treatments consisted of weed–free duration for the initial 30, 60, 90, 120 days after planting and upto harvest and weedy duration for the initial 30, 60, 90, 120 days after planting and upto harvest. There was no significant increase in grain yield with the increase in the initial weed free period beyond 30 days after sowing. Weedy check for the whole crop season caused about 82 percent reduction in the grain yield. Grain yield reduced significantly with an increase in the initial weedy duration beyond 30 days of sowing.

## 2.17 NUTRIENT REMOVAL BY WEEDS IN SUMMER COWPEA (*VIGNA UNGUICULATA* (L.) WALP)

Rajender Singh, S. K. Katyal and R. S. Balyan
Deptt. of Agronomy, CCS Haryana Agric. Univ., Hisar.

Field investigation were carried out to study the nutrient removal by weeds in summer cowpea as affected by plant geometry, fertility and weed control methods during 1988 and 1989. Crop geometry and fertility had no significant effect on the population of total weeds. Similarly, there was no effect of crop geometry and fertility on dry matter accumulation of total weeds. However, the dry matter of total weeds was significantly higher in crop spacing of 45 cm × 10 cm at 45 DAS during 1988 and 60 DAS and at harvest in both years. Weed control treatments reduced the density and dry matter of total weeds significantly over the unweeded check. The N and K uptake by weeds did not differ significantly under both the crop geometries. However, P uptake by weeds was significantly higher in 45 × 10 cm crop spacing. The N uptake was higher in recommended fertility than half. The P uptake by weeds was significantly higher in recommended level than half and zero level. The N, P and K uptake by weeds was maximum in weedy check followed by pendimethalin and minimum in the hand hoeing treatment.

## 2.18 CROP–WEED COMPETITION AND WEEDING FREQUENCY IN BUSH AND POLE TYPE OF SNAP BEAN (*PHASEOLUS VULGARIS* L.)

Bijendra Singh
Division of Horticulture, Res. Complex for NEH Region, Barapani, Meghalaya.

Field studies were carried out during the spring summer season to determine the critical period and frequency of weeding for optimum growth and yield of snap bean (bush and pole type) at mid hills of Meghalaya. To avoid the crop weed competition, crop should be kept weed free 2 to 4 weeks in bush type and 6 to 8 weeks in pole type variety. Weeding once at early stage; namely 3 weeks in bush and 4 weeks in pole type was beneficial to snap bean. Where weeding is to be twice, the second weeding should be done at 6th and 8th week after sowing of bush and pole type, respectively. More than three weeding had no significant influence in both the types of snap bean.

## 2.19 ENERGY AND NUTRIENTS UTILIZATION IN SOYBEAN-WEED ECOSYSTEM UNDER DIFFERENT METHODS OF SOWING AND HERBICIDAL TREATMENTS

K. K. Jain, J. P. Tiwari and T. R. Sahu
Deptt. of Agronomy, J. N. Krishi Vishwa Vidyalaya, Jabalpur.

In a soybean-weed system, the solar energy utilization by weeds was maximum under those plots where sowing was done without killing the weeds, i.e., M1 (132.97), followed by those plots where sowing was done afte killing the first flush of weeds, i.e , M2 (71.99) and those plots where sowing was done after killing the two flushes of weeds, i.e., M3 (40 85 lakhs K Cal/ha). Amongst different weed control treatments, the weeds utilized the greater energy under weedy check (178.37), followed by oxadiazon (79.84), fluchloralin (78.85) and haloxyfop-methyl (60.97) treatments and minimum in hand weeding (11.64). The energy utilization by total crop was higher in M2 method (366.90), followed by M3 (302.29) and M1 (206.37). The energy utilization in weeds also had same trend. Maximum energy utilization by crop was under hand weeding (412.62), followed by fluchloralin (301.60), oxadiazon (262.78) and haloxyfop-methyl (257.63) and lowest was in weedy check (224.73). The NPK uptake by total weeds was maximum in M1 (33.68, 8.80, 113.12 Kg/ha) and minimum (14.69, 3.84, 35.81) under M3. Amongst weed control treatments, the maximum NPK uptake by crop was under hand weeding (217.62, 39.43, 184.33), followed by fluchloralin (194.22, 27.09, 140.53), whereas it was the lowest under weedy check (96.39, 18.47, 98.57).

## 2.20 CROP-WEED COMPETITION IN SOYBEAN UNDER IRRIGATED CONDITION

N. K. Prabhakaran, S. P. Palaniappan and S. Jeyaraman
Deptt. of Agronomy, TN GDN Agril. University, Coimbatore.

Field experiment was conducted during monsoon, 1985 (Aug-Oct) to assess the optimum weed-free period for soybean (Co. 1) under irrigated condition on a

Sandy loam soil at Coimbatore. In this experiment, weed-free and local-infested conditions upto 15, 30, 45 and 60 DAS were compared with unweeded check and weed-free condition upto harvest. Weed index was lower in weed-free period from 15 to 45 DAS. Increasing the weed-free period, reduced the weed dry matter and nutrient removal by weeds and increased the crop growth characters. Yield was not significantly increased for weed-free condition beyond 45 days and was not reduced for weed-infested condition upto 15 DAS. Hence weed-free period from 15 to 45 DAS would be optimum to get high yield.

## 2.21 STUDIES ON WEEDING TIME, ECONOMIC AND SIGNIFICANCE OF WEED CONTROL ON GROUNDNUT YIELD IN NORTHERN HILL ZONE OF MADHYA PRADESH

V. K. Singh, R. P. Bajpai and B. P. Mishra
Deptt. of Agronomy, I. G. K. V. V. Zonal ARS, Ambikapur, Surguja.

A number of field trials were conducted at the Research Farm of the IGKVV, Zonal ARS, Ambikapur during 1987-88 to 1989-90 to findout the proper weeding time, efficacy and economics of weed control methods and significance of weed control among major crop production inputs in groundnut. The weed flora comprised mainly of *Echinochloa* spp., *Cyperus rotundus*, *Panicum* spp., *Xanthium strumarium*, *Ageratum conyzoides*, *Eclipta alba*, *Celosia argentea* and *Apluda varia*. Experimental results revealed that the removal of weeds at 20, 35 and 50 DAS by hand weeding recorded highest pod yield (2513 kg/ha) and net income (Rs. 11538/ha) followed by removal of weeds at 20 and 50 DAS (2198 Kg/ha) or at 20 and 35 DAS (2137 Kg/ha) by hand weeding. Considering the efficacy and economics of various weed control methods, hand weedings at (20 and 35 DAS) followed by interculture operation after each hand weeding proved superior in obtaining higher net income (Rs. 7278/ha). While studying the significance of weed control as one of the crop production inputs in comparison to fertilizer use and plant protection measures, it was found that without weeding, use of fertilizer and plant protection measures accelerated luxurient growth of weeds which resulted in increased crop-weed competition.

## 2.22 CROP-WEED COMPETITION IN RAPESEED

H. Kalita and A. K. Gogoi
Deptt. of Agronomy, Assam Agric. University, Jorhat.

Field experiments were conducted during *rabi* 1988-89 and 1989-90 to evaluate the critical period of crop weed competition in rape (cv. M-27). The major weed species of the experimental field were *Ageratum conyzoides*, *Borreria hispida*, *Cynodon*

*dactylon* and *Setaria glauca*. The season long weedy treatment was at par with weed free up to 10 DAS and weedy upto 40 DAS and in terms of number of branch/plant, siliqua/plant, seed/siliqua and seed yield. The season long weed free treatment accrued highest weed control efficiency, crop growth and yield attributes and seed yield, and was statistically alike to weedy treatment upto 10 DAS and weed free upto 40 DAS. This indicated that weed growth before 10 DAS and beyond 40 DAS had no effect on crop growth and yield and hence this period of 10–40 DAS was the critical period of crop weed competition in rape seed.

## 2.23 WATER LOSSES DUE TO WEEDS IN *GOBHI SARSON* (*BRASSICA NAPUS* VAR. OLERACEAE)

O. P. Vats, R. S. Narang and G. C. Bains
Deptt. of Agronomy, Punjab Agric. Univ., Ludhiana.

Fluchloralin applied pre-plant incorporation at 0.5 kg/ha and two and three hoeings controlled both grassy and broad-leaf weeds; were effective in conserving soil moisture and also resulted in significantly higher yields. The relative moisture content was highest in above-said weed control treatments and lowest in the weedy check plots.

## 2.24 NUTRIENTS UPTAKE BY GROUNDNUT AND ASSOCIATED WEEDS AS INFLUENCED BY CROP GEOMETRY, IRRIGATION AND WEED CONTROL

R. K. Pannu, R. K. Malik, K. P. Singh and D. S. Malik
Deptt. of Agronomy, CCS Haryana Agric. Univ., Hisar.

Two years field study was conducted at Hisar during 1982 and 1983. Crop geometry did not influence the uptake of nutrients by the crop and weeds. Rainfall received immediately after giving irrigation at 150 mm CPE value mitigated the treatment effects on nutrients uptake and hence no trend could be revealed. At harvest, maximum uptake of N (285 kg/ha), P (39 kg/ha) and K (202 kg/ha) by the crop was observed in the weed free plots. The maximum uptake by weeds at harvest was recorded in the weedy check. At 60 days, the relative uptake of N, P and K by the weeds in the weedy check as compared to 100 by the crop in the weed free control was 90, 75 and 159, respectively. The translocation of N, P and K into the kernels in the plots kept weed free at harvest was 79, 60 and 12% as compared to 33, 51 and 5% in the weedy check, respectively.

## 2.25 WEED COMPETITION FOR NUTRIENT IN COTTON

R. Jayakumar, N. Kamuchetty, S. Sankaran and S. P. Palaniappan
Directorate of Soil and Crop Management, TN G. D. Naidu Agric. Univ., Coimbatore.

Field experiments were conducted during 1988 and 1989 with cotton var. MCU 5 at Coimbatore. Treatments constituted various weed free and weedy periods compared with farmer's practice of two manual weedings. The nutrients uptake by weeds and cotton crop at harvest revealed that uptake of N, P and K by crop drastically reduced as the weeds persisted for more periods which consequently reduced the yields. The nutrients uptake were on the increasing side when weed free situations existed. The available nutrients in the post-harvest soil did not differ much indicating that the nutrient status of the soil was not much reduced though the percentage share between crop and weeds very greatly.

## 2.26 CROP-WEED COMPETITION STUDIES IN PIGEONPEA

O. P. Mishra and G. Singh
Deptt. of Agronomy, G. B. Pant Univ. of Agric. & Tech. Pantnagar, U.P.

Crop-weed competition studies in pigeonpea were conducted to find out the critical duration of weed control during *kharif* 1989. Treatments consisted of weed free condition for the first 30, 60, 90 and 120 DAP upto harvest and weedy condition for the first 30, 60, 90 and 120 DAP and upto harvest. There was no significant increase in the grain yields with the initial weed-free period beyond 30 DAS. Weedy condition for the whole crop season caused more than 82% reduction in the grain yield. Grain yield reduced significantly with a increase in the initial weedy duration beyond 30 days of sowing.

## 2.27 STUDIES ON CROP-WEED COMPETITION IN JAPANESE-MINT (*MENTHA ARVENSIS* L.)

Rohitashav Singh and J. N. Singh
Deptt. of Agronomy, H. P. K. V. V., Palampur, H.P.

The investigation on crop-weed competition in Japanese-mint was carried out during 1987 and 1988 at Pantnagar. Major weed species infesting the crop were *Chenopodium album*, *Rumex acetosella*, *Cyperus rotundus*, *Echinochloa coluna* and *Eleusine indica* upto first cutting. Whereas, after first cutting of the crop *Echinochloa*

*colona, Eleusine indica* and *Cyperus rotundus* were the pre-dominant weed species. Uncontrolled weed upto harvest reduced the fresh herb yield upto 75.9 and 85.3% whereas reduction in oil yield was 79.6 and 87.9% at first and second cutting, respectively. The herb and oil yield of Japanese-mint increased significantly with the increase in initial duration of weed-free condition upto 75 DAP at first cutting. After first cutting, initial 60 days were critical for crop-weed competition. Weed infestation upto 30 DAP at first cutting and upto 15 days, after first cutting produced fresh herb and essential oil yields similar with weed-free. Density and dry weight of weed emerging 75 DAP at first cutting and 60 days, after first cutting were low and their growth was suppressed by the crop. So the critical period for crop-weed competion in Japanese-mint occurred between 30 to 75 DAP and 15 to 60 days after first cutting.

# 3. ALLELOPATHY

## 3.1 ALLELOPATHIC EFFECT OF *IMPERATA CYLINDRICA* (L.) BEAUV ON SEED GERMINATION OF IMPORTANT CROPS

S. Chandra, C. M. Singh and J. Singh
Deptt. of Agronomy, Himachal Pradesh Krishi Vishvavidalaya, Palampur.

To study the allelopathic effect of *I. cylindrica* on seed germination and growth of important crops, glass house experiment was conducted taking cereals, pulses, vegetables and oil Seeds (Wheat, Maize, Rice, Oat, Soybean, Moong, Pea, Lentil, Arhar, Red mash, Cucumber, Bhindi, Mustared and Flex) with extract of *I. cylindrica* i. e. Boiled, unboiled, along with a standard check (water). The results showed that the boiled or unboiled extract of this weed had, in general inhibitory effects on germination of cereals, Pulses, Vegetables and Oil seed crops. The time taken for germination was prolonged and root, shoot and leaf developments were seriously inhibited. The injurious effects were in order of boiled extract>unboiled extract>standard check (control).

## 3.2 ALLELOPATHY EFFECT OF *PARTHENIUM HYSTEROPHORU* L. ON SEED GERMINATION OF FIVE CROP PLANTS

K. R. Aneja and Anju Bala Sharma
Deptt. of Botany, Kurukshetra University, Kurukshetra.

Effect of aqueous extracts (1, 10, 50 and 100 per cent) of root, stem, leaves and inflorescence of *Parthenium hysterophorus* was studied on seed germination of *Abelmoschus esculentus, Brassica campestris, Capsicum annum, Triticum vulgare* and *Trifolium alexandrinum.* Of the four plant parts tested inflorescence extract was the most inhibitory in action. Inflorescence extract inhibited seed germination of all the five crops, maximum being in wheat seeds where inhibition was 100 per cent followed by bhendi (95%), berseem (80%), chillies (40%) and minimum in brassica (30). Leaf extract of *Parthenium* showed more inhibition in seed germination of chillies (93%) and bhendi (90%) than in berseem, brassica and wheat. Root and stem extracts were comparatively less inhibitory on seed germination of the five crops than to inflorescence and leaf extracts, where inhibition was comparatively more in chillies and berseem which ranged in between 68 and 75 per cent. In the light of the above results, it is obvious that *A. hysterophorus* has got allelopathic properties to crop plants, hence its spread must be checked to avoid its infestation to agricultural lands.

## 3.3 RESPONSE OF *AMARANTHUS VIRIDIS* TO THE ALLELOPATHIC EFFECTS OF CERTAIN OTHER WEEDS

G. Velu, N. Kempuchetty, S. P. Palaniappan and S. Sankaran
Deptt. of Agronomy, T. N. G. D. Naidu Agric. University, Coimbatore.

Experiments were carried out under glass house condition to study the effect of *Trianthema portulacasturm*, *Boerhaavia diffusa*, *Echinochloa sp.* and *Amaranthus viridis* on germination, dry matter production (DMP) and vigourous index (VI) of *Amaranthus viridis*. An aqueous extract of 10 percent concentration (24 hours soaked) of root, stem, leaf, and whole plant of each weed were prepared separately and the experiments were also conducted separately besides the control (tap water) was maintained for comparison.

*Trianthema portulacastrum* weed extracts affected all the parameters studied significantly. A minimum of 45.2% germination for root extract, 2.2 mg of DMP, and 106.2 of VI for the leaf extract were obtained as against the control of 65.5%, 3.0 mg and 198.9 respectively. *Echinochloa* sp. did not affect the germination percentage, but there was an increase in value of DMP (3.5 mg) and VI (271.1) for the whole plant extract which was comparable to control.

Regarding the effect of *Boerhaavia diffusa*, plant extracts had no affect on the germination percentage, DMP and VI of seedling. The autotoxic effect indicated that the germination percentage was significantly affected, but effect in the VI and DMP were nonsignificant.

## 3.4 ALLELOPATHIC EFFECT OF *AGERATUM CONYZOIDES* L. AND *EUPATORIUM ODORATUM* L. ON GERMINATION AND SEEDLING GROWTH OF LINSEED (T-397)

S. K. Sharma and C. S. Patel
Division of Agronomy, ICAR Res. Complex for NEH region, Barapani.

The allelopathic effect of *A. conyzoides* L. and *E. odoratum* L. in various concentrations (5 ppm-30 ppm) were studied on germination and growth of linseed seedlings. Germination percentage, growth of the seedlings, and fresh and dry weights of the seedlings were not much affected upto 15 ppm weed extracts. However, concentrations above 15 ppm significantly inhibited germination and growth of seedlings by both the weed extracts. Leaf development and fresh weight of the seedlings were significantly inhibited by both the weed species extracts at higher concentrations (above 15 ppm) of ethanol extracts as compared to aquous extract.

## 3.5 BIOLOGICAL CONTROL OF WEEDS IN PAPPAYA

Sandhya Rani and L. Veeramiah
TN G. D. Naidu Agri. University, Coimbatore.

The residual effect of pappaya root exudate on weed flora such as *Parthenium hysterophorus, Amaranthus viridis, Trianthema portulacastrum* and *Echinochola colona* was studied and it was observed that these root exudates had inhibitory effect or total control on these weeds because of the presence of *Benzyl isothiocate* and *phenols.* The root exudates of pappaya greatly enhanced the bacterial, fungal, azotobactor and actinomycetese population. It was concluded that the root exudates of pappaya had dual role viz., beneficial effect to the crop plants and inhibitory effect on weed flora.

# 4. WEED BIOLOGY

## 4.1 PHOTOSYNTHETIC EFFICIENCY OF WHEAT AND *PHALARIS MINOR* IN WHEAT-*PHALARIS* ECOSYSTEM

J. P. Tiwari and S. N. Murti
J. N. Krishi Vishwa Vidyalaya, Jabalpur, M.P.

Photosynthetic efficiency and other physiological parameters of *Phalaris minor* Retz. and wheat were studied under wheat-*Phalaris* ecosystem and their pure stands. The results revealed that the unshaded leaves of *Phalaris minor* under pure stand had higher photosynthetic rates ($16.10 \pm 1.64$ mg $CO_2/s/m^2$) than shaded leaves in wheat ecosystem (2.25 mg). The unshaded wheat leaf had the highest apparent photosynthetic rate ($20.37 \pm 1.87$ mg $CO_2/s/m^2$) while the middle leaf had lower efficiency ($2.15 \pm 0.68$). The stomatal conductance was greater in *Phalaris minor* under both unshaded and shaded conditions as compared to wheat. The growth in terms of height, leaf area, and the net dry matter/plant in wheat was more as compared to *Phalaris minor* grown either in pure stand or with wheat. Efficacy of isoproturon at 0.5, 0.75 and 1.0 Kg/ha applied post emergence against *P. minor* was 92% when sprayed on wheat + *P. minor* as compared to its pure stand (50%).

## 4.2 CORRELATION AND REGRESSION ANALYSIS OF WHEAT-*PHALARIS* ECOSYSTEM

D. C. Bhatt and J. P. Tiwari
J. N. Krishi Vishwa Vidyalaya, Jabalpur, M.P.

The correlation and regression analysis of wheat-*Phalaris minor* ecosystem revealed that total weed population and weed biomass had significant negative correlation with grain yield ($r = -0.86$). The linear regression analysis revealed that with increase of one weed plant/$m^2$, the predicted reduction in wheat yield was 2.63 Kg/ha. The quadratic curve indicated greater depression in yield at 300 to 500 weed plants/$m^2$. Amongst the weed species noted in the wheat ecosystem, greater reduction in yield could be predicted by *Medicago denticulata*, followed by *Melilotus* spp., *Trifolium flagiferum* and *Phalaris minor* Retz., the reduction in yield could be to the extent of 41, 39, 25 and 4 Kg/ha with increase in one plant/$m^2$, respectively. Standardized partial regression revealed higher negative coefficient of *P. minor* followed by *Medicago denticulata*. The reduction in yield by 0.62 Kg/ha could be predicted with increase of one kilogram weed dry weight per hectare.

## 4.3 CORRELATION AND REGRESSION ANALYSIS OF RICE-WEED ECOSYSTEM UNDER TRANSPLANTED CONDITION

K. M. Dubey and J. P. Tiwari
J. N. Krishi Vishwa Vidyalaya, Jabalpur, M.P.

The correlation analysis revealed that amongst different species of weed ecosystem, *Caesulia axillaris* had high significant negative correlation (r=–0.83) with rice yield followed by *Ammannia baccifera* (–0.81), *Cyperus difformis* had higher negative correlation coefficient (–0.54) with rice yield followed by *Ammannia baccifera* (–0.53) *Monochoria vaginalis* (–0.43), *Caesulia axillaris* (–0.43) and *Commelina communis* (–0.40). These weeds had significant positive correlation with total weed biomass. The regression model and yield on weeds predicted the reduction in rice-yield by 23, 19, 16, and 12 Kg/ha with increase of one plant/$m^2$ each of *Cyperus compressus*, *Commelina communis.*, *Caesulia axillaris* and *Ammannia baccifera*, respectively in first location. Based on second location, the greater reduction in yield (591 kg/ha) was predicted with increase of one plant of *Caesulia axillaris*/$m^2$.

## 4.4 CORRELATION AND REGRESSION ANALYSIS OF SOYBEAN-WEED ECOSYSTEM

K. K. Jain, J. P. Tiwari and T. R. Sahu
J. N. Krishi Vishwa Vidyalaya, Jabalpur, M.P.

The correlation of different growth and yield parameters with yield indicated that total crop biomass had the highest correlation coefficient amongst different growth parameters (0.82), followed by branches/plant (0.64) and LAI (0.59. The step down regression analysis revealed that crop biomass was most important parameters contributing for grain yield, followed by LAI.

The yield was linearly decreased with increased weed dry weight. The reduction could be predicted by 0.13 Kg/ha with increase of one Kg weed dry weight/ha. Among weed species, the highest negative correlation was noted with *Commelina benghalensis* (–0.75) followed by *Euphorbia geniculata* and *Echinochloa crusgalli* (–0.70). *Euphorbia geniculata* had the highest positive correlation with weed dry weight, followed by *Psoralea corylifolia*, *Echinochloa crusgalli* and *Rungia repens*. The stepdown regression analysis also revealed that *Psoralea corylifolia* was the greatest contributor for weed dry matter.

## 4.5 NEW WEED HOSTS FOR RICE SHEATH BLIGHT FUNGUS

K. Sivaprakasam, K. Seethoraman and K. T. Subbaraja
Agric. College and Res. Insti., Madurai, T. N.

Rice Sheath blight disease incited by *Rhizoctonia salani* is assuming serious proportions in Vaigai-Periyar Ayacut area. The common cultivars viz., ADT 36, Jaya, ADT 39, ASD 16, IR 50 etc. were severely affected. The maximum disease intensity of 7 grade (on 1-9 scale) was recorded in variety ADT 36. Grassy weeds like *Cyperus rotundus, Echinochloa colona, Cynodon dactylon, Panicum repens* and *Brachiaria mutica* were found to be infested with this disease. These grasses on isolation in artificial medium yielded the causal fungus *R. solani,* The pathogen was multiplied in autoclaved straw bits and artificially inoculated to all the grasses under pot culture. The symptoms were expressed after 15-20 days and the symptoms were exactly similar to that of natural infection. The fungus was reisolated again from these grasses. Cross inoculation studies conducted on rice plant also developed the disease with typical symptoms. These collateral hosts are the first record in Tamil Nadu.

## 4.6 IN VITRO ANTIMYCOTIC ACTIVITY OF AN OBNOXIOUS WEED-*PARTHENIUM HYSTEROPHORUS* L.

M. K. Rai and M. L. Sharma
Daniolson College, Chhindwara, M.P.

*In vitro* activity of leaf-extract of *Parthenium hysterophorus* was evaluated against *Microsporum gypseum. Trichophytan mentagrophytes, T. rubrum, Epidermophytan floccosum, Aspergillus fumigatus,* and *Rhizopus oryzae.* The maximum inhibition was sown by *E. floccosum* (91%) followed by *M. gypseum* (80%), *T. mentagrophytes* (76%) and *A. fumigatus* (70%).

## 4.7 EFFECT OF SOIL SOLARISATION ON WEED EMERGENCE

Binod Kumar, N. T. Yaduraju and K. N. Ahuja
Division of Agronomy, I. A. R. I., New Delhi.

Soil solarisation is a method of heating soil by tarping it with polyethylene mulch to trap solar radiation. The resultant increase in soil temperature was reported to be lethal to many soil-inhabiting pests including weeds. In an experiment conducted at New Delhi, it was noticed that mulching sandy loam soil with transparent polyethylene of 100 $\mu$ thickness during May-June, 1990 increased the temperature of surface soil by 5-12°C over unmulched soil. Solarisation effect was higher in

wet soil but decreased with soil depth. Weed emergence following irrigation at the end of solarisation treatment of four weeks gave over 90% control of annual weeds such as *Trianthema portulacastrum, Acranchne racemosa, Echinochloa colona* and *Dactyloctenium aegyptium.* Solarisation for 2 weeks was less useful. Although *Cyperus* sp. emerging from seeds were well controlled, solarisation had opposite effect on *Cyperus* coming from rhizomes/tubers. Early growth of soybean which was sown after soil solarisatton was better in solarised plots.

## 4.8 BRIEF NOTE ON *STRIGA* AND *OROBANCHE* IN KAHNATAKA

M. M. Hosmani and H. Hanumanthappa
Univ. of Agric. Sciences, Dharwad, Karnataka.

*Striga asiatica* (L.) Kuntze; a noxious root parasite having wide geographical distribution, causing severe damage to host cereals produce several hundred thousand microscopic and dormant seeds. These seeds require a state of preconditioning (high moisture and optimum temperature of 27°C for a period of 10–12 days) before germination. Based on the review various workers have indicated that root exudates of ground–nut, maize, redgram and cotton and growth regulator like kinetin stimulated *Striga* germination. Higher doses of nitrogen reduced the incidence of this weed but addition of compost alone increased the population of *Striga.* Trap crops like, cowpea, groundnut, linseed and cotton reduced the *Striga* population in the succeeding sorghum. The direct spraying of ammonium sulphate (5 to 10%) and 2, 4–D at flowering stage resulted in excellent control of *Striga* without showing any adverse effect of sorghum. The pot culture experiments have indicated that maximum germination of *Orobanche* was observed with chilli (10%). Based on sandwitch filter paper disc method the germination in blackgram, greengram, horsegram, cowpea, sesamum and sunhemp ranged from 2.6 to 5.0%.

## 4.9 NUTRITIVE VALUE OF COMPOST FROM SOME WEEDS OF HYDERABAD, A. P.

K. Nagamani and V. Rajagopal
College of Agric. Rajendra Nagar, Hyderabad, A. P.

Eighteen weed species of *kharif* season (50 kg) were collected from waste lands and composted in shallow pits ($1 \times 1 \times 0.25$ M) using cowdung+urea (5%) as starter. The COD of weed residues was 900–1400 mg/g which fell to 300–400 mg/g in 80–120 days. The C:N ratio also narrowed down to 10–2–3 in final composts, indicating their faster decomposability as compared to paddy straw. The weed composts had a higher N (0.75–1.60%), P (0.3–0.5%) and K (1.5–2.0%) contents as compared to

FYM or composts of other sources. The composts made from *Tephrosia purpurea* and *Lagasca mollis* had higher N (1.60%) while that from *Euphorbia geniculata* and *Commelina benghalensis* had higher P (0.5%) and the K content was higher (2.2%) in compost of *Cyanotis axillaris* and *Allmania nodiflora*. In a pot culture, the manurial value of these composts were evaluated with maize. The dry matter yield and nutrient uptake was increased due to addition of these manures, which was 35–70% as compared to that of fertilizer treatment (100%).

## 4.10 BIOLOGY AND CONTROL OF *HYDRILLA VERTICILLATA*

R. S. Balyan, S. Singh and R. S. Dhankar
Deptt. of Agronomy, Haryana Agric. Univ., Hisar.

Experiment on the biology and control of Hydrilla were carried out in cemented aquatic pits of 1000 L water capacity (1.0 m deep and 1.0 m diameter) at Hisar during *kharif* seasons of 1990 and 1991. The fresh weight of Hydrilla increased with the increase in the depth of standing water from 25 cm to 100 cm and with the increase in the time of observation. After 6 months of planting the increase in fresh weight was 208, 247 and 250 times more to initial weight with 25, 50 and 100 cm depth, respectively. Application of Ally (metsulfuron) at 0.005, 0.01 and 0.02 ppm effectively controlled the *Hydrilla*.

## 4.11 AN ANATOMICAL STUDY OF HOST RANGES OF PARASITE–*CUSCUTA*

M. K. Rapolum, S. M. Kondap and Madhav Rao
College of Agric., Rajendra Nagar, Hyderabad, A. P.

*Cuscuta* is an obligate stem parasite, establish their contact with host through specialised organ called "*Haustoria*". The species is known to establish their haustorial connection with host plants at varied time intervals, and differences in tolerance to parasite. The present Anatomical study was carried out at Hyderabad. The study indicated that *Cascuta* did not require any host stimulus for germination which was contrary to other parasites viz. *Striga* and *Orabanche*. Among the pulse crop studied for host parasite relationship, the degree of penetration was higher in green-gram and the haustorium reached the vascular tissue earlier causing greater damage to the host, compared to blackgram. This is due to the nature of the stem i.e. nodulation on blackgram stem caused a barrier in penetration of parasite haustoria into the host plant.

In oilseed crops, the haustoria penetration was deeper in sunflower due to presence of stomata on epidermal layer of stem. The penetration of the parasite was not found in cereals viz. rice, wheat. It may be due to several layers of sclearchymatic tissue below the epidermal layer.

## 4.12-PRELIMINARY OBSERVATIONS ON THE MANAGEMENT OF *PARTHENIUM HYSTEROPHORUS* L. AND *EICHHORNIA CRASSIPES* L.

L. P. Kauraw and D. K. Pandey
National Centre for Weed Science, Adhartal, Jabalpur, (M.P.).

*Parthenium hysterophorus* growth could be biologically controlled by inoculation of *Cuscuta reflexa* Roxb. twines. The plants of *Parthenium* were inoculated at vegetatively grown up stage before initiation of flowering. The *Cuscuta* plants gradually coiled over the *Parthenium* plants resulting in loss of growth, flower and seed formulation. Finally, the *Parthenium* plants were killed. Subsequently, probably due to non availability of the host, the *Cuscuta* plants also died. This relationship may have implications of significance in population dynamics of *Parthenium*. Spraying extracts of phyllody disease infected *Parthenium* plants on healthy plants at vegetative stage supressed the flowering and caused the phyllody disease in the healthy once in pot experiments. *Parthenium* was completely controlled by spraying diammonium phosphate at 200 gm/litre of water. There was no recovery of the weed in the season. Similarly, spraying the weed with Orthophosphoric acid at the rate of 25–30 ml/litre of water burnt the weed within a period of 24 hours and there was no further re-growth.

Growth of *Eichhornia crassipes* L. was supressed completely by a spray of plant extract of *Parthenium* at the rate of 1.5 to 2.0 kg green matter extract/litre of water in pot culture. Following the spray the leaves showed burning symptoms within 2 days. There was no recovery subsequent to the spray.

## 4.13 INCORPORATION OF WASTELAND WEEDS AS GREEN LEAF MANURE IN RICE

A. Balakrishnan, P. Jayapaul, S. Jeyaraman and V. Veerabadran
Tamilnadu Agril. University, Coimbatore.

The following wasteland weed viz., *Parthenium hysterophorus, Eichhornia crassipes, Ipomoea carnea,* were incorporated 15 days before transplanting at the rate of 12.5 t/ha with 75% of recommended inorganic nitrogen/ha during the second season of 1989-90 with rice IR 20 and compared with the application of 100%

recommended N and no green leaf manure. The results revealed that among the wasteland weeds, incorporation of *Ipomea carnea* recorded higher grain yield of 6538 kg/ha but was comparable with the application of 100% recommended N/ha and no green leaf manure, with the saving of 25% of applied inoragnic fertilizer N/ha.

## 4.14 ROLE OF WEEDS IN THE EPIDEMIOLOGY OF PLANT VIRUSES

A. A. Zaidi, R. D. Singh, R. Ram, SNH Zaidi, & D. Mukherjee
CSIR Complex Palampur, (H. P.).

A survey of weeds growing in Ornamental crops & near by area was carried-out, during 1989-91, to study the role of weeds as natural reserviors of viruses infecting ornamental crops. The weeds showing typical virus symptoms (mosaic, mottling, chlorosis, crinckling, leaf deformation, dwarfing, yellowing, etc.) were collected and tested to ascertain the presence of Bean yellow mesaic virus (BY MV), Cucumber mosaic virus (CMV), Potato virus Y (PVY) and Tobacco mosaic virus (TMV), The tests revealed occurrence of BYMV in *Trifolium repens, Melilotus officinalis :* CMV in *Mentha sylvestris, Bidens pilosa* ; PYV & TMV in *Solanum nigrum, Solanum viarum, Verbascum thapsus, Verbena bonariensis* and *Ageratum conyzoides.* The study, lso revealed that weeds, perennial species in particular, help virus (s) to sustain even in fallow periods. Thus, emphasising of need of combating weeds in virus management.

## 4.15 CARPET WEED GROWTH AS INFLUENCED BY WEED MAINTENANCE IN MAIZE

R. C. Tyagi, A. K. Tyagi, R. K. Malik and B. R. Singh
Deptt. of Agronomy C. C. S. Haryana Agril. Univ., Hisar

Field experiments were carried out at crop Research Farm, Haryana Agricultral University, Hisar for consecutive *kharif* seasons of 1987 and 1988. Plots were maintained weed free for initial 15, 30, 45 and 60 DAS and then weeds were allowed to grow. In the second set of treatments weeds were allowed to grow for initial 15, 30, 45 aud 60 DAS. These treatments were compared with a weed free and weedy check. The grain yield of maize was found to be positively correlated with the population and dry weight of weeds comprising of carpet weed *(Trian thema portulacastrum)* and nut sedge (Cyperus rotundus). Based on the average yield it was found that first 3 to 4 weeks were most critical for weed crop competition. Keeping the plots weedy for initial 30 days allowed yield loss of 1169 and 1332 kg/ha during 1987 and 1988, respectively.

# 5. WEED MANAGEMENT

## 5.1 RICE

### 5.1.1 HERBICIDAL MANIPULATION TO IMPROVE EFFICIENCY OF FERTILIZER NITROGEN IN DIRECT SOWN RICE

J. S. Urkurkar and B. L. Chandrakar
Indira Gandhi Krishi Vishwa Vidyalaya, Raipur, M.P.

A field experiment was conducted during *Kharif* 1989 with five treatments of nitrogen application time and three treatments of weed control. There was dominance of 8 weed species in the experiemental field viz., *Echinochloa colona* (30%), *E. crusgalli* (10%), *Ischaemum rugosum* (15%), *Eleusine indica* (10%), *Cyperus iria* (15%), *Fimbristylis littoralis* (10%), *Eclipta alba* (5%) and *Caesulia auxillaris* (5%). Application of thiobencarb (1.0 and 1.5 kg/ha) proved effective against monocot weeds but not against broad leaf weeds. Weed control by thiobencarb at 1.5 kg/ha and nitrogen application in three splits with 20% as basal, 50% at tillering and 30% at panicle initiation produced significantly higher grain yield (4480 kg/ha) than other treatment combinations. The grain yield of rice in the weedy check ranged from 1972 to 2516 kg/ha. Nitron applied at sowing favoured weed growth.

### 5.1.2 NUTRIENT UPTAKE AS INFLUENCED BY SEEDING METHODS AND WEED CONTROL IN UPLAND RICE

K. K. Purohit, B. L. Chandrakar and M. C. Bhambrai
Indira Gandhi Krishi Vishwa Vidyalaya, Raipur, M.P.

Field experiments were conducted during *Kharif* 1986 and 1987 at IGKVV, Raipur to study the influence of method of seeding and weed control on nutrient uptake by weeds and the crop. Treatments included three methods of sowing (broadcast, drilling and in plough furrow line) and four weed control treatments (butachlor at 2 kg/ha applied 6 DAS, butachlor at 1.0 kg/ha applied 6 DAS followed by one hand weeding at 30 DAS, two hand weeding at 30 and 50 DAS and an untreated control). Total nutrient uptake by rice were greater when rice was sown by drilling or in plough furrow line. Nutrient uptake were significantly greater in plots where two hand weedings were given or where butachlor was supplemented with one weeding at 30 DAS. Maximum nutrient uptake by weeds were recorded in the broadcast sowing method and in the untreated check plots. The yield attributing characters and grain yield were influenced favourably when crop was sown by drilling method over broadcasting and seeding in plough furrow line. Two hand weedings at 30 and 50 DAS produced significantly higher grain yield and superior yield attributes over other weed control treatments.

## 5.1.3 EVLUATION OF WEED CONTROL MEASURES IN TRANSPLANTED RICE (*ORYZA SATIVA* L.)

Ghanshyam Kulmi
Deptt. of Agronomy, JNKVV, RRS-Sidhi, M.P.

In a field experiment conducted at JNKVV, Jabalpur, uncontrolled weeds (50% grasses, 40% broad leaf weeds and 10% sedges) reduced the grain yield of rice by 17%. Rotary weeding given 35 DAT was the cheapest method and gave maximum yield (2837 kg/ha). Pretilachlor at 1.0 kg/ha or piperophos at 1.25 kg/ha applied post emergence were the best alternative if rotary weeder is not available. Pendimethalin at 1.0 kg/ha or thiobencarb at 1.5 kg/ha applied pre emergence were also considered to be remunerative. Oxadiazon proved phytotoxic to rice.

## 5.1.4 INTEGRATED WEED MANAGEMENT UNDER VARIOUS METHODS OF RAINFED RICE CULTIVATION

B. Behra and J. C. Prusty
CRS Orissa Univ. of Agric. and Tech., Bubneshwar, Orissa.

An experiment was conducted at Bhubneswar during *Kharif* 1987 and 1988 to find out appropriate weed control measures under various systems of rice cultivation. Three planting methods (line sowing, broadcasting and transplanting) each with five different methods of weed control (manual, mechanical *beushaning-khelua*, chemical and chemical+other methods) were tested in a randomised block design. Plots where mechanical+hand weeding (25+40 DAE) were given in drilled-rice recorded maximum grain yield of 3556 kg/ha and a net profit of Rs. 5418/- ha. Under broadcast rice, manual weeding (25+40 DAE) produced maximum grain yield of 3666 kg/ha with a net profit of Rs. 5525/-. Butachlor at 2.0 kg/ha applied 4 DAT proved as effective as two hand weedings in transplanted rice.

## 5.1.5 INTEGRATED WEED MANAGEMENT IN RAINFED DIRECT SEEDED RICE

J. C. Prusty and B. Behera
CRS Orissa Univ. of Agric. and Tech., Bhubneswar

An experiment was conducted at Bhubneshwar during *Kharif* 1988 and 1989 to findout the relative efficiency of herbicide alone and in combination with conventional cultural operation to control the weeds in direct sown rainfed rice. On an average, summer ploughing+*beushaning* (30 DARE)-*khelua* (37 DARE)+2 manual weedings at 40 and 60 DARE recorded the maximum grain and straw yield of 3910

and 4940 kg/ha, respectively. This cultural practice supplemented by *khalibachha* (20 DARE)+handweeding (40 DARE) proved equally effective. Butachlor supplemented by *beushaning-khelua*, *khalibachha* and hand weeding coinciding with the time of *beushaning-khelua* recorded grain and straw yield of 3630 and 4680, 3520 and 4590 and 3690 and 4790 kg/ha, respectively. From the economic point of view it was clear that in labour scarcity situation butachlor supplemented by *beushaning-khelua* or *khalibachha* can be resorted to.

### 5.1.6 CHEMICAL WEED CONTROL IN TRANTPLANTED RICE

S. N. Jena and S. S. Mishra
RRS, Chiplima, Sambalpur, Orissa.

Field experiments were conducted at Chiplima during the wet season of 1988 and dry season of 1989 under transplanted conditions. The yield losses due to unchecked weed growth were 37.8% and 17.4% in wet and dry seasons, respectively. The predominant weeds in transplanted rice comprised mainly of *Cyperus iria*, *C, difformis*, *Scirpus supinus*, *Fimbristylis miliacea*, *Echinochloa crusgalli*, *Paspalum distichum*, *Ludwigia parviflora*, *Spenoclea zeylanica* and *Marsilia quadrifolia*. Butachlor or anilofos alone applied 6 days after transplanting (DAT) were effective on the above weeds. Application of Dowco 356, 6 DAT showed phytotoxicity on rice seedlings and hence reduced the grain yield. Butachlor treated plots registered a higher grain yield than other herbicides.

### 5.1.7 EFFECT OF HERBICIDES ON *ECHINOCHLOA COLONA* AND *DIGITARIA* SPP UNDER RAINFED UPLAND RICE ECOSYSTEM

S. N. Jena and S. S. Mishra
Regional Research Station, Chilplima, Sambalpur, Orissa

Field experiments were conducted at Chilplima during *Kharif* 1989 and 1990 under rainfed upland conditions to evaluate the performance of butachlor, pendi methalin, pyrazosulfuromethyl and 2, 4-D against two hand weeding given 20 and 40 days after rice emergence (DARE) and weed free check. Pendimethalin was most effective against *Echinochloa colona* and *Digitaria* spp. Pyrazosulfuromethyl+1 hand weeding at 30 DARE gave better control of weeds than other herbicides or their combinations.

### 5.1.8 EFFECT OF TILLAGE AND WEED CONTROL ON YIELD AND ECONOMICS OF DIRECT SEEDED AND TRANSPLANTED RICE

Salik Ram and S. P. Patel
Central Rice Research Institute, Cuttack, Orissa

A field experiment was conducted to compare the effect of tillage (one, two and three criss cross ploughing) and weed control (chemical, manual, mechanical and unweeded), on rice grown under direct seeded and transplanted condition at Cuttack during *Kharif* 1987. Weed population was less in transplanted rice compared to direct seeded. Increasing tillage operation through criss cross ploughing using tractor drawn disc puddler decreased weed population by 70.6% and increased the yield of transplanted rice by 7.8% over the conventional tillage. Manual weeding proved to be more effective than chemical or mechanical method. The increase in the grain yield was more in direct seeded rice (725 kg/ha) than in the transplanted rice (250 kg/ha). Three criss cross ploughing with manual weeding were beneficial for higher productivity of rice under direct seeded or transplanted conditions.

### 5.1.9 STUDIES ON THE EFFECT OF CULTURE AND CHEMICAL METHODS OF WEED CONTROL IN TRANSPLANTED RICE

S. S. Mishra, S. J. Singh, K. K. Sinha and S. S. Sinha
Deptt. of Agronomy, Rajendra Agric. Univ., Pusa, Bihar

Field studies were conducted at RAU, Pusa (Samastipur) during *kharif* 1988 and 1989 on the loamy sand soil. The experiment comprised of three cultural and six herbicidal treatments alongwith a weedy check. Butachlor or thiobencarb each at 1.5 kg/ha, pendimethalin at 1.0 kg/ha, anilofos at 0.5 kg/ha, and oxyflourfen at 0.15 kg/ha each applied pre-emergence gave four to six fold reduction in the dry weight of weeds. The grain yield following the treatment of butachlor+one weeding was more than other treatments.

### 5.1.10 EFFECT OF WEED MANAGEMENT AND FERTILITY LEVELS ON WEED GROWTH AND GRAIN YIELD OF RICE

S. J. Singh, S. K. Mishra, K. K. Sinha, S. S. Sinha and S. S. Mishra
Deptt. of Agronomy, Rajendra Agric. Univ., Pusa, Bihar

A field experiment on weed control and fertility management in rice in calcareous soil was conducted at Pusa during *kharif* 1989 and 1990. The experiment comprised of three fertility levels (no fertilizer, 50% and 100% of recommended dose) and six weed control treatments, viz. butachlor at 1.5 kg/ha, thiobencarb at 1.5 kg/ha, anilofos at 0.40 kg/ha alongwith one hand weeding and a weedy check. The interaction of fertility levels and weed control showed that the maximum grain yield was recorded where 80, 40 and 20 kg N, P and K/ha were applied and one hand weeding was given.

## 5.1.11 EFFECT OF WEED MANAGEMENT ON WEED DYNAMICS IN UPLAND RICE

R. P. Sinha and S. K. Sinha
Deptt. of Agronomy, Banaras Hindu Univ., Varanasi, U.P.

The field experiment was conducted during *kharif* 1988 and 1989 to study the effect of weed management on weed dynamics in upland rice. Observations from unweeded plots indicated that population of sedges and *Cynodon dactylon* decreased while population of *Echinochloa* spp. and broad leaf weeds increased from first year to second year. Different weed control treatments did not show any marked effect on variation of grassy weeds except 2, 4–D at 1.0 kg/ha where the population increased from 75.3 to 114.1/$m^2$. However, the sedges and broad leaf weeds population were lower in second year compared to first year, irrespective of treatment. 2, 4–D at 1.0 kg/ha proved to be most effective in lowering down the sedges and broad leaf weeds compared to other treatments.

## 5.1.12 EFFECT OF METHODS OF RICE-CULTURE, NITROGEN LEVELS AND WEED CONTROL ON RICE AND ASSOCIATED WEEDS IN NORTH BIHAR

S. S. Sinha, N. N. Sharma, S. J. Singh, K. K. Sinha and S. S. Mishra
Deptt. of Agronomy, Rajendra Agric. Univ., Bihar

An experiment was carried out with two methods of rice culture (direct seeded and transplanted); three nitrogen levels (40, 80, 120 kg/ha) and five weed management system (hand weeding, butachlor 1.5 kg/ha, thiobencarb 2 kg/ha, oxadiazon 0.75 kg/ha and a weedy check) were compared in a split design in 1986-87. Transplanted crop recorded significantly lower weed dry weight than direct seeded crop. Significantly lower weed dry weight was also recorded under all the weed management system than unweeded control. Increasing levels of nitrogen increased the weed dry matter production. Higher level of nitrogen recorded significantly more effective tillers, panicle length and other indices, Maximum grain yield was recorded under transplanted condition with hand weeding and 120 kg N/ha in both the years.

## 5.1.13 HERBICIDE AND FERTILIZER COMPATABILITY UNDER DRILLING AND *LEHI* METHODS OF SOWING IN RICE AT DIFFERENT LEVELS OF NITROGEN

S. P. Kurchania and K. K. Samaiya
Deptt. of Agronomy, JNKVV, Jabalpur, M.P.

Effect of weed control treatments was evaluated under three nitrogen levels (30, 60 and 90 kg/ha) in drill and *Lehi* methods of sowings at Jabalpur. Density and dry weight of weeds were lower in *Lehi* method of sowing. Nitrogen rates did not influence the density and dry weight of weeds. Performance of butachlor or thiobencarb applied at 2.5 and 3.0 kg/ha were similar in spray or broadcast method of application. The herbicides produced similar weed control as was obtained with hand weeding at 30 DAS.

### 3.1.14 WEED CONTROL IN DIRECT SEEDED FLOODED RICE

M. Z. Siddiqui and P. A. Sarkar
Allahabad Agric. Institute, Allahabad, U. P.

The herbicides applied alone and in combination with one hand weeding at 15 DAS and weeding alone were compared. Based on one year data, thiobencarb at 1.0 kg/ha allowed maximum increase in the grain yield of rice. 2, 4-D applied in plots hand weeded at 15 DAS provided excellent control of weeds.

### 5.1.15 INTEGRATED WEED MANAGEMENT IN RICE BASED CROPPING SYSTEMS

G. K. Choudhury, P. Pothiraj, A. Balasubramanian and N. Kempuchetty
Tamilnadu G. D. Naidu Agric. Univ., Coimbatore.

Field experiments were conducted during 1986-87 and 1987-88 in wetlands at Coimbatore to investigate the influence of methods of land preparation, nitrogen management practices and of weed control in rice-rice-greengram system to evolve a suitable integrated weed management practice. The results indicated that paraquat at 1.0 kg/ha applied pre-plant and summer ploughing provided a broad spectrum weed control, Molinate at 3.0 kg/ha applied post emergence controlled sedges and broad leaf weeds. The investigations conclusively proved that pre-plant spray of paraquat at 0.1 kg/ha, skipping basal application of N for 15 days and pre-emergence butachlor at 1.0 kg/ha or hand weeding twice could be adopted as economically effective weed management practices for higher productivity in rice-rice-greengram system.

### 5.1.16 INFLUENCE OF TIME OF APPLICATION OF PRE-EMERGENCE HERBICIDES IN SEMI-DRY RICE

S. Ramiah and S. Porpavai
Tamilnadu G. D. Naidu Agric. Univ., Madurai.

Pendimethalin at 1.25 kg/ha, oxyfluorfen at 0.10 kg/ha, oxadiazon at 0.75 kg/ha and thiobencarb at 1.5 kg/ha applied 3, 5, 7, 9 or 11 days after sowing (DAS) were compared in a field experiment in 1989 at Madurai. Oxyfluorfen applied 3 or 5 DAS was phytotoxic but late applications were safe to rice. In general, effect of herbicides were more when applied upto 7 DAS. Application of herbicides on 7th day was found to be the best time of application.

### 5.1.17 WEED AND NITROGEN MANAGEMENT FOR SEMI DRY RICE

P. Jayapaul, S. N. M. Ramachandra Boopathi, S. Ganeshraja, A. Balakrishnan and V. Veerabadran
Tamilnadu G. D. Naidu Agric. Univ., Madurai

An experiment was conducted at Madurai, to study the improved agro-techniques like integrated weed management coupled with suitable N management in semi dry rice (var. PMK 1). Experimental results revealed that hand weeding given twice on 25 and 40 DAS registered higher grain yield (2360 kg/ha), but was comparable with pre-emergence application of thiobencarb at 1.5 kg/ha followed by one hand weeding given on 25 DAS (2080 kg/ha) by way of effective control of weeds in the early period of crop-weed competition. Thiobencarb did not cause any adverse effect on the establishment of *Azospirillium* biofertilizer applied as seed treatment (1 kg/ha) and soil application (5 kg/ha).

### 5.1.18 WATER AND WEED MANAGEMENT IN DIRECT SEEDED LOWLAND RICE

S. Krishnasamy, A. Mohmed Ali and R. Balasubramanian
Deptt. of Soils and Agronomy, Agric. College Res. Institute, Killikulum, T. N.

A study was taken up at Killikulam to evolve suitable water management, tillage practices and optimum time of herbicide application for managing weeds during *kharif* 1990. The major weeds were *Echinochloa colona*, *Echinochloa crusgalli*, *Marselia quadrifolia*, *Sphenoclea zeylanica*, *Cyperus difformis* and *Cyperus iria*. Among the tillage and water management practiced studies, puddling 4 times with continuous submergence recorded higher grain yield of rice (5230 kg/ha) which was comparable with puddling 4 times with submergence to disappearance of water. The weed dry matter was lower at 30 DAS in the above practices. Among weed control treatments, hand weeding twice at 20 and 30 DAS recorded higher grain yield and this was comparable with application of thiobencarb (1.25 kg/ha) at 6th or 8th days after sowing with one hand weeding on 35 DAS followed by propanil (1.5 kg/ha) at at 15 DAS with one hand weeding on 35 DAT. The weed dry matter was lower in these treatments in the respective order. Application of thiobencarb at last puddling affected the germination of rice and reduce the grain yield of direct seeded rice.

## 5.1.19 EFFECT OF TIMING OF PRE-EMERGENCE HERBICIDE APPLICATION ON DIRECT SEEDED PUDDLED RICE

A. Balakrishnan, P. Jayapaul, S. Jeyaraman and V. Veerbadran
Tamil Nadu G. D. Naidu Agric. Univ., Madurai.

A field test was conducted during rabi 1990-91 to determine the effect of pre-plant application of butachlor, thiobencarb and pendimethalin. All the herbicides were applied before sowing and on the day of sowing and compared with the application of butachlor on 8th day after sowing to study the phytotoxicity and weed control efficiency. This study revealed that the application of pendimethalin at 1 kg/ha at 2 days before sowing was effective for weed control with less phytotoxic effect on rice seedlings. The application of pendimethalin before sowing caused a decrease in weed density and weed dry weight and also coupled with healthy and better establishment of seedlings than application after sowing.

## 5.1.20 INTERATION OF CULTURAL MANAGEMENT AND CHEMICAL CONTROL OF WEEDS IN BROADCAST-SEEDED SEMI-DRY RICE

O. S. Kandasamy and S. P. Palaniappan
Tamilnadu G. D. Naidu Agril. Univ., Coimbatore.

This study was conducted at Aduthurai to find out a suitable method of weed control in dry seeded rice during *kuruvai* (Jun-Sept) and *samba* (Sept-Feb) and wet seeded rice in *thaladi* (Oct-Mar). Integrated weed control methods were evaluated for direct sown rice involving five herbicides applied pre emergence followed by hand weeding and applied early post emergence in combination with 2, 4-D and two hand weeding, compared with unweeded check with three moisture regimes. Weed density was highest during *samba*, because of favourable moisture and climatic conditions. Irrespective of the season, among the monocots *E. colona* was the major species (50-80%), *C. rotundus* (50-60%) dominated the *sedges* and *Ludwigia adscendens* and *Marsilea quadrifolia* (30-50%) dominated the broadleaf weeds.

The lower weed growth and greater grain yields were obtained on soil continuously flooded (4700 kg/ha) and alternately flooded (4500 kg/ha) water regimes compared to soil kept under saturation (3000 kg/ha). Two hand weedings or herbicides applied pre-emergence followed by one late hoeing provided similar grain yields (4700 to 4100 kg/ha).

## 5.1.21 PRE AND POST PLANTING MEASURES FOR WEED CONTROL IN RICE

A. Alwar Arunachalam, R Balasubramaniam, S. N. M. Ramachandra Boopathi and A. Mohamed Ali
Deptt. of Soils and Agronomy, Agric. College Res. Institute, Killikulum, T.N.

An experiment was designed to evolve suitable pre and post planting methods of weed control in rice including summer ploughing, paraquat spray (Preplant), use of pre-emergence herbicides (Post planting) in comparison with farmer's method of 4 puddling and two hand weedings as pre and post planting methods respectively. Summer ploughing completed with two puddlings effectively controlled grasses and sedges and recorded maximum grain yield (4814 kg/ha). In post planting methods for weed control in low land rice, hand weeding twice at 20 and 35 DAP registered higher grain yield which was comparable with pre-emergence application of anilofos at 0.4 kg/ha. It was found that summer ploughing with two puddlings and application of anilofos as pre emergence with one hand weeding were found to be effective in controlling weeds and to record higher grain yield in low land rice.

## 5.1.22 EFFECT OF MODIFIED FORMS OF UREA AND WEED MANAGEMENT ON WEEDS IN RIGE

R. Venkitaswamy, S. Subramanian, V. Veerabadran and S. Sankaran
Deptt. of Agronomy, Tamilnadu Agric. Univ., Coimbatore, T.N.

Trials were conducted at Coimbatore to study the effect of five forms of urea, neemcake coated urea (NCU), dicyandiamide coated urea (DCU), rock phosphate coated urea (RPCU), urea supergranules (USG) and prilled urea (PU) with three levels of nitrogen 60, 90 & 120 kg/ha alone with one absolute control & two systems of weed management during the seasons of north-east monsoon (NEM) 1981, summer 1982 and and south-west monsoon SWM) 1982. Application of N through urea supergranules reduced the dry weight of weeds when compared to NCU, RPCU and PU. Weed control efficiency was more than 80% in most of the treatments at 20 days after transplanting (DAT) indicating the superiority of butachlor+2, 4-D EE application at 1.00+4.5 kg/ha. Application of butachlor+2, 4-D EE reduced the dry weight of weeds and N uptake by weeds with all the forms of urea.

## 5.1.23 WEED MANAGEMENT UNDER DIFFERENT SEEDING METHODS IN SEMI DRY RICE

G. Kathirsesan and V. Veerabandran
Agricultural College and Research Institute, Madurai T.N.

A field experiment was conducted to evaluate various weed management practices under three seeding methods in semi dry rice at Paiyur during *Rabi* 1988-89.

The weed control treatments included an unweeded check, manual weeding twice, pre-emergence application of butachlos/anilofor/pendimethalin followed by one manual weeding, post-emergence application of butachlor followed by post-emergence application of 2, 4-D EE. Three seeding methods viz., broadcasting, continuous drilling in lines & hill planting were compared. Seeding methods caused only marginal differences in weed density and dry matter production. Pendimethalin at 1.0 kg/ha applied pre-emergence followed by one manual weeding 20 days later was the most effective weed management practice resulting in highest grain yield of 3880 kg/ha which was 13% higher over the yield with two manual weedings (3447 kg/ha). Pendimethalin effectively controlled carpetweed.

The concept of critical wage rate was applied to decide the wage rate of manual labour at which each of the herbicides would be economical to use in semi-dry rice. The critical wage rate for pendimethalin would be economically viable only at labour wage rates exceeding Rs. 14.00/day. Corresponding values of critical wage rates for butachlor and 2, 4-D EE were Rs. 8.00 and Rs. 7.00, respectively.

## 5.1.24 EFFECT OF CHEMICAL AND CULTURAL METHODS OF WEED CONTROL IN RICE

A. Palchamy, S. D. Sundar Singh and P. Pothiraju
Tamilnadu G. D. Naidu Agric. Univ., Coimbatore.

Field experiments were conducted at Madurai to study the effect of chemical and cultural methods of weed control in transplanted rice IR-20. The treatments consisted of (i) unweeded check; (ii) butachlor granules at 2.5 kg/ha, propanil at 3.0 kg/ha and each herbicide supplemented with one hand weeding. The results indicated that there were 21 weed species, of which *Echinochloa crusgalli, Marsilia quadrifolia Cyperus* sp. were predominant. There was no complete control of *Echinochloa* sp. & *Cyperus* sp. by any of the herbicides applied. *Marsilia* sp. regenerated profusely in all the herbicide applied plots. Significant reduction in weed population was observed when the herbicides were supplemented with one hand weeding.

## 5.1.25 WEED CONTROL IN TRANSPLANTED RICE WITH *AZOLLA PINNATA* L.

N. S. Venkataraman, V. Thirumurugan and V. Veerabadran
Agril. College and Res. Instt., Madurai, T.N.

Effect of *Azolla* in combination with weed control practices was studied on transplanted rice var. IR 50 during first crop (June-Sept.) and IR 20 second crop (Oct-Feb) seasons 1985-86 at Madurai. Effect of *Azolla* in combination with hand weeding & pre-emergence herbicides was tested. *Echinochloa colona, Cyperus difformis,*

*Eclipta alba, Marsilia quadrifolia, Ludwigia perennis* were the predominant weeds. The lowest weight of weed and the highest grain yield were obtained from the plot weeded twice 25 and 40 days after planting. The incorporation of *Azolla* alone recorded lesser dry weight of weed than the unweeded check and with weed control efficiency of 24% and 31% during first and second crop seasons, respectively. *Azolla* with hand weeding or pre-emergence herbicides gave significantly higher grain yield and reduced dry weight of weeds compared to unweeded check. The grain yield of rice following the pre-emergence treatments of thiobencarb, butachlor or oxadiazon and later followed by a hand weeding were similar to two hand weeding given 25 and 40 DAS.

### 5.1.26 EFFECT OF SEED RATE AND WEED MANAGEMENT ON DIRECT SEEDED LOW LAND RICE

M. S. Ramakrishnan, K. Velayudham and A. Mohamed Ali
Agric. College and Res. Instt., Killikulam, T.N.

Study was conducted to evolve a rice production technology on direct seeded low land rice with effective weed control. The yield data revealed that pre-emergence application of pendimethalin 1.25 kg/ha followed by 2, 4-D ethyl ester 1.0 kg/ha as post-emergence (25 DAS) was found to be significantly superior over other treatments with higher grain yield of 6400 kg/ha. Pendimethalin and 2, 4-D combination was most effective in controlling weeds. Although the cost of weeding was higher.

### 5.1.27 EFFICACY OF OXYFLUORFEN IN TRANSPLANTED RICE

S. Rajaram, M. R. Vani and Jeyaraman
Agril. College and Res. Instt., Madurai, T.N.

To study the efficacy of oxyfluorfen in transplanted rice, field experiments were conducted at Madurai during *Kharif* and *Rabi* 1989-90. Pre-emergence application of oxyfluorfen effectively controlled the pre-dominant grassy weed (*Echinochloa colona*) and broad leaf weed *Marsilia guadrifolia*. In *Kharif* rice, the grain yield recorded by oxyfluorfen at 0.15 kg/ha supplemented by a hand weeding on 30 DAT was comparable with oxyfluorfen at 0.10 kg/ha supplemented by a hand weeding on 30 DAT, while in rabi rice, the grain obtained by oxyfluorfen at 0.125 kg/ha supplemented by hand weeding on 30 DAT was comparable with oxyfluorfen at 0.10 kg/ha supplemented by hand weeding on 30 DAT. Phytotoxic effect of oxyfluorfen at higher dose (0.2 kg/ha) on rice was observed. The highest net return was realised by oxyfluorfen at 0.15 kg/ha supplemented by one hand weeding on 30 DAT in *Kharif* rice and by oxyfluorfen at 0.10 kg/ha supplemented by one hand weeding on 30 DAT in *rabi* rice.

## 5.1.28 INTEGRATED WEED AND WATER MANAGEMENT IN LOWLAND RICE

S. Purushothaman, S. Jeyaraman and M. Chandrasekaran
Agric. College and Res. Instt., Madurai, T.N.

The experimental results revealed that though the weed dry matter production was more under irrigation to 5 cm water one day after disappearance, the water efficiency was higher over irrigation to 5 cm continuous submergence. Among weed control treatments, pre-emergence application of butachlor @ 1.25 kg/ha plus post-emergence application of 2, 4-D sodium salt @ 0.75 kg/ha effectively controlled the prevalent weeds and recorded least weed dry matter and maximum water use efficiency followed by two hand weedings on 15 and 30th DAT during both the seasons. The combined approach of irrigation to 5 cm submergence one day after disappearance and weed control through pre-emergence butachlor plus post emergence 2, 4-D Na salt could economise the use of irrigation water in transplanted rice which otherwise would have been used by competing weeds.

## 5.1.29 EFFECT OF SUMMER PLOUGHING AND PUDDLING IMPLEMENTS ON WEEDS AND GRAIN YIELD OF LOW LAND RICE

V. Thirumurugan, N. S. Venkataraman and V. Veerabadran
Agric. College and Res. Instt., Madurai, T.N.

A field experiment was conducted at Madurai during June-Sept., 1990 *Echinochloa colona, Cyperus difformis, C. iria, Ammania baccifera, Ludwigia parviflora, Eclipta alba, Marsilea quadrifolia* were the pre-dominant weed species. The results revealed that the minimum population and weed weight were recorded in the plots ploughed in summer and had higher grain yield. Tractor puddling with rotavator caused significantly lesser weed population, weed dry weight and higher grain yield. Puddling with tractor cage wheel or power tiller puddling with rotavator caused significant reduction in weed dry weight and increased grain yield compared to puddling with country plough.

## 5.1.30 STUDIES ON IRRIGATION, WEED AND BIO-FERTILIZER MANAGEMENT IN IRRIGATED LOW LAND RICE

P. Muthukrishnan and S. Purushothaman
Agri. College and Research Institute, Madhuri, T.N.

Field experiments were carried out at Madurai during South-west monsoon of 1988 and 1989 and North-east 1987 and 1988 seasons to study the influence of irrigation water, weed and bio-fertilizer management practices on the growth and

development of irrigated low land rice. Continuous submergence followed by irrigation one day after disappearance of water resulted in lesser growth and development of weeds. Butachlor as pre-emergence at 1.25 kg/ha followed by one hand weeding at 25 DAT was effective and economical in checking the weed growth and for getting higher yields. *Azolla* dual cropping was found to suppress the weed growth and enhance the grain yield to an extent of 10-18% in different seasons. The impact of bio-fertilization with *Azolla* in checking the weed growth was much pronounced under continuous submergence. Similarly weed control method at higher irrigation level as well as with *Azolla* dual cropping caused greater check of weed growth. Butachlor application did not affect *Azolla* growth.

### 5.1.31 TILLAGE, IRRIGATION AND WEED MANAGEMENT STUDIES IN LOWLAND RICE

V. Ganesaraja, P. Subramanian, S. Purushothaman and P. Jayapaul
Agric. College and Research Institute, Madurai, T.N.

An experiment was conducted during *kharif* 1989 to study the influence of summer ploughing, levels of irrigation and weed management practices on control of weeds and yield of lowland rice. The weed density was minimum in the summer ploughing twice and puddling (48.4/$m^2$) compared to summer ploughing once and puddling (68.8/$m^2$) and puddling without summer ploughing. Levels of irrigation did not influence weed population. Pre-emergence application of butachlor 1 5 kg/ha + one hand weeding at 30 DAT recorded lower population over unweeded check. However, summer ploughing + pre-emergence application of butachlor @ 1.5 kg/ha recorded a significant reduction in weed density of 72.8% and 63.8% by summer ploughing once, respectively, over control. Summer ploughing twice + pre-emergence application of butachlor @ 1.5 kg/ha and hand weeding 30 DAT recorded 63.8% higher grain yield over unweeded check. Summer ploughing once + pre emergence application of butachlor @ 1.5 kg/ha and hand weeding 30 DAT recorded 63.8% higher grain yield over unweeded check. Summer ploughing once + pre emergence application of butachlor @ 1.5 kg/ha and hand weeding 30 DAT recorded 56.9% increase in grain yield over unweeded check. Application of butachlor @ 1.5 kg/ha + hand weeding 30 DAT alone recorded 35% higher yield than control.

### 5.1.32 BIO-EFFICACY OF SOME PROMISING HERBICIDES FOR WEED CONTROL IN TRANSPLANTED RICE

S. Murali Krishnasamy, C. Srinivasan and N. Kempuchetty
Tamilnadu G. D. Naidu Agril. Univ., Coimbatore

Field experiments were conducted at Coimbatore during monsoon and summer season of 1985-86 to evaluate the bio-efficacy of pretilachlor (1.0 kg/ha), piperophos

(1.0 kg/ha), anilofos (0.4 kg/ha) and fluoroxypyr (0.8 kg/ha). The chemicals were compared with thiobencarb at 1.5 kg/ha and hand weeding twice. Among the herbicides, anilofos at 0.4 kg/ha and thiobencarb at 1.5 kg/ha were most promising. Pretilachlor and piperophos each at 1.0 kg/ha resulted in moderate weed control. Performance of fluoroxypyr at 0.8 kg/ha was not satisfactory. Analysis of floristic composition revealed that thiobencarb and piperophos were effective against grasses, sedges were better controlled by anilofos and piperophos. Fluroxypyr recorded the lowest dicot weeds. Considering each treatment as an independent weed complex, the similarity co-efficient values worked out also revealed altered floristic composition in herbicide treated plots.

### 5.1.33 WATER WEED *(FISSENDACARPA LINIFOLIA* (VAHL.) BENNET) A PROBLEMATIC WEED IN TRANSPLANTED RICE UNDER MIDLAND SITUATIONS

I. C. Barua and A. K. Gogoi
Assam Agril. Univ., Jorhat

A field experiment was conducted during *kharif* 1990 with three different rice varieties & five herbicides along with a weedy check, to evaluate the weed suppressing rice varieties on *Fissendocarpa linifolia* (Vahl.) Bennet and its control. Maximum weed population was recorded in IET-6666 (17, 813.33/ha) and per cent area covered by the weed also highest (27.58%). However, average area covered per weed was maximum under variety *Kolojoha* (2442.71 sq. cm). While comparing the weed crop ratio (height) the maximum ratio was obtained in Badshabhog (1 : 1.22). Among the weed control treatments none of the herbicides were capable of decreasing the population of weed. However, the area covered by the weed was 24 10% (anilofos), 20.00% (cinmethyline), 19.81% (pretilachlor), though thiobencarb and butachlor comparatively decreased the per cent area covered by the weed. Pretilachlor (1.16) recorded maximum weed crop ratio, which was closely followed by cinmethyline (1.15).

### 5.1.34 EFFECT OF TILLAGE PRACTICES AND WEED CONTROL MEASURES ON WEED COMPETITION IN TRANSPLANTED RICE

A. K. Gogoi
Assam Agril. Univ., Jorhat

A field experiment was conducted during *Kharif* 1987 and 1989 at Jorhat to find out the effect of tillage frequencies and weed control measures on weed competition in transplanted rice. The highest grain yield was recorded under farmers' practice (five ploughings with country plough followed by laddering just after third,

fourth and fifth ploughings) and weed dry matter was 65.6 and 33.3 g/m² in farmers' practice and ploughing once with mould board plough followed by ploughing once with country plough (7 days interval) and followed by country plough and laddering at similar interval. The pre-emergence application of butachlor 1.5 kg/ha, rotary weeder (20 DAT) and hand weeding (20 DAT) were found better in controlling weeds and significantly increased the grain yield. The weed control efficiency of these three treatments was 19.5, 24.5 and 17,8%, respectively. The reduction in grain yield due to unchecked weed growth was as high as 14.7%.

### 5.1.35 WEED CONTROL IN PUDDLED RICE *(ORYZA SATIVA)* UNDER DIFFERENT WATER REGIMES

A. K. Choudhury, M. Saikia, K. Dutta, and A. K. Gogoi
Assam Agril. Univ., Jorhat.

Field experiment was conducted during summer seasons of 1980 and 1990 at Jorhat. The treatments consisted of 4 water regimes (continuous submergence, 7 cm irrigation 1, 3 and 5 days after disappearance of ponded water) and 4 weed control measures (unweeded, application of rotary weeder at 30 DAT, butachlor and benthiocarb @ 1.5 kg/ha applied at 7 DAT). The dominant weed flora in the experimental area was *Cyperus iria, Echinochloa colona, E. crusgalli, Digitaria sanguinalis, Monocharia vaginallis* Differential water regimes could not bring about any significant change in grain yield of rice during both the years. Butachlor 1.5 kg/ha as pre-emergence was found to be superior over all other treatments. Weed control treatments changed the weed dry matter only 45 DAT. Applicatian of 7 cm irrigation 5 days after disappearance of ponded water was best and yielded highest water-use-effiency without significant yield reduction and saved a considerable amount of water, which can be diverted to some other fields in the irrigation command.

### 5.1.36 EFFECT OF METHOD OF APPLICATION OF BUTACHLOR IN TRANSPLANTED RICE

A. K. Gogoi
Assam Agril. Univ. Jorhat.

A field experiment was conducted during *Kharif* 1989 at Jorhat to evaluate an easy and acceptable method of applying butachlor under lowland transplanted situations. Butachlor (G) recorded maximum grain yield (3316 kg/ha) but at par with butachlor (EC) applied in standing water (3670 kg/ha), stand mix (3258 kg/ha), rice husk mix (3154 kg/ha) and saw dust mix (3109 kg/ha). Weed dry matter decreased significantly when butachlor was applied either as granule or EC formulation, irrespective of the methods of application. Weed control efficiency of different methods were ranged from 29.1 to 55.7%.

## 5.1.37 MANAGEMEKT OF PLANT POPULATION AND WEEDS IN DIRECT SOWN RICE CV. ADT-38

S. Ragupathi, R. M. Kathiresan and E. Thiruvarasan
Annamalai Univ., Annamalainagar, T.N.

A field experiment was conducted in Samba season during 1989-90 with three different seed rates viz. 50 kg/ha, 75 kg/ha and 100 kg/ha as main treatments and weed control measures like pre-sowing and pre-emergence application of butachlor and thiobencarb @ 2.0 kg/ha, post emergence application of 2, 4-D Na salt @ 0.75 kg/ha and twice hand weeding and an unweeded control were the sub treatments, Higher seed rates reduced the dry weight of weeds. Increasing seed rates significantly increased the grain yield of rice. A seed rate of 100 kg/ha recorded a higher grain yield of 3220 kg/ha. Hand weeding twice recorded significantly higher weed control index of 95.05% and grain yield of 4450 kg/ha followed by pre-sowing application of butachlor and thiobencarb which were at par.

## 5.1.38 EFFECT OF ORGANIC MANURE AND HERBICIDE ON RICE CV. ADT-37

R. M. Kathiresan and M. P. Arulchezian
Annamalai Univ., Annamalainager, T.N.

A field experiment was conducted at Annamalainager during February-May 1989 to study the influence of organic manures on rice weed flora and weed control measures. The experiment was taken up in a split-plot design with the main treatments comprising of different source of organic manures like FYM 10 t/ha, pressmud 10 t/ha, *Glyricidia manulata* Jacq. 10 t/ha, combination of pressmud and *Glyricidia maculata* each with a dose of 5 t/ha along with a no organic manuring treatment. The sub-treatments consisted of weed control measures, i. e. unweeded control, twice handweeding, butachlor @ 1.0, 1.5 and 2.0 kg/ha.

Organic pressmud 10 t/ha reducd the weed count (41.44) and weed dry matter (752.32 kg/ha) 60 DAT and recorded a weed control index of 43.55% and grain yield of 5520 kg/ha. Butachlor 2.0 kg/ha produced significantly lower weed count (22.7), and least weed dry matter of 432.04 kg/ha and higher weed control index of 70.59% and the higest yield of 5640 kg/ha. Pressmud application @ 10 t/ha along with butachlor @ 1.5 and 2.0 kg/ha yielded the same net return per rupee invested of 3.56.

## 5.1.39 INTERACTION OF MANURING AND CHEMICAL WEED CONTROL IN DIRECT SOWN LOWLAND SAMBA RICE CV. CR-1009

P. Panneer Selvam and J. Dhananjayan
Annamalai Univ., Annamalainagar, T.N.

Field experiment was laid out at Annamalai Experimental Farm in split plot design during September 1989 to March 1990 to find out the interaction effect of different levels of manuring and various chemical weed control measures on weed control of direct sown lowland samba rice Cv.-1009. Different N levels viz., no N, 60 kg/ha, 120 kg/ha and 180 kg/ha were distributed in main plots. Various weed control measures viz. pre-emergeece application of butachlor 1.25 kg/ha, thiobencarb @ 1.25 kg/ha, oxyfluorfen 0.15 kg/ha, 2, 4-D Na salt @ 0.5 kg/ha and handweeding twice on 30 and 40 DAS and unweeded control were taken as sub plot treatments. The weed biomass recorded positive correlation with increasing levels of nitrogen 120 kg N/ha recorded higher net return of Rs. 2.87/rupee investment. Among herbicides, oxyfluorfen recorded higher weed control index due to better control of weeds.

## 5.1.40 NURSERY AND MAIN FIELD WEED MANAGEMENT IN TRANSPLANTED RICE

R. M. Kathiresan and D. Surendran
Annamalai Univ., Annamalainagar, T.N.

A field experiment was conducted at Annamalainagar, during January-May, 1990 with rice cultivar ASD-16 to study the influence of both the nursery and field weed control measures on the main field weed flora, growth and yield of rice. Among the nursery weed control measures, use of weed free crop seeds performed superior by recording higher nursery and main field weed control indices of 56.63% and 59.12% respectively, higher seedling population of 842.66/$m^2$, seedling dry weight of 94 g/$m^2$, and grain yield of 5200 kg/ha. Among the main field weed control measures, hand weeding twice was found to be superior by recording higher weed control index of 81.87% and a higher grain yieid of 5640 kg/ha. Thiobencarb and butachlor were next in order and were at par. Use of weed free crop seeds in nursery followed by twice hand weeding in main field favourably influenced all the parameters taken up for comparison and fetched the highest return per rupee invested of Rs. 2.70.

## 5.1.41 STUDIES ON WEED CONTROL IN DIRECT SEEDED RICE

T. K. Prabhakara Setty and V. Jaganatha
Deptt. of Agronomy, Reg. Res. Station, Brahmavar, Karnataka.

Field experiments were conducted during *Kharif* 1989 and 1990 at Brahmavar, Karnataka to find out the optimum time and dose of thiobencarb in direct seeded upland rice. Application of thiobencarb at sowing @ 1.0 and 2.0 kg/ha had caused severe injury to the crop. However, 5 DAS, the injury was to an extent of 30% but no injury to crop, was noticed when the herbicide was applied 10 DAS.

Higher grain yield of rice was recorded with thiobencarb applied 10 DAS. Further thiobencarb 1.0 kg/ha 10 DAS with one hand weeding had recorded higher grain yield in both the years over thiobencarb 20 kg/ha 10 DAS, hand weeding twice and weed free check. The unweeded check recorded slightly higher grain yield compared to application of thiobencarb at sowing. It may be concluded that application of thiobencarb at 1.0 kg/ha 10 DAS with one hand weeding at 20 days was effective against weeds, besides recording higher grain yield under rainfed conditions of coastal Karnataka.

## 5.1.42 EFFECT OF PRE-EMERGENCE HERBICIDES ON WEED CONTROL IN TRANSPLANTED RICE (*ORYZA SATIVA* L.)

G. J. Janardhan and T. V. Muniyappa
Univ. of Agril. Sci. G. K. V. K. Campus, Bangalore, Karnataka.

A field experiment was conducted during summer season of 1989 to study the effect of pre-emergence herbicides viz., pratilachlor, 2, 4-D ethyl ester, anilofos and pendimethalin on weed control in transplanted rice. The results indicated that application of pendimethalin 2.0 kg/ha reduced weed popoulation and weed dry weight drastically as compared to unweeded control and gave higher grain yield next to weed free treatment. Pendimethalin (1.75 kg/ha), anilofos (0.60 kg/ha) and pratialachlor (1.0 kg/ha) were promising in controlling weeds and Increasing rice yields.

## 5.1.43 EFFECT OF SOIL SOLARIZATION, SUMMER PLOUGHING AND BUTACHLOR ON NUTRIENT CONTENT IN WEEDS AND RICE SEEDLINGS AS WELL AS SOIL STATUS IN RICE NURSERY

A. G. Patel and H. M. Mehta
Gujarat Agril. Univ. Anand

The experiment was conducted on loamy sand soil during *Kharif* 1987. The dates of cultural operations 1st April, 1st May, 1st June and 1st July were relegated to main plot while soil solarization and summer ploughing were embeded to sub-plot. The weed management treatments; butachlor 1.5 and 0.75 kg/ha (5 DAS), handweeding (two times) and unweeded control were employed to sub-sub-plots.

The cultural operations in April increased N and $P_2O_5$ content of weeds and rice seedlings; however, $K_2O$ content was increased in rice seedlings only. Soil solarization reduced N, $P_2O_5$ and $K_2O$ content of weeds as compared to summer ploughing. Handweeding and 1.5 kg/ha butachlor reduced N content of weeds but increased N content of rice seedlings. Solarization in April increased N, $P_2O_5$ and

$K_2O$ content of seedlings compared to rest of the combinations. The results on the N status of soil after uprooting seedlings indicated that ploughing before sowing reduced the N (750 kg/ha) status of soil as compared to cultural operations in May. Soil solarization increased N status compared to summer ploughing. Phosphorus and potassium did not exhibit any out standing response.

## 5.1.44 WEED MANAGEMENT IN RICE BASED CROPPING SYSTEM IN SALT AFFECTED SOILS

M. Nadanam, K. Andi and K. Valliappan
Soil Salinity Res. Centre, Trichy, T.N.

Field experiments were conducted at Trichy, in a partially reclaimed salt affected soil to study the best suited cropping system and the weed management in rice based cropping system. Six garden land crops, namely, sorghum, cumbu, ragi, cotton, castor and cowpea were raised during summer followed by cumbu, ragi, fodder sorghum, green gram, daincha and Kudiraivali during *Kharif*. Rice was raised uniformly under low land condition during *rabi* season. The pH of the soil was 9.2 and the pH and EC of the well water used was 8.9 and 0.31 ds/m respectively.

The rice crop raised under low land condition recorded a weed biomass of 7.9 $g/m^2$ of dicot and 5.6 $g/m^2$ of monocot which was very less compared to the weeds under garden land cropping. There were very few weeds in herbicide applied plots (3.6 $g/m^2$ of monocot weeds and 2.7 g of dicot weeds). The results of the study indicated that rice cultivated under flooded condition helps in controlling the weed flora remarkably in the rice based cropping system.

## 5.1.45 HERBICIDE MANIPULATION TO IMPROVE EFFICIENCY OF FERTILIZER NITROGEN IN RICE PRODUCTION UNDER UNPUDDLED SOIL CONDITION

B. L. Chandrakar and R. S. Tripathi
Indira Gandhi Agric. Univ., Raipur, M. P.

Field experiments were conducted during kharif 1989 and 1990 to findout the interaction effect of weed control measures and spliting of nitrogen in direct sown rice under unpuddled soil condition. The experimental field was dominantly occupied by *Echinochloa colona* (30%), *E. crusgalli* (15%), *Ischaemum rugosum* (10%), *Eleusine indica* (5%), *Cyperus iria* (20%), *Fimbristylis littoralis* (10%), *Eclipta alba* (6%) and *Cassulia auxillaris* (4%). Pre-emergence application of thiobencarb (1.5 kg/ha) and anilofos (0.6 kg/ha) proved effective on monocot weeds specially grasses and showed

poor performance on dicot weeds. Application of 20–30% recommended N as basal dose with initial weed control through herbicide recorded higher rice yield as compa red to higher basal N application. Under no weed control situation basal application of higher N (above 30% recommendation) the rice yield was markedly reduced due to heavy weed infestation. Splitting of N, 20–30% at sowing, 50–40 at tillering and 30% at P. I. stage with weed control through pre-emergence herbicides was best.

### 5.1.46 EFFICACY OF HERBICIDE CARRIERS FOR WEED CONTROL IN RICE

A. Ali Mohamed and N. Asoka Raja
Deptt. of Soils and Agronomy, Agric. College and Res. Inst., Killikulam, T.N.

Experiments were conducted during 1985-86 to 1987-88 in lowland rice at Killikulam to findout efficiency of neem cake as a herbicide carrier. The herbicide carriers like neem cake and neem coated urea individually and in combination with butachlor @ 1.5 kg/ha were applied at 5th day after planting. These were compared with hand weeding twice (20 and 35 DAT) and unweeded control treatments. Toxicity ratings on 15th day and yield atributing parameters were recorded.

*Echinochloa colona* and *Cyperus difformis* were the major weeds in lowland rice. Mixing neem cake powder (15 to 45 kg/ha) with pre-emergence butachlor 1.5 kg/ha was effective in controlling the annual weeds and selective to the rice crop. Butachlor at 1.5 kg/ha in combination (mixture) with neem cake at 30 kg/ha recorded the highest grain yield of rice and this was comparable with 45 kg of neem cake used as a carrier has been well compensated with an additional grain yield of 460 kg/ha,

### 5.1.47 WEED MANAGEMENT IN RICE NURSERIES

Samar Singh, B. R. Singh, R. K. Malik and Rupa Dhawan
Deptt. of Agronomy, CCS Haryana Agric. Univ., Hisar.

Three field experiments were conducted during 1990 and 1991 at Regional Research Station Uchani, Karnal to evaluate the efficacy of butachlor, thiobencarb and anilofos for weed control in rice nursery. Based on these experiments it was concluded that butachlor is the most potent herbicide and caused toxicity to rice nurseries. Thiobencarb at 0.6 kg/ha or anilofos at 0.1 kg/ha applied 3 or 6 days before sowing provided 60 to 70% control of barnyard grass with minimum injury to rice seedlings. From the treated plots water was drained out before sowing the sprouted seeds.

### 5.1.48 EFFICACY OF ANILOFOS 50 EC IN TRANSPLANTED RICE

K. Narayana Rao and R. S. N. Rao
Weed Science Division, Agric. College Campus, Bapatla, A. P.

An experiment was conducted at the Agricultural College farm Bapatla with anilofos 50 EC at 0.3, 0.4 and 0.6 kg/ha comparing with anilofos 30 EC at 0.37; 2, 4-D EE at 1.0 kg, hand weeding and unweeded control in transplanted rice during *kharif*, 1990-91.

The results of the trial indicated that hand weeding twice recorded the highest weed control efficiency (WCE) of 89% followed by anilofos 50 EC at 0.6 kg (75%) and at 0.4 kg (74%) and 2, 4-D EE at 1.0 kg (70%). Highest grain yield of 5550 kg/ha was recorded with hand weeding twice which was similar to anilofos 50 EC at 0.6 and 0.4 kg/ha (5500 and 5450 kg/ha respectively). Unweeded control recorded the lowest yield of 4850 kg/ha.

## 5.2 WHEAT

### 5.2.1 WEED MANAGEMENT WITH RESPECT TO NUTRIENT UPTAKE IN WHEAT

A. K. Johri, G. Singh and D. Sharma
G. B. Pant Univ. of Agric. and Tech., Pantnagar, U. P.

Field studies were conducted in 1984 and 1985 at Pantnagar to evaluate the effect of different row spacings (22.5 and 15.0 cm), seed rates (100 and 150 kg/ha), sowing methods (one direction and cross sowing) and weed control measures (weedy, weed free, isoproturon at 0.5 and 1.0 kg/ha) on uptake of nutrients by different weed species in wheat. Closer row spacing and cross sowing caused maximum reduction in nutrients uptake of *Vicia sativa* and *Lathyrus aphaca* followed by *Phalaris minor* and *Avena ludoviciana* and was least affected by other weed species. This led to a increase in uptake of nutrients by crop. Higher seed rate and isoproturon (0.5 and 1.0 kg/ha) considerably reduced the nutrient uptake of *P. minor* and *A. ludoviciana* as compared to other weed species.

### 5.2.2 WATER UTILISATION IN WHEAT-*PHALARIS MINOR* WEED ECOSYSTEM UNDER DIFFERENT IRRIGATION AND WEED CONTROL TREATMENTS

D. C. Bhatt, B. P. Tiwari and J. P. Tiwari
Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur, M. P.

The investigation, on water management under different weed control methods, was carried out at Jabalpur during 1985-86 and 1986-87. The experiment was conducted with five irrigation treatments in main plots and four weed control methods (weedy check, two hand weeding, isoproturon at 1.0 kg/ha as pre and post emergence) in sub-plots. The consumptive use of water for total dry matter production of wheat-weed ecosystem was higher under irrigation at CRI+Jointing+boot+flowering stage followed by irrigation at 75 CPE and 100 mm CPE. Similar trend was noted for crop biomass and grain production. The consumptive use of total weed-biomass production was higher at 100 mm CPE, followed by 75 mm CPE 125 mm CPE, CRI+Jointing stage and CRI+Jointing+boot flowering stages. For *Phalaris minor*, the minimum values were obtained under irrigation at CRI+J+B+F stages. The water-use efficiency of *P. minor* was higher under irrigation at CRI+Jointing stages, followed by 125 mm CRI+J+B+F stages and 75 mm CPE. The water use efficiency of *P. minor* was higher under isoproturon pre-emergence (412.45 kg/ha-cm), followed by hand weeding (322.45 kg/ha-cm), isoproturon (309.92 kg/ha-cm) and weedy check (275.68 kg/ha-cm).

## 5.2.3 CULTURAL AND CHEMICAL METHODS OF WEED CONTROL IN WHEAT

Om Pal Singh and K. C. Gautam
Division of Agronomy, IARI, New Delhi.

An investigation was carried out to find out relative superiority of planting geometry, methods of sowing of wheat and their influence on weed growth. In this study four methods of sowing, viz., normal sowing at 23 cm apart, closer sowing at 15 cm spacing, criss cross sowing and broadcast of seed were adopted with uniform seed rate. 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 spray at 0.50 and 0.75 kg/ha applied on 30 DAS. The results showed that the weed population and dry matter accumulation in weeds appreciably decreased under closer as well as criss cross sowing methods of wheat. Criss cross sowing method produced the highest grain yield of wheat, followed by closer sowing at 15 cm spacing. Significantly lowest yield was obtained in broadcast method. Hand weeding as well as herbicide application applied either as pre or post-emergence irrespective of lower or higher dose registered significantly higher yield over weedy check. Interaction between methods of sowing and weed control was found significant.

## 5.2.4 INFLUENCE OF NITROGEN LEVELS AND CROP DENSITIES ON GROWTH OF WEEDS AND WHEAT

K. C. Gautam
Division of Agronomy, IARI, New Delhi

A field experiment was initiated to study the effect of various levels of nitrogen and seed rates on the growth of weeds and wheat. The treatments consisted of three levels of nitrogen viz., 80, 100 and 120 kg/ha and three seed rates (100, 125 and 150 kg/ha) superimposed with four weed control measures. Weed control measures included a weedy check, hand weeding and post-emergence isoproturon applied at 0.50 & 0.75 kg/ha. Results revealed that the weed population was drastically reduced under 100 and 120 kg N/ha coupled with higher seed rates (125 and 150 kg/ha). As regards the yield of wheat, 120 kg N/ha recorded significantly more yield over 80 and 100 kg N/ha. In case of seed rates, the trend was reverse. Significantly higher grain yield was obtained with 100 kg/ha seed rate to that of 125 & 150 kg/ha. Hand weeding and both the levels of isoproturon applied post-emergence, registered significantly higher grain yield as compared to the weedy check. Interaction effects between nitrogen levels and weed control measures were found to be significant. 80 kg N/ha with weed control measures produced significantly higher grain yield of wheat over 100 kg N/ha and at par with 120 kg N/ha in the absence of weed control measures.

## 5.2.5 COMPARATIVE EFFICACY OF VARIOUS HERBICIDES FOR CONTROLLING WEEDS IN IRRIGATED WHEAT

D. A. Tank, S. G. Sadaria, B. S. Jadon and B. R. Raghvani
Gujarat Agril. Univ. Junagadh, Gujarat

An experiment was conducted on medium black soil at Junagadh for three years (1982-83 to 1984-85) in *Rabi* season to find out the suitable herbicide to substitute the manual weeding in irrigated wheat (Cv. Lok-1). Various products of isoproturon, chlorotoluron, 2, 4-D (Sodium salt) and pendimethalin were compared with one hand weeding and an unweeded control. The results indicated that pendimethalin 1.0 kg/ha (pre-emergence) recorded the highest grain yield (4234 kg/ha). Hand weeding once during crop growth period ranked second, producing grain yield of 3725 kg/ha which was closely followed by post-emergence application of various herbicides viz.; chlorotoluron at 0 5 kg/ha, isoproturon at 0.75 kg/ha and 2, 4-D at 0.75 kg/ha. It was suggested that pendimethalin at 1.0 kg/ha applied pre-emergence may be substituted for one hand weeding during the shortage of labour in irrigated wheat area of Saurashtra.

## 5.2.6 EVALUATION OF WEED CONTROL METHODS IN WHEAT FIELDS IN NORTHERN HILL ZONE OF MADHYA PRADESH

R. P. Bajpai, V. K. Singh, R. K. Dwivedi and B. P. Mishra
IGKVV, Zonal Agril. Res. Station, Ambikapur, Surguja, MP

Field trails on weed control in dwarf wheat (Var. WH-147), combining cultural, conventional, and chemical treatments were carried out at Ambikapur during 1988-89 and 1989-90 on sandy loam soils under rice-wheat cropping system. The weed flora mainly comprised of *Phalaris minor, Chenopodium album, Portulaca oleracea, Vicia sativa, Rumex dentatus, Anagallis arvensis, Asphodelus tenuifolius, Ageratum conyzoides.* Highest weed dry weight and weed population were recorded in broadcast (conventional practice) sown crop while the lowest values were observed in plots treated with isoproturon at 1.0 kg/ha. Two hand weedings at 20 and 40 DAS gave maximum grain yield (2480 kg/ha) of wheat but net income was higher (Rs. 3248/ha) with isoproturon. Isoproturon applied pre-emergence or post-emergence at 1.0 kg/ha was at par in respect of grain yield and proved superior in saving weeding cost than other methods of weed control.

## 5.2.7 EFFICACY OF ISOPROTURON AND OTHER HERBICIDES FOR THE CONTROL OF WEEDS IN IRRIGATED WHEAT (*TRITICUM AESTIVUM* L.)

J. S. Samra and S. S. Dhillon
Punjab Agril. Univ., Ludhiana

Field studies on control of grassy and broad leaf weeds in wheat *(Triticum aestivum* L.) were carried out at Ludhiana during *Rabi* 1981-82 and 1982-83. Isoproturon (0.5 to 0.75 kg/ha applied post-emergence was quite effective against monocot and dicot weeds. Further, application of isoproturon at 0.5 kg/ha either 21 DAS (before first irrigation) or 28 DAS (after 1st irrigation) on light texture soil gave same level of weed control as that of its highest dose 0.75 kg/ha applied 35 DAS. Application of chlorotoluron though gave good control of weeds but was toxic to the crop. Pendimethalin at 0.75 kg or 1.0 kg/ha applied pre-emergence was found effective against *Phalaris* but not against wild oats. Isoproturon proved superior to fluchloralin, pendimethalin or chlorotoluron.

## 5.2.8 EFFECT OF CLOPYRALID ON *CIRCIUM ARVENSE* AND WHEAT

Govindra Singh and S. Tiwari
G. B. Pant Univ. of Agri. & Technology, Pantnagar, U.P.

Experiments were conducted to evaluate the effects of clopyralid on *Circium arvense,* other weeds of winter season and wheat yield. *Circium arvense, Melilotus*

*alba*, *Vicia sativa*, *Lathyrus aphaca* and *Medicago denticulata* were highly susceptible to clopyralid. *Chenopodium album* was moderately susceptible, *M. indica* and *Anagallis arvensis* were moderately resistant, whereas *Fumaria parviflora*, *Phalaris minor* and *Avena ludoviciana* were resistant to this herbicide. Control of *C. arvense* increased with the increase in the dose of clopyralid from 50 g to 250 g/ha applied 4 weeks after weed emegence. Split application of clopyralid at 50 g/ha at 4 weeks stage, followed by 50 g/ha at 3 weeks after first application, 100 g/ha at 4 weeks stage followed by 50 g/ha at 3 weeks after first application or 100 g/ha at 4 weeks stage followed by 50 g/ha at 3 weeks after first application provided almost complete control of *C. arvense* and were similar to that of single application either at 200 or 250 g/ha at 4 week stage. Clopyralid at 150 or 250 g/ha applied at 30 days stage or 100 g/ha at 30 days followed by 50 g/ha at 50 days after wheat sowing produced grain yield at par with weed-free treatment.

### 5.2.9 EFFECT OF RATE AND TIME OF APPLICATION OF ISOPROTURON AND METOXURON AGAINST *PHALARIS MINOR* IN WHEAT

L. S. Brar and U. S. Walia
Punjab Agril. Univ., Ludhiana

Investigations were carried out at Ludhiana in 1987, 88 to 1989 on the loamy sand to sandy loam soil having low organic matter, medium nitrogen and high phosphorus and potassium. Data revealed that isoproturon at 0.75 or 0.94 kg/ha and metoxuron at 1.3 or 1.5 kg/ha when applied pre-emergence gave significant reduction in the dry matter production of *P. minor* compared to two hand weedings (except 1987-88) and unweeded control and consequently increased the grain yield. Isoproturon at 0.56 kg/ha applied 20-25 DAS gave complete control of *P. minor* and produced grain yield of 4070 kg/ha (av. of 3 years) as against 3640 kg/ha obtained after giving two hand weedings. Similarly lower dose of metoxuron when applied 20-25 DAS also gave a marked reduction in the density of wild canary grass and proved at par with isoproturon 0.94 kg/ha applied 35 DAS. The studies thus reveal that in case of light to medium texture soils lower rates with early application (2-3 leaf stage of *Phalaris* are more effective and economical than higher rates and late application of isoproturon and mextoxuron.

### 5.2.10 EFFECT OF PLANTING TIME, SOWING METHOD AND HERBICIDES OF N, P, K UTILISATION BY WHEAT AND ASSOCIATED WEEDS

M. L. Patel, S. P. Kurchania, J. P. Tiwari and H. C. Jain
J. N. Krishi Vishwa Vidyalaya, Jabalpur, M. P.

In a field dominated by *P. minor* effect of planting time (normal, mid-late and late), sowing method (solid and cross sowing) and six weed control treatments

involving isoproturon at 1.0 kg/ha applied pre-emergence or post-emergence, metoxuron at 2.0 kg/ha applied post-emergence, pendimethalin at 1.5 kg/ha applied pre-emergence and weeding 20 and 40 DAS and the weedy check were evaluated. The density and the dry weight of weeds reduced with the delayed planting and cross row method of sowing. Average weed dry weight in the hand weeded plots were 232 kg/ha as compared to 1748 kg/ha in the unweeded plots and 337 kg/ha in the isoproturon treated plots. The average NPK uptake were more in plots sown at the normal recommended time. The uptake of nutrient by weeds decreased with delayed sowing. Similarly the NPK uptake by weeds were lower in the plots sown by cross sowing method. Weeds in the untreated plots removed 46, 3 and 3 kg/ha of N, P and K, respectively.

### 5.2.11 INFLUENCE OF VARIOUS CULTURAL AND CHEMICAL WEED CONTROL METHODS ON GROWTH OF *PHALARIS MINOR* RETZ, AND YIELD ATTRIBUTING CHARACTERS OF WHEAT

S. P. Kurchania, M. L. Patel and J. P. Tiwari
J. N. Krishi Vishwa Vidyalaya, Jabalpur, M. P.

In a field dominated by *P. minor*, effect of planting time (normal, mid-late and late), sowing method (solid and cross sowing) and six weed control treatment involving isoproturon at 1.0 kg/ha pre-emergence or post-emergence, metoxuron at 2.0 kg/ha post-emergence, pendimethalin at 1.5 kg/ha pre-emergence and weeding 20 and 40 DAS and the weedy check were evaluated for their effects on the growth of *P. minor*, yield and yield attributes of wheat. Number of weeds were greater in solid planting method of sowing than in cross sowing. Weed density decreased with corresponding delay in wheat sowing. All herbicides effectively controlled *Phalaris minor*. Effect of herbicides were greater in the mid-late sowing as compared to normal and late sowings. Grain yield of wheat and characters contributing to yield were minimum in the late sowing wheat. Among herbicides, the grain yield and the economic returns following the treatment of isoproturon at 1.0 kg/ha applied pre-emergence were greater than other treatments.

### 5.2.12 BIOEFFICACY OF MILRON 50% FLOWABLE (ISOPROTURON 50% FLOWABLE) FOR THE CONTROL OF WEEDS IN WHEAT

A. Mehta, C. Kandaswamy and G. Krishnamurti
Montari Agric. Research Station, Village Lohgarh, P. O. Daulat Singhwala (Bavat) Zirakpur.

Isoproturon is an effective herbicide for selective control of weeds in wheat. Milron 50% flowable-a new formulation of isoproturon was developed at our research

station and was tested for its bio-efficacy at four doses; 750, 875, 940 and 1000 g a.i./ha). Milron 75 WP was taken as reference product for comparison at recommended dose (940 g a.i./ha). The flowable formulations are edging the conventional wettable powder (W.P.) formulations in Europe and other countries due to minute particle size making spray more effective, dust free material reducing environmental pollution and hence less phytotoxic. Milron 50% flowable gave better control of grassy weeds even at lower dose (875 g a.i./ha) than Milron 75 WP (940 g a.i./ha). The control of grassy weeds was 11% higher with the application of Milron 50% flowable at 875 g a.i./ha in comparison with Milron 75 WP (940 g a.i./ha).

### 5.2.13 RESPONSE OF DIFFERENT WHEAT VARIETIES TO HERBICIDES

D. Swain and B. N. Mitra
National Res. Centre for Weed Science, Adhartal, Jabalpur, M. P.

The sensitivity of wheat cultivars to pendimethalin and fluchloralin was studied in field conditions. The rate of germination was adversely affected in all varieties except H 1-1114 by pendimethalin as compared to the control. The lowest germination percentage was noted in variety HP-1209 and UP-262 and highest in BW-11. As regards dry matter accumulation, one month plants were found to be more adversely affected by pendimelhalin than methabenzthiazuron as compared to the control. Two month old plants showed dry matter accumulation similar to those of control in both cases thereby showing their recovery from the adverse effect of herbicides at later stages of growth. Grain yields of varieties Janak, HP-1029, C-306, UP-262, HD 2402 and Sonalika were higher than their respective controls and thus not affected by both the herbicides.

### 5.2.14 EFFECT OF WEEDING ON PROTEIN CONTENT IN WHEAT GRAINS

M. K. Porwal and O. P. Gupta
Agril. Res. Station, Banswara, RAU, Bikaner, Rajasthan.

Field investigations were carried out to ascertain the relationship between weed biomass and protein content in wheat grains as influenced by weeding treatments. Post-emergent 2, 4-D (0.5 kg/ha), bentazon 1.0 (kg/ha), tank mixtures of 0.5 kg/ha of 2, 4-D with metoxuron (0.325 kg/ha), methabenzthiazuron (0.25 kg/ha), and bentazon (0.25 kg/ha) increased the per cent crude protein in wheat grains by 14.1-16.0 over unweeded check (10.6). Tank mixtures tended to increase the crude protein content over their straight herbicide components.

## 5.2.15 EVALUATION OF HERBICIDES FOR WEED CONTROL IN WHEAT

S. S. Punia, R. S. Panwar, R. K. Malik and Satish Kumar
Deptt. of Agronomy, CH. C. S. Haryana Agril. Univ. Hisar

An experiment was conducted during winter season of 1988-89 and 1989-90 at Hisar to test the efficacy of different herbicides for the control of *A. ludoviciana* and *C. album* in wheat. Tralkoxydim at 0.25 kg/ha provided excellent (90 to 96%) control of *A. ludovicana* but not of *C. album*. Application of diclofop-methyl at 1.0 kg or tralkoxydim+isoproturon at 0.25+0.75 kg/ha proved highly effective against both weeds and the overall control by above herbicides ranged from 85 to 90% during both the seasons.

Tralkoxydim at 0.25 kg+isoproturon at 0.75 kg was injurious to wheat. Tralkoxydim at 0.25 kg/ha or diclofop-methyl at 1.0 kg/ha provided significant improvement on the grain yield of wheat.

## 5.2.16 EFFICACY OF CLOPYRALID, ISOPROTURON AND 2, 4-D FOR THE CONTROL OF *CIRCIUM ARVENSE* IN WHEAT

R. K. Malik, R. S. Panwar, R. S. Balyan and S. S. Punia
Deptt. of Agronomy, CH. C. S. Haryana Agril. Univ., Hisar

Field studies were conducted at Hisar during *rabi* seasons of 1989-90 and 1990-91. The fleld was dominated by *C. arvense*, *P. minor*, *C. album* and *A. ludoviciana*. All weed control treatments significantly reduced the dry matter accumulation by weeds compared to the unweeded control. Combination of isoproturon+clopyralid at 1.0+0.075, or 1.0+0.100 kg/ha and clopyralid+fluroxypyr at 0.125+0.10 kg/ha provided excellent control of *C. arvense* and other broad leaf weeds. Clopyralid alone at 0.100 to 0.125 kg/ha also proved very effective against *C. arvense*. Above mentioned treatments also registered significantly higher yields than unweeded control which were statistically similar to that of weed free yield.

## 5.2.17 NUTRIENT UPTAKE BY WEEDS IN WHEAT AS AFFECTED BY VARIATION IN IRRIGATION, HERBICIDES AND FERTILITY LEVLS

I. S. Hooda and S. K. Aggarwal
Deptt. of Agronomy, Haryana Agril. Univ., Hisar

A field experiment was conducted during *rabi* seasons of 1981-82 and 1982-83 at Agronomy Research Farm, Hisar to study the nutrient uptake by weeds in wheat crop as influenced by three irrigation (2 irrigations at CRI+F, four irrigations at

CRI+T+F+M and six irrigations at CRI, T, J, F, M, D), three weed control treatments (Weedy check, methabenzthiazuron at 1.5 Kg/ha and isoproturon at 1.0 Kg/ha) and two fertility levels (60 Kg N+30 Kg $P_2O_5$ and 120 Kg N+60 Kg $P_2O_5$/ ha). Application of four irrigations resulted into significantly higher nitrogen uptake by weeds as compared to two irrigations applied at CRI and flowering stages in 1981-82 and six irrigations applied at all the critical stages of growth in 1982-83. Phosphorus uptake by weeds remained unaffected due to variations in irrigation number. Use of herbicides and recommended rate of fertilizers significantly enhanced the uptake of nitrogen and phosphorus over weedy check and half dose of fertility in both the years, respectively.

## 5.2.18 EFFICACY OF FLUROXYPYR AS INFLUENCED BY THE TIME OF APPLICATION FOR WEED CONTROL IN WHEAT

R. S. Panwar, R. K. Malik, R. S. Balyan and S. S. Dahiya
Deptt. of Agronomy, C. C. S. Haryana, Agril. Univ. Hisar

To control broad leaf weeds i.e. *C album*, *V. sativa* and *L. aphaca* a field experiment was conducted during winter seasons of 1988-89 and 1989-90 at Hisar. The field was dominated by *L. aphaca*. The dry matter of weeds at 60 and 90 DAS decreased with the increase in the herbicide rate from 0.10 to 0.30 kg/ha at all the stages of application. Application of fluroxypyr at 20 DAS proved very effective against weeds at all the doses as compared to its application at 15, 30 or 40 DAS. The differences in weed weight was significant between 15 and 20 DAS application during both crop seasons. Fluroxypyr at 0.20 and 0.30 kg/ha applied 20 or 30 DAS produced crop yield statistically at par to that of weed free yield.

## 5.2.19 INFLUENCE OF TANK MIXTURE OF ISOPROTURON AND FLUROXYPYR ON THE CONTROL OF COMPLEX WEED FLORA IN WHEAT

R. K. MaliK, R. S. Panwar and R. S. Balyan
Deptt. of Agronomy, C. C. S. Haryana Agril. Univ., Hisar

Field studies were carried out at Hisar during *rabi* seasons of 1989-90 and 1990-91. The experimental field was infested with *A. ludoviciana*, *P. minor*, *C. album*, *L. aphca*, *V. sativa* and *A. arvensis*. Among them *A. ludoviciana* and *C. album* were dominant weeds. Though all the weed control treatments significantly minimised the dry matter accumulation of weeds but combination of fluroxypyr and isoproturon at 0.15+0.75 or 2, 4-D+isoproturon at 0.375+0.75 and 0.500+0.75 kg/ha proved highly effective against both type of weeds. Application of 2, 4-D or fluroxypyr controlled *C. album* and not *A. ludoviciana*. Based on the effectiveness on weeds, these above treatments produced statistically similar crop yield to that of season long weed free yield.

## 5.2.20 RECURRENCE OF WEEDS IN WHEAT FIELDS : STUDIES ON CONTAMINATION OF CROP SEEDS

M. K. Sidhu and H. Kaur
Deptt. of Botany, Punjabi Univ., Patiala, Punjab.

Inspite of the best efforts made by the farmers, weed grow year after year in the crop fields. Presently, attempt has been made to see the extent of contamination of the crop seeds which helps in recurrence of weeds. Fifty samples, each of 1 kg of wheat seeds, of different varieties were collected from various parts of the state of Punjab. They were analysed with respect to purity of seed samples, identification of weeds from fruit/seed, counting their number and taking their weight. Purity of the wheat sample ranged from 81 to 99%. Number and weight of weed seeds varied from .66 in *Asphodelus tenuifolius* to 204 in *Phalaris minor* and 2 to 16.45 gm/sample, respectively. Seeds of *Avena ludoviciana, Asphodelus tenuifolius, Rumex dentatus, Chenopodium album* and *Malvastrum coromandelianum*, were 100% viable. Presence of large number of viable seeds in wheat seed samples indicates that it is one of the efficient mode of recurrence of weed in crop fields.

## 5.2.21 WEED SEED POPULATIONS OF ARABLE SOILS OF PATIALA, PUNJAB

M. K. Sidhu
Deptt. of Botany, Punjabi Univ., Patiala, Punjab.

Weed seed population studies have been carried out in wheat field soils of Patiala District, Punjab. Fifty samples of soil each of $10 \times 10$ cm and 10 cm depth area were collected for two years. Samples were collected in November (before sowing) and April (after harvesting of crop). Analysis of the sample show the presence of seeds of nine weeds belonging to seven families. In November samples, only four species represented the seed bank with *Medicago polymorpha* (90 seeds/$m^2$) and *Chenopodium album* (87 seed/$m^2$) present in all samples. In November the crop fields had 194 weed seeds/$m^2$. In April the soils have been found with higher number of seeds of *M. polymorpha* (82/$m^2$) and *Anagallis arvensis* (62/$m^2$) present besides others. Viability of weed seeds has also been determined for both November and April samples.

# 5.3 OIL SEED AND PULSES

## 5.3.1 CHEMICAL WEED CONTROL IN MUSTARD (VAR. *VARUNA*)

R. D. Vaishya and Sushil Kumar
N. D. Univ. of Agric. and Tech., Faizabad, U. P.

A field trial was conducted at Faizabad during winter season of 1989-90 to study the efficacy of different herbicides for weed control in mustard (var. Varuna). The results revealed that most of the herbicide treatments proved their superiority over unweeded check in reducing weed populatian and weed dry weight and increasing the seed yield of mustard. Hand weeding 25 and 45 DAS, isoproturon 0.5 kg/ha (post-emergence) and 1.0 kg/ha (pre-emergence) fluchloralin 0.5-1.0 kg/ha (ppi) and thiobencarb 0.5-2.0 kg/ha (pre-emergence) gave seed yield of mustard comparable to weed free check. The weeds allowed to grow for the entire crop season in the experimental field reduced the seed yield of mustard by 40.4% compared to weed free check.

## 5.3.2 WEED CONTROL IN MUSTARD UNDER VARYING MANAGEMENT SYSTEMS

Anil Dixit and K. C. Gautam
Division of Agronomy, I.A.R.I., New Delhi.

An investigation was carried out to study the interactive effects of various management systems (fertilizer, irrigations and weed control measures) on weeds and crop. The population, dry matter accumulation of weeds and nutrient depletion by weeds increased significantly under management system ($N_{80}P_{40}K_{40}$+2 irrigations at 30 DAS and flowering) as compared to other management systems (No fertilizer and no irrigation, 50% recommended fertilizer -$N_{40}P_{20}K_{20}$+one irrigation at flowering, $N_{40}P_{20}K_{20}$+2 irrigations and 100% recommended fertilizer -$N_{80}P_{40}K_{40}$+one irrigation at flowering). Pendimethalin and hand weeding brought about maximum reduction in the population and dry matter accumulation of weeds and resulted in arresting the enormous drain of nutrients compared to that of weedy check. Higher doses of fertilizers coupled with two irrigations exerted significant influence on crop growth and registered more grain and stover yields than other management systems. Hand weeding or pendimethalin application pushed up the grain yield to a level of significance over weedy check. Nutrient uptake by crop appreciably increased due to management system and weed control measures.

### 5.3.3 EFFECT OF FERTILIZER PLACEMENT AND MECHANICAL WEED CONTROL ON THE PERFORMANCE OF MUSTARD (VAR. PUSABOLD)

H. Kalita and A. K. Gogoi
Assam Agric. Univ., Jorhat, Assam.

A field experiment was conducted during *Rabi* 1988-89 and 1989-90 to evaluate the effect of fertilizer placement and performance of various simple weeding tools on weed growth and seed yield of mustard. *Grubbing* (hand weeding) twice at 20 and 40 DAS, weeding with dry land weeder and, hand hoeing (20 and 40 DAS) were effective in reducing the weed population and their dry matter accumulation. Two weedings by dryland weeder (907 kg/ha), hand hoeing once (785 kg/ha) and twice (790 kg/ha) and hand weeding twice (897 kg/ha) recorded higher grain yields over weedy check. The weed control efficiency of the different weeding tools were ranged from 11.1 to 46.9%.

### 5.3.4 EFFECT OF FERTILIZERS PLACEMENT AND WEED CONTROL ON MUSTARD AND ASSOCIATED WEEDS

H. Kalita and A. K. Gogoi
Assam Agric. Univ., Jorhat, Assam

Field investigations were carried out during *Rabi*, 1988–89 and 1989–90. The pre-dominant weeds were *Ageratum conyzoides*, *Cynodon dactylon*, *Setaria glauca* and *Chenopodium album*. Broad-leaf weeds were 73.7% and the grasses and sedges were 26.3%. Fertilizer placement had no significant effect on weeds, but in 1988–89 it recorded significantly higher seed yield than broadcasting method. *Grubbing* (hand weeding) twice, weeding by dry land weeder twice at 20 and 40 DAS and once at 25 DAS controlled weeds effectively during both years and registered much higher number of branch/plant, siliqua/plant, seeds/siliqua and 1000-seed weight and ultimately led to significant increase in seed yield in comparison to the weedy check as well as *grubbing* and hoeing once. These treatments being at par, were statistically alike to hand weeding twice which provided highest weed control efficiency and crop growth and yield.

### 5.3.5 INTEGRATED APPROACH OF WEED CONTROL IN GROUNDNUT

S. S. Mahalle
Konkan Krishi Veedyapeeth, Dapoli, Maharashtra.

Field experiments were conducted at Dapoli during *Rabi* seasons of 1986–87, 1987–88 and 1988–89 and in *Kharij* during 1985, 1986 and 1987. It was observed

that pre-emergence application of butachlor @ 2.0 kg/ha supplimented with one mannual weeding at 30 DAS and pre-emergence application of oxadiazon @ 1.0 kg/ha found effective in controlling the weeds in groundnut during *Rabi* and *Kharif* season respectively.

### 5.3.6 VARIETAL AND HERBICIDAL INTERATION STUDIES IN GRONDNUT

H. C. Kundra, L. S. Brar and H. S. Brar
Punjab Agril. Univ., Ludhiana

Selectivity and bio-efficacy of promising herbicides like pendimethalin, fluchloralin, alachlor ethal fluralin and fluazifop-p-butyl in two varieties of groundnut (M 37 and M 335) was tested during 1988 and 1989 at Ludhiana. It was observed that all herbicides proved safe to groundnut and provided effective control of weeds. Pre-plant application of fluchloralin 0.84 kg/ha and pre-emergence application of pendimethalin 0.75, ethalfluralin 0.83 and alachlor 2.5 kg/ha produced crop yield as good as obtained under two hand weedings (4 and 6 WAS). Post-emergsnce application of fluazifop-p-butyl at 0.4 kg/ha did not control broad leaf weeds, however, gave very effective control of grass weeds like *Eleucine agyptia* and *Eragrostis tenella.*

### 5.3.7 WEED MANAGEMENT IN IRRIGATED GROUNDNUT UNDER UPPER KRISHNA PROJECT AREA

C. B. Kurdikeri, B. S. Lingaraju and Nagesh Naik
Agril. Res. Station, Kawadimatti, AP.

A field experiment in red soils was conducted at Kawadimatti during *Kharif* 1990 to study the effect of herbicides cultral practices, eombination of herbicides and cultural practices alongwith a weed free treatment on the control of weeds in irrigated groundnut. The results revealed that hand weeding thrice (20, 40 and 60 DAS) controlled the weed growth effectively (WCE 82.0%) resulting in higher pod yield (1680 kg/ha). Application of pendimethalin or alachlor at 1.0 kg/ha with one hand weeding 30 DAS were the next best in suppressing weeds (WCE 76.8 and 71.7%, respectively) and produced pod yield of 1296 kg/ha and 1191 kg/ha, respectively. Application of herbicides alone were not found in suppressing weed growth compared to their combination either with one hand weeding or one hoeing 30 DAS. Highest net return (Rs. 12, 440/ha) was realized from three hand weedings, followed by application of pendimethalin at 1.0 kg/ha+one hand weeding 30 DAS (Rs. 8745/ha) and application of alachlor at 1.0 kg/ha+one hand weeding 30 DAS (Rs. 8033/ha).

## 5.3.8 WEED AND NITROGEN MANAGEMENT IN GROUNDNUT CROP IN VERTISOLS

P. M. Nimje
Central Institute of Agril. Engineering, Bhopal, M.P.

An experiment was conducted at Bhopal during *Kharif* 1987 and 1988 on a deep vertisol, poor in N, medium in P and rich in K status. The groundnut pod yield was reduced by about 50% in weedy check compared to conventional method of controlling weeds through two hand weeding at 20 and 40 DAS. The dry matter and N uptake by weeds was lowest in conventional method. This treatment gave significantly higher yield, than the herbicidal treatment and was comparable with two mechanical weedings ginen 25 and 40 DAS. The combination of herbicide and one mechanical weeding at 40 DAS significantly decreased the dry weight and N uptake by weeds and increased the pod yield over herbicides alone. Both the herbicides, fluchloralin or oxadiazon controlled weeds effectively up to 25 DAS. Their effect on pod yield was more or less equal to one hand weeding or mechanical weeding given 20 to 25 DAS. Both the herbicides adversely affected root nodulation in both the seasons. However, the combination of herbicides and one mechanical weeding improved root nodulation.

## 5.3.9 MANAGEMENT OF PERENNIAL WEEDS IN RAINFED GRONDNUT

T. Senthivel and P. Parameswarau
Oilseeds Res. Station, Tindivanam, T.N.

A field experiment was carried out in the *Kharif* seasons of 1989 and 1990 at Tindivanam, on the sandy loam soils. The results of the study indicated that adopting summer ploughing twice with glyphosate spray at 0.8 kg/ha recorded less weed population and 17% increased pod yield and summer ploughing alone recorded 11% higher yield over control (No ploughing and herbicide). Among the weed control measures pendimethalin at 1.0 kg/ha as pre-emergence+fusilade 0.250 kg/ha applied post-emergence with one hand weeding on 45 DAS and imazithapyr 0.1 kg/ha (pre-emergence)+fusilade 0.250 kg/ha (post emergence) with one hand weeding on 45 DAS provided good control of perennial weeds and recorded higher pod yield over other treatments.

## 5.3.10 WEED CONTROL IN IRRIGATED GROUNDNUT

A. Palchamy, S. D. Sunder Singh and P. K. Rangiah
Forest Research Station, Methupalayam, T.N.

Field experiments were conducted in light loamy soils to study the effect of different herbicides in controlling weeds in groundnut crop. *Echinochloa crusgalli*

and *Trianthema portulacastrum* were the predominant weeds. Alachlor, nitrofen and and chloramben were very effective in controlling the germinating grasses, sedges and other broad leaf weeds. EPTC was not effective in controlling the weeds probably due to its high volatile nature and prevailing high temperature (36–38°C). In the case of other herbicides, there was a significant reduction in weed population when combined with one hand hoeing.

## 5.3.11 WEED CONTROL IN GROUNDNUT WITH HERBICIDES

K. N. Ahuja and N. T. Yaduraju
Division of Agronomy, I.A.R.I. New Delhi.

A field trial was conducted both in rainfed and irrigated condition in the *Kharif* 1990. The major weeds present were *Trianthema portulacastrum*, *Digera arvensis*, *Tribulus terrestris*, *Echinochloa colona*, *Acrachne racemosa* and *Cyperus rotundus*. Pre-planting or pre-emergence application of imazethapyr or metolachlor were better than fluchloralin or pendimethalin treatments in reducing the growth of monocot weeds. However, either application of pendimethalin and fluchloralin gave better control of dicots than other treatments. While pre-plant application of either metolachlor or imazethapyr was comparable to pendimethalin and fluchloralin treatments, pre and post emergence application of imazethpyr gave poor control of dicots. The pod yield was higher under rainfed conditions, where fluchloralin recorded the highest yield followed by pendimethalin and pre-plant metolachlor. Other treatments recorded lesser yield. Under irrigated conditions, however, pre-emergence application of imazethapyr at 0.1 kg/ha recorded the highest yield followed by pre-plant applications of metolachlor at 0 5 kg/ha. Pre-plant applications of 0.1 kg/ha imazethapyr and metolachlor at 0.75 kg/ha (pre-emergence) also gave yield comparable to fluchloralin and pendimethalin.

## 5.3.12 ENERGY AND ECONOMIC EVALUATION OF VARIOUS SOWING AND WEED CONTROL METHODS IN RAINFED GROUNDNUT

B. P. Mishra, V. K. Singh and R. P. Bajpai
IGKVV, Zonal Agric. Res. Station, Ambikapur, U.P.

Field experiment was conducted on upland sandy loam soil at Ambikapur during *Kharif* 1986 and 1987. The treatments comprised four sowing methods viz. *Nari*, behind plough, broadcast and *diffan* as main plot and six weeding methods viz. developed hand hoe, spade, hand weeding, alachlor at 1.5 kg/ha, bullock drawn developed sweep and weedy check as sub-plot. Results revealed that *Nari* (line) sowing gave 35% higher pod yield over broadcast method of sowing (1229 kg/ha). Besides, significant increase in pod yield by *nari* and *diffan*, both the methods also gave higher

net income and energy use efficiency (energy output-input ratio 6.6 and specific energy requirement 4.8 MJ/kg) than broadcast sowing (energy output-input ratio 4.9 and specific energy requirement 6.6 MJ/kg). Weeding by developed hand hoe recorded higher pod yield (1741 kg/ha), higher energy output-input ratio (7.88), minimnm specific energy requirement (5.1 MJ/kg) and a net saving of 1748 MJ/ha of human labour energy over traditional weeding practice. Traditional weed control methods like spade and hand weeding consumed highest input energy in order of 1843 and 1975 MJ/ha, respectively, and recorded lower energy use efficiency. Alachlor at 1.5 kg/ha comparatively gave high energy use efficiency (SER 5.48 MJ/kg) and energy ratio (5.8) than two hand weediug (SER 6.40 and energy ratio 4.97).

### 5.3.13 PERFORMANCE OF HERBICIDE UNDER LINE SOURCE SPRINKLER IRRIGATION SYSTEMS IN GROUNDNUT

K. Vairavan, S. Sankaran and S. Jeyaraman
Agric. College and Res. Institute, Madurai, T. N.

A field experiment was conducted during summer season of 1990 at Madurai. Three moisture regimes through line source, viz. 4.78, 4.00 and 3.18 cm compared with surface flow method at 4.00 cm in combination with and without fluchloralin at 1.0 kg/ha. The results revealed that fluchloralin applied pre-emergence, significantly increased the pod yield under different irrigation regimes tried as compared to control. Among the moisture regimes, irrigation at 4.00 cm moisture level through line source enhanced the herbicidal activity in controlling weeds.

### 5.3.14 WEED MANAGEMENT IN SUNFLOWER

P. K. Legha, R. K. Malik and A. S. Faroda
CCS Haryana Agric. Univ. Regional Research Station, Bawal, Haryana.

A field experiment was conducted at Bawal in *Kharif* 1990 to determine the effect of herbicides (pendimethalin and oxadiazon) applied alone, and in combination with physical methods, weedy check and weed free on the seed yield of sunflower. Both the physical and chemical methods used alone or in combination provided significantly higher seed yield (1396 to 2410 kg/ha) than weedy check (860 kg/ha). Pendimethalin @ 1.0 kg/ha and oxadiazon @ 0.5 kg/ha followed by one hand weeding 40 DAS recorded more yield in comparison to chemicals used alone even with increased doses.

## 5.3.15 INTEGRATED WEED MANAGEMENT IN RAINFED SUNFLOWER

S. Jeyaraman, D. Sivasankaran, S. Rajaram and N. S. Venkataraman
Agric. College and Res. Institute, Madurai, T. N.

Field experiments were conducted at Aruppukottai in *Rabi* 1983–84 and 1984-85. Two levels (0.75 and 1.5 kg/ha) of three herbicides, viz., fluchloralin, oxadiazon and thiobencarb alone and in combination with one weeding on 30th day were compared with farmers method (weeding twice on 15 and 30 DAS) and unweeded check. The results revealed that the pre-emergence application of thiobencarb at 1.5 kg/ha supplemented by a hand weeding on 30 DAS was found to be more economical with reference to the gross return per rupee invested on weeding. It gave Rs. 2.34 gross return per rupee invested as against Rs. 1.96 realised from farmer's method of two weeding. Application of thiobencarb at 1.5 kg/ha+one weeding on 30th DAS also recorded 7.6 per cent more seed yield (768 kg/ha) of sunflower over the conventional method of two weeding (714 kg/ha).

## 5.3.16 STUDIES ON INTEGRATED WEED MANAGEMENT IN SUNFLOWER (*HELIANTHUS ANNUS* L.)

G. Suresh, N. V. Reddy, P. C. Rao, S. M. Kondap and C. N. Reddy
College of Agriculture, Rajendranagar, A.P.

A field experiment was conducted during *Kharif* 1990 on an alfisol of medium fertility status with a view to findout effective herbicide dosage for sunflower (APSH–11). Lower weed density, lower dry matter production and higher weed control efficiency were observed in Metolachlor+hand weeding treatmcnt, resulting in higher sunflower seed yield. The post-emergence application of Fluaziopp–butyl @ 0.25 kg/ha resulted in effective control of *Cynodon dactylon*. Bio–assay studies using greengram did not indicate any residual effect of these herbicides on the succeeding crop.

## 5.5.17 DRY MATTER ACCUMULATION IN SUNFLOWER AS INFLUENCED BY DIFFERENT WEED CONTROL METHODS

R. H. Bhosle, D. K. Shelke, V. D. Salunke and N. S. Jadhav
Maharastra Agric. Univ., Parbhani.

A field investigation was conducted during *Kharif* season of 1989 at Parbhani. Eight weed control treatments viz. unweeded control, hand weeding and hoeing at 3 and 6 WAS, pendimethalin @ 0.75 and 0.50, metolachlor @ 1.85, fluchloralin @

1.35 and 0.90 kg/ha and weed free up to harvest were tested. The dominant weeds were *Dinebra retroflexa*, *Phyllanthus medraspatensis*, *Digera arvensis*, *Acalypha indica*, *Psedothia viscidue* and *Cyperus rotundus*. The dry matter accumulation at 30, 60 and 90 days in leaf and stem was 55.28, 44.72 and 29.08% and 48.43, 12.19 and 38.92% of total dry matter, respectively. The dry matter accumulation in head increased from 22.49 (at 60 days) to 49.39% (at 90 days) of total dry matter accumulation. Further, all weed control treatments significantly favoured dry matter accumulation in different plant parts, compared to control.

## 5.3.18 CONTROL OF WEEDS WITH HERBICIDES IN GINGELLY (*SESAMUM INDICUM*)

R. S. N. Rao and K. Narayana Rao
Weed Science Division, Agril. College, Baptala

Experiments were conducted during 1987–88 and 1988-89 at Baptala on sandy loam soil for the control of weeds in gingelly. The treatments comprised of fluchloralin at 0.62 and 1.25 kg, alachlor at 1.5 and 3.0 kg, thiobencarb at 2.0 and 3.0 kg/ha and hand weeding twice and unweeded control. The lower dose of herbicides were combined with one hand weeding at 35 DAS. The results revealed that the hand weeding twice and application of alachlor and fluchloralin at lower dose combined with one hand weeding was found effective in suppressing the weed density, weed dry weight and in increasing the seed yield with a benefit-cost ratio of 3.5, 3.5 and 3.3, respectively.

## 5.3.19 INTEGRATED WEED MANAGEMENT IN IRRIGATED SESAMUM

S. Rajaram, N. Prabhakar Rao and S. Jeyaraman
Deptt. of Agronomy, Agril. College and Res. Inst., Madurai, T.N.

A field experiment was conducted at Madurai during January to April, 1985. The treatments consisted of three pre-emergence herbicides at two rates (fluchloralin (0.75, 1.0 kg/ha), (butachlor, (1.0, 1.5 kg/ha) and (thiobencarb (1.0, 1.5 kg/ha) with and without supplemental hand weeding on 30 DAS, including two hand weeding at 15 and 30 DAS and unweeded check.

Effective control of weeds was observed with fluchloralin supplemented by one hand weeding. The highest yield was recorded by fluchloralin at 1.0 kg/ha with a supplemental hand weeding, followed by fluchloralin at 0.75 kg/ha with one hand weeding. Higher net return per rupee invested (Rs. 3.50) was realised by fluchloralin 0.75 kg/ha and one hand weeding.

## 5.3.20 EFFET OF NITROGEN LEVELS AND WEED CONTROL METHODS ON SEED YIELD OF RAYA (*BRASSICA JUNCEA* (L) CZERN AND COSS)

Jiya Ram Sharma and S. S. Pahuja
Deptt. of Agronomy, CCS Haryana Agril. Univ., Hisar.

Feld experiment was conducted during the rabi season of 1990-91 at Hisar to study the effect of nitrogen levels (0, 40, 80 and 120 kg/ha) and weed control methods on the seed yield of raya. Increasing levels of nitrogen and weed control with herbicides decreased the number and dry weight of weeds. The seed yield increased upto 87% at 80 kg N/ha with no further increase at 120 kg N/ha. Presence of weed for the whole season reduced the raya yield by 53%. Isoproturon at 0.75 kg/ha applied 30 DAS increased the yield (46%) significantly over the weedy check.

## 5.3.21 WEED MANAGEMENT SYSTEMS IN SUNFLOWER (*HELIANTHUS ANNUS*)

N. V. Reddy, G. Suresh, C. N. Reddy, P. C. Rao, M. Padmavathi Devi and S. M. Kondap
Deptt. of Agronomy, College of Agric., APAU, Hyderabad A.P.

A field experiment was conducted during rainy season of 1990 at Rajender Nagar. The weed flora of the experimental field consisted of *Cynodon dactylon, Cyperus rotundus, Dactyloctenium aegypticum, Digitaria sanguinalis, Parthenium hysterophorus, Amaranthus viridis, Commelina benghalensis* and *Trichodesma indicum*. Lowest weed density and highest weed control efficiency was obtained with metolachlor @ 1.0 kg/ha followed by hand weeding at 30th DAS in comparison to other treatments. Significant increase in head diameter, number of filled seeds/head, 1000 seed weight, and seed yield was also recorded in this treatment. The reduction in seed yield due to weed competition ranged between 42 to 72%. Based on the results obtained and economics of weed management practices, it was concluded that pre-emergence application of metolachlor @ 1.0 kg/ha followed by hand weeding at 30th DAS was found the effective weed management practice in sunflower.

## 5.3.22 EVALUATION OF HERBICIDES IN SUNFLOWER (*HELIANTHUS ANNUS*) UNDER DIFFERENT MOISTURE REGIMES

P. Nalayini, S. Sankaran and N. Kempuchetty
TN G. D. Naidu Agril. Univ., Coimbatore

Field experiments were conducted at Coimbatore to evaluate the effect of herbicides and moisture levels on weed control in *Kharif* and *Rabi* sunflower during

1989-90. The pre-dominant weed flora of the experimental field consisted of *Cynodon dactylon, Dactyloctenium aegypticum* among grasses, *Trianthema portulacastrum, Flaveria australasica, Amaranthus viridis* among broad-leaved weeds and *Cyperus rotundus* among sedges. The control efficiency was lowest in the high moisture treatment and was comparable under medium and low moisture regimes. Fluchloridone 0.5 kg followed by one hand weeding at 40 DAS reduced weed number/unit area, biomass and nutrient uptake by weeds and registered highest weed control efficiency. The succeedings crops viz., Sorghum, pearlmillet and cowpea were not affected by herbicide residues.

## 5.3.23 EFFICACY OF HERBICIDES WITH *RHIZOBIUM* INOCULATION IN GROUNDNUT (*ARACHIS HYPOGAEA* L.)

Rapolu, M. K., S. M. Kondap, N. V. Reddy, P. C. Rao and C. N. Reddy
College of Agric., APAU, Hyderabad.

Field experiment was carried out on the red sandy loam soil at Hyderabad. The results of the study indicated that performance of herbicides were better due to *Rhizobium* inoculation which may be due to better and early vigorous growth of crop. *Rhizobium* inoculation reduced weed density and weed dry matter production and thereby recorded significantly higher yields compared to without inoculation (11.4%). However, the interaction effect of herbicides with *Rhizobium* inoculation was not significant. Among weed control treatments hand weeding was best followed by pendimethalin 1.5 kg/ha (pre-emergence) and haloxyfop-methyl and fluazifopp-butyl (post-emergence) in controlling weeds. The percentage yield reduction in groundnut due to weeds was 67.26.

## 5.3.24 INCREASED OIL SEED PRODUCTION THROUGH WEED MANAGEMENT IN GROUNDNUT+SUNFLOWER INTERCROPING SYSTEM

C. N. Reddy, N. V. Reddy, P. C. Rao, M. Padmavathi Devi and S. M. Kondap
AICRP on Weed Control, College of Agric., Rajendranagar.

A field experiment was conducted during post rainy season of 1988-89 and rainy season 1989-90 on an alfisol of medium fertility status. Groundnut (Cv. J-11) and Sunflower (Cv. morden) were sown in 5:1 planting pattern. The important weed flora observed during both the seasons were *Parthenium hysterophorus, Amaranthus viridis, Panicum sp., Cyperus rotundus, Tribulus terristris, Tridax procumbans, Cynodon dactylon, Celosia argentia, Elavaria australasica.* The dry matter production of weeds was reduced significantly by weed managment practices. Among the weed management practices, significantly lowest weed drymatter was recorded with

pendimethalin 1.0 kg/ha+hand weeding treatment. Imazethypr proved phytotoxic to sunflower, but crop recovered afterwards. Significantly higher crop drymatter production, pod yields of groundnut (1065 kg/ha), pod equivalents (1122 kg/ha) and gross monetary returns were obtained with pendimethalin @ 1.0 kg/ha+hand weeding on 35th DAS. Based on the results it was concluded that the pre-emergence application of pendimethalin @ 1.0 kg/ha+hand weeding on 35th DAS was found to reduced weed competition, increase yieids and thereby net returns to the farmer.

### 5.3.25 CONTROL OF *CUSCUTA SP.* WITH HERBICIDES IN BLACK GRAM UNDER UPLAND CONDITIONS

K. Narayana Rao and S. N. Rao
Weed Science Division, Agric. College, Baptala, A.P.

An experiment was conducted at Baptala with herbicides pendimethalin (1.0 and 1.5 kg/ha), fluchloralin (1.25 and 1.87 kg/ha) and the combination of pendimethalin+fluchloralin (0.50+0.60 and 0.60+0.70 kg/ha) for the control of *Cuscuta* in black gram (cv. IBG-20) during *rabi* 1989-90. The results indicated that the application of pendimethalin at 1.0 and 1.5 kg/ha and the combination of pendimethalin at 0.60 kg+fluchloralin at 0.70 kg were effective in reducing the infestation of *Cuscuta* seedlings at 30 DAS. Maximum seed yield of 996 kg/ha was recorded with pendimethalin at 1.0 and 1.5 kg/ha followed by the combination of pendimethalin at 0.60+fluchloralin 0.70 kg/ha (810 kg/ha). Lowest yield of 216 kg/ha was recorded in untreated control and the increase in yield due to herbicide treatments was 252 to 361% over control.

### 5.3.26 CHEMICAL WEED CONTROL IN SOYBEAN

R. S. N. Rao and K. Narayana Rao
Weed Science Division, Agric. College, Baptala, A.P.

An experiment was conducted for the control of weeds in soybean, during *kharif* 1989-90 at Baptala with two doses of alachlor, pendimethalin, fluchloralin with hand weeding twice and unweeded control. The plots, received the lower doses of the above herbicides were supplemented with one hand weeding. The results indicated that all the herbicide treatments were significantly superior to unweeded control in reducing weed density and weed dry weight. The weed control efficiency of herbicides ranged from 68.5 to 86.8%. Maximum grain yield of 2000 kg/ha was recorded in hand weeding twice which was 130% more compared to unweeded control. Among the herbicides, maximum grain yield of 1800 kg/ha was recorded with pendimethalin at 1.5 kg/ha followed by its lower dose of 1.0 kg+hand weeding and fluchloralin at 1.0 kg+hand weeding treatments each recording 1770 kg/ha. Herbicide treatments increased the grain yield by 84 to 107%.

## 5.3.27 WEED MANAGEMENT STUDIES IN CHICKPEA

Debdulal Masanta, J. N. Singh and Govindra Singh
Deptt. of Agronomy, G. B. Pant Univ. of Agric. and Tech., Pantnagar, U.P.

Weed management studies were carried out at Pantnagar. The crop was Pre-dominantly infested with *Anagallis arvensis*, *Melilotus indica*, *Chenopodium album*, *Linaria minor* and *Phalaris minor*. Isoproturon and pendimethalin were effective in reducing the density and dry weight of weeds when compared with the weedy check. Pendimethalin at 1.0 kg/ha and pendimethalin at 0.5 kg/ha supplemented with one weeding at 30 DAS were more effective than isoproturon. Uncontrolled weeds reduced the grain yield by 78%. The grain yield in the plots treated with pendimethalin were more than the plots treated with isoproturon.

## 5.3.28 CONTROL OF *ECHINOCHLOA* SP. IN PULSES WITH POST EMERGENCE HERBICIDES

K. Narayana Rao and R. S. N. Rao
Weed Science Division, Agric. College, Baptala, A.P.

Experiments were conducted for the control of *Echinochloa* species in pulses during *rabi* 1989-90, with post-emergence application of thiobencarb at 1.5 kg/ha applied 10 DAS and fluazifop-p-butyl and sethoxydim each at 0.1, 0.2 and 0.3 kg/ha applied 15 DAS. The results revealed that the application of fluazifop-p-butyl and sethoxydim at 0.2 or 0.3 kg/ha were superior in reducing density and dry weight of weeds and increased the seed yield of green gram compared to their lower dose of 0.1 kg/ha, thiobencarb 1.5 kg/ha and unweeded control. The increase in yield due to the herbicides treatments ranged from 51 to 34% over unweeded control.

## 5.3.29 WEED MANAGEMENT IN FIELD PEA *(PISUM SATIVA* L.) IN NORTH-WESTERN HILLS OF INDIA

Ved Prakash, Prem Singh and Kamta Prasad
Vivekananand Parvatiya Krishi Anusandhanshala, Almora, U.P.

Field experiment was conducted on a sandy loam soil at Almora during *rabi* season of 1985-86 and 1986-87 with a view to find out the appropriate time and number of weeding in field pea grown under rainfed conditions, Percent weed competition index was the lowest under three weedings followed by two weedings while it was maximum in unweeded check. With respect to grain yield, two hand weedings were at par with the weed free crop; however, from economics point of view

it was considerably superior than the later and gave an additional net return of Rs. 930/ha over weed free treatment. Number of pods/plant, number of grains/pod, pod length and 1000-grain weight were comparable under three and two weedings but were significantly superior than weeding once at 75 DAS and unweeded check in both the year.

### 5.3.30 WEED CONTROL IN RAINFED SOYBEAN WITH SPECIAL REFERENCE TO *OXALIS LATIFOLIA*

Prem Singh, Kamta Prasad and Ved Prakash
Vivekanand Parvatiya Krishi Anusandhan Shala, Almora, U.P.

An experiment was conducted at Almora during *kharif* 1988 and 1989 with an objective to find out the suitable control measures for *Oxalis latifolia* in rainfed soybean. Experiment was conducted on sandy loam soil which was predominantly infested with *O. latifolia*. Results revealed that significantly lower population and dry weight of weeds were recorded in oxadiazon treated plots. On an average, maximum grain yield (1496 kg/ha) was obtained in weed free treatment, which was comparable with the treatments of hand weeding twice (1462 kg/ha); oxadiazon+metolachlor (1383 kg/ha) and oxadiazon followed by one hand weeding (1200 kg/ha).

### 5.3.31 STUDIES ON WEED MANAGEMENT IN SOYBEAN UNDER RAINFED CONDITIONS OF U.P. HILLS

Ved Prakash, Kamta Prasad and Prem Singh
Vivekananda Parvatiya Krishi Anusandhanshala, Almora, U.P.

A field study was conducted during *kharif* 1983 and 1984 at Almora on sandy loam soil under rainfed conditions. The predominant weed species were, *Gainsoga parviflora*, *Echinochloa crusgalli*, *Cyperus rotundus*, *Panicum* sp. and *Eleusine indica*. The average losses of grain yield due to weed competition in unweeded check were 59% as compared to the weed free check. However, initial 30 days of crop growth was more susceptible to weed infestation and two weedings accomplished at 15 and 30 DAS were adequate for obtaining an average yield of 2550 Kg/ha which was quite comparable with weed free yield (2900 kg/ha). From economic point of view, three weedings gave the highest additional net returns (Rs. 5,640/ha) followed by four weedings (Rs. 5,500/ha) and two weeding (Rs. 5,360/ha) over unweeded check.

### 5.3.32 INTEGRATED WEED MANAGEMENT IN CHICKPEA

S. S. Mukhopadhayay, A. Hossain and D. C. Mondal
Weed Science Lab. Insti. of Agric. Sriniketan, West Bengal

In the field experiment conducted under AICRP-Weed Control during *rabi* 1987-88 the predominant weed species were *Digitaria sanguinalis* (L.) Scop.,

*Cynodon dactylon* (L.) *Pers.*, *Gnaphalium indicum* L., *Spergula arvensis* L., *Anagallis arvensis* L. and *Chenopodium album* L. Fluchloralin alone at 1.0 kg/ha or fluchloralin at 0.5 kg/ha followed by one hand weeding reduced the dry weight of weeds.

The grain yield in the plots treated with fluchloralin applied pre-plant incorporation at 0.5 kg/ha and followed by one weeding was 1383 kg/ha which was 43% higher than the weedy check.

### 5.3.33 INTEGRATED WEED CONTROL IN SNAP BEAN (*PHASEOLUS VULGARIS* L.)

Bijendra Singh
Division of Horticulture, ICAR, Res. Complex, N. E. H. R.-Barapani, Meghalaya

Field experiments were conducted to study the integrated weed control method in snap bean during August, 1989 and March 1990 in Meghalaya. *Galinsoga parviflora, Ageratum conyzoides, Bidens pilosa, Digitaria marginata* and *Eleusine indica* were the dominated weeds. All weed control treatments were significantly superior over unweeded plots with regard to green pod yield. The pod yield in the plots where three weedings were given and in plots where pendimethalin at 1.0 kg/ha was supplemented with one weeding were more than other treatments.

### 5.3.34 EFFECT OF WEED CONTROL AND CROP GEOMETRY ON YIELD AND YIELD ATTRIBUTING CHARACTERS OF BLACK GRAM (*VIGNA MUNGO* (L.) HEPPER) CULTIVARS

R. K. Jaglan and S. S. Pahuja
Deptt. of Agronomy, CCS, Haryana Agril. Univ., Hisar.

Field study on the effect of weed control and crop geometry on yield and yield attributing characters of black gram cultivars was conducted at Hisar during *kharif* season of 1985–86. Three varities of black gram viz , T-9, UH 80-7 and UH 80-4 were compared under four weed control treatments (weed free, weedy check, fluchloralin at 1.0 kg/ha (PPI) and hoeing twice at 20 and 40 DAS with two crop geometries viz., 30 cm × 10 cm and 30 cm × 7.5 cm. Experimental findings revealed that weed free treatment recorded the maximum seed yield (2163 kg/ha) and stover yield 5949 kg/ha), number of pods (59 60) and grains/plant (378.49) which were significantly higher over other weed control treatments. It was followed by two hoeings and fluchloralin treatments. The weed control treatments significantly reduced the weed population and their dry matter production. Two hoeings at 20 and 40 DAS were found to be most economical. Variety UH 80-7 produced significantly higher

grain yield (1766 kg/ha) than UH 80-4 (1540 kg/ha) and T-9 (1645 kg/ha) varieties. Both the crop geometries proved to be non-significant in respect of grain and stover production.

## 5.3.35 CULTURAL AND CHEMICAL WEED CONTROL IN SOYBEAN (*GLYCINE MAX* L. MERRILL) IN MALWA REGION OF MADHYA PRADESH

V. B. Upadhyay, Manorama Sharma, V. N. Acharya and N. R. Nakely
J. N. Krishi Vishwa Vidyalaya, Res. Station, Ujjain, M.P.

Field experiment on weed management in Soybean was conducted on clay loam soil during 1990-91. The study revealed that manual weeding at 30 DAS, mechanical weeding through Kolpa at 10 and 25 DAS and chemical weed control through fluchloralin 1.0 and 1.5 kg/ha, pendimethalin 0.75 and 1.0 kg/ha and alachlor 1.5 and 2.0 kg/ha controlled the weeds and increased the grain and straw yield of soybean significantly over weedy check. The significant negative correlation was found between weed biomass and soybean yield. Hand weeding had significantly higher seed yield (2085 kg/ha) and weed control efficiency (72.64%) and reduction in weed biomass (21 kg/ha), compared to weedy check. Among different herbicides, fluchloralin 1.5 kg/ha established its superiority over pendimethalin and alachlor at all levels.

## 5.3.36 HERBICIDAL WEED CONTROL IN LINSEED UNDER DIFFERENT LEVELS OF IRRIGATION AND FETILITY

N. K. Jain, J. P. Tiwari and N. M. Gogulwar,
J. N. Krishi Vishwa Vidyalaya, Jabalpur, M.P.

Field studies were carried out at Jabalpur during Rabi season of 1986-87 and 1987-88. The main treatments consisted of three irrigation (0, 1 and 2) and two fertility levels (40+20+10 and 60+30+20 kg NPK/ha) with five sub treatments of weed control (weedy check, hand weeding, isoproturon 1.0 kg/ha pre and post emergence and pendimethalin 1.0 kg/ha). The major weeds were *Anagallis arvensis* L., *Cichorium intybus*., *Cyperus rotundus* L., *Digitaria adscendens* Henr., *Phalaris minor* Retz., *Chenopodium album* L. and *Vicia sativa* L. The highest weed control efficiency was noted under hand weeding (84%) followed by isoproturon post-em. (50.1%) and pendimethalin (45.6%). The irrigation and fertility levels did not influence the weed population and weed biomass. With the increase in the level of irrigation and rate of fertility the linseed yield increased. Among weed control treatments hand

weeded plots gave higher grain yield (1167 kg/ha) which was significantly superior to herbicidal treated plots. Though all the weed control treatments registered significantly better yield than unweeded check.

## 5.3.37 WEED MANAGEMENT IN SOYBEAN

P. Ulaganathan, A. Rajagopal, A. Balasubramanian and N. Kempuchstty
Tamil Nadu G. D. Naidu Agril. Univ., Coimbatore.

Field experiments were conducted during *Kharif* 1989 and *Rabi* 1989-90 to evolve a suitable weed control method for soybean under irrigated condition on sandy clay loam soil at Coimbatore. The herbicides viz. pendimethalin, fluchloralin, oxadiazon, mixtures of herbicides along with conventional weed control methods were tried. Hand weeding twice at 20 and 40 DAS and pendimethlin at 1.0 kg/ha were effective and economical method of weed management in soybean. Among the integrated methods, mixture of pendimethalin and fluchloralin (0.5+0.625 kg) with one late hand weeding was effective and economical. There was no residual toxicity of herbicides observed on succeeding crops of sorghum, maize, greengram and cotton in the field and cucumber in pot culture.

## 5.3.38 WEED MANAGEMENT IN SOYBEAN

A. S. Venkatakrishnan, N. Kempuchetty, S. Purushothaman, S. P. Palaniappan and S. Sankaran
Directorate of Soil and Crop Mgmt. Studies, T N GDNAU Coimbatore, T.N.

Efficacy of Alachlor (2.0 kg/ha), pandimethalin (1.0 kg/ha), fluchloralin (1.0 kg/ha) and metolachlor (1.0 kg/ha) with and without hand weeding once and cultural methods of weed control (planting at 22.5 cm row spacing) with and without hand weeding once and application of straw, were evaluated to control weeds in soybean during *kharif* 1989 and 1990 at Coimbatore. Major weeds, associated with the experimental plot were *Trianthema portutacasltrum, Flavaria australasica, Boerhaavia diffusa, Amaranthus viridis, Cynodon dactylon, Echinochloa colona, Dactyloctenium aegyptium* and *Cyperus rotundus.* Among the different treatments alachlor 2.0 kg/ha+one hand weeding significantly reduced the number and weed dry matter production followed by fluchlorialin at 1.0 kg/ha+one hand weeding and pendimethalin 1.0 kg/ha+one hand weeding and were comparable with twice hand weeded plots. The highest grain yield was recorded in the alachlor 2.0 kg/ha+one

hand weeding and the effect was comparable with fluchloralin 1.0 kg/ha with one hand weeding and pendimethalin 1.0 kg/ha with one hand weeding and hand weeding twice plots.

## 5.3.39 WEED MANAGEMENT IN SOYBEAN IN THE NORTH WESTERN ZONE OF TAMIL NADU

C. Chinusamy, C. Jayanthi, V. Veerabadran and P. Rangasamy
Regional Res. Station Paipur and Madurai, T.N.

Field experiments were conducted during 1987 to 1989 to maximise the production potential of soybean Co-1 both under irrigated and rainfed conditions with efficient weed managment system along with other management aspects of plant density and fertilizer levels. Results in terms of grain yield indicated that pre-emergence application of fluchloralin at 1.25 kg/ha on 3 DAS recorded higher grain yield of 1900 kg/ha resulting in better fertilizer use efficiency in irrigated soybean. Fluchloralin at 1.0 kg/ha resulted in the grain yield of 727 kg/ha during normal rainfall years. Lesser weed population and reduced weed dry matter production favoured better yield with herbicide application in soybean under irrigated and rainfed conditions.

## 5.3.40 CHEMICAL WEED CONTROL IN SOYBEAN

N. K. Prabhakaran, S. B. Palaniappan, Ganesaraja and S. Jeyaraman
Deptt. of Agronomy, Agri. College and Res. Inst., Madurai, T.N.

Field experiment was conducted during summer, 1986 (Feb.–April) under irrigated condition on a sandy loam soil at Coimbatore. Fluchloralin at 1.25 kg/ha was found to be effective for broad leaf weeds and grasses. Fluchloralin, oxadiazon and pendimethalin at 1.25, 1.00 and 1.50 kg/ha respectively had better weed control efficiency. Weed index was lower for pendimethalin at 1.0 kg/ha and fluchloralin at 1.25 kg/ha, weed dry matter production and nutrient uptake were reduced by fluchloralin, pendimethalin and oxadiazon and hand weeding twice treatments. Yield was more in hand weeding twice, pendimethalin 1.00 kg/ha and fluchloralin in 1.25 kg/ha. Thus it could be concluded that besides hand weeding twice on 20 and 45 DAS, pendimethalin at 1.0 kg/ha and fluchloralin at 1.25 kg/ha gave effective weed control and grain yield.

## 5.3.41 STUDIES ON PRE-EMERGENCE HERBICIDES IN RAINFED GREEN GRAM

K. Srinivasan, M. Ramasamy, R. Sentha and K. S. Jehangir
National Pulses Res. Centre, Vamban, Pudukkotai.

Field trials were conducted during three successive *Kharif* seasons in rainfed conditions of Vamban. Seven pre-em. herbicides viz., pendimethalin 1.0, fluchloralin 0.50, fluchloralin 1.0, oxadiazon 0.75, oxyfluorfen 0.75, alachlor 0.50 and butachlor 0.50 kg/ha were compared with one hand weeding (15 DAS), two hand weedings (15 and 30 DAS) and weedy check. Grassy weeds and sedges were dominant. The seeeling mortality (%) was significantly higher in oxyfluorfen at 0.75 kg/ha followed by oxadiazon at 0.75 kg/ha. The weed dry weight was significantly less in Oxyfluorfen at 0.75 kg/ha followed by fluchloralin at 1.0 kg/ha. Fluchloralin at 1.0 kg/ha produced significantly better growth and yield attributes and grain yield. Fluchloralin controlled most of the broad leaved weeds in the field. Oxadiazon and oxyfluorfen proved phytotoxic to crop.

## 5.3.42 EFFECT OF DIFFERENT WEED CONTROL TREATMENTS ON GROWTH AND DRY MATTER PRODUCTION IN PIGEONPEA

M. P. Maheswarappa and H. V. Nanjappa
Deptt. of Agronomy, Agri. College, G.K.V.K. Campus, Bangalore.

Studies were conducted to find out the effect of different weed control treatments on crop growth and weed growth in pigeonpea. Weed free, hand weeded twice and herbicide treatments combined with one hand weeding at 45 DAS recorded higher dry matter of stem, leaves and pods which consequently resulted in higher seed yield. Oxyfluorfen at 1.5 kg/ha was phytotoxic to the crop during early stages and crop recovered at later stages.

## 5.3.43 EFFECT OF WEED MANAGEMENT PRACTICES ON THE ATTACK OF STEMFLY (*MELANAGRMYZA SOJAE*) AND GRAIN YIELD IN SOYBEAN

M. L. Sharma, B. D. Rai and R. K. Saraf
Zonal Agril. Res. Station, Chhindwara.

An experiment on the effect of weed management on the attack of stemfly and grain yield in soybean was conducted during *kharif* 1989 at Chhindwara. All the plant found infested with stemfly. Thiobencarb at 3 kg/ha as pre-em. recorded maximum (82.10%) weed mortality, less number of exit holes on stem (3.06), less

average and tunnel length in the stem (13.53 cm and 18.29%), more (89.74%) filled pods and grain yield (1344 kg/ha) followed by butachlor at 2 kg/ha. Among the manual operation treatment, hand weeding at 25 and 35 DAS was best and recorded highest grain yield (1552 kg/ha) followed by two hand weeding at 15 and 25 DAS and one hand weeding at 20 DAS.

### 5.3.44 COMPARATIVE EFFICIENCY OF CULTURAL AND HERBICIDAL METHODS TO CONTROL *ASPHODELUS TENUIFOLIUS* L. IN CHICKPEA

P. K. Legha, P. Rao, S. K. Aggarwal and Ajit Singh
Regional Research Station, HAU, Bawal.

Field experiment conducted at Bawal during 1989-90 to control *Asphodelus tenuifolius* L. in chickpea (*Cicer arietinum*) three herbicides viz. Imazethapyr, diclofop-methyl, tralkoxydim with different doses and time of application compared with weedy check, weed free and weeding at 25 and 45 DAS. Results showed that mechanical method of weed control gave significantly higher grain yield, 1000 grain weight and pods/plant to unweeded control plots. These were found at par with weed free plot, further the grain yield was at par with two hand weedings when diclofop-methyl at 1.0 kg/ha applied 20 DAS. However, none of the three herbicides gave significantly higher grain yield than the weedy check.

### 5.3.45 COMPARATIVE EFFICACY OF DIFFERENT HERBICIDES IN RAINFED BLACKGRAM

K. Srinivasan, M. Ramasamy, R. Shentha and K. S. Jehangir
National Pulses Research Centre, Vamban, Pudukkottai.

Field trials for three successive *kharif* seasons were conducted at Vamban to evaluate the efficacies of different herbicides in rainfed blackgram. Seven herbicidal treatments, viz., pendimethalin at 0.75 kg/ha, fluchloralin at 0.5 kg/ha, fluchloralin at 1.0 kg/ha, oxadiazon at 0.75 kg/ha, oxyfluorfen at 0.75 kg/ha, alachlor at 0.50 kg/ha and butachlor at 0.5 kg/ha as pre-emergence spray were compared with one hand weeding, two hand weeding and weedy control. Grassy weeds and sedges occupied major bulk. The results indicated that the seedling mortality was significantly higher in oxyfluorfen at 0.75 kg/ha, followed by oxadiazon at 0.75 kg/ha. Fluchloralin recorded the least seedling mortality. The weed dry weight was significantly low in oxyfluorfen at 0.75 kg/ha and fluchloralin at 1.0 kg/ha. The weed control efficiency was also significantly higher in oxyfluorfen at 0.75 kg/ha and fluchloralin at 1.0 kg/ha. All the growth and yield attributes and grain yield were

significantly higher in fluchloralin at 1.0 kg/ha. Though, the weed dry weight was less in oxyfluorfen, oxadiazon and butachlor but the grain yield of crop was adversely affected due to their phytotoxicity.

## 5.3.46 INTEGRATED WEED MANAGEMENT IN PIGEONPEA

S. Kumar, R. K. Malik and S. B. Phogat
Deptt, of Agronomy, CCS HAU, Hisar

A field experiment on pigeonpea conducted at NARP research area of C.C.S. HAU, Rohtak Campus during *kharif* 1991 revealed that mechanical methods of weed control (30+60 DAS and weed free) was superior to the chemicals. Among chemical weed control methods application of fluchloralin @ 1 kg/ha as PPI in combination with one hand weeding at 45 DAS provided highest grain yield of pigeonpea over the other chemicals used alone and in combination with interculture (pendimethalin @ 1.0 kg/ha and 1.5 kg/ha as pre-emergence and PPI). Yield was 69.57% higher than the weedy check. Pendimethalin @ 1 kg/ha alone as pre-emergence gave lowest yield among herbicides which was 21.10% higher than that of weedy check.

## 5.3.47 CHEMICAL WEED CONTROL IN JAPANESE MINT (*MENTHA ARVENSIS* L.)

Jai Dev, J. N. Singh
Deptt. of Agronomy, N. D. Univ. of Agric. and Tech., Kumarganj.

Field experiments conducted during 1985 and 1986 on silty-loam soil at Pantnagar, India, revealed that unrestricted weed growth reduced the green herbage and oil yields of Japanese mint (*Mentha arvensis* L. Cv. MAP) by 86.6 and 87.8%, respectively. Pendimethalin and oxyfluorfen at 1.5 and 0.3 kg/ha, respectively causing control of weeds to the extent of 80 and 76% and first cutting and 60 and 52% at second cutting of mint crop, respectively, & gave herbage, oil at *menthol* yields comparable to weed free and hand weeding check. Hand weeding treatment was very close to weed-free check in all respects. Application of fluchloralin at 0.75-2.25 kg/ha, although proved selective but failed to produce desired results. Among broad leaf weeds, *Chenopodium album* was completely controlled in all the herbicidal treatments. None of the treatments impaired the quality of mint oil measured in terms of menthol content.

## 5.3.48 EFFECT OF HERBICIDES ON BLACK GRAM (*VIGNA MUNGO* (L.) HEPPER) AND ASSOCIATED WEEDS

O. P. Mishra
Deptt. of Agronomy, G. B. Pant Univ. and Tech, Pantnagar,

Pendimethalin, alachlor and fluchloralin were tested in a field experiment during kharif 1990 and 1991. Major weed species in the experiment were *Echinochloa colona*, *Cyperus rotundus*, *Cleome viscosa*, *Celosia argentia*, *Eleusine indica* and *Physalis minima*. The density and dry weight of weeds reduced effectively under herbicide and hand weeding treatments. During kharif 1990, significantly highest grain yield was obtained under weed-free condition which was at par with that of pendimethalin at 1.0 and 1.5 kg/ha as pre-emergence, fluchloralin at 1.0 kg/ha as pre-plant incorporation & hand weeding twice at 25 & 50 DAS. Though there was no marked variation in grain yield of urdbean due to various treatments during kharif 1991, however, it was highest under weed-free condition followed by pre-emergence application of pendimethalin at 1.0 and 1.5 kg/ha.

## 5.3.49 PERFORMANCE OF CHICKPEA CULTIVARS UNDER DIFFERENT WEED MANAGEMENT SYSTEM

R. S. Balyan, R. K. Malik, R. S. Panwar, S. M. Singh and R. S. Dhankar
Deptt. of Agronomy, CCS Haryana Agril. Univ., Hisar.

Field studies are conducted at Hisar during rabi seasons of 1989-90 and 1990-91. The experimental field was infested with *C. album*, *V. sativa*, *F. parviflora*, *M. indica* and *A. tenuifolius*. Weed interference throughout the crop season reduced chickpea yield by 71% (av. of cultivars and years). Maximum yield loss of 78% was recorded in H-86-143 cultivar and least (65%) in C-235. Similarly these cultivars recorded maximum and minimum weed weight, respectively. Dry matter accumulation at early stages, number of branches and pods/plant seem to be the better characters in governing the competing ability in chickpea than plant height. Though none of the cultivar was found highly competitive with weeds, however, C-235 and H-82-2 performed better than H-86-143.

## 5.3.50 EVALUATION OF HERBICIDES FOR WEED MANAGEMENT IN PEAS (*PISUM SATIVUM* L.) IN MID-HILLS OF HIMACHAL PRADESH

Janmejai Sharma
HPKVV, Regional Res. Station Bajaura, (HP).

Experiment was conducted for three consecutive *rabi* seasons (1987-88 to 1989-90) to evaluate the promising herbicides for weed control in Peas at Bajaura.

Results revealed that application of pendimethalin 1–1.5 kg/ha, oxadiazon 0.75 kg/ha and alachlor 2 kg/ha gave more than 75% mean weed control efficiency. Oxadiazon 0.75 kg/ha and alachlor 2.0 kg/ha gave phytotoxic effects on crop plants. Weeds caused a reduction of 63.3% in yield. Application of pendimethalin 1.0 kg/ha thiobencarb 1.5 kg/ha, alachlor 1.5 kg/ha and oxadiazon 0.5 kg/ha were found as effective as hand weeding and gave higher yields.

## 5.3.51 EFFECT OF FLUAZIFOP-P-BUTYL ON THE CONTROL OF WEEDS IN SOYBEAN

Sahadev Singh and V. M. Bhan
National Res. Centre for Weed Science, Adhartal, Jabalpur, M.P.

A field experiment was conducted during 1990 and 1991 at Jabalpur, to evaluate the efficiency of fluazifop-p-butyl applied at 300, 400 and 800 g/ha at 20, 25 and 30 DAS in soybean. Increasing rates of fluazifop-pbutyl from 300 to 500 g/ha significantly reduced the density of weeds and found effective in increasing yield of soybean. The application of fluazifop-p-butyl @ 300 g/ha at 20 DAS has shown less effect in reducing number of weeds and increasing yield of soybean. The middle dose of fluazifop-p-butyl has considerably reduced number of weeds & increased seed yield compared to control and lower dose. But the highest dose of fluazifop-d-butyl at 30 DAS has shown best result in reducing weed population and increasing seed yield of soybean in comparison to all other treatments.

## 5.3.52 INTEGRATED WEED MANAGEMENT IN SOYBEAN AND SORGHUM GROWN IN BLACK SOIL

H. S. Bisen and V. V. Singh
National Res. Centre for Weed Sci., Adhartal, Jabalpur, M.P.

Field experiment on evaluation of herbicide sprays and weeding by mechanical tools as integrated weed control measures was conducted in Soybean and Sorghum. Herbicide used in Soybean was a pre-emergence fluchoralin (Basalin) and for Sorghum crop was Atrazine. Three tyned hand weeder, animals drawn weeding tool (M.P. Dora) and hand tool "Khurpi" were used as mechanical tools. The results indicated that the application of pre-emergence herbicide controlled the weed between 31–53% in the initial stages of crop growth and reduced the time of subsequent weeding by mechanical weeding tools considerably. It was revealed from the studies that the chemical spray of pre-emergence herbicides supplemented by weeding with mechanical tools as a combination was found ideal and effective,

## 5.3.53 INTEGRATED WEED MANAGEMENT IN PIGEONPEA ($BDN_2$)

A. N. Giri, D. K. Shelke, R. H. Bhosle, V. D. Salunke and Jadhav
AICRP On Weed Control, M.A.U., Parbhani.

A field experiment to findout the comparative performance of physical, chemical and integrated method of weed control was conducted at Parbhani during 1991-92 under rainfed conditions. The seven treatments comprised of unweeded control, handweeding and hoeing 3 and 6 WAS; handweeding and hoeing 3, 6 and 9 WAS, pre-emergence application of pendimethalin @ 0.75 kg/ha, pre-emergence application of pendimethelin @ 0.50 kg/ha followed by one handweeding and hoeing 6 WAS, pre-emergence application of alachlor @ 2.0 kg/ha and pre-emergence application of alachlor @ 1.0 kg/ha followed by one handweeding and hoeing 6 WAS.

Dominant weeds associated with the crop were *Brachiarea erusiformis, Dinebra retroflexa, Cynodon dactylon* and *Digera arvensis.* All treatments produced significantly higher grain yield over unweeded control. Hand weeding and hoeing treatments proved significantly superior to all treatments. Herbicide with interculture treatments were next best and were superior to alone herbicides.

## 5.3.54 EFFECT OF SPACING, PHOSPHORUS AND WEED CONTROL ON GROWTH AND YIELD OF SOYBEAN UNDER VERTISOLS OF CHHATTISGARH

K. K. Purohit, M. Dhruwa, B. L. Chandrakar and R. S. Tripathi
Deptt. of Agronomy, IG Krishi Vishwa Vidalaya, Raipur, M.P.

An experiment was conducted during kharif 1990 on clay loam soil at Raipur, with three row spacing (20, 30 and 40 cm), four levels of phosphorus (0, 30, 60 and 90 kg $P_2O_5$/ha) and two levels of weed controls (Fluchloralin 1 kg/ha and unweeded check). Significant differences were observed in nodulation, growth and yield attributes and seed yield of soybean. 20 cm row spacing significantly increased the nodulation, reduced weed biomas production, while 30 cm row spacing produced significantly higher grain yield. 40 cm row spacing produced increased number of branches, pods/plant and weed dry matter. The increasing dose of phosphorus increased the growth and yield attributes of soybean crop as well as the nodulation and weed biomass over without phosphorus treatment. Significantly increased number of nodules, branches/plant, pods/plant, test weight and grain yield was obtained with 90 kg $P_2O_5$. Application of fluchloralin 1 kg/ha significantly reduced the weed biomas production and increased the growth and yield attributes.

## 5.3.55 EFFECT OF NITROGEN LEVELS AND WEED CONTROL METHODS ON SEED YIELD OF RAYA (*BRASSICA JUNCEA* (L.) CZERN AND CROSS)

Jiya Ram Sharma and S. S. Pahuja
Deptt. of Agronomy, CCS, Haryana Agric. Univ., Hisar.

Field experiment was conducted during the *rabi* season of 1990-91 at the Hisar to study the effect of nitrogen levels (0, 40, 80 and 120 kg/ha) and weed control methods on the seed yield of raya. Increasing levels of nitrogen decreased the number and dry weight of weeds whereas cultural and chemical methods of weed control reduced the weed population and dry weight significantly over cantrol. The seed yield increased by 87% with the applicaiion of 80 kg N/ha and 120 kg N/ha over control. Presence of weed throughout the growing season reduced the raya yield by 53%. Isoproturon applied 30 DAS at 0.75 kg/ha increased the raya yield by 46.4%.

## 5.3.56 SURVEY OF RABI WEEDS IN SUNFLOWER FIELDS OF SATPURA PLATEAU REGION OF MADHYA PRADESH

V. K. Paradkar, R. K. Saraf and J. P. Tiwari
J. N. K. V. V., Zonal Agric. Res. Station. Chhindwara, M.P.

A survey of weed flora of Sunflower field was conducted during Rabi 1991–92. Among the thirty five species of weeds recorded, three were grasses one sedge and thirty one broad leaved weeds. The most dominant weeds among dicotyledonous were *Chenopodium album, Anagallis arvensis, Melilotus alba, Portulaca oleracea, Launea aspenifolia* and *Convolvulus arvensis.* The pre–dominant monocotyledonous weeds comprised of *Cyperus rotundus* and *Cynodon dactylon.*

## 5.3.57 EFFECT OF WEED CONTROL PRACTICES ON THE PRODUCTIVITY OF URDBEAN

Rakesh Kumar, Mehar Singh and R. C. Singh
Deptt. of Agronomy, C.C.S. Haryana Agril. Univ., Hisar

The efficiency of four herbicides (Pendimethalin @ 0.75 kg/ha pre–em., fluchloralin @ 1.00 kg/ha PPI, oxadiazon @ 0.75 kg/ha pre–em. and alachlor @ 2 kg/ha pre–em.) and four cultural practices (Traditional, handweeding 15 DAS, two hand weeding 15 and 35 DAS and intercultivation 15 DAS) alongwith weed free and weedy check were assessed during *Kharif* seasons of 1987 to 1989 at Research farm, Hisar. Results averaged over three years revealed that two hand weedings 15 and 35

DAS being at par with weed free condition and alachlor 2.0 kg/ha, produced significantly more seed yield than rest of the treatments. However, amongst herbicides, alachlor @ 2.0 kg/ha, proved its superiority over pendimethalin, fluchloralin and oxadiazon with an increasing tune of 45.5, 49.2 and 32.8%, respectively.

## 5.3.58 EFFECT OF HERBICIDES ON GUARA (*CYAMOPSIS TETRAGONOLOBA*) AND ASSOCIATED WEEDS

S. S. Rathee, R. S. Panwar, R. S Balyan and R. K. Malik
Deptt. of Agronomy, C.C.S. Haryana Agril. Univ. Hisar

Two years field studies were conducted at Hisar. The field was dominated by carpetweed (*Trianthema portulacastrum* L.). Fluchloralin, pendimethalin and oxadiazon each applied at 1.0 and 1.5 kg/ha were compared with oxyfluorfen at 0.10 and 0.20 kg/ha, one or two hand weedings, a weedy and a weed free check. Fluchloralin or pendimethalin significantly reduced the weed dry weight as compared to oxyfluorfen at 0.10 kg/ha, one hand weeding and the weedy check. Oxadiazon was injurious to Guara and caused significant yield reduction as compared to other treatments. The grain yield of Guara in pendimethalin or fluchloralin treated plots ranged from 1366 to 1560 kg/ha compared to 980 kg/ha in the weedy check.

# 5.4 WEED MAMAGEMENT IN COARSE GRAIN CROPS AND INTERCROPPING SYSTEMS

## 5.4.1 WEED MANAGEMENT IN HOT WEATHER FORAGE MAIZE

D. K. Shelke, R. H. Bhosle, V. D. Salunke, N. S. Jadhav
Deptt. of Agronomy, Maharastra Agril. Univ. Parbhani.

A field investigation on weed management on hot weather forage maize was undertaken during 1990 at Parbhani. Six weed control treatments (unweeded control hand weeding and hoeing at 3 and 5 WAS, atrazine, simazine and pendimethalin each at 1.0 kg/ha as pre-emergence and oxyfluorfen at 0.10 kg/ha as post-em. were used. Dominant weeds were *Charozophore rottleri, Cyperus rotundus, Convolvulus arvensis* and *Cynodon dactylon* Different weed control treatments could not mark their significant influence on green as well as dry fodder yield over unweeded control because of low weed intensity (average 6 weeds/$m^2$) during summer season and better suppressing ability of forage crop.

## 5.4.2 EVALUATION OF HERBICIDES FOR WEED CONTROL IN WINTER MAIZE

R. D. Vaishya and S. S. Singh
Deptt. of Agronomy, N. D. Univ. of Agril. and Tech. Faizabad, U.P.

The results of field trial conducted at Faizabad during *rabi* season of 1988-89 revealed that all the herbicide treatments were found effective to reduce the weed population and weed dry mass/unit area and to enhance the grain yield of crop as compared to unweeded check. The pre-emergence application of atrazine and metolachlor each at 1.0 kg/ha recorded significantly higher grain yield of crop than other herbicides. Unchecked weed growth reduced the grain yield of winter maize by 77.7% when compared with weed free treatment.

## 5.4.3 STUDIES ON WEED MANAGEMENT IN *KHARIF* MAIZE

R. C. Tyagi, A. K. Tyagi, B. R. Singh and R. K. Malik
Deptt. of Agronomy, CCS Haryana Agril. Univ., Hisar.

In a field dominated by carpetweed (*Trianthema portulacastrum*), effect of atrazine or alachlor applied alone or as tank mixture or in supplementation with one

or two hand weedings given at 20 DAS or 20 and 45 DAS was studied during 1987 and 1988 at Hisar. Atrazine applied at 0.5 kg/ha reduced the population of weeds from 65 plants to 7 plants/$m^2$. The effect of alachlor was less than atrazine. The grain yield in the plots following the application of atrazine at 0.5 kg/ha was 2959 kg/ha as compared to 1815 kg/ha in the weedy check and 2669 kg/ha in the plots given two hand weeding at 20 and 45 DAS.

### 5.4.4 EFFECT OF ATRAZINE ON CONTROL OF WEED IN MAIZE

Sahadeva Singh and V. M. Bhan
National Res. Centre for Weed Science, Adhartal, Jabalpur, M.P.

Efficiency of atrazine applied at 0.5, 1.0 and 1.5 kg/ha at three different times viz. pre-emergence, 7 and 14 DAS was studied in maize during 1991. The atrazine applied as pre-emergence and 14 DAS with different doses has considerably reduced density of weeds and increased seed yield in comparison to control. The application of atrazine at 1.5 kg/ha at 7 DAS has shown best result in reducing weed population and increasing seed yield of maize.

### 5.4.5 INTERACTION EFFECT OF NITROGEN APPLICATION AND TIME OF WEED REMOVAL ON PRODUCTIVITY OF PEARLMILLET

A. Kumar, N. L. Bhatia, S. S. Punia and S. K. Agarwal
Deptt. of Dryland Agric., CCS. Haryana Agril. Univ. Hisar.

Trials were conducted at farmers fields in villages Kanwari and Balawas, Hisar during Kharif seasons of 1990 and 1991. The treatments, four doses of nitrogen (0, 20 40 and 60 kg/ha) and two weedings (20 and 35 DAS) were applied in pearlmillet at many locations. Application of 60 kg N/ha out yielded 40 and 20 kg N/ha and the control (no N) by 19, 56 and 107%, respectively. Weeding at 35 DAS increased pearlmillet seed yield by 6% over weeding at 20 DAS.

The per cent increase in yield between weeding at 20 and 35 DAS decreased with the increase in levels of nitrogen, from 9.4% in control to 5% in 60 kg N/ha. The difference in yield between weeding at 35 DAS with lower levels of nitrogen and weeding at 20 DAS with higher levels of nitrogen decreased with the successive increase in nitrogen application.

### 5.4.6 EFFECT OF HERBICIDES AND IRRIGATION LEVELS IN RELATION TO WEED MANAGEMENT IN PEARLMILLET

A. S. Malik, Jagdev Singh and R. S. Banga
Deptt. of Agronomy, Haryana Agril. Univ., Hisar

The experiments were conducted at Hisar during Kharif seasons of 1984-85 and 1985-86. The treatment comprised of three weed management practices (weed,

free, weedy check and Atrazine at 0.5 kg/ha as pre-emergence) and three irrigation levels (No irrigation, one irrigation at grain formation and two irrigations first at heading and second at grain formation).

Data revealed that under weed free condition pearlmillet produced higher grain and straw yield as compared to weedy condition. Grain yield was reduced by 15 to 18% and straw yield by 6 to 16%. Application of atrazine at 0.5 kg/ha reduced weeds dry matter by 70 to 86% and produced grain yield comparable to weed free conditions. Irrigation has no effect on grain yield in both the years. Contrary to this the straw yield was significantly increased by the irrigation in both the years. No response of irrigation on grain yield of crop could be attributed due to sufficient rainfall during both the years and moisture contribution from shallow water table, fluctuating between 118 to 200 cm.

### 5.4.7 EFFECT OF DEEP AND SHALLOW PLOUGHING ON WEEDS AND YIELD OF HYBRID PEARLMILLET

H. M. Mehta, D. A. Tank, R. P. Vadodaria and J. M. Joshi
Deptt. of Agronomy, Guzarat Agril. Univ. Anand.

An experiment was conducted on loamy sand soil to study the effect of deep and shallow ploughing on weed control and yield of pearlmillet (Cv. G.H. B-27) in *kharif* 1988, 1989 and 1990. The results revealed that dry biomass of monocot weeds was significantly reduced in deep ploughing during 1990 before first hand weeding. However, at the time of harvest deep ploughing had consistently suppressed monocot weeds during all the years of study compared to shallow ploughing. With regards to dicot weeds, it was found that deep ploughing consistently suppressed these weeds before first hand weeding until harvest. As a result of these, the grain and straw yield of pearlmillet were significantly increased in deep ploughing over shallow ploughing.

### 5.4.8 STUDIES ON THE CONTROL OF *STRIGA* AND OTHER WEEDS IN RAINFED SORGHUM

A. Muthusankaranarayanan, A. Balasubramanian and M. R. Narayananasamy
Tamil Nadu G. D. Naidu Agric. Univ., Coimbatore.

Field experiments were conducted in black soil block of Kovilpatti to evaluate different method for control of striga and other weeds in rainfed sorghum (*Sorghum bicolor*). Striga population was the lowest under 10% urea spraying on 45th day (14.1/$m^2$), and was followed by hand weeding twice (17.0/$m^2$), and atrazine at 0.25 kg/ha + 2, 4–D (18,3/$m^2$). With regard to grain yield, two weeding recorded the

highest yield of 1138 kg/ha and was followed by the pre-emergence application of atrazine at 0.25 kg/ha+2, 4-D at 1.0 kg/ha as post application (1048 kg/ha). Atrazine at 0.25 kg/ha with post emergence application of 2, 4-D at 1.0 kg/ha either on 25th or 45th day was found to be economical in controlling striga & other weeds.

### 5.4.9 EFFECT OF WEEDING PRACTICES ON THE GROWTH AND DEVELOPMENT OF *AZOSPIRILEUM LIPOFERUM* AND SORGHUM UNDER DIFFERENT SOIL MOISTURE REGIMES

P. Subramanian, M. Petchimuthu and V. Ganesaraja
Deptt. of Agronomy, Agric. College and Res. Inst., Madurai, T. N.

The study indicate that more broad leaf and grassy weeds and their dry matter were recorded with more frequent irrigations (0.60 and 0.75 ID/CPE ratio) compared to less irrigations (0.45 ratio). Maximum weed control efficiency (WCE) was obtained with minimum number of irrigations. Pre-emergence application of atrazine at 0.4 kg followed by one late hand hoeing at 30 DAS produced maximum WCE and also 15 to 18% increased water use efficiency (WUE) compared to unweeded checks, combined application of atrazine+2, 4-D (Sodium salt) and farmers' practice of two hand hoeing and weedings. Regarding removal of nutrients by weeds, higher values were associated with increased soil moisture (0.75 ratio) and lower values with atrazine plus one hand hoeing among weed control treatments *Azospirillum* inoculation had no impact on the removal of nutrients by weeds.

### 5.4.10 WEED MANAGEMENT IN MAIZE+BLACK GRAM INTERCROPPING SYSTEMS IN MID HILLS SUB-HUMID ZONE OF HIMACHAL PRADESH

Janemjai Sharma and Subhash Nayital
HP. Krishi Vishvavidyalaya, Regional Res. Station, Bajaura.

Field studies on herbicidal weed control in Maize+Blackgram intercropping system were conducted at Bajaura during *kharif* 1986-88. Uninterrupted weed growth reduced maize yieid by 61.3% as compared to complete weed free check. Application of metolachlor and pendimethalin each at 1.0-2.0 kg/ha, thiobencarb at 1.5-2.0 kg/ha and oxadiazen 0.5-1.25 kg/ha gave excellent control of weeds. However, oxadiazon at higher rate proved phytotoxic to both crops. Based on yield performance and weed control, metolachlor 1.0, pendimethalin 1.0, thiobencarb 2.0 and oxadiazon 0.5 kg/ha can be safely used in maize+blackgram intercropping system.

## 5.4.11 RESPONSE OF MAIZE-GROUNDNUT INTERCROPPING SYSTEM TO FERTILITY LEVELS AND WEED MANAGEMENT IN CALCAREOUS SOIL OF NORTH-BIHAR

S. J. Singh, K. K. Sinha, S. S. Sinha and S. S. Mishra
Deptt. of Agronomy, Rajendra Agril. Univ. Pusa, Bihar.

A field experiment was conducted during the *kharif* seasons of 1988 and 1989 at Dholi (Muzaffarpur) farm. The treatment consisted of three fertility levels viz. 0, 50 and 100% of recommended dose (100 kg N, 60 kg $P_2O_5$, 40 kg $K_2O$/ha) and six weed control treatments i.e. hand weeding, fluchloralin at 1.0 kg/ha, pendimethalin at 1.0 kg/ha, oxadiazon at 0.5 kg/ha, lentagran at 1.0 kg/ha and unweeded control. Grain yield of maize increased with increasing levels of fertilizers. All weed management treatments found effective in increasing the grain yield significantly in both the years. Interaction effect between fertility levels and weed management were found significant in both the years. Maximum maize grain yield of 6690 and 6210 kg/ha was recorded with high fertilility levels+hand weeding treatment.

## 5.4.12 CHEMICAL WEED CONTROL IN MAIZE-SOYBEAN INTER CROPPING SYSTEM

M. Madhu and H. V. Nanjappa
Deptt. of Agronomy, U. A. S. Bangalore, Karnataka.

Field experiment was conducted to study the effectiveness of chemical weed control in maize-soybean inter-cropping system. Application of alachlor at 1.25 kg/ha and pendimethalin at 0.75 kg/ha gave an excellent control of weeds without affecting crop and also it gave higher yield of both the crops.

## 5.4.13 WEED MANAGEMENT IN MAIZE AND MAIZE+SOYBEAN CROPPING SYSTEM

A. S. Venkatakrishnan, N. Kempuchetty, S. Purushothaman, S. P. Palaniappan and S. Sankaran
Deptt. of Agronomy, T. N. G. D. Naidu Agril. Univ., Coimbatore.

Field experiment was conducted during winter season of 1989-90 at Coimbatore to investigate the suitable weed control measures in maize and maize+soybean cropping systems. The treatments consisted of pre-emergence application of herbicides viz. alachlor 2.0 kg/ha, pendimethalin 1.0 kg/ha and metolachlor 1.0

kg/ha. The results revealed that highest grain yield was recorded in hand weeding twice plot in pure maize (4128 kg/ha) followed by pre-em. application of alachlor 2.0 kg/ha, pendimethalin 1.0 kg/ha in pure maize as well as in maize+soybean cropping systems. The increased grain yield in the herbicidal treated plot was primarily due to the lower population and dry matter production of weeds.

### 5.4.14 EFFICACY OF DIFFERENT HERBICIDES AGAINST *TRIANTHEMA PORTULACASTRUM* AND OTHER WEEDS IN PEARLMILLET AND COWPEA MIXED FODDER

I. S. Thind, K. P. Puri, L. S. Brar and M. S. Tiwana,
Deptt. of Animal Science, Punjab Agril. Univ., Ludhiana.

The present studies were undertaken at Ludhiana during *kharif* season of 1984 to 1986. Pre-emergence application of terbutryn (0.50 and 0.75 kg/ha), pendimethalin (0.75 and 1.50 kg/ha) and their combinations (terbutryn+Pendimethalia @ 0.25+0.50 and 0.50 and 1.0 kg/ha) controlled the weeds effectively. Fluchloralin 0.5 and 1.0 kg/ha, alachlor 1.5+2.0 kg/ha though proved superior to unweeded control but failed to give a satisfactory control of weeds. Among herbicides alachlor proved phytotoxic to crops. Application of terbutryn gave significantly higher green fodder and dry matter yields, which were 23.9 and 20.4% higher over unweeded control, respectively and was comparable with hand weeding treatment. Tank mix application of terbutryn and pendimethalin at both the rates also increased the forage yield compared to unweeded control but differences in yield were sifinificant only during 1986.

### 5.4.15 WEED MANAGEMENT IN RAINFED SORGHUM WITH INTERCROP AND HERBICIDE

U. Solaippan, S. Subramanian and T. Senthivel
Deptt. of Agronomy, Regional Res. Station, Aruppukottai, T.N.

The germination of cowpea and sorghum was affected by the application of isoproturon (0.6 kg/ha) and pendimethalin (0.75 kg/ha), respectively under intercropped situation. The weed control efficiency was higher in sorghum sole crop with pre-emergence application of isoproturon + one hand weeding 35 DAS (75%) followed by two hand weeding (59%) over unweeded control. The weed suppression due to the smothering effect of intercrop of cowpea was 6.2% over sorghum sole cropping system. The sorghum grain yield with pre-emergence application of isoproturon coupled with one hand weeding was 2290 kg/ha. The increase in grain yield over unweeded control was 118%. The economic gain by using herbicide plus one hand weeding in rainfed sorghum was Rs. 3630 per ha.

## 5.4.16 WEED MANAGEMENT STUDIES ON SORGHUM-SOYBEAN AND MAIZE-SOYBEAN INTERCROPPING SYSTEM

P. M. Nimje
Central Institute of Agric. Engg , Bhopal, M.P.

Two field experiments on Sorghum, Soybean and Maize+Soybean intercropping systems were conducted in 1988 and 1989 on deep vertisols at Bhopal receiving about 1000 mm of rainfall during monsoon season. In sorghum+soybean intercropping system, the use of herbicides significantly reduced the weed density and weed dry weight and increased the grain yield of both sorghum and soybean over weedy check. The use of fluchloralin at 1.5 kg/ha as pre-plant incorporation gave an increase in grain yield of the order of 57.5 and 47% in sorghum and 77.4 and 51.5% in soybean over weedy check during 1988 and 1989, respectively. In maize+soybean intercropping system, oxadiazon at 1.0 kg/ha proved significantly superior to weedy check and fluchloralin 1.5 kg/ha and pendimethalin 1.0 kg/ha in terms of weed control and grain yield of both maize and soybean.

## 5.4.17 WEED MANAGEMENT IN IRRIGATED SORGHUM BASED ON INTERCROPPING SYSTEM WITH FORAGE LEGUMES

A. Balasubramanian, S. Sankaran and N. Kampuchetty
Tamil Nadu G. D. Naidu Agril. Univ., Coimbatore.

The experiment were conducted during *kharif* seasons of 1985-86 to 1987-88 in clay loam soil at Coimbatore to develop integrated weed management for irrigated sorghum based on intercropping system with forage legumes. The sorghum (CSH-5) was raised in paired row system (30/90 × 10 cm) with two rows of fodder legumes viz. forage cowpea, forage soybean, swordbean and greengram. Pure sorghum was raised in 60 cm × 10 cm row spacing. The weed control treatment consisted of hand hoeing and weeding twice and pre-emergence application of isoproturon at 0.5 kg/ha with one hand hoeing and weeding on 40th day. The forage legumes viz., forage cowpea and forage greengram and swordbean reduced dicot weed population more than forage soybean. Pre-emergence application of isoproturon at 0.5 kg/ha can be recommended for sorghum based intercropping system with forage legumes for effective weed control. There was no residual toxicity on succeeding wheat.

## 5 4.18 WEED MANAGEMENT IN SORGHUM-LEGUME INTERCROPPING SYSTEM

N. S. Venkataraman, S. Rajaram, S. Jeyaraman and V. Veerabadran
Deptt. of Agronomy, Agric. College and Res. Inst., Madurai, T.N.

A field experiment was conducted at Madurai during September-January, 1986-87. Sorghum (Co-24) was intercropped with cowpea (Co-3) and green gram

(KM-2) in a paired row system of planting. *Echinochloa colona, Cyperus rotundus, Boerhaavia diffusa, Cleome viscosa, Eclipta alba* were the predominant weed species. The results showed that spatial competition under the intercropping systems have reduced the weed growth. Intercropping of pulse did not complement the yield of sorghum but was helpful in achieving increased weed control efficiency to the tune of 8.9% with greengram and 13.6% with cowpea. Among the weed control methods, hand weeding twice on 15 and 30 DAS or fluchloralin at 1.0 kg/ha or isoproturon were more effective, against weeds and gave higher grain yield.

## 5.4.19 ROLE OF SMOTHER INTERCROPS IN INTEGRATED WEED MANAGEMENT FOR HIGH INTENSITY CROPPING SYSTEM

N. Balasubramanian and S. Subramanian
Tamil Nadu G. D. Naidu Agril. Univ., Coimbatore.

Cowpea as well lab-lab in sorghum in cotton showed significant control of weeds during critical period of crop-weed and blackgram competition. "Sorghum+cowpea-finger millet-cotton+blackgram" system reduced the weed growth by 20% over the pure crop system of "Sorghum-fingermillet-cotton". Combination of the above cropping system with the application of Isoproturon 0.60 kg/ha+hand weeding in sorghum as well as in fingermillet and fluchloralin 1.0 kg/ha+hand weeding in cotton gave the highest weed control efficiency of 89%. This integrated system checked the growth, dry matter production & nutrient uptake by weeds which in turn increased the dry matter production and nutrient uptake by component crops.

## 5.4.20 INTEGRATED WEED MANAGEMENT SYSTEMS FOR HIGH INTENSITY CROPPING SYSTEM

N. Balasubramanian, S. Subramanian and S. Sankaran
Tamil Nadu G. D. Naidu Agril. Univ., Coimbatore

Field experiment was conducted at Coimbatore. Application of isoproturon at 0.60 and 0.40 kg/ha in sorghum sole and with intercrops, isoproturon 0.60 kg/ha and pendimethalin at 0.66 kg/ha in pearlmillet and fluchloralin at 1.0 and 0.50 kg/ha in sole cotton and with intercrops, with and without supplemental manual weeding were compared with the farmer's practice of manual weeding twice and unweeded check. Cowpea and lab-lab in sorghum and black gram in cotton were found to be best smothering intercrops and exhibited higher smothering ability in suppressing the weeds. Combination of high intensity sequential cropping having smother intercrops of "sorghum+cowpea-fingermillet-cotton and blackgram" with the weed management system of application of isoproturon 0.60 kg/ha+manual weeding (for sorghum with intercrops as well as for fingermillet), and fluchloralin 1.0 kg/ha+manual weeding (for cotton with intercrops) was most effective and economical

weed management system. The above weed management system increased the weed control-cum-smothering efficiency and the net profit, without any phytotoxic residual effect on the subsequent sorghum+pulse intercrops in the crop sequence.

## 5.4.21 WEED MANAGEMENT IN SOYBEAN-WHEAT CROPPING SEQUENCE

A. N. Tewari, V. Singh and R, P. Dubey
Deptt. of Agronomy, C. S. Azad Univ. of Agric. and Tech., Kanpur, U.P.

Field experiment was conducted during 1989-90 at Belatal (Manipur) to develop chemical weed control schedule for soybean-wheat cropping sequence. The treatments comprised of weedy check, manual weeding once, twice, weed-free, pre-emergence alachlor (1.5 kg and 2.0 kg/ha), pendimethalin (1.5 kg and 2.0 kg/ha), metribuzin, (0.5 kg and 0.6 kg/ha). Results revealed that alachlor (1.5 kg), pendimethalin (1.5 kg) and metribuzin (0.5 kg) were found quite effective in controlling annual grasses and broad leaf weeds. The higher grain yield of soybean obtained in the above treatments was comparable with manual weeding twice. The phytotoxic effect of herbicide on soybean was observed when metribuzin was applied at higher dose (0.8 kg/ha). However, none of the herbicides applied to soybean caused phytotoxic effect on succeeding crop of wheat.

## 5.4.22 STUDIES ON EFFECTIVE WEED MANAGEMENT IN RICE+ GROUNDNUT CROPPING SYSTEMS

Raj Singh, C. S. Patel and U. K. Hazarika
ICAR, R.C. for N.E.H.R. Barapani, Meghalaya.

Field experiments were conducted at Barapani (950 MSL). The treatments included three cropping systems (rice sole, groundnut sole and rice+groundnut) (3:1), with five weed control treatments (hand weeding at 20 and 50 DAS, 2, 4-D, 0.50 kg; butachlor 1.0 kg+2, 4-D, 0.50 kg/ha and unweeded check). Experimental results revealed that hand weeding at 25 and 50 DAS was found to be most effective against weeds in groundnut sole. Application of pendimethalin with 2, 4-D and butachlor with 2, 4-D also provided effective control of weeds in groundnut sole and rice+groundnut cropping systems as compared to rice sole. Maximum rice equivalent yield (5760 kg/ha) was recorded by hand weeding twice followed by butachlor+2, 4-D (5250 kg/ha) and pendimethalin+2, 4-D (4830 kg/ha) in groundnut sole, while hand weeding twice and pendimethalin with 2, 4-D produced 4540 and 4090 kg/ha in rice+groundnut cropping system, respectively. The lowest yield (810 kg/ha) was recorded in rice sole under unweeded condition.

## 5.4.23 WEED MANAGEMENT IN PIGEONPEA-SESAME INTERCROPPING SYSTEM IN VINDHYAN RED LOAM TRACT OF EASTERN UTTAR PRADESH

A. K. Singh, R. P. Singh and R. A. Singh
Deptt. of Agronomy, Banaras Hindu Univ., Varanasi, U.P.

Field experiments were conducted during kharif season of 1989 and 1990 to find out the most suitable weed control measures and intercrop population pressure of sesame in pigeonpea (*Cajanus cajan* L.) and sesame (*Sesamum indicum*) intercropping system. Pigeonpea (100%) was intercropped with various plant populantion pressures of sesame (i.e. 50%, 75% and 100%) and weed control methods applied were hand weeding twice at 20 and 40 DAS, fluchloralin 1.0 kg/ha applied PPI, pendimethalin 1.0 kg/ha applied pre-emergence and unweeded check. The weed suppression was more in 100% population of sesame with 100% pigeonpea, 75% population of sesame was the most advantageous over sole crop and resulted in maximum pigeonpea equivalent yield. Amongst weed control treatments, fluchloralin 1.0 kg/ha proved to be most effective in checking the weed growth and increasing grain yield of pigeonpea and sole sesame as well as in combination of both crops.

## 5.4.24 STUDIES ON INCREASING THE OILSEED PRODUCTIVITY IN GROUNDNUT AND SUNFLOWER INTERCROPPING THROUGH WEED CONTROL

S. Singh, S. M. Kondap, N. Venkat Reddy, P. C. Rao, and C. N. Reddy
Deptt. of Agronomy, College of Agric., Rajendra Nagar, A.P.

A field experiment was conducted during rainy season of 1990. Important weed flora were *Cyperus rotundus*, *Echinochloa colona*, *Dactyloctenium aegyptium*, *Dinebra arabica*, *Ocimum cannum*, *Eclipta alba* and *Parthenium hysterophorus*. The application of imazethapyr and oxyflourfen indicated phytotoxicity on groundnut and sunflower crops initially. Among herbicidal treatments, pendimethalin and hand weeding recorded lower weed density and drymatter and high weed control efficiency and thus resulted in higher pod equivalent which was at par with weed free till harvest treatment.

## 5.4.25 WEED MANAGEMENT IN PEARLMILLET BASED INTERCROPPING SYSTEM

S. S. Rathee, R. K. Malik, R. S. Panwar and R. S. Balyan
Deptt. of Agronomy, CCS, Haryana Agril. Univ,, Hisar.

A field experiment was conducted at Hisar in 1981 and 1983. The intercropping of moong and cowpea under different system of planting was tried under weed infested and weed free situation. The main weeds present were *Trian-thema portulacastrum, Echinochloa crusgalli, Cyperus rotundus, Cynodon dactylon,* and *Tribulus terristris.* The treatments included were 7 combination of pure crop and inter crop viz. Pure pearlmillet, pure moong, pure cowpea, pearlmillet+moong (alternate), pearlmillet+cowpea (alternate), pearlmillet+moong (paired row) pearlmillet+cowpea (paired row) 3 weedings viz., no weeding, weed free and weeding at 4 weeks after sowing. The treatment were arranged in split plot design with levels of weeding in main plot and intercropping in sub plots.

The data on the effect of various treatments on the grain yield of pearlmillet indicated that under pearlmillet+moong and pearlmillet+cowpea when planted in alternate rows, the grain yield was comparatively lower as compared to other treatments. However, under paired row, the yield was almost at par with pure pearlmillet under all levels of weeding. The dry weight of weeds was higher under pure moong and pure cowpea as compared to pure pearlmillet. Under no weeding, intercropping gave reduction in the dry weight of weeds and this reduction was more under paired row system of planting as compared to alternate row system of planting of cowpea and moong with bajra. The grain yield of pure moong was significantly higher than when it was intercropped with pearlmillet. However, the reduction in yield due to intercropping was comparatively less under no weeding as compared to weeding.

## 5.4.26 WEED MANAGEMENT SYSTEMS IN TURMERIC+MAIZE INTERCROPPING SYSTEM

C. N. Reddy, N. V. Reddy, P. C. Rao, M. Padmavathi Devi and S. M. Kondap
AICRP on Weed Control, College of Agric., Rajendranagar.

A field experiment was conducted during rainy season of 1989-90 at Rajendranagar. Turmeric (cv. Armoor local) and maize (cv. synthetic B 41) were sown 2 : 1 row spacing and the 100% plant populations of both the crops were maintained. The herbicide treatments included pre-emergence application of atrazine at 1.0 kg/ha,

pendimethalin at 1.5 kg/ha, oxadiazon at 1.0 kg/ha, alachlor at 1.0 kg/ha and imazethapar at 0.125 kg/ha. These herbicides were followed by one hand weeding on 40 DAS. Post-emergence application included fluazifop-p-butyl at 0.5 kg/ha at 25 DAS. During the early part of rainy season, *Parthenium hysterophorus, Rottboellia exhaltata, Cyperus rotundus, Cynodon dactylon, Digera arvensis, Dactyloctenium aegyptium* and *Euphorbia hirta* were the weed species observed. Late in the season *Chenopodium album, Melilotus alba, Datura metal & Argemone mexicana* were observed. Low weed densities, low weed dry matter and high weed control efficientcy were obtained in fluchloralin and atrazine treatments. Application of oxadiazon indicated slight phytotoxicity on maize plants initially but they recovered by 30 DAS. Highest yields of maize, highest gross returns obtained with fluchloralin+hand weeding; next was atrazine+hand weeding.

# 5.5 WEED MANAGEMENT IN COMMERCIAL AND FIBRE CROPS

## 5.5.1 HERBICIDE MANAGEMENT OF *STRIGA* IN SUGARCANE

G. Vellu, N. Kempuchetty, S. P. Palaniappan and S. Sankaran
Deptt. of Agronomy, Directorate of Soil and Crop Mgmt. Studies, Coimbatore. T.N.

Field experiment was carried out in farmers' holding during Summer 1989 to find out the efficacy of herbicides on *Striga*, sugarcane quality and yield. Incorporation of ammonium sulphate (10%) resulted in maximum height, leaf area and dry matter/plant of cane. The *striga* population was reduced a month after the application of treatments and their effect was persistent upto 190 days. There was not much difference between the treatments applied on the population and growth of *Striga*. However, significant differences were noticed in the bio-mass production of weed plants due to different treatments. Copper sulphate 1.0% applied 45, 75 and 105 DAP recorded the lowest dry weight of *Striga*.

## 5.5.2 EVALUATION OF HERBICIDES FOR WEED CONTROL IN SUGARCANE

B. J. Pandian, P. Muthukrishnan and S. Rajasekaran
Sugarcane Research Station, Cuddalore, T.N.

Field experiments were conducted at Cuddalore to find out the suitable herbicide for the control of weeds in sugarcane. The results revealed that weed population was significantly lesser in the plots received atrazine as pre-emergence at 2.0 kg/ha followed by glyphosate at 1.0 kg/ha at six weeks. The cane yield attributes were higher with atrazine application at 2.0 kg/ha as pre-emergence followed by hand weeding and it was on par with atrazine spray at 1.0 kg/ha as pre-emergence followed by glyphosate at 1.0 kg/ha.

## 5.5.3 WEED MANAGEMENT IN SUGARCANE

B. J. Pandian, P. Muthukrishnan and S. Rajasekaran
Sugarcane Research Station, Cuddalore, T.N.

Field experiments were conducted at Cuddalore during 1985 to 1987 to investigate suitable chemical and cultural methods for controlling weeds in sugarcane. The

results revealed that the weed population was comparatively lesser in plots hand-weeded 30, 60 and 90 days after planting and followed by atrazine applied pre-emergence at 1.0 kg/ha plus one hand weeding at 45 DAS. Highest number of millable cane and sugar yield were recorded by the manual weeding and it was on par with the atrazine spray at 1.0 kg/ha followed by one hand weeding at 45 DAP.

## 5.5.4 EFFICACY OF TRASH MULCHING FOR CONTROL OF WEEDS IN SUGARCANE

K. Kannappan andM. Nandanam
T. N. G. D. Naidu A. U., Sugarcane Res. Station, Sirugamani.

Field experiments were conducted to study the effect of trash mulching and herbicides on the control of weeds under wet land condition. The studies were conducted in farmers holdings at Kulithalai and Lalgudi for two years. Application of trash mulch controlled weed effectively in comparison with herbicides. There was significant increase in cane yield as well as sugar yield in trash mulched plots and it was on par with herbicide applied plots. Application of metribuzin effectively controlled most of the broad leaf weeds and sedges compared to other herbicides tried.

## 5.5.5 EFFECT OF PLANTING SYSTEMS AND MULCHING ON CONTROL OF WEEDS IN SUGARCANE

P. Parameswaran, M. S. Ramkrishnan and S. N. M. Ramachandra Boopathi
Deptt. of Agronomy, Agric. College and Res. Inst., Madurai, T.N.

A field experiment was conducted at Sirugamani. The major weeds were *Echinochloa colona, Trianthema portulacastrum L., Cynodon dactylon, Cyperus rotundus, Panicum repens* and *Cleome viscosa.* The result revealed that the dry matter production of weeds was significantly reduced in deep trench system (34 kg/ha) compared to shallow system (119 kg/ha). Among the mulched plots, the dry matter of weeds was greatly reduced in trash mulched plots (30 kg/ha) over coir waste mulched plots (83 kg/ha). The cane yield increased in deep trench system (128400 kg/ha) compared to conventional shallow system (114400 kg/ha). Trash mulching recorded higher cane yield (125800 kg/ha) than coir waste mulch (119900 kg/ha) and unmulched (118500 kg/ha) plots.

## 5.5.6 WEED MANAGEMENT UNDER DIFFERENT IRRIGATION SCHEDULES IN EARLY MATURING SUGARCANE

C. Chinnasamy and S. Subramanian
Regional Rerearch Station, Paipur, T. N.

Field experiments were conducted with early maturing sugarcane (Coc.671) during main (May through February) and special (August through May) seasons, 1984-85 at Coimbatore to investigate the usefulness of climatological approach for scheduling irrigation and improving the water use efficiency under various weed management systems. Results indicated that during both seasons, better weed control in respect of lesser weed population and weed dry matter was obtained with atrazine applied pre-emergence at 2.0 kg/ha+one hand weeding at 60 DAS coupled with higher levels of irrigation. Herbicide+hand weeding favoured better cane growth and yield attributes resulting in cane yields of 99200 kg/ha and 102300 kg/ha during main and special seasons, respectively. Field and crop water use efficiencies were higher with herbicide+hand weeding.

## 5.5.7 EFFICACY OF PRE AND POST EMERGENCE HERBICIDES AGAINST ANNUAL WEEDS IN SPRING PLANTED SUGARCANE

S. P. Mehra and L. S. Brar
Deptt. of Agronomy, Punjab Agril. Univ., Ludhiana.

Field experiments were carried out at Kheri during 1987-88 and 1988-89. The results revealed that application of simazine/atrazine at 1.0 kg/ha, metrizine at 1.4 kg/ha and diuron at 1.6 kg/ha as pre-emergence gave significant reduction in the dry matter accumulation of weeds compared to the control. The increase in cane yield over weedy check under these treatments ranged from 108 to 120%. Application of herbicides at lower doses (50% less than their above mentioned doses) as pre-emergence when supplemented with one interculture at 75-80 DAP gave about 106 to 124% increase in cane yield over control, and this increase in yield was comparable with the crop given two hoeing (116.5%). Further, band application of simazine/atrazine at 0.33 kg/ha, metribuzine at 0.47 kg/ha and diuron at 0.53 kg/ha (post emergence) on the crop row area followed by interculture in the inter-row area also gave cane yield comparable with other herbicidal treatments.

## 5.5.8 GLYPHOSATE FOR CONTROL OF JOHNSON GRASS (*SORGHUM HALEPENSE*) IN SUGARCANE

S. P. Mehra, R. K. Bhatia and R. S. Kanwar
Deptt. of Agronomy, Punjab Agril. Univ., Ludhiana.

A field experiment was carried out during 1989 on sandy loam soil at Kheri for the control of Johnson grass. Glyphosate at 0.82 to 1.25 kg/ha was applied post-emergence (45–50 DAP) as directed spray with and without 3% solution of urea. Johnson grass was at 3–4 tiller stage. The study revealed that glyphosate at 0.82 to 1.25 kg/ha proved quite effective and gave significant reduction in the dry weight of Johnson grass which ranged from 65.9 to 70.7%. The bio-efficacy of this herbicide further improved slightly (73.2%) when sprayed with 3% urea. The efficacy of glyphosate at 1.25 kg/ha was comparable with glyphosate 0.82 kg/ha+3% urea and these treatments gave 60.8% and 55.3% increase in cane yield, respectively over control (no weeding). Tank mixture of glyphosate at 1.25 kg+3% urea+atrazine 1.0 kg/ha (60–65 DAP) was found to increase the spectrum of weed kill but was slightly toxic to the sugarcane crop.

## 5.5.9 CHEMICAL CONTROL OF WEEDS IN SPRING PLANTED SUGARCANE

R. S. Chauhan and G. B. Singh
Indian Institute of Sugarcane Research, Lucknow, U.P.

A field study was carried out at Lucknow, on different methods of weed control in Sugarcane. The major weed flora in the experimental field consisted of dicot annuals (*Chenopodium album*, *Trianthema monogyna*, *Solanum nigrum* and *Convolvulus arvensis*) and monocot species viz., *Cynodon dactylon*, *Sorghum halepense*, *Cyperus rotundus* and *Panicum colonum* etc. Weed infestation caused on an average 38% reduction in sugarcane yield, depending upon the intensity of weed flora. Pre-emergence application of atrazine (2.0 kg/ha) followed by post emergence spray of 2, 4–D (1.5 kg/ha) effectively controlled the weeds and resulted 29% higher cane yield than weedy check. None of the treatments affected the cane quality.

## 5.5.10 MANAGEMENT OF NUTGRASS (*CYPERUS ROTUNDUS*) IN SUGARCANE FIELD

A. Sathyavelu, K. N. Chinnasamy and S. Rajasekaran
Sugarcane Research Station, Cuddalore, T. N.

Glyphosate (N-(Phosphonomethyl) glycine), a post-emergence herbicide was found to be effective in the control of nutgrass, broad leaf weed and grassy weeds, in sugarcane fields. Nutgrass constitute more than 70% in the weed composition. Highest weed control efficiency was obtained, when atrazine was aprayed pre-emergence on 3rd day, followed by glyphosate, sprayed as post-emergence on 30th day. Thereby, the above treatment affected the higher cane yield and ultimately increased the net profit.

### 5.5.11 INTEGRATED WEED MANAGEMENT IN WINTER IRRIGATED COTTON

K. Prathapan, S. Purushothaman and S. Jeyaraman
Deptt. of Agronomy, College of Agric. Vellaiyan, T. N.

An experiment was conducted at Madurai during winter season of 1987-88 to find out the appropriate weed control method in cotton. The results revealed that pre-emergence application of fluchloralin at 1.0 kg/ha plus one hand weeding on 45 DAS was superior to all the other methods of weed control. This treatment allowed a significant reduction of weed dry matter production and nutrients drain and also recorded highest net return (Rs. 10241/ha) and return per rupee invested (Rs. 2.80).

### 5.5.12 INTEGRATED WEED MANAGEMENT FOR IRRIGATED COTTON

S. R. Salvaraj, G. Srinivasan and P. Pothiraj
Tamil Nadu G. D. Naidu Univ. of Agril., Coimbatore.

Field experiment was carried out at Coimbatore, during 1986. The results revealed that skipping of basal application of nitrogen combined with fluchloralin at 1.0 kg/ha + hand hoeing at 45 DAS reduced weed density significantly. Vegetation analysis indicated a selective control of dicot weeds by fluchloralin. Smother intercrop cowpea reduced the incidence of sedges. Seed cotton yield was highest with hand weeding twice and was comparable with fluchloralin.

### 5.3.13 INTEGRATED WEED MANAGEMENT IN *DESI* COTTON (GOSSYPIUM ARBOREUM)

U. S. Walia and L. S. Brar
Deptt. of Agronomy, Punjab Agril. Univ., Ludhiana.

Field experiments were conducted at Ludhiana during *kharif* 1988 and 1989. Pre-emergence application of fluchloralin at 0.75 kg/ha and pendimethalin at 0.75

kg/ha with and without follow up one hand hoeing (45 DAS) significantly improved seed cotton yield and reduced the dry matter of weeds over unweeded control. Integration of mechanical removal with the post-emergence application (*Layby*) of diuron at 0.5 kg/ha, fluchloralin at 0.75 kg/ha and pendimethalin at 0.75 kg/ha produced a seed cotton yield of about 1800 kg/ha as against 1710 and 980 kg/ha for two hand weedings and unweeded control, respectively. During 1988, application of both pendimenthalin or fluchloralin alone proved on par with two hand weedings with regard to weed control potential and seed cotton yield but during 1989, these treatments failed to retain their superiority because of the appearance of broad leaf weeds in the later stages.

### 5.5.14 NITROGEN USE ECONOMY THROUGH INTEGRATED WEED MANAGEMENT IN RAINFED COTTON

D. K. Shelke, R. H. Bhosle, V. D. Salunke and N. S. Jadhav
Deptt. of Agronomy, Maharashtra Agril. Univ., Parbhani.

Field studies were conducted in rainfed cotton ($H_4$) to explore the possibility of saving of nitrogen through weed management at Parbhani. Common weeds associated with the cotton crop were *Bracharia eruciformis*, *Dinebra retaroflexa*, *Digera arvensis*, *Corchorus acutangularis*, *Acalypha indica* and *Parthenium hysterophorus*. It was observed that weed control either through hand weeding/hoeing alone or herbicide followed by interculture proved significantly superior to unweeded control in enhancing seed-cotton yields. Application of 40 kg N/ha found optimum for increasing seed-cotton. Interaction of weed control and nitrogen revealed that pre-plant application of fluchloralin at 0.90 kg/ha followed by interculture at 6 WAS in absence of nitrogen gave about 3 to 4 times more seed cotton yield (788 kg/ha) over unweeded control with 80 kg N/ha (253 kg/ha).

### 5.5.15 RELATIVE EFFICACY OF PRE-EMERGENCE HERBICIDES IN COTTON

S. N. M. RamachSndra Boopathi, P. Jayapaul and V. Veerbadran
Deptt. of Agronomy, Agril. College and Res. Institute, Madurai, T. N.

Field experiments were conducted at Madurai. The treatments were pre-emergence application of fluchloralin at 1.0 and 1.5 kg/ha, thiobencarb at 1.5 and 2.0 kg/ha, butachlor at 1.5 and 2.0 kg/ha & post-emergence application of flauzifop-p-butyl at 0.25, 0.50 and 1.00 kg/ha compared with hand weeding twice and the unweeded check. The dry matter production of weeds was greatly reduced due to two hand weedings (40 kg/ha), pre-emergence application of fluchloralin at 1.0 kg/ha

(54 kg/ha) and butachlor at 1.5 kg/ha (57 kg/ha). The corresponding yield levels of the above promising treatments were 1540, 1470 and 1420 kg/ha of seed cotton.

## 5.5.16 EFFECT OF HERBICIDES ON YIELD AND YIELD ATTRIBUTES OF COTTON

D. S. Nehra, M. S. Kairon and L. K. Bishnoi
CCS Haryana Agril. Univ., Hisar.

In a field dominated by *Trianthema portulacastrum* and *Echinochloa colona*, two years study on cotton reveals that the seed cotton yield following pendimethalin treatment at 2.0 kg/ha was higher than those treatments where herbicides were applied post-emergence. In the plots where weeds were not allowed to grow, seed cotton yield was 678 and 886 kg/ha higher than the weedy check in 1985 and 1986, respectively. Pendimethalin applied pre-planting incorporation at 2.0 kg/ha provided similar yield to that obtained in the weed free check.

## 5.5.17 MALFORMATION IN COTTON DUE TO 2, 4-D

O. P. Nehra and S. S. Pahuja
Deptt. of Agronomy, CCS, Haryana Agril. Univ., Hisar.

A pot experiment was conducted during the *kharif* season of 1989 in the screen house at Hisar to study the injurious effects of direct spray of 2, 4-D on American cotton (*Gossypium hirsutum* L.) var. H-777. The concentrations of 2, 4-D ethyl ester tried were 1, 5 and 10 ppm at 45, 75 and 105 days after sowing. Treated plants exhibited malformation within 4 to 24 hours of spraying of 2, 4-D. The highest concentration of 10 ppm of 2, 4-D induced malformation within 4 hours and 1 ppm concentration took 24 hours when sprayed at 45 days after sowing. The same concentration took a little more time when applied at the later stages of crop growth. 2, 4-D sprayed plants exhibited epinastic effect i.e. bending of leaves and branches from 10 to 60°. Bending of leaves and branches was more on the top portion compared to the lower portion. Swelling of stem at the base was observed with increasing concentrations of 2, 4-D spray. Recovery of malformed plants was observed within 4 to 6 and 13 weeks after spraying at early stages in case of 1 and 5 ppm concentrations whereas plants did not recovered 10 ppm concentration. Number of bolls, boll opening, boll weight and yield per plant were reduced significantly with 2, 4-D spray at higher concentration. Reduction in yield/plant was upto 98% with higher concentration of 2, 4-D applied at 45 days after sowing. A minimum reduction of 10% in the yield/plant was observed with the lowest (1 ppm) concentration of 2, 4-D applied at 105 days after sowing.

## 5.5.18 STUDIES ON WEED MANAGEMENT IN OLITORIUS JUTE

Deptt. of Agronomy, Centre for Soil and Crop Mgmt. Studies, Coimbatore, T.N.
H. Asokaraja and S. Jeyaraman

Experiments were conducted during summer seasons of 1987–89 at Coimbatore to evolve suitable weed management techniques for Jute (*Corchorus olitorius*). Herbicides viz., fluchloralin, flauzifop-p-butyl and pendimethalin were tested against conventional weed control methods. Manual weeding twice on 21 & 35 DAS recorded the lowest weed dry matter and the maximum plant height, basal stem diameter and plant green weight. Among the herbicides tested, fluchloralin @ 1.0 kg/ha applied either on third or seventh day before sowing as pre-plant herbicide with one weeding on 35 DAS yielded on par with flauzifop-p-butyl @ 0.60 kg/ha applied as post emergence (21 DAS) with one weeding on 35 DAS. Under peak demand period labour, the herbicides viz., fluchloralin and flauzifop-p-butyl can be used as pre-plant herbicides with one weeding at 35 DAS for weed control in Jute.

## 5.5.19 STUDIES ON WEED MANAGEMENT IN *ROSELLE*

N. Ashokaraja and S. Jeyaraman
Deptt. of Agronomy, Tamil Nadu G. D. Naidu Agril. Univ., Coimbator.

Experiments were conducted during summer seasons of 1987-89 at Cotton Breeding Station, Coimbatore to evolve suitable weed management techniques for roselle crop (*Hibiscus sabdariffa*). Herbicides viz., fluchloralin, flauzifop-p-butyl and pendimethalin were tested against conventional weed control methods. Manual weeding twice on 21 and 23 DAS recorded the lowest weed dry matter and the highest plant height, basal stem diameter and plant green weight. Among the herbicides tested, fluchloralin @ 1.0 kg/ha applied either on third or seventh day before sowing as PPI with one weeding on 35 DAS yielded on par with fluazifop-p-butyl @ 0.60 kg/ha on 21 DAS as post emergence with one weeding on 35 DAS. Herbicides like fluchloralin and flauzifoy-p-butyl can be used as pre-plant with one weeding on 35 DAS for statisfactory control of weeds in roselle.

# 5.6 WEED MAMAGEMENT IN VEGETABLE AND HORTICULTURAL CROPS

## 5.6.1 STUDIES ON COMPARATIVE BIO-EFFICACY OF HERBICIDES IN POTATO

H. C. Kundra, L. S. Brar and H. S. Brar
Deptt. of Agronomy, Punjab Agril. Univ., Ludhiana.

Field studies carried out at Ludhiana, during 1988-89 and 1989-90 indicated that in autumn planted *Khurfi Chandermukhi* variety of potato unchecked weeds reduced tuber yield to 14420 kg/ha as against 23140 kg/ha under two hand weeding treatment. Pre-emergence application of isoproturon and pendimethalin at 0.75 kg/ha and post-emergence application of paraquat at 0.25 kg/ha and tank-mixture of paraquat at 0.25 kg/ha and isoproturon at 0.25 kg/ha or atrazine 0.125 kg/ha (20 DAS) provided excellent control of most of the annual weeds and resulted in significantly higher tuber yield of the crop.

## 5.6.2 WEED MANAGEMENT IN POTATO BASED CROPPING SYSTEMS

S. S. Lal and J. S. Grewal
Central Potato Research Institute, Shimla, H.P.

In potato-wheat sequence, pre-emergence application of metribuzin at 0.70 kg/ha or oxyfluorfen at 0.20 kg/ha to potato were most effective herbicides for controlling the weeds not only in potato but also in wheat through residual effect. Metribuzin at 0.70 kg/ha applied in potato controlled the weeds through direct as well as residual effect followed by methabenzthiazuron in potato-blackgram crop sequence. Metribuzin at 0.8 kg/ha or simazine at 0.5 kg/ha could be used for the successful control of weeds and for higher income in potato+maize intercropping system.

## 5.6.3 WEED MANAGEMENT IN POTATO-WHEAT SEQUENTIAL CROPPING

A. N. Tiwari and R. D. Singh
Deptt. of Agronomy, C. S. Azad Univ. of Agric. and Tech., Kanpur, U.P.

A field experiment was conducted in 1986-87 and in 1987-88 at Kanpur to assess the herbicidal efficacy on potato-wheat cropping sequence. Isoproturon (1.0 kg/ha), pendimethalin (1.0 kg/ha), haloxyfop-methyl (0.25 kg/ha) and simazine

(0.25 kg/ha) registered, 89, 90, 74 and 46% control of grassy weeds and 52, 76, 11 and 56.2% control of broad leaved weeds in potato crop. The carryover effect of these herbicides resulted in 79, 70, 34 and 53% reduction in grassy and 69, 54, 40 and 59% in broad leaved weed populations in succeeding crop of wheat, respectively. *Cyperus rotundus* L. was not affected by any treatment. The highest tuber yield of potato (16670 kg/ha) and grain yield of wheat (2980 kg/ha) were recorded in plots treated with isoproturon. It was followed by 15580 kg/ha and 2740 kg/ha yield of potato and wheat, respectively under pendimethalin treated plot. An additional net monetary returns of Rs. 3883/ha and Rs. 2366/ha were obtained with isoproturon and pendimethalin, respectively.

### 5.6.4 EVALUATION OF HERBICIDES AT FARMER'S FIELD ON POTATO IN HARYANA

V. K. Srivastava, K. K. Thakral, Hardeep Singh and C. B. Singh
Deptt. of Vegetable Crops, CCS Haryana Agril. Univ., Hisar.

Investigations were conducted at two places i.e. Chatiaolia (Sonepat) and Umri (Kurukshetra) villages of Haryana during the autumn season of 1986-87 to confirm the recommendation for weed control in potato. The treatments were pre-planting application of fluchloralin at 1.0 kg/ha, pre-emergence application of metribuzin and oxadiazon each at 1.0 kg/ha, pendimethalin at 1.2 kg/ha and early post-emergence application of paraquat at 0.5 kg/ha alongwith farmer's practice i.e., weeding and earthing up at 30 days after planting. The results indicated that all the herbicidal treatments significantly reduced the weed population and improved tuber yield over farmer's practice except fluchloralin at 1.0 kg/ha at Umri. Maximum tuber yield was obtained where metribuzin at 1.0 kg/ha was applied 8 days after planting which was closely followed by pendimethalin at 1.2 kg/ha and oxadiazon at 1.0 kg/ha. Since metribuzin and oxadiazon are not commercially available in the market, pendimethalin at 1.2 kg/ha is recomended for controlling weeds in potato.

### 5.6.5 INTEGRATED WEED MANAGEMENT IN ONION

T. N. Barevadia, H. M. Mehta and B. H. Patel
Deptt. of Agronomy, Gujrat Agril. Univ., Anand, Guzrat.

Two years (*rabi* 1988-89 and 1989-90) field experiments on integrated weed management in onion cv. *Pusa red* were carried out on loamy sand soil at Anand. The pooled results revealed that the herbicide applied alone or when supplemented with one manual weeding (60 DAP) were at par but produced significantly higher

bulb yield than the weedy check and the plots received either one, two or three manual weeding. The highest bulb yield (30940 kg/ha) was recorded in plots treated with pendimethalin at 1.50 kg/ha. All the weed control treatments resulted in significantly lower weed dry matter compared to the weedy check and one hand weeding treatments.

### 5.6.6 CHEMICAL WEED CONTROL IN ONION

T. R. Nandal, A. K. Singh, P. S. Arya,
Deptt. of Vegetables, Regional Res. Station, Dhaulakuan, H.P.

The trial on chemical weed control in onion as carried out at Dhaulakuan during the *rabi* season of 1989 and 1990. Weed intensity and their dry weight at 90 DAS and at harvest were reduced by all herbicidal treatments except at 90 days in the year 1989. The maximum plant stand at the time of harvest, bulb diameter and the yield/plot were recorded in plots treated with oxadiazon at 1.5 kg/ha.

### 5.6.7 COMPARATIVE STUDIES ON METHODS OF WEED CONTROL IN ONION (*ALLIUM CEPA* L.)

I. P. Mishra and B. R. Sharma
Deptt. of Vegetable Crops and Floriculture, JNKVV. Jabalpur, M.P.

Field experiments were conducted during 1984-85 and 1985-86. The perennial weeds viz. *Cynodon dactylon* Pers. and *Cyperus rotundus* L. were not controlled by herbicides. Bulb yield were higher with all weed control treatments. Maximum yield was recorded in plots kept weed free by 4 hand weedings. Among the herbicidal treatments, the maximum weed control efficiency (79%) and minimum weed index (2%) were exhibited with fluchloralin at 1.5 kg/ha, applied pre-plant incorporation and superimposed with one handweeding 45 DAT and resulted in significantly higher yield (25913 kg/ha) in comparison to weedy check (13813 kg/ha),

### 5.6.8 EFFECT OF HERBICIDES AND MULCH ON WEED CONTROL EFFICIENCY AND YIELD POTENTIAL IN ONION (*ALLIUM CEPA* L.)

I. P. Mishra
Deptt. of Vegetable Crops and Floriculture, JNKVV. Jabalpur, M.P.

Field experiments were conducted during *rabi* 1978-79, 1979-80 and 1980-81. The dominant weed species were *Chenopodium album* L. and *Daucus carota* L. The results revealed that application of alachlor at 2.0 kg/ha applied pre-emergence fb propanil at 1.75 kg/ha applied 40 DAT proved most effective with highest weed control efficiency (76%) and maximum average yield (48869 kg/ha) of marketable bulbs.

## 5.6.9 INTEGRATED WEED MANAGEMENT FOR THE CONTROL OF *CUSCUTA* IN ONION

N. Kempuchetty, S. Sankaran, R. Jayakumar and S. P. Palaniappan
Deptt. of Agronomy, Dte. of Soil and Crop Mgmt. Studies, Coimbatore, T.N..

A farmer's field trial was carried out during *kharif* 1990 at Udumalpet. The cuscuta infestation was recorded at maximum level of 32% of the crop population with dry matter of 6.3 g /$m^2$ in unweeded check plot. This was followed by glyphosate 0.01 kg/ha with cuscuta dry matter of 5.6 g/$m^2$. The lowest cuscuta dry matter was recorded in hand weeded twice plots. Among other herbicide treatments, lower cuscuta DMP of 2.8 g/$m^2$ was recorded with oxadiazon 0.6 kg, applied after first weeding and was at par with metolachlor 1.0 and pendimethalin 1.0 kg and pre-emergence application (3 DAP) of oxadiazon 0.6 kg/ha. Besides cuscuta, this method of herbicide application also reduced the other weeds significantly and extended the weed free situation for the crop. The onion bulb yield was higher with hand weeded twice plot (1120 kg/ha) and was comparable with hand weeded (15 DAP)+oxadiazon at 0.6 kg/ha (1030 kg/ha), hand weeded (5 DAP)+metolachlor (990 kg/ha) and hand weeded+pendimethalin 1.0 kg/ha (960 kg/ha). The unweeded check recorded the lowest bulb yield of 640 kg/ha.

## 5.6.10 NITROGEN USE ECONOMY THROUGH INTEGRATED WEED MANAGEMENT IN ONION

M. K. Porwal and M. M. Singh
Deptt. of Agronomy, Agril. Res. Station, Banswara, Rajasthan.

Field investigations were carried out to ascertain the relationship between the use of nitrogen and weed control measures in onion. The study involved three levels of nitrogen (50,100 and 150 kg/ha) and nine weed control treatments. Comparable bulb yield was obtained at lower level of nitrogen (50 kg/ha) with integrated approach of controlling weeds with pre-emergence oxadiazon (1.0 kg/ha) and supplementee with one manual weeding 45 DAP than either of method alone at 100 kg N/ha. Despite heavy N fertilization (150 kg/ha) weedy check recorded lowest bulb yield.

## 5.6.11 INTEGRATED WEED CONTROL IN HYBRID TOMATO (*LYCOPERSICUM ESCULENTUM* MILL)

T. V. Muniyappa and N. P. Deve
Deptt. of Agronomy, Univ. of Agril. Sciences, Bangalore, Karnataka.

A field experiment was conducted during *kharif* 1989. The results indicated that all herbicides at their higher doses and when supplemented with one hand

weeding gave lower dry weight of the weeds. Among mechanical treatments, hand weeding resulted in significantly lower weed dry weight compared to earthing up alone. The maximum fruit yield was obtained in metribuzin+one hand weeding (18180 kg/ha), followed by metribuzin alone (17370 kg/ha). All these treatments were significantly superior over unweeded control.

### 5.6.12 EFFICACY OF CULTURAL AND CHEMICAL WEED CONTROL METHODS IN TOMATO

Jitendra Singh, U. C. Pandey and K. K. Thakral
Deptt. of Vegetable Crops, CCS Haryana Agril. Univ., Hisar.

The field investigations were carried out at Hisar during 1985-86, 1986-87 and 1988-89 on Tomato cv. *HS-101* to evaluate the comparative performance of four herbicides viz. fluchloralin (1.0 and 1.5 kg/ha), metribuzin (0.5 and 0.75 kg/ha), pendimethalin (0.5 and 1.0 kg/ha), alachlor (1.5 and 2.0 kg/ha) and lower doses of all the herbicides in combination with one hand weeding at 40 DAT alongwith two hand weeding (at 30 and 60 DAP), weed free and straw mulch were compared with weedy check. The results indicated that all the weed control treatments significantly reduced the weight of weeds and increased fruit yield over weedy check. The maximum fruit yield was recorded in weed free treatment followed by pendimethalin at 1.0 kg/ha. The minimum fruit yield was recorded in weedy check. It was also noticed that no herbicidal treatment imparted any type of phytotoxic effect on the tomato crop. Maximum net income and cost benefit ratio was obtained in pendimethalin at 1.0 kg/ha followed by straw mulch.

### 5.6.13 EFFICIENCY OF VARIOUS HERBICIDES IN BRINJAL

S. S. Tripathi and G. Singh
Deptt. of Agronomy, G. B. Pant Univ. of Agric. and Tech., Pantnagar, U.P.

Alachlor, pendimethalin and fluchloralin each applied alone at two doses and in combination with one manual weeding at 30 days stage were evaluated for their effect on weeds and brinjal during *kharif* 1985 to 1988. The major weed species were *Sorghum halepense* (43%), *Echinochloa crusgalli* (24%), *Cyperus rotundus* (16%), *Ageratum conyzoides* (8%) and *Solanum nigrum* (6%). All the herbicides except alachlor at 1.5 kg/ha and pendimethalin at 0.5 kg/ha caused significant reduction in the density and dry weight of weeds. Weed control efficiency of the herbicides increased due to superimposition of one manual weeding at 30 days stages. Uncontrolled weeds resulted into 80% reduction in the fruit yield of brinjal. Alachlor at 1.5 kg/ha or supplemented with one weeding, pendimethalin at 1.0 kg/ha supplemented with one weeding, fluchloralin at 1.0 and 1.5 kg/ha supplemented with one weeding produced brinjal fruit yield at par to that of two hand weedings done at 30 and 60 days stage and weed-free condition.

## 5.6.14 CROP-WEED COMPETITION STUDIES IN OKRA (*ABELMOSCHUS ESCULENTUS* L.) MOENCH

Bijendra Singh, K. P. Singh and A. N. Maulya
ICAR Res. Complex for NEH Region, Barapani, Meghalaya.

*Cyperus rotundus, Cynodon dactylon, Echinochloa crusgalli, Eragrostis tennella, Melilotus alba* and *M. indica* were the major weed species. The critical period of crop weed competition in okra was 5 weeks after sowing. Highest pod yield obtained in weed free which was at par with weed free for first 10 and weed infested for the first 2 WAS. Competition with weed for first 4 weeks and beyond resulted in significant reduction in pod yield. Competition after 8 weeks or before 2 weeks had no adverse effect on pod yield.

## 5.6.15 EFFCT OF PRE-EMERGENCE HERBICIDES ON GROWTH AND YIELD OF OKRA

S. N. Ramachandra Boopathi, P. Jayapaul and N. Veerabadran
Agric. College and Res. Inst., Madurai, T.N.

A field experiment on okra (var. *Pusa savani*) was undertaken at Madurai. The major weed flora were *Echinochloa colona, Trianthema portulacastrum, Cleome viscosa, Cyperus rotundus, Boerhaovia diffusa, Amaranthus viridis, Corchorus olitorius* and *Eclipta alba.* The results indicated that the highest weed control efficiency was achieved by hand weeding twice at 15 and 30 DAS (98%) followed by pre-emergence application of fluchloralin at 1.0 kg/ha (96%). The corresponding yield levels of the above treatments were 6560 and 6280 kg fruits/ha.

## 5.6.16 CHEMICAL CONTROL OF WEEDS IN OKRA (*ABELMOSCHUS ESCULENTUS* (L) MOENCH

B. R. Sharma, I. P. Mishra and A. K. Naidu
Deptt. of Vegetable Crops and Floriculture, JNKVV, Jabalpur. M.P.

Field experiments were conducted during Kharif 1984 and 1985. The major weeds observed were *Cyperus rotundus* L., *Chenopodium album* L and *Cyperus esculentus.* All weed control treatments recorded higher yield than the weedy check. Among the herbicidal treatments the maximum weed control efficiency (83%) and minimum index (13%) was noted in alachlor at 1.5 kg/ha applied pre-emergence and superimposed with one hand weeding 45 DAS and resulted in significantly higher yield (10289 kg/ha) as compared to the weedy check (3595 kg/ha) which gave an additional yield (6794 kg/ha) of freshly harvested fruits. Maximum yield was recorded in the weed free plots.

## 5.6.17 EFFICICACY OF HERBICIDES AND HAND WEEDING ON GROWTH AND SEED YIELD OF OKRA (*ABELMOSCHUS ESCULENTUS* (L) MOENCH)

R. P. Pandey, K. P. Asati, J. P. Tiwari and S. K. Tiwari
Deptt. of Vegetable Crops and Floriculture, JNKVV Jabalpur. M.P.

*Cyperus rotundus* and *Cynodon dactylon* could not be controlled effectively by any of the herbicide. The reduction of weed density to the extent of 81%, 77%, 75% & 72% was noted under butachlor 2.5 and 2.0 kg/ha, isoproturon at 1.5 & 1.0 kg/ha, respectively, when all these were superimposed with one hand weeding. The highest weed control efficiency was under butachloat 2.5 kg fb one hand weeding. The maximum seed yield (453 kg/ha) was obained under isoproturon at 1.0 kg/ha fb one hand weeding and proved the most economical treatment. The yields under one hand weeding and weedy check were 288 and 96 kg/ha, respectively.

## 5.6.18 RESPONSE OF INTEGRATED WEED CONTROL METHODS ON OKRA CROP (*ABELMOSCHUS ESCULENTUS* (L) MOENCH)

B. Singh, A. N. Maurya and K. P. Singh
Deptt. of Hort., Instt. of Agril. Sciences, Banaras Hindu Univ., Varanasi. U.P.

A field trial was carried out to evaluate the response of butachlor, fluchloralin, pendimethalin applied at 1.5 kg/ha alone and supplemented with one hand weeding 45 DAS, organic mulch (wheat straw) 5 t/ha alone and super-imposed with one hand weeding at 45 DAS; one, two and three hand weeding i.e. 30, 30 and 45; 30, 45 and 60 DAS, respectively, alongwith weed free and weedy check on plant survival in okra during 1984 to 1985. Maximum germination of seed was observed under wheat straw mulch. Simultaneously, herbicides application had no adverse effect on germination except fluchloralin which delayed germination upto 2 days. The treatment of organic mulch, pendimethalin and butachlor super-imposed with one hand weeding at 45 DAS alongwith three and two hand weeding resulted better survival (88 to 86% in 1984 and 89 to 85% in 1985) of plants.

## 5.6.19 WEED CONTROL STUDIES IN RELATION TO NITROGEN LEVELS IN OKRA

Satyaveer Singh and B. R. Batra
Deptt. of Vegetable Crops, CCS, Haryana Agril. Univ., Hisar.

The field experiment was conducted during kharif season of 1989–90 at Hisar. The experimental results revealed that the plant height, number of branches, dry

matter plant increased significantly with all weed control treatments over weedy check. Higher number of fruits, fruit yield/plant and total fruit yield was recorded with different weed control treatments over weedy check. Increased doses of nitrogen resulted in the increase in plant height, no. of branches and total fruit yield over no nitrogen. Weed free treatment with 150 kg N/ha recorded the highest yield of okra. Highest net return was obtained by weed free+150 kg N/ha followed by fluchloralin 1.0 kg+150 kg N/ha. The yield produced with fluchloralin 1.0 kg and pendimethalin 1.0 kg/ha was statistically at par with each other.

## 5·6.20 CONTROL OF *CHENOPODIUM ALBUM* AND *ERAGROSTIS* IN CUMIN

A. L. Patel and H. M. Mehta
Deptt. of Agronomy, Gujarat Agril. Univ., Anand.

Weed competition in cumin caused yield reduction to the tune of 94%. A reduction of 0.42 kg and 1.45 kg yield of cumin with an increase of 1 kg/ha dry weight of *C. album* and *E. tenella* was observed. It was revealed that *E. tenella* emerged later than *C. album*. Thus crop had faced competition with this weed at later stages of crop growth. Coefficient of correlation (r) and coefficient of determination ($R^2$) for dry weight of total weeds were 0.9786 and 95.76%, respectively. The same values for dry weight of *C. album* were 0.7717 and 59.77% and for E. tenella 0.8138 and 66.23%, respectively. Pendimethalin 0.5 kg/ha checked *C. album* almost completely upto harvest. Fluchloralin 0.75 kg/ha suppressed this weed comparable with three hand weedings. Pendimethalin and fluchloralin at 0.5/ha were effective and consistent in controlling *E. tenella* and *Digitaria adscendens* population.

## 5.6.21 HERBICIDAL CONTROL OF WEEDS IN FENUGREEK

K. K. Thakral and G. R. Singh,
Deptt. of Vegetable Crops, CCS, Haryana Agril. Univ., Hisar.

The experiment was conducted at Hisar to test the relative efficacy of various herbicides in regard to control of weeds in fenugreek var. *Pusa Early Bunching*. The treatments comprised of fluchloralin (0.5 and 1.0 kg/ha) as pre sowing application, methabenzthiazuron (1.0 and 1.5 kg/ha) oxadiazon (0.5 and 0.75 kg/ha), metribuzin (0.5 and 0.75 kg/ha), oxyfluorfen (0.1 and 0.2 kg/ha), pendimethalin (0.5 and 1.0 kg/ha) as post-emergence application alongwith weed free and unweeded controls. The results indicated that all the herbicidal treatments significantly reduced the weed population and their dry weight and increased seed yield as compared to unweeded

control. Maximum seed yield was obtained from the pre-emergenee application of methabenzthiazuron at 1.5 kg/ha and it was closely followed by weed free and pre-sowing application of fluchloralin at 1.0 kg/ha. Metribuzin at both the rates was injurious to the crop.

### 5.6.22 WEED MANAGEMENT IN BELL PEPPER (*CAPSICUM ANNUM* L.)

N. P. Singh, A. K. Johri, and A. K. Singh
Deptt. of Vegetable Crops, Y. S. Parmar Univ. of Hort. and Forst., Nauni, H.P.

Weed control treatments significantly reduced the population and dry weight of weeds leading to significant increase in the fruit yield by increasing fruit number/plant and fruit weight/plant compared to weedy check. Highest yield resulted when pendimethalin (1.0 kg/ha) plus oxyfluorfen (0.15 kg/ha) was applied as pre-emergence and it increased 77.6 and 41.4% fruit yield compared to weedy check and hand weeding at 20 and 40 DAP.

### 5.6.23 WEED CONTROL IN CHILLIES

S. Gurumoorthy, N. S. Venkataraman and V. Veerabadran
Deptt. of Agronomy, Agric. College and Res. Inst., Madurai, T. N.

A field experiment was conducted at Madurai to find out the suitable pre-emergence herbicide for controlling weeds in chillies. *Echinochloa colona, Cyperus rotundus, Cleome viscosa, Trianthema portulacostrum* and *Euphorbia hirta* were the predominant weed species. Among the weed control methods, hand weeding twice on 25 and 45 DAP or nitrofen 1.5 kg/ha supplemented by a hand weeding were found to be more effective against weeds and gave higher yield of green chillies.

### 5.6.24 INTEGRATED WEED MANAGEMENT PRACTICE FOR CHILLI BASED CROPPING SYSTEM

A. Mohamed Ali and N. Asoka Raja
Deptt. of Soils and Agronomy, Agric. College and Res Inst., Killikulam, T.N.

A study on integrated opproach for the control of weeds in chilli based cropping system was carried out at Killikulam during 1990. Pre-dominant weeds were *Echinochloa colona, Cyperus rotundus* and *Boerhaavia diffusa.* Pre-emergence application of fluchloralin at 0.75 and 1.00 kg/ha and isoproturon 0.25 and 0.50 kg/ha followed by one hand weeding was effective in controlling weeds and increased the yield of chilli in the border crops, castor, redgram, gourds and sesbania were able to withstand nutgrass infestation and established well. Growth and stand of cowpea as a residue crop was good, indicating there was no residual toxicicity of applied herbicides to chilli.

## 5.6.25 WEED MANAGEMENT IN CHICORY (*CCIHORIUM INTYBUS* L.) WITH FLUCHLORALIN

K. U. Solanki, A. M. Parakhia, T. N. Barewadiya and B. K. Patel
Deptt. of Pl. Path. and Agronomy, Gujarat Agril. Univ., Anand.

Pre-emergence application of fluchloralin at 0.5 kg/ha was found most effective in reducing the weed population to a greater extent. *Chenopodium album* L., *Eragrostis major* L. and *Digitaria sanguinalis* L. were controlled upto 88.3, 95.5 and 99.0%, respectively, as compared to control. *Phyllanthus niruri* L., *Cyperus rotundus* L. and *Cynodon dactylon* (L.) Pers. were not controlled.

## 5.6.26 EFFECT OF HERBICIDES ON SPROUT PRODUCTION IN SWEET POTATO (*IPOMEA BATATAS POIR*)

Amar Chandra, B. R. Sharma. A. K. Naidu and B. K. Verma
Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur, M.P.

Maximum number of sprouts/tuber were recorded with 30 ppm ethylene chlorohydrin (17.26) followed by 10 ppm 2, 4-D (16.63) and 1% Thiourea (15.23), whereas untreated tubers produced only 7.5 sprouts/tuber. The chemical treatments were also effective in increasing fresh weight of sprout/tuber significantly, compared to control (untreated). The variation for number of sprouts and fresh weight of sprout/tuber between *Pusa safed* and *Pusa lal* were not significant.

## 5.6.27 EFFICIENCY OF HERBICIDES FOR CONTROLLING WEED IN GARLIC

S. S. Tripathi and G. Singh
Deptt. of Agronomy, G. B. Pant Univ. of Agric. and Tech., Pantnagar, U.P.

Isoproturon (pre and post-emergence), pendimethalin (pre-emergence) each at 0.5, 1.0 and 1.5 kg/ha and fluchloralin (pre-plant incorporation) at 1.0 kg/ha along with weed free and weedy treatments were evaluated for their effect on weeds and yield of garlic. *Chenopodium album* (40%), *Fumaria parviflora* (24%), *Sorghum halepense* (16%) and *Cyperus rotundus* (13%) were the dominant weeds. Infestation with these weeds caused more than 94% reduction in garlic yield. Density as well as dry matter production of weeds were significantly reduced in herbicide treated plots. Application of pendimethalin at 1.0 and 1.5 kg/ha produced garlic yield at par with that of weed-free treatment.

## 5.6.28 SCREENING OF HERBICIDES FOR CONTROLLING WEEDS IN 'ANAB-E-SHAHI' GRAPE VINE YARD

B. Chunchaiah, T. V. Muniyappa, N. Vijayakumar; V. Nachegowda and V. C. Reddy
Deptt. of Agronomy, Univ. of Agril, Sciences, Bangalore, Karnataka.

To evaluate the efficacy of commonly available herbicides a study was conducted in *Anab-E-Shahi* vine yard using five pre-emergence herbicides viz., simazine, diuron, alachlor, pendimethalin and fluchloralin and glyphosate as post-emergence which were tried alone and in combinations to control the broad spectrum of weeds. A combination of diuron (1.5 kg/ha) as pre-emergence spray plus glyphosate (0.75) as post-emergence found to give best control of weeds in vine yards.

## 5.6.29 EFFECT OF HERBICIDES AND MINERAL FERTILIZERS ON YIELD AND QUALITY OF PAPAYA VAR. *COORG HONEYDEW*

Prabha Challa
Division of Plant Physiology and Biochemistry, IIHR, Bangalore, Karnataka.

Experiments were conducted to study the effect of herbicides viz. fluchloralin, butachlor, alachlor and glyphosate and manual weeding by khurp and cultural method of control using cowpea as cover crop, in combination with 100, 75 and 50% of the recommended NPK fertilizers, revealed that though the number of fruits/tree were more in manual weeding, fruit weight increased in the herbicidal treated plots. In glyphosate, the yield output was more in the plots receiving 75% of the NPK dosage. Maximum increase in yield was found in fluchloralin followed by butachlor. Decrease in fruit weight with reducing NPK input was observed in all the treatments except glyphosate. Quality of the fruit did not show significant changes except a slight increase in fruit TSS of alachlor treatment.

## 5 6.30 EFFECT OF HERBICIDES AND NPK FERTILIZERS ON PLANT GROWTH, YIELD AND QUALITY OF PAPAYA VAR. *COORG HONEYDEW*

Prabha Challa
Division of Plant Physiolagy and Bio-chemistry, I. I. H. R., Bangalore, Karnataka.

Several field experiments were conducted to investigate the effect of fluchloralin, butachlor (2.0 kg/ha) and glyphosate (3.0 kg/ha) on NPK utilization and the growth and yield parameters of papaya var. *Coorg Honey Dew* during 1987-91 at Bangalore. Significant increase in fruit yield was observed in the fluchloralin treated plots receiving 75% of NPK recommended dosage, when compared to hand weeded, butachlor,

## 5.6.33 EFFECT OF RATE OF NITROGEN AND HERBICIDES ON THE OIL YIELD AND QUALITY OF ROMAN CHAMOMILE (*ANTHEMIS NOBLIS* L.)

Tajuddin, J. N. Singh and G. Singh
Deptt. of Agronomy, G. B. Pant Univ. of Agric. and Tech., Pantnagar, U.P.

Nitrogen levels did not affect weed density but weed dry weight increased with increase in levels of nitrogen. Linuron at 1.0 and 1.5 kg/ha and oxyfluorfen at 0.20 kg/ha were the most effective herbicide in controlling *Polypogon monspeliensis* and *Chenopodium album*. Flower and essential oil yield increased significantly with increase in nitrogen rates. Increase in oil yield was associated with increase in oil content in the flowers with increasing rates of nitrogen. Uncontrolled weeds resulted into 60 and 66% reduction in flower and oil yield, respectively. Among the herbicides oxyfluorfen at 0.20 kg/ha yielded significantly more flower and oil yield. Herbicides decreased the content of germacrene and nor-geuerzlene while bi-cycloether was increased, when compared with weed-free treatment. Farnasene, L-Bisabololoxid A and B were not influenced significantly by herbicides used when compared with free treatments.

# 5.7 PERENNIAL AND AQUATIC WEEDS

## 5.7.1 CONTROL OF *CYPERUS ROTUNDUS* THROUGH CHEMICAL AND NON-CHEMICAL METHODS

K. S. Sandhu and R. K. Bhatia
Deptt. of Agronomy, Punjab Agril. Univ., Ludhiana.

Field and pot studies were conducted to evaluate 2, 4-D, glyphosate, oxyflurofen and metolachlor for the control of nutsedge. 2, 4-D and glyphosate reduced shoot growth but number of tubers and their growth remained unaffected. Split application of glyphosate 1.0 kg/ha fb 1.0 kg/ha however, helped in reducing the num- of tubers. The basal bulbs and tubers attached to visibly killed shoots treated with 2, 4-D or glyphosate or resprouted later on. Transparent polyethylene mulching increased soil temperature by 7-10°C in 0-10 cm depth and adversely affected shoot growth. It had no effect on bulbs and tubers. Frequent hot weather cultivations during May-June and raising quick growing smother crops (cowpea, maize and pearlmillet for fodder and sunhemp and *dhaincha*) helped reducing the tubers population of *C. rotundus*.

## 5.7.2 EVALUATION OF CERTAIN HERBICIDES AGAINST *LANTANA CAMARA* VAR. *ACULEATA* L.

R. D. Singh,, R. K. Sud. M. R. Tamang, D. N. Chakrabarty and N. K. Jain
Council of Scientific and Industrial Res. Complex, Palampur, H. P.

A study to evaluate certain herbicides singly or in combination at different months showed that application of 2, 4-D Na salt+diesel oil in 1 : 4 ratio on freshly cut stumps was most effective, followed by 2, 4-D Na+kerosene oil in the ratio of either 1 : 4 or 1 : 6, in controlling *Lantana*. Tankmix of 1% and 0.5% 2, 4-D Na or only 1% 2, 4-D Na from July to September was most suitable.

## 5.7.3 CHEMICAL CONTROL OF *AGERATUM HOUSTONIANUM* M. IN NON-CROPPED LAND

Anil Kumar and N. N. Angiras
H. P. Krishi Vishvavidyalaya, Palampur. H.P.

Field experiments were conducted during 1989-90 at Palampur. In undisturbed conditions about 34 plants/$m^2$ were recorded with an average dry matter accumulation of 518 g/$m^2$. Glyphosate at 2.0 kg/ha when applied on undisturbed foliage

followed by glyphosate at 1.0 kg/ha on regenerated foliage controlled this weed effectively. Application of 2, 4–D Na salt at 1.5 kg/ha on undisturbed foliage reduced the dry matter signifcantly over solution NaCl 20% and 2, 4–D (ester) at 1.5 kg/ha. Fluroxypyr at 0.50 kg/ha when applied directly on undisturbed plants was least effective. Application of fluroxypyr at 0.25 kg/ha on regenerated foliage after cutting the plants was effective in controlling this weed.

### 5.7.4 STUDIES ON THE EFFECT OF GLYPHOSATE ALONGWITH AMMONIUM SULPHATE ON THE CONTROL OF *CYPERUS ROTUNDUS*

M. Madhavi, P. C. Rao, N. V. Reddy, C. N. Reddy and S. M. Kondap
College of Agric. R. Nagar, Hyderabad, A.P.

*Cyperus rotundus* can be successfully controlled by glyphosate at 1.5 kg/ha. The results indicated that application of glyphosate at 1.5 kg/ha with 2% ammonium sulphate was very effective without any residual effect on succeeding crop like green-gram sown 15 days after spraying. Glyphosate at 1.5 kg/ha+2% ammonium sulphate was comparable to glyphosate alone at 2.25 kg/ha. The study also indicated that the efficiency of lower doses of glyphosate can be increased by the addition of ammonium sulphate.

### 5.7.5 BIOLOGICAL CONTROL OF *LUDWIGRA PARVIFLORA* ROXB.

S. Mohankumar and R. Velusamy
Agric. College and Res. Instt., Killikulam, T.N.

Preliminary studies on the beetle's ability to suppress the weed in the field as well as in the green house were undertaken. *L. parviflora* as well as rice plants in the field were covered separately with *mylar* film cages and infested with 25 beetles/cage. Seven days after release, the plants were examined for the damage due to feeding by the beetle. Only light scraping was noticed on rice plant. But these beetles completey destroyed the plant by feeding all the leaves (100% damage) of *L. parviflora*. In the green house rice and *L. parviflora* were planted in pots, covered with *mylar* cages and infested with same number of beetles. In this study the complete destruction of *L. parviflora* was observed in five days by 25 number released and rice plant remained unaffected. The utilization of blue beetle on the control of *L. parviflora* can be further explored.

## 5.7.6 STUDIES ON THE EFFICACY OF HERBICIDES IN CONTROLLING *IMPERATA CYLINDRICA* (L.) BEAUV.

C. M. Singh, and S. Chandra
Deptt. of Agronomy, H. P. Krishi Vishvavidyalaya, Palampur.

An experiment was undertaken in glass house conditions during 1989–90. The experimental pots were filled with soil+FYM+sand in 1 : 1 : 1 ratio, and rhizomes of *I. cylindrica* were sown in each pot kept in glass house. The spray of herbicides was done with mist sprayer after one month of rhizome plantation. The results showed that glyphosate at both rates was highly effective and led to complete mortality of *I. cylindrica* and there was no regeneration even 115 days after spray of herbicide. The other effective herbicides were; haloxyfop-methyl and dalapon at both rates of application. Paraquat was least effective and regeneration started 15 days after spraying which was 70 and 25% of 0.5 and 1.0 kg/ha, respectively.

## 5.7.7 WEED MANAGEMENT IN ENERGY FARMS IN WASTELANDS OF NAGARJUNANAGAR

P. N. Rao and J. Ashakumari
Deptt. of Botany, Nagarjuna Univ., Guntur, A.P.

Experiments on weed control were conducted during 1988–89 using butachlor as pre-emergence and paraquat as post-emergence. With butachlor at 1000 ppm no emergence of weeds was noted between 6th and 15 day. Emergence of *Cyperus rotnndus* and *Cymbopogon caesius* was noted between 20 and 25th day. A second application induced dwarfing, reduced cotyledonary leaves, wilting and death in broad-leaved weeds. Spraying of paraquat at 3000 ppm induced downward bending of stem tip, wrinkling of shoots, yellowing of leaves and death in broad leaf weeds. Both broadleavf and narrow leaf weeds got charred with 5000 ppm sprays of paraquat.

## 5.7.8 GLYPHOSATE–A WONDER PRODUCT FOR WEED CONTROL

A. T. Lilani and M. R. Vashi
Excel Industries Ltd., 184-87, S. V. Road Jogeshwari (West), Bombay.

Glyphosate, N–(Phosphonomethyl) glycine, is very widely used for control of annual and perennial dicot and monocot weeds. This paper reviews in detail the efficacy of glyphosate in different crop situations including work done by Indian scientists, factors affecting glyphosate activity, the mode of action, environmental impact, viz. fate of glyphosate in soil and aquatic environment. Finally, line of work that can be taken up to add to our knowledge of the product is described.

## 5.7.9 STUDIES ON THE EFFECT OF GLYPHOSATE ALONG WITH AMMONIUM SULPHATE ON THE CONTROL OF *CYPERUS ROTUNDUS*

N. V. Reddy, M. Madhavi, C. N, Reddy, P. C. Rao and S. M. Kondap
AICRP on Weed Control, College of Agriculture, R. Nagar, Hyderabed, A.P.

To study the efficiency of glyphosate, a study was undertaken with different levels of glyphosate (0, 0.75, 1.5 and 2.25 kg/ha) with and without 1 and 2% ammonium sulphate. The results indicated that application of glyphosate at 1.5 kg/ha with 2% ammoninm sulphate was very effective without any residual effect on succeeding crop like greengram sown 15 DAS. The dose of 1.5 kg/ha glyphosate+ 2% ammonium sulphate was comparable to 2.25 kg/ha of glyphosate alone. The study also indicated that the efficiency of lower doses of glyphosate can be increased by addition of adjuvants like ammonium sulphate.

## 5.7.10 CONTROL OF JOHNSON GRASS WITH HERBICIDES AND POLYETHYLENE MULCH

R. S. Balyan, R. K. Malik, S. K. Pahwa and S. S. Rathee
Deptt. of Agronomy, CCS Haryana Agril. Univ., Hisar.

Field experiments were conducted at Hisar during rainy seasons of 1989 and 1990 to study the effect of herbicides and mulching on Johnson grass. Glyphosate at 2 and 4 kg, dalapon at 8 and 12 kg and haloxyfop at 0.25 and 0.50 kg/ha as well white and black polyethylene mulches greatly reduced the reproductive potential (sprouts/$m^2$) by controlling the Johnson grass effectively. Higher rates of herbicides proved more effective than lower rates. Haloxyfop-methyl failed to provide desirable control. Glyphosate at 4 kg, dalapon at 12 kg/ha and black and white polyethylene mulches exhibited more effect on total sugars, reducing sugar and non-reducing sugars and oil content of rhizomes. Oil content in the rhizomes was also greatly reduced by glyphosate and dalapon at both the rates. The reduction in sugars and oil content was more severe with black polyethylene followed by white polyethylene and higher rates of glyphosate and dalapon during both years of experimentation.

## 5.7.11 INFLUENCE OF MANAGEMENT LEVELS ON GROWTH AND DEVELOPMENT OF *PARTHENIUM HYSTEROPHORUS*

V, M. Bhan and Sahadeva Singh
National Research Centre for Weed Science, Jabalpur, M.P.

The influence of weed management levels on control of *Parthenium* was studied by spraying 2, 4-D at 1.0 and 2.0 kg/ha, 2, 4-D 1.0 kg+Oil 2 l/ha, 2-4 D 2.0 kg+

Oil 1 l/ha+Teepol at 50 ml/100 l of solution, 15% common salt at four leaf stage at Jabalpur. The observation on number of leaves, plant height, number of branches and number of flowers were taken at 15 days interval upto 145 days after spraying. The application of 15% common salt has very less effect in reducing number of leaves, plant height, number of branches and number of flowers in comparison to control. The medium level of effect was noticed with 2, 4-D 1.0 kg/ha+oil 2 l/ha which had considerably affected all the above parameters. The best results were observed when the plants were sprayed with 2, 4-D at 2 kg/ha+oil I l/ha which reduced the number of leaves, plant height, number of branches and number of flowers effectively.

### 5.7.12 HERBICIDAL CONTROL OF *WATER HYACINTH* AND ITS EFFECT ON CHEMICAL COMPOSITION OF WATER

Samunder Singh, S. S. Pahuja and R. K. Malik
Deptt. of Agronomy, CCS Haryana Agril. Univ., Hisar.

The experiment was conducted in the aquatic Weed section of Agronomy Research Farm at Hisar, during 1982 in the circular lined pits to study the effect of herbicides and their minimum possible contact period, on the mortality and regeneration of water hyacinth. 2, 4-D and glyphosate at 1.0 and 2.0 kg/ha controlled water hyacinth effectively, whereas paraquat could not control it due to low doses (0.25 and 0.5 kg/ha). Almost 100% sinking of plants took place, 50 days after spraying of 2, 4-D and glyphosate. Water hyacinth plants regenerated in case of paraquat. The pH of water decreased and E.C. increased after herbicides application. The chemical composition of water in respect of $HCO_3$, Cl, Ca, Mg, K and Na also altered due to mortality of plants. 2, 4-D required only 1 to 2 days contact period at higher and lower doses, whereas glyphosate required 4 to 6 days, respectiIely for 100% mortality of *water hyacinth.*

# 6. PHYSIOLOGICAL AND BIOCHEMICAL ASPECTS OF HERBICIDES

## 6.1 IDENTIFICATION OF VULNERABLE GROWTH AND SUITABLE TECHNOLOGY TO SUPPRESS SPROUTING OF *CYPERUS ROTUNDUS* L. TUBERS

R. Devendra, Mallikarjun G. Awati, T. N. Prasad and M. Udaya Kumar
Univ. Agril. Sciences, Bangalore, Karnatka.

Experiments were conducted to know the growth pattern of *Cyperus rotundus* with two specific objectives; to identify most vulnerable growth stage for its effective control of tuber sprouting ability and growth rate of this weed. Thirty to forty days after sprouting is the most vulnerable growth stage for control.

Experiments were also conducted to enhance penetration and translocation of foliar applied herbicides. Though, ethephon pre-treatment (24h) enhanced the efficacy of herbicides (2, 4-D, glyphosate), it was not economical. Thus, glyphosate post emergence spray (30 days after sprouting), which effectively brings in mortality of establi hed foliage, followed by a pre-emergence herbicide spray (pursuit or anilofos +2, 2-D formulation or refit or atrazine) seems to be most effective control measure to suppress sprouting.

## 6.2 INFLUENCE OF SOIL MOISTURE ON PENDIMETHALIN AVAILABILITY AND UPTAKE IN FINGER MILLET AND REDGRAM

Anke Gowda, S. J. Devendra, R. Uday Kumar, M. and Mune Gowda, M. K.
Univ. Agril. Sciences, Bangalore, Karnatka.

Experiments were conducted to study the mobility of pendimethalin in soil and the selectivity of plant species for this herbicide. Maize root growth inhibition bioassay system was found to be a most suitable bioassay for pendimethalin.

The role of soil moisture status on movement of this herbicide, by using this bioassay was applied. It was observed that much of herbicide remained on soil surface (0-5 cm depth), even upto 28 days after spray. This was more pronounced under low soil moisture status. Movement of the herbicide to lower soil depths increased with time and soil moisture status. Finger millet and *Digitaria marginata* were suceptible to pendimethalin, whereas redgram and *Cyperus rotundus* are relatiyely tolarent. In sueeptible species, the uptake of 14C pendimethalin per unit fresh weight or per unit root surface area was more, compared to tolerant species. This indicates that selectivity for pendimethalin depends on the differential uptake from the soil and its translocation to shoot.

## 6.3 EFFECT OF HERBICIDES ON GROWTH AND NITROGEN CONTENT OF THE BLUE GREEN ALGAE

A. H. Khan and R. D. Vaishya
Deptt. of Agronomy, N. D. Univ. of Agric. and Tech., Kumarganj, Faizabad, U.P.

Butachlor at 1.0 kg/ha, thiobencarb, molinate, fluchloralin each at 1.5 kg/ha & 2, 4–D at 0.8 kg/ha were evaluated in respect to their effects on growth and nitrogen content of blue green algae at Faizabad. Butachlor and thiobencarb were the most detrimental causing high reduction in fresh weight and nitrogen content of blue green algae when inoculated just for 7 days after herbicides application. The remaining herbicides showed little effect on fresh weight and nitrogen content of blue green algae when inoculation was done after herbicide application. The inoculation of blue green algae in the rice field as a bio–fertilizer should be avoided upto 13 days after the application of butachlor and thiobencarb while this plant could be inoculated safely just after the application of 2, 4–D Na salt, molinate and fluchloralin.

## 6.4 EFFECT OF NITROGEN AND WEED MANAGEMENT PRACTICES ON CHLOROPHYLL CONTENT IN PUDDLED BROADCAST RICE

A. K. Srivastava and R. D. Vaishya
Deptt. of Agronomy, N. D. Univ. of Agric. and Tech., Faizabad, U.P.

The results of a field trial contucted during rainy season of 1990 revealed that the increasing doses of nitrogen increased the chlorophyll content in rice crop and the maximum was recorded under 120 kg N/ha. The effect of weed management practices on chlorophyll content was pronounced only at 60th day stage of crop. Application of pendimethalin at 1.0 kg/ha as pre-emergence + 2, 4–D Na salt at 0.5 kg/ha as post–emergence was at per with butachlor at 1.5 kg/ha. These treatments were found most promising to increase the chlorophyll content in rice crop. The application of pendimethalin at 1.0 kg/ha as pre-emergence supplemented with hand weeding 40 DAS or 2, 4–D Na salt at 0.5 kg/ha post–emergence was found to be most effective to enhance the chlorophyll content in rice.

## 6.5 EFFECT OF DIFFERENT WEED CONTROL MEASURES ON THE INCIDENCE OF *TIKKA* DISEASES IN GROUNDNUT AND THEIR ECONOMICS

R. B. S. Sangar, V. K. Singh and R. P. Bajpai
IGKVV, Zonal Agric. Res. Station, Ambikapur, M.P.

A field ezperiment was conducted to study the effect of different weed control measures on weed flora, pod yield of groundnut during *kharif*, 1989. The disease

incidence was found significantly reduced in two hand weedings followed by interculture at 20 and 35 DAS treatment as compared to weedy check and pendimethalin at 1.5 kg/ha as pre-emergence application. Hand weeding with interculture in 20 and 35 days allowed a total profit of Rs 7278 ha.

## 6.6 PHYSIOLOGICAL AND BIOCHEMICAL EFFECT OF ISOPROTURON, 2, 4-D AND THEIR COMBINATION ON *VICIA SATIVA* L.

S. K. Pahwa and Jai Prakash
Deptt. of Agronomy, CCS Haryana Agric. Univ., Hisar.

*Vicia sativa* plants were raised in eartheru pots in open air net house conditions. These plants were treated with isoproturon at 1.0 kg/ha, 2, 4-D at 0.5 kg/ha and their combination at 1.0+0.5 kg/ha, respectively at 30, 45 and 60 DAS separately. Plants were sampled on 6th, 12th and 18th day after treatment for measurement of growth and biochemical parameters. All the treatments of herbicides reduced the length of shoot and root and their dry weights. All the treated plants were killed by 18th day of the treatment. Isoproturon, 2, 4-D and their combination caused reduction in chlorophyll a, chlorophyll b and total chlorophyll of leaves of treated *Vicia* plants in comparison to control. Combination of both herbicides had greater reduction in comparison to their individual treatments. All treatments caused reduction in carotenoids content when given at 30 DAS; later treatments had no adverse effect on carotenoids content. Reducing sugars and total soluble carbohydrates of treated plants were also lower in comparison to untreated control plants. Free amino acids and insoluble protein were generally more in treated plants than untreated plants.

## 6.7 EFEECT OF VARIOUS CAUSES OF MALFORMATION ON FIBRE QUALITY OF *HIRSUTUM* COTTON

O. P. Nehra, S. S. Pahuja and V. K. Madan
Deptt. of Agronomy, CCS Haryana Agril. Univ., Hisar.

Eleven treatment combinations selected for inducing malformation in *hirsutum* cotton cv H-777 viz. delinted seed, fertilizer, insecticide each contaminated with 2, 4-D ethyl ester 34 EC, spray of 2, 4-D EE 34 EC just befor sowing of cotton, insecticide (dimethoate (Rogor) 30 EC) spray with 2, 4-D contaminated spray pump, suprious or outdated insecticide (dimethoate (Rogor) 30 EC) spray, black and white polyethylene sheets used as mulching material were evaluated for finding out their impact on main fibre quality characters. 2.5% span length and uniformity ratio were not significantly affected due to these treatments, 2, 4-D EE contaminated

spray pump used for spraying fresh sample of dimethoate had maximum adverse effect on micronaire value, maturity coefficient, intrinsic fibre fineness and fibre strength. Black polyethylene sheet used as mulching material improved micronaire value, intrinsic fibre fineness and fibre strength.

## 6.8 EFFECT OF HERBICIDES ON SOIL MICROFLORA OF WHEAT FIELD

S. K. Mukhopadhyay, S. Dasgupta, A. Hossain and D. C. Mondal
Weed Science Laboratory, Institute of Agric., Sriniketan, W. B.

A field experiment was conducted at Sriniketan in *rabi* 1986-87 to study the effect of herbicides on soil microflora in wheat crop. The micro-organisms so far identified were *Aspergillus niger*, *Penicillium chrysogenum*, *Curvularia* sp., *Fusarium* sp., *Alternaria* sp., *Rhizopus* sp., *Helminthosporium* sp., *Cunninghamella* sp. and *Mucor* sp., (Fungi). Besides these, some species of *Deutesomycetes* have been found In *Actinomycetes* species both *Actinomyces* and *Streptomyces* group were present in this experimental field. There was an increase of population of bacteria and *Actinomycetes* and the total number of fungal population was reduced with advancement of crop age. Total microbial population was found to be least in 1.0 kg butachlor treated plots and this was followed by 0.5 kg, 1.0 kg/ha of 2, 4-D (Na).

## 6.9 EFFECT OF HERCICIDES ON THE GROWTH, NODULATION AND NITROGEN FIXATION IN MUNGBEAN (*VIGNA RADIATA* (L.) WILCZEK)

Jai Prakash and S. K. Pahwa
Deptt. of Agronomy, CCS Haryana Agril. Univ., Hisar.

Five healthy seeds of mungbean were sown in earthern pots filled with field soil and farm yard manure (6 : 1) and which were thinned to two plant after germination. Fluchloralin at 0.75, 1.0 and 1.25 kg/ha were incorporated in soil before sowing. Pendimethalin at 1.0, 1.5 and 2.0 kg/ha were applied pre-emergence. While sethoxydim at 0.75, 1.0 and 1.25 kg/ha was applied as post-emergence spray 15 DAS. All the herbicides decreased the length of shoot and root alongwith number of leaves and their dry weights of treated plants in comparison to control plants at all the stages of sampling. Fluchloralin and pendimethalin increased the number of nodules/plant along with their fresh weights upto recommended doses. But the leghaemoglobin content of nodules decreased in all the treated plants. As a result, the nitrogen fixing efficiency was reduced as recorded on 30th DAS in mungbean.

## 6.10 RESIDUAL EFFECTS OF HERBICIDES ON SOIL FAUNA IN SOYBEAN-WHEAT CROPPING SYSTEM

H. S. Yadav and J. P. Tiwari
J. N. Krishi Vishwa Vidyalaya, Jabalpur M.P.

The treatment consisted of fluchloralin 1.0 kg/ha PPI, oxadiazon 0.75 kg/ha, oxyfluorfen 0.2 kg/ha, butachlor 2.0 kg/ha as pre-em. hand weeding at 20 days and control to soybean and sub treatments namely isoproturon 1.0 kg/ha, oxadiazon 0.75 kg/ha, hand-weeding at 30 days and control to weeds. After continuous applications for four years; the soil fauna was studied after harvest of soybean and before wheat sowing. The population of red small ant was less in oxadiazon, while the Jassid population was higher in control as compared to treated plots. Other soil fauna did not differ due to treatments. However, the black field cricket population was slightly reduced under oxyfluorfen. Fluchloralin had higher population of soil treatments and control. The variations between other treatments were meagre. The herbicide applied in wheat had less population than hand weeding and control.

## 6.11 EFFECT OF VARIOUS HERBICIDES ON SOIL-BORNE PLANT PATHOGENIC FUNGI, BACTERIA AND BENEIFICIAL N FIXING MICRO-ORGANISMS

S. M. Patel, P. R. Patel, and B. K. Patel
Deptt. of Plant Pathology, Gujarat Agril. Univ., Anand.

Thiobencarb at double dose effectively discouraged the growth and development of *Aspergillus niger*, causing the collar-rot in groundnut followed by double dose of alachlor. Against *Fusarium solani* (Arhar isolate), alachlor at recommended dose showed poor visual growth followed by fluchloralin. Thiobencarb and 2, 4-D at double dose gave poor growth of *Rhizoctonia bataticola* causing root-rot in cotton. Pendimethalin at 1/2 dose showed poor visual growth of *Pythium aphanidermatum* causing damping-off of tobacco seedlings. 2, 4-D at 1/2 dose developed lowest colonies of *Azotobacter* sp. on Ashby's medium. Significantly lowest *Rhizobial* population was observed in 1/2 dose of atrazine and thiobencarb at recommended dose on yeast extract mannitol agar medium.

## 6.12 EFFECT OF HERBICIDES ON SOIL INHABITATING ROOT-KNOT (*MELOIDOGYNE INCOGFITA*) AND RENIFORM (*ROTYLENCHULUS RENIFORMIS*) NEMATODES

B. K. Patel and P. R. Patel
Deptt. of Plant Pathology, Gujarat Agril. Univ., Anand.

Plant pathogenic nematodes viz., *Meloidogyne incognita* and *Rotylenchuius reniformis* were tested against alachlor fluchloralin, isoproturon, 2, 4-D pendimetha-

lin, atrazine and thoibencarb at three concentrations (1/2 the recommended dose, recommended dose and a twice the recommeuded dose). Except 2, 4-D and thoibencarb, all the herbicides gave complete mortality of the larvae within 24 hours at all the concenrations. 12% larvae of the *M. incognita* survived up to 48 hours at 1/2 concentration of recommended dose of thiobencarb. At half dose of thiobencarb 14% larvae of *R. reniformis* survived under submerged condition up to 24 hours, but died within 48 hours. 2, 4-D at 0.75 kg/ha reduced the population of both *M. incognita* and *R. reniformis* up to 17% and 36% respectively, within 72 hours after its application under submerged conditions. Both 2, 4-D and thiobencarb 0.75 and 1.0 kg/ha, respectively were found ineffective in reducing the population of *M. incognita* and *R. reniformis* upto 100%.

## 6.13 EFFECT OF ALACHLOR ON SOIL MICROBIAL POPULATION, NEMATODES, GERMINATION, COLLAR-ROT, POD YIELD, WEEDS AND NODULATION IN SUMMER GROUNDNUT

P. R. Patel and B. K. Patel
Deptt. of Plant Pathology, Gujrat Agric. Univ., Anand.

On 30th day after pre-emergence application of alachlor at 1.0 kg/ha, increased the microbial population in unamended soil with FYM, but significantly reduced in amended soil with FYM and sprayed with alachlor. Highest *Azotobacter* as well as *Rhizobial* count was observed when alachlor was applied at double the recommended dose in unamended soil with FYM. Population of both were adversely affected in amended soil with FYM. At the time of harvest, 71% increase in nematode population was recorded in the plots sprayed with 1/2 dose of alachlor alone. Lowest collar-rot (caused by *Aspergillus niger*) was recorded when the alachlor was sprayed at double rate in unamended soil with FYM. Lowest weed population was recorded in the plots treated with double dose of alachlor alone. Application of alachlor in FYM amended soil found benificial in increasing the pod yield and not affected the nodulation.

## 6.14 EFFECT ON ENVIRONMENT AND BIOTYPES ON THE POTENCY OF ISOPROTURON AGAINST *PHALARIS MINOR* RETZ.

R. K. Malik, Samunder Singh and Attar Singh
Deptt. of Agronomy, CCS Haryana Agric. Univ., Hisar.

*Phalaris minor* Retz. seeds were collected from six locations in Haryana where isoproturon has been continuously used for many years. Three sets of experiments were conducted to see the effect of environment on the performance of isoproturon

applied at 0.063, 0.125, 0.25, 0.50 and 1.0 kg/ha on six biotypes of *Phalaris minor*. To evaluate the effect of environment on the phytoxicity of isoproturon, all six biotypes were sown on Nov. 10, 1991, Nov. 25, 1991 and Dec. 10, 1991. Isoproturon was sprayed when all biotypes had attained $2\frac{1}{2}$ leaf stage. The maximum and minimum temperature following isoproturon application at this stage were 25/7.0, 18/6.0, 19/4.0°C. The % control of *P. minor* was maximum in the biotypes sown on 25 Nov., 1991 and where the mean temperatures one week following isoproturon application were 18.0 and 6.0°C. When the data was subjected to probit analysis, the $GR_{50}$ levels were found to be more for two biotypes of Karnal and Ambala. The dose requirement were minimum for the biotypes of Hisar distt. When these experiments were repeated in the field, the biotype variation were not as evident as were observed in the pot culture studies, In the field conditions, the effect of isoproturon was relatively less on Karnal biotype than other biotypes.

## 6.15 EFFECT OF HERBICIDES ON SOIL FLORA AND FAUNA IN GROUND NUT

B. K. Patel and P. R. Patel
Deptt. of Plant Pathology, Gujrat Agril. Univ. Anand

Alahlocr, fluchloralin and isoproturon at recommended dose were applied as pre-em. in groundnut cv GG-2 in amended and unamended soil with FYM. Initial microbial and *Azotobacter* population was at par in both types of soil. Higher rhizobial population was observed in unamended soil. Fluchloralin and alachlor showed tremendous reduction in the microbial population within a month period. Least *Azotobacter* population was noticed in the plots when sprayed with isoproturon in ameneded soil. Rhizobial population was build up in control plots without FYM within 30 days after sowing the *Kharif* groundnut. At the time of harvest, all the treatments reduced the microbial population. Isoproturon gave highest *Azotobactor* and rhizobial population. Lowest rhizobial population was observed in alachlor treated plots. Fluchloralin showed the highest nematode reduction within 30 days. Minimum reduction in nematode population was recorded in the control treatment without FYM. This treatment has also showed the highest seed germination and lowest weed population in alachlor sprayed plots.

## 6.16 PHYSIOLOGICAL PARAMETERS OF WHEAT AND *PHALARIS MINOR* AS INFLUENCED BY SOWING DATE, PLANTING GEOMETRY AND WEED CONTROL METHODS.

M. L. Patel, S. P. Kurchania, J. P. Tiwari and H. C. Jain
Deptt. of Agronomy, JNKVV, Jabalpur, (M. P.)

Field trial was conducted during *rabi* reason of 1986-87 and 1987-88 at Jabalpur. The results revealed that LAI (11) and CGR (29) values were

obtained due to mid-late sowing followed by normal and late sowing. The cross sowing had exhibited 2 and 3 higher values of LAI and CGR, respectively over solid sowing. The highest and lowest values of LAI 11 and 3 and CGR 31 and 12 were noted under isoproturon 1.0 kg/ha applied as pre-emergence and weedy check, respectively. All the herbicides registered higher LAI and CGR values than weedy check. The highest grain yield (4263 kg/ha) was recorded in normal sowing. The cross planting also gave 231 kg/ha more yield than solid planting. Amongst weed control methods, higher grain yield of 4437 kg/ha was obtained in isoproturon 1.0 kg/ha pre-emergence. Isoproturon 1.0 kg/ha post-emergence, metoxuron 2.0 kg/ha (post) and two hand weeding recorded almost similar yield but higher than pendimethalin 1.5 kg/ha (3862kg/ha).

## 6.17 EFFECT OF SOIL MOISTURE ON THE PHYTOTOXICITY OF TRALKOXYDIM AGAINST *WILD OATS*

R. S. Dhawan and R. K. Malik
C. C. S. Haryana Agril. Univ. Reg. Res. Stat , Uchani, Karnal.

The effect of soil moisture stress on the phototoxicity of tralkoxydim applied to *Avena ludoviciana* has been investigated. Wild oat was grown in sandy loam soil in plastic containers that were maintained at two levels of soil moisture; field capacity and 50% of FC. Plants were sprayed with 0.6 kg/ha tralkoxydim at 2, 4 and 6 leaf stage. Plants sprayed with water served as control. Tralkoxydim was more effective at FC and its efficacy decreased with the decrease in moisture from FC to 50% FC. The effects were pronounced on the plants at 2 leaf stage as compared to those at 4 and 6 leaf stage.

## 6.18 STUDIES ON WEED CONTROL IN DIRECT SEEDED RICE– INFLUENCE OF STAGE OF APPLICATION OF THIOBENCARB

T. K. Prabhakara Setty and V. Jagannatha
Reg. Res. Station, Brahmavar, Karnataka.

Field experiments were conducted during 1989 and 1990 *Kharif* season at Brahmavar, Karnataka to find out the optimum time and dose of thiobencarb for effective control of weeds in direct seeded rice under upland rainfed conditions. The treatments involved the application of thiobencarb at 1.0 and 2.0 kg/ha applied at 5 and 10 DAS, one hand weeding was introduced wherever the dose was 1.0 kg at 20 days after spraying. In addition to this, treatments with hand weeding twice (farmer's practice), weed free and unweeded check were also included for comparison. The results of indicated that application of thiobencarb at sowing both at 1.0 and

2.0 kg/ha caused severe injury to the crop, however, at 5 DAS, the injury was to an extent of 30%; while, there was practically no injury to crop when the herbicide was applied at 10 DAS. Higher grain yield of rice was recorded with thiobencarb applied at 10 DAS. Application of thiobencarb at 1.0 kg/ha at 10 DAS with one hand weeding recorded higher grain yield in both the years over thiobencarb at 2.0 kg/ha at 10 DAS, hand weeding twice and weed free check.

## 6.19 EFFECT OF SOIL SOLARISATION ON WEEDS AND NEMATODES

Binod Kumar, N. T. Yaduraju, K. N. Ahuja and D. Prasad
Division of Agronomy, I.A.R.I., New Delhi.

The control of weeds and nematodes by solar heating of soil using transparent polyethylene (PE) sheets was studied in the field during summer 1990. PE mulching for 32 days decreased the emergence of *Dactyloctenium aegyptium* (L.) P. Beauv., *Acrachne racemosa* (Roem and Schult) Ohwi, *Cyperus rotundus* L. from seed, *Trianthema monogyna* Linn.–the dominant weeds in the field by over 90%. *C. rotundus* emergence from tubers was increased by the mulching treatments. The 16 days mulching also decreased weed emergence but was not as good as 32 days mulching Solarisation gave about 90% reduction in the population of plant parasitic (*Tylenchus* spp., *Heterodera* spp., *Xiphinema* spp., *Heplolaimus* spp., *Pratylenchus* spp. and *Rotylenchus* spp), and about 60% for saprophytic nematodes. However, 70 days later, nematode control was very much less. The mean maximum soil temperatures recorded at 5 cm depth were warmer when mulching followed irrigation. The growth of soybean was improved and grain yields increased by upto 78% following solarisation.

# 7. HERBICIDE MIXTURES

## 7.1 EVALUATION OF FLUROXYPYRIS AND OPROTURON MIXTURES FOR WEED CONTROL IN WHEAT

S. P. Kurchania, J. P. Tiwari and N. R. Paradkar
Deptt. of Agronomy, JNKVV, Jabalpur, M.P.

Field experiment was conducted at Jabalpur dry *rabi* 1989. Fluroxypr at 0.2 kg/ha with 27.5% WCE recorded the highest crop biomass (9655 kg/ha) and grain yield (4243 kg/ha). The bioefficiency of fluroxypyr improved considerably when tank mixed with isoproturon at 0.75 kg/ha. The crop biomass and grain yield under all the combination of fluroxypyr and isoproturon, 2, 4-D + isoproturon at 0.75 and 1.0 kg/ha post-emergence and 1.0 kg/ha pre-emergence were more or less alike. However, isoproturon 0.75 kg/ha alone and combination with 0.2 kg/ha fluroxypyr gave substantially higher yield (4996 and 4962 kg/ha). All the treatments were significantly superior in grain yield as compared to weedy check. The WCE ranged from 76 to 81% among the treatments,

## 7.2 RELATIVE EFFICACY OF HERBICIDES FOR WEED CONTROL IN SUGARCANE

Shiv Kumar, S. N. L. Srivastava and Ran Singh
RRS, CCS Haryana Agric. Univ., Uchandi.

Field studies were conducted during 1988-89 and 1989-90 to find out effective and economical weed control method for sugarcane. The unchecked growthof weeds reduced cane yield by 34.4%. Among different herbicide treatments, atrazine 1 kg/ha (pre-em.) followed by glyphosate 1 kg/ha 6-8 WAP gave highest cane yield and was found statistically at par with 2, 4-D 1 kg/ha+gramoxone 0.5 kg/ha applied 3 WAP and supplemented with same application at 6-8 WAP, 2, 4-D amine 2 kg/ha (pre-em.) and supplemented with same application at 8-10 WAP, alachlor 2 kg/ha (pre-em.), alachlor 1 kg/ha+atrazine 1 kg/ha (pre-em.) and metribuzin 2 kg/ha (pre-em.). However, alachlor 1 kg/ha+atrazine (pre-em.) gave highest net returns (Rs 8070/ha) but 2, 4-D amine 2 kg/ha (pre-em.) supplemented with same application at 8-10 WAP recorded maximum tost: benefit ratio of 10.5.

## 7.3 WEED MANAGEMENT STUDIES IN SEMI-DRY RICE

S. Ramiah and P. Muthukrisanan
Agric. College and Res. Inst., Madurai, T.N.

Field experiment was conducted at Madurai during *rabi* season of 1988. Among the weed control treatments, pre-emergence application of pendimethalin at

1.25 kg/ha at 8 DAS followed by post-em. application of 2, 4-D sodium salt at 1.0 kg/ha at 21 DAS was found to control the weeds effectively. Pendimethalin effectively controlled most of the grasses and sedges, while 2, 4-D sodium salt gave better control of broad leaved weeds. Better weed control and enhanced tiller production under pendimethalin followed by 2, 4-D sodium salt application resulted in higher grain yield. The benefit cost ratio, additional yield and return were also higher in this treatment combination over control. Reduction in grain yield due to weed competition in unweeded check was to an extent of 12-31% compared to different weed control treatments.

## 7.4 STUDIES ON WEED MANAGEMENT IN GROUND NUT (*ARACHIS HYPOGEA* L.)

S. S. Mishra, S. J. Sinha and S. S. Sinha
Deptt. of Agronomy, Rajendra Agril. Univ., Bihar.

A field investigation was carried out at Dholi (Muzaffarpur) during *Kharif* seasons of 1988 and 1989, consisting of eight weed control treatments along with hand weeding and weedy check. Maximum ground nut yield (2200 and 2260 kg/ha) was recorded with oxyfluorfen at 0.15 kg/ha followed by alachlor at 1.0 kg/ha (Soil incorporation). All the chemicals either applied as pre-emergence or soil incorporated were at par among themselves and with hand weeding. Although, highest weed control efficiency was recorded with hand weeding treatment. Oxyfluorfen also gave satisfactory weed control efficiency in both the years.

## 7.5 CONTROL OF *CUSCUTA* SP. WITH HERBICIDE MIXTURES IN BLACK GRAM UNDER UPLAND CONDITIONS

K. Narayana Rao and R. S. N. Rao
Weed Science Division, Agril. College Campus, Baptala.

An experiment was conducted at Baptala with herbicides like pendimethalin fluchloralin, the combination of pendimethalin and fluchloralin for the control of *Cuscuta* in black gram (cv. LBG-20) during *rabi* 1989-90. The results indicated that the application of pendimethalin at 1.5 and 1.0 kg/ha and the combination of pendimethalin at 0.60 kg+fluchloralin 0.70 kg were effective in reducing the infestation of *Cuscuta* seedlings at 30 DAS and also the % infestation at 60 DAS. Maximum seed yield of 996 kg/ha was recorded with pendimethalin at 1.0 and 1.5 kg/ha followed by the combination of pendimethalin at 0.60+fluchloralin 0.70 kg/ha (810 kg/ha). Lowest yield of 216 kg/ha was recorded in unsprayed control and the increase in yield due to herbicide treatments was 252 to 361% over unsprayed control.

## 7.6 INFLUENCE OF TRALKOXYDIM ON THE CONTROL OF WILD OAT (*AVENA LUDOVINCIANA*) IN WHEAT (*TRITICUM AESTIVUM* L.)

R. S. Panwar, R. K. Malik and Samunder Singh
Deptt. of Agronomy, CCS Haryana Agril. Univ., Hisar.

Field and pot culture studies were conducted Hisar, India during *rabi* seasons of 1988-89 and 1989-90. Tralkoxydim at 0.30 or 0.35 kg/ha effectively controlled wild oat. Fluroxypyr or 2, 4-D controlled common lambsquarter. Tank mixture of tralkodydim and 2, 4-D reduced the control of wild oat. Tralkoxydim plus fluroxypyr did not influence the effectiveness of tralkoxydim on wild oat. Based on pot culture study, combination of tralkoxydim and isoproturon improved the control of wild oat. Tralkoxydim at 0.35 kg/ha provided greater yield than isoproturon treated plots. Plots treated witn tralkoxydim at 0.35 kg/ha+fluroxypyr at 0.20 kg/ha yielded 5117 and 5808 kg/ha as compared to 6068 and 6248 kg/ha in weed free check during 88-89 and 89-90, respectively.

## 7.7 INTEGRATED WEED MANAGEMENT IN LOWLAND DIRECT SOWN RICE

C. R. Chinnamuthu and S. Sankaran
Tamil Nadu G. D. Naidu Agril. Univ., Coimbatore.

Field experiments were conducted on the wetlands G. D. NAU, Coimbatore during winter and summer seasons of 1988-89. Application of anilofos 0.40 kg/ha followed by one hand weeding was highly effective compared to anilofos fb 2, 4-DEE 0.80 kg/ha. The result was comparable with hand weeding twice and butachlor 1.00 kg/ha fb one hand weeding. Phytotoxic effect was significant when anilofos and butachlor (0.30+0.75 kg/ha) were applied as mixture but not in sequential application. Increased leaf area, dry matter of crop, productive tillers/unit area, number of filled grains/panicle resulted in increased grain yield in anilofos followed by one hand weeding and hand weeding (twice) treatments. Butachlor followed by one hand weeding also showed a similar effect in direct sown rice.

## 7.8 INTEGRATED WEED MANAGEMENT IN SESAMUM

N. Kempuchetty, S. Sankaran, R. Jayakumar and S. P. Palanlappan
Deptt. of Agronomy, Tamil Nadu G. D. Naidu Agril. Univ., Coimbatore-3.

Field investigation were conducted during summer 1989 and *kharif* 1990 at Coimbatore. The results showed that none of the herbicides applied either as preplant incorporation or pre-emergence showed phytotoxic symptom to germination

and establishment of sesamum during summer 1989. But during the *kharif* 1990 trial, oxyfluorfen 0.1 kg showed the phytotoxic symptoms of yellowing and scorching of leaves and stunted growth of sesamum up to the rating of 2–4. All the weed control treatments reduced the weed population to a signifIcant level. However, among the herbicide treatments, least weed count and biomass on 35 DAS recorded with pre-emergence application of alachlor 1.5 kg followed by pendimethalin 1.0, metolachlor 1.0 and oxyfluorfen 0.1 kg during 1989 and alachlor 1.5 kg followed by oxyfluorfen 0.1 kg, pendimethalin 1.0 kg and metolachlor 1.0 kg during 1990. During 1989, highest seed yield of 810 kg/ha was obtained in hand weeded twice check and was comparable with pre-emergence alachlor 1.5 kg (794 kg/ha, pre-emergence pendimethalin 1.0 (786 kg/ha) and metolachlor 1.0 kg/ha (779 kg/ha). During 1990 also, highest grain yield was obtained in hand weeded twice plot (750 kg/ha) and was comparable with metolachlor 1.0 kg/ha (736 kg/ha) and pendimethalin (732 kg/ha).

## 7.9 RESPONSE OF WHEAT (*TRITICUM AESTIVUM*) AND ASSOCIATED WEEDS TO NITROGEN AND ISOPROTURON APPLIED POST-EMERGENCE

P. C. Bhagwati, A. S. Faroda and R. K. Malik
Deptt. of Agronomy, CCS Haryana Agric. Univ., Hisar

Three field experiments were conducted on a sandy loam soil at Hisar to evaluate the changes in the density and dry weight of weeds as affected by nitrogen rates and isoproturon in wheat. On an average the weed density in the field dominated by broad leaf weeds at 60 DAS was about 44, 29 and 1. % more in the unfertilized plots than in the plots fertilized with 120, 80 and 40 kg N/ha, respectively. Dry weight of total and individual weeds at 60 DAS was greater in the fertilized plots than in the unfertilized plots. Isoproturon at 1.0 kg/ha plus 2, 4–D at 0.5 kg/ha was not effective in controlling broad leaf weeds and wild oats. Isoproturon at 0.75 kg/ha plus surfactant at 0.1% improved the control of yellow sweet clover and wild oats. Competition by broad leaf weeds reduced the grain yield of wheat by 34, 14 17 and 17% at 0, 40, 80 and 120 kg N/ha, respectively. The reduction in average grain yield of wheat in the presence of 180 wild oat plants/$m^2$ were 32, 25, 12 and 19% at 0, 40, 80 and 120 kg N/ha. Efficiency of isoproturon was more in the unfertilized plots.

## 7.10 TRALKOXYDIM POTENTIAL HERBICIDE FOR THE CONTROL OF GRASS WEEDS IN WHEAT

K. C. Gautam
Division of Agronomy, IARI, New Delhi.

A field investigation was undertaken to evaluate the bio-efficacy and crop selectivity of talkoxydim alone and in combination with 2, 4-D and for the comparision of isoproturon alone and in combination with fluroxypyr treatments were included. A weedy check was also included *A. ludoviciana, P. minor, C. album, M. indica* and *F. parviflora* constituted the major bulk of the weeds. Tralkoxydim at higher dose (0.350 kg/ha)+2, 4-D at 0.5 kg/ha was found to be the best combination in achieving 92.4 and 88.2% weed control efficiency of broad leaf weeds and grasses, respectively and in registering the highest grain yield (4110 kg/ha) followed by isoproturon+fluroxypyr application which produced 4107 kg/ha of grain yield and weed control efficiency were 89.3 and 87.6% with respect to broad leaf weeds and grasses, respectively. Weedy check treatment could produce only 3077 kg/ha. Tralkoxydim+2, 4-D tank mixed application appeared to be slightly better over isoproturon plus fluroxypyr application.

## 7.11 CHEMICAL WEED CONTROL IN TRANSPLANTED RICE UNDER LOW LAND SITUATION

J. C. Prusty and B. Behera
Central Res. Station, Orissa Univ. of Agric. and Tech., Bhubaneswar.

An experiment was conducted at Bhubaneswar during *kharif* 1988 and 1989. The herbicides used were bensulfuron methyl (0.04 kg/ha), butachlor (1.0 kg/ha), quinchlorac (0.20 kg/ha), naproanilide+thiobencarb (1.0+0.7 kg/ha), piperophos+2, 4-D (0.3+0.2 kg/ha), 2, 4-D (0.8 kg/ha) were compared against farmers practice of hand weeding at 20 and 35 DAT. In both the seasons farmers practice recorded maximum yield and se of herbicides such as pretilachlor+fenchlorim, butachlor and pendimethalin remained at par. Farmers practice of weed control recorded mean grain and straw yield of 4007 and 4717 kg/ha, respectively. Among herbicides pretilachlor+fenchlorim, butachlor and pendimethalin ranked the 1st, 2nd and 3rd with mean grain and straw yield of 3950 and 4833, 3767 and 4422 and 3655 and 4253 kg/ha, respectively. These three herbicides can substitute the farmers practice of two manual weedings under transplanted conditions,

## 7.12 STUDIES ON THE RELATIVE EFFICIENCY OF CERTAIN HERBICIDES AND THIER COMBINATIONS IN TRANSPLANTED RICE

A. Venkata Raman, K. Narayana Rao and K. Rama Rao
A. P. Agril. Univ., Baptala.

An experiment was conducted on sandy clay loam soils of Baptala during *kharif* 1989-90 with herbicides applied alone or in combination. The results indicated that the application of cinmethylin at 0.08 kg+2, 4-D EE at 0.04 kg/ha, cinmethylin

alone at 0.08 kg/ha and 0.12 kg/ha were effective in reducing the weed density and dry weight of weeds. Lowest nutrient uptake by weeds was recorded in hand weeding twice followed by cinmethylin+2, 4-D EE and maximum uptake was in unweeded control because of unchecked weed growth, while maximum N, P and K uptake by grain was obtained in hand weeding twice followed by cinmethylin+2, 4-D EE. Maximum grain yield of 6110 kg/ha was recorded in hand weeding twice followed by cinmethlin at 0.08 kg+2, 4-D EE at 0.04 kg/ha (5962 kg/ha) and cinmethylin alone at 0.08 kg/ha (5845 kg/ha).

## 7.13 EFFICACY OF ANILOFOS+2, 4-D EE MIX IN LOWLAND RICE ECOSYSTEM

S. Ranganayaki and S. Purushothaman
Agric. College and Res. Inst., Madurai.

Field experiments were conducted to study the influence of time of application of anilofos+2, 4-D EE mix in transplanted rice during *kharif* and *rabi*, 1989-90. The results revealed that application of herbicides at 4 DAT significantly reduced the weed density and dry weight when compared to application at 12 DAT. Weed control efficiency (WCE) was reduced with delayed application of anilofos while, 2, 4-D EE applied at different time didn't reduce the WCE. Among the mixtures, anilofos 0.3 kg+2, 4-D EE 0.4 kg/ha recorded higher WCE and was comparable with WCE of hand weeding twice. More over, the above mixture recorded higher WCE than individual application of either anilofos or 2, 4-D EE. The yield level of hand weeding twice and anilofos 0.3 kg+2, 4-D EE 0.4 kg/ha applied upto 8 DAT were comparable.

Unweeded check reduced the yield by 21 to 30%. Higher net income and benefit-cost (BC) ratio were obtained with anilofos 0.3 kg+2, 4-D EE 0.4 kg/ha applied upto 8 DAT.

## 7.14 *AZOLLA* AS A COMPONEOT IN INTEGRATED WEED MANAGEMENT IN TRANSPLANTED RICE

G. Srinivasan, P. Pothiraj, N. Kempuchetty and P. Subbian
Tamil Naidu G. D. Naidu Agril. Univ., Coimbatore·

Field investigations were carried out at Coimbatore, during 1988-89 to evaluate the performance of herbicides in combination with *azolla* in controlling weeds in rice fields. Anilofos+2, 4-D (ethyl ester) at 0.30+0.51 kg/ha and thiobencarb+2, 4-D EE at 1.00+0.51 kg/ha were comparable with that of hand weeding twice in controlling weeds in rice fields. Better control of *Paspalum paspalodes* and *Marsilea minuta* was observed under hand weeding twice. Dual cropping with *Azolla pinnata*

in rice fields significantly reduced the infestation of *Marsilea minuta*. Hand weeding twice coupled with *azolla* dual culture resulted in marked reduction of *Marsilea minuta*. Better control of weeds under integrated weed management practice resulted in higher grain yields.

## 7.15 PERFOYMANCE OF FORMULATED MIXTURE OF ISOPROTURON AND 2, 4-D ON WEED CONTROL IN WHEAT

R. K. Malik, R. S. Panwar and R. S. Balyan
Deptt. of Agronomy, CCS Haryana Agric. Univ., Hisar.

Field experiments were conducted at Hisar during *rabi* seasons of 1989-90 and 1990-91 to test the efficacy of isoproturon and 2, 4-D each applied alone and in combination as a formulated mixture (Gharda chemicals) for wide spectrum weed control wheat. Isoproturon+2, 4-D as formulated mixture in the ratio of 4:1 was compared with tank mixture of isoproturon and 2, 4-D in the same ratio. Five doses of such mixtures were 0.500+0.125, 0.625+0.156, 0.750+0.187, 1.000+0.250 and 1.20+.300 kg/ha were used. The formulated mixture of isoproturon and 2, 4-D in the above doses reduced the weed dry weight from 102 g/m$^2$ to 18, 11, 9, 6 and 6 g/m$^2$ in 1989 and from 249 g/m$^2$ to 47, 39, 29, 25 and 18 g/m$^2$ in 1990, respectively. The effect of tank mixture of isoproturon and 2, 4-D was similar to the effect of formulated mixture. The grain yield of wheat following the treatment of formulated mixture at 0.50+0.250 kg/ha and 0.625+0.156 kg/ha were 4859 and 4762 and 4487 and 4405 kg/ha in 1989 and 1990 as compared to 3262 and 2817 kg/ha in the weedy check during both seasons, respectively.

# 8. HERBICIDE RESIDUES

## 8.1 PERSISTENCE OF PENDIMETHALIN IN SOIL

R. S. Dhawan and R. K. Malik
CCS Haryana Agril. Univ., Regional Res. Station, Uchani, Karnal.

A laboratory study was conducted to study the persistence of pendimethalin in soil during 1990 at Uchani. Soil pre-treated with pendimethalin (24 ppm) was kept in the incubator at 25°C. This soil was taken out from the incubator at 0, 30, 60, 90, 120 and 150 days intervals and the samples were kept in deep freezer before using for bioassay studies. The residue of pendimethalin in soil were determined by bioassay method using sorghum as test plant. The soil was diluted to 12, 6, 3, 1.5 and 0.75 ppm. Untreated soil was kept as control. The study revealed that pendimethalin hampered seed germination, plant height, root length and dry matter accumulation/plant. Concentrations upto 6 ppm caused 50% inhibition in the germination even after 150 days of incubation. Lower concentrations, however, caused lesser inhibition.

## 8.2 RESIDUAL EFFECTS OF HERBICIDES ON SUCCEEDIOG *RABI* CROPS

O. P. Mishra and J. N. Singh
Deptt. of Agronomy, G. B. Pant Univ. Agric. and Tech., Pantnagar, U.P.

Field experiments were conducted to study the residual effects of herbicides applied in transplanted rice, on succeeding crops of wheat, gram, pea and lentil. The treatments in rice were thiobencarb, butachlor each at 1.0 kg/ha, hand weeding at 30 and 60 DAS and the weedy check. None of the herbicides showed any effect on succeeding crops and associated weeds.

## 8.3 HERBICIDES RESIDUE STUDIES IN POST HARVEST SOIL OF FRENCH BEAN

S. S. Singh and R. D. Vaishya
Deptt. of Agronomy, N. D. Univ. of Agric and Tech., Faizabad, U. P.

A field/laboratory experiment was conducted at Agronomy Research Farm Faizabad during *rabi* 1988-89 and 1989-90 with an object to see the herbicide residues in post harvest soil of french bean. Fluchloralin, pendimethalin, metolachlor each applied at 0.75, 1.0 and 1.25 kg/ha or alachlor at 1.5, 2.0 and 2.5 kg/ha did not leave any residue in the post harvest soil of french bean.

## 8.4 MANAGEMENT OF ATRAZINE RESIDUE IN MAIZE-SOYBEAM CROPPING SYSTEM

K. B. Ravi, A. Rajagopal, A Balasubramanian and N. Kempuchetty
Tamil Naidu G. D. Naidu Agril. Univ., Coimbatore.

Field experiments were conducted during *kharif* 1989 and *rabi* 1990 at Coimbatore to find out the effect of farm yard manure on atrazine in *kharif* maize and its residual effect on succeeding soybean. Different agronomic management practices such as seed treatment of activated charcoal, basal application of charcoal and application of farm yard manure were adopted individually and in combination. Different doses of atrazine (0.25, 0.5 and 1.0 kg/ha) with and without FYM were tried in the first crop of maize. Combination of treatment of activated charcoal at 5 kg/ha with hand application of charcoal at 20 kg/ha and FYM at 12.5 t/ha performed better and gave higher yield of 1263 kg/ha. This was followed by hand application of charcoal (1093 kg/ha). Based on the economics, seed treatment of charcoal at 5 kg/ha was the best among all agronomic management practices. Above all, application of FYM at 12.5 t/ha both in maize and in the succeeding soybean minimised the residual toxicity of atrazine considerably.

## 8.5 DYNAMICS OF PENDIMETHALIN IN DIFFERENT SOIL TYPES

R. Jayakumar, N. Kempuchetty, S. Sankaran and S. P. Palaniappan
Deptt. of Soil & Crop Mgmt. Tamil Nadu, G. D. Naidu Agril. Univ , Coimbatore.

Laboratory experiments were conducted to study the adsorption, desorption, movement and degradation of pendimethalin in three soil types viz., alluvial, black and red soil. The adsorption of pendimethalin was high in black soil followed by alluvial and red soils while the desorption was high in red soils followed by alluvial and black soil. The Freundlich K, the adsorption isotherm, worked out for various soils indicated that the adsorption was more in black soils which might be due to high clay content. The movement studies carried out with glass column indicated that pendimethalin was accumulated in top 0-10 cm layer followed by 10-20 cm layer in black soil but the same was not detectable in 20-30 cm layer and in leachate. In alluvial soils, the same could distribute upto 30 cm. In none of the leachates, pendimethalin could be detected. The degradation of pendimethalin in soils was rapid and the half lives of pendimethalin in alluvial, black and red soils were 26, 20 and 16 days and the persistence were upto 70, 60 and 50 days, respectively.

## 8.6 MOBILITY OF ATRAZINE IN SOIL COLUMNS UNDER PUDDLED AND UNPUDDLED GARDEN LAND CONDITION

M. Subashchandrabose, S. Anbazhagan and S. Balasubramanian
Tamil Nadu G. D. Naidu Agril. Univ., Coimbatore.

Experiment was conducted to study the leaching of atrazine in alluvial soil. In the present study the soil was imposed with two water management practices viz, puddled flooded and unpuddled garden land conditions. Vertical leaching column apparatus was packed with 15 cm soil column and the above conditions were suitable imposed. Atrazine was applied on top of the soil at two concentrations (0.5 and 5 mg/kg). The leachate were collected periodically upto 56 days and analysed for atrazine residue by gas chromatography. The analytical results revealed significant variability in leaching of herbicide with water management practices as well as with herbicide concentrations. The leaching rate increased markedly from 7th to 14th day at 0.5 mg/kg level under puddled condition. Under unpuddled garden land condition 0.5 mg/kg level exhibited a situation similar to that of 5 mg/kg level under flooded puddled, but at higher concentration (5 mg/kg) an increasing trend was observed upto 7th day and maintained upto 14th day. The leaching rate decreased significantly upto 42nd day and gradually thereafter.

## 8.7 HERBICIDE RESIDUE STUDIES IN SUNFLOWER (*HELIATHUS ANNUS*) UNDER DIFFERENT MOISTURE REGIMES

P. Nalayni, S. Sankaran and R. Jayakumar
Tamil Nadu G. D. Naidu Agril. Univ., Coimbatore.

Field experiments were conducted to evaluate the herbicides viz. fluchloridone at 0.5 kg, pendimethalin at 1.0 kg and fluchloridone at 0.25+pendimethalin at 0.5 kg under three moisture regimes viz., 0.5, 0.75 and 1.0 IW/CPE ratios at Coimbatore during *Kharij* and *Rabi* seasons of 1989-90. The effect of herbicides on the soil microbes showed that, soil bacteria, fungi and actinomycetes were reduced following treatments of herbicides but they recovered within 25 days after treatment. The gas liquid chromatographic estimation of herbicide residues revealed that the degradation of herbicide was faster in the high moisture regimes than low moisture regimes.

## 8.8 DEPLETION PATTERN OF ANILOFOS UNDER DIRECT SEEDED PUDDLED RICE

C. T. Chinnamuthu and S. Sankaran
Tamil Nadu G. D. Naidu Agril. Univ., Coimbatore.

Field experiments were carried out on the clay loam soils of Coimbatore, during *kharif* and *rabi* seasons of 1988-89. The main plots were applied with either

5 tonnes of neem leaf or 50 kg of neem cake/ha with no manure treatment as control. The sub-plots were applied with anilofos at 0.20, 0.30, 0.40 and 0.50 kg/ha. Anilofos at 0.40 kg/ha effectively controlled most of the weeds, particularly the grasses at all stages of crop growth. Anilofos at 0.50 kg/ha caused 33 to 35% stand reduction of rice crop. The selectivity of the herbicide was improved when it was applied in the 5.0 t/ha of neem leaf treated plot. The degradation of the herbicide was fast in organic manure applied plots. The half life of anilofos ranged from 4 to 6 days.

## 8.9 PERSISTENCY EFFECT OF HIGHER DOSE OF SOME SELECTED HERBICIDES ON LENTIL AND GRAM

A. Quayum, V. C. Srivastava
Deptt. of Agronomy, Birsa Agril. Univ., Ranchi, Bihar.

In a field trial on a acidic red silt loam soil, residual effects of fluchloralin, pendimethalin, alachlor, butachlor, atrazine, 2, 4–D, thiobencarb and isoproturon were evaluated using lentil and gram as test crops. Based on the dry weight data, these herbicides did not remain persistant for more than 110 days.

## 8.10 RESIDUAL EFFECT OF HERBICIDES ON SUMMER CROPS IN INTENSIVE CROPPING SYSTEM

A. L. Patel and H. M. Mehta
Deptt. of Agronomy, Gujarat Agril. Univ., Anand.

Pre emergenee application of pendimethalin (0.5, 1.0 and 1.5 kg/ha), fluchloralin (0.5, 0.75 and 1.0 kg/ha) and thiobencarb (0.5, 0.75 and 1.0 kg/ha) were made on *rabi* cumin on loamy sand soil. The residual effect of herbicides were studies on pearlmillet, groundnut, greengram and sorghum. Significant reduction in emergence of pearlmillet was observed in pendimethalin 1.5 kg/ha (12%) and 1.0kg/ha (10%). Yield of pearlmillet in pendimethalin treated plots at 1.0 kg/ha (461 kg/ha) and 1.5 kg/ha (237 kg/ha) were significantly low compared to handweeding three times.

## 8.11 ISOPROTURON RESIDUE STUDIES IN WHEAT (*TRITICUM AESTIVUM* L.)

N. S. Jadhav, D. K. Shelke, R. H. Bhosle and V. D. Salunke
Deptt. of Agronomy, M. A. U., Parbhani. Maharashtra.

A field experiment was conducted during *rabi* 1985–86 on wheat at Parbhani study the residue of isoproturon in soil, wheat grain and straw. Isoproturon was

applied as pre-emergence spray at 0.33, 0.66 and 0.99 kg/ha. Quantitative determination of isoproturon residue in soil (0–15 cm depth), grain and straw were carried out after harvest of the crop (120 DAS). The study indicated that isoproturon applied at 0.99 kg/ha had left residue in the soil, wheat grain and straw below the safer limit.

## 8.12 BEHAVIOUR OF PENDIMETHALIN IN ALLUVIAL SOIL

G. Kulshreshtha and S. B. SINGH
Div. of Agril. Chem. IARI, New Delhi

Influence of moisture, autoclaving and adsorption on dissipation of pendimethalin in alluvial soil was investigated. Loss of herbicide was rapid in ffooded soil (half life; 35 days) compared to non-flooded soil (half life, 53 days). Autoclaving reduced the degradation ranging from 9 to 14% in 90 days indicating the extent of microbial decomposition. However, IARI soil with low clay and organic matter showed substantial tendency to adsorb (K=16.235) this herbicide. Pendimethalin was degraded to corresponding aliphatic dealkylated and vitro reduction products in non flooded soil while degradation in flooded soil led to the formation of benzimidazole derivative.

## 8.13 PERSISTENCE OF PENDIMETHALIN AND FLUCHLORALIN RESIDUES IN SOIL

Kalpana Diwan, T. N. Barewadia, P. G. Shah and B. K. Patel
Deptt. of Agronomy, Gujarat Agril. Univ., Anand.

A field experiment was carried out with cumin (*Cuminum-cyminum*), at Anand during *rabi* 1989 and 1990. The experimental soil was loamy sand having pH 7.8. Pre-emergence application of pendimethalin at 0.5, 1.0, 1.5 and 2.0 kg/ha and fluchloralin at 1.0 kg/ha were applied one day after sowing. Residues of both herbicides were studied in 0-15 cm soil depth at 0, 15, 30, 60 and 90 days after application and at the harvest stage of the crop. Residues of pendimethalin applied at 0.5, 1.0, 1.5 and 2.0 kg/ha and fluchloralin at 1.0 kg/ha, were 0.079, 0.136, 0.204, 0.215 and 0.061 mg/kg, respectively, for the year 1989, while corresponding soil residues values for the year 1990 were 0.058, 0.174, 0.254, 0.335 and 0.085 mg/kg, respectively at the time of harvesting (124 DAS).

## 8.14 ADSORPTION-DESORPTION OF METOXURON ON FOUR SOILS OF HYDERABAD

Saroja Raman and Chhandini Patnaik
A. P. Agril. Univ., Rajendranagar, Hyderabad.

Adsorption of metoxuron was studied in two vertisols and two alfisols of Hyderabad by batch suspension method at 27±1°C. Adsorption isotherms were L-shaped with initial tendancy for mild S-shape and conformed to Freundilch equation. Adsorption was similar and higher in vertisols than in alfisols. Desorption was carried out by successive withdrawal of 5 ml of supernatant and replacement by 0.01 M $CaCl_2$ solution. Desorption isotherms exhibited hysteresis in all the four soils and at every level of initial concentration of metoxuron. The cummulative percentage of desorption was higher in alfisols as compared to vertisols possibly due to high OM and clay content. Cummulative desorptiod in general was inversely related to the initial concentration of adsorbed metoxuron. There was a gradual increase in Freundlich K and n values for desorption isotherms as the initial concentration of adsorbed metoxuron increased. Desorption isotherms were closer to adsorption isotherms when the initial concentration of adsorbed metoxuron was low. Thus at the concentration used in weed control, large accumulation of metoxuron in "bound" or unavailable form appear to be serious.

## 8.15 STUDIES ON THE RESIDUAL EFFECT OF GLYPHOSATE ON GROUNDNUT CROP

M. Madhavi, S. M. Kondap, P. C. Rao, N. V. Reddy and C. N. Reddy
College of Agric., Rajendranagar, Hyderahad, A.P.

To study the residual effect of glyphosate on succeeding groundnut crop, an experiment was conducted at Rajendranagar with glyphosate at 1.5 kg/ha plus 1% ammonium sulphate sprayed on 21 days old *Cyperus* plants, To study the residual effect, groundnut crop was sown one, seven, fourteen and twenty one days after spraying. The results have indicated that there was no effect on emergence, dry mtater production and yield of groundnut crop due to application of glyphosate as there was no significant difference among intervals of sowing in glyphosate treated plots compared to untreated plots.

## 8.16 ATRAZINE PERSISTENCE STUDIES IN BERSEAM FOR FODDER

K. S. Sandhu, S. K. Randhawa and R. K. Bhatia
Deptt. of Agronomy, Punjab Agril. Univ., Ludhiana.

A trial was conducted to study tolerance of berseam to atrazine (50, 75, 100, 125, 150, 175, 200 g/ha). Plant samples collected at 15 and 30 days after application and soil samples collected 0, 15, 30, 45, 60, 80 and 100 days after application were analysed for atrazine residue. The data revealed that atrazine got degraded to non-detectable limits in plants after 30 days. In soil the herbicide applied at 50, 75 and 100 g/ha degraded to non-detectable limits upto 100 days. Higher concentrations of the herbicide persisted even longer.

## 8.17 STUDIES ON PERSISTENCE OF ISOPROTURON AND METHABENZTHIAZURON APPLIED FOR WEED COTROL IN ONION

S. K Randhawa and K. S. Sandhu
Deptt. of Agronomy, Punjab Agril. Univ., Ludhiana.

Persistence of isoproturon and methabenzthiazuron (0.5 and 0.75 kg/ha) applied post-emergence for weed control in onion was studied in plant (bulbs) and soil. Bulb samples were taken at 15 and 30 days and soil samples from 0-10 cm depth at 0, 15, 30, 45, 60, 80, 100 and 120 days after application of herbicides. Both the herbicides got degraded to non-detectable limits in onion bulbs after 30 days. In soil isoproturon got degraded by 120 and methabenzthiazuron by 100 days after application.

## 8.18 PERSISTENCE OF THIOBENCARB AND BUTACHLOR IN SOIL INCUBATED AT DIFFERENT TEMPERATURES

Jitender Kumar and Jai Prakash
Deptt. of Botany, CCS Haryana Agril. Univ., Hisar.

Persistence of thiobencarb and butachlor applied at 1.5, 3.0 and 4.5 kg/ha was studied in lab condition in a field soil of known composition. Treated soils were incubated at 25°, 35°C and room temp ($30\pm3$°C) for 90 days. Soil samples treated as well as control were taken at 15 days interval and persistence was studied by bioassay technique using *Echinochloa crusgalli* as test plant. Persistence of both herbicides decreased with time and direct correlation was observed between temperature and dose i.e. lower temp eratuse and higher dose resulted greater persistence.

## 8.19 EFFECT OF SOIL MOISTURE AND INCUBATION ON THE PERSISTENCE OF PENDIMETHALIN

Samunder Singh, R. K. Malik and R. S. Karwasara
Deptt. of Agronomy, CCS Haryana Agril. Univ., Hisar.

Pendimethalin was incubated at field capacity in sandy loam soil in an incubator at 25°C from 0 to 240 days during 1989-90. The residue was assessed through bioassay method using sorghum as test plant with graded concentrations of pendimethalin (0-4 ppm). The degradation was faster during 0 to 20 and 20 to 40 days incubation and slowed down later on. There was 90% degradation at 240 days based on GR 50 values. The root length and root, shoot weight were also affected significantly by incubation period. Root and shoot weight were more affected at 4.0 ppm at 240 days incubation than root length.

## 8.20 PERSISTENCE OF ISOPROTURON AS INFLUENCED BY ADSORPTION AND MOVEMENT IN SOILS

S. Mandal and G Kulshrestha
Division of Agril Chemicals, IARI, New Delhi.

Investigations were conducted to study the influence of adsorption and movement on persistence of isoproturon in three Indian soils of different climatic zones viz. Ustochrepts (alluvial soil), Pellusterts (black soil) and Humitropepts (foot hill soil). Amount of adsorption was directly related with the concentration of the herbicide in soil. In general, S-type adsorption isotherms were obtained. The adsorption isotherms fitted well in the Freundlich equation. The 'K' values ranged between 0.316 and 0.505 for the three soils. After destruction of organic matter and binding agents soils exhibited L-type adsorption isotherms. The adsorption isotherms fitted well in both the Freundlich and Langmuir equations. The mechanism of adsorption of isoproturon in soil studied using Infrared Spectra of hydrogen montmorillonite isoproturon and smectite-isoproturon complexes suggested involvement of either physical (Vander Waal's forces) or Hydrogen bonding between >C=O or >N—H groups of the herbicides and the active soil surface. Movement of isoproturon in the three soils was investigated using soil column studies. The herbicide leached down with water to zones below 15 cm and that the movement was higher in light textured alluvial soil, medium in black soil and lower in hill soil. Herbicide degraded in the three soils with half-lives of 27, 32 and 37 days for alluvial, hill and black soils. respectively.

# 9. NEW HERBICIDES

## 9.1 EFFECT OF TRIBENURON ON WHEAT, CHICKPEA AND SOME *RABI* SEASON ANNUAL WEEDS.

Samunder Singh and R. K. Malik
Deptt. of Agronomy, CCS Haryana Agril. Univ., Hisar.

Sensitivity of some important annual broad leaf weeds and crops was studied through bioassay in the screen house during 1990–91. Tribenuron was applied 30 DAS wheat, chickpea, *Vicia sativa* L., *Lathyrus aphaca* L., *Melilotus indica* All. Fl. Ped., *Asphodelus tenuifolis* and *Anagallis arvensis* L. at 2.5 to 20 g/ha. Tribenuron had no effect on wheat but caused mortality to chickpea and reduced its dry weight significantly. Among weeds, *Asphodelus*, *Anagallis*, *Vicia* and *Melilotus* were found very sensitive but *Lathyrus aphaca* was not affected.

## 9.2 SELECTIVITY OF CHLORIMURON AGAINST WINTER SEASON CROPS AND WEEDS

Samunder Singh. R. K. Malik and Samar Singh
Deptt. of Agronomy, CCS Haryana Agril. Univ., Hisar.

Chlorimuron at 4 to 32 g/ha applied 30 DAS against some important *rabi* season crops and weeds during 1990–91. Raya was highly sensitive to this herbicide resulting into complete mortality even at 4 g/ha followed by tomato, onion and chickpea. Field pea was less affected as compared to other crops. Chlorimuron was very effective against *Polypogon monspeliensis* Deaf., *Asphodelus tenuifolius* Cav. and *Melilotus indica* All. Fl. Ped. causing 70–90% control at lower dose. *Vicia sativa* L., *Phalaris minor Retz.*, *Avena ludoviciana* Dur. and *Lathyrus aphaca* L. were also found sensitive to it causing 30 to 90% mortality. Chlorimuron significantly reduced the dry weight of all weed species.

## 9.3 EVALUATION OF SULFONYL UREA HERBICIDES FOR WEED CONTROL IN TRANSPLANTED RICE

B. N. Mitra and B. C. Ghosh
Indian Instt. of Tecnhology, Kharagpur, West Bengal.

Field experiments were carried out to assess the efficacy of metsulfuron, chlorimuron and tribenuron for weed control in transplanted rice. The phytotoxic effect in terms of leaf drying and stunted seedling growth were maximum in case of

tribenuron applied at 15 g/ha+chlorimuron at 12 g/ha. Metsulfuron at 4 g/ha and chlorimuron at 6 g/ha effectively controlled *Echinochloa colona* and *Cyperus iria*. The combination of metsulfuron at 2 g/ha+chlorimuron at 6 g/ha and metsulfuron 4 g/ha+chlorimuron at 4 g/ha were also effective against above weeds. The dry weight of weeds at harvest were lowest in plots where chlorimuron was applied at 6 g/ha. In 1990–91, the lowest dry weight was, however, recorded in the plots treated with metsulfuron at 4 g/ha. The performance of these herbicides in terms of grain yield did not differ significantly with the weedy check.

## 9.4 EFFECT OF CHLORIMURON AND METSULFURON ON WEED CONTROL IN TRANSPLANTED RICE

Samar Singh, R. K. Malik, Rupa Dhawan and Samunder Singh
Deptt. of Agronomy, CCS Haryana Agril. Univ., Hisar.

Two years field studies were conducted during 1990 and 1991 at H.A.U., Uchani to evaluate the performance of chlorimuron, and metsulfuron against barnyard grass in transplanted rice. Thirteen treatments including metsulfuron at 2, 4 and 8 g/ha, chlorimuron 6, 12 and 24 g/ha, butachlor at 1000 g/ha+metsulfuron at 2 g/ha, butachlor at 1000 g/ha+chlorimuron at 6 g/ha, anilofos at 400 g/ha, butachlor and thiobencarb each at 1500 g/ha, a weedy and a weed free check were compared in a randomised block design. Metsulfuron provided 47 to 57% control of barnyard grass in 1990 and 27 to 45% control in 1991. Chlorimuron at 24 g/ha provided 60% control of barnyard grass. The dry weight of total weeds were significantly lower, in the treated plots as compared to untreated plots. However, the dry weight reductions were more in butachlor, thiobencarb or anilofos treated plots. The paddy yield following the treatment of metsulfuron at 8 g/ha, chlorimuron at 24 g/ha were 6771 & 7060 kg/ha in 1990 and 3956 & 4373 kg/ha in 1991 as compared to 7465 kg/ha in 1990 and 5044 kg/ha in 1991 in plots treated with anilofos at 0.4 kg/ha.

## 9.5 PERFORMANCE of TRIFLURALIN AND CHLORIMURON FOR WEED CONTROL IN SOYBEAN (*GLYCINE MAX*)

R. K. Malik, R. S. Balyan R. S. Dhankar and R. S. Panwar
Deptt. of Agronomy, CCS Haryana Agril. Univ., Hisar.

Field investigation was conducted during *kharif* season of 1990 at Hisar. Trifluralin at 1.5 kg/ha provided effective control (83 to 88%) of broad and narrow leaf weeds. Chlorimuron application at 12 or 24 g/ha proved very effective (73–83%) against broad leaf weeds, particularly *T. portulacastrum* when applied 20 DAS. Chlorimuron application at later stages failed to provide satisfactory control of weeds. Pre-plant application of triuralin at 1.5 kg and post-emergence application

of chlorimuron (20 DAS) at 12 and 24 g/ha proved as effective as pendimethalin 1.5 kg/ha. Trifluralin 1.5 kg, chlorimuron 24 g/ha and pendimethalin 1.5 kg/ha provided seed yield of soybean satistically at par to that of weed free yield. Chlorimuron provided less control of barnyard grass compared to trifluralin or pendimethalin.

## 9.6 EVALUATION OF METSULFURON, CHLORIMURON AND THEIR MIXTURES AGAINST SOME *KHARIF* SEASON WEEDS.

Samunder Singh, R. K. Malik and R. S. Balyan
Deptt. of Agronomy, CCS, Haryana Agril. Univ., Hisar.

Metsulfuron, chlorimuron and their combinations were evaluated during *kharif* season of 1990 and 1991 against *Cyperus iria* L., *Fimbristylis tenera* Roem and Sch., *Echinochloa crus-galli* L., *E. glabrescens* Munro ex Hook f., *Dactyloctenium aegyptium* (L.) P. Beauv. and *Trianthema portulacatrum* L. All the herbicides were applied pre-emergence and were compared with butachlor. Chlorimuron was found to have an edge over metsulfuron in per cent growth reduction and dry weight reduction of above weeds. The control of grassy weeds by these herbicides were lower than the control of *T. Portulacatrum.* Chlorimuron provided better control of *D. aegyptium* than metsulfuron. Butachlor proved more potent against barnyardgrass than metsulfuron and chlorimuron.

## 9.7 CONTROL OF *CIRCIUM ARVENSE* (L.) SCOP WITH CLOPYRALID

R. K. Bhatia and K. S. SANDHU
Deptt. of Agronomy, Punjab Agril. Univ., Ludhiana.

Canada thistle (*Circium arvense*); a perennial weed propagating through rhizomes is found infesting wheat fields in certain areas of Punjab. Efficacy of clopyralid-a new herbicide, was compared with 2, 4-D, isoproturon and dicamba. Clopyralid proved very effective against this weed and caused considerable growth reduction of rhizomes. It did not allow resprouting during the crop season. Efficacy of this herbicide was comparable with isoproturon+dicamba and it was safe to the wheat at 100 to 250 g/ha. 2, 4-D and isoproturon offered temporary control of the weed and resprouting occurred in these treatments during the season.

## 9.8 EFFICACY OF CLOPYRALID APPLIED ALONE AND IN COMBINATION WITH ISOPROTURON ON THE CONTROL OF *CIRCIUM ARVENSE* IN WHEAT

R. S. Panwar, R. S. Balyan, R. K. Malik and S. S. Punia
Deptt. of Agronomy, CCS, Haryana Agril. Univ., Hisar.

A field experiment was conducted during *rabi* seasons of 1989-90 and 1990-91 at Hisar. The experimental field was uniformly infested with *C. arvense* during both the crop seasons. Efficacy of clopyralid applied alone or in mixture with isoproturon was compared with tank mix or formulation of isoproturon and 2, 4-D. Clopyralid alone at 0.125 to 0.325 kg/ha provided 60 to 65% control of this obnoxious weed, however, when it was applied with isoproturon at 0.075+0.75, 0.125+0.75, 0.075+1.0 or 0.125+1.0 kg/ha, respectively, provided significantly better control of this weed over single application and slightly better than isoproturon+fluroxypyr or isoproturon+2, 4-D (T). Combination of isoproturon+clopyralid at 1.0+0.125 kg/ha provided statistically similar yield to that of weed free and significantly better than unweeded control during both the seasons.

## 9.9 CHEMICAL WEED CONTROL IN DIRECT SOWN RICE UNDER PUDDLED CONDITIONS

K. Kenchaiah, K. M. Devaraju, S. Lingaraju., D. M. Gowda and Geethadevi T.
UAS Agril. Complex, Gulbarga, Karnataka

Six pre-emergence herbicides viz., Pretilachlor, pyrazosulfuronethyl, oxadiazon, anilofos, butachlor and 2, 4-D ethyl ester were evaluated along with weed free condition and unweeded check in paddy crop on red sandy loam soil at Regional Research Station, Mandya during Kharif 1990. Among the herbicides tried, Pretilachlor at 0.75 and 1.0 kg/ha, pyrazosulfuronethyl at 0.010 kg/ha, anilofos at 0.6 kg/ha, and butachlor at 1.5 kg/ha. were found effective in controlling weeds and produced grain yield comparable to weed free conditions. Highest grain yield recorded in pretilachlor 1.0 kg/ha. (5099 kg/ha) and lowest in 2, 4-D Na salt sprayed plots (2710 kg/ha). Unweeded check recorded grain yield of 3320 kg/ha.

## 9.10 EFFECT OF ANILOFOS ON RICE NURSERY AND ASSOCIATED WEEDS

Ram Prasad and G. Singh
Deptt. of Agronomy, G. B. Pant Univ. of Agri. and Tech. Pantnagar, U.P.

In rice nursery *Echinochloa* spp., *Caesulia axillaris, Ischaemum rugosum* and *Cyperus* spp. were the major weeds. Anilofos at 0.3 to 0.5 kg/ha was toxic to rice seedlings when applied on 4th day of seedling in puddled condition. Anilofos at 0.3 and 0.4 kg/ha at 7 days after seeding did not affect the rice seedlings and reduded the density and dry weight of weeds as recorded at 25 days stage. Thiobencarb at 1.5 kg/ha applied 5 days of seedling was safe and effective for weed control in rice nursery.

## 9.11 EFFECT OF DIFFERENT FORMULATIONS OF ANILOFOS ON WEED CONTROL IN TRANSPLANTED RICE

Samar Singh, R. K. Malik and L. K. Bishnoi
Deptt. of Agronomy, CCS Haryana Agril. Univ., Hisar.

Two years field studies were conducted during 1990 and 1991 at H. A. U. Regional Research Station, Uchani. Anilofos 30 EC and 50 EC each applied at 0.20 0.30 and 0.40 kg/ha were compared with butachlor at 1.0 and 1.5 kg/ha in 1990 and 1991 with butachlor and two other formulations (Control H 30; Crop Health Ltd. and Sweep; Gujrat Agro industries Ltd.) of anilofos at 0.4 kg/ha. The control of barnyard grass; the most dominant weed, was similar with all formulations of anilofos at 0.4 kg/ha. In first year paddy yield following the treatments of anilofos 30 EC or 50 EC at 0.4 kg/ha were 7986 and 7788 kg/ha, respectively. In 1991, the paddy yield with all four formulation of anilofos including Control H 30 and Sweep at 0.4 kg/ha ranged from 5895 kg/ha to 6044 kg/ha. The paddy yield in the weedy check and weed free plots in 1991 were 4889 kg/ha and 6155 kg/ha., respectivcly.

## 9.12 EFFICACY OF PENDIMETHALIN AND IMAZETHAPYR IN SOYBEAN AND THEIR RESIDUES

Govindra Singh and S. Tiwari
Deptt. of Agronomy, G. B. Pant Univ. of Agric. and Tech., Pantnagar, U.P.

Pendimethalin (0.50, 1.0. 2.0 kg/ha) and imazethapyr (0.05, 0.075, 0.10 kg/ha) alone and in combination with each other with fluchloralin at 1.0 kg/ha and alachlor at 2.5 kg/ha were evaluated for their weed control efficacy in soybean. Pre-emergence application of pendimethalin at 1.0 and 2.0 kg/ha provided effective weed control in comparison to imazethapyr. Weed control efficacy of imazethapyr increased when tank mixed with pendimethalin. Alachlor at 2.0 kg/ha, fluchloralin at 1.0 kg/ha tank mixed with pendimethalin at 0.75 kg/ha produced grain yields at par with weed-free treatment. None of the treatments had any residual effect on the subsequent crop of lentil and also the weeds associated with lentil. Residues of pendimethalin in soil, grain and straw of soybean at harvest were non-detectable.

## 9.13 INFLUENCE OF HALOXYFOP-METHYL AND FLUAZIFOP-P-BUTYL ON WEEDS AND SOYBEAN

J. P. Tiwari, S. P. Kurchania And N. R. Paradkar
Deptt. of Agronomy, JNKVV, Jabalpur, M.P.

Efficacy of haloxyfop-methyl at 0.125, 0.25 and 0.50 kg/ha as post-emergence application at 15 and 28 DAS was evaluated against weeds and soybean and

compared with fluazifop-p-butyl at 0.50 kg/ha applied 21 DAS, one hand weeding, one hoeing and control. Haloxyfop-methyl was phytotoxic to grassy weeds only. Among grassy weeds, *Echinochloa crusgalli* regenerated at lower doses. The hand weeding had 88% weed control efficacy while hoeing and fluazifop-p-butyl exhibited 48 and 57% efficacy. All the herbicidal treatments produced significantly greater crop biomass and yield than the weedy control and at par with hand weeding (2122 kg/ha). The significantly higher yield was noted under haloxyfop-methyl at 0.50 kg/ha applied 21 DAS (2288 kg/ha), compared to 0.25 kg/ha applied 15 DAS and 0.125 kg/ha applied at 21 DAS. All the herbicidal treatments were at par except haloxyfop-methyl 0.50 kg/ha at 21 DAS.

## 9.14 STUDIES ON THE EFFICACY OF IMAZETHAPYR IN CONTROLLING WEEDS IN SOYBEAN-WHEAT+PEAS CROPPING SYSTEM

N. N. Angiras, C. M. Singh and M. C. Rana
Deptt. of Agronomy, H. P. K. V. V. Palampur, H.P.

A field experiment was initiated in acidic soils at palampur during *Kharif* 1990 and *Rabi* 1990-91 to evaluate the efficacy of imazethapyr at 4 doses (50, 100, 150 and 200 g/ha) and 3 times of application (pre-plant incorporation, pre-emergence and early post-emergence) for weed control in soybean and its subsequent effect on succeeding crop of wheat + pea. Significantly lowest weed dry weight recorded with pre-and early post-emergence applications of imazethapyr which were statistically at par with two hand weedings. Application of imazethapyr at 50, 100, 150 and 200 g/ha increased the grain yield by 127, 212, 258 and 301% respectively, over the unweeded check.

In study the residual effect of imazethapyr applied in soybean, already treated plots were sown with wheat and pea in inter-cropping system. The treatments of unweeded check, hand weeding and isoproturon at 1.6 kg/ha were super imposed. No phytotoxic effect was observed on the emergence of wheat and pea seedlings. The visual observations on residual effect on control of weeds indicated that plots treated with imazethapyr 200 g applied pre-emergence or early post-emergence showed less weed emergence as compared to the untreated check.

## 9.15 WEED CONTROL STUDY IN GROUNDNUT WITH METOLACHLOR

Damodar Singh, Ranjan Ashutosh Sharan and P. Singh
Nalanda College, Bihar Sarif, Nalanda.

Field experiments were carrid out at Agricultural farm, Giriak (Nalanda) in rainy season of 1989. Three treatments including metolachlor at 2 kg/ha,

fluchloralin 2 kg/ha and 2,4-DES at 2 kg/ha were evaluated. The dominant weed species in the experimental field were : *Amischophacelus axillaris* (Linn.) Rolla Rao; *Bulbostylis barbata* (Rottb.) Kunth; *Chloris virgata* WS; *Commelina diffusa* Burm.; *Cynodon dactylon* (Linn.) Pers; *Cyperus rotundus* Linn; *C. tuberosus* Rottb; and *Digitaria ciliaris* (Retz.). Metolachlor at 2 kg/ha was found quite suitable for weed elimination and it promoted the crop stand by 100% as compared to the weedy plots. Metolachlor applied post-emergence at 4 kg/ha provided better control of weeds as compared to 2, 4-DES or fluchloralin.

## 9.16 EFFICACY OF CERTAIN HERBICIDES FOR CONTROL OF TIGER GRASS (*SACCHARUM SPONTANEUM* L.)

G. C. Trivedi, P. H. Patel and H. M. Mehta
Deptt. of Agronomy, Gujarat Agril. Univ., Anand.

Field experiment was conducted during *rabi* season to study the effect of certain herbicides on control of tiger grass. The treatment comprised were fenoxapropethyl 1.94%, cyclocydim 1.67% and tank mixture of glyphosate 0.5%+atrazine 1.67% In case of glyphosate, 0.5% ammonium sulphate was mixed with spray solution. The experiment was continued for 230 days after planting. The results indicated that both glyphosate and fenoxapropethyl had significantly reduced plant height, newly emerged shoots and increased number of affected leaves. Glyphosate 1.5% and 2.25% increased phytotoxic effect on the plant growth as revealed by dry leaves. Glyphosate at 2.25% effectively discouraged new shoot growth and upto 110 days after spraying on shoots emerged as comparedto control (11.6 shoots/plant).

## 9.17 SENSITIVITY OF *ASPHODELUS TENUIFOLIUS* CAV. AND *EUPHORBIA DRACUNCULOIDES* LAMK TO DIFFERENT HERBICIDES

Samunder Singh, R. K. Malik and Attar Singh
Deptt. of Agronomy, CCS Haryana Agril. Univ., Hisar.

Naproanilide, clopyralid, bentazon and isoproturon were evaluated against *Asphodelus tenuifolius* Cav. and *Enphorbia dracunculoides* Lamk during *robi* 1991-92 in the screen house. All the herbicides were applied post-emergence at 2-3 leaf stage of *Asphodelus* and 3-4 pair of leaf of *Euphorbia*. *Asphodelus* was highly sensitive to bentazon resulting into complete mortality at 0.50 kg/ha. Bentazon at 0.25 kg/ha was more effective than naproanilide at 4.0 kg, and clopyralid at 0.50 kg/ha. Isoproturon was found very effective against *Euphorbia*, causing its complete mortality. Bentazon at 4.0 kg, clopyralid at 0.50 kg and naproanilide at 4.0 kg/ha provided 60, 57 and 37% control, respectively.

## 9.18 EFFECT OF OXYFLUORFEN ON OKRA AND ASSOCIATED WEEDS

M. S. Saimbhi, K. S. Sandhu, Daljit Singh, K. S. Kooner and N. P. S. Dhillon
Deptt. of Vegetable Crops, Landscaping and Floriculture, Punjab. Agril. Univ., Ludhiana.

Field experiments were carried out to study the performance of herbicides for weed control in okra at Vegetable Research Station, Jalandhar in 1990 and Department of Vegetable Crops, Ludhiana in 1991 during rainy season. At both the places, pre-emergence application of pendimethalin at 0.75 kg/ha, and 0.56 kg/ka+one weeding, oxyflurofen 0.15 kg/ha and 0.1 kg/ha+one weeding and fluchloralin at 1.2 kg/ha and 0.8 kg/ha+one weeding 35 days after seed sowing gave very good weed control, reduced dry matter of weeds and produced pod yield on par with hand weeded check.

## 9.19 PERFORMANCE OF HERBICIDES IN CAULIFLOWER (*BRASSICA OLERACEA* VAR. *BOTRYTIS* L.)

M. S. Saimbhi, K. S. Sandhu, Daljit Singh, K. S. Kooner and J. S. Dhiman
Deptt. of Veg. Crops, Landscaping and Floriculture, Punjab. Agril. Univ., Ludhiana.

Field trials were carried out in the department of Vegetable Crops. Landscaping and Floriculture, Punjab Agricultural University, Ludhiana for 2 years during 1990 and 1991 to study the performance of new herbicides for weed control in cauliflower (*Brassica oleracea* var. *botrytis* L.). The pre-plant application of pendimethalin at 0.75 kg/ha and 0.56 kg/ha+one weeding or oxyfluorfen at 0.15 kg/ha and 0.10 kg /ha+one weeding 45 days after transplanting gave very good weed control, reduced weed dry matrer accumulation and produced curd yield on a par with hand weeded control. These treatments also resulted in marked reduction in the incidence of *Alternaria* blight.

## 9.20 BIO-EFFICACY OF SOME PROMISING HERBICIDES FOR WEED CONTROL IN TRANSPLANTED RICE

S. Murali Krishnasamy, G. Srinivasan and N. Kempuchetty
T.N.G.D. Naidu Agril. Univ., Coimbatore.

Field experiments were conducted at Coimbatore during monsoon and summer seasons of 1985-86 to evaluate the bio-efficacy of pretilachlor (1.0 kg/ha), piperophos (1.0 kg/ha), anilofos (0.4 kg/ha) and fluroxypyr (0.8 kg/ha). These herbicides were compared with thiobencarb at 1.5 kg/ha and hand weeding twice.

Among the herbicides, anilofos at 0.4 kg/ha of and thiobencarb at 1.5 kg/ha were most promising. Pertilachlor and piperphos each at 1.0 kg/ha resulted in

moderate weed control. Performance of fluroxypyr at 0.8 kg/ha was not satisfactory. Analysis of florisitic composition revealed that thiobencarb and piperphos were effective against grasses while sedges were better controlled by anilofos and piperophos. Fluroxypyr recorded the lowest dicot weeds. Considering each treatment as an independent weed complex, the similarity coefficient values worked out also revealed altered floristic composition in herbicide treated plots.

## 9.21 TRALKOXYDIM–A NEW POST-EMERGENGE HERBICIDE FOR THE CONTROL OF *AVENA SPP* AND *PHALARIS MINOR* IN WHEAT

R. E. Dhanaraj
ICI India Limited, 149 Montieth Road, Egmore, Madras

Tralkoxydim, is a post–emergence herbicide which selectively controls *Avena* and *Phalaris* and few other weeds in wheat and barley. Tralkoxydim has low mammalian toxicity and is not environmentally persistent.

In India, tralkoxydim has been actively evaluated in wheat by scientists in Punjab, Haryana and Uttar Pradesh. Tralkoxydim at 0.3 to 0.4 kg ai/ha as foliar spray at 25 to 30 days after sowing effectively controlled *Avena* and *Phalaris*. The scope of tralkoxydim and suggestions for future line of field research in India have also been projected in this paper.

## 9.22 EFFICACY OF FLUAZIPOP-P-BUTYL (FUSTLADE) ON WEED CONTROL AND YIELD IN RAINFED GROUNDNUT (VAR. JL 24)

T. Senthivel and P. Parameswaran
T. N. G. D. Naidu Agril. Univ. Tindivanam.

A study to test the efficacy of the herbicide fluazipop-p–butyl on the control of weeds in rainfed groundnut, an investigation was carried out at Tindivanam during the rainfed seasons of 1988 and 1989. The study consisted of eight treatments including two levels of fluazipop-p–butyl (0.125 kg and 0.250 kg/ha), fluchloralin (1.00 kg/ha), farmers practice (2 HW on 20 and 45 DAS), weed free check and unweeded check. Study has revealed that application of fluazifop-p–butyl at 0.25 kg/ha as post-emergence spray at 15 DAS followed by one hand weeding on 45 DAS has effected good control on *Cyanodon dactylon* and annual grasses with 81% weed control efficiency and 39 weed index. Fluchloralin controlled broad leaved weeds viz., *Trianthema portulocastrum*, L., and *Cleome viscosa* effectively.

## 9.23 FLUAZIFOP-BUTYL FOR CONTROL OF GRASS WEEDS IN OIL SEED CROPS

R. E. Dhanaraj
ICI India Limited, 149 Montieth Road, Egmore, Madras.

Fluazifop-p-butyl is a post-emergence graminicide to control selective grass weed in several broad leaved crops. In India fluazifop-p-butyl has been extensively evaluated under various Agro-climatic conditions in groundnut, sunflower, soybean, cotton, pulses etc. The effective rate of fluazifop-p-butyl in these crops is from 0.125 kg to 0.25 kg a.i./ha. Its prospects in major oilseed crops, pulses and plantation crops are projected.

## 9.24 MICROHERBICIDES

K. Seetharaman, K. Sivaprakasam and Savitha Doraisamy
Deptt. of Plant Pathology, Agril. College and Res. Inst., Madurai.

Biocontrol of weeds has certain advantages over chemical herbicides. A rust fungus *Puccinia chondrillina* Bubak and Syd against skeleton weed *Chondrilla juncea* L.-a serious weed on wheat in U.S.A.; *Cercospora rodmanii* against water hyacinth in Florida along with two other fungi-viz., *Cephalosporium zonatum* and *Rhizoctonia solani*; the autoecious black berry rust fungus *Phragmidium violaceum* (Schultz) Winter, against black barries a serious weed in pastures in chile; *Cercospora agerutinae nomen nudem* against pamakani weed (*Ageratina riparia-Eupatorium riparia*) in pastures in Hawaii; *Colletotrichum glocosporoides* against winged water prim rose (*Jussiaea decurrens*) in rice; *Phytophthora citrophthora* against strangler vine (Morrenia odorata Lindl) in citrus groves, and *Puccinia lantanae* against rush skeleton weed lantana (*Lantana camara* L.) etc. are successful in the bio-control of weeds.

## 9.25 EFFECT OF NEW HERBICIDES IN LOW LAND RICE

S. Murali Krishnasamy, P. Pothiraj, S. P. Palaniappan and C. Ramaswami
Tamil Naidu G. D. Naiud Agril. Univ., Coimbatore.

Pre-emergence application of anilofos at 0.4 kg/ha and piperophos at 1.0 kg/ha at 4th day after transplanting were effective in controlling *Echinochloa crusgalli* and other rice weeds. Fluoroxypyr at 0.8 kg/ha was found to control broad leaved and aquatic weeds effectively. Highest grain yield of 5808 kg/ha and 7034 kg/ha was recorded in piperophos at 1.0 kg/ha and anilofos at 0.4 kg/ha treated plots in *kharif* and summer respectively.

## 9.26 CINMETHYLIN (ARGOLD 10 EC)–LOW DOSE HIGH EFFICIENCY HERBICIDE FOR WEED CONTROL

S. K. Mukhopadhyay, Jhangir Alam and Kiriti Benerjee
Weed Science Laboratory, Instt. of Agric., Visva Bharati Univ., Sriniketan, West Bengal.

Four field experiments were conducted at West Bengal during the *kharif* (Warm-wet) 1988, *kharif* 1989, *Boro* 1989–90 (*Rabi* Pre *kharif*) and *kharif* 1990 with a new herbicide Cinmethylin used in the form of Argold–10 EC of Shell International Supplied by NOCIL India. The herbicide belongs to the group of cineoles with chemical name exo–1–methyl–4–(1–methyl–ethyl)–2–(2–methyl phenyl methoxy)–7–oxabicylo (2–2–1) heptane.

Major weed flora in the *kharif* seasons consisted of *Echinochloa colona* (L.) Link., *Digitaria sanguinalis* (L.) Scop., *Sphenoclea zeylanica* Gaertn., *Hydrolea zeylanica* (L.) Vohl., *Ludwigia parviflora* Rozb and *Cyperus iria* L. and *Fimbristylis miliacea* (L.) Vahl., While in *Boro* Season, the major weed species were *Echinochloa colona* (L.) Link, *Ludwigia parviflora* Rozb, *Marsilea quadrifolia* L., *Fimbristylis miliacea* (L.) Vahl., and *Scirpus* sp.

The herbicide cinmethylin was used from the dose ranges of 40 g to 160 g/ha along with standard rice herbicide, butachlor at 1250 g to 1500 g a.i./ha.

Pre–emergence application of new herbicide cinmethylin applied 7 days after transplanting showed significantly same effectiveness at a low dose of 40 to 80 g/ha as butachlor at 1250 to 1500 g/ha applied at 2–3 days after transplanting in terms of weed control and increasc in yield of grain of rice crop.

There was no injury to rice crop by the application of cinmethylin upto 80 g/ha while the higher doses of 100 g and 160 g/ha showed injury of 20–25% to the rice crop.

## 9.27 EFFECT OF GLYPHOSATE ON WEED CONTROL IN GUAVA CV. L–49

D. S. Kalyan and B. S. Daulta
College of Agril., Kaul, Kaithal, Haryana.

Weed control studies carried out during first week of July on 7 year old L–49 cv. of guava with simazine, diuron (each at 2, 3 and 4 kg/ha applied pre–emergence and glyphosate (1, 2 and 3 kg/ha applied post–emergence) revealed that all herbicides and commercial manual weeding reduced the weed population significantly over control, however, diuron and simazine 4 kg/ha were found superior in reducing the weed count and increasing the guava yield. Increased fruit weight and reduced ascorbic acid content was observed in all the treatments over control, whereas, fruit length, breadth, T.S.S. and acidity remained unaffected.