

**Proceedings of  
Annual Group Meeting  
All India Coordinated Research Project on Weed Control  
26-27 April, 2013  
Venue: Chaudhary Sarwan Kumar Himachal Pradesh Krishi Vishvavidyalaya  
Palampur 176 062 (Himachal Pradesh)**

**26 April, 2013**

**INAUGURAL SESSION**

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Dr. S.K. Sharma, Vice Chancellor, CSKHPKV, Palampur inaugurated the Annual Group Meeting of AICRP-Weed Control. While addressing the participants, Dr. Sharma mentioned that both crops and weeds are evolving subject to climate change. Nearly 560 crops are being grown in India for economic gains, out of which, about half are exotic. Many obnoxious weeds came to India through import of foodgrains. During export of foodgrains also, care needs to be taken to maintain weed-free consignments. He emphasized on making stringent quarantine laws in the country to check the spread of weeds. Appreciating the good work being done by weed control group, he opined that AICRPs should have some element of basic science research at least at some Centres where good facilities exist.

Dr. S.P. Sharma, Director of Research, CSK-HPKVV informed that problem of insect-pests including weeds is increasing as a result of high-input intensive agriculture being practiced to meet the growing food demand. Weed management could be the best option to increase food production. He remarked that imbalanced use of inputs is causing shift in weed flora. He highlighted the importance of quarantine to avert the threat of invasive weeds due to globalization. Agriculturally active population is on the decrease, requiring use of herbicides and machines in agriculture, he added.

Dr. P.K. Sharma, Dean, College of Agriculture, CSK-HPKVV stated that weeds cannot be eradicated but managed. With globalization and free trade, movement of weeds is also happening. Climatic changes are also responsible for shift in weed spectrum. He emphasized on developing eco-friendly weed management techniques and weed utilization for economic purposes.

Dr. J.S. Chauhan, Director, DRMR, Bharatpur informed about the magnitude of *Orobanche* infestation in mustard in states like Rajasthan, Haryana, Gujarat and Madhya Pradesh. He emphasized to study the biology and ecology besides management of *Orobanche*.

Dr. A.R. Sharma, Director, DWSR remarked that weed management technology is the fastest adopted technology on farmer's fields. He submitted that quality output is not coming from the AICRP on Weed Control. DG (ICAR) has often expressed his concern about the poor performance of AICRPs and their relevance in the present context. Dr. Sharma stressed on weed management for conservation agriculture systems for sustainable food production. Later, he made a detailed presentation on the salient research achievements and activities undertaken at different centres during 2012-13. He also presented the QRT recommendations approved by the ICAR, and asked for effective implantation of the general as well as specific recommendations for each centre. Publication record of better performing centres in the last 5 years was highlighted, while others are asked to improve their performance.

During the inaugural function, the following publications were released:

- Technical Bulletins on “*Dhan, Gehun evam Makka ke pramukh kharpatwar evam unka niyantran*” by S. K. Gautam and S.S. Rana of CSHKPKV, Palampur.
- “*Kharpatwar Niyanttran*” by R.R. Upasani of BAU, Ranchi.

- “Sustainable weed management options” and “Major Weeds of Tamil Nadu” by C. Chinnusamy *et al.* of TNAU, Coimbatore.

Dr. N.N. Angiras, former Head, Agronomy and PI, AICRP-WC at CSKHPKV, Palampur was felicitated for his valuable contributions in weed management.

Dr. D. Badiyala, PI, CSKHPKVV Centre proposed vote of thanks.

## **TECHNICAL SESSION – I**

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### **Presentation of salient findings by Principal Investigators of AICRP-WC Centres in North Zone**

- Chairman** : Dr. N.N. Angiras, Former Professor & Head, Agronomy, CSKHPKV, Palampur  
**Co-Chairman** : Dr. A.R. Sharma, Director, DWSR, Jabalpur  
**Rapporteurs** : Dr. V.P. Singh, DWSR, Jabalpur  
 Dr. C. Chinnusamy, TNAU, Coimbatore

Action Taken Report on the recommendations of the Biennial Workshop held at KAU, Thrissur during 17-18 April, 2012 was presented by Dr. R.P. Dubey, Incharge, AICRP on Weed Control.

Some salient points of the ATR were:

1. Weeds of major cropping systems have been identified by most of the Centres.
2. Some centres did not report GPS data under weed survey due to non-availability/non-working of GPS instrument. It was decided to provide GPS to such Centres from HQ.
3. Comprehensive and conclusive data on long-term trials are still required from many Centres.
4. Centres having GC/GLC facility are now not reporting data from bioassay studies.
5. Most of the Centres are taking steps to fill the vacant staff positions.
6. Publication record of most of the centres is not up to the mark.
7. Herbicide testing is mostly done as per the university authorities' directives and not as per ICAR guidelines.
8. Annual Reports from the centres need further improvement in light of the guidelines circulated from the HQ.
9. Only 9 Centres submitted the Annual Report on time, 5 Centres submitted with 15 days delay, while 8 Centres submitted the reports later than 15 days.
10. Most Centres did not submit the ATR as required from the HQ.

Dr. V.P. Singh, Nodal Officer for North Zone presented an overview of research highlights, constraints and suggestions etc.

### **Comments**

#### **CCSHAU, Hisar**

- Weed biology and physiology in respect of *Orobanche* under WS-2 was not reported properly and even same study in respect to *Cyperus rotundus* was also not conducted.
- Approved research experiments (WS-5.1 to 5.6) related to herbicide residues and environmental quality under WS-5 was not initiated due to lack of laboratory facilities.
- The quality of slides and presentation was very good.

- Centre has not followed the proper numbering system in the Annual Report, allotted to different network programmes as per the protocol supplied from the HQ.
- Centre has published 9 research papers, 3 popular articles, and 16 research papers were presented in seminars/ symposia.
- The post of Lab-Attendant is vacant.

#### **NDUAT, Faizabad**

- Weed biology and physiology in respect of weedy rice and *Phalaris minor* under WS-2 was not conducted.
- Weed management in turmeric under WS-3 was not reported, and during discussion it was informed that the experiment is in progress.
- Biological control of water hyacinth was not initiated.
- Quality of presentation and slides were not good and there were lot of mistakes in the data.
- Centre has published 3 research papers, 3 popular articles, and 9 research papers were presented in seminars/ symposia.
- Centre has conducted 7 trainings and awareness campaign and delivered 6 radio talks.
- Posts of Jr. Agronomist (from 31.08.2012) and Steno-cum-Clerk (from 30.06.2012) are vacant.

#### **PAU, Ludhiana**

- Weed biology and physiology in respect of *Cyperus rotundus* was not conducted.
- The quality of slides and presentation was very good.
- B:C ratio in most cases was reported as <1.0 which may be rechecked..
- Centre has published 7 research papers, 3 popular articles, 2 monographs and 13 research papers were presented in seminars/ symposia.

#### **CSKHPKV, Palampur**

- Weed biology and physiology in respect of *Phalaris minor* and physiological studies in long-term trial in tillage and herbicides under WS-2 was not conducted.
- Newly formulated project on weed management in conservation agriculture system under WS-3.6 in non-rice based cropping system was not initiated. However, findings of some other experiment were reported under the same head.
- Quality of slides and presentation was very good.
- Centre has published 9 research articles, and 13 research papers were presented in seminars/ symposia.

#### **GBPUAT, Pantnagar**

- Weed biology and physiology in respect of *Cyperus rotundus* was not conducted.
- It was informed that the long-term trial on tillage in different cropping systems has already been conducted for five years.
- Biological control of *Parthenium* by means of *Cassia tora* was not conducted
- Quality of slides and presentation was very good.
- Yield of wheat was low (<4 t/ha). Experimental crop should be managed well to achieve the potential yield in the best treatment.
- Centre has published 12 research papers, 13 popular articles, and one bulletin.
- Thirty research papers were presented in seminars and symposia, and also delivered 12 radio talks.
- One member of the team i.e., Dr Rohitashav Singh was awarded ISWS Fellow.
- Post of Driver is vacant.

#### **Dr. M.S. Bhullar, Principal Investigator, presented the salient findings of PAU, Ludhiana Centre:**

- Intensity of *Phalaris minor* was found increasing in wheat. *Poa annua* was likely to be dominant weed in wheat, berseem and oats; *Ipomoea* in berseem; weedy rice in transplanted rice, and

*Dactyloctenium*, *Leptochloa* and *Eragrostis* in direct-seeded rice. *Phalaris minor* showed signs of cross resistance to pinoxaden, sulfosulfuron, mesosulfuron + iodosulfuron and clodinafop.

- Promising herbicides alone or their combinations were evaluated. In transplanted rice, pyrazosulfuron @ 20 g/ha *fb* tank-mix application of bispyribac @ 25 g + ethoxysulfuron @ 18.5 g/ha; in turmeric, pendimethalin @ 1000 g/ha, metribuzin @ 400 g/ha, atrazine @ 750 g/ha *fb* paddy straw mulch @ 10 t/ha *fb* one hoeing; in greengram, imazethapyr @ 70 g/ha + @ pendimethalin 800 g/ha; and in wheat, sequential or tank-mix application of pinoxaden @ 50 g/ha with metsulfuron 5 g/ha or 2,4-D @ 500 g/ha or carfentrazone @ 20 g/ha for *P. minor* and broadleaved weeds were found suitable for weed control.
- Continuous use of butachlor @ 1500 g and pretilachlor @ 750 g/ha to rice for 17 and 15 years did not leave any residue in soil, grain and straw. At farmers' field, butachlor and pretilachlor did not move into water, and were below detectable limits in soil and rice.
- Weed management technologies for wheat with fenoxaprop + metribuzin @ 500 g/ha and tembotrione @ 110 g/ha for maize were demonstrated on farmers' fields.

**Dr. V.P. Singh, Principal Investigator, presented the salient findings of GBPUAT, Pantanagar Centre:**

- No case of herbicide resistance in weeds was observed through surveillance programme. Isoproturon resistant *P. minor* was completely controlled by clodinafop under normal and delayed sowing. Maximum mortality of *C. rotundus* was observed with glyphosate @ 1.5 kg/ha with no quantitative advantage with jaggery.
- Weed management technologies involving combination of pretilachlor @ 750 g + chlorimuron-ethyl or metsulfuron-methyl @ 4 g/ha for transplanted rice, and PE application of pendimethalin @ 1000 g/ha *fb* PoE bispyribac-sodium @ 25 g/ha + HW for direct-seeded rice were found effective.
- Integrated weed management from long-term trial in rice-wheat cropping system revealed that PE butachlor @ 1.5 kg *fb* PoE 2,4-D @ 0.5 kg/ha + *Sesbania* for rice, and PE isoproturon @ 1.0 kg/ha + one HW at 45 DAS for wheat were effective technologies. For ratoon sugarcane, PE application of metribuzin @ 0.88 kg/ha at 3 days after ratooning (DAR) *fb* hoeing at 45 DAR *fb* PoE application of 2,4-D (amine salt) @ 0.75 kg/ha was found effective.
- In long-term herbicide trials as well as in farmers' fields, herbicide residues were non-detectable in soil, straw and grain of rice, wheat, and sugarcane crops. Oryzalin was not-detected in leachates and its adsorption increased with concentration.
- On-farm research trials on weed management revealed that yields of rice, wheat and soybean were higher with recommended weed management techniques over farmers' practice. In hilly areas, 33% farmers managed weeds by manual weeding, while 67% farmers adopted combination of manual and chemical methods.

**Dr. Dinesh Badiyala, Principal Investigator, presented the salient findings of CSKHPKV, Palampur Centre:**

- Dominance of *Ageratum conyzoides*, *Commelina benghalensis* and *Brachiaria ramosa* increased in Kangra district. *Parthenium hysterophorus* also started invading the upland *kharif* crops in the mid-hill conditions of Himachal Pradesh. Herbicide resistant weeds / escapes were not noticed so far. Resistance to isoproturon was also not noticed on *Phalaris minor*, and all the weeds were effectively controlled with isoproturon and 2,4-D Na salt.

- Pendimethalin @ 1000 g at 0-2 DAS *fb* bispyribac-sodium @ 25 g at 20 DAS *fb* manual weeding at 45 DAS in rice; clodinafop + metribuzin (60 + 122.5 g/ha) in wheat; metribuzin @ 0.7 kg/ha *fb* straw mulch @ 10 t/ha *fb* 1 hand weeding in turmeric; and imazethapyr + pendimethalin (pre-mix) @ 1000 g/ha (pre-emergence) in blackgram were the promising weed management technologies. Irrespective of continuous or rotational use of herbicides in rice or wheat, use of 75% N through fertilizer and 25% N through *Lantana* in rice resulted in better productivity.
- In transplanted rice-wheat sequence, non-detectable levels of butachlor and isoproturon residues; and pendimethalin in pea were recorded. Herbicide butachlor was not found in water samples collected near crop fields.

**Dr. Jaidev Sharma, Principal Investigator, presented the salient findings of NDUAT, Faizabad Centre:**

- New weeds *Polypogon monspiliensis* and *Poa annua*, *Rumex* spp. and *Medicago denticulata* in wheat and weedy rice were found in lowlying rice growing areas.
- Bispyribac-Na + Almix (25 g + 4 g/ha) was found very effective in rice.
- *Phalaris minor* did not show any resistance against isoproturon @ 1000 g/ha.
- Metribuzin @ 700 g/ha *fb* straw mulch *fb* 1 HW recorded significantly higher rhizome yield of turmeric.
- *Neochetina* weevil released on water hyacinth was found very effective and damaged the leaves at 90 days after release.
- Increase in the yield in FLD due to weed management was observed in the range of 9.6-24.4% and additional returns were Rs. 4840-9812 per ha in different crops.

**Dr. S.S. Punia, Principal Investigator, presented the salient findings of CCSHAU, Hisar Centre:**

- In *kharif* rice, wild rice was not observed in any of the district in state. Many grassy weeds like *Leptochloa chinensis*, *Eragrostis* spp. and *Dactyloctenium* were not being controlled by any of the herbicides used. Sporadic infestation of *Cuscuta* was observed in berseem. *Avena ludovicovina* has become a serious weed of wheat in Southern Haryana. Infestation of *Orobanche* spp. was also observed in tomato in Haryana.
- Pretilachlor *fb* ethoxysulfuron or bispyribac was found to be the best treatment for controlling of complex weed flora in transplanted rice. In moongbean, early post-emergence application of imazethapyr @ 50 g/ha and imazethapyr + imazamox (RM) @ 60 g/ha was found very effective without any residual toxicity to succeeding mustard.
- Pre-emergence application of atrazine (1.0 kg/ha) *fb* ethoxysulfuron @ 37.5 g/ha or 2,4-D were found promising to control weeds in sugarcane. Ready mixture of sulfosulfuron + metsulfuron @ 32 g/ha, meso + iodosulfuron @ 14.4 g/ha and pinoxaden @ 50 g/ha were found effective to control of clodinafop-resistant biotypes of *P. minor*. Pre-emergence use of pendimethalin, metribuzin or atrazine *fb* straw mulch @ 10 t/ha *fb* one hand weeding at 50 DAS was best for weed management in turmeric.
- For the control of *Orobanche* in mustard, post-emergence application of glyphosate @ 25 g/ha at 30 DAS followed by its sequential use @ 50 g/ha at 55 DAS provided 79% control without any phytotoxicity to mustard with yield increase of 7-17% in on-farm trails. Post-emergence use of tembotrione @ 100 g/ha along with surfactant provided good control of *Eleusine indica*, *Cyperus rotundus* and *Commelina benghalensis*.

**Presentation of salient findings by Principal Investigators of AICRP-WC Centres in South Zone**

- Chairman** : Dr. N.N. Angiras, Former Professor & Head, Agronomy, CSKHPKV, Palampur  
**Co-Chairman** : Dr. A.R. Sharma, Director, DWSR, Jabalpur  
**Rapporteurs** : Dr. Sushilkumar, DWSR, Jabalpur  
 Dr. S.S. Punia, CCSHAU, Hisar

Dr. Sushilkumar, Nodal Officer for South Zone presented an overview of research highlights, constraints and suggestions etc.

**Specific observations**

Most of the centers in the south zone conducted all the assigned experiments except a few by one or two centers due to either non-infestation of the weed or non-availability of the chemical standards and facilities. In brief, following centers did not conduct the experiments assigned to them:

Approved experiments	Allotted centers	Not conducted
WS 1: Weed surveillance WS 1.2: Monitoring of herbicide resistance / escapes in weeds of the dominant cropping system	ANGRAU, Hyderabad TNAU, Coimbatore UAS, Dharwad UAS, Bengaluru, KAU, Thrissur	UAS (D)
Ws 2: Biology of important weeds 1. <i>Aristolochia bracteata</i>	UAS(B), UAS(D)	UAS (D) UAS (D)
WS 3: Weed management in crops and cropping systems (1) Non-rice based cropping systems Pearl millet–chickpea / mustard	UAS (D)	UAS (D)
WS 4: Management of problematic / invasive / parasitic / aquatic weeds 4.1b. Management of <i>Cuscuta</i> . Crop: Lucerne, Crop: Onion	ANGRAU UAS(B),UAS(D)	ANGRAU - not done due to harsh conditions UAS(D); Not done due to harsh condition
WS 4.2 Biological weed management WS 4.2b: Biological control of <i>Parthenium</i> by competitive replacement through <i>Cassia tora</i> ANGRU cleared two ponds by this approach but did not take observations on population of the bioagent as per technical programme	All centers of South Zone	KAU & ANGRAU did but presented only casual observation
WS 5.0 : Herbicide residues and environmental quality WS 5.3: Characterization of leaching behaviour of herbicide in soil	ANGRAU, TNAU, UAS(B), KAU TNAU	KAU: Not done due to non-availability of standard
WS 5.5. Studies on secondary metabolites of herbicides	TNAU, KAU	KAU: Not done due to lack of facility

On-Farm trails and FLDs were done by all the centers of south zone ranging from 3-8 in number. The publication of original research article was poor by ANGRAU (1), and excellent by TNAU centre (12). Maximum number of trainings, awareness campaign and radio talks were conducted and given by ANGRAU. The maximum number of papers in conferences/symposium etc. were presented by Coimbatore (56), followed by UAS-B (24), KAU (12), ANGRU (7) and UAS-D (3). Coimbatore center also contributed 13 book chapters.

**Dr. C. Chinnusamy, Principal Investigator, presented the salient findings of TNAU, Coimbatore Centre:**

- Weed surveillance in western agro-climatic zone of Tamil Nadu revealed the dominance of *Parthenium hysterophorus* in cropped and non-cropped area, replacing *Tridax procumbens*.
- For the management of weeds in maize and sunflower, conventional tillage with one disc ploughing + two harrowing with PE atrazine @ 0.5 kg/ha and PE application of pendimethalin @ 1.0 kg/ha + HW at 45 DAS was found best treatment, respectively.
- In System of Rice Intensification, for weed control PE pyrazosulfuron-ethyl @ 30 g/ha at 3 DAT + weeding with finger type double-row rotary weeder at 40 DAT was recommended.
- In groundnut, PE oxyfluorfen @ 250 /ha followed by POE imazethapyr @ 100 g/ha + quizalofop-ethyl @ 50 g/ha at 15 DAS were found best for broad-spectrum weed control.
- For control of broad-spectrum weeds in onion, application of PE oxyfluorfen @ 250 g/ha at 3 DAS *fb* weeding by wheel hoe at 45 DAS was demonstrated through OFTs and FLDs.
- For the management of *Striga* in sugarcane, integration of PE atrazine @ 1.0 kg/ha at 3 DAP + HW at 45 DAP + earthing-up at 60 DAP + POE 2,4-D Na salt 5 g/l + urea 20 g/l on 90 DAP *fb* trash mulching @ 5 t/ha on 120 DAP was found best treatment.
- To control *Orobanche* in tobacco, plant hole application of neem cake @ 200 kg/ha at 30 DAT or imazethapyr @ 30 g/ha on 55 DAT was recommended.
- Continuous application of butachlor + 2,4-DEE or rotational application of butachlor + 2,4-DEE during *kharif*, and pretilachlor + 2,4-DEE during *rabi* did not show build-up of residue in the post-harvest soil, grain and straw of rice.
- Glyphosate + 2% jiggery was found more effective than glyphosate alone.
- Plant-hole application of neem cake + imazethaypr in tobacco was effective for *Orobanche* management.

**Remarks:** Chairman of the session showed his concern on the increasing density of *Parthenium* in the crop area. He pointed out that herbicides are safer than other pesticides in context to non-build up of residues in grain and straw.

**Dr. R. Devendra, Principal Investigator, presented the salient findings of UAS, Bengaluru Centre:**

- In Karnataka, new weed species viz. *Tithonia diversifolia* (giant Mexican sunflower (Asteraceae) – Native of Eastern Mexico and Central America, *Mikania micrantha* and *Ipomoea triloba* were reported.
- First time, a new quarantine weed, *Ambrosia psilostachya* was reported from Tureevakare taluk of Tumkur district of Karnataka, which led to fodder scarcity. The need was felt to eradicate the weed at war footing before it spread to other areas. *Ambrosia* resembled *Parthenium* in early stages but had different leaf size.
- Study revealed that *Cyperus rotundus* can tolerate high temperature up to 58<sup>0</sup>C. Tubers placed at different depths were found viable. Tubers were found as major biomass accumulator.
- To manage weeds in transplanted rice, pretilachlor *fb* ethoxysulfuron, and pretilachlor *fb* by Almix were the best treatments.

- To manage weeds in direct-seeded rice, pendimethalin *fb* bispyribac-Na (1000 and 25 g/ha) was found the best treatment.
- In maize-sunflower long-term trial, CT-CT tillage plots and plots of CT-ZT tillage recorded more weeds than ZT-ZT and ZT-CT plots. Zero tillage recorded lower density of weeds especially with butachlor and two hand weedings.
- Growing of rice (transplanted or direct-seeded) under conventional tillage along with herbicide (pyrazosulfuron-ethyl @ 20 g/ha at 3 DAS) alone or with mechanical weeding had significantly lower weed emergence and consequently had higher yields than zero tillage. Direct-seeded rice under conventional tillage resulted in higher yields than zero tillage,
- At the time of harvest (113 days after herbicide application), the residues of butachlor were below the detectable level of 0.01 ppm in soil, grain and straw samples
- Residue of pyrazosulfuron-ethyl was seen only up to 4<sup>th</sup> week after application in underground water. However by 45<sup>th</sup> day, the residue of pyrazosulfuron-ethyl were below detectable level

**Remarks:** Chairman showed his concern about the report on occurrence of a quarantine weed *Ambrosia psyllostachia* by Bengaluru center. He suggested to attend the problem immediately to restrict its further spread followed by its eradication.

**Dr. C.T. Abraham, Principal Investigator, presented the salient findings of KAU, Thrissur Centre:**

- Recommended application of fenoxaprop @ 60 g/ha or azimsulfuron @ 35 g/ha or penoxsulam @ 25 g/ha at 2-4 leaf stage for control of *Echinochloa* in rice.
- For control of *Loranthus*, spraying of ethrel @ 25 ml/l was recommended. If regrowth occurred, padding with 2,4-D @ 1 g/20 ml water on the cut made on the bark of the parasite was suggested.
- For controlling weedy rice, stale seedbed technique and application of glyphosate (15 ml/l) on the ear head of weedy rice, using a wick-wipe applicator were found effective.
- In the weed survey / surveillance work, a few weeds like *Alternanthera bettzickiana*, *Merremia vitifolia*, *Wedalia calendulacea* were reported invading large areas.
- Long-term trial on tillage showed the possibilities of zero tillage in wetland rice, even though, the yield was lesser than the conventional tillage.
- Long-term trial on herbicide use in rice-rice system did not show accumulation of butachlor or pretilachlor in soil or grains even after continuous use in 24 seasons. However, herbicide temporarily reduced the population of earthworms.
- Butachlor did not persist to detectable level in the field beyond 60 DAS. About 95% of the oxyfluorfen applied on the soil got adsorbed to the soil particles within two hours.
- There were evidences of establishment of *Zygotyphlocyba bicolorata* at Chittur area in Palakkad district.

**Remarks:** Data on increase in availability of P and K with herbicide application need to be checked.

**Dr. M. Yakadri, Principal Investigator, presented the salient findings of ANGRAU, Hyderabad Centre:**

- Survey in Anantpur district revealed the occurrence of two new weeds, viz. *Vicoa indica* and *Cassytha filiformis* (parasitic weed) which were found to have medicinal value.
- Pretilachlor @ 0.75 kg/ha fb almix were better options for efficient weed control and higher grain yield in transplanted rice.
- Pendimethalin @ 1.0 kg/ha (PE) fb bispyribac sodium (PoE) @ 25 g/ha fb manual weeding at 45 DAS can be recommended for economic and efficient weed control and higher grain yield in direct-seeded rice.
- In conservation agriculture system under rice-maize-greengram system, for *kharif* rice, early post-emergence application of bispyribac-sodium @ 20 g/ha fb mechanical / hand weeding at 40 DAT was found viable.
- In long-term herbicide trial, atrazine @ 1.0 kg/ha applied as pre- or early post-emergence was found best.
- Butachlor was at below detectable level of 0.01ppm at 60 DAS after application. Atrazine residues were below detectable limit of 0.025 mg/kg during all the sampling stages in ground water.
- The residue of pyrazosulfuron-ethyl were below detectable level on 45<sup>th</sup> day after application of herbicide in underground water in rice cultivated field at both 25 and 50 g/ha.
- No detectable residues of atrazine were present in the samples of grain and stover in maize.
- *Neochetina* spp. weevil completely controlled water hyacinth in two big water bodies in Hyderabad.

**Remarks:** Chairman suggested to study weed shift on long-term basis. He also suggested to follow the technical programme finalized during the Biennial Workshop.

**Dr. Ramesh Babu, Principal Investigator, presented the salient findings of UAS, Dharwad Centre:**

- Surveys undertaken revealed the incidence of *Solanum elaeagnifolium* in Hukkeri block of Belgaum district.
- In long-term herbicidal trial in maize-chickpea system, during *rabi* 2011-12, chickpea yields were significantly higher in conventional tillage (CT) than zero tillage (ZT).
- The treatment atrazine @ 1 kg/ha PE 3 DAP + HW on 45 DAP fb earthing up on 60 DAP fb post-emergence spraying of 2,4-D Na salt 5 g/l + urea 20 g/l at 90 DAP fb trash mulching @ 5 t/ha on 120 DAP) was not effective since the emergence of *Striga* was noticed only after 110 to 120 DAP.

**Remarks:**

- Chairman pointed out to recheck the B:C ratio in some of the experiments.
- Standard weed management practices in organic farming of high-value crops should be formulated. A high-value crop like turmeric should not be overloaded with 3-4 herbicides in sequence.

### Presentation of salient findings by Principal Investigators of AICRP-WC Centres in East Zone

- Chairman** : Dr C.L. Acharya, Former Director, IISS, Bhopal  
**Co-Chairman** : Dr. A.R. Sharma, Director, DWSR, Jabalpur  
**Rapporteurs** : Dr Bhumesh Kumar, DWSR, Jabalpur  
Dr Ramesh Babu, UAS, Dharwad

Chairman welcomed the delegates and expressed the role of PIs in overcoming the nutritional security of the country as weeds steal away considerable amount of nutrients. He emphasized the importance of weed management in increasing the crop productivity and overall agricultural production.

Dr. Bhumesh Kumar, Nodal Officer for East Zone presented an overview of research highlights, constraints and suggestions. Centre-wise specific observations were as follows:

#### Assam Agricultural University (AAU), Jorhat

- WS1.2: Monitoring of herbicide resistance is completely missing.
- WS2.1f, WS2.1g, WS2.1i: Biology and physiology of *Mimosa*, *Mikania* and *Cyperus*, have not been done properly.
- WS4.2a: Issue of non-establishment of Mexican beetle should be discussed.
- WS 6.1 and 6.2 (TOT): Completely absent and reason for this need to be explained.

#### Visva-Bharati (V-B), Sriniketan, West Bengal

- Most of the experiments conducted nicely.
- While reporting, data must be given in standard units only instead of locally preferred units, e.g. in hectare and not bighas.

#### Orissa University of Agriculture & Technology (OUAT), Bhubaneswar

- WS1.1: Weed surveillance and experiments under WS 3.0 were conducted nicely.
- Experiments under WS 2.1b, 2.1d, 2.1g, 2.3, 4.2a, 4.2b, 4.2c are completely missing.
- A network trial on *Orobanche* management in mustard should be conducted.

#### Rajendra Agricultural University (RAU), Pusa

- WS 1.2: Monitoring of herbicide resistance - it is reported that no case of herbicide resistance was observed, but still we need to be vigilant if there is any in coming year(s).
- WS 4.2c: Weed biology of *Echinochloa* sps. other than *E. colona* also need to be studied in detail.

#### Birsa Agricultural University (BAU), Ranchi

- WS1.2: Monitoring of herbicide resistance is missing.
- WS 6.1: Plot size for OFTs is only 100 m<sup>2</sup>. If possible, it should be increased.

## General observations

- Studies on weed biology need to be done in detail.
- Centres who are working on weedy rice can send specimen seed samples to DWSR, Jabalpur for further characterization at molecular level.
- Some problems in transportation of *Neochetina* weevil seem to be there as most of the centres reported that they received only dead weevils.
- Uniformity in reporting the results should be observed.
- Report should be printed on both sides of paper to make the document portable.

Chairman remarked that Nodal Officer should compile and synthesize all the information and come up with overall recommendations.

### **Dr. J. Deka, Principal Investigator, presented the salient findings of AAU, Jorhat Centre:**

- Altogether 26 network trials were allotted to the centre during 2012-14, out of which 22 experiments were carried out.
- In aquatic situations of Dibrugarh district, *Eichhornia crassipes* was found to be the most dominant in the summer season, followed by *Ipomoea cornea*. New weeds were recorded in rice-wheat and rice-rice system. Identification method of *Monochoria vaginalis* and *Sagittaria guayanensis* has been developed. *Cyperus rotundus* was successfully controlled with glyphosate @ 1.5 kg/ha (twice application at 15 days interval) with or without mixing with jaggery (2%).
- The highest grain yield of transplanted winter rice was achieved from pretilachlor 1000 g/ha followed by Almix 4 g/ha. In autumn rice, butachlor + 2,4-D (75% NPK through chemical fertilizer + 25% through organic source) was found better. In turmeric, higher yields were recorded with metribuzin 700 g/ha + hoeing 30 and 60 DAP.
- In long-term experiment, residue of butachlor and pretilachlor was below detectable level in soil, water, grain and straw of rice.
- FLDs on weed management in winter rice indicated an increase of 26-57% with pretilachlor 750 g/ha PE.

### **Dr B. Duary, Principal Investigator, presented the salient findings of V.B. Sriniketan Centre:**

- Weed species increased in potato, cabbage and cauliflower in 2011-12 as compared to 2008-09. *Solanum sysimbrifolium* was found making colonies and may become a serious threat in coming years. *Echinochloa glabrescens* showed highest emergence and height of plants grown from fresh seeds (2 months old) and lowest emergence and height of plants from 2-3 years aged seeds.
- To control complex weed flora, combination of bispyribac-sodium + [metsulfuron-methyl + chlorimuron-ethyl] (Almix) (20 g + 4 g) was the most effective in controlling weeds, resulting in higher grain yield in transplanted rice.
- In blackgram-mustard cropping system, imazethapyr + pendimethalin (pre-mix) @ 800 g/ha appeared to be effective against mixed weed flora and registered higher yield in blackgram.
- In mustard, repeated use of pendimethalin decreased the density of *Digitaria sanguinalis* and new appearance of *Polygonum plebejum*, *Solanum nigrum* and *Cynodon dactylon* was noticed. However, no reduction in yield of rice as well as mustard was noticed due to repeated application of butachlor in rice and pendimethalin in mustard continuously for 12 years.

- Mexican beetle (*Zygogramma bicolorata*) on *Parthenium* was found more effective with respect to population build-up, establishment and control of *Parthenium* when released in May-June immediately after first flush of rain as compared to late release in August-September.

**Dr. M.M. Mishra, Principal Investigator, presented the salient findings of OUAT, Bhubaneswar Centre:**

- In East and South Eastern Coastal Plain Zone, *Mikania micrantha*, *Parthenium hysterophorus*, *Eichhornia crassipes*, *Alternanthera philoxeroides*, *Orobanche aegyptica* were major weeds. In Mid-Central Table Land Zone, *Celosia argentea*, *Echinochloa colona* and *Digitaria sanguinalis* were dominant weeds. *Phragmites karaka* (a submerged weed) in Chilika Lagoon was found posing problem.
- Bispyribac + Almix (20 + 4 g/ha) controlled complex weed flora in transplanted rice and gave higher yield and net returns. In direct-seeded rice, pendimethalin (1000 g/ha) *fb* bispyribac (25 g/ha) *fb* manual weeding (45 DAS) was found to be the best treatment.
- In long-term trial on tillage in rice-rice cropping system, CT-CT reduced the weed densities during different growth stages over ZT-ZT method in *rabi* and *kharij* season. The composition of weed seed bank in ZT was dominated with grasses (63.6%), followed by broad-leaved weeds (23.6%) and sedges (12.8%). The corresponding values in CT were 64.5, 23.6 and 12.1%.
- In rice-groundnut system, use of butachlor + 2, 4-DEE rotated with pretilachlor in rice along with application of alachlor in groundnut recorded significantly lower weed density during initial stages of crop growth.
- Stale seedbed *fb* pendimethalin @ 1.0 kg/ha PE recorded the lower *Cuscuta* density and higher yield in niger.
- Studies on leaching behaviour of quizalofop-ethyl in different soils revealed that residues could be detected up to 15 cm depth irrespective of concentrations.
- Persistence of butachlor in soils of transplanted rice (Farmers' field) was not detected even as early as 20 DAS.
- In OFTs on transplanted rice, oxadiargyl @ 0.065 kg/ha gave higher yield and net returns.

**Dr R.R. Upasani, Principal Investigator, presented the salient findings of BAU, Ranchi Centre:**

- Turmeric yield with application of metribuzin 0.7 kg/ha *fb* straw mulch 10 t/ha *fb* one hand weeding were better than rest of the treatments. Application of fenoxaprop along with metsulfuron or pendimethalin or metribuzin developed appearance of grassy weeds profusely.
- Conventional tillage along with application of pretilachlor 0.5 kg/ha + 2,4-D 0.5 kg/ha in rice appeared to control weeds most effectively as compared to hand weeding.
- Continuous use of 2,4-D in rice either in combination with butachlor or with Almix reduced density of broad-leaved weeds.

**Remarks:** Chairman pointed out that turmeric should not be overloaded with as much as three herbicides.

**Dr D.K. Roy, Principal Investigator, presented the salient findings of RAU, Pusa Centre:**

- In *kharif* rice, initially the dominant weed species were: *Cyperus rotundus*, *Cynodon dactylon*, *Echinochloa colona* and *Eleusine indica*, but at later stages, *Caesulia axillaris* emerged as dominant weed. The infestation of weedy rice was found in direct-seeded deep water rice in Darbhanga and Madhubani districts of Bihar.
- No case of herbicide resistance in weeds was observed in dominant cropping systems.
- For control of complex weed flora in transplanted rice, bispyribac (25 g/ha) + ethoxysulfuron (18.75 g/ha) gave the best and gave higher yield. In turmeric, the highest yield (52.5 t/ha) was recorded with atrazine 0.75 kg/ha *fb* fenoxaprop 67 g/ha + metsulfuron 4 g/ha.

**Remarks:**

1. Because of climate change, new weeds are emerging. Weed shift and increase in weed density is being observed. This needs immediate attention.
2. Work on herbicide chemistry – adsorption, leaching, degradation should be conducted.
3. There is a growing concern over the herbicide residues in food chain. Hence, herbicide overload due to sequential application must be looked into.
4. Conservation tillage should become a part of farming, and at least 30% of soil surface should be covered with crop residues. Weeds management in conservation agriculture needs utmost attention.
5. Indigenous weed management techniques are to be compiled, validated and fine tuned.
6. Weeds are used as fodder or green manures, and such uses also need to be accounted while calculating monetary returns.
7. Weed physiological studies require more attention from weed scientists.
8. Technical programme finalized in group meeting should be strictly followed.
9. Phyto-toxic effects of herbicides should be recorded and reported.

**27 April, 2013**

**TECHNICAL SESSION – IV**

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**Presentation of salient findings by Principal Investigators of AICRP-WC Centres in West Zone**

**Chairman** : Dr K.C. Gautam, Ex. Principal Scientist (Agronomy), IARI, New Delhi  
**Co-Chairman** : Dr. A.R. Sharma, Director, DWSR, Jabalpur  
**Rapporteurs** : Dr. Anil Dixit, DWSR, Jabalpur  
Dr. J. Deka, AAU, Jorhat

Dr. Anil Dixit, Nodal Officer, West Zone presented the overview of the status and salient results from the four centres, viz. Dapoli, Anand, Bikaner and Parbhani under the zone. Many experiments were not conducted at Dapoli, Bikaner and Parbhani. It was suggested that on-farm trials should be conducted near to roadside and in a more representative manner. The display board should be fixed having university name and other details.

**Status of experiments conducted:**

Approved experiments	DBSKKV, Dapoli	AAU, Anand	SKRAU, Bikaner	MAU, Parbhani
WS 1.1: Monitoring of weed shift / appearance of new weeds due to weed management practices,	Not reported	Reported	Reported	Reported

changes in cropping systems and climatic parameters				
WS 1.2: Monitoring of herbicide resistance / escapes in weeds of the dominant cropping system	Not reported	Reported	Not reported	Not allotted
WS-1.4 : Special survey on <i>P. minor</i> in wheat	Not allotted	Reported		Not allotted
WS 2.1d: Biology of <i>Orobanche</i>	Not allotted	Not allotted	Not reported	Not allotted
WS-2.2: Viability / regeneration potential of glyphosate-treated <i>Cyperus rotundus</i>	Not allotted	Reported	Not allotted	Not allotted
WS 2.3: Physiological studies in long-term trials on tillage and herbicide	Reported	Reported	Not reported	Not allotted
WS 3.2: Herbicides combinations for control of complex weed flora in direct-seeded rice	Reported	Not allotted	Not allotted	Not allotted
WS-3.3 Weed management in turmeric	Not allotted	Not allotted	Not allotted	Reported
WS 3.4: Weed management in blackgram / greengram and its residual effect on succeeding mustard crop	Not allotted	Reported	Not reported	Not allotted
WS 3.5: Permanent trial on tillage in different cropping system	Reported	Reported	Not reported	Not allotted
WS 3.6: Weed management in conservation agriculture systems	Not reported	Reported	Not reported	Reported
WS 3.7: Long-term herbicide trial in different cropping system	Reported	Reported	Reported	Reported
WS-4.1c : Management of <i>Cuscuta</i> in lucerne	Not allotted	Reported	Reported	Not reported
WS 4.2a Biological control of <i>Parthenium</i> by <i>Zygomma bicolorata</i>	Not reported	Reported	Reported	Reported
WS 4.2b: Biological control of <i>Parthenium</i> by competitive replacement through <i>Cassia tora</i>	Not reported	Reported	Reported	Not reported
WS 4.1d : Management of <i>Loranthus</i> on mango	Not allotted	Reported	Not allotted	
WS 5.1: Herbicide residues in long-term herbicide trial	Not allotted	Reported	Not allotted	Reported
WS 5.2: Studies on herbicide persistence in water	Not allotted	Reported	Not allotted	Reported
WS 5.3 : Characterization of leaching behaviour of herbicide in soil	Not allotted	Reported	Not allotted	Reported
WS 5.4 : Testing of persistence of herbicides in the farmers' field (Soil and crop produce)	Not allotted	Reported	Not allotted	Reported
WS 5.5: Studies on secondary metabolites of herbicides	Not allotted	Reported	Not allotted	Not allotted
WS 5.6 : Adsorption and desorption behavior of herbicides	Not allotted	Reported	Not allotted	Not allotted
WS 6.1: On-Farm trial (OFT)	Not reported	Reported	Not reported	Reported
WS 6.2: Frontline demonstration	Not reported	Reported	Not reported	Reported
Publications:	Paper in conference proceedings : 3	Research paper: 1 Conference proceedings: 6 Popular articles: 2 Book: 1 Chapter/Pamphlets : 3	Research papers : 2 Conference proceedings : 12	Paper in conference proceedings : 5 Dr. A.S. Jadhav received Vasantrao Naik

				Agricultural Scientist Award – 2012
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**Dr A.S. Jadhav, Principal Investigator, presented the salient findings of MAU, Parbhani Centre:**

- In turmeric, metribuzin @ 0.7 kg/ha fb straw mulch @ 10 t/ha fb 1 hand weeding was the best treatment.
- In respect of the conservation agriculture in pearl millet-chickpea cropping system, tillage practices did not affect the weed growth and yield of the crop.
- Application of atrazine @ 1.5 kg/ha or atrazine @ 0.75 kg/ha fb 2,4-D @ 0.5 kg/ha in maize were at par with 2 mechanical weedings under maize-chickpea cropping system. Chickpea recorded the highest maize equivalent yield with pendimethalin @ 0.75 kg/ha fb 1 hand weeding.
- In direct-seeded rice, the best treatments were fenoxaprop + Almix and azimsulfuron, which were at par with 2 hand weedings.
- No herbicide residue above detectable level was found in context of atrazine in sorghum and oxyfluorfen in wheat. Leaching of 2,4-D was observed up to 30 cm depth in 15 days.

**Dr M.J. Mane, Principal Investigator, presented the salient findings of DBSKKV, Dapoli Centre:**

- In long-term trial on tillage on rice-lablab bean, the highest yield was recorded with conventional tillage in rice, and zero tillage in lablab combined with 2 hand weedings 20 and 40 DAS to each crop along with the highest population of beneficial soil microbes.
- Application of pyrazosulfuron fb bispyribac-Na or pendimethalin combined with hand weeding at 40 DAS was found effective in direct-seeded rice.
- Pendimethalin was at par with weed-free in groundnut in a rice-groundnut sequence.
- For effective control of *Cuscuta* in lablab, pre-emergence application of pendimethalin @ 1.0 kg/ha sand-mix after ploughing was recommended.
- There is no serious *Parthenium* infestation in the area.

**Mr. Vikash Sharma, Asstt. Microbiologist, presented the salient findings of SKRAU, Bikaner Centre:**

- Weed survey conducted in Barmer district during *rabi* season indicated that *Chenopodium album* was the most dominating weed of wheat and cumin, and *Asphodelus tenuifolius* in mustard. During *kharif* season, *Cenchrus biflorus* was the most dominant weed of pearl millet and sorghum, while *Digera arvensis* was observed in moth bean and sesame, and *Cenchrus biflorus* in clusterbean and greengram.
- Six years' of experimentation on lucerne confirmed that application of pendimethalin 1.0 kg/ha as sand-mix significantly increased green fodder yield, net returns and B:C ratio of compared to farmers' practice.
- In station trial on clusterbean, application of imazethapyr + imazamox (ready-mix) @ 40 g/ha or imazethapyr @ 40 g/ha significantly reduced the density and dry weight of broad-leaved weeds as

compared pendimethalin @ 0.75 kg/ha as pre-emergence, but grassy weeds were effectively controlled by quizalofop-ethyl @ 37.5 g/ha or fenoxaprop-ethyl @ 50 g/ha.

**Dr. B. D. Patel, Principal Investigator from AAU, Anand centre did not attend the AGM. Accordingly, there was no presentation from this centre.**

**Remarks:**

- It is a serious matter that PI of Anand centre did not inform about his absence nor deputed any other scientist for participation in the meeting.
- Quality of slides and presentation of the research data need improvement. Grammatical errors should be avoided, and standard units should be used.
- B:C ratio up to 4-5 at Bikaner centre should be rechecked.
- Exclusive reliance on herbicide should be avoided.
- DWSR work should also be presented in the Annual Group Meeting.
- Publication record of the centres need improvement.

**TECHNICAL SESSION–V**

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**Presentation of salient findings by Principal Investigators of AICRP-WC Centres in Central Zone, and Volunteer Centres**

**Chairman** : Dr. G.L. Bansal, Dean, College of Basic Sciences, CSKHPKV  
**Co-Chairman** : Dr. A.R. Sharma, Director, DWSR, Jabalpur  
**Rapporteurs** : Dr. R.P. Dubey, DWSR, Jabalpur  
Dr. P.K. Singh, DWSR, Jabalpur

Dr. R.P. Dubey, Nodal Officer for Central Zone presented an overview of research highlights, constraints and suggestions. It was pointed out that the annual reports of centres i.e. Gwalior, Kanpur and Raipur were not properly compiled and written as per guidelines submitted by the Coordinating unit. Publication of research papers by centres was also not impressive. Centre wise observations were as follows:

**RVSKVV, Gwalior**

1. The annual report was received too late.
2. The numbering of the WS experiments was not as per approved technical programme.
3. The report did not contain the chapters like recommendations for package of practices, TSP and linkages.
4. The report was too lengthy i.e. 189 pages. It was suggested to prepare the report in a concise manner.
5. Slides and presentation of research highlights should be improved.

**CSAUAT, Kanpur**

1. Annual report was received in time.
2. Contents and sequence of chapters was not as per outline of Annual Report given by Coordinating Unit.
3. Slides and presentation of research highlights should be improved.

**IGKV, Raipur**

1. Annual Report was received too late.
2. Contents and sequence of chapters were not as per the guidelines of HQ.
3. Results of practical utility, recommendations for package of practices and linkages were not included in the report.
4. Economics of the treatments in network as well as on-station trials was not reported.

5. The report was printed on single side despite instructions to print on both sides.
6. Meteorological data for 2012 was mentioned in the contents page but not reported in the text.

**Status of experiments conducted:**

Approved experiments	RVSKVV, Gwalior	CSAUAT, Kanpur	IGKV, Raipur
WS 1.1: Monitoring of weed shift / appearance of new weeds due to weed management practices, changes in cropping systems and climatic parameters	No GPS data	Reported	No GPS data
WS 2.1b: Weedy rice	Not reported	Not allotted	Not allotted
WS 2.1b: Weedy rice	Not reported	Not allotted	Not allotted
WS 2.1d. <i>Orobanche</i>	Not reported	Not allotted	Not allotted
WS 2.3: Physiological studies in long-term trials on tillage and herbicide	Not allotted	Not reported	Reported
WS 3.1: Herbicides combinations for control of complex weed flora in transplanted rice	Not allotted	Reported but without economics	Reported
WS 3.2: Herbicides combinations for control of complex weed flora in direct-seeded rice (dry/wet)	Not allotted	Reported but without economics	Reported
WS 3.4: Weed management in blackgram / greengram and its residual effect on succeeding mustard crop	Reported	Not allotted	Not allotted
WS 3.6 : Weed management in conservation agriculture systems (i) Non-rice based cropping systems	Not reported	Not reported	Not allotted
WS 3.7: Long-term herbicide trial in different cropping systems	Reported but under different No.	Reported	Reported
WS 4.1a: Management of <i>Orobanche</i> in mustard and solanaceous crops	Tomato and brinjal not reported	Not allotted	Not allotted
WS 4.1d: Management of <i>Loranthus</i>	Not allotted	Reported	Not allotted
WS 4.2a Biological control of <i>Parthenium</i> by <i>Zygomma bicolorata</i>	Reported	Reported	Reported
WS 4.2b: Biological control of <i>Parthenium</i> by competitive replacement through <i>Cassia tora</i>	Not reported	Not reported	Not allotted
WS 5.1: Herbicide residues in long-term herbicide trial	Reported	Reported	Not allotted
WS 5.2: Studies on herbicide persistence in water	Not reported	Not reported	Not allotted
WS 5.3: Characterization of leaching behaviour of herbicide in soil	Reported	Not allotted	Not allotted
WS 5.4: Testing of persistence of herbicides in the farmers' field (soil and crop produce)	Reported	Not allotted	Not allotted
WS 6.1: On-Farm Trial (OFT)	Reported	Reported	Reported
WS 6.2: Front Line Demonstration (FLD)	Not reported	Reported	Reported
Publications	Research paper- nil Seminar/Symposia -9		Research paper-2 Seminar/Symposia -2
TSP programme	Not reported	Research paper nil, Popular article-1 Seminar/Symposia -	Well conducted

		2, Media publications-17	
Overall performance	Need improvement	Need improvement	Satisfactory

**Dr. J.P. Dixit, Principal Investigator, presented the salient findings of RVSKVV, Gwalior Centre:**

- In Bhind, Datia, Shivpuri and Sheopur districts, mustard was highly infested with *Orobanche aegyptica*, whereas Gwalior and Morena districts were highly infested with *Orobanche aegyptiaca* as well as *Asphodelus tenuifolius*.
- Under pearl millet-wheat cropping system, in pearl millet in weed-free treatments (2 hand weeding at 30 and 45 DAS) recorded the highest grain yield, followed by atrazine @ 0.5 kg/ha PE + one hand weeding at 30 DAS. However, application of atrazine @ 0.5 kg/ha PE proved profitable because of higher B: C ratio than other treatments.
- Under pearl millet-wheat cropping system, application of isoproturon @ 0.75 kg/ha + 2,4-D @ 0.5 kg/ha and isoproturon @ 0.75 kg/ha + one hand weeding at 60 DAS were more effective weed management practices for control of mixed weed flora in wheat.
- Application of iodosulfuron + mesosulfuron 400 g/ha followed by pinoxaden + 2,4-D (50 +500 g/ha) gave higher WCE, grain yield, net returns and B:C ratio with lowest weed index. However, maximum grain yield and weed control efficiency were recorded in weed-free (2 hand weeding at 28 and 45 DAS).
- Application of 2,4-D sodium salt to wheat at 0.5 and 1.0 kg/ha persisted in soil up to 30 and 45 days after application, respectively. Sulfosulfuron 25 g/ha persisted in soil up to 45 days while clodinafop (60 g/ha), metribuzine (175 g/ha) and pinoxaden (50 g/ha) persisted in soil up to 30 DAA. No residues of all the herbicides used were left after harvest of crop as per bioassay method using blackgram as test crop.
- Chlorimuron-ethyl applied to soybean @ 9 and 18 g/ha caused residual toxicity to succeeding mustard crop at 25 and 40 DAS. Pendimethalin at 2.0 kg/ha reduced the growth of succeeding mustard up to 25 days only.
- On-farm trials and demonstrations were conducted in 8 locations on farmer's fields. Application of sulfosulfuron was economically viable (Rs. 20260 /ha) as compared to clodinafop (Rs. 18586 /ha).

**Remarks:**

- It was suggested to recheck the high B:C ratio in some of the experiments.
- Occurrence of *C. rotundus* in wheat was questioned. The PI informed that it was not dominant but present in wheat.
- It was suggested to study management of *Orobanche* in mustard as per the treatments followed at Hisar. The centre should also study the residual effect of imazethapyr applied in greengram / blackgram on succeeding mustard as there are reports of its toxic effects in that region.

**Dr. R.A. Yadav, Principal Investigator, presented the salient findings of CSAUAT, Kanpur Centre:**

- Weed population/m<sup>2</sup> and its dry weight were found minimum with application of pendimethalin (1000 g/ha) fb bispyribac (25 g/ha) and manual weeding and maximum in weedy check in direct-seeded rice.

- Transplanting of rice in conventional tillage significantly minimized weed population and their dry weight in comparison to direct sowing of rice in conventional tillage and zero tillage.
- Highest net income (Rs. 1,40,604/ha) and B:C ratio (2.73) were obtained with application of trifluralin @ 1.25 kg/ha in sugarcane.
- Conventional- conventional tillage system produced higher grain yield (5.07 t/ha) due to less dry matter accumulation by weed. The yield reduction under zero-zero tillage sowing was in the tune of 19.6% as compared to conventional-conventional tillage. The highest net income (Rs. 45,653/ha) was recorded under conventional-conventional tillage and lowest under zero-zero tillage (Rs. 34005/ha).

**Remarks:** Clarification on occurrence of *Carthamus* and *Asphodelus* during *kharif* season was sought. The PI informed that the observations were taken during the first week of November. It was suggested to record observations on crop and weed as per standard methodologies.

**Dr. A.P. Singh, Principal Investigator, presented the salient findings of IGKV, Raipur Centre:**

- *Alternanthera triandra* emerged as a new problematic weed in direct-seeded rice.
- *Malwa pusila* was increasing on roadsides but seen replacing *Parthenium*.
- Bispyribac + Almix application in transplanted rice and pendimethalin *fb* bispyribac in direct-seeded rice (wet) were effective against complex weed flora.
- In rice-chickpea system, intensity of *Medicago denticulata* was 39% higher in CT than ZT in chickpea.
- Pinoxaden + carfentrazone (50 + 20 g/ha) was most effective against weeds in wheat.
- FLDs were done in 225 acres area in rice in 18 tribal villages in 5 tribal districts.
- *Zygodramma* beetles failed to establish possibly due to heavy rains.

**Remarks:**

- It was suggested that *Alternanthera denticulata* infesting puddle rice could be *A. philoxeroides*.
- PI informed that they are making IGKV, Raipur campus as *Parthenium* free.
- Physiological studies on weeds in long-term experiments should be done in addition to weed density and seed bank.
- *Medicago* in chickpea in Chhattisgarh region is a serious problem and an effective strategy should be developed for its management.
- Machine to machine i.e. labourless cultivation in rice was emphasized in Raipur region.

**Dr. Anil Kumar, Principal Investigator, SKUAST, Jammu volunteer centre presented the research highlights:**

- In long-term experiment on maize-wheat, the highest grain yield of wheat was recorded with the application of metribuzin @ 200 g/ha. Zero tillage treatments along with metribuzin application also recorded relatively higher net returns and B.C ratio in wheat. In the following maize crop, the grain yield was significantly higher in conventionally tilled maize along with application of atrazine @ 1 kg/ha.

- In long-term experiment on rice-wheat system, significantly higher wheat grain yield was recorded with isoproturon @ 1 kg/ha alone or tank-mix with 1% urea and 0.1% surfactant which also proved economically superior to all other weed management treatments. In the following rice crop, butachlor @ 1.5 kg/ha was superior in yield and relative economics of rice.
- *Phalaris minor*, known locally as 'Sitti' is a serious problem in wheat.

**Remarks:** It was suggested to recheck the cost of cultivation of rice as it appeared too low. PI desired to make the centre as main centre. The centre had good record of research publications, which is better than most of the main centres.

**Dr. J.P. Deshmukh, Principal Investigator presented the research highlights of PDKV, Akola volunteer centre**

- Integrated weed management in soybean: Combination of imazethapyr @ 0.100 kg/ha PoE 15 DAS + quizalofop-ethyl @ 0.075 kg/ha PoE 15 DAS were found better in controlling weed, dry matter accumulation, weed control efficiency, weed index, grain yield and NMR, while imazethapyr + imazamox (pre-mix) @ 0.080 kg/ha PoE 15 DAS recorded highest B:C ratio.
- Integrated weed management in cotton: Pyriithiobac-sodium @ 0.062 kg/ha PoE 20-40 DAS + hoeing at 40 DAS proved better in reducing weed dry matter accumulation, higher weed control efficiency, weed index, higher seed cotton yield, NMR and B:C ratio.

Director remarked that during his visit to the centre, the experimental crop of cotton was not well maintained.

**Dr. Parshotam Singh, PI SKUAST, Kashmir presented an overview of weeds in crops in Kashmir.**

**Dr. P. Saravane from PAJANCOA, Puduchery presented an overview of weed flora of crops in Puducherry.**

**Dr. S.S. Tomar from SVBPUAT, Meerut presented the research highlights of two experiments**

- Bispyribac + almix was found to be the best against weed flora in rice.

Director remarked that during his visit to the centre, the experiments were not well maintained.

**Dr. S. Saha**, Principal Scientist, CRRI, Cuttack presented an account of work on weed management being done at his Institute, particularly on weedy rice. Rice variety with purple base are suitable for identifying weedy rice in the rice field. Two types of wild rices are present in India i.e. *O. rufipogon* and *O. nivira*. He informed that work on weed competitive rice varieties is also progress.

**Dr. C. Kannan** presented an overview of work done on *Orobanche*. He emphasized to conduct an exhaustive survey on extent of infestation in non-conventional areas and crops. At DWSR, biology of the weed is being studied. Large-scale coordinated OFTs should be planned and monitored for management of *Orobanche*.

**Remarks:**

Chairman pointed out that biology, phenology of weeds, mode of action of herbicide resistance, biological weed management, crop-weed competition studies should be given more emphasis. Rationalization of scientific positions is required for focused research.

### **General discussion, technical programme, financial issues, interaction with herbicide industry etc.**

**Chairman** : Dr. A.R. Sharma, Director, DWSR, Jabalpur  
**Convener** : Dr. R.P. Dubey, DWSR, Jabalpur

#### **The following points were discussed and decisions taken:**

1. Discussion was held on a sponsored research project entitled “Evaluate weed control efficacy of glyphosate formulation (MON 76366) against weeds occurring in cotton and corn” by Monsanto during 2010-11. The trial was conducted for one season at Coimbatore, Parbhani, Bengaluru, and Jabalpur. Hyderabad Centre did not conduct the trial. For this purpose, fee of Rs. 15.30 lakhs was received at DWSR. However, no Centre was paid fund for conducting the trials. It was decided that if Monsanto agreed, then the trial can be conducted for another season during 2013 and the total fee paid to the Centres as per norms.
2. Most Centres mentioned about inadequate budget under contingency for conducting experiments in view of the enhanced wages of farm workers. Chairman mentioned that budgetary provisions have been enhanced in the XII plan, which are yet to be approved by the Council.
3. Many Centres are not conducting the allocated experiments as per the approved network technical programme and do not inform the Coordinating Unit. It was decided that Centres should submit a detailed list of network trials to be conducted during 2013-14 along with modifications, if any, to Coordinating Unit at DWSR within a month.
4. A provision of Rs. 1.5 lakhs will be made for purchase of happy seeder to be used under conservation agriculture experiments at the Coordinating Centres.
5. A compilation of five major weeds of different states is underway. All PIs were requested to submit the information including utilization aspects of the weed species in the Proforma already supplied by Coordinating Unit by June 2013.
6. It was decided that the Coordinating Centres who have not submitted the comprehensive data of long-term trials on herbicide and tillage should submit the same within 3 months i.e. by July 2013.
7. Dr. Shobha Sondhia, Sr. Scientist, DWSR was requested to compile the information on residue studies at the Coordinating Centres. She will also provide common protocols/ methodology, and arrange to provide herbicide standards for conducting herbicide residue studies to the Coordinating Centres. It was also decided that laboratory facilities at DWSR can be utilized by the Centres in consultation with Dr. Shobha.
8. It was emphasised that chromatogram must be provided in all matrix under herbicide residue studies.
9. It was noted that a common format for economic analysis of the experiments is not being followed at the Centres. Hence, it was decided that Dr. Govindrajan, Agriculture Economist at TNAU Centre shall provide a common proforma for economic analysis.
10. It was decided that Annual Group Meeting will be conducted every year for three days, and all scientists working in the project will be invited as in the case of all other AICRPs. As part of the Silver Jubilee year (2013-14) of DWSR, the next Annual Group Meeting will be held at DWSR, Jabalpur during last week of February or early March 2014.

11. It was decided that all the Coordinating Centres will compile data on herbicides consumption in their respective states and provide the information to the Coordinating Unit by June 2013.

## PLENARY SESSION

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<b>Chairman</b>	:	Dr. S.P. Sharma, Director of Research, CSHPKV, Palampur
<b>Co-Chairman</b>	:	Dr. A.R. Sharma, Director, DWSR, Jabalpur
<b>Convener</b>	:	Dr. R.P. Dubey, DWSR, Jabalpur

The rapporteurs of different technical sessions, viz. Dr. C. Chinnuswamy, Dr Sushilkumar, Dr. Ramesh Babu, Dr. J. Deka and Dr. R.P. Dubey presented the summary/recommendations of different sessions:

Dr. K.C. Gautam, Former Project Coordinator, AICRP-Weed Control and expert of the Group Meeting emphasized on non-chemical weed control. He pointed out that routine testing of herbicides doses should be given least priority.

Dr. N.N. Angiras, Former PI & Head, Agronomy, CSKHPKV, Palampur stressed on studying weed management in organic farming systems.

Dr. A.R. Sharma, Director, DWSR summarized the overall presentations of the Annual Group Meeting and made the following remarks:

1. There is a lot of variation in the performance of different Centres. The centres not performing well need to make considerable improvement.
2. Annual Report of AICRP on Weed Control for 2012-13 could not be printed this time before the workshop because it was not submitted in time by most centres. Moreover, it was poorly written by some centres. A good quality report will be prepared soon after this meeting and sent to all concerned.
3. Some recommendations of Biennial workshop held at KAU, Thrissur have not been fully complied with. Necessary action should be taken by concerned Centres.
4. Best performing Centres shall be identified based on some specific criteria, and better performing Centres should be given additional incentives.
5. In the XII plan proposal, provision for flexi discipline and need-based research has been made.
6. All centres should submit the information on five major weeds in the prescribed format by the end of June, 2013.
7. Weed management technologies developed at Centres should be documented and sent to HQ for compilation.
8. Some of the AICRP Centres will be involved in the research programme under conservation agriculture platform.
9. Provision of happy seeder to the Centres shall be kept in the XII plan proposal.
10. Annual Reports of most centres are not well prepared, and data presentation are not uniform.
11. A common protocol shall be developed for economic analysis of data.
12. Data on long-term experiments on herbicides and tillage shall be compiled and submitted to HQ within three months. Similarly, compilation of herbicide residues studies should also be done.
13. Some SAUs are violating the guidelines for filling-up of staff positions and shifting of staff.
14. Next Annual Group Meeting shall be held at DWSR during February/March, 2014.
15. Research publications by the Centres need improvement. Research papers can be sent for publication in IJWS.

16. GPS sets shall be provided to some of the Centres, for which, the PIs should submit requisition to HQ.
17. Herbicide residue analysis work needs strengthening because quality data are not coming from the centres.
18. Station trials by the Centre should be discussed in the Group Meeting.
19. Weed-free village concept should be followed by all the Centres. The Centres should insure that their university campuses are *Parthenium* free.
20. The work of Centres required more intensive monitoring, at least twice a year. Nodal Officer for respective zone along with one or two scientists from other nearby Centres shall comprise the monitoring team.

Dr. Sharma appreciated the efforts of CSKHPKV, Palampur Centre in organizing the Group Meeting efficiently.

Dr. S.P. Sharma, Director of Research, CSKHPKV, Palampur in his address emphasized on the following:

1. Low input technologies should get priority for filling the gap between research planning and demand of farmers.
2. Basic research must be published in high impact journals, whereas applied research should go to the farmers' fields.
3. Technologies generated and included in the state package of practices do not serve the desired purpose. A complete analysis of the constraints and impact at stakeholders level is necessary.
4. While conducting the FLD and OFT, digitization of those areas by GPS should be done.
5. Coded samples of soil, water and plants accurately analyzed at DWSR laboratory can be sent to the Centres for verification. More than 10% variation should not be acceptable.
6. Application of research papers and technology adopted in the farmers' field can be major indicators for judging the performance of the Centres.
7. Technical programme of AICRP-Weed Control was very well planned and focused on scientific lines. Dr. S.P. Sharma requested for enhancing the contingency grants to the Centres. He admitted that SAUs have their own problems, due to which, sometimes redeployment of staff is done. He was of the opinion that facilities should be shared across the AICRPs. Dr. Sharma informed that post-emergence herbicides are in great demand for peas even in tribal dominated districts of Lahaul Valley of H.P.

At the end Dr. R.P. Dubey, Incharge, AICRP-Weed Control proposed vote of thanks.

## General recommendations

### Research

1. A quarantine weed, *Ambrosia psyllostachia* noticed in Karnataka is a cause of concern. It was suggested to attend the problem immediately to restrict its further distribution followed by its eradication.
2. High-value crops like turmeric should not be overloaded with herbicides. A combination of chemical along with mechanical and cultural practices should be worked out for effective weed management.
3. Conservation tillage should become a part of farming and at least 30% of soil surface should be covered with crop residues. Weeds management in conservation agriculture needs utmost attention.
4. Indigenous weed management techniques are to be documented, validated and fine-tuned to suit local conditions.
5. Weeds are used as fodder or green manures, and such uses also need to be accounted for while calculating monetary returns.
6. Physiological studies on weeds in long-term experiments should be done in addition to weed density and seed bank.
7. Sponsored trial on “Evaluate weed control efficacy of glyphosate formulation (MON 76366) against weeds occurring in cotton and corn” should be conducted by the identified centres during 2013-14. Funds received from Monsanto will be released from the HQ.
8. Many Centres are not conducting the allocated experiments as per the approved network technical programme. It was decided that Centres should submit a detailed list of network trials to be conducted during 2013-14 along with modifications, if any, to Coordinating Unit within a month. If no information is received, it would imply that experiments listed in the Technical Programme for 2012-14 will be conducted by the respective centres.
9. A compilation of five major weeds at different states is underway. All PIs should submit the information including utilization aspects of the weed species in the proforma already supplied by Coordinating Unit by June 2013.
10. Coordinating Centres who have not submitted the comprehensive data on long-term trials on herbicides and tillage should submit the same within 3 months i.e. by July 2013.
11. Dr. Shobha Sondhia, Sr. Scientist, DWSR will compile the information on residue studies at the Coordinating Centres. She will provide common protocols/ methodology, and arrange to provide herbicide standards for conducting herbicide residue studies to the Coordinating Centres. It was also decided that laboratory facilities at DWSR can be utilized by the Centres in consultation with Dr. Shobha.
12. It was emphasized that chromatogram must be provided in all matrix under herbicide residue studies.
13. It is not possible to strengthen all centres for herbicide residue studies. Facilities available within the region at a nearby centre or at the DWSR HQ can be utilized.
14. It was noted that a common format for economic analysis of the experiments should be followed. Dr. Govindrajan, Economist at TNAU Centre will provide a common proforma for economic analysis.

15. All the Coordinating Centres will compile data on herbicides consumption in their respective states and provide the information to the Coordinating Unit by June end 2013.
16. Annual Report must be prepared as per the prescribed format and guidelines. PIs should take care of minute details such as font size, units, spacing, no. of pages, data analysis etc. There is no need to send the copy of the Annual Report by each centre directly to the ADG / DDG.
17. Nodal Officers identified for different regions / thematic areas should compile and synthesize the research findings, and present an overview of the centre's performance based on their assessment.
18. Quality of slides and presentation by some of the Centres was not good. PIs should check all the data carefully and present the major findings in a concise and scientific manner.
19. A presentation on the research work done at DWSR should also be made during the Annual Group Meeting. A copy of the Annual Report of the Directorate can be sent to all AICRP-WC centres.
20. There are large variations in the economic analyses, despite similar yields levels, due to different methodologies adopted for such analysis. A common protocol for economic analysis of the data will be developed and sent to all centres.
21. Protocols for on-station as well as on-farm trials / FLDs are not being followed by most centers. Some centers also do not conduct the allotted experiments as per approved technical programme. This is a serious issue, and the centers must do the committed experiments as per guidelines.
22. On-Farm Trials and FLDs should be conducted as per the prescribed guidelines and impact assessment of the technologies adopted should be done. Yields in most experiments, OFTs, FLDs are quite low – even lower than the state average. Trials should be well conducted so that the yields in the best treatment are up to potential level of the crop/variety.
23. Research work on weed management in horticultural and plantation crops, and also under rainfed conditions should be conducted.
24. Information for RFD i.e. technologies generated, impact, increase in productivity, trainings organized etc. should be submitted by the centres regularly for onward submission to the ICAR.
25. Weed Atlas prepared by the Directorate has to be revised as per the recent recommendation of RAC. Necessary information for this revision should be submitted by the Centres.
26. A compilation on important weed management technologies developed by each AICRP-WC centre will be made. One page note on each technology specifying the problem, technology developed, productivity and economic benefits, and precautions / constraints along with one small table and photograph should be submitted.

### **Administrative**

1. Annual Group Meeting will be conducted for three days, and all scientists working in the project will be invited as in the case of all other AICRPs. As part of the Silver Jubilee year (2013-14) of DWSR, the next Annual Group Meeting will be held at DWSR, Jabalpur during last week of February or early March, 2014.
2. Most Centres complained about inadequate budget under contingency for conducting experiments in view of the enhanced wages of farm workers. It was informed that this aspect has been taken care of in the SFC submitted to the Council which is yet to be approved.

3. There will not be necessarily uniform allocation of funds to all centres. Best performing centres will be identified based on selected criteria. Such centers can be considered for additional grants based on their performance.
4. A provision of Rs. 1.5 lakhs will be made under XII plan for purchase of happy seeder to be used under conservation agriculture experiments at Coordinating Centres.
5. General recommendations of QRT and specific recommendations to each centre should be effectively implemented. Centres identified as 'Average' and 'Below average' need to do serious introspection and improve their performance considerably.
6. Performance of the centres will be judged based on the reports of the monitoring teams, implementation of approved technical programme, quality of data in the Annual Report, presentation made in the AGM, research publications, OFTS / FLDs conducted, timely submission of AUC, staff position, expenditure statement and other information sought by the HQ, budget utilization, extension activities, awards / recognitions etc.
7. Funds under TSP will be allotted to those states having tribal districts as per classification of the Planning Commission. These funds should be effectively utilized for On-Farm Research Trials / FLDs, training and capacity building, and for development of physical assets as per guidelines.
8. It was suggested to propose change in the name of AICRP from 'AICRP on Weed Control' to 'AICRP on Weed Management'.

**All India Coordinated Research Project on Weed Control  
26-27 April, 2013**

**Venue: Chaudhary Sarwan Kumar Himachal Pradesh Krishi Vishvavidyalaya  
Palampur (Himachal Pradesh)**

**LIST OF PARTICIPANTS**

**DIRECTORATE OF WEED SCIENCE RESEARCH, JABALPUR**

- |     |                    |                                   |
|-----|--------------------|-----------------------------------|
| 1.  | Dr. A.R. Sharma    | Director                          |
| 2.  | Dr. P.K. Singh     | Pr. Scientist (Agril. Extension)  |
| 3.  | Dr. V.P. Singh     | Pr. Scientist (Agronomy)          |
| 4.  | Dr. Sushilkumar    | Pr. Scientist (Entomology)        |
| 5.  | Dr. Anil Dixit     | Pr. Scientist (Agronomy)          |
| 6.  | Dr. R. P. Dubey    | Pr. Scientist (Agronomy)          |
| 7.  | Dr. Shobha Sondhia | Sr. Scientist (Residue Chemistry) |
| 8.  | Dr. C. Kannan      | Sr. Scientist (Plant Pathology)   |
| 9.  | Dr. Bhumesk Kumar  | Sr. Scientist (Plant Physiology)  |
| 10. | Sri O.N. Tiwari    | Technical Officer                 |
| 11. | Sri Pankaj Shukla  | Technical Officer                 |

**SPECIAL INVITEES**

- |     |                  |   |
|-----|------------------|---|
| 12. | Dr. K.C. Gautam  | Ex. Principal Scientist (Agronomy) / Project<br>Coordinator, AICRP on Weed Control    |
| 13. | Dr. N.N. Angiras | Professor & Head (Retd.), Deptt. of Agronomy,<br>CSKHPKV, Palampur                    |
| 14. | Dr. H.L. Sharma  | Professor & Head, Deptt. of Agronomy (Retd.),<br>CSKHPKV, Palampur                    |
| 15. | Dr. G.L. Bansal  | Dean, College of Basic Sciences, CSKHPKV, Palampur                                    |
| 16. | Dr. C.L. Acharya | Former Director, IISS, Bhopal & Director of Extension<br>Education, CSKHPKV, Palampur |

**AICRP-WC CENTRES**

17.	Dr. M.S. Bhullar Principal Investigator, AICRP-Weed Control Dept. of Agronomy Punjab Agricultural University Ludhiana 141004 (Punjab)	20.	Dr. R. A. Yadav Principal Investigator, AICRP-Weed Control Dept. of Agronomy CSA University of Agriculture & Technology Kanpur 208002 (U.P.)
18.	Dr. R. Devendra Principal Investigator, AICRP-Weed Control Main Research station University of Agricultural Sciences Hebbal, Bengaluru 560 024 (Karnataka)	21.	Dr. C.T. Abraham Principal Investigator, AICRP-Weed Control Dept. of Agronomy Kerala Agricultural University KAU- P.O., Thrissur 680 656 (Kerala)
19.	Dr. J.P. Dixit Principal Investigator, AICRP-Weed Control Dept. of Agronomy College of Agriculture RVS KVV, Gwalior, (M.P.) 474 001	22.	Dr. M.M. Mishra Principal Investigator, AICRP-Weed Control Administrative building 2nd floor Dean of Research Orissa University of Agriculture & Technology Bhubaneswar 751 003 (Odisha)

23.	Dr. V. Pratap Singh Principal Investigator, AICRP-Weed Control Dept. of Agronomy College of Agriculture GBPUAT, Pantnagar 263 145 Distt. Udham Singh Nagar (Uttarakhand)	31.	Dr. M. Yakadri Principal Investigator, AICRP-Weed Control Diamond Jubilee Block Rajendranagar, Hyderabad 500 030 (Andhra Pradesh)
24.	Dr. S.K. Guru Sr. Research Officer, AICRP-Weed Control Dept. of Agronomy College of Agriculture GBPUAT, Pantnagar 263 145 Distt. Udham Singh Nagar (Uttarakhand)	32.	Dr. S.S. Punia Principal Investigator, AICRP-Weed Control Dept. of Agronomy CCS Haryana Agricultural University Hisar 125 004 (Haryana)
25.	Dr. J. Deka Principal Investigator, AICRP-Weed Control Dept. of Agronomy Assam Agricultural University Jorhat 785 013 (Assam)	33.	Dr. D.K. Roy Principal Investigator, AICRP-Weed Control Dept. of Agronomy Rajendra Agricultural University Samastipur, Pusa 848 125 (Bihar)
26.	Dr. A.S. Jadhav Principal Investigator, AICRP-Weed Control Dept. of Agronomy Marathwada Agricultural University Parbhani 431402 (Maharashtra)	34.	Dr. M.J. Mane Principal Investigator, AICRP-Weed Control Dept. of Agronomy, College of Agriculture Dr. Balasaheb Sawant Konkan Krishi Vidya Peeth Dapoli 415 712 (Maharashtra)
27.	Dr. C. Chinnusamy Principal Investigator, AICRP-Weed Control Dept. of Agronomy Tamil Nadu Agricultural University Coimbatore 641 003 (Tamil Nadu)	35.	Dr. A.P. Singh Principal Investigator, AICRP-Weed Control Dept. of Agronomy Indira Gandhi Krishi Vishva Vidyalaya Raipur 492 006 (Chhattisgarh)
28.	Dr. Jaidev Sharma Principal Investigator, AICRP-Weed Control, Dept. of Agronomy NDUniversity of Agriculture & Technology Kumarganj, Faizabad 224 229 (U. P.)	36.	Dr. Ramesh Babu Principal Investigator AICRP-Weed Control Main Research Station University of Agricultural Sciences Dharwad 580 005 (Karnataka)
29.	Dr. B. Duary Principal Investigator, AICRP-Weed Control Institute of Agriculture Visva - Bharati, Sriniketan 731 236 Birbhum, West Bengal	37.	Mr Vikas Sharma Jr. Microbiologist, AICRP-Weed Control Dept. of Agronomy Swami Keshwanand Rajasthan Agricultural University Bikaner 334 006 (Rajasthan)
30.	Dr. R.R Upasani Principal Investigator, AICRP-Weed Control, Dept. of Agronomy Birsa Agricultural University Kanke, Ranchi 834 006 (Jharkhand State)	38.	Dr. (Mrs.) Sheela Barla Jr. Agronomist, AICRP-Weed Control, Dept. of Agronomy Birsa Agricultural University Kanke, Ranchi 834 006 (Jharkhand State)

39.	Dr. Dinesh Badiyala Principal Investigator, AICRP-Weed Control Dept. of Agronomy, Forage and Grassland Management, College of Agriculture Ch. Sarwan Kumar HPKV, Palampur 176 062 (H. P.)	41.	Dr. Suresh Gautam Sr. Agronomist, Dept. of Agronomy, AICRP- Weed Control Ch. Sarwan Kumar HPKV, Palampur 176 062 (H. P.)
40.	Dr. (Mrs) Neelam Sharma Residue Chemist, Dept. of Agronomy, AICRP-Weed Control Ch. Sarwan Kumar HPKV, Palampur 176 062 (H. P.)	42.	Dr. Rajinder Kumar Jr. Microbiologist, Dept. of Agronomy, AICRP-Weed Control, Ch. Sarwan Kumar HPKV, Palampur 176 062 (H. P.)

#### AICRP-WC VOLUNTEER CENTRES

43.	Dr. Anil Kumar Professor of Agronomy, Department of Agronomy Sher-e-Kashmir University of Agricultural Sciences and Technology Main Campus, Chatha Jammu- 180 009, J&K	47.	Dr. Purshotam Singh Asstt. Professor (Agronomy) Sher-e-Kashmir University of Agricultural Sciences and Technology - Kashmir Shalimar, Srinagar 191 121
44.	Dr. Jai Kumar Sher-e-Kashmir University of Agricultural Sciences and Technology - Kashmir Shalimar, Srinagar 191 121	48.	Dr. Sandeep Singh Tomar Department of Agronomy Sardar Vallabh Bhai Patel University of Agriculture & Technology Meerut 250 110 (U.P.)
45.	Dr. J.P. Deshmukh Principal Investigator Department of Agronomy Dr. Panjabrao Deshmukh Krishi Vidyapeeth Akola, (M.S.) 444 104	49.	Dr. P. Saravanane Asstt. Professor (Agronomy) Dept. of Agronomy P.J. Nehru College of Agriculture & RI Serumavilangai, Nedungadu (P.O.), Karaikal, 609 603 U.T. of Pondicherry
46.	Dr. P.V. Singhrup Department of Agronomy Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, (M.S.) 444 104		
50.	<b>ICAR INSTITUTES</b> Dr. Sanjay Saha Pr. Scientist (Agronomy) CRRI, Cuttack (Odisha)	51.	<b>HERBICIDE INDUSTRY</b> Mr. Mahak Luthra Parijat Industries M77, New Delhi

**CSKHPKV, PALAMPUR**

52.	Dr. S. Bhan Prof. & Head Deptt. of Horticulture, College of Agriculture CSKHPKV, Palampur	59.	Dr. T.R. Sharma Professor & Head Department of Agricultural Biotechnology CSKHPKV, Palampur
53.	Dr. R.K. Mittal Professor Department of Plant Breeding & Genetics CSKHPKV, Palampur	60.	Dr. J.P. Saini Professor & Head, Department of Organic Agriculture CSKHPKV, Palampur
54.	Dr. J. Shekhar Sr. Agronomist Rice and Wheat Research Station, Malan	61.	Dr. Pankaj Chopra Asstt. Scientist, Deptt. of Agronomy CSKHPKV, Palampur
55.	Dr. S.K. Subehia Sr. Scientist (Soils) Deptt. of Agronomy CSKHPKV, Palampur	62.	Dr. Rajendra Prasad Sr. Agrometeorologist CSKHPKV, Palampur
56.	Dr. S.S. Rana Asstt. Scientist, Deptt. of Agronomy CSKHPKV, Palampur	63.	Dr. S.C. Negi Sr. Agronomist, Deptt. of Agronomy CSKHPKV, Palampur
57.	Dr. G.D. Sharma Sr. Agronomist, Deptt. of Agronomy CSKHPKV, Palampur	64.	Dr. M.C. Rana Assoc. Professor, Deptt. of Agronomy CSKHPKV, Palampur
58.	Dr. A.D. Bindra Agronomist Directorate of Ext. Education CSKHPKV, Palampur	65.	Dr. Pawan Pathania Sr. Scientist Deptt. of Agronomy CSKHPKV, Palampur