Proceedings of XIX Biennial Workshop of
Directorate of Weed Science Research Coordinating Centres,
February 23-24, 2010
Venue: Indira Gandhi Krishi Vishva Vidyalaya, Raipur- 492 006 (Chhattisgarh)

Date: 23-02-2010

INAUGURAL SESSION

The XIX Biennial Workshop of Coordinating Centres of Directorate of Weed Science Research was inaugurated by Shri P. Joy Oommen, IAS, Chief Secretary, Govt of Chhattisgarh. Dr. Krish S. Iyengar, IAS, Joint Secretary, NCPH, Ministry of Agriculture, Govt. of India was the special guest on the occasion. Dr M.P. Pandey, Vice-Chancellor, IGKV, Raipur chaired the session. Dr Jay G. Varshney, Director, DWSR, Jabalpur, Dr S.S. Shaw, Director of Research, IGKV and Dr A.P. Singh, Principal Investigator also graced the occasion.

Dr Jay G. Varshney in his address informed the house that the workshop is being organized at Raipur to focus weed control in Chhattisgarh and there is need to create awareness on weed control to solve food security problems in the country. He mentioned to give greater emphasis on management of invasive alien weeds and weedy rice, weed management under rainfed agriculture and under climate change. Sh. K.S. Iyengar was of the view that new technology is essential for growth in agriculture and the research should be taken up in mission mode. Dr M.P. Pandey cited that this was the most important event held at IGKV. He emphasized on research in weed management under rainfed rice ecosystems. Chief Guest, Shri Oommen in his address viewed that there is need for developing ecofriendly ways of weed management. The solution to problems need to be effectively communicated to the tribal farmers who are moving forward to adopt new technology and organized agriculture.

On the occasion following books/reports were released :

1. Herbicides Toxicology and Residue Methodology by K.M. Durga Devi, C.T. Abraham and T. Girija of KAU, Thrissur centre
2. Long Term Tillage and Integrated Weed Management in Cropping System by Dr C. Chinnusamy, TNAU, Coimbatore centre
3. Long Term Herbicide Trial in different Cropping Systems by Dr C. Chinnusamy, TNAU, Coimbatore centre
4. Hand Book on Weeds of Chhattisgarh, Vol. I, by A.P. Singh, T. Chowdhury, Shweta Gupta of IGKV, Raipur centre
5. Annual Report (2009-10) of DWSR Coordinating Centres

Awards to coordinating centres based on their performance were given. The Best Annual Report 2009-10 award went to GBPUAT, Pantnagar while Second Best Annual Report 2009-10 award was given to AAU, Anand centre. TNAU, Coimbatore was awarded the “Best Centre 2009-10” award.

At the end Dr A.P. Singh proposed the vote of thanks.

TECHNICAL SESSION – I

Presentation of salient findings and recommendations of network trials conducted during 2008-09.

Chairman	**:**	Dr. D. P. Singh, former VC, JNKVV
Co-Chairman	**:**	Dr. Jay G. Varshney, Director, DWSR, Jabalpur
Rapporteurs	**:**	Dr. C.T. Abraham, KAU, Thrissur Dr. B. Duary, V.B. Sriniketan

WS 1: Weed survey and surveillance

In the first part of the Technical session –I Seven presentations on salient findings of network trials were made by different resource persons. Dr. J. Deka from AAU, Jorhat presented the salient findings of Weed survey and surveillance at different centres. In the first part of his lecture he highlighted weed survey at different centres and presented weed flora of different habitats across the country state wise. In the second part he highlighted surveillance and shift of weed flora with probable reasons of shift. At Palampur, *Syndrella viallis,* a new weed was recorded in maize fields and *Commelina benghalensis* and *Brachiaria ramosa* population was increasing in maize due to continuous use of atrazine. *Lantana camara*, *Ageratum conyzoides*, *A. houstonianum*, *Parthenium hysterophorus, Imperata cylindrica*, *Bidens pilosa* are increasing in grasslands. At Hisar, broadleaf weeds like *Medicago denticulata*, *Chenopodium album*, *Rumex dentatus* are increasing in wheat field due to continuous use of clodinafop. At Ludhiana, *Poa annua* is increasing in wheat field due to continuous use of clodinafop and sulfosulfuron, *Coronopus didymus* is emerging as major weed in place of *Chicorium intybus* in berseem due to continuous use of atrazine in maize & sorghum. There was a good interaction among the scientist on the purpose and methodology of weed survey and surveillance.

Dr S.K. Guru, GBPUAT, Pantnagar presented the results of WS 1.2 to WS 1.7

WS 1.2: Studies on herbicide resistance in different weed flora

No resistance has developed against butachlor in *Echinochloa* in the lateritic zone of West Bengal and against azimsulfuron at Tamil Nadu due to continuous use of herbicide. For management of herbicide resistant *P. minor* at PAU, Ludhiana, alternative herbicides like pinoxaden was the most effective. Rate of resistance development in clodinafop and sulfosulfuron was more. Cross and multiple resistance in *P. minor* is developing against clodinafop and sulfosulfuron at Hisar. Resistance level against clodinafop is increasing over the years and very fast.

WS 1.3: Propagation potential of perennial weeds

Propagation potential of perennial weeds like *Cyperus rotundus* reduced to the maximum with glyphosate 1.5 kg/ha.

WS 1.4: Weed longevity of weeds associated with the major cropping systems under arable condition

Studies on weed seed longevity of weeds associated with major cropping systems revealed that in rice-wheat cropping system dominant weeds were *E. colona* and *E.*

crusgalli and in soybean-wheat cropping system *E. colona* and *C. rotundus* and in rice-rice cropping system *Leersia hexandra*, *Eleocharis*, *Ceratophyllum acutangulus* and *Monochoria vaginalis* were the dominant weeds.

WS 1.5: Crop weed toxicity of herbicide & recovery time

Measurement of relative fluorescence forms a good parameter to judge plant stress due to herbicide toxicity. Again herbicide damage to relative tolerance of weeds can be assessed by using chlorophyll content and membrane integrity.

WS 1.6: Physiological studies in long term net work trials

At Ludhiana, in rice- wheat system, the weed seed bank of *P. minor* had declined because of replacement of isoproturon with trifluralin in 2007-08 season. *R. dentatus* seed bank was higher in sulfosulfuron alone treatment but had declined in clodinafop as it was supplemented with metsulfuron or 2,4-D. In rice, seed bank of *E. crusgalli* had declined but that of *Caesulia axillaries* had increased in all treatments. The seeds of *C. iria* were higher in anilofos treatment but those of *I. rugosum* had declined.

In long term trial on tillage under maize-wheat system, at Ludhiana, in wheat, *P. minor* weed seed bank was lower in clodinafop treatment. It was also lower in conventional - zero and zero-conventional system than zero-zero or conventional - conventional system. *A. arvensis* seed bank was lower in zero-zero and conventional -zero (zero to wheat) systems as compared to two other systems. Clodinafop had higher seed bank of A. *arvensis* than hand weeding treatment. In maize the seed bank of *A. racemosa* was higher in conv-conv system. The seed bank of *E. aegyptiacum* was much lower than *A. racemosa.*

In the long-term herbicide trial in rice-wheat cropping system, at Pantnagar, there was a reduction in the net photosynthetic rate in the butachlor treatment as compared to the weedy, hand weeding and anilophos treated plots. Protein contents were similar in the herbicide treated plants as well as in the weed free plots whereas in the weedy plots, it was comparatively lower. Proline contents were lower in the herbicide treated plants as compared to that in the weedy and hand weeding treatments.

WS 1.7: Effect of CO_2 enrichment on response to different weed flora and herbicide efficacy

Studies on effect of CO_2 enrichment on weed species in different centres revealed that a few weed species like *D. marginata*, *D. aegyptium*, *B. articula* and *E. colona* responded to elevated CO_2 but *C. rotundus* and *Eleusine indica* did not respond to the CO_2 enrichment. Under enhanced temperature, higher level of CO_2 and humidity weed growth was more.

Discussion

Dr D.P. Singh, suggested that observations under experiments on effect of elevated CO_2 needs to be taken carefully and only after long hours of exposures. In physiological studies CGR should be calculated in place of RGR.

Dr R.K. Bhatia, Sr. Plant Physiologist, PAU, Ludhiana was requested to compile and prepared a report on last 10 years work carried out on IPU resistance in *Phalaris minor*. A common methodology for calculating GR_{50} values will be circulated to all concerned by Dr Bhatia.

Dr I.C. Barua, AAU, Jorhat presented the results of WS 1.8 and WS 1.9

WS 1.8: Study on biology of *Echinochloa*

Dr Barua, highlighted various morphological characteristics of six different species of *Echinochloa* and key for identification of weed seedlings and protocol for study of weed seedlings.

WS 1.9: Weed seedling identification method

Morphological characters of the seedlings at their very infant stage, after emergence of primary leaves, have been recorded observing the seedling from the top. At this stage, the developing lamina only had exposure to the digital camera. Altogether 12 characters, which have been found to be apparently stable for taxonomic operations were recorded.

WS 2 : Weed management in crops and cropping systems

Dr N. N. Angiras, CSKHPKV, Palampur presented the research findings.

WS 2.1 : Effect of time of sowing and weed control methods in direct seeded rice

Sowing after onset of monsoon and management of weeds by butachlor 1.5 kg/ha *fb* one hand weeding is economically effective to get higher productivity of direct seeded rice at Coimbatore, Faizabad, Kanpur, Ranchi, Jorhat and Raipur. However, at Dapoli, Pantnagar and Kerala sowing before onset of monsoon was superior to sowing after onset of monsoon in integration with butachlor *fb*1 H.W. At Bangalore, Pusa, Bhubaneswar, Hyderabad and Sriniketan irrespective of sowing time butachlor *fb* 1 H.W. was economical.

WS 2.2 : Effect of rice establishment techniques under different weed management practices.

Studies on effect of weed management practices under different rice establishment techniques showed that SRI in integration with pyrazosulfuron 30 g/ha (Pre.)/pretilachlor 0.75 kg/ha/butachlor 1.5 kg/ha *fb* mechanical weeding/hand weeding was effective to manage weeds and increase productivity of rice.

WS 2.3 : Effect of rice based cropping systems on weed dynamics and crop productivity

At Raipur, the dry matter production at 30, 60 DAS and at harvest was not significantly different due to different rice-based cropping systems. The variation in grain yield under cropping system treatments was found to be non-significant. The weed population at 60 DAS was maximum under rice-chickpea followed by rice-field pea and rice-linseed cropping systems during *rabi* season. Though the variation in yield of different *rabi* crops is significant but the yield of different crops is not comparable due to wide difference in their genetic yield potentials.

Significantly higher weed dry weight was recorded under wheat, greengram and field pea, while the lowest was recorded in ricebean at Jorhat.

At 90 DAS, the maximum total weed density was observed in direct seeded rice-potato system in the hand weeded plots it was 17% lower compared to weedy plots in same cropping system. The reduction in weed density in other systems ranged between 34 to 90%. Significantly higher grain yield was recorded in Rice-field pea and it was followed by Rice-berseem, Rice-potato and Rice-chickpea at Pantnagar.

At Kanpur, among *rabi* crops, berseem recorded lowest weed population at harvest.

At Ranchi, the weed population in chickpea increased. Direct seeded rice-wheat consistently recorded reduced weed dry matter accumulation as compared to rest of the cropping system. Direct seeded rice – wheat and Mustard was more competitive as compared to chick pea, field pea, potato, linseed or berseem. However, DSR- Potato recorded maximum wheat equivalent yield indicating minimum yield loss of 23.7% by weeds.

In direct seeded rice–potato cropping system integration with hand weeding twice produced significantly highest wheat equivalent yield at all the centres except Hyderabad and Ludhiana. In direct seeded rice-maize and transplanted rice-berseem/potato integration with hand weeding twice was the most productive treatment. Cropping systems did not significantly influence the productivity of rice.

WS 2.4 Effect of maize based cropping systems on weed dynamics, soil health and crop productivity

At Ludhiana, the cropping system did not influence the intensity of all the weeds statistically except *C. intybus* which was significantly higher in maize- berseem as compared to all the other cropping systems. However, dry matter of *P. minor* was the highest in mazie-potato system and was at par to maize- chickpea/fieldpea/berseem cropping systems. Maize-berseem system recorded the highest dry matter of broadleaf weeds and was at par to maize-potato-green gram system. Application of recommended herbicides to *rabi* crop significantly reduced intensity and dry matter of grassy and broadleaf weeds. During *kharif*, *A. racemosa* had highest infestation in maize-wheat/mustard, *E aegyptiacum* in maize-chickpea/fiekldpea/berseem, *C rotundus* in maize-potato-green gram. Cropping system did not influence the dry matter of grasses; however, maize-chickpea recorded the highest broadleaf weed dry matter. Dry matter of sedges was the highest in maize-potato-green gram cropping system.

: At Palampur, during *rabi* at 90 DAS, the population of *Phalaris minor* and *Avena ludoviciana* was significantly influenced by different cropping systems. The population of *Avena ludoviciana* was significantly reduced by potato, mustard, chickpea and pea crops over wheat crop. The dry weight of *Avena ludoviciana* was significantly reduced by potato and chickpea at both the stages of observations. However, it was statistically at par with pea and mustard at 120 and 150 DAS, respectively. The dry matter of *Coronopus didymus* was significantly reduced by potato and at par in mustard, chickpea and wheat crops. Results revealed that maize-potato cropping system resulted in significantly lower total weed count and weed dry matter at 90 DAS. However, it was statistically at par with mustard in total weed count at 90 days and total weed dry weight at 120 DAS. Potato crop produced significantly highest wheat equivalent yield. Pea crop was the next best in increasing the wheat equivalent yield.

During *kharif*, The population of *Commelina benghalensis* was significantly reduced by maize – pea cropping system at 60 and 90 DAS but it was statistically at par with maize-chickpea at 60 DAS, with maize- mustard and maize- wheat at 90 DAS. While significantly lowest population of *Echinochloa colona* was obtained with maize-wheat cropping system.

WS 2.5 : Integrated weed management studies in sugarcane ratoon

Metribuzin 0.88 kg/ha (3DAP) *fb* hoeing (45 DAP) *fb* 2,4-D(Na) 1.25 kg /ha (90 DAP) was found to be economically best treatment at Bhubneswar and Pantnagar. However, at Pusa atrazine 2.0 kg/ha (3 DAP) *fb* 2,4-D 0.5 kg/ha (75-90 DAP) was economically best treatment.

WS 2.6 : IWM in sugarcane intercropping systems

At Faizabad, intercropping of potato with sugarcane in with isoprotuiron 1.0 kg/ha (Pre.) /pendimethalin 1.0 kg/ha (Pre.) produced significantly higher cane yield and also additional yield of potato by smothering weed infestation.

At Kanpur, intercropping of black gram with sugarcane produced significantly highest cane yield and also produced additional yield of black gram over sole sugarcane by controlling weeds.

WS 2.7 : Efficacy of carfentrazone and pinoxaden with and without surfactant against grasses and broad leaf weeds in wheat

Sequential application of pinoxaden 40 g/ha (35 DAS) *fb* carfentrazone 25 g/ha with 1% ammonium sulphate (42 DAS) was most effective for effective weed management in wheat and producing more yield of wheat.

Dr. C. Chinnusamy, TNAU, Coimbatore presented the results of WS 2.8 and WS 2.9.

WS 2.8 : Long term trial on tillage in different cropping systems

In rice-rice system, at Bhubaneswar the treatments of Conventional tillage-Conventional tillage (CT-CT) considerably reduced the weed density (11.1% to 28.3%) and weed biomass (17.7% to 26.3%) over Zero tillage (ZT) – Conventional tillage (CT) and CT - ZT methods during different stages of crop growth. Use of butachlor (1.5 kg ha-1) reduced the weed density by 63.6% over unweedy check during initial stages of crop growth. The yield reduction in ZT - ZT method was in the tune of 25% as compared to CT - CT method ZT – ZT method alongwith use of herbicide obtained the maximum B:C ratio of 1.86 in *rabi* rice and 1.80 in *kharif* rice as compared to other combinations of tillage and weed management practices.

At Raipur, under rice-wheat system different tillage treatments did not influence the weed population at 60 DAS and grain yield in both the crops.

At Pantnagar, application of isoproturon 1.0 kg/ha + metsulfuron-methyl 4 g/ha at 35 DAS recorded lowest weed density and highest grain yield in wheat crop. Conventional tillage in wheat caused significantly higher dry weigh of grassy, broad leaved and total weeds than zero tillage. In rice crop also conventional tillage recorded higher weed dry weight than zero tillage. Tillage and weed control in wheat did not influence the grain yield in rice.

At Kanpur, in rice-wheat system, in both the crops conventional tillage recorded the lowest weed dry weight and higher grain yield. Among weed control treatments minimum weed dry weight in wheat crop was observed in hand weeding fb sulfosulfuron 30 g/ha.

At Faizabad, in rice-wheat system, low density of total weed and their dry weight was observed under zero tillage condition as compared to wheat sown through conventional tillage. Total weed density and their dry weight was significantly less in isoproturon treated plots over weedy check. The highest grain yield of wheat was recorded when crop was given two hand weeding at 30 and 50 DAS.

In maize based cropping system, at Ludhiana, in wheat, the dry matter of both grassy and broadleaf did not vary statistically among tillage systems. Alternate zero and conventional tillage recorded significantly higher grain yield than continuous zero or conventional tillage system and the recommended herbicide and produced significantly higher grain yield than hand weeding and weedy check. In maize, herbicides and hand weeding reduced population and dry matter of grassy and broadleaf weeds as compared to weedy check. Alternate system of Z-C tillage produced the highest grain yield. The recommended herbicides recorded higher grain yield than two hoeings.

In maize-chickpea system, at Dharwad, the weed dry weight was lower in hand weeding (328 kg/ha) than recommended herbicide atrazine 1.0 kg/ha (397kg/ha) and weedy check (2005 kg/ha) at 60 DAS in maize. Among weed management practices, the hand weeding (7189 kg/ha) and recommended herbicide (6244 kg/ha) were superior to weedy check (4323 kg/ha), thus could register 66 and 44 per cent more maize grain yield over weedy check.

In pearlmillet based cropping system, at Anand, tillage treatments did not show any effect on weed dry weight recorded at harvest in pearlmillet. The maximum WCE (88.1 %) reported under HW carried out at 30 DAS followed by application of atrazine 0.50 kg/ha in *kharif* pearl millet (85.9 %). Significantly higher grain yield (2514 kg/ha) was recorded under pre-emergence application of atrazine 0.5 kg/ha. The tillage treatments failed to manifest any effect on weed dry biomass in wheat. Among weed management practices, hand weeding done at 30 DAS showed significantly lower dry weed weight (221 kg/ha) which was at par with pre emergence application of pendimethalin 0.5 kg/ha. Tillage treatment had no significant effect on grain and straw yield of wheat. Significantly higher grain (4377 kg/ha) and straw (8672 kg/ha) yield were recorded under hand weeding done at 30 DAS which was at par with pre-emergence application of pendimethalin.

In pulse based cropping system, at Parbhani, in soybean, lowest dry matter of broad-leaved weeds was observed in CT-CT. The maximum weed control efficiency of grassy weeds at 30 and 60 days was observed in CT-CT. Soybean crop recorded significantly highest grain yield under tillage practices of CT-CT tillage system. As regards weed control treatments, 2 HW produced significantly higher grain yield and was found at par with pre- emergence application of alachlor 2.0 kg/ha. In wheat, the lowest dry matter was observed in CT-CT tillage system which was found at par with Minimum-Minimum tillage system & ZT-CT tillage system and found significantly lowest than rest of the treatments. Wheat crop recorded the highest grain yield under the tillage practice of Conventional - Conventional tillage system i.e. Bed-Bed system which was found at par with minimum – minimum tillage system and found superior over rest of the treatments.

WS 2.9 : Long term herbicide trial in different cropping systems

In rice-groundnut system, in the 9th year, application of butachlor + 2,4-D EE –organic matter to rice and alachlor to groundnut recorded the highest BC ratio of 1.82 at Bhubneswar. Where as in rice-rice system, continuous application of butachlor + 2,4-DEE herbicide mixtures in every season or rotational application of butachlor + 2,4-DEE during *kharif* and pretilachlor + 2,4-DEE during *rabi* did not show build up of these herbicides in the post harvest soil or grain and straw at Coimbatore.

At, Thrissur, in rice-rice system, in the 9th year, application of butachlor/ pretilachlor as pre emergence did not give sufficient grass weed control in the rice field. Few *Echinochloa sp.* survived during the initial years produced seeds profusely which resulted in gradual build up of their population over the years. However, FYM application significantly improved the bioefficacy of butachlor and pretilachlor. *Echinochloa* build up was not noticed in FYM treated plots. Variations in the population of *Echinochloa sp.* between years is attributed to the rainfall pattern also.

At Ludhiana, in the 16th year, in rice- wheat cropping system, in wheat, all the herbicides effectively controlled *P. minor* as compared to unweeded control. Sulfosulfuron and 2, 4-D performed poorly against *R. dentatus* and *C. album* while triflurlain against *M denticulata.* Trifluralin and sulfosulfruon both followed by 2,4-D, clodinafop fb metsulfuron and rotational treatment were at par and recorded significantly higher grain yield than the rest of herbicidal treatments. In rice, *E. crusgalli* was observed in al treatments but it was more in continuous butachlor and pretilachlor treatments. Anilofos gave good control of *I. rugosum while* C. axilaris was more in continuous anilofos and rotational treatment. *C. iria* was higher in rotational treatment. Anilophos in integration with metsulfruon gave the highest grain yield. Butachlor and pretilachlor alone gave lower grain yield as compared to rotational treatment and when these herbicides were integrated with metsulfruon.

Rotational use of clodinafop 60 g/ha *fb* 2,4-D 1.0 kg/ha in wheat at Palampur and continuous use of clodinafop at Hisar resulted in significantly lower population and dry matter of *Phalaris minor* and other weeds in rice-wheat cropping system

Dr V.P. Singh, GBPUAT, Pantnagar presented the results of WS 2.10, WS 2.11 and WS 2.12

WS 2.10 : Long term studies on weed management in rice-chickpea croppi system

WS 2.11 Long term studies on weed management in rice-wheat cropping system

WS 2.12 Long term studies on weed management in maize-chickpea/ lentil/ pea

- Long term studies on weed management in rice-chickpea cropping system have been conducted since 2006-07. Results revealed that lowest weed density and highest grain yield was obtained with the application of pendimethalin 0.75 kg/ha fb one hand weeding at 30 days after sowing in chickpea at Pantnagar and Faizabad. In addition, application of anilophos 0.5 kg/ha as pre-emergence in rice during *kharif* season encouraged the yield of chickpea significantly during *rabi* season over rest of the treatments. In rice, hand weeding 20 and 40 DAS and butachlor 1.5 kg/ha and anilophos 0.5 kg/ha each along with one hand weeding being similar to each other provided excellent control of weeds as compared to weedy treatment.
- Long term studies on weed management in rice-wheat cropping system have been conducted since 2006-07. At Jorhat, application of isoproturon with adjuvant produced significantly higher grain yield and lower weed density and dry weight. Butachlor increased grain yield of rice significantly over weedy check and mechanical weeding, but it was at par with

pretilachlor, the effect was also seen in case of weed density and dry weight. However, residual effect of weed management in wheat was not observed in rice. Residual effect of weed management in rice was observed in wheat in terms of weed density and dry weight, but without any effect on grain yield**.** The treatments involving non-chemical weed management viz., weedy and mechanical weeding showed relatively higher microbial population, even with application of herbicides in the preceding crop. *Azotobacter* and *Azospirillum* population was relatively higher in both the crops compared to the PSB population.

- Long term studies on weed management in maize-pea cropping system have been conducted since 2006-07. At Pantnagar, in maize-pea cropping system, lowest weed density was recorded with pendimethalin 0.75 kg/ha supplemented with one hand weeding and pendimethalin 1.0 kg/ha followed by mechanical weeding. Significantly higher yield of pea was recorded with mechanical weeding (30 and 60 DAS) and pendimethalin 0.75 kg/ha *fb* one HW.

At Palampur, in maize, significantly higher grain yield of maize was obtained with the application of atrazine at 1.5 kg/ha. In pea, application of pendimethalin 0.75 kg/ha fb mechanical weeding being statistically and mechanical weeding twice resulted in significantly higher pod yield of pea by effective control of the weeds.

In field pea/chickpea at Ludhiana, integration of pendimethalin at 0.75 with one hoeing gave season long control of weeds and recorded seed yield at par to two hoeings. Microbial population in soil showed a downward trend upon herbicidal treatments.

At Anand, in maize, significantly higher grain yield (3854 kg/ha) was recorded with pre-emergence application of atrazine (0.75 kg/ha) *fb* post emergence application of 2, 4-D. While in chickpea, significantly higher seed yield was recorded in pre-emergence application of pendimethalin (0.75 kg/ha) *fb* mechanical weeding which was at par with pre emergence application of pendimethalin 1.0 kg/ha.

Discussion: MAU, Parbhani centre was requested to distribute the Cycle hoe to DWSR and other coordinating centres.

WS 3 : **Management of parasitic/invasive/problematic/ aquatic weeds**

Dr. T.V. Ramchandra Prasad, UAS, Bangalore presented the results.

WS 3.1 : Management of *Cuscuta*

In Lucerne, pendimethalin 1.0 kg/ha (pre-em), stale seed bed + paraquat 0.5 kg/ha or pendimethalin 0.5 kg/ha (post-em, 20 DAS) in Bikaner, pendimethalin 0.5 kg/ha post-em and Imazethapyr 150 g/ha post-em in Hyderabad gave effective control of *Cuscuta* by reducing the density by almost 60% and doubling the forage yield. In mustard, summer deep ploughing lowered *Cuscuta* menace by 5%. Stale seed bed *fb* pendimethalin 0.5 kg/ha as pre-em., pendimethalin 1.0 kg/ha as pre-em sand mix, imazethapyr 75 g/ha – PPI lowered the menace by 50%.

WS 3.2 : Management of *Orobanche* sp. in different crops

In mustard, neem cake 200 kg/ha (in rows) *fb* hand weeding or hoeing 60 – 75 DAS, neem cake 200 kg/ha (in rows) *fb* spraying, glyphosate 25 g/ha (directed application) 60 -75 DAS was effective in controlling *Orobanche* at Hisar.

WS 3.3 : Management of *Orobanche* in tomato, potato, tobacco and brinjal-based system

In tobacco, brinjal and potato to lower the density of *Orobanche* neem cake 200 kg/ha (in rows), spraying of glyphosate 2 g/l or paraquat 0.6 g/l – 55 DAP were found effective. Soil solarisation delayed emergence/ lowered *Orobanche* menace by 60-70% at Pusa.

WS 3.4 : Management of *Striga* in maize, sorghum, sugarcane and pearl millet

In sugarcane, at Coimbatore, pre-em atrazine 1.0 kg/ha *fb* mulching with crop residues after final intercultivation on 120 DAP, 2,4-D Na salt 1.0 kg/ha + urea 1% + soap solution 1% at 70 – 75 DAP was the best in lowering *Striga*.

WS 3.5 : Management of *Dendropthoe* (syn.*Loranthus)* on fruit trees

At Thrissur, trimming the infested branches, spraying ethrel 4000 ppm on parasite showed defoliation in 2 weeks, but regrowth was observed in 6 months**.**

WS 3.6 : Management of aquatic weeds (*Eichhornia crassipes*)

Glufosinate of ammonia 6.5 g/l, metsulfuron methyl 0.05 to 0.075 g/l caused complete drying without regeneration till 120 days at Jorhat. In Kerala, glyphosate 7.5 to 10 ml/l, 2,4-D Na salt 1.25 g/l caused complete drying at 45 days. Herbicides did not affect fish. Decaying water hyacinth due to herbicides caused eutrophication and affect dissolved oxygen content in the water.

WS 4 : Herbicide testing, leaching behaviour, persistence, residues and toxicity

Chairman : Prof. N.N. Angiras, CSKHPKV, Palampur

Rapporteurs : Dr P.P. Choudhary, DWSR, Jabalpur
Dr G. R. Hareesh, UAS, Bangalore

WS 4.1 : Studies on herbicide residue in food chain, soil and ground water

Dr Shobha Sondhia, DWSR, Jabalpur presented the results

Herbicides like isoproturon, fenoxaprop, sulfosulfuron, pretilachlor, quizalofop ethyl, trifluralin, pendimethalin, cyhalofop butyl, atrazine, imazethapyr, clodinafop, 2,4-D, butachlor, anilophos, fluchloralin, pinoxaden, metsulfuron-methyl and a combination product of mesosulfuron and idosulfuron were applied on different crops like rice, wheat, soybean, pearlmillet, coriander, maize, groundnut, chickpea at various centres. Residues were below detectable limit in soil and grain. Only pendimethalin residues were detected at the time of harvest in sandy loam soil under groundnut crop at Anand.

WS 4.2 : Studies on herbicide persistence in water

Dr Neelam Sharma, CSHPKV, Palampur presented the results

Paraquat residue was below detectable limit in water at Jorhat. No fish mortility was found. Anilophos, butachlor, isoproturon, 2,4-D, clonilafop and sulfosulfuron did not move into the ground water in Punjab at 50-475 feet. Paraquat residues was detected in water up to 15 days, within 20 days more than 90% of applied 2,4-D was degraded. From the toxicological point of view, fatty infiltration in liver with paraquat and effect on muscles of fish by 2,4-D and glyphosate were observed at Thrissur.

Dr R.B. Patel AAU, Anand presented the results of WS 4.3, WS 4.4, WS 4.5 and WS 4.6

WS 4.3 : Characterization of leaching behavior of herbicide in soil.

2,4-D leaches in soil up to 30-40 cm as per bioassay technique using greengram as test crop at Gwalior. At Jorhat, butachlor and pretilachlor residues were detected up to 25 cm depth of leaching through soil column at twice recommended dose, while the same for recommended dose was observed up to 20 cm depth. Alachlor residue decreased with increase in soil depth and residue was detected upto 60 cm depth under both the levels of application (2 and 4 kg/ha) at Coimbatore. Increased dose of application enrich the soil with that herbicide molecule besides transporting considerable quantity to lower depth also. At Pantnagar, leaching of metsulfuron-methyl showed the residue concentration was maximum at the middle of column mainly at the depth from 30 to 40 cm, indicating high mobility of metsulfuron methyl in soil column. At Palampur, at two levels of application of sulfosulfuron i.e. 25 g/ha and 50 g/ha, most of sulfosulfuron herbicide remained only up to 25 cm but the movement of herbicide is up to 50 cm. Similarly in case of mobility studies of metsulfuron at two levels of application i.e. 4 g/ha and 8 g/ha, most of the herbicide remained only up to 20 cm but the movement of herbicide was up to 45 cm. More than 60 % of the applied herbicide remained at the 0 -10 cm layer. Only less than 20 % leached out to a depth below 20 cm, as reported at Thrissur.

WS 4.4 : Persistence of herbicides in the farmers field (soil and crop produce).

No residue above MRL was detected with herbicides isoproturon, butachlor, pretilachlor, atrazine and pendimethalin at Pantnagar, Palampur, Thrissur, Bhubaneswar, Coimbatore, Anand and Hyderabad in wheat, rice, maize, groundnut and tomato.

WS 4.5 : Studies on secondary metabolites of herbicides

Only one centre (TNAU) performed this study on atrazine. Some metabolities like S- triazine-2-ol, 4- (ethyl amino)- 6- (isorpoyl amino hydroxyl) atrazine and 1,35- triazin 2,4-D diamine were identified in soil collected from farmers field.

WS 4.6 : Adsorption and desorption behaviour of herbicides

Adsorption of alachlor was high in peat soil followed by black and red soil. On an average, 70-80 % of the applied 2,4-D was adsorbed in rice soil within 2 hrs. The adsorption of pendimethalin varied from 48.3, 62.7 and 56.4% in case of red, black and alluvial soil, respectively.

Discussion

1. **Dr. D.P. Singh –** It is important to present data of herbicide residues in food chain.
2. **Dr. Jay. G. Varsheny** – Some centres should carry out the study on secondary metabolite isolation

Chairman's remark – Residue, persistence and metabolism study should be carried out accurately in all phases of environment including food chain. Then only recommendation for farmers can be made. On the basis of this results integrated approach of agronomic practices can be suggested to farmers to minimize the pesticide residue in substrates.

WS 5.0 : Transfer of technology

Chairman : **Dr S.S. Kolhe, IGKV, Raipur**

Rapporteurs : Dr. S.S. Tomar, RVSKVV, Gwalior
Dr. J. Deka, AAU, Jorhat

WS 5.1 : *Parthenium*-management by *Zygogramma* beetles

Dr. Sushilkumar, DWSR, Jabalpur presented the salient findings

It was found that the Mexican beetle has established in many parts of Uttar Pradesh, Himachal Pradesh, Haryana, Punjab, Karnataka, Uttranchal, Andhra Pradesh, Tamilnadu, Madhya Pradesh while in few other states like in Orissa, Assam, West Bengal, Bihar, Jharkhand its establishment was moderate while at few sites like Gwalior, Anand, Jorhat beetle could not be established.

The following suggestions were recommended-

(i) Extensive survey may be conducted in the target states wherein the beetle did not establish to find out the reasons and needful solutions.

(ii) It is important to find out the optimum time for release and establishment of the beetle in different states/zones

WS 5.2 : Yield loss estimation

Dr. Jaulkar of RVSKV, Gwalior presented the salient findings

Dr Jaulkar analyzed data of recommended practices, farmers practice and weed free practices. Comparison was made between recommended practice and farmers practice as well as recommended practices and weed free practices. Yield loss estimates were given. However, farmers' practice was not defined and therefore the comparative values were not acceptable to the house. Major constraints have been prioritized and accordingly electricity, labour shortage and water were named. The presentation also showed the major information source of weed management as SAU/extension Agency/Govt. Agril. Department. Farmers are partially satisfied with the technologies. Anticipated yield loss due to weeds in different crops was in the range of 10-60%. Further, lack of technical knowledge was cited as the main reason for non-adoption of technology. It was suggested that the causes of huge losses reported in various crops under specific conditions should be explained.

WS 5.3 : On Farm trial (OFT)

Dr. B. Duary, V.B., Sriniketan presented the salient findings

A total of 278 OFTS have been conducted out of which rice and wheat comprised 102 and 84, respectively and rest on other crops. Technologies in pipe line were tested vis-a-vis farmers practice. It was decided that number of treatments should be restricted to 3 to 4 only in any OFT. The house accepted the suggestion that the format given for compilation of success stories should be used. It was also suggested that trade names of herbicides should not be mentioned, only common names should be used.

WS 5.4 : Impact analysis on weed management

Dr. K. Govindarajan, TNAU, Coimbatore presented the salient findings

In context of impact analysis of weed management, discussion was made on constraints, yield gain and awareness adoption of weed management. Partial budgeting and function budget analysis were used as tool for analysis of data. It was suggested that sample size should be more (at least 30). Also range of the yield data should be mentioned.

Date: 24.02.2010

TECHNICAL SESSION – II

Presentation of research highlights (Station trials) by coordinating centres/ volunteer centres

Chairman	**:**	**Dr. D.P. Singh, Ex- VC, JNKVV, Jabalpur**
Rapporteurs	**:**	Dr. Anil Dixit, DWSR, Jabalpur Dr. N.C. Deka, AAU, Jorhat

All the 22 DWSR centres conducted the state trials in addition to the network trials to meet out the local needs of the States. The station trials included 'ethno-botanical studies of important weeds, chemical methods of weed control by using new molecules for field crops, horticultural crops including floriculture & cropping systems, production of organic crops by using vermi-compost produced from weed biomass, evaluation of weed control implements for its weed control efficiency, evaluation of competitive rice cultivars to dominate over weeds, performance of rice transplanting by 'thumba method', enrichment of vermi-compost produced from weed biomass by using PSB, Azospirillium etc.

Among volunteer centres, six centres namely; Meerut, Agra, Kalyani, Madurai, Trichi and Akola presented their activities. It is learnt that except a few, most of the volunteer centres are new to the research on weed science. The activities of these centres encompass weed survey, management of weeds in local crops and cropping systems etc.

After a brief discussion the following suggestions were recommended-

The findings of the results of the volunteer centres may be compiled and presented along with the results of the identical experiment of the network centres of DWSR.

Later on, it was informed to the house that a financial grant of Rs. 10000.00 (Rupees ten thousand) only for each trial will be provided to the volunteer centre subject to the condition that the research should be conducted in true scientific fortitude.

TECHNICAL SESSION III

Formulation of Network technical programme for 2010-11 & 2011-12

Chairman	**:**	Dr. D.P. Singh, Ex- VC, JNKVV, Jabalpur
Rapporteurs	**:**	Dr. Anil Dixit, DWSR, Jabalpur Dr. B. Duary, V.B., Sriniketan

In technical session-III network technical programme for 2010-11 and 2011-12 was formulated in four concurrent sessions.

i) Agronomy WS1, WS2, WS3, Weed utilization and others.
ii) Physiological and climate change studies
iii) Microbiological studies
iv) Herbicide residue studies

The final technical programme by session conveners was presented for interaction, modification and suggestions.

First presentation was made by Prof. T.V. Ramchandran Prasad of UAS(B) on technical progamme of agronomical aspects. Dr. Prasad suggested for enhancement of contingency and providing addional fund for OFT. The final technical programme on agronomical aspect was accepted by the house after some modification and suggestion.

Prof. R. Devendra presented the technical programme on physiology and climate change and the programme was finalized with some modifications.

Dr. Tapash Chowdhury, and Dr. Shobha Sondhia presented the technical progamme on microbiological studies and herbicide residue studies, respectively. It was decided that no separate field experiments will be conducted for these two groups. Finally, the technical programme was accepted after some modifications.

PLENARY SESSION

Chairman	**:**	**Dr. M.P. Pandey , Vice Chancellor, IGKV, Raipur**
Co-Chairman	**:**	Dr D.P. Singh, Ex-VC, JNKVV, Jabalpur
	:	Dr. Jay G. Varshney, Director, DWSR, Jabalpur

The summary presentation and recommendations of each technical session was made by the rapporteurs. The chairman suggested that the proceedings of all the technical sessions which were presented by respective rapporteurs should also be circulated in the house. He suggested to initiate studies on exploitation of genetic variability on weed suppression and also to work on GM approach. Dr D.P. Singh expressed his happiness on new research proposals particularly on effect of climate change and herbicide residues in food chain.

At the end Dr (Mrs) S.K. Randhwa, Principal Investigator PAU, Ludhiana was felicitated on her superannuation. The house profusely thanked her for the services rendered in the project and wished her peaceful retired life.

Finally Dr R.P. Dubey, I/C coordinating unit, DWSR, Jabalpur proposed the vote of thanks and assured the chairman to initiate action on suggestions made by him.

RECOMMENDATIONS

Technical

1. Reporting of weed survey and other data should be uniform at all the centres. The technical programme should be scrupulously followed by the coordinating centres.
2. Shift in weed flora and herbicide resistant weeds were noticed due to continuous use of some herbicides. New weeds species are also seen in some areas. There is need to strengthen the weed surveillance programme and action has to be taken to manage the new weed problem.
3. PAU, Ludhiana, GBPUAT, Pantanagar and CCSHAU, Hisar centres were requested to send IPU resistant P. minor seeds to DWSR, Jabalpur, UAS, Bangalore, RAU, Pusa, NDUAT, Faizabad, RVSKVV, Gwalior.
4. In view of the increasing trend in atmospheric CO_2 level, research needs to be strengthened to study the response of individual weeds to elevated CO_2 levels and higher temperature.
5. More coordination is needed among plant physiologists working under the project.
6. Studies on aquatic weed control should emphasise on biological control measures.
7. The long term herbicidal trial being conducted for the last 8-9 years have not shown any build up of herbicide residues in soil or crop produce.
8. The long term trial on tillage under different cropping system showed that zero/conservation tillage is feasible in many crops i.e. direct seeded rice, wheat, pearlmillet without any reduction in crop yield or adverse effect on soil properties.
9. For management of aquatic weed water hyacinth spraying of glyphosate 10 ml/l or 2,4-D 5 g/l of water may be recommended. No direct adverse effect has been noticed in fish from these herbicides.
10. For management of parasitic weed *Cuscuta*, pendimethlin 1.0 kg/ha pre or post emergence, stale seed bed *fb* pendimethalin + 0.5 kg/ha in lucerne may be recommended.
11. Under characterization of leaching behaviour of herbicides in soil, it was recommended to include surface runoff studies on herbicides applied.
12. Besides studies on effect of herbicides on microbes, earthworm should also be included under pot experiments.
13. At centres where Mexican beetle has not survived a study may be conducted to find out if there are any predators on the beetles.

Administrative

1. Shifting of trained scientists working in the project should be avoided at university level as this hampers research work output.
2. Training to scientists on GPS application in weed surveillance programme need to be provided.
3. Weed atlas and weed seed atlas may be purchased by all the coordinating centres.

DIRECTORATE OF WEED SCIENCE RESEARCH, JABALPUR

XIX BIENNIAL WORKSHOP OF COORDINATING CENTRES

Venue : Indira Gandhi Krishi Vishva Vidyalaya, Raipur – 492 006 (Chhattisgarh).

Date : February 23-24, 2010

LIST OF PARTICIPANTS

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6.	Dr. Sushilkumar	Sr. Scientist (Entomology)
7.	Dr. Shobha Sondhia	Sr. Scientist (Residue Chemistry)
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9.	Dr. P.P. Choudhary	Sr. Scientist (Residue Chemistry)
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