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कार्यवृत
Proceedings

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की XXIII वार्षिक समीक्षा बैठक

XXIII Annual Review Meeting of
All India Coordinated Research
Project on Weed Management

स्थान
जैन इरीगेशन सिस्टम्स, जलगांव (महाराष्ट्र)

28–30 अप्रैल, 2016

Held at

Jain Irrigation Systems, Jalgaon (Maharashtra)

28-30 April, 2016

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Proceedings of
XXIII Annual Review Meeting
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INAUGURAL SESSION

Inaugural session was graced by the presence of Chief Guest, Dr. Subramaniam, Senior Vice President, Jain Irrigation system, Jalgaon, Guests of Honour, Mr. B. Patil, Agronomist, Jain Irrigation System, Jalgaon, Dr. A.R. Sharma, Director, ICAR-Directorate of Weed Research, Dr Shobha Sondhia, In-charge All India Coordinated Research Project on Weed Management, ICAR-DWR, Jabalpur. The scientists of coordinating centres, volunteer centre, ICAR Institute, ICAR-DWR, Jabalpur, Jain Irrigation system and UPL industry attended the meeting. After lighting of the lamp by the Chief Guest, Dr. A.R. Sharma, Director, ICAR-DWR welcomed the participants and gave a brief description of Jain Irrigation system, its success in short span of time and pioneer work in the field of drip irrigation system, processing of farm produce, tissue cultured products etc. for the welfare of farmers. Homage was paid to Mr. Bhavarlal Jain, founder of Jain Irrigation Systems. Dr Sharma highlighted the role of AICRP-WM in managing weeds and made a brief presentation of salient research achievements of ICAR-DWR, Jabalpur. Dr. Sharma appreciating the good work being done by AICRP-WM centres. He made a brief presentation of research highlights of work done at ICAR-DWR, Jabalpur. Dr. Shobha Sondhia presented salient research achievements of AICRP-WM.

In the inauguration ceremony, three books i) 'Weed Science' by the scientists of BAU, Ranchi, ii) 'Integrated Weed Management in Modern Agriculture' in Gujratibu language by AAU, Anand and iii) 'Technologies on Weed Management' by ICAR-DWR, Jabalpur were released. Dr Madhuban Gopal, Emeritus Scientist and Consultant, Monitoring of Pesticide Residues and Dr A.N. Tewari, Ex Dean, CSAUAT, Kanpur were the resource persons. Best AICRP-WM Centre Award was presented to PAU Ludhiana for significant achievements in weed management in the state of Punjab. Dr Santosh K. Deshmukh, Jain Irrigation System, Jalgaon proposed vote of thanks.

TECHNICAL SESSION – I

Presentation of salient findings of AICRP-WM Centres in North Zone

Chairman	**:**	Dr. A.R. Sharma, Director, ICAR - DWR, Jabalpur
Rapporteurs	**:**	Dr. T. Girija, KAU, Thrissur
		Dr. Dinesh Shah, CAU, Pasighat

Dr. Shobha Sondhia presented the action taken report of all the centres on the recommendations of 22st ARM held at 17-18 October, Hyderabad. Dr. Madhuban Gopal desired that ATR should be more specific.

Dr. Bhumesh Kumar, Nodal officer presented the overview of five north zone centres viz., Jammu, Palampur, Ludhiana, Pantnagar and Hisar. An over view of experiments undertaken, results, publication, staff position, constraints etc were discussed and general suggestions were given. This was followed by presentations by PIs of this zone.

PAU Ludhiana

Dr M.S. Bhullar presented highlight of PAU, Ludhiana centre.

- Imazethapyr phytotoxicity to mustard was not observed in loamy soil, however, imazethapyr was not found safe in berseem.
- Carfentrazone and metsulfuron was found effective for *Cannabis sativa* where 2, 4-D is not working.
- In conservation tillage experiment, soil health was found to be improved when zero tillage was adopted with residue.
- In the long term herbicide trial in rice, the total seed in soil seed bank was lower under rotation with herbicides having different modes of action as compared to continuous use of the same herbicides.
- Weed shift was observed in rice due to water deficiency and semi dry weeds like *Alternanthera* were found in rice fields.
- In garlic, integrated use of herbicides and paddy straw mulch provided better control of weeds than mulch alone.
- Residue retention in rice and/or in wheat improved soil health after two cropping cycles in weed management in CA. Wheat grain yield under ZT-with residues were higher than ZT-without residues.
- Pendimethalin residues decreased successively with time and >61 and 89% residues dissipated within 30 and 90 days of application, respectively. Dissipation followed first order kinetics with half-life of 31.3 days

Comments

- Directorate should take the leadership in developing models for economic analysis and expertise can be sought from IARI and centres can be guided accordingly.
- No need to report trade name of herbicides such as Roundup and Gramaxone.
- Annual report of PAU centre was appreciated.
- It was suggested that for DSR, complete package is required for recommendation.

GBPUAT, Pantnagar

Dr V.P. Singh, Agronomist and PI presented salient research achievements of G.B Pant University of Agricultural Technology, Pantnagar centre:

- Weed shift was recorded in ZTR(R)-ZTW (R) and *Echinochloa crus-galli* replaced *Echinochloa colona*.
- Highest grain yield and yield increase percent was found with pinoxsulam+metsulfuron (PoE) 0.06+0.004 kg/ha and was at par with pendimethalin 0.75 kg/ha in wheat.
- Least total weed biomass and highest WCE (83.6%) was found with pendimethalin 1.0 kg/ha (PE) *fb* straw mulch 10 t/ha *fb* 1 HW (75 DAP) in turmeric
- Oxyfluorfen 0.223 kg/ha, pendimethalin 1.0 kg/ha and 2 HW in combination with straw mulch at 5 t/ha recorded similar garlic bulb yield which was higher than the treatments without straw mulch.
- Among the interaction effect of establishment method and WM practices, the maximum yield was obtained in conventional system of rice followed by ZT wheat along with *Sesbania* which was at par with conventional system of rice and wheat under recommended practices of WM as well as DSR -CTW along with *Sesbania* grown in IWM in rice-wheat cropping system**.**
- At farmers' field residues of anilofos, butachlor and 2, 4-D was not detected in soil, rice grain and straw at the time of harvest of crop.
- Application of penoxsulam combined with cyhalofop (135 g/ha) or supplemented with 1 HW gave the higher yield (6 t/ha) as compared to two hand weedings, while the highest yield was recorded under weed free situation in DSR.

Comments

- Studies on biology of weeds such as *Phalaris minor* should be discontinued and less studied weeds should be included.
- Avoid using abbreviation of herbicides in presentation or while reporting data.
- In long-term trials inclusion of unweeded control as a treatment should be reconsidered.
- Quality of annual report and publications of Pantnagar centre were appreciated.
- Work on control of *Celosia arvensis*, a big problem in Tarai region and *Argemone mexicana* in DSR.
- Specify conditions for DSR such as lowland, highland or rainfed situations.
- Compilation on herbicide residues needs improvement.

CSKHPKV, Palampur

Dr Neelam Sharma, Residue Chemist presented research highlight of CSKHPKV, Palampur centre.

- *Cirsium arvense* has invaded wheat fields in an alarming proportion.
- In conservation tillage, population of bacteria and actinomycetes was influenced both by herbicide and tillage treatments but fungal population was not influenced by these.
- Butachlor persistence in soil/crop up to harvest.
- Pendimethalin *fb* bispyribac *fb* manual weeding behaved statistically alike with all the weed control treatments except three mechanical weedings with cono/rotary weeder and pendimethalin 1000g/ha *fb* manual weeding (25-30 DAS) in direct-seeded rice (dry).
- In black gram, imazethapyr + imazamox 80 g/ha effectively controlled *Echinochloa* sp., *Cyperus iria* and *Dactyloctenium* sp.
- Total population of beneficial microorganism *i.e.* azotobacter and phosphate solublising microorganism and other soil properties viz. basal soil respiration, dehydrogenase activity, microbial biomass carbon, alkaline phosphotase and acid phosphotase activities were not affected significantly by various herbicide treatments in both wheat and rice crops at the time of harvesting in transplanted rice-wheat system.
- Zero tillage alone or zero tillage + residues was found to reduce the weed populations and increased yield of both wheat and maize over the conventional tillage treatments.

Comments

- Publications by the centre need to be improved further.
- Organic farming experiments should be initiated.
- Present only confirmed results of metsulfuron residues and metabolites in crop and soil.
- Information sought from the headquarter should be submitted in time.
- Compilation on herbicide residues needs improvement.

CCSHAU, Hisar

Dr S.S. Punia, Agronomist & PI presented research highlights of CCHAU centre.

- Infestation of *Orobanchae* in cauliflower, brinjal and tomato is increasing in some part of Hisar.
- In berseem, *Coronopus didymus* is replacing *Chichorium intybus* as a major weed.
- *Cuscuta* sp. emerging as a new weed in berseem.
- Protected spray of glyphosate in cotton was found effective for control of *Orobanchae*.
- Ethoxysulfuron application in tomato caused toxicity to tomato infested with *Orobanche*.
- Ammonium sulfate along with glyphosate caused toxicity in mustard.
- The new weed *Lolium* sp. is currently spreading in wheat and berseem.
- *Coronopus didymus* and *Poa annua* are becoming major weeds in the region in cotton.

- In wheat, under green manuring, residues of sulfosulfuron dissipated faster than under non-green manuring conditions.
- In a cross multiple resistance study of 20 biotypes of *Phalaris minor* in wheat, mesosulfuron, iodosulfuron and pinoxaden controlled majority of the biotypes.

Comments

- Publication by the centre was appreciated.
- Formulate focused and farmer centric research work while proposing technical program for 2016-18.
- *Orobanche* management, developed by Hisar centre should be adopted and tested by other centres. The technology for *Orobanche* control in mustard should be extended to rainfed areas where the problem exists.
- Sand-herbicide mix application, being an old technology should be discouraged.

SKUAST, Jammu

Dr B.R. Bazaya, Agronomist & PI presented salient research achievement of Jammu centre.

- Weedy rice and *Loranthus* are major problems in the some part of state.
- Post- emergence application of imazethapyr + imazamox (RM) at 3-4 leaf stage proved effective in reducing weed density and weed biomass in summer blackgram.
- Pre-emergence application of imazethapyr + pendimethalin (RM) at 1000 g/ha or post-emergence application of imazethapyr at 70 or 80 g/ha were promising against most of weeds registering higher crop.
- Management of problematic weeds and parasitic weed *Dendrophthoe* spp. was identified.
- Directed spray of paraquat and glyphosate gave satisfactory control of *Dendrophthoe* spp. in walnut, timbru, apricot, pomegranate, fig, grewia and citrus.

Comments

- Too much animation in presentation should be avoided.
- Do less number of quality experiments only.
- Follow guidelines for annual report.

General comments north zone

- In the residue work, repetition should be avoided and studies on new molecules currently used by the farmers should be taken up.
- Regarding the TSP programme, funds can be spent only as per ICAR guidelines and the balance funds available with the centres cannot be further revalidated.
- Specific reply should be given in ATR.

TECHNICAL SESSION – II

Presentation of salient findings of AICRP-WM Centres in Central Zone

Chairman	**:**	Dr. A.R. Sharma, Director, ICAR - DWR, Jabalpur
Rapporteurs	**:**	Dr. S.K. Guru, GBPUAT, Pantnagar
		Dr. Parvinder Kaur, PAU, Ludhiana

Dr. P.J. Khanakhane, Sr. Scientist, ICAR-DWR, Jabalpur and nodal officer presented the overview of central zone centres RSKVV, Gwalior, NDUAT Faizabad, IGKV Raipur and RAU, Pusa. Dr Khankhane pointed out that almost all the allotted experiments were conducted by respective centers except WS 2.1 (a) and 2.1 (b) on biology of weeds and WS 5.1 and 5.2 on studies on herbicide persistence and in water WS 6.2 allotted to Gwalior centre.

Gwalior

Dr Asha Arora, PI of Gwalior centre presented the significant research achievement of the centre.

- No weed species was found under weed surveillance.
- *Orobanchae* has been reduced to a minor problem due to replacement of mustard by Guar-Wheat cropping system.
- There was no phytotoxicity of herbicides applied in black gram in the succeeding mustard crop.
- Under conservation agriculture, IWM was most effective in the pearl millet based cropping system.
- Highest significant yield of mustard with minimum population and dry weight of *Orobanchae* was obtained under glyphosate 25 and 50 g/ha with 1% ammonium sulphate (+ 125% recommended N and P) and glyphosate 25 and 50 g/ha at 25-30 and 55-60 DAS.
- Two hand weedings at 30 and 60 DAS gave maximum grain yield followed by herbicide combinations (RM) pinoxaden + metsulfuron, sulfosulfuron + metsulfuron, mesosulfuron + iodosulfuron as PoE application. Highest B: C ratio of (3.6) was obtained in treatment pinoxaden + metsulfuron (pre mix) followed by sulfosulfuron+ metsulfuron (3.7) and mesosulfuron + idosulfuron (3.5) in wheat.
- Two hand weedings at 20 & 40 DAS give maximum seed yield and significant reduction in weed population and dry weight followed by pre-mix herbicides i.e. imazethapyr + imazamox 80 g/ha as PoE and pendimethalin + imazethapyr 1000 g/ha as PE.
- Net return and BC ratio were higher in pendimethalin + imazethapyr as PE followed by application of imazethapyr + imazamox PoE in blackgram.
- Under pearlmillet-mustard-green gram cropping system, IWM practices (atrazine 500 g/ha PE +1 HW) significantly reduced weed population and weed dry weight in pearl millet. Under conservation tillage practices ZT+R-ZT+R – ZT was find superior on other tillage practices in respect to yield as well as economics point of view.
- Herbicides atrazine 500 g/ha PE & 2, 4-D 500 g/ha PoE and atrazine 500 g/ha PE + 1HW at 30 DAS applied to pearlmillet persisted in soil up to 45 days.
- Biological control of water hyacinth was unsuccessful as the agent did not multiply.

Comments

- Annual report of the centre was not prepared as per the guidelines issued and also performance of the centre needs further improvement.
- Limit the experiments and do quality work.
- Give more emphasis on publication of the data already generated.
- Compilation on herbicide residues needs improvement.

IGKV, Raipur

Dr Tapas Choudhary, Soil Microbiologist presented significant research achievements of the IGKV, Raipur centre

- Infestations of *Alternanthera triandra* is increasing in DSR, road sides and field bunds.
- No cases of herbicide resistance were observed by the centre during surveillance.
- In the long term trial on rice-chickpea cropping system, *Celosia* spp. was found replacing *Alternanthera* spp. in the 6th year of trial.
- In the long term trial on rice-chickpea cropping system, PSBs were less affected by herbicides as compared to the free living N-fixers.
- In the conservation agriculture system, grain yield of CT-TPR was higher than ZT-DSR.
- Two recommendations have been passed on by the centre to the state package of practices.
- Seed yield under CT (transplanted) rice was remarkably higher over ZT-direct seeded rice.
- Significantly higher seed yield was recorded under recommended practice *i.e.* pyrazosulfuron 20 g/ha *fb* penoxsulam 22.5 g/ha POE than unweeded check.
- Lowest values of carbon stock were recorded under integrated weed management system whereas highest amount of carbon was accumulated in fields where chemical method of weed management was done.
- The significantly higher fodder yield (cowpea) was recorded under the application of pendimethalin 1.0 kg/ha as PE *fb* one hand weeding at 20 DAS than rest.
- Maximum enzymatic activity and microbial biomass carbon was found in soil which had experience of zero tillage with crop residue under direct seeded conditions.

Comments

- Efforts were appreciated for the improvements and progress made in publications and quality of the annual report.
- Publish in higher impact factor journals.
- Report herbicide resistance data carefully.
- Yield in IWM in CA is very low.
- The data on carbon sequestration in conservation agriculture reported by the centre needs to be rechecked.

NDUAT, Faizabad

Dr Jai Dev Sharma, Agronomist and PI of Faizabad centre presented the significant achievements of the centre. It was informed that permanent herbicide trial in CA is going to be concluded in this season.

- Infestation of wild rice in low lying areas of Barabanki, Amethi and Jaunpur is increasing.
- Infestation of the BLWs, *Eclipta alba* and *Caesulia* spp. is increasing in rice crop.
- *Parthenium* has been completely replaced by *Cassia* spp. and *Cannabis* spp. whereas *Zygogramma* beetle establishment was very poor and thus found ineffective.
- Mulching was most effective for weed management in turmeric and IWM was most effective in garlic.
- Application of neem cake 200 kg /ha + soil drenching of metlaxyl MZ 0.2% at 20 DAP recorded higher tobacco leaf yield (262.5 g/plant) followed by imazethapyr 30 g /ha at 20 DAP (237.5 g/plant) OFT conducted on tobacco to control the *Orobanchae cernua.*
- Herbicides applied in green gram did not show any residual toxicity in the succeeding mustard crop.
- In the rice-wheat cropping system, wheat recorded highest yield under CT-TPR-CT wheat treatment, while the yield of rice was highest in CT-ZT-ZT.

- In the long term herbicide trial, a shift towards BLWs was observed in both rice and wheat crops.
- A combination of various herbicides e.g. triafamone + ethoxysulfuron (RM) 60 g/ha recorded higher grain yield (5805 kg/ha) *fb* penoxsulam + cyhalofop (RM) 135 g/ha (5647 kg/ ha) and bispyribac (20 g/ha) + Almix (4 g/ha) (5445 kg/ha), respectively, in transplanted rice.
- In garlic, integrated weed management (paddy straw mulch, 10 t/ha + oxyfluorfen 0.223 kg/ha) found most effective to control all types of weeds and recorded higher yield. No Phytotoxicity appeared on the crop.
- In turmeric, metribuzin 700 g /ha or pendimethalin 1000 g/ha *fb* straw mulch 10 t/ha+ one hand weeding or glyphosate POE 7.5 ml/lit at 25 DAT + 2HW were found most effective against all type of weeds. Some phytotoxicity appeared due to herbicide on crop.

Comments

- Lots of improvement is needed with respect to publications of the centre as none of the publications reported were related to weed science.
- Post of residue chemist may not be filled up after the retirement of Dr. S.S. Singh.
- Annual report of the centre was not prepared as per the guidelines issued and also performance of the centre needs further improvement.
- Compilation on herbicide residues needs improvement.

No presentation was made from RAU, Pusa centre.

TECHNICAL SESSION–III

Presentation of salient findings of AICRP-WM Centres in East Zone

Chairman	**:**	Dr. A.R. Sharma, Director, ICAR - DWR, Jabalpur
Rapporteurs	**:**	Dr. Neelam Sharma, CSKHPKV, Palampur
		Dr. N. Kaur, PAU Ludhiana

Dr Yogita Gharde presented an overview of research highlights, constraints and suggestions of the centres under east zone. Dr Gharde pointed out that almost all the allotted experiments were conducted by respective centers. Centre-wise specific presentations were as follows:

AAU, Jorhat

Dr. J. Deka, Agronomist and PI presented the results of AAU, Jorhat centre.

- A new invasive weed *Nicandra physaloides* has identified which appeared in the winter season crops at Tinsukia district.
- Sequential application in lower dose of glyphosate was found to be effective in reducing population and rhizome biomass of *Panicum repens.*
- *Panicum repens, Dichanthiu* and *assimile* were found escaped from the efficacy of glyphosate through its deep placing rhizome complex.
- Rice variety Inglongkiri, collected from hilly regions, performed the best in plains in Assam and showed better weed suppressing ability due to efficient canopy coverage in the direct seeded upland conditions of autumn season,.
- *Neochetina* spp. supplied by ICAR-DWR, Jabalpur did not survive.
- A technology under Indian Patent Act for wound healing drug using a tropical weed *Achyranthes aspera* was patented by Dr. I.C. Barua and his team in the name of Assam Agricultural University.

- Application of metribuzin 500 g/ha + garden hoe 30, 60 DAP and metribuzin 500 g/ha + garden hoe 30, 50 and 80 DAP caused lowest weed density, weed dry weight and higher fruit yield from the crop
- Treatment with oxadiargyl 90 g/ha *fb* garden hoeing at 30 DAP was significantly superior to hand weeding and garden hoeing in respect of weed population, weed dry weight, flower no and marigold flower yield.
- Metribuzin 0.75 kg/ha as early post-emergence and pretilachlor 0.75 kg/ha as pre-emergence was effective in potato.
- The highest turmeric rhizome yield was obtained from pendimethalin 1000 g/ha *fb* straw mulch 10 t/ha *fb* hand weeding 75 DAP closely followed by metribuzin 700 g/ha *fb* straw mulch 10 t/ha *fb* hand weeding 75 DAP and atrazine 750 g/ha *fb* straw mulch 10 t/ha *fb* HW 75 DAP.

Comments

- In addition to the data on weed density, weed dry matter/m^2 should also be recorded to express the threshold level.
- Maintaining of '*Parthenium free*' campus by AAU, Jorhat was appreciated and suggested to put-up a board of *Parthenium free campus*.
- Check LAI values of rice varieties. Calculate threshold value for *Cyperus rotundus* on the basis of dry matter weight.
- No publication from project work despite 21 experiments conducted in last year.
- Focus work on weed management in tea in collaboration with TOCKLAI Institute.
- Send glyphosate resistant seed to the Directorate.

OUAT, Bhubaneswar

Dr. M.M. Mishra, PI of the centre presented the salient research findings of OUAT, Bhubaneswar. He informed that centre conducted all trials as per protocol and allotment except WS 5 (Herbicide residue). He pointed out that zero till machine is not available for CA experiments.

- A new weed, *Mikania* was reported in banana, guava and mango.
- No herbicide resistance was reported in rice-rice cropping system against butachlor even after its continuous use.
- Pendimethalin *fb* bispyribac in transplanted rice and pyrazosulfuron *fb* bispyribac in direct seeded rice were reported to be the best herbicide combinations for management of complex weed flora.
- Application of pyrazosulfuron 20 g/ha as pre-emergence stage i.e. 0-3 DAS followed by bispyribac-sodium 25 g/ha as post-emergence i.e. 25 DAS found to be the best combination for control of complex weed flora in direct seeded rice.
- Significantly higher grain yield of ginger 2.72 t/ha was obtained with application of glyphosate (0.8kg) *fb* pendimethalin (1.5 kg/ha) which was at par with glyphosate (0.8kg) *fb* oxyfluorfen (0.2kg/ha) (2.67 t/ha).
- In blackgram, application of imazethapyr + pendimethalin (RM) 1.0 kg/ha as pre-emergence spray recorded significantly highest yield of 1.02 t/ha whereas weedy check treatment recorded the lowest yield (0.2 t/ha). This RM combinations also registered an increase of 20 and 40 % yield advantage over sole application of pendimethalin (1 kg/ha) and imazethapyr (70 g/ha)
- Application of neem cake 200 kg/ha at sowing *fb* pendimethalin 1.0 kg/ha as pre- emergence at 3 DAP found to be the best treatment in reducing the population of *Orobanchae* in brinjal.
- Stale seed bed followed by application of pendimethalin 1 kg /ha recorded lowest *Cuscuta* density (3 /m^2) and highest yield in niger crop (1020 kg /ha)

Comments

- Reduce the number of experiments.
- Needs improvement in the annual report and presentation of the centre.
- Check spelling of weeds in presentation.
- Check the dose of pretilachlor/pendimethalin.
- Residue chemist should show some work on herbicide residues.
- Add data on how use of herbicides can save labour.
- Instead of weed free situations, write manual weddings at 30, 60 and 90 days.
- Compilation on herbicide residues needs major improvement.

BAU, Ranchi

Dr. RR Upsani, PI of , BAU, Ranchi, highlighted the centre's research accomplishments.

- The resistance against pendimethalin in *Coronopus didyms* was reported.
- Infestation of *Orobanchae* was reported in many crops like tomato, brinjal, potato and chili.
- Atrazine 0.75 or metribuzin 0.7 kg/ha *fb* straw mulch 10 t/ha *fb* HW 75 DAP recorded maximum turmeric yield.
- Treatments overloaded with metribuzin / pendimethalin or atrazine *fb* fenoxaprop + metsulfuron (45 DAP) showed phytotoxicity on turmeric.
- Atrazine 0.75 or metribuzin 0.7 kg/ha *fb* straw mulch 10 t/ha *fb* HW 75 DAP recorded maximum turmeric yield (28.0 t/ha), net return (Rs.5, 95, 800) and B: C ratio (5.9).
- Glyphosate 0.80 kg/ha + oxyfluorfen 0.2 kg/ha applied just before emergence of sprouts of ginger was most effective in controlling weed and produced maximum ginger rhizome yield.
- Pre -emergence application of imazethapyr 50g/ha applied in black gram recorded maximum seed yield (1104 kg/ha), net return (Rs 23818/ha) and B: C ratio (2.3).
- *Coronopus didymus* is destroying milk quality.
- Application of carfentrazone 0.31 kg/ha PoE between rows similar to glyphosate 1 kg/ha pre-plant burn down and paraquat (24%) 1 kg/ha 3 days before sowing recorded significantly higher carrot yield (209 q/ha), net return (Rs 2, 63,634 and B: C ratio (5.2) in carrot.

Comments

- Improvement in quality of presentation and annual report is needed.
- Carfentrazone application between the rows needs to be checked properly.
- Use new molecules in maize instead of old molecules.
- Verify effect of chlorimuron-ethyl on chickpea and lentil.

CAU, Pasighat

Dr Dinesh Shah, PI of Pasighat centre presented salient research highlight. He expressed difficulties in conducting experiments due to high rainfall in rainy season and water scarcity in winter season.

- Application of oxyfluorfen+ hand weeding+mulching was found to be the best treatment for integrated weed management in ginger.
- While the maximum number of tillers/plant, fingers/plant, longest rhizome and highest fresh rhizome yield (9.2 t/ha) recorded with pendimethalin *fb* 1HW after mulching in ginger.
- Efforts were made to maintain campus *Parthenium* free campus

Comments

- Intensity and infestation of various weeds needs to be done at Pasighat.
- Start experiments on non-chemical methods of weed management in high-value crops.

General observations east zone

- All centres conducted trials as allotted.
- Very little work was done on residue of herbicide in the Eastern region.
- Critical observations should be made in the experiments of *N. bruchi*.
- All the centers should include publications only from the project or related to weed science.
- When applying post-emergence herbicides, residue analysis must be done, especially for vegetable crops like ginger and turmeric
- Compatibility of different agrochemical inputs should be studied.
- More options should be searched for weed management in organic farming.
- Uniformity should be observed while reporting the results.

TECHNICAL SESSION – IV

Presentation of salient findings by Principal Investigators of AICRP-WM Centres in west zone

Chairman	**:**	Dr. A.R. Sharma, Director, ICAR-DWR, Jabalpur
Rapporteurs	**:**	Dr. Jayant Deka, AAU, Assam
		Dr. R.R. Upsani, RAU, Ranchi

Dr. R.P. Dubey, Principal Scientist (Agronomy) and Nodal Officer, west zone presented an overview of the achievements, constraints and monitoring reports Anand, Dapoli, Udaipur and Akola centres. Regarding the vacant position of steno-typist at Anand, Dr Sharma informed that the post of steno-typist post where ever it is existing, may be withdrawn as and when the incumbent retires from the post.

AAU, Anand

Dr B.D.Patel, PI of the center presented the salient achievements. He informed that a sum of Rs. 22 lakh would be received from state sources very soon, which will be sufficient to compensate total deficit of Rs 19 lakh in the project. It was also informed that the residue work could be started with the appointment of the Residue Chemist. Microbiology lab has been established with transfer of equipments made available with state fund.

- *Celosia argentea* was found a severe problem in middle Gujarat, North Gujarat and some part of Saurashtra region in *Kharif* crops like soybean, pigeonpea, greengram, blackgram on farmer's field.
- Escape incidences of *Commelina benghalensis* was observed on farmers' field/s after application of recommended herbicides in different crops and on experimental field. While escape incidences of *Digera arvensis* was observed in pendimethalin applied experimental field/s
- Application of pendimethalin 0.50 kg/ha (sand mix) as PE showed phytotoxic effects on tobacco and caused very poor plant stand and growth due to this nearly 10 % plants were survived after germination in pendimethalin application in Lucerne.
- Butachlor as PE and foliar spray of metalaxyl MZ 0.2 % at 20 DAS did not show any positive effect to control *Cuscuta.*
- Mulching of paddy straw 5 t/ha with pre-emergence herbicide produce higher garlic bulb yield
- Pendimethalin 0.5 kg/ha as sand mix showed phytotoxicity on lucerne crop but 100% control of *Cuscuta*
- Highest green biomass of lucerne was recorded in the application of imazethapyr 40 g/ha at 20 DAS followed by pre-emergence application of butachlor *fb* foliar spray of metalaxyl MZ 0.2% at 20 DAS.

- Heavy infestation of *Orobanchae* on bidi tobacco at later stage of crop was recorded in middle Gujarat. No feeding by *Neochetina bruchi* scars was observed on the water hyacinth plant.
- No any dieback symptoms were recorded on the water hyacinth plants (0 scale) by the weevil.

Comments

- Compile data on variability of phytotoxicity of imazethapyr in blackgram in different centres.
- Good progress was made by this centre and annual report was also well compiled.
- Technical program on weed biology need to be reviewed thoroughly.
- Reason for low efficacy of *Neochetina bruchi* work should be reviewed.
- TSP fund available with the centre should be utilized for some visible developmental programme which will benefit the community.
- Slides for presentation should be prepared as per the guidelines.
- Cropping sequence can be changed with different crops after 4-5 years.
- Happy seeder should be purchased with university fund which could be used for sowing of different crops.

DBSKKV, Dapoli

Dr. S. S. Pinjari, Jr Agronomist presented the achievements of the centre. It was informed that the centre has submitted two articles on long term trials. He also informed that a review will be done on weed biology.

- Application of pendimethalin (PE) 1 kg/ha *fb* manual weeding was the most effective and economical treatment (WCE 92.84 %, yield 3.6 t/ha, B: C ratio 1.3) followed by weed free check (HW at 20, 40, and 60 DAS) (WCE 95 %, yield 3.8 t/ha, B: C ratio 1.2) to control weeds effectively in direct seeded drilled rice during *Kharif* season.
- Application of oxadiargyl + 1 HW at 40 DAS was the best treatment exhibiting highest WCE % (83.6 %) in terms of growth of weeds and consequently grain and straw yield of rice (2.6 & 2.9 t/ha).
- In guava and coconut, *Hyptis suaveolens* was most dominant weed followed by *Isachne globosa, Colocasia antiquorum, Urena lobata* and *Mimosa pudica.*
- Weed growth of monocots at all stages of observation significantly least in CT (Transplanted rice) over all other tillage practices and resulted into increase in yield attributes and yield (2.9 t/ha) of rice
- Incorporation of green manure (*Sesbania rostrata*) and application of fixed herbicide pretilachlor (PE) 0.75 kg/ha 3 to 7 DAT for *Kharif* rice and pendimethalin (PE) 1 kg/ha 2 to 3 DAS for *Rabi* groundnut reduced weed growth with increase in total REY (186.7 q/ha) of the rice groundnut cropping system.

Comments

- There is improvement in the annual report preparation by the centre.
- Publication of papers should be done in the NAAS rated journals only.
- Frequent shifting of I/C and other staff at Dapoli is hampering quality output.
- Compile long-term data of the centre.
- Biology of weeds may be initiated under abiotic/biotic stress conditions.

Dr. PDKV, Akola

Dr J.P. Deshmukh, PI of Aola, centre presented salient research highlight. He informed that soybean is replacing sorghum and imazethapyr is very popular in soybean. He also informed that ninety eight percent of cotton area is under Bt Cotton.

- Combination of imazethapyr 0.100 kg /ha PoE + quizalofop- ethyl 0.050 kg /ha PoE 15 DAS (Tank mix) found better in controlling weed population, weed dry matter accumulation, maximum weed control efficiency, lower weed index in soybean.
- Maximum grain yield also produced by the same herbicidal treatment among various herbicides treatments under study.
- In cotton, 3 HW at 20, 40 & 60 DAS proved better in controlling weeds, lesser weed dry matter accumulation, higher weed control efficiency, minimum weed index and higher SCY, this was also comparable with treatment combination of post emergence herbicides *fb* non selective herbicides under directed protected spray 45 DAS in cotton.
- Maximum grain yield was observed in weed free treatment while among the pre and post herbicidal treatments application of atrazine 0.50 kg/ha *fb* 2,4-D sodium salt 0.5 Kg PoE 30 DAS recorded higher grain yield in maize.
- The PoE propaquizofop 0.10 kg/ha 20 DAS and imazethapyr + imazomox 0.10 kg/ha PoE 20 DAS registered more yield and economically best feasible herbicidal weed management practices for groundnut.

Comments

- Availability of herbicides is making certain crops more popular like soybean in Maharashtra.
- Bring out publication of papers on weed aspects.
- There is no need to print annual reports on costly / glossy paper.

MPUAT Udaipur

Dr A. Verma, Agronomist and PI presented salient research highlight of the centre. He informed that three posts in supporting positions are vacant. Benchmark survey on weeds in Udaipur district has been started.

- Maximum weed control efficiency (95.2%) was recorded with ready mix application of imazethapyr + imazamox 0.080 kg/ha which was at par with its lower concentration 0.070 kg/ha and pre -emergence application of imazethapyr + pendimethalin 1.00 kg/ha in blackgram.
- In maize crop, sequential application of alachlor 2.0 kg/ha as pre-emergence followed by tembotrione 0.125 kg/ha at 20 DAS found better in reduction in weed density and weed dry matter.
- In soybean, highest weed control efficiency (94.5%) at 30 DAS was observed by manual weeding and it was significantly superior over rest of the treatments but at 60 DAS maximum weed control efficiency was observed with post emergence application at 21 DAS of propaquizafop + imazethapyr and it was significantly superior over two hand weedings.
- Amongst the chemical weed control treatments, highest weed control efficiency at 30 DAS (91.4%) and at 60 DAS (97.5%) was observed with post- emergence application at 21 DAS of propaquizafop + imazethapyr and it was at par on both the stages with post-emergence tank mix application of quizalofop + imazethapyr at 20 DAS in soybean.
- Maximum net returns (Rs. 55,818) and B: C (2.53) was recorded with imazathapyr 0.075 kg/ha + quizalofop- ethyl 0.060 kg/ha (Tank mix) at 21 DAS and it was par with imazethapyr 0.075 kg/ha + quizalofop-ethyl 0.060 kg/ha (Tank mix) at 21 DAS. All weed control treatments gave significantly higher seed yield than weedy check. All herbicides were safe to soybean.

Comments

- Significant results should be presented in bullet form.
- Slides quality was not good.
- Reduce number of experiments.
- Improve quality of annual report.

TECHNICAL SESSION – V

Presentation of salient findings of AICRP-WM Centres in South Zone

Rapporteurs : Dr SS Punia , HAU, Ludhiana
Dr. Jayant Deka, AAU, Assam

Dr R.P. Dubey, Principal Scientist (Agronomy), Dr Shobha Sondhia, I/C AICRP-WM, Dr Madhban Gopal and Dr A.N. Tewari conducted this session. Dr Sushil Kumar, Principal Scientist (Entomolgy) and Nodal Officer of south zone presented annual progress of five centres: Hyderabad, Bengaluru, Thrissur, Coimbatore and Raichur. He informed that all the centres have done needful regarding ATR. The new invasive weeds *Tithonia diversifolia, Ludwigia peruviana* and *Sphagneticola* in high ranges were reported from Thrissur. Four approved experiments were not conducted by Bengaluru centre.

PJTSAU, Hyderabad

Dr Y. Yakadri, Agronomist and PI presented research highlights of the centre.

- In 2nd year of experimentation of aerobic rice decrease in population density of *Aeschynomene* spp. and *Alternanthera paranychioides* was noticed, where as occurrence of new weed species like *Dinebra retroflexa* and *Chloris barbeta* was noticed during 2015.
- Higher kapas yield, gross returns, net returns and B:C ratio (3036 kg/ha, Rs 1,15,372, Rs 78,122 and 3.1) were obtained from either mechanical weeding thrice at 20, 40 and 60 DAS or pre-emergence application of pendimethalin *fb* 2 HW at 20 and 50 DAS (3010 kg/ha, Rs 1,14,476, 71,136 and 2.64).
- Higher grain yield of 5136 kg/ha could be obtained with B: C ratio of 2.1 under conventional transplanted rice over aerobic rice under conventional or zero till system of practice.
- In aerobic rice, PE application of pendimethalin 1000 g/ ha *fb* bispyribac- sodium 25 g/ ha *as* PoE at 20 -25 DAS (2-3 weed leaf stage) and 2, 4-D sodium salt at 60 DAS was economical with more gross returns (Rs 48,356 /ha), net returns (Rs 10,046 /ha) and BC ratio of 0.83.
- Higher gross returns, net returns and B.C ratio (Rs 2,08,762, Rs1,83,842 and 8.38) were obtained with pre-emergence application of alachlor 1000 g/ha *fb* hand weeding at 30 DAS or hand weeding twice at 20 and 40 DAS in beetroot, Phyto-toxicity was observed with pre-emergence herbicides.
- Residue of pretilachlor and oxyfluorfen remained in the soil up to 30 and 45 days, respectively.
- Residues of bispyribac -sodium_in the soil samples, rice grain and straw were below the detectable limit of 0.02 ppm at the time of harvest.
- Two new weed species were reported.
- In beetroots phytotoxicity of metribuzin was observed and caused complete failure of beetroot.

Comments

- Quality of annual report needs a lot of improvement, there are several spelling and editorial mistakes.
- Compilation on two long-term trails is pending since long.
- Most publications are not related to weed science.
- Check B: C ratio calculations.
- Pendimethalin + hand weedings in cotton is very old recommendation and may be avoided.
- For control of *Orobanche*, design experiment in consultation with Dr. S. S. Punia, PI, AICRP-WM CCSHAU, Hisar Centre.

UAS, Bengaluru

Dr G.N. Dhanapal, Agronomist and PI presented research highlight of the centre.

- Higher kapas yield was obtained in pendimethalin *fb* hand weeding.
- Integrated weed management (pyrazosulfuron-ethyl 25 g/ha – 3 DAP/S *fb* mechanical weeding- passing conoweeder–45 DAS/P) has recorded higher grain and straw yield of paddy followed by recommended herbicide (pyrazosulfuron -ethyl 25 g/ha – 3 DAP/S).
- In transplanted rice, chickpea and green gram cropping system, performance of summer green gram under CT transplanted rice – chickpea and conventional tillage direct seeded rice – chickpea was better than continuous zero tillage directed seeded rice - chickpea with residues and without residues owing to better establishment, growth and yield attributes which contributed to higher green gram seed yield.
- Oxyfluorfen *fb* bispyribac-sodium yielded 3.2 t/ha grain which is resulted in higher B: C ratio (2.7).
- Among the treatments, cotton padding of 4 g copper sulphate + 0.5 g 2, 4-D sodium salt was non-phytotoxic and resulted in 55-90% control of the *Dendrophthoe falcata*.
- *Cassytha filiformis* reported as a new weed.
- Ten technologies were recommended to inclusion in package of practices

Comments

- Report herbicide name and dose with standard procedure and fallow uniform pattern.
- Study residues of herbicide in turmeric.
- Quality of annual report needs improvement.
- The report of the long-term compilation on herbicide residues needs improvement.

UAS, Raichur

Dr. R. B. Negalur, Agronomist and PI presented research highlight of the centre.

- Application of glyphosate 2.13 kg /ha was found to the best herbicide in controlling *Cyperus rotundus* as evidenced by higher shoot mortality, lower regeneration and viability of shoots followed by application of glyphosate 2.13 kg/ha.
- Application of pyrazosulfuron- ethyl 20 g/ha – 3 DAT *fb* chlorimuron -ethyl + metsulfuron methyl 4 g/ha - 25 DAT was found better in controlling the weeds and resulted in more yield of rice apart from saving cost of weed management as compared to hand weeding. Application of penoxsulam + cyhalofop (RM) 135 g/ha – 15-20 DAT was also found effective in controlling weeds by recording on par yield and B: C in transplanted rice.
- Application of pyrazosulfuron-ethyl 20 g/ha at 3 DAS fb bispyribac-sodium 25 g/ha at 25 DAS and penoxsulam + cyhalofop (RM) 135 g/ ha – 15 DAS were found on par with that of hand weeding thrice at 20, 40 & 60 DAS with respect to grain yield and B:C in dry direct seeded rice.
- Application of pendimethalin 1 kg /ha as pre-emergence *fb* hand weeding at 40 DAS recorded lower total weed density, weed dry weight, weed index, higher WCE, grain and straw yield, GR, NR and B:C next only to two hand weeding at 20 and 40 DAS in maize.
- Fresh leaf leachates 10 and 20% of eucalyptus and *Prosopis juliflora* were found promising in inhibiting the germination and seedling growth of *Parthenium hysterophorus* under laboratory condition.

Comments

- No need to give LSD for B: C ratio or economic analysis.
- Annual report needs improvement.
- Use uniform style for writing/reporting dose of herbicides.

KAU, Thrissur

Dr T. Giriga, Physiologist and PI presented research highlights of the centre.

- Among the treatments, glyphosate 1.5 kg/ha and 2, 4-D amine salt 125 g/ha *fb* glyphosate 750 g/ha were the best treatments both in the field and under controlled conditions for control of *Cyperus rotundus.*
- Bispyribac-sodium and penoxsulam were effective in reducing population of *Echinochloa* spp.
- Penoxsulam was also effective against *Leptochloa chinensis* but bispyribac-sodium was ineffective.
- Pendimethalin *fb* manual weeding recorded the highest WCE (93.3%). Hand weeding (92%) and pendimethalin *fb* bispyribac-sodium *fb* hand weeding (90.60%) were on par in DSR.
- Ethrel 25 ml/lit of water spray gives complete defoliation of *Loranthus.*
- Residues of oxyfluorfen and pendimethalin were below the detectable level in the ginger rhizome, after the harvest of the crop.
- *T. diversifolia*, *A. houstonianum*, *S. trilobata* and *B. suaveolens* spreading in Idukki district and replacing the natural weeds of the regionDevelop a weed wiper for control of weedy rice.

Comments

- Annual report was not prepared as per the guidelines issued.
- In transplanted rice, B: C ratio calculations should be checked.
- Write research papers in high impact factor journals.

TNAU, Coimbatore

Dr C. Cinnusamy, PI of the centre presented research highlights of the centre.

- Application of glyphosate at 1.5 kg/ha was effective in reducing density and dry weight of *Cyperus rotundus*
- Application of pretilachlor PE *fb* chlorimuron + metsulfuron POE at 750 *fb* 4 g/ha recorded lesser total weed density, dry weight and higher grain yield in transplanted rice.
- PE pendimethalin at 1000 g/ha *fb* POE bispyribac- sodium at 25 g/ha at 20 DAS recorded lesser total weed density & dry weight and higher grain yield in wet seeded rice.
- Imazethapyr and its combination with imazomox or pendimethalin did not affect nodulation, microbial flora *viz*., fungi, actinobacteria and soil enzymes activities in blackgram but there was reduction in the population of total bacteria, diazotrophs and phosphobacteria up to 5 DAHA and significantly increased during later crop growth.
- Tillage had no significant influence on grain yield of 1st maize in maize-sunflower cropping system; whereas, PE atrazine 0.5 kg/ha + HW on 45 DAS recorded significantly higher grain yield.
- Conventional tillage and PE atrazine at 0.5 kg/ha + HW on 45 DAS recorded maximum number of microbial population and enzyme activities at 60 DAS in maize.
- *Parthenium* damage was very moderate (18 to 29%) with an average damage of 21% after one month of release of *Zygogramma bicolorata.* Survival of the beetle was moderate.
- Six technologies were recommended to inclusion in package of practices

Comments

- Annual report was appreciated.
- Good presentation but follow guidelines while report writing
- Abbreviations of herbicides not followed properly.
- Write full description while recommending herbicide molecules
- Take care of *Parthenium* near the experiment
- Write full name of herbicides in place of abbreviations in the tables and recommendations

- Before formulating technical programme, the earlier work should be revisited and publish in the refereed journals.

TECHNICAL SESSION–VI

Presentation of salient findings of volunteer centres and Information system by Dr. Yogita Gharde

Rapporteurs **:** Reporters : Dr. Asha Arora, RVSKVV, Gwalior
Dr. Sheela Barala, BAU, Ranchi

Dr. Maduban Gopal, Dr. A.N. Tewari, Dr R.P. Dubey, Principal Scientist (Agronomy) along with Dr Shobha Sondhia, Incharge, AICRP-WM conducted this session. Out of six volunteer centres, only one centre, viz. PJNCA & RI, Pondicherry made the presentation.

PJNCA & RI, Pondicherry

Dr P. Saravanane, Agronomist and PI presented research highlights of the centre

- No new weed species or shift in weed flora was noticed.
- Application of trifamone + ethoxysulfuron significantly reduced the weed density, dry weight and resulted in higher rice yield.
- Application of pendimethalin PE efficiently controlled the weeds in direct seeded rice.
- 20% eucalyptus leaf leachates effectively inhibited the germination of parthenium seed in lab condition.

Information system of AICRP – WM

Dr. Yogita Gharde, Scientist, ICAR-DWR, Jabalpur presented information system on AICRP – WM. In this system one has to do AICRP – centre log on DWR site. End users are all scientists of AICRP - WM centres. They will upload the data by entering data points or by excel sheet, choose the design and transformation. The PI will be sub – administrator and approve the data. At ICAR-DWR Jabalpur, one administrator and one super administrator will approve the data. The system will be modified according to new technical programme of AICRP-WM for 2016-18.

TECHNICAL SESSION–VII

General discussion, financial issues, interaction with herbicide industry etc.
Presentation from industry

General issue related to weed management and finical issue were discussed. Dr Shrama informed the house that as such no fund is given by the ICAR under instruments and there are meagre chances that any fund under this head will come. Sufficient budget under recurring contingency is being given by the head quarter and remaining by the university should be utilized wisely.

Mr Ravinder Kinkar from UPL presented new range of products for weed control in soybean, greengram, blackgram. He informed chemical weed management through various commercial products developed by UPL such as IRIS, a mixture of acifluorfen +clodinafop-propargyl at 700g/ha in soybean; Eros (mixture of pyrazosulfuron-ethyl and pretilachlor) in paddy as pre-emergence for

control of grassy, broadleaved weeds and sedges. Another product, Shagun (metribuzin +clodinafop-propargyl) can be used as post-emergence in wheat for control of grassy weeds. Dr Sharma asked for availability of chemical control for chickpea and lentil.

30 April, 2016

TECHNICAL SESSION – VIII
(Presentation of network Technical Programme for 2016-17 & 2017-18)

Dr A.R. Sharma presented guidelines for preparation of Annual report of AICRP-WM for 2016-17 and urged all PIs to follow these guidelines strictly. He also suggested to limit the number of experiments and urged focus on quality rather quantity of experiments.

A visit to Gandhi Teerath was also arranged by the Jain Irrigation system followed by theme-wise presentation the on technical programme by the Nodal Officers.

A detailed discussion on presentation of technical program for 2016-18 by Nodal Officers was made. After through discussion on technical program it was suggested that each PI will submit details of experiments by 10th May 2016 and the concerned Nodal officers will finalize the technical programme by 15th May, 2016. The final technical programme will be communicated to all the centers by 31th May, 2016.

- Dr A.N. Tewari suggested to work on weed management under intercropping, DSR under irrigated conditions, problem of weedy rice in DSR, organic farming on Basmati rice, vegetables, spices, conservation agriculture under rainfed situations, evaluation of weeding tools, spray technology/calibration/nozzles, and
- Conclude long-term experiments.

Dr Madhuban suggested that if herbicides are being applied to crop like turmeric and vegetables, then residues analysis should be done. It was discussed to prepare a consolidated report of long-term herbicide. Financial issues of AICRP-WM centres were also discussed.

PLENARY SESSION

Chairman	**:**	Dr. A.R. Sharma, Director, DWR, Jabalpur
	:	Mr Santosh K. Deshmukh, Jain Irrigation system, Jalgaon
	:	Mr V.B. Patil, Jain Irrigation system, Jalgaon
	:	Dr. Shobha Sondhia, ICAR-DWR, Jabalpur

In the plenary session, Dr Sharma mentioned significant improvement in the quality of the Annual report of almost all of the centres. He also urged PIs to give specific reply in ATR on various comments/recommendations. Dr Sharma opined that improvement is required in the technical programme. He said that ATR needs to be properly documented. Nodal officer should be in touch with PIs and scientists to plan technical programme for 2016-18. It was mentioned that no new recommendations will be made this time but the recommendations made in the earlier meetings since 2012 which have not been effectively implemented till now will form the recommendations of this meeting. He appreciated the kind of hospitality and support by Jain Irrigation system for organizing this meeting. He urged that we must learn from Jain irrigation system to set the targets and share responsibilities. He urged to do proactive research which is problem-oriented, farmers-centric and collaborative. Dr Madhuban Gopal emphasized on publication of papers. Dr V.B. Patil said in Jains we are working for farmers and farmers-oriented technologies.

Homage was paid to Dr R.K. Pandey, weed scientist of RAU, Pusa who left for heavenly abode in December, 2015. Dr Shobha Sondhia proposed vote of thanks in the end.

Recommendations of XXIII Annual review Meeting: Jain Irrigations Systems Ltd. (2016)

It was decided that no new recommendations will be made during the current Annual Review Meeting; rather the recommendations which were made in the earlier meetings since 2012 and which have not been effectively implemented till now, will be reemphasized. Accordingly, the following points were identified as the recommendations for the XXII Annual Review meeting:

XIX Annual Review Meeting: KAU, Thrissur (2012)

1. All centres should identity 5 major species in cropped / non-cropped lands of their jurisdiction / state. An article on the current state of knowledge with respect to their infestation, biology and management should be prepared. Accordingly, a compilation on major weeds of India should be compiled based on the information available from different states / regions.
2. Studies on weed management in organic farming systems should be taken-up in high-value crops.
3. Weed management should also be undertaken in horticulture (fruits, vegetables, ornamentals) / plantation crops – based systems in the relevant centres / universities.
4. A realistic economic analysis is a must in all field trials including OFTs and FLDs. The benefits or otherwise of any weed management practice should be clearly quantified in terms of BCR and ICBR.
5. A compiled report on the previously conducted and concluded experiments including long-term tillage / herbicide trials should be presented in the annual reports of the respective centres and submitted to the coordinating unit. In long-term experiments, base year data and yearly variations in treatment responses should be recorded and presented.
6. A system-based approach to weed management should be pursued. The direct, residual and cumulative effects of weed management practices / herbicides should be investigated in a system mode on a long-term basis.
7. In long-term field trials, the herbicide residues including secondary metabolites in soil and plant (grain, stover / fodder) should be monitored on a continuous long-term basis, at least in the selected herbicidal treatments. Herbicide residue data, especially in case of long-term experiments, should be presented as per the treatments enlisted in the technical programme for better interpretation of results.
8. Effective collaboration must be made with other disciplines, AICRPs in the same university, KVKs, NGOs and GOs (state department of agriculture / horticulture) for dissemination of technologies.
9. Productivity, profitability and impact analysis of weed management interventions should be worked out. Impact analysis should indicate the coverage of area, improvements in livelihood security and rural transformation, etc.
10. Biological control of *Parthenium* and water hyacinth should be demonstrated in the city premises and in villages at prominent locations. Select 1-2 large ponds / water bodies in the city /village infested with water hyacinth and show the effect of biological control.
11. Research articles published by most scientists of coordination centres are not high quality. We must generate quality data and publish articles in high ranked journals.
12. Data of long-term experiments conducted by different centres should be compiled for pooled / combined analysis and working out location x treatment interactions. An article based on each of the long-term experiment should be submitted to the HQ for publication.

XX Annual Review Meeting: CCS HPKVV, Palampur (2013)

1. 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.

2. 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.
3. Physiological studies on weeds in long-term experiments should be done in addition to weed density and seed bank.
4. 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.
5. 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.
6. It was noted that a common format for economic analysis of the experiments should be followed. Dr. P.K. Singh, Nodal Officer (Agril. Extension) will provide a common proforma for economic analysis.
7. 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.
8. Research work on weed management in horticultural and plantation crops, and also under rainfed conditions should be conducted.
9. 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.
10. 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.

XXI Annual Review Meeting: ICAR-DWR, Jabalpur (2014)

1. Major focus should be on biology and management of 5 problem weeds identified under cropped and non-cropped lands in each state / region. The biology of 5 major weeds of the respective centre should be studied in relation to associated crops and the effects of different biotic and abiotic factors on these weeds. Studies conducted over 5 years should be critically analyzed and continued only, if required.
2. The long-term trial on tillage (WS 3.5) should be replaced with the trial on conservation agriculture (WS 3.6). This trial should be conducted in at least 200 m^2 plot size without replications by ensuring the running of zero-seed drill machines. The long-term trials under WS 3.7 completing 10 years may be stopped with valid documentation. In one year the scientists of each centre should compile the data and bring out good publications.
3. It was decided to discontinue the trials which have completed 5 years or more and valid recommendations should be brought out for testing at farmers fields.
4. The losses caused due to weeds should be estimated in a scientific manner and a concrete report should be brought out by the DWSR.
5. Information generated over the years on weed survey and surveillance is required to be compiled, documented and uploaded in the DWSR website before the next Review Meeting.
6. Biology and management of five major weeds of crop and non-crop situations should be documented.
7. Weed management in vegetable, horticulture and plantation crops should receive priority.
8. It was noted that a common format for economic analysis of the experiments is still not being followed by the Centres. Dr. P.K. Singh, Nodal Officer was requested to prepare a uniform methodology for economic analysis in consultation with economists at JNKVV.

9. PIs should give information on contract research trials pertaining to herbicide testing and resource generation in the Annual Report.
10. The number of slides to be presented for every centre should not exceed 10 slides per scientist per centre for timely conclusion of all the technical sessions so that sufficient time is available for discussion. While making presentation in the Review Meeting, only the salient findings need to be presented and that too be discussed with reasons. The results should be synthesized before presentation.
11. All the centres should publish quality research papers in reputed journals.
12. Monitoring of Coordinating centres is lacking in AICRP-WC, which should be made more effective. 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.
13. General recommendations of QRT and specific recommendations for each centre should be effectively implemented. Centres identified as 'Average' and 'Below average' need to do serious introspection and improve their performance considerably.

XXII Annual Review Meeting: PJTSAU, Hyderabad (2015)

1. It was realized that specific recommendations for some individual centres and most of the general recommendations made in the earlier review meetings in 2012, 2013 and 2014 have not been fully acted upon. Therefore, all such points should be duly considered and a convincing ATR should be presented in the next meeting in 2016.
2. Publication record of most centres has not shown any improvement over the last 5 years despite repeated emphasis and recommendations by the QRT. This issue will also be thoroughly discussed in the next meeting.
3. Long-term trials on tillage and herbicides have been conducted for 15-20 years or even more at some centres, which have yielded a vast volume of data. An article on each experiment as per the guidelines should be prepared by each centre and submitted by 31st December, 2015.
4. An article on herbicide residues data generated over the years has been submitted by most centres but it is not in the required format / shape. A thoroughly revised version should be submitted by 15 November, 2015 so that this publication can be released at the next ARM in April, 2016.
5. Long-term experiments which have been conducted for more than 10 years should be terminated. Based on the information generated, new experiments should be proposed and presented at the next meeting. Such experiments should include the latest available herbicide molecules / mixtures for a given crop / situation.
6. A farm pond infested with aquatic weeds like water hyacinth should be selected in the city or in the village, and a success story on weed eradication should be developed and widely publicized. Similarly, *Parthenium* eradication programme must be undertaken in the campus. Such centres showing visible impact of weed control technology will be suitably recognized at the ARM and provided additional grants for infrastructure development.
7. Technical Programme for the next biennium (2015-16 and 2016-17) should be based on the results obtained previously, resources / manpower available, collaboration with other AICRPs, emerging weed problems and farm-oriented problem-solving research. Emphasis should be on fewer experiments but on generation of quality data with visible outputs.
8. Economic analysis has still not been standardized despite development of a common protocol. Dr. P.K. Singh and Dr. Yogita Gharde should develop an MS EXCEL sheet for economic analysis, which must be uniformly followed by all centres from the current year. Dr. Yogita Gharde will finalize the Information System for data acquisition/ analysis of the AICRP trials before the next meeting.
9. Studies on herbicide residues must be conducted in high-value crops, vegetables, spices and fodder crops; and must specify the soil depth, moisture, minimum detectable limits / limit of detection.

10. Technology on *Orobanche* management developed at HAU centre should be demonstrated on a large scale at all other centres including Gwalior, Udaipur and others, for which additional funding support can be provided from the HQ.
11. Directorate will process the specific cases received from the centres, which are related to herbicide recommendations not included in the label claim, and submit to the DPPQS / CIRBC for consideration.
12. Centre which still do not have adequate facilities for estimation of herbicide residues may continue with herbicide/enzyme bioassay studies to generate practical information on residual effect of herbicides.
13. Work on crop modelling should be taken up at centres which have the requisite expertise, e.g. Hyderabad under the guidance of Dr. D. Raji Reddy, Director of Research and an expert in this field.

Specific deadlines for completing the pending / ongoing works were decided as follows:

Item	Deadline	Responsible person
Submission of revised technical programme	10 May, 2016	Principal Investigators
Finalization of Technical programme	15 May, 2016	Nodal officers
Finalization and submission of Technical Programme to all PIs	31st May, 2016	In-charge, AICRP-WM
Submission of revised / final version of the article on herbicide residues	15 June, 2016	Residue Chemists
Submission of articles on long-term herbicide / tillage experiments	15 June, 2016	Principal Investigators
Publication on Major Weeds of India	31st August, 2016	Dr. R.P. Dubey
Publication on Herbicide Residues	31st August, 2016	Dr. Shobha Sondhia and Dr. P.P. Choudhury
Publication on Long-Term Herbicide / tillage experiments	31st August, 2016	Dr. R.P. Dubey and Yogita Gharde

4/6/2016

Dr Shobha Sondhia
Senior Scientist and I/C AICRP-WM
ICAR-DWR, Jabalpur

6/6/2016

Dr A.R. Sharma
Project Coordinators and Director
ICAR-DWR,-Jabalpur

Guidelines for preparation of Annual Report

Outline

1. Introduction of the Centre
2. Weather conditions during the year and deviation from the normal
3. Staff position and Expenditure statement
4. Executive Summary (English & Hindi)
5. Results of practical utility / recommendations passed on to state package of practices
6. Research achievements
   i. Network trials
   ii. Station trials
   iii. TSP programme
7. Publications (original research articles, popular articles, books/book chapters, review articles, presentations in seminars/symposia/conferences, technical/ extension bulletins, radio/TV talks etc. (from the project work and others)
8. Trainings/awareness campaigns
9. Awards/recognitions/students guided
10. Linkages and collaborations
11. Action taken report on the ARM recommendations

General guidelines

- Last date of submission of Annual Report to Coordinating unit, ICAR-DWR is 31st January. Good quality reports with properly analyzed data should be submitted well before the due date. Reports submitted after the last date and those of very poor quality will not be considered.
- Annual Report (2015-16) should contain the findings from January to December, 2015 i.e. experiments conducted *Rabi* 2014-15 and *kharif* 2015.
- Annual Report should not be more than 100 pages (printed on both sides) having text matter in Arial font and font size 11 in single spacing. Title of text should be set in sentence case and bold letters.
- All scientific or technical names as well as all data and facts must be rechecked carefully before submitting the annual report. Methodology followed be written briefly with clarity.
- Furnish complete information under each experiment as proposed in the technical programme.
- All weights and measurements must be in SI or metric units. Use kg/ha, or t/ha (if more than 999 kg/ha), but not q/ha. Do not follow the style kg ha^{-1} or t ha^{-l}. Use % after numbers, not per cent, e.g. 7%. Digits after decimal should be optimized. (0.00543, 0.0543, 0.543, 54.3, 5.43)
- Report yield data in kg/ha or t/ha (as in case of vegetables, potato, sugarcane etc. If yields are affected due to adverse seasonal conditions and are less than national/state averages, furnish specific reasons.
- Weed density / dry weight data to be reported on per m^2 basis. Both square root transformed and original values to be reported.
- Proper statistical analysis should be done for all experiments. SD, SEm and LSD (P=0.05) values given for comparison of treatment means in tables and figures.
- Use of unnecessary abbreviations and treatment symbols such as T_1, T_2 etc. under running paragraphs should be avoided. Use internationally accepted names for crops. Specify with scientific name if the crop / weed is not well known.
- Do not use @ and a.i. while denoting the herbicide dose.
- While reporting the herbicide residue analysis data, all the relevant chromatograms should be included.
- Economics (cost of cultivation, gross and net returns, B:C ratio should also be worked out on the basis of support price. In fact, the economic analysis should also include the additional cost of improved weed management and additional returns thereof (ICBR).
- Avoid numerals and abbreviations at the beginning of a sentence. Only standard abbreviations should be used and these should invariably be explained at first mention. Avoid use of self-

made abbreviations such as Rhizo., Azo., buta., iso., MSM etc. for *Rhizobium*, *Azotobactor*, butachlor, isoproturon, metsulfuron-methyl, respectively.

- For names of herbicides, the first letter need not be capitalized. Trade names should normally be avoided.
- Annual Report and the summary report should be submitted to the Coordinating unit as soft copy and hard copy by post within the due date.

Further points

- Do not mention name of the Director, In-charge or Principal Investigator on the front cover page.
- Design the cover page with a proper theme, or give good quality important photograph(s) given in the text.
- Acknowledgement / Preface can be given, with signature of the Principal Investigator.
- Do not use a very glossy / thick / photographic paper. Do not leave blank pages in between. Preferably adjust tables in portrait, rather than landscape format.
- All centre reports will be uploaded on the DWR website for reference by all concerned.

Broad guidelines for formulating the Technical Programme of AICRP on Weed Management for 2016-18

Suggestions from the NRM Division, ICAR

- AICRPs are an integral part of the Institute, meant for location-specific research.
- The AICRP centres should act like regional centres of the Institute for multi-locational testing / verification of results.
- There must be complete harmony of the research programmes at the Institute and the AICRP centres.
- Centers at the same university must develop effective linkages with other AICRPs for sharing of manpower, laboratory, experiments and other resources. This should be reflected in the technical porgramme as well as in the Annual Report.

General guidelines

- Routine experiments on screening of already available / recommended herbicides in crops may be stopped. Studies on bioefficacy of new herbicide molecules may be done in the respective centres as Station Trials only.
- Emphasis should be given on the emerging / existing problem, for which, research work was not done earlier. Focus on the location-specific problem-oriented research for technology development.
- Consider the existing resources including manpower available. No additional manpower / funding is likely to be available in the coming years.
- Identify a research gap based on the information already generated over the years, and plan new experiments accordingly. It is possible to have different experiments for different centres.
- Limit the number of field experiments. Focus on quality rather than quantity.
- Follow the recommendations of the RAC, QRT and ARMs over the last 4-5 years and address the recommendations / issues raised in these meetings.
- There must be effective collaboration with other AICRPs at your University, e.g. AICRP on Rice, Wheat, Maize, Soybean, Sugarcane, Oilseeds, Pulses, Integrated Farming Systems, Dryland agriculture, Agroforestry, Network projects on organic farming, pesticide residues, and others. This must be reflected in the technical programme document.

Themes of the research programmes should be revised as follows:

Existing theme	**Proposed theme**
1. Weed survey and surveillance	Drop this theme
2. Weed biology and physiology	Weed dynamics and management under the regime of climate change and herbicide resistance
3. Weed management in crops and cropping systems	Development of sustainable weed management practices in diversified cropping systems
4. Herbicide residues – monitoring and mitigation	Monitoring, degradation and mitigation of herbicide residues and other pollutants in the environment
5. Management of problematic / perennial weeds in non-cropped areas	Biology and management of problem weeds in cropped and non-cropped areas
6. On-farm research	On-farm research and demonstration of weed management technologies, their adoption and impact assessment

Specific suggestions

Theme 1: Development of sustainable weed management practices in diversified cropping systems

- Continue with the experiment on "Weed management in CA systems" initiated in 2012. Follow the guidelines strictly.
- Formulate a new long-term experiment on "Weed management in organic farming systems" in high-value crops of your state / region.
- Plan in a cropping system mode, and limit the number of treatments to less than 12.
- Greater emphasis should be given on problem-solving experiments on integrated weed management in pulses / oilseeds, vegetables, horticulture and plantation crops, and on management of problem weeds in respective states.
- Experiments on improving weed control efficiency through management of nutrients, water, soil (tillage), crop (variety), and others may also be planned.

Theme 2: Weed dynamics and management under the regime of climate change and herbicide resistance

- Plan any such experiment depending on the facilities / infrastructure available and specific problem of your region

Theme 3: Biology and management of problem weeds in cropped and non-cropped areas

- Five weed species were identified each for cropped and non-cropped lands in 2012. It was suggested that two species should be focused in each biennium (2012-14, 2014-16). Now take up the remaining species not researched in the last 4 years, and any other emerging problem / new introduction.
- For weeds in non-cropped areas including aquatic situations, application of most promising 2-3 treatments based on past experience and develops it as a Success Story.
- Select a water body / pond in your city / village infested with aquatic weeds and apply the 2-3 most promising treatments
- Select an area (1 ha) infested with the most problematic weed and undertake integrated management
- *Parthenium* eradication from your campus

Theme 4: Monitoring, degradation and mitigation of herbicide residues and other pollutants in the environment

- Study herbicide residues in the long-term CA experiment
- Studies on herbicide residues in high-value crops (organic farming experiment)
- Undertake lab / pot culture experiments on the candidate herbicides for generating information on adsorption, degradation, mitigation etc.
- Testing of persistence of herbicides in the farmers' field (soil and crop produce)
- May undertake bioassay studies if adequate laboratory facilities do not exist.
- Residue scientists can also study the changes in soil health parameters.

Theme 5: On-farm research and demonstration of weed management technologies, their adoption and impact assessment

- Undertake at least two OFR and FLDs in 3-4 locations in each season on the most prominent crops of the area in the farmers' fields.
- Impact analysis may be done in collaboration with social scientists at the Directorate.

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XXIII ANNUAL REVIEW MEETING
ALL INDIA COORDINATED RESEARCH PROJECT ON WEED MANAGEMENT
ICAR - DIRECTORATE OF WEED RESEARCH, JABALPUR

28-30 APRIL, 2016

VENUE: JAIN IRRIGATION SYSTEMS, JALGAON, MAHARASHTRA

PROGRAMME

April 28, 2016 (Thursday)

0830-0930 hrs **REGISTRATION**

0930-1100 hrs **INAUGURAL SESSION**

Welcome address & salient research achievements of ICAR-DWR during 2015-16	**:**	Dr. A.R. Sharma, Director, ICAR - DWR, Jabalpur
Salient achievements of AICRP on Weed Management	**:**	Dr. Shobha Sondhia, In-charge, AICRP – Weed Management
Address by Chief Guest	**:**	Dr. Subramaniam, Sr. Vice President (Agricultural Biotechnology) Jain Irrigation Systems, Jalgaon
Vote of thanks	**:**	Dr. Santosh Deshmukh, Jain Irrigation Systems
1100-1115 hrs	**TEA BREAK**	
1115-1300 hrs	**Guest Presentations by Jain Irrigation Systems** 1. Corporate presentation: Dr. Santosh K. Deshmukh 2. Micro-irrigation and products: Mr. Sanjay Patole 3. Drip irrigation and weed control : Mr. V.B. Patil	
1300-1400 hrs	**Lunch**	
1400-1530 hrs	**TECHNICAL SESSION – I**	
	Presentation of Action Taken Report of previous Annual Review Meeting by Dr. Shobha Sondhia, In-charge, AICRP-WM	
	(Presentation of salient findings of AICRP-WM Centres in North Zone) **Rapporteurs:** Dr T. Girija and Dr Dinesh Shah	
	An overview of north zone centres by Dr. Bhumesh Kumar, Nodal Officer, followed by presentation on research achievements by each PI	
	PAU, Ludhiana	
	GBPUAT, Pantnagar	
	CSKHPKV, Palampur	
	CCSHAU, Hisar	
	SKUAST, Jammu	
1530-1545 hrs	**TEA BREAK**	

1545-1615 hrs	**TECHNICAL SESSION – II** **(Presentation of salient findings of AICRP-WM Centres in central Zone)** **Rapporteurs**: Dr. S.K. Guru and Dr Parvinder Kaur
	An overview of central zone centres by Dr. P.J. Khankhane, Nodal Officer, followed by presentation on research achievements by each PI
	RVSKVV, Gwalior
	IGKV, Raipur
	NDUAT, Faizabad
	RAU, Pusa
1615-1800 hrs	**TECHNICAL SESSION – III** **(Presentation of salient findings of AICRP-WM Centres in East Zone)** **Rapporteurs:** Dr Neelam Sharma and Dr Simerjeet Kaur
	An overview of east zone centres by Dr. P.K. Singh, Nodal Officer, followed by presentation on research achievements by each PI
	AAU, Jorhat
	OUAT, Bhubaneswar
	BAU, Ranchi
	CAU, Pasighat
April 29, 2016 (Friday)	
830-1100 hrs	**Visit to Jain Irrigation Systems**
1100-1200 hrs	**TECHNICAL SESSION – IV** **(Presentation of salient findings of AICRP-WM Centres in West Zone)** **Rapporteurs:** Dr Jayant Deka and Dr R.R. Upasani
	An overview of west zone centres by Dr. R.P. Dubey, Nodal Officer, followed by presentation on research achievements by each PI
	AAU, Anand
	DBSKKV, Dapoli
	PDKV, Akola
	MPUAT, Udaipur
1200-1215 hrs	**TEA BREAK**
1215-1330 hrs	**TECHNICAL SESSION –V** **(Presentation of salient findings of AICRP-WM Centres in South Zone)** **Rapporteurs:** Dr. S.S. Punia and Dr. Jayant Deka
	An overview of south zone centres by Dr. Sushil Kumar, Nodal Officer, followed by presentation on research achievements by each PI
	PJTSAU, Hyderabad
	UAS, Bengaluru
	UAS, Raichur
	KAU, Thrissur
	TNAU, Coimbatore
1330-1430 hrs	**LUNCH BREAK**

1430-1530 hrs	**TECHNICAL SESSION –VI** **(Presentation of salient findings of volunteer centres and ICAR institutes and release of information system on AICRP-WM)** **Rapporteurs:** Dr Asha Arora and Dr Sheela Barla		
	SVBPUAT, Meerut		
	SKUAST, Srinagar		
	BAU, Sabour		
	PJNCA&RI, Pondicherry		
	ICAR-IVRI, Izatnagar		
	ICAR-CIARI, Port Blair		
	Others		
1530–1545 hrs	**TEA BREAK**		
1545-1645 hrs	**TECHNICAL SESSION –VII** **(General discussion, financial issues, interaction with herbicide industry etc.)**		
1700-1900 hrs	**Visit to Gandhi Tirath**		
April 30, 2016 (Saturday)			
830-1100 hrs	**Visit to Jain Irrigation Systems**		
1100-1300 hrs	**TECHNICAL SESSION – VIII** **(Presentation of network Technical Programme for 2016-17 & 2017-18)**		
Dr. R.P. Dubey	:	Development of sustainable weed management practices in diversified cropping systems	
Dr. Bhumesh Kumar	:	Weed dynamics and management under the regime of climate change and herbicide resistance	
Dr. Sushil Kumar	:	Biology and management of problem weeds in cropped and non-cropped areas	
Dr. Shobha Sondhia	:	Monitoring, degradation and mitigation of herbicide residues and other pollutants in the environment	
Dr. P.K. Singh	:	On-farm research and demonstration of weed management technologies, their adoption and impact assessment	
1300-1400 hrs	**LUNCH BREAK**		
1400-1600 hrs	**CONCLUDING / PLENARY SESSION** **(Presentation of summary recommendations)**		

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Status of experiments

SL. No	Coordinating Centres	Network Programmes					
		WS 1: Weed surveillance	**WS 2: Weed biology and physiology**	**WS 3: Weed management in crops and cropping systems**	**WS 4: Management of problematic / invasive / parasitic / aquatic weeds**	**WS 5: Herbicide residues and environmental quality**	**WS 6: Transfer of technology**
1.	PAU, Ludhiana	WS1.1a WS 1.2 WS 1.3	WS 2.1a WS 2.1b WS 2.1c WS 2.1d	WS 3.1.1 WS 3.2 WS 3.3.2 WS 3.4.1 WS 3.5 WS 3.6 WS 3.7	WS 4.1b WS 4.1c WS 4.3	WS 5.1 WS 5.2 WS 5.3 WS 5.5	WS 6.1 WS 6.2
2.	UAS, Bengaluru	WS 1.1a WS 1.2 WS 1.3	WS 2.1a * WS 2.1b WS 2.1d*	WS 3.1.1 WS 3.1.2 WS 3.1.3 WS 3.3.1 WS 3.3.2 WS 3.5 WS 3.6 WS 3.7 WS 3.8.14 WS 3.8.15	WS 4.1a * WS 4.1b* WS 4.1c WS 4.1e WS 4.2	WS 5.1 WS 5.2 WS 5.3 WS 5.5	WS 6.1 WS 6.2
3.	RVSKKV, Gwalior	WS 1.1a WS 1.2 WS 1.3	WS 2.1a* WS 2.1e*	WS 3.2 WS 3.4.1 WS 3.6 WS 3.7	WS 4.1a WS 4.1c WS 4.2 WS 4.3	WS 5.1 WS 5.2 WS 5.3 WS 5.5	WS 6.1 WS 6.2*
4.	GBPUAT, Pantnagar	WS 1.1a WS 1.2 WS 1.3	WS 2.1a WS 2.1d	WS 3.1.1 WS 3.2 WS 3.3.1 WS 3.3.2 WS 3.4.1 WS 3.6 WS 3.8.12* WS 3.8.13*	WS 4.2	WS 5.2 WS 5.3 WS 5.5	WS 6.1 WS 6.2
5.	CSKHPKV, Palampur	WS 1.1a WS 1.2 WS 1.3	WS 2.1a WS 2.1b	WS 3.1.3 WS 3.2 WS 3.3.1 WS 3.4.1 WS 3.6 WS 3.7 WS 3.8.6	WS 4.1c* WS 4.1e WS 4.3	WS 5.1 WS 5.2 WS 5.3 WS 5.4 WS 5.5	WS 6.1 WS 6.2
6.	AAU, Jorhat	WS 1.1a WS 1.2 WS 1.3	WS 2.1a WS 2.1b WS 2.2, WS 2.3.1 WS 2.3.3	WS 3.1.3 WS 3.3.1 WS 3.3.3 WS 3.7	WS 4.3*	WS 5.1 WS 5.2 WS 5.3 WS 5.5	WS 6.1 WS 6.2
7.	AAU, Anand	WS 1.1a WS 1.2 WS 1.3	WS 2.1a	WS 3.2 WS 3.3.2 WS 3.4.1 WS 3.5 WS 3.6 WS 3.7	WS 4.1a WS 4.1b WS 4.1c WS 4.2 WS 4.3	WS 5.1* WS 5.2* WS 5.3* WS 5.5*	WS 6.1 WS 6.2

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8.	TNAU, Coimbatore	WS 1.1a WS 1.2 WS 1.3	WS 2.1a WS 2.1b* WS 2.1d	WS 3.1.1 WS 3.1.2 WS 3.1.3* WS 3.4.1 WS 3.5 WS 3.6, WS 3.7,	WS 4.1a WS 4.1c* WS 4.1d* WS 4.2 WS 4.3	WS 5.1 WS 5.2 WS 5.3 WS 5.4 WS 5.5	WS 6.1 WS 6.2
9.	NDUAT, Faizabad	WS 1.1a WS 1.2* WS 1.3*	WS 2.1a WS 2.1b	WS 3.1.1 WS 3.1.3 WS 3.2 WS 3.3.1 WS 3.3.2 WS 3.4.1 WS 3.6 WS 3.7	WS 4.1a WS 4.1c* WS 4.2 WS 4.3*	WS 5.1 WS 5.2 WS 5.3 WS 5.5	WS 6.1 WS 6.2
10.	BAU, Ranchi	WS 1.1a WS 1.2 WS 1.3	WS 2.1a WS 2.1b WS 2.1d	WS 3.1.3 WS 3.2 WS 3.3.1 WS 3.3.3 WS 3.6 WS 3.7 WS 3.8.3 WS 3.8.4	WS 4.1b WS 4.1c WS 4.2 WS 4.3	-	WS 6.1 WS 6.2
11.	KAU, Thrissur	WS 1.1a WS 1.2 WS 1.3*	WS 2.1a WS 2.1b WS 2.1d	WS 3.1.1 WS 3.1.3 WS 3.3.3 WS 3.6 WS 3.7 WS 3.8.5	WS 4.1e WS 4.1f WS 4.2	WS 5.1 WS 5.2 WS 5.3 WS 5.5	WS 6.1 WS 6.2
12.	OUAT, Bhubaneshwar	WS 1.1a WS 1.2 WS 1.3	WS 2.1a WS 2.1b*	WS 3.1.1 WS 3.1.3 WS 3.3.3 WS 3.4.1 WS 3.6, WS 3.8.8* WS 3.8.9*	WS 4.1a WS 4.1b* WS 4.1c WS 4.2* WS 4.3*	WS 5.1 WS 5.2* WS 5.3 WS 5.5*	WS 6.1 WS 6.2
13.	PJTSAU, Hyderabad	WS 1.1a WS 1.2 WS 1.3	WS 2.1a	WS 3.1.2 WS 3.5 WS 3.6 WS 3.7 WS 3.8.2	WS 4.1a WS 4.1c* WS 4.1d WS 4.2* WS 4.3	WS 5.1 WS 5.2 WS 5.3 WS 5.5 WS 5.6	WS 6.1 WS 6.2
14.	CCSHAU, Hisar	WS 1.1a WS 1.2 WS 1.3	WS 2.1c WS 2.1e	WS 3.1.1 WS 3.3.1 WS 3.4.1 WS 3.5 WS 3.6 WS 3.7	WS 4.1a WS 4.1c WS 4.2 WS 4.3	WS 5.1 WS 5.2 WS 5.3 WS 5.5	WS 6.1 WS 6.2
15.	RAU, Pusa	WS 1.1a WS 1.2 WS 1.3	WS 2.1a, WS 2.1b	WS 3.1.1 WS 3.2 WS 3.3.1	WS 4.1a WS 4.1c WS 4.2	WS 5.1* WS 5.2* WS 5.3*	WS 6.1 WS 6.2

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		WS 1: Weed surveillance	**WS 2: Weed biology and physiology**	**WS 3: Weed management in crops and cropping systems**	**WS 4: Management of problematic / invasive / parasitic / aquatic weeds**	**WS 5: Herbicide residues and environmental quality**	**WS 6: Transfer of technology**
				WS 3.3.3 WS 3.6 WS 3.7	WS 4.3	WS 5.5*	
16.	D BSKKV, Dapoli	WS 1.1a WS 1.2* WS 1.3*	WS 2.1a	WS 3.1.3 WS 3.6 WS 3.7	WS 4.2* WS 4.3		WS 6.1 WS 6.2
17.	IGKVV, Raipur	WS 1.1a WS 1.2 WS 1.3	WS 2.1a	WS 3.1.3* WS 3.6, WS 3.7 WS 3.8.1	WS 4.2 WS 4.3	-	WS 6.1 WS 6.2
18.	SKUAST-Jammu	WS 1.1a WS 1.2*	-	WS 3.4.1	WS 4.1e WS 4.2	-	WS 6.1 WS 6.2
19.	PDKV, Akola	WS 1.1a* WS 1.2*	-	WS 3.3.1 WS 3.5 WS 3.8.10 WS 3.8.11 WS 3.8.16	WS 4.2*	-	WS 6.1* WS 6.2*
20.	CAU, Pasighat	WS 1.1a*	-	WS 3.3.3	WS 4.2*	-	-
21.	UAS, Raichur	WS 1.1a WS 1.3	WS 2.1a WS 2.1d	WS 3.1.1 WS 3.1.3 WS 3.8.10 WS 3.8.18	WS 4.2*	-	-
22.	MPUAT, Udaipur	WS 1.1a	-	WS 3.4.1 WS 3.6 WS 3.8.10 WS 3.8.16	WS 4.2	-	WS 6.1* WS 6.2

***Not conducted**