

Proceeding of Workshop-cum-Meeting on ‘Weed management in Conservation Agriculture’ held on 11-12 September, 2018 at ICAR-DWR, Jabalpur (MP)

A workshop-cum-meeting on “Weed Management in Conservation Agriculture” was held at ICAR-Directorate of Weed Research, Jabalpur (M.P.). This workshop was attended by PIs/Co-PIs who are working on CRP on Conservation Agriculture project of 10 different ICAR institutes located in 8 states along with scientists of the Directorate. The workshop-cum-meeting was attended by following dignitaries, scientists and project staff listed below:

Sl. No.	Participant	Designation	Address
1.	Dr. S.K. Chaudhary	ADG, Soil and Water Management	NRM, ICAR, KAB-II, New Delhi
2.	Dr. A.K. Patra	Director	ICAR-IISS, Bhopal
3.	Dr. P.K. Singh	Director	ICAR-DWR, Jabalpur
4.	Dr. A.K. Biswas	LCPC, CRP on CA	ICAR-IISS, Bhopal
5.	Dr. R.S. Choudhary	Deputy-LCPC, CRP on CA	ICAR-IISS, Bhopal
6.	Dr. T.K. Das	Principal Scientist & PI	ICAR-IARI, New Delhi
7.	Dr. Ranbir Singh	Principal Scientist & PI	ICAR-CSSRI, Karnal
8.	Dr. Parvender Sheron	Principal Scientist & Co-PI	ICAR-CSSRI, Karnal
9.	Dr. R.S. Chhokar	Principal Scientist & PI	ICAR-IIWBR, Karnal
10.	Dr. R.C. Singh	Principal Scientist & PI	ICAR-CIAE, Bhopal
11.	Dr. Dushyant Singh	Principal Scientist & Co-PI	ICAR-CIAE, Bhopal
12.	Dr. Pratibha	Principal Scientist & PI	ICAR-CRIDA, Hyderabad
13.	Dr. S. Kundu	Scientist & Co-PI	ICAR-CRIDA, Hyderabad
14.	Dr. Somasundaram	Principal Scientist & Co-PI	ICAR-IISS, Bhopal
15.	Dr. A.K. Vishwakarma	Principal Scientist Co- PI	ICAR-IISS, Bhopal
16.	Dr. Sushmita	Scientist & Co-PI	ICAR-NRRI, Cuttuck
17.	Dr. Yogeshwar Singh	Senior Scientist & PI	ICAR-NIASM, Baramati
18.	Dr. B.K. Jha	Principal Scientist & Co-PI	ICAR-RC-ER, Ranchi, Patna
19.	Dr. V.K. Choudhary	Senior Scientist & PI	ICAR-DWR, Jabalpur
20.	DR. Sushil Kumar	Principal Scientist	ICAR-DWR, Jabalpur
21.	Dr. R.P. Dubey	Principal Scientist	ICAR-DWR, Jabalpur
22.	Dr. Sobha Sondhia	Senior Scientist & Co-PI	ICAR-DWR, Jabalpur
23.	Dr. Yogita Gharde	Scientist & Co-PI	ICAR-DWR, Jabalpur
24.	Dr. Dibakar Ghosh	Scientist	ICAR-DWR, Jabalpur
25.	Dr. Subhash Chander	Scientist & Co-PI	ICAR-DWR, Jabalpur
26.	Er. Chethan, C.R.	Scientist & Co-PI	ICAR-DWR, Jabalpur
27.	Ms. Anshita Gupta	SRF, CRP on CA	ICAR-IISS, Bhopal
28.	Dr. Abhishek Chauhan	SRF, CRP on CA	ICAR-DWR, Jabalpur
29.	Mr. Akhilesh Patel	SRF, CRP on CA	ICAR-DWR, Jabalpur

The workshop-cum-meeting was inaugurated by Dr. S.K. Chaudhari, ADG (Soil & Water Management), NRM division, New Delhi. In his inaugural address, Dr. Chaudhari appreciated the works done by Directorate of weed research in the field of CA both on-farm research and demonstration of conservation agriculture in nearby districts of Jabalpur for promotion of the technology. He mentioned that Madhya Pradesh had greater scope for spread of conservation agriculture which might be helpful to save the resources and protect the environment. He appealed to the participants to interact in depth to fulfill the objectives of the weed science and to come out with the fruitful recommendations at the end of the workshop. He urged to prepare district-wise doable technologies and road map for wide scale adoption of

CA and also emphasized the need of standardizing proper weed management in conservation agriculture in different crops and cropping systems for its wide scale adoption. He also emphasized on the need to search for an alternative to glyphosate as it was restricted in some of the states. He urged upon LCPC and all concerned to come out with a publication on weed management for different crops and cropping systems under different ecologies under CA. Dr. V.K. Choudhary and Dr. A.K. Vishwakarma were given the responsibility to come up with compilation latest by December, 2018. Dr. A.K. Patra, Director of ICAR-Indian Institute of Soil Science, Bhopal stressed upon the need of weed management in conservation agriculture and hoped that this workshop would be helpful in finding the solution of the problems related to weed management in conservation agriculture. Dr. A.K. Biswas, LCPC, CRP on CA, ICAR-IISS, Bhopal briefed about the objectives of the workshop-cum-meeting and urged the scientists to discuss in depth and wished that the workshop would be more interactive and focused on finding the weed management options in different cropping systems under CA under different agro ecosystems. Dr. P.K. Singh, Director, ICAR-Directorate of Weed Research, Jabalpur informed the participants about the work carried out by Directorate under CRP on CA at the institute as well as in nearby districts of the Jabalpur and in 16 states through AICRP-Weed Management centers located at different State Agricultural Universities. He also informed the house that yield loss incurred by weeds accounted to 33-37% which amounts to about 11 billion US\$ in 10 major field crops. Three publications of the Directorate were also released by the dignitaries on this occasion.

After the inaugural session two technical sessions were conducted followed by field visits to conservation agriculture demonstration plots at the Directorate and at farmers fields adopted under on-farm research trials at Bargi locality.

Technical Session

In this session there were seven presentations made by PIs & Co-PIs of different centers under CRP on CA. The salient points emerged from the presentation & discussions are as follows:

Dr. R.P. Dubey started the technical session by giving a presentation on overall theme of weed management with regard to ICAR-DWR, Jabalpur. He mentioned about the yield losses due to weed infestation in 10 major field crops, which caused an economic loss to the extent of 11 US billion dollars. He also mentioned the impotence of fertilizer application, IWM and good agronomic practices as major pillars of CA beside the other ones. He emphasized on the dominance of grassy weeds under CA practice and particularly dominance of *E. colona* and *D. retroflexa* in DSR system; and infestation of perennial weeds due to adoption of CA for longer period. In Rice-Wheat Cropping System, *Cyperus iria* was more dominant weed than others in Rice & *Medicago polymorpha* in Wheat. DSR was more difficult component in Rice-Wheat system during Kharif season. He stated that success of CA largely depended upon effective weed management and urged the house not to be over dependent on glyphosate alone. He urged to include the allelopathic effect of crop residue on weed and crop as a researchable issue and also for the selection of competitive crops & genotype for weed suppression in CA.

Dr. T.K. Das made a presentation on weed management in conservation agriculture and related problem in irrigated agro ecosystem with regard to ICAR-IARI, New Delhi. In his opinion weeds are prolific breeder & seeder and weed seed bank is almost inexhaustible. He informed the house that weed seeds are mostly present in the surface layer under CA as against the conventional tillage system. He emphasized on the shifting of weed flora due to long term adoption of CA practice. He proposed 5 R's concept viz. Right choice, Right source, Right dose, Right time of application and Right method for weed management in CA. He also emphasized on the use of higher spray carrier volume for pre-emergence herbicide particularly under CA practice when crop residues were retained over the soil surface. Further he also mentioned about the importance of post-emergence herbicide over pre-emergence herbicide. He suggested use of granular herbicides under CA for soil application, a higher rate of application with higher volume of water and preference to be given to Post emergence herbicides. He stressed on the

determination of herbicide residue, pathways of degradation, sorption, desorption & transport mechanism of herbicides under CA.

Dr. Pratibha Moturi made a presentation on the topic of weed management in conservation agriculture and related problem in rainfed agro-ecosystem with regard to ICAR-CRIDA, Hyderabad. She emphasized on the importance of herbicide rotation, brown manuring in rice and ridge and furrow system for suitable crops under CA for effective weed management. She asked the house to recommend suitable herbicides for weed management in finger millet-pigeon pea cropping system under CA. She emphasized on the inclusion of one hand weeding after application of pre- and post-emergence herbicides to reduce weed seed bank pressure. She also requested the house to suggest alternative herbicide for glyphosate as it is expected to be banned in Telangana and the house suggested glufosinate ammonium as an alternative.

Dr. A. K. Vishwakarma made a presentation on the topic of weed management in conservation agriculture and related problem with regard to ICAR-IISS, Bhopal. He mentioned the lower efficacy of pre- and post-emergence herbicides either due to lack of proper soil moisture at initial stage or by erratic rainfall during critical period of crop weed competition resulting in poor weed control efficacy of herbicides. Multiple weed flushes at regular interval is another major problem in rainy season, even after application of pre- and post-emergence herbicides in soybean, maize and direct seeded rice crops. Due to over reliance on herbicides minor weeds are assuming alarming proportion and becoming major weeds in CA fields, e.g. *Dichanthium* sp, *Alternanthera* sp., *Acalypha indica* etc. Experimental findings at IISS proved that removal of escaped weeds after application of pre-and post-emergence herbicides at 60-70 DAS would solve the issue of weed shift & resistance development in weeds. He suggested application of tank mix pre-emergence herbicide (Pendimethalin) along with post-emergence nonselective herbicide like (Glyphosate/Paraquat) within 48 hours of sowing for effective weed control without any phytotoxic effect on germination and crop performance. This will also result in saving of labour and resources.

Dr. Ranbir Singh made a presentation on weed management in conservation agriculture and related problem with regard to ICAR-CSSRI, Karnal. He informed the house that in sodic soil the application of pre-emergence herbicide in happy seeder sown field affected the crop germination and he suggested closing the furrows by providing some plank type structure behind the happy seeder to avoid such problems. He also informed the house that farmers in Haryana were practicing DSR continuously for two years and TPR in third year to break the weed dominancy and again starting with DSR in fourth year. Weed management in a major constraint cycles in DSR, and DSR cannot progress without proper weed control.

Dr. Sushmita Munda made a presentation on weed management in conservation agriculture and related problem in rice with regard to ICAR-NRRI, Cuttack. She informed the house about the problem of suppressing the rice ratoon due to higher residual soil moisture in CA practice, even it affected the growth of succeeding greengram crop. She mentioned that the performance of rice variety "Naveen" was better in CA as compared to other tested rice varieties. Under ZT+DSR+ No Residue, Rice variety CR Dhan 303 & CR Dhan 304, & under ZT+DSR+ Residue, Rice variety Swarna and CR Dhan 304 recorded higher yield than rest of the varieties evaluated. She also informed the house about severe weed competition under DSR and multiple resurgence of weeds in case of DSR.

Dr. R.C. Singh made a presentation on weed management in conservation agriculture and machinery related problems with regard to ICAR-CIAE, Bhopal. He mentioned that modification and refinement was needed in the CA machineries. He urged to use the inclined plate planters for sowing purposes to enhance the seed germination. He also suggested including one mechanical weeding with minimum soil disturbance as a part of IWM approach in CA. He mentioned the lack of availability of CA machineries at custom hiring centers. Further he suggested to bring out some policy changes at Govt. level so that every custom hiring center should have all the machineries required for CA practice.

Dr. R.S. Chhokar made a presentation on weed management in conservation agriculture with regard to ICAR-IIWBR, Karnal. He mentioned that in wheat crop, *Phalaris minor* population was less in ZT plot owing to its early establishment in CA, thus the crop competed better and helped in reducing the weed population. Under ZT condition, less stagnation of water was observed as compared to puddling situation in rice and thus severe weed problems were there in DSR. In sugarcane-greengram cropping system, control of weed is not an easy task. In ZT condition, shift in weed flora was also observed as perennial weeds replaced all other weeds. In case of Turbo Happy Seeder machine, slits remained open thus resulting in poor germination problem after sowing. Crop rotation helped to manage the *Phalaris minor* infestation in Haryana. He also urged the house to reexamine the concept of water saving in DSR.

Dr. V.K. Choudhary made a presentation on weed management under conservation agriculture in different crops and cropping system with regard to ICAR-DWR, Jabalpur. He emphasized on the problem of weed shift in weed flora in permanent ZT plots in different cropping systems. For instance, in rice, grasses and sedges are dominating weeds as compared to broad leaved weeds. Similarly, in wheat, *Avena spp* is the most prevalent one than all other weeds. Early sowing reduced the incidence of *Phalaris minor* in wheat. The efficacy of pre-emergence herbicide may be further improved by applying 750 l/ha of spray volume. Post-emergence herbicides have better control in ZT. Over the period of time, in chemical weed management plots, secondary weeds have become the dominant than others. Single method of weed management is not sufficient for conservation agriculture. Hence, he suggested adopting sequential application of pre-and post-emergence herbicides and need based one hand weeding. This will certainly provide broad spectrum weed control and further reduce the weed seed bank. He also emphasized on the follow herbicide rotations, to achieve broad spectrum weed control. However, perennial weeds became the major problems in ZT plots, even after application of glyphosate at 12-15 ml/l weeds are not been controlled.

Dr. Yogeshwar Singh made a presentation on weed management in sugarcane based cropping system with regard to ICAR-NIASM, Baramati. He emphasized on the earthing up was being followed in sugarcane under ZT plot which was eventually a minimum tillage rather than ZT. Earthing up is must follow practice in sugarcane which also helps in reducing the weed population. However, weed management is not a major problem in sugarcane crop under minimum tillage as compared to CT. He suggested use of preventive measures for removal of weeds before seed set.

Dr. B.K. Jha made a presentation on weed management and other practices adopted by the ICAR-RC-ER, Patna centre under CA. He emphasized on the weed management problem in rainfed situations. He mentioned that they were getting problem in appropriate weed management especially in rice fallow crops like Lentil, Chickpea and other oilseed crops. However, he suggested the advance rice breeding line “IR84899-B-179-13-1-1-1” and released “Swarna Shreya” are good in suppressing weeds under upland rice. He also mentioned about severe weed problem in DSR and lack of suitable herbicides for pulses.

During the presentation the house discussed about the issue of resurgence of weeds even after application of pre and post emergence herbicides, weed shift, resistance and abundance of perennial weeds in the conservation agriculture fields faced by all the centers. It has been unanimously decided by the house that removal of escaped weeds with minimal soil disturbance should be adopted as part of IWM technology for CA. The house also discussed the issue of application of different group of herbicides in combination as tank mixture by some of the centers. Application of Pendimethalin with glyphosate/paraquat has been suggested by IISS Bhopal which gives good results at a reasonable lower rate of application 6-8 ml/lit without any phytotoxic effect on crop, whereas some of the centers are recommending 12-15 ml/lit of glyphosate and even reporting that it is not working well and causing damage to crop besides other environmental concerns. Thus there is need to test these combination in experiments at different locations to validate the aspects considering residual effect, compatibility and environmental issues for its large scale recommendation to farmers. A separate experimental setup may be installed for carrying out

experiment on this aspect and DWR may take initiative to formulate the experiment involving combinations of herbicides and removal of escaped weeds. Caution must be exercised in mixing of herbicide molecules without studying their compatibility, warning and direction prescribed by the manufacturer should also be taken care of while using as tank mixture.

Besides technical sessions, on 12th September, 2018 visit to the research farm of the Directorate was organized, where detailed discussion was done with respect to tillage and weed management practices. Later, all the participants visited on-farm research trials on conservation agriculture at farmer's field where rice and maize based cropping systems are being practiced. The field visit was coordinated by Dr. V.K. Choudhary, Senior Scientist and Principal Investigator, CRP on Conservation Agriculture at ICAR-DWR, Jabalpur (MP).

A bulletin on weed management under CA would be brought out by synthesizing all the presentations made by different centres and/or taking inputs from all centres. Drs. T.K. Das, Pratibha M. A.K. Vishwakarma and V.K. Choudhary would make the first draft. The bulletin has to be published within the shortest possible time preferably within this year.

The workshop concluded with vote of thanks by Dr. V.K. Choudhary and Dr. R.S. Chaudhari, Deputy LCPC, ICAR-IISS, Bhopal.

Distribution

(A.K. Biswas)

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All participants