

Proceedings of Biennial Conference of Indian Society of Weed Science

(1-3 March, 2017)

Venue: Maharana Pratap University of Agriculture and Technology, Udaipur, Rajasthan

Theme: Doubling Farmers' Income by 2022: The Role of Weed Science

Weeds pose a serious biotic constraint in agricultural production systems globally. Besides reducing crop yield and quality, weeds adversely affect biodiversity, animal health and environmental security. Further, problem is aggravating due to climate change, globalization of trades and development herbicide resistance in weeds. Realizing the increasing weed infestations in the cropped and non-cropped lands, agricultural scientists have been undertaking research and sharing their findings at various platforms. Indian Society of Weed Science was established in 1968 and All India Coordinated Research Project on Weed Control was launched in 1978. The establishment of National Research Centre for Weed Science in 1989 at Jabalpur and its up-gradation as ICAR- Directorate of Weed Research (DWR) in 2009 was a major step forward to undertake systematic research and development programmes on weed management in a holistic manner by adopting multi-disciplinary approach.

Indian agriculture plays a major role in the country's economy with 60% of India's population depending on agriculture sector. India may need at least 20 million tons of additional food every year to meet the minimum food and nutritional demands of the growing population which is expected to be 1.7 billion by 2050. The greatest challenge of the 21st century is to meet the rising food demand while maintaining the sustainability of the natural resources. Low productivity of Indian agriculture as indicated by modest average crop yields is another concern for a sustainable growth in Indian economy. Hence, a big challenge for Indian agriculture is to produce more with minimal input resources without causing imbalance to environment and in a sustainable manner.

In order to address the emerging challenges and for doubling farmers' income over the next 7 years, the Biennial Conference of the Indian Society of Weed Science was organized during 1-3 March, 2017 at Maharana Pratap University of Agriculture and Technology, Udaipur, Rajasthan with a theme "Doubling Farmers' Income by 2022: The Role of Weed Science". Following sub-themes were focused during the event.

- Innovative approaches for weed management in crops / cropping systems (Part I)
- Non-chemical methods of weed management
- Herbicide residues and their mitigation
- Innovative approaches for weed management in crops / cropping systems (Part II)
- Weed management for higher input-use efficiency
- Herbicide resistant weeds and crops
- Emerging problem weeds and their management
- Weed risk analysis and ICTs

The conference was organized from 1-3 March, 2017. The major highlights of the conference included: (i) About 200 delegates from all over India and overseas including members of the Society,

scientists from agricultural research institutions and State Agricultural Universities (SAUs), representatives from concerned government departments and industries attended the Conference, (ii) There was General Body Meeting of ISWS on 1 March 2017, (iii) Eight technical sessions were organized, (iv) One Keynote lecture, one Presidential lecture, 8 Plenary presentations, 18 lead papers and 30 oral papers and 252 posters were presented ,(v) Cultural programme on 2 March 2017, (viii) Field visit of the delegates to On-Station and On-Farm trials on 3 March, 2017.

The conference was inaugurated by Dr. U.S. Sharma, Vice Chancellor, MPUAT, Udaipur, and the Chief Guest of the function. The other dignitaries present were; Dr. N.T. Yaduraju, President, ISWS; Dr. T.V. Muniyappa and Dr. L.S. Brar, Former Presidents, ISWS; Dr. A.R. Sharma, Secretary, ISWS and Director, DWSR, Dr. Bhagirath Chauhan from Australia. In his inaugural address, Chief Guest highlighted the problems posed by the weeds and Dr. Mruthyunjaya addressing the gathering emphasized the need of their integrated management instead of relying only on chemicals. He desired that weed scientists should formulate strategies on weed management which are especially suitable for the small and marginal farmers of the country. Dr. A.R. Sharma, Secretary, ISWS welcomed the participants representing almost every state of India. He explained the challenges posed by weeds and the importance of their management. He hoped that this Conference will be useful for the delegates and students to know about the emerging challenges in weed management in different parts of the country and the world. Dr. N.T. Yaduraju, President ISWS highlighted the current scenario of weed problems in the country and the world. He informed the gathering about the role of integrated weed management in improving the input-use efficiency, productivity and profitability. Dr. Mruthyunjaya, former Director, NCAP and National Director, NAIP, ICAR New Delhi, in his keynote address emphasized that reduction in input cost and increase in crop productivity are the major components to the income increase, hence efficient weed management has much importance and play a vital role in increasing the farmers' income.



Release of publications: A book on ‘Weed Science and Management (Eds. N.T. Yaduraju, A.R. Sharma and T.K. Das), jointly published by Indian Society of Weed Science and Indian Society of Agronomy was also released by the Chief guest and dignitaries. On the occasion, Proceedings of Biennial Conference entitled “Doubling Farmers’ Income by 2022: The Role of Weed Science” was also released.



Awards and Fellowships: During inaugural function, the following scientists were honoured for their outstanding contributions to weed science.

Life Time Achievement Award	Dr. L.S. Brar (PAU, Ludhiana, Punjab) Dr. Gita Kulshrestha (IARI, New Delhi)
ISWS Special Recognition Award	Dr. Bibhas C. Ray, New Delhi Dr. Devraj Arya, RML AgTech (P) Ltd. Dr. Bhagirath S. Chauhan, Australia
ISWS Gold Medal	Dr. J.S. Mishra, ICAR-RCER, Patna (2014) Dr. C.T. Abraham, KAU, Thrissur (2015)
ISWS Fellow 2014	Dr. Mahesh K. Upadhyaya, Vancouver, Canada Dr. Dr. C.R. Chinnamuthu, TNAU, Coimbatore Dr. Dharambir Yadav, CCSHAU, Hisar
ISWS Fellow 2015	Dr. V.S.G.R. Naidu, CTRI, Rajahmundry Dr. B. Duary, VB, Sriniketan Dr. Neelam Sharma, CSKHPKV, Palampur
ISWS Young Scientist Award	Dr. Ramphool Punia, SKUAST, Jammu
ISWS Best Ph.D. Thesis Award	Dr. N. Viji, TNAU, Coimbatore Dr. Nimmi Jose, KAU, Thrissur
ISWS Best Book Award	Dr. Bhagirath S. Chauhan & Dr. Gulshan Mahajan
ISWS Student Travel Grant Award	Ms. Tarun Suryavanshi, IGKV, Raipur Mr. Saurabh Pagare, RDVV, Jabalpur Mr. Manpreet Singh, PAU, Ludhiana Mr. Shyam Lal, IGKV, Raipur Mr. Subhash Kumar Mishra, MGCGV, Chitrakoot Mr. Tapas Ranjan Sahoo, OUAT, Bhubaneswar Mr. R. Thirumalaikumar, TNAU, Coimbatore Ms. Paawan Kaur, PAU, Ludhiana Ms. Maninder Kaur, HAU, Hisar Ms. Gunjan Guleria, HPKV, Palampur
Best poster awards	Three best poster awards were also distributed



Proceeding of Technical sessions

Date; 1.3.2017

TECHNICAL SESSION 1: Innovative approaches for weed management in crops/cropping systems (Part I)

Chair: Dr L.S. Brar, Rapporteur: Dr P.S. Bodake

During the session, two lead and five rapid fire presentations were made. Dr V. Pratap Singh presented first lead paper and discussed about the impact of crop establishment on weed shift and yield in rice-wheat cropping system. Dr M.S. Bhullar in his lead presentation stressed upon the innovative approaches for weed management in crops and cropping systems. After lead papers presentations rapid fire presentations were made. Dr Simerjeet Kaur discussed about the control of mixed weed flora in wheat with pre- and post-emergence herbicide combinations. Dr R.K. Ghosh explained that how pre-emergence herbicides are ancillary apt for annual planning of weed management in system intensification at inceptisol. Dr Ramanjit Kaur Randhawa presented the effect of sequential herbicide application and their effect on growth and yield of *Rabi* onion. Dr P.S. Bodake presented research finding on the influence of integrated weed management on green forage yield and quality of oat. Last presentation was made by Dr A.S. Rao who presented his findings on post-emergence herbicides on weed control and yield of sesamum.

Chairman of the session appreciated all the speakers and asked to continue their efforts more vigourously keeping in mind realistic needs at the farmers' end.

TECHNICAL SESSION-2: Non-chemical methods of weed management

Chair: Dr T.V. Muniyappa, Co-chair: Dr M.K. Porwal, Rapporteur: Dr. T. Girija

Lead paper was presented Dr .S.K. Sharma on Weed management in organic agriculture. He pointed out that 20% more rates were obtained from organically grown crops. In addition, organic farming also had positive impact on biodiversity, increased employment opportunities and improved soil moisture conservation. Dr. Dinesh Sah from Phasighat, Arunachal Pradesh reported higher gross and net returns with soybean or blackgram inter-cropping with maize with two hand weedings i.e. at 25 and 50 DAP. The third speaker was S.H. Kakade who discussed about integrated weed management in turmeric. Dr. Parmeet Singh of SKUAST Kashmir presented the potential use of encapsulated essential oils of *Callistemon viminalis* as a potent bio-herbicide and discussed about the methodology of producing it. Dr N. Ananda discussed the effect of allelo-chemicals on Parthenium control. He reported that *Eucalyptus* fresh leaf leachate 10% and also leaf extract of *Prosopis* leaf provide good control of Parthenium. The chairman summed up the session with the suggestion that research work must also go out of laboratory and demonstration trials to the farmers' fields.

Date 2.3.2017

TECHNICAL SESSION-3: Herbicide residues and their mitigation

Chair: Dr. Gita Kulshrestha, Co-chair: Dr Shashi Bala Singh, Rapporteur: Dr Anil Duhan

During the session, 3 lead presentations and 4 rapid fire presentations were made. Dr. Shobha Sondhia presented her research findings on herbicide residue hazards and their mitigation modalities. She

reported about herbicides residues in various commodities and their effect on aquatic ecosystem. Dr Shashi Bala Singh presented reaserch work on remediation strategies for herbicides, and stressed over various remedial aspects like physical adsorption method, bioremediation methods using various microbes and some fungal strains, bio-stimulation of microorganisms already present in the soil by various means. She also informed the house about various new technologies for effective removal of herbicides residues like phytoremediation, vermiremediation, some combined technologies like use of bio-beds, prepared inoculums, engineered microbes and engineered plants etc. In another lead presentation delivered by Dr Neelam Sharma on Herbicides vis-a-vis other pesticides: an overview on use and potential hazards, the speaker explained critically by comparing the various pesticides with herbicides in reference to their usage pattern, their impact on soil, water contamination and other potential hazards.

In rapid fire section, Dr. T Ramprakash delivered presentation on phytotoxicity and soil dissipation of pre-emergence herbicides applied to beetroot. Dr. P.P. Chaudhary discussed about decontamination of bispyribac-contaminated soil by *Azotobacter chroococcum*, The presentation was very informative in reference to tolerance of *Azotobacter* isolate to bispyribac-sodium, rate kinetics as affected by *A. chroococcum* and various degradation products of bispyribac-sodium observed in soil. Dr. P. Murali Arthanari, in his presentation on dissipation kinetics of quizalofop ethyl in acidic and high organic matter soil, informed that persistence of quizalofop ethyl in soil varies with doses of application. He also stressed that even after fast degradation of quizalofop ethyl, it could form persistent metabolite like quizalofop acid due to hydrolysis and stressed over the need of continuous monitoring in environment to circumvent the contamination and buildup of its residue in soil and crop produce.

Chairperson summarized all the presentations and congratulated all the speakers for their informative and novel research inputs in this field.

TECHNICAL SESSION-4: Innovative approaches for weed management in crops/cropping systems (Part II)

Chair: Dr V. Pratap Singh, Co-chair: Dr J.S. Mishra, Rapporteur: Dr M.T. Sanjay

Two lead presentations and 5 rapid fire presentations were made during the session. Dr M. Madhavi presented work on sequential application of herbicides for weed control in transplanted rice including economics and energetics. In another presentation, Dr T.K. Das discussed about weed management under conservation agriculture. He also discussed about challenges ahead and needs with reference to weed management under conservation agriculture. During rapid fire presentations, Dr R.S. Choudhary detailed about suitable weed management strategies in maize. Dr J. Deka highlighted potential weed management strategies in potato. Dr R.P. Dubey discussed about the effective weed management practices in mango orchards. Dr V. P. Singh presented research work on effect of integrated weed management technique comprising of trash mulching against weeds in sugarcane. Last presentation of the session was made by Dr U.P. Singh during which he discussed about viable weed management options for sustainable crop production. Chairman summed up the session and emphasized the need of viable options for pulses and high value crops.

TECHNICAL SESSION-5: Weed management for higher input-use efficiency

Chair: Dr R.K. Ghosh, Rapporteur: Dr P.J. Khankhane

The technical session 5 was focused on 'Weed management for higher input use efficiency' and comprised of two lead presentations and 4 rapid fire presentations. At the outset chairman welcome the delegates and speakers. Dr. J. S. Mishra presented the lead paper on weed management for higher input use efficiency. He pointed out the need of weed management to avoid competition for nutrients and water. He also stated that integrated weed management of inter-cropping, stale seed bed and herbicide use are the key for improvement of input use efficiency. In next lead presentation, in another lead presentation, Dr. B. Duary discussed about biology and management of *Echinochloa* sp. under rice farming system. Among rapid fire presentation, Dr V. K. Sindhu discussed about how pre-emergence herbicides can tactically fit into conservation agriculture system and with various benefits. Dr. Tapas Choudhary presented on changes of microbiological properties and sequestering of carbon in soil under influence of conservation agriculture. He reported that higher carbon sequestration was recorded in zero till condition than conventional tillage. Dr. Murali A. Palanisamy presented paper on reduced tillage and weed management strategies on productivity of maize –sunflower under conservation agriculture system. Dr R. Upasani discussed about the effect of weed management in blackgram and its residual effect on succeeding mustard crop. He reported that combination of imazethapyr and imazomox controlled weeds both at 30 and 60 days than application of herbicide alone. There was no phytotoxic effect of herbicide on succeeding mustard crop.

Chairman summed up the session with the remark Increase in input use efficiency gave a direct benefit to the farmers and can help in doubling of the farmer's income if research on the associated aspects persuaded in a right perspective.

TECHNICAL SESSION-6: Herbicide resistant weeds and crops

Chair: Dr C. Chinnusamy, Rapporteur: Dr P. Deshmukh

In this session, Dr C. Chinnusamy talked on herbicide tolerant crops as an innovative approach of integrated weed management in crop production. He discussed various claims, apprehensions and other social issues related to herbicide tolerant crops in Indian context. Dr R.S. Chhokar discussed about management of herbicide resistant weeds for sustainable crop production with special focus on *Phalaris minor* which had acquired multiple herbicide resistance and resulting huge losses in wheat crops in northern India. During rapid fire presentations, Dr Dharam Bir Yadav reported new herbicide resistant weed '*Rumex dentatus*' from Haryana. Dr Ramesh K. Singh discussed about new formulation of mesosulfuron-methyl 1% + clodinafop-propargyl 6% which is found very effective for management of resistant weeds in wheat. Dr Durg Singh told about targeting isoproturon resistant D1 protein of *Phalaris minor* which is based on Rational drug design approach. Dr Maninder Kaur during his presentation, made confirmation of multiple herbicide resistance in *Phalaris minor* and possible management measures with herbicide mixtures and sequences. Dr Myank Yadav from DOW Agrosience highlighted ALS herbicide resistance in rice ecosystem in India. He focused on current understanding of the subject and way forward to deal with the problem of herbicide resistance.

Chairman appreciated the presentations made during the session, and expressed satisfaction over the efforts being made by the researchers to deal with the problem of herbicide resistance in weeds.

TECHNICAL SESSION-7: Emerging problem of weeds and their management

Chair: Dr R.M. Kathiresan, Co-chair: Dr Virendra Nepalia, Rapporteur: Dr D.K. Roy

In this session two lead presentations and two rapid fire presentations were made. First lead presentation was given by Dr. S.S. Punia on *Orobanche* and its management in mustard and solanaceous crops. He reported that *Orobanche* has emerged as a major threat to rapeseed-mustard production in northern Rajasthan, Haryana, Punjab, North-east Madhya Pradesh and Purvanchal region of U.P. In Andhra Pradesh, 50% area under tobacco infested with *Orobanche* causing 50% crop losses. Second lead presentation was presented by Dr. Sushil Kumar. He reported that in India, manual removal of aquatic weeds is still the most popular way, however use of mechanical devices like aquatic weed harvester and JCB machines can be proved efficient and economical way. He also suggested use of integrated approaches and converting the biomass for aquatic weed into vermi-compost and termed it as a viable option to mitigate the aquatic weed problems. During rapid fire presentation, Dr. P. Jones Nirmalnath discussed about the effectiveness of fungi in the management of *Striga* in sugarcane under farmers' fields in north Karnataka. Last presentation was made by Dr. D.K. Roy. He reported that in Bihar, application of neem cake @ 200 kg/ha at sowing *fb* soil drenching of Metalaxyl MZ 02% at 20 DAP was found effective in management of *Orobanche* shoots.

Chairman of the session thanked the speakers and asked to further intensify their efforts for management problematic weeds.

TECHNICAL SESSION-8: Weed risk analysis and information and communication technologies (ICTs)

Chair: Dr B.S. Chauhan, Co-Chair: Dr. M.S. Bhullar, Rapporteur: Dr V.S.G.R. Naidu

The session was chaired by Dr B.S. Chauhan from Australia. In his opening remarks, he explained the need of weed risk analysis and use of ICTs. Dr M.C. Singh discussed in detail the objective of a risk assessment for invasive weeds is to decide which species should be listed on quarantine weed lists and to decide which new species infestations should be controlled or removed in order to prevent their spread. Protocol for weed risk analysis and its validation also discussed. Dr V.S.G.R. Naidu talked on opportunities for collaborative research in applications of ICTs in weed management. He clarified that decision making on weed control is challenging due to dynamism of the problem of weeds. ICT tools can play a potential role in achieving timely and effective inputs for weed management. It also helps in establishing collaboration among research and extension personnel, students and farmers in order to get updated technical knowledge and adopt appropriate technologies to propagate best weed management practices. Dr. Ajit Kumar gave an account of role of herbicide industries to address present and future challenges.

Major recommendations

1. Research efforts must be focused on realistic farmers needs.
2. Location-specific weed management technologies must be developed for whole cropping system instead of a single crop.
3. **Effective formulation of bio-herbicides may play crucial role in managing herbicide resistant weeds, therefore, emphasis needs to be intensified in this direction.**

4. In response to honorable Prime Minister's call for doubling of farmers' income by 2022, input use efficiency must be increase with innovative and eco-friendly approaches in weed management.
5. Organic farming is being promoted on a large-scale in recent years. There is an urgent need to develop weed management technology in organic agriculture for high-value crops.
6. There is a need for validation of recommended weed management technologies on farmers' fields and impact assessment of the adopted technologies.
7. Integration of chemical weed control with mechanical, cultural and biological means must be taken care to reduce the dependence of herbicides and to ensure the environmental safety.
8. Work on herbicide tolerant crops should be expedited and products must be evaluated thoroughly for commercialization.
9. More strict protocols must be developed to check the entry of alien invasive weed species into India. Existing protocols may be revised suitably in consultation with nodal agency.
10. A robust extension system based on Information and Communication Technologies (ICTs) must be developed to bring all the stakeholders at a common platform. Public involvement and awareness must be a priority for successful implementation of the research programmes.

(Sushil Kumar)
Secretary