



WEED news



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From Director's Desk



Herbicides are the foundation of weed control in modern agricultural production systems. The evolution of herbicide-resistant weed populations is a natural response to selection pressure imposed by such agricultural production technologies. Resistance of weeds to herbicides is an undesirable secondary effect produced after the repeated use of same herbicide, where a specific weed population is no longer controlled with the same efficacy by the herbicide. Evolution of resistance or avoidance is also favoured when a particular management practice is repeated over a period of time without any diversification. There are currently 416 unique cases (species x site of action) of herbicide resistant weeds globally, with 222 species including 129 dicots and 93 monocots. Weeds have evolved resistance to 21 of the 25 known herbicide sites of action, and to 150 different herbicides. Herbicide resistant weeds have been reported in 74 crops from 63 countries.

Resistance in *Phalaris minor* to isoproturon application is the only reported case so far in India since the first report in early 1990s. Now this is common throughout the Indo-Gangetic Plains covering more than one million ha of wheat growing area. Recently, some of the populations of *Phalaris minor* have also evolved multiple resistances to 3 modes of action (Photosynthesis at photosystem II site A, ACCase and ALS inhibitor). However, these multiple resistant populations are sensitive to triazine (metribuzin and terbutryn) and dinitroaniline (pendimethalin) herbicides. The dependence on herbicides has contributed to the rapid evolution of multiple herbicide resistance, and integrated weed management strategies must be adopted to ensure the sustainability of crop production. The long-term strategies comprising of suitable crop rotation, herbicide rotation and sanitation practices (weed-free crop seeds and manure) along with other agronomic tactics (competitive variety, early sowing, higher seed rate, zero tillage, stale seedbed etc.) need to be integrated for effective management of herbicide resistant weeds.

Our Directorate has initiated a research programme on "Weed management in the context of herbicide resistance" to study the physiological and molecular aspects, especially in species like *Phalaris minor* and *Echinochloa crusgalli*. Such aspects should receive greater attention of weed scientists as the use of herbicides is finding rapid acceptance among the farmers throughout the country.



Herbicide resistant biotypes of *Phalaris minor* at DWSR farm

Research notes

Effect of herbicides on water quality and fish mortality

With the increasing use of herbicides for weed control, the applied herbicide may find its way into the streams and underground water sources by runoff and leaching mechanism. The side effect of usage of such herbicides may result in undesirable consequences on



non-target organisms. Therefore, the herbicide residues in water and their effect on water quality and fish were evaluated in rice-based cropping system.

There was slight increase in pH (7.6-8.1) and electrical conductivity (287-395 $\mu\text{S}/\text{cm}$) of pond water receiving runoff due to the flood irrigation in wheat. The increase was higher where carfentrazone was applied, followed by

Residues of herbicides in fish ($\mu\text{g}/\text{g}$)

Days after application	Pyrazosulfuron-ethyl	Pretilachlor
30	0.0056	0.063
60	<0.001	0.010
100	<0.001	<0.01

pinoxaden and fenoxaprop-p-ethyl. The pH of the pond water varied from 7.20-7.85, and EC from 648-805 $\mu\text{S}/\text{cm}$ during the period from 0-90 days. Fish mortality and toxicity symptoms were recorded at 30 and 60 days, when herbicides applied in the rice crop during Kharif season entered through runoff water. Residues of pretilachlor were found in fish at 30 and 60 days and while pyrazosulfuron-ethyl residues were found at 30 days only. Thereafter, the residues were below detection limit (<0.001 $\mu\text{g}/\text{g}$).

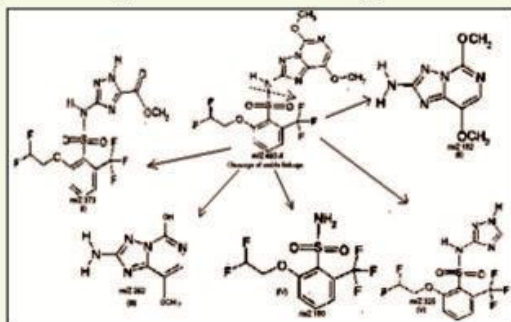
DWSR
Celebrating

25 years
1989-2014

Major degradation products of penoxsulam obtained by *Aspergillus flavus* in soil

Biological degradation mediated by soil microbes is the main route for ALS inhibitors detoxification in soils. Thus, a fungal mechanism was identified to degrade penoxsulam in the soil by isolating and identifying penoxsulam-degrading fungi from soil of rice field.

Five metabolites of penoxsulam degraded by *Aspergillus flavus* were identified by LC/MS/MS from field soil of rice crop as: methyl 3-[[[2-(2,2-difluoroethoxy)-6-(trifluoromethyl)phenyl]sulfonyl]amino]-1H-1,2,4-triazole-5-carboxylate m/z 373 (I); 5-hydroxyl, 8-methoxy 1,2,4-triazolo-[1,5-c]pyrimidin-2-amine (III); 1,2,4-triazolo-[1,5-c]pyrimidin-2-amine, 5, 8-dicarboxylic acid (I); 2-(2,2-difluoroethoxy)-6-(trifluoromethyl)benzenesulfonamide (IV); 5,8-dimethoxy 1,2,4-triazolo-[1,5-c]pyrimidin-2-amine (II) and 2-(2,2-difluoroethoxy)-N-1H-1,2,4-triazole-3-yl-6-(trifluoromethyl)benzenesulfonamide (V).



Transformation products of penoxsulam obtained by *Aspergillus niger* in soil

News

Weed Management in Conservation Agriculture – a Major Initiative

A major research programme on conservation agriculture-based technologies has been undertaken at the Directorate of Weed Science Research (DWSR), Jabalpur. Several research and extension programmes in conservation agriculture have been taken up in diversified cropping systems. A network programme on weed management in conservation agriculture systems has also been initiated at the 22 centers of AICRP on Weed Control, which are located in different agro-climatic regions of the country. Almost the entire research farm (60 ha) of the Directorate was put under zero-till sown crops



Wheat sowing with Happy Seeder

during rabi 2012-13, and burning of any crop residue including weeds was completely stopped. Most of the Kharif and Rabi season crops were grown under zero-till condition. Results obtained during the first cycle showed significant advantages of improved technologies compared with the conventional practice. On-farm research trials were also undertaken in the farmers' fields. Additional returns over the farmer's practice increased substantially and the farmers were highly satisfied with the demonstrated technologies. The programme was highly successful and led to greater awareness among the farmers about the low-cost weed management practices.

Agriculture Education Day

DWSR celebrated the 2nd Agriculture Education Day on 10 December, 2013 to promote the spirit of agricultural science among the school children. Thirty four students along with their teachers from



six different schools (Wings Convent High School; Maharajpur, Sardar Vallabh Bhai Patel High School; Singod, Singod High School; Singod, Government Girls High School; Panagar, Ajay Satya Prakash High School; Panagar, and Baroda High School; Baroda.) located in rural areas of Jabalpur took part in day-long activities, viz. inspirational talks, visit to information centre, library, laboratories, research fields, and quiz competition.

Dr. K.K. Barman, Sr. Scientist and the Programme Convener, in the introductory remarks highlighted the importance of agricultural education. Dr. AR Sharma, Director eloquently enlightened the participants about the historical perspectives and current



status of agricultural research and education in India, and highlighted the opportunities existing for the students in pursuing their career in agricultural education. Presentations were made by scientists on different topics of agriculture on this occasion. Students were demonstrated field trials, methods of making vermicompost and biological control of Parthenium. The students enthusiastically interacted with the scientists while visiting laboratories, experimental fields and information centre. In the closing ceremony, awards to winners of quiz completion and participation certificate to all participants were given by the Director.

DWSR-Industrial Day

DWSR-Industry Day was organized for the first time on 19 December, 2013 in order to further strengthen the linkages for effective collaboration with the herbicide industry for testing of new molecules/formulations as well as those dealing with farm machinery, spraying equipments and instrumentation. Dr. Shobha Sondhia, Senior Scientist and the Convener, in her introductory remarks highlighted the emerging concerns and challenges in agricultural production particularly with respect to weed infestation and the important role of industry and weed scientists representatives from different industries were present in the event. Er. H.S. Bisen, Acting Director, DWSR was Chairman of the event. Presentations and discussions were held on need to change scientific enterprising in the era of globalization, scientists from DWSR suggested industry persons to orient pesticide dealers for further disseminating knowledge to stakeholders about safe use of herbicides and disposal of containers. It was also suggested that some initiatives should be made by Government to check spurious pesticides in India.



Communal Harmony Week

The Communal Harmony Week was celebrated at DWSR from 19-25 November, 2013 and the Flag Day was observed on 25 November 2013. The Director appraised the importance of the week to staff and mentioned that besides promoting communal harmony, the main objective of the Communal Harmony Campaign is to provide assistance for the physical and psychological rehabilitation of the child victims of communal, caste, ethnic or terrorist violence, with special reference to their care, education and training. A sum of ₹ 1460/- collected from the staff was donated on the occasion.

ISO 9001: 2008 Certification to DWSR

It was an honour and moment of celebration for the DWSR to be conferred certification on 21 December, 2013 by implementing the Quality Management System as per the ISO 9001:2008 standards. Acquiring ISO 9001:2008 certification is one of the performance mon-



itoring indicators to be complied by all Government Departments in the country as per the Result Framework Document (RFD).

Implementation of ISO 9001-2008 as per the approved action plan of RFD 2013-14 is the success indicator of mandatory objective under administrative reforms of all the Government Departments. It testifies the commitment towards assuring quality services to its customers with continual improvement of its delivery system. As per the quality policy, the DWSR is committed to continual improvement for achieving excellence in agricultural research.

Participation in ICAR Inter-zonal Sports Meet

Sports contingent of the Directorate consisting of 04 players participated in individual events in ICAR Inter-Zonal Sports meet - 2013 held at N A A R M ,



Hyderabad during 17-21 December, 2013. Sh. S.K. Bose (Chess - Men) and Sh. Veer Singh (Carom - Men) won second position.

Personalia

Participation in Seminars/Symposia

- Dr. A.R. Sharma attended '24th Asian-Pacific Weed Science Society (APWSS) Conference' during 22-25 October, 2013 held at Bandung, Indonesia.
- Dr. V.P. Singh attended 'National Symposium on Modern Agricultural Technologies' during 14-16 December, 2013 held at CIFE, Mumbai and delivered a lecture on 'Achievements and Challenges in weed Management'.
- Dr. Bhumes Kumar attended the National Conference of Plant Physiology-2013 on 'Current Trends in Plant Biology Research' at the Directorate of Groundnut, Junagadh (Gujarat) during 13-16 December, 2013 and presented a paper on "Bioprospection of weed species for food and nutritional security under the regime of climate change: Adding new items in food basket".
- Dr. D.K. Pandey attended the National Conference of Plant Physiology-2013 on 'Current Trends in Plant Biology Research' at the Directorate of Groundnut, Junagadh (Gujarat) during 13-16 December, 2013 and presented a paper on "Relative herbicidal activity of sesquiterpene lactone parthenin on pondweed (*Potamogeton crispus*) and rice var. Kranti".
- Dr. A.R. Sharma delivered a lecture on Conservation Agriculture and was the Guest of Honour at the Model Training Course on "Integrated farming systems for enhancing resource-use efficiency and livelihood" at IARI, New Delhi on 27 December, 2013.

Director's Meeting with Scientists and Staff

- Monthly scientists' meetings were conducted to review progress of ongoing research and other related works on 1 October, 1 November and 26 November, 2013.
- Meetings of scientists were held on 11-16 November, 2013 to discuss and review the action taken on recommendations of QRT, RAC, IRC and Annual Review Meeting of the AICRP on Weed Control.

Guest Lectures

- Dr. T.R. Sharma, Principal Scientist (Biotechnology), NRCPB, New Delhi: "Plant genomics for gene discovery and genotype development" on 14 November, 2013
- Dr. B. Gangwar, Director, PDFSR, Modipuram: "Farming Systems Research" on 20 December, 2013.

Technical Seminars

- Dr. Meenal Rathore: "Weedy rice: Problems and prospects" on 30 October, 2013
- Dr. A.R. Sharma: "Deputation seminar for participating in the 24th APWSS Conference at Bandung, Indonesia" on 21 November, 2013
- दिनांक 13 दिसम्बर 2013 को खरपतवार विज्ञान अनुसंधान निदेशालय के समस्त तकनीकी वर्ग के अधिकारियों/कर्मचारियों हेतु रा.का.समिति द्वारा हिन्दी कार्यशाला का आयोजन किया गया, जिसमें निदेशालय के वरिष्ठ तकनीकी अधिकारी श्री संदीप धगत द्वारा निदेशालय के विभिन्न डेटाबेस की जानकारी से संबंधित विषय पर वक्तव्य दिया

M.Sc./Ph.D. Thesis Seminar

- Mr. Rajesh Yadav: "Remediation of agro-contaminants in soil under different plant species" on 10 December, 2013.

Training

- Dr. Raghwendra Singh, Senior Scientist and Mr. Dibakar Ghosh, Scientist attended a 21-day training on 'Advances in Experimental Designs for Development of Technologies in Agriculture' during 23 October-12 November, 2013 held at IASRI, New Delhi.
- Dr. P. J. Khankhane, Senior Scientist attended training-cum-workshop on Hindi at the Central Hindi training Institute, New Delhi during 18-22 November, 2013.
- Dr. Yogita Gharde, Scientist attended 5-day training on 'Data analysis using SAS' at the IASRI, New Delhi under NAIP during 9-13 December, 2013.

Field visits

- A field visit was organized on 3 October, 2013 to review the progress of on-going experiments of the scientists.

Distinguished visitors

- Dr. Thomas Tan from PI Industries Ltd, Malaysia on 8 October, 2013
- Dr. Vishwanathan Gade, GM, PI Industries Ltd, India on 8 October 2013
- Dr. Poh Leong Tat from PI Industries Ltd, Malaysia on 8 October, 2013
- Dr. T.R. Sharma, Principal Scientist, NRCPB, New Delhi on 14 November, 2013.
- Dr. B. Gangwar, Director, PDFSR, Modipuram, Meerut on 20 December, 2013.



Promotion

Sh. Rajendra Hadge was promoted from Office Assistant to Assistant Administrative Officer w.e.f. 09 December, 2013.



Transfer

Shri R.N. Bharti, Librarian, was transferred on 07 September 2013 from DWSR, Jabalpur to Indian Institute of Sugarcane Research, Lucknow (UP) along with his post.



Forthcoming Events at DWSR:

Coinciding with the Silver Jubilee Year of The Directorate (1989-2014), the following events will be held at DWSR, Jabalpur:

- Annual Review Meeting of All India Coordinated Research Project on Weed Control (AICRP-WC) from 12-14 February, 2014
 - Biennial Conference of the Indian Society of Weed Science on 'Emerging Challenges in Weed Management' from 15-17 February, 2014. Following sub-themes are proposed:
 - Weed biology and ecophysiology
 - Sustainable weed management in diversified cropping systems
 - Weed management in conservation agriculture systems
 - Crop-weed interactions under changing climate
 - Herbicide resistance and herbicide tolerant crops
 - Biological weed management & allelopathic interactions
 - Herbicide residues and their mitigation
 - Invasive, parasitic and aquatic weed management
 - On-farm research and impact assessment
- Scientists, PG students, personnel from the herbicide industry and other organizations are invited to participate in this Conference. Detailed information is available on the website: www.isws.org.in

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