ISWS News Letter

A publication of Indian Society of Weed Science

July – December 2021

ISWS HOME PAGE ACCESSED AT: www.isws.org.in

Message from President

Dear Honorable Members of the ISWS

Greetings!!!.
"Wish you all a very happy and prosperous New Year, 2022".

The year 2021 was full of challenges for all of us. We have witnessed the world's worst second wave of Covid-19 and the loss of lives of dear ones. I pray the Almighty for grant of peace to the eternal souls who have lost their lives during the pandemic. In spite of persistent Covid-19 threat, we have started to concentrate in our work with the regular opening of research institutions in the country. I am sure, you all have taken both the doses of vaccines to fight against this devastated disease effectively. I appeal to all of my elder colleagues to go for booster dose immediately, if it has not been taken yet.

In the year 2021, we started a series of webinars almost every month on different current topics on weed science by the eminent weed scientists of India and abroad to uplift the current knowledge of the members especially younger ones. This series of webinars received very warm response from the members, which can be judged by large number of participations in each of such webinars. On the demand of members, we also organized one online 6 days training course on 'Advances in weed management for sustainable agriculture' during 13-18 December, 2021, which was also attended by large number of participants from all over India. You will also be delighted to know that more than 76 new colleagues have joined the Society during the period of 2021. I welcome all of them in the Society. We have also done a lot of improvement in the website of ISWS for its easy access and to retrieve the information with single click. I request all of you to visit the ISWS website regularly to get updates and to access the Indian Journal of Weed Science.

You will be happy to learn that ISWS in collaboration with Anand Agricultural University, Anand (Gujarat) and ICAR-Directorate of Weed Research is organizing 3rd International Weed Conference (3rd IWC) during 20-23 December, 2022 at Anand. This venue is kept in view of its proximity with the world tallest statute "Statue of Unity". We are exploring the possibility to organize a trip to this point for the participants to witness the statue and scenic beauty of the area. I invite all of you to participate in this conference and request you to lock the dates.

Please take utmost care of yourself and your family.

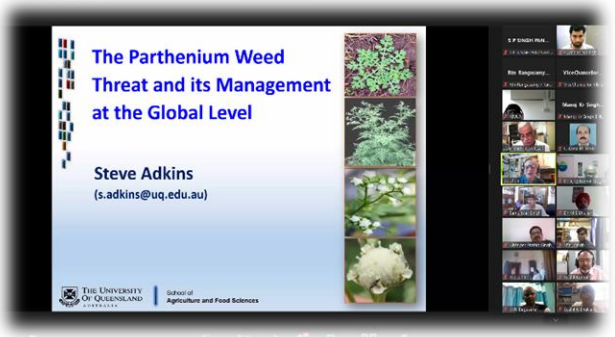
Wish you all the best in your endeavor in weed science.

Sushil Kumar

Webinar series organized by ISWS in collaboration with ICAR-DWR

Webinar	Date	Topic	Speaker	Chairman	Convener	Organizing Secretary
7th Webinar	20th July, 2021	Restrictions in use of glyphosate: Implications in weed management	Stakeholder's Dialogue	Dr. Sushil Kumar, President, ISWS, Jabalpur	Dr. C.R. Chinnamuthu, Vice-President, ISWS, Coimbatore	Dr. J.S. Mishra, Secretary, ISWS & Director, ICAR-DWR, Jabalpur
8th Webinar	16th August, 2021	The *Parthenium* weed problem and its weed management at Global level	Dr. Steve W. Adkins, School of Agriculture and Food Sciences, University of Queensland, Brisbane, Australia	Dr. A.K. Pandey, Vice Chancellor, Vikram University, Ujjain	Dr. Sushil Kumar, President, ISWS, Jabalpur	Dr. J.S. Mishra, Secretary, ISWS & Director, ICAR-DWR, Jabalpur
9th Webinar	28th September 2021	Harvesting of weed seeds: A novel preventive way of weed management	Dr. Michael Walsh, Director Weed Research, Plant Breeding Institute, University of Sydney, Australia	Dr. B. Shridar, Dean (Agrl. Engg.), AEC&RI,	Dr. Sushil Kumar, President, ISWS, Jabalpur	Dr. J.S. Mishra, Secretary, ISWS & Director, ICAR-DWR, Jabalpur
10th Webinar	29th October, 2021	Weed flora and their management in rice-wheat cropping system	Dr. R.K. Malik, CIMMYT, New Delhi & Dr. Virender Kumar, Senior Scientist, IRRI, Philippines	Dr. N.T. Yaduraju, Past President, ISWS & Former Director, ICAR-DWR, Jabalpur	Dr. Sushil Kumar, President, ISWS, Jabalpur	Dr. J.S. Mishra, Secretary, ISWS & Director, ICAR-DWR, Jabalpur

Proceedings and video link: https://www.isws.org.in/Webinar.aspx



National training programme on "*Advances in weed management for sustainable agriculture*"

The ICAR-Directorate of Weed Research, Jabalpur, Madhya Pradesh in association with the Indian Society of Weed Science jointly organized a 6-day Virtual National Training Programme on "Advances in Weed Management for Sustainable Agriculture" from December 13 to 18, 2021. While inaugurating the programme, Dr. S. Bhaskar, ADG (Agronomy, Agroforestry & Climate Change), ICAR emphasized on the development and demonstration of the location-specific Weed Management Technologies in field and horticultural crops to achieve sustainable crop production. Dr. R.M. Kathiresan, Vice-Chancellor, Annamalai University, Tamil Nadu, in his valedictory address, stressed on the need of developing need-based collaborative projects for external funding from DST, DBT and Biodiversity Authority, etc., on invasive weeds management & utilization, and climate-change induced weed risk assessment. Dr. J.S. Mishra, Director, ICAR-DWR, Jabalpur, in his welcome address highlighted the importance of weed ecology and biology studies to understand the behavior of weeds in various agro-ecosystems. Dr. Sushil Kumar, Principal Scientist & President, ISWS shared his experience about the Weed Management in non-crop areas including aquatic and invasive weeds. Around 316 participants attended the programme.

Training on "Integrated Weed Management" and *Parthenium* awareness campaign at Cotton Research Station, Srivilliputhur

Cotton Research Station (CRS), TNAU, Srivilliputtur and Indian Society of Weed Science (ISWS), Jabalpur jointly organized training programme on "Integrated Weed Management" and *Parthenium* awareness campaign on 27.08.2021 at CRS, Srivilliputtur. There were about 40 farmers, farm labourers and officials participated and benefited from the training about the concept and components of integrated weed management. Dr. C.R. Chinnamuthu, Professor and Head, Department of Agronomy, TNAU, Coimbatore and Vice president, ISWS presided over the function and highlighted about the selection, time and method of application of different herbicides for the field crops. Dr. Veeraputhiran, Associate Professor (Agronomy) and Head (i/c), CRS, Srivilliputtur and Councillor of the ISWS, Tamil Nadu chapter delivered special lecture on weed management for cotton crop. Dr. P. Murali Arthanari, Associate Professor (Agronomy) and Principal Investigator; AICRP Weed Management, TNAU, Coimbatore and Joint Secretary, ISWS explained about ill-effects of *Parthenium* on crop, animals and human being and its management through different methods. Later, a demonstration on the control methods of *Parthenium* was also arranged.

Honours and Awards

Dr. R.M. Kathiresan, Ex. Professor and eminent weed scientist, Department of Agronomy, Annamalai University, Annamalainagar, Tamil Nadu has been appointed as **Vice-Chancellor** of the same University on November 20, 2021.

Dr. J. S. Mishra, Director and eminent weed scientist, ICAR-Directorate of Weed Research, Jabalpur has been selected as a "**Fellow of the National Academy of Agricultural Sciences**" from 1st January 2022.
Dr Mishra has also been awarded with **"Certificate of Honour"** by the Indian Society of Agronomy during the 5th International Agronomy Congress held at PJTSAU, Hyderabad during November 23-27, 2021.

Dr. Nitya Nand Angiras, former Professor and Head, Department of Agronomy, Forages and Grassland management, CSK HPKV Palampur and Professor Weed Science, State of Eritrea, Africa was recently conferred with "**Life Time Achievement Award**" by the Society for Tropical Agriculture during its Twelfth International Conference on Agriculture, Horticulture and Food Science held at Hotel Landmark Shimla on December 29-30, 2021

Dr. A.S. Rao, Ex. Director of Research, ANGRAU, Guntur, ISWS Life member, has been awarded with "**Gold Model of Indian Society of Agronomy for 2018**" in recently held 5th International Agronomy Congress, Hyderabad.

Dr. Jayanta Deka, Dean, Faculty of Agriculture, Assam Agricultural University and eminent weed scientist has been awarded with "**Fellow of Indian Society of Agronomy for 2018**" in recently held 5th International Agronomy Congress, Hyderabad.

Dr. V.K. Choudhary, Sr. Scientist (Agronomy), ICAR-Directorate of Weed Research, Jabalpur has been awarded with "**ISA Associate Award**" by the Indian Society of Agronomy in recently held 5th International Agronomy Congress, Hyderabad.

Dr Dibakar Ghosh, Scientist ICAR-Indian Institute of Water Management, Bhubaneswar and ISWS Life member, has been awarded with "**ISA-Best Ph.D. Thesis Award for the year 2018**" by the Indian Society of Agronomy, New Delhi for his thesis entitled "Weed and nutrient managements in maize-greengram-rice crop sequence under new alluvial soil". He completed his Ph.D degree in Agronomy from the Department of Agronomy, BCKV, Mahanpur, Nadia, West Bengal under the chairmanship of Dr. Koushik Brahmachari. The award was given in recently held 5th International Agronomy Congress, Hyderabad.

Ms. Ayesha Fatima has been awarded with "**ISA-Best M.Sc. Thesis Award for the year 2017**" by the Indian Society of Agronomy, New Delhi for her thesis entitled "Response of sesame cultivars to weed management by straw mulching with or without pre-emergence herbicide during summer season". She completed her M.Sc. (Ag.) degree in Agronomy from the Department of Agronomy, Institute of Agriculture, Visva-Bharati, Sriniketan, West Bengal under the chairmanship of Dr. B. Duary. The award was given in recently held 5th International Agronomy Congress, Hyderabad.

ICAR-Directorate of Weed Research, Jabalpur has been awarded with "**First Prize**" by Nagar Rajbhasha Karyanvayan Smiti, Zone-2, Jabalpur on promotion and popularization of Rajbhasha Hindi for the year 2020.

Dr. Naveen. N.E., Scientist (Agronomy), KSNUAHS, Shivamogga, ICAR- Krishi Vigyan, Kendra, Udupi and ISWS Life member, has been awarded with **"Best Paper Presentation Award"** in 16th Kannada Vijnana Sammelana held during September 15-17, 2021.

Dr. Sheela Barla, Junior Scientist cum Assistant Professor, Department of Agronomy, BAU, Ranchi, Jharkhand and ISWS Life member, has been awarded with "**Best Poster award**" in International Conference on "Integrated Agriculture, Natural Farming, Biodiversity Conservation and Rural Bio-Entrepreneurship under Changing Climate Scenario" held at College of Agriculture, Kyrdemkulai, (CAU-Imphal) Meghalaya during December 7-9, 2021.

Research highlight

Biological control of alien invasive weed *Salvinia molesta* in central India

Dr. Sushil Kumar
ICAR-Directorate of Weed Research, Jabalpur

The *Salvinia molesta*, commonly known as "Water Fern" is an aggressive and a fast-growing Alien Invasive Aquatic Weed of the South-Eastern Brazil origin. During the past 60 Years, it has been spread widely throughout the world and recently added on to the list of the World's 100 Most Invasive Species.

Earlier, it was reported as problematic aquatic weed in Kerala and the other parts of South India, besides the stray occurrence in Odisha, Uttarakhand and Maharashtra. Recently, the Weed's severe infestation was found in Satpura Reservoir in Sarni Town of Betul and 3 to 4 Villages of Jabalpur and Katni Districts of Madhya Pradesh adversely affecting the irrigation, hydroelectric generation, water availability and navigation besides drastic reduction in production of fish and aquatic crops (chestnut).

The Weed may turn out to be a menace in the aquatic bodies of the Central and North India. The non-availability of the label-claim herbicides for aquatic weed management, water quality deterioration, environmental pollution, high cost of mechanical removal, regeneration of Weeds after removal, etc., are the major challenges for its management.

The manual removal is only practical in the early stages of invasion. After the plant becomes established, the biomass of about 80 t/ha and rapid re-growth makes mechanical harvesting and removal impractical and not cost-competitive. Therefore, the biological control was considered to be an eco-friendly and cost-effective method for its management.

A host-specific insect namely *Cyrtobagous salviniae* is known to be an effective bio-agent against *Salvinia molesta* in Kerala. Initially, the insect was collected from Thrissur, Kerala where it was released earlier during the 1980. The initial culture was brought to the ICAR-Directorate of Weed Research, Jabalpur, Madhya Pradesh for testing its bio-efficacy and further multiplication.

The Study revealed that the insect bio-agent may be effective for controlling the Weed in spite of very low and high temperature variation under the climatic conditions of Central India. For demonstrating the technology, a 20-hectare *Salvinia* infested pond in the village Padua of Katni District was selected for the release of the bio-agent in consultation with the Villagers and Sarpanch. The pond was found to be severely infested for the last 3 Years and all the efforts of manual removal by the Villagers were in vain.

Initially, 2,000 adult weevils of host/specific bio-agent *Cyrtobagous saliviniae* were released in the infested pond in the Month of December, 2019.

After releasing the bio-agent, it started multiplying in the pond gradually. Initially, up to 6 Months, there were no visible symptoms of the attack, but the gradual increase in insect population was recorded. The bio-agent population increased from negligible to 125.5 adults per meter square in 11 Months and started to decline in the due course with the decrease in population density of the Weed.

With the increase of bio-agent population, 50%, 80% and 100% control of *Salvinia molesta* was achieved by 8, 11 and 18 Months, respectively. The insect kills the Weed by feeding on the terminal buds and new growth, while its larvae tunnel through buds and rhizomes. The killing of the terminal buds checks the re-growth of the Weed.

The *Cyrtobagous salviniae* population declines corresponding to the decline in the Weed density. The decline eventually comes to a low-level equilibrium between the Weed and insect population. There was no regeneration of Weed from a few scattered remnants of *Salvinia molesta*. This is the first successful example of biological control of the Alien Invasive Aquatic Weed from Central India.

Although the technology takes time, it is very effective, sustainable and cheap for the management of *Salvinia molesta*.

Orobanche/ Broomrape management in mustard

Arvind Verma, S.S. Punia & Ruchika Choudhary
PMUAT, Udaipur

Orobanche, locally known as margoja, rukhri, khumbhi or gulli is an annual, branched, achlorophyllous, noxious, obligate root holoparasite which parasitizes on plants belong to Cucurbitaceae, Compositae, Cruciferae, Fabaceae, Solanacae and Umbelliferae families. The *Orobanche* genus includes six species those are of agricultural importance and cause significant yield and quality losses of many agricultural crops around the globe (*O. aegyptiaca* in mustard, cabbage, cauliflower, carrot, fababean, tomato, chrysanthemum; *O. ramosa* in tomato, tobacco, water melon, potato, brinjal; *O. crenata* in faba bean, lentil, chickpea and pea; *O. cernua* in tobacco, sunflower, tomato, potato and brinjal; *O. cumana* in sunflower, tobacco; *O. minor* in red clover, alfalfa, celery, lettuce). Among these six species *Orobanche aegyptica* and *Orobanche ramosa* are widely reported species in Udaipur region. In India, *Orobanche aegyptiaca* is considered as a major biotic production constraint to Indian mustard particularly in mustard growing regions of Haryana, Punjab, northern Rajasthan, western Uttar Pradesh, and north-eastern Madhya Pradesh. *Orobanche* reproduces only by seeds with total seed production of 1 to 3 lakh/plant. Generally the seeds remain viable in the soil for more than 10 years, and germination of seeds is stimulated by suitable host plant root exudates. The weed spends most of its vegetative stage underground and

emerges over soil surface at its flowering stage soon after the host plants attain the flowering stage. It takes 30-45 or even 90-120 days to emerge after germination. Flowering begins 6 to 9 days after emergence and seed production occurs within the next 7 days. Early infestation of the weed is characterized by the attachment of small tubercles of the parasite to host roots. The young parasite is spherical, brownish-yellow, and a few millimeters long. More advanced parasites (1 cm) bear roots of various lengths, often orange or brown in colour that forms a crown around the infection site on the host root surface. Early infestation can kill the host seedlings completely, whereas infestation occurring at later stages affects significantly to the several developmental stages of the host plants. Effective interventions like avoiding the dispersal of *Orobanche* seeds from infested locations; preventing the movement of infested soil by vehicles, farm machineries; promoting the use of certified seeds; preventing the use of water contaminated with *Orobanche* seeds for irrigation; collection and destruction of *Orobanche* spikes prior to flowering, deep summer ploughing, soil solarization etc. can minimise the infestation level. Besides, the herbicides like pendimethalin 500 g/ha as PE at adequate soil moisture level and glyphosate application can minimise infestation level up to 60 to 70%. Two spray of glyphosate 25 g/ha at 30 DAS and 50 g/ha at 55 to 60 DAS can be adopted during the afternoon hours. Irrigation needs to be given 2 days prior to the spray for ensuring adequate moisture level during the spray.

Outbreak of *Arundo donax* in croplands

Dr. Iswar Chandra Barua
AICRP on Weed Management, AAU, Jorhat, Assam

Arundo donax L. is native to Asia to Middle East and Mediterranean region, cultivated and introduced in many countries for various useful purposes; however, in most of the cases it escaped and turned into an environmental weed with invasive nature, both in tropical and warm temperate regions. It is a perennial tall grassy plant belonging to family Poaceae and its sub-family Arundinoideae.

Because of similarity in general morphology and habitats of occurrence, many a times, *A. donax* is confused with *Phragmites karka* (Retz.) Trin. ex Steud. and locally called "Nal ghanh" in Assam. Both the species are perennial reed grass and possessed 2-7 m tall erect culms with hollow internodes, tufted habit with tough and knotty spreading rhizomes and deep penetrating fibrous root system. However, *A. donax* possessed glabrous rachilla and hairy lamina instead of villous rachilla and dorsally glabrous lamina of *P. karka*.

Arundo donax is a highly fire prone plant with tremendous fast growing capacity in aquatic and marginal areas, and fast recovering capacity after fire. It has a wide range of adaptations in various land situations both of saline to acidic condition and from heavy clay to loose sandy soils. In northeast India, it is an integral part of riparian grasslands and an integrated component of diversified food-web in the Indo-Burma Biodiversity Hotspot, and a good support for household materials for indigenous people of this region. However, being an environmental weed *A. donax* seriously displaced native and resident vegetation at the places of infestation and thus caused tremendous disruption to food-web and biodiversity. It is also reported that a dominant population of *A. donax* in aquatic habitat increased water temperature, which led to reduce oxygen concentration resulting in diminishing aquatic animal diversity.

Farmers of Brahmaputra valley uprooted the Arundo thickets manually in order to recover land for farming. This practice is very laborious and expensive. The species can regenerate vegetatively by means of rhizome and stem. The small fragment of rhizomes and a portion of stem with at least one or two nodes can regenerate in marshy and aquatic environment. Rising river water during flood and careless handling during farming and fishing facilitated the spread of the weed in new areas. *Arundo donax* is one of those rare species which show invasive weedy behavior in their places of nativity, unlike other invasive weeds.

Despite of invasive nature, *A. donax* was not so far known to occur as a cropland weed. The present report is from deep-water paddy at Kumarani Pathar and Chahala Chapori, Golaghat district of Assam (in and around 26^0 40' 41.718" N lat., 93^0 38' 20.4144" E long., alt. 78.0m MSL), where, it caused serious threat to the paddy resulting in almost 30 to 70% yield loss of paddy by means of its aggressivity, fast growing habit and tremendous competitive ability. Gradual increase of infested areas in deep-water paddy fields in Golaghat district has increased the possibility of infestation threat to other deep water-paddy fields of the state, as these fields are inundated by flood annually, and the flood water is a good carrier of the propagating materials of *A. donax*. Use of glyphosate (3-5%) with 3 to 4 times repeated application has been found to be effective in non-crop areas. The weed has the capacity to produce the biomass of 20 to 75 t/ha/year in non-crop areas and 0.3 to 1.8 t/ha/year in deep-water paddy of Assam.

Menace of *Arundo donax* in deep-water paddy fields in Kumarani Pathar, Assam

Regeneration of *Arundo donax* from rhizomelets

Vallisneria - A new threat to wetland paddy

Dr. Prameela and Dr. Savitha Antony,
AICRP on Weed Management, KAU, Thrissur

Vallisneria also known as eelgrass or tape grass or water celery is a common submerged aquatic plant seen in shallow fresh water bodies. The genus is widely distributed in tropical and subtropical regions of Asia, Africa, Europe, and North America. This was introduced to our country as an ornamental aquarium plant. It is a monocot and belongs to family Hydrocharitaceae.

Recently this aquatic plant has emerged as a weed of rice in parts of Kerala. The problem is very much severe in transplanted rice where *Vallisneria* get ideal growing conditions like standing water, sufficient inter-space and sunlight. The weed attains peak vegetative growth covering the entire inter-spaces of rice plants within 50-70 days and offers severe competition to rice plants. In rice filed the weed attains the height of 5 to 7cm only and covers the soil surface as a thick green mat. It starts to produce flower when the rice plants are about 50 days of transplanting. Small white flowers are not very much conspicuous and they can be seen over water surface on close examination. Numerous minute light

weight seeds are produced in capsule like fruits and these get dispersed to new areas through water.

The preliminary trials conducted by AICRP on weed control, KAU shows that some of the common post-emergence herbicides recommended for rice are effective against *Vallisneria*. Post-emergence broad spectrum herbicides like bispyribac sodium or premix herbicides like cyhalofop-butyl + penoxsulam or 2.4-D can be applied at 20 DAT. Indiscriminate use of insecticides may be avoided for restoring the population of natural enemies of *Vallisneria* and other aquatic plants and maintaining the natural balance.

Currently many aquarium plants or their propagules are available online and therefore, public awareness on safe disposal of these propagules may be given due importance, so that the propagules of these alien flora do not reach our water bodies. Strict quarantine measures have to be followed as these plants have the potential to become invasive as natural enemies are absent in the areas of introduction, and can multiply rapidly and also invade the new areas.

Genome editing: A tool for generation of herbicide resistant crops

D.V. Pawar, D. Sreekanth, P.K. Singh, Ashish Marathe[1]
ICAR-DWR, Jabalpur; [1]ICAR-NIBSM, Raipur

Herbicide resistance (HR) has been developed and crop yield has been increased using the traditional breeding approaches such as mutation breeding and hybridization. Regardless of whether natural variation or intentional mutation is used, mutants are generated randomly in traditional breeding, making them very hard to differentiate and filter. Furthermore, the steady loss of natural genetic variety in plants had a significant impact on food productivity. As next-generation sequencing technologies have been progressed already, more crop genomes are being sequenced, and recently discovered gene functionalities lead investigators to pursue the transgenic breeding. Although transgenic breeding has been effective, the end result is genetically modified (GM), which has raised the safety and regulatory issues and has yet to gain widespread acceptance. As a result, non-GM plants with herbicide resistant traits and low-risk traits are usually preferred.

Genome editing techniques have been successfully utilized to target genes in a variety of crops to improve overall crop yields in order to satisfy the growing needs of the current global food demand. These crops can turn out as an environmentally friendly and economically viable agricultural plan to improve cultivars for better quality, higher yield, disease resistance, and HR. Because of its higher level of efficacy, adaptability, simplicity, and consistency, this method has transformed the area of crop breeding in recent years. For HR development in plants, all modern genome editing technologies have been used, including transcription activator-like effector nucleases (TALENS), zinc finger nucleases (ZFNS), clustered regulatory interspaced short palindromic repeats (CRISPR), and CRISPR-associated (Cas) approaches.

CRISPR-Cas9 systems are the most effective and frequently used gene editing technology for inducing phenotypic improvement in crop plants, including HR. The most recent advancements in genome editing have resulted in novel CRISPR-Cas9 tools, such as base editing, which is more accurate, efficient, and a promising tool that permits targeted point alterations via programmable nucleotide substitution. CRISPR-Cas techniques, especially base editing, have the potential to produce non-GM HR crops. Non-GM plants developed by using CRISPR-Cas systems have also been exempted from GMO legislation in a number of nations. As a result, genome editing is now the most suited alternative to transgenic and conventional procedures for the production of non-GM HR plants, which can provide a cost-effective alternative option for farmers to manage weeds.

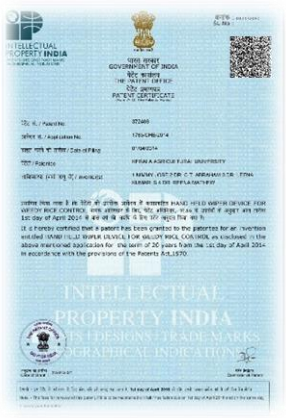
List of herbicide resistant plants developed using genome editing tools

Plant	Genome Editing System	Target Gene	Target Herbicide	Reference
Rice	CRISPR-Cas9	*ALS*	Bispyribac- sodium	Sun et al., 2016
	CRISPR-Cas9	*ALS*	Imazethapyr	Wang et al., 2020
	TALEN	*ALS*	Bispyribac- sodium	Li et al., 2016
	Target-AID	*OsALS*	Imazamox	Shimatani et al., 2018
	ABE	*OsTubA2*	Dinitroaniline	Liu et al., 2020
	CBE	*OsACCase*	Gallant	Liu et al. , 2020
	BEMGE	*OsALS1*	Bispyribac-sodium	Kuang et al., 2020
	STEMEs	*ACCase*	Haloxyfop	Li et al., 2020
	CRISPR–Cas9	*EPSPS*	Glyphosate	Li et al., 2016
	ABE	*ACCase*	Haloxyfop	Li , et al. 2018
	Prime editing	*OsALS*	Bispyribac sodium	Butt et al., 2020
	Prime editing	*ALS*	Imidazolinone	Hua et al., 2020
	Prime editing	*OsACCase1*	Haloxyfop	Xu et al., 2020
Watermelon	CBE	*ClALS*	Tribenuron	Tian, 2018
Wheat	n/dCas9-PBE	*TaALS, ACCase*	Sulfonylurea, Imidazolinone and Aryloxyphenoxy propionate	Zhang et al., 2021
	n/dCas9-PBE	*TaALS*	Nicosulfuron	Zong et al., 2018
Maize	CBE	*ZmALS*	Sulfonylurea	Li et al., 2020
	Cas9-gRNA	*ALS*	Chlorsulfuron	Svitashev et al., 2015
Arabidopsis	CBE	*ALS*	Tribenuron-methyl	Chen et al., 2017
Oilseed rape	CBE	*BnALS1*	Tribenuron-methyl	Wu et al., 2020
Tomato and Potato	CBE	*ALS*	Chlorsulfuron	Veillet et al., 2019
Soybean	CRISPR–Cas9	*ALS1*	Chlorsulfuron	Li et al., 2015
Flax	ssODN and CRISPR/Cas9	*EPSPS*	Glyphosate	Saueret al., 2016
Chile peeper	Intragenic method	*EPSPS*	Glyphosate	Ortega et al., 2018
Cassava	Cas9-gRNA	*EPSPS*	Glyphosate	Hummel et al., 2018
Potato	GVR	*ALS1*	Imidazolinone	Butler et al., 2016

ABE: adenine base editing, CBE: cytidine base editing, PBE: plant base editor, BEMGE: base editing-mediated gene evolution, STEMEs: saturated targeted endogenous mutagenesis editors, GVR: geminivirus replicon

Patent on "KAU Weed Wiper" developed by AICRP unit on Weed Management, Kerala Agricultural University

'KAU Weed Wiper' developed by the scientists of Kerala Agricultural University (KAU) has been awarded Indian Patent as per Order No.1763/ CHE/2014 dated 22.07.2021 of the Indian Patent Office, Chennai. The invention which was filed for patent during 2014 has given new directions to the efforts for countering the growth of weedy rice ('Vari' in local parlance) in paddy fields of Kerala. The technology was transferred to M/s Raidco Kerala Ltd., a Government of Kerala Enterprise and the product is available in the market. The novel wiper device was designed as part of the doctoral programme of Dr Nimmy Jose, Scientist at Rice Research Station, Moncompu of KAU. The research conducted under the guidance of Dr C T Abraham, former Professor and Head, All India Coordinated Research Project on Weed Control, KAU, could also standardize an integrated strategy for the management of weedy rice in paddy fields. The research programme was awarded with the best Ph.D thesis for the year 2015 by the Indian Society of Weed Science.



Registration of Design on Wheel Hoe Weeder developed by College of Agriculture, Vellayani, Kerala Agricultural University

Wheel Hoe Weeder (WHW) is a manually operated push-type machinery with a wheel and weeding blade for weeding. The machinery can be operated by a single woman for weeding in inter row spaces of row planted crops. The long handle lets the operator to avoid bending over to pull out the weeds. An operator using the machinery with weeding blade of sweep size 20 cm attached to it can remove weed from the area of 0.015 ha (3.7 cents) in an hour in loamy soil. The machinery is operated by pushing action through force exerted by operator on the handle bar with grips, which allows the soil working part of the machinery *i.e.* weeding blade to penetrate into the soil, skim below the ground surface and cut or uproot the weeds in between the crop rows. Soil mass to a depth of 1.5 cm is manipulated by the machinery during operation. Wheel hoe weeder has been developed as a part of post graduate/doctoral research programme of Seethal Rose Chacko, Dhanu Unnikrishnan, Krishnasree R K and Anitrosa Innazent under the guidance of Dr. Sheeja K Raj, Dr. Jacob D and Dr. Shalini Pillai P, Department of Agronomy, College of Agriculture, Vellayani, Kerala Agricultural University, Thrissur, Kerala.

The design patent has been granted by Government of India for a period of 10 years from July 2021.

Ph.D. and M.Sc. theses in Weed Science

Lokesh Kumar Jain has successfully completed ***Degree of Doctor of Philosophy*** in the thesis entitled "*Effect of Organic Weed and Nutrient Management Practices on Productivity of Maize (Zea mays L.) and Their Residual Effect on Mustard (Brassica juncea L. Czern)*" under the chairmanship of Prof. P.L. Maliwal, Maharana Partap University of Agriculture and Technology, Udaipur, Rajasthan.

Kirti Kumud Binjha has successfully completed ***Degree of Master of Philosophy*** in the thesis entitled "*Efficacy of herbicides on weed dynamics and productivity of soybean*" under the chairmanship of Dr. Sheela Barla, Birsa Agricultural University, Ranchi, Jharkhand.

Pooja Kumari has successfully completed ***Degree of Master of Philosophy*** in the thesis entitled "*Efficacy of herbicides on weed dynamics and productivity of mustard*" under the chairmanship of Dr. Sheela Barla, Birsa Agricultural University, Ranchi, Jharkhand.

Miss Seethal Rose Chacko has successfully completed ***Degree of Master of Philosophy*** in the thesis entitled "*Eco-friendly Weed Management in Okra (Abelmoschus esculentus (L.) Moench*" under the chairmanship of Dr. Sheeja K Raj, Kerala Agricultural University, Thrissur, Kerala.

Sumit Maity has successfully completed ***Degree of Master of Philosophy*** in the thesis entitled "*Weed management in direct seeded rice under conservation agriculture-based rice - yellow sarson - greengram cropping system*" under the chairmanship of Dr. B. Duary, Institute of Agriculture, Visva-Bharati, Sriniketan, West Bengal.

Antara Pramanik has successfully completed ***Degree of Master of Philosophy*** in the thesis entitled "*Weed management in summer sesame sown before and after irrigation*" under the chairmanship of Dr. B. Duary, Institute of Agriculture, Visva-Bharati, Sriniketan, West Bengal

Recent published articles in Indian Journal of Weed Science

Volume 53(2) 2021

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Welcome of new life members in Indian Society of Weed Science (July-December, 2021)

1. **Dr. R. Sureshkumar** LM-1351
   TNAU, Coimbatore, Tamil Nadu
2. **Dr. D. Krishnamurthy** LM-1352
   Directorate of Research, UAS, Raichur, Karnataka
3. **Miss. Pokala Sravani** LM-1353
   S.V. Agricultural college, ANGRAU, Tirupati, Andhra Pradesh
4. **Miss. Kadiri Saimaheswari** LM-1354
   S.V. Agricultural college, ANGRAU, Tirupati, Andhra Pradesh
5. **Mrs. Karanam Navya Jyothi** LM-1355
   Regional Agricultural Research Station Tirupati, Andhra Pradesh
6. **Mr. John Debberma** LM-1356
   Tripura State Government Agartala, Tripura
7. **Dr. Rekha Yadav** LM-1357
   Nagaland University, Dimapur, Nagaland
8. **Miss. Lenmem Yosung** LM-1358
   Nagaland University, Dimapur, Nagaland
9. **Mr. Gonmei Zion** LM-1359
   Nagaland University, Dimapur, Nagaland
10. **Miss. Virosanuo Solo** LM-1360
    Nagaland University, Dimapur, Nagaland
11. **Mr. Vipin Kumar** LM-1361
    International Rice Research Institute, Guwahati
12. **Mr. Rupesh Deshmukh** LM-1362
    Indira Gandhi Krishi Vishwavidyalaya, Raipur Chhattisgarh
13. **Dr. Bholanath Mondal** LM-1363
    Visva-Bharati, Bolpur, West Bengal
14. **Mr. Pardeep Goyal** LM-1364
    Punjab Agricultural University Ludhiana, Punjab
15. **Dr. Parthipan Thangavel** LM-1365
    TNAU, Regional Research Station, Vridhachalam, Tamil Nadu
16. **Dr. Mausam Verma** LM-1366
    Rajendra College, Chapra, Bihar
17. **Mr. Akshit Rathore** LM-1367
    CCS Haryana Agricultural University, Hisar, Haryana
18. **Mr. Ramanand Chaudhary** LM-1368
    Bihar Agricultural University, Bhagalpur, Bihar
19. **Mr. Hansraj Hans** LM-1369
    Bihar Agricultural University, Bhagalpur, Bihar
20. **Dr. Shiv Prasad Vishwakarma** LM-1370
    Kulbhaskar Ashram PG College, Prayagraj, Uttar Pradesh
21. **Dr. Ashu Sharma** LM-1371
    Krishi Vigyan Kendra, Kathua, SKUAST, Jammu
22. **Dr. Amit Shahane** LM-1372
    College of Agriculture (CAU, Imphal), Kyrdemkulai, Meghalaya
23. **Mr. Paramjeet Singh** LM-1373
    Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh
24. **Mr. A. Jamaludheen** LM-1374
    ICAR-Directorate of Weed Research, Jabalpur, Madhya Pradesh
25. **Dr. Babu Lal Dudwal** LM-1375
    S.K.N. COLLEGE OF AGRICULTURE, Jaipur, Rajasthan
26. **Dr. Ajit Raj** LM-1376
    Navsari Agricultural University, Bharuch, Gujarat
27. **Dr. D. Jacob** LM-1377
    Kerala Agricultural University, Thiruvananthapuram, Kerala
28. **Dr. Shalini Pillai** LM-1378
    KAU, College of Agriculture, Thiruvananthapuram, Kerala
29. **Dr. Lanunola Tzudir** LM-1379
    Nagaland University, Medziphema, Nagaland
30. **Dr. Savitha Antony** LM-1381
    College of Agriculture, Thrissur, Kerala
31. **Dr. Sathiya Kumaresan** LM-1382
    TNAU, Thiruvannamalai, Tamil Nadu
32. **Dr. Sunilkumar Nooli** LM-1383
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33. **Dr. Bhimireddy Padmaja** LM-1384
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34. **Dr. Nisha Singh** LM-1385
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35. **Dr. S.B. Yogananda** LM-1387
    College of Agriculture, V. C. Farm, Mandya, Karnataka
36. **Mrs. Jyothi Swaroopa** LM-1388
    Kerala Agriculture University & ICRISAT, Hyderabad, Telangana
37. **Mrs. G.K. Shruthi** LM-1389
    College of Agriculture, V. C. Farm, Mandya, Karnataka
38. **Dr. Sontara Kalita** LM-1390
    Assam Agricultural University, Jorhat, Assam
39. **Dr. Lokesh Kumar Jain** LM-1391
    College of Agriculture Sumerpur, Rajasthan
40. **Dr. Anita Mahapatra** LM-1392
    Directorate of Research, OUAT, Bhubaneswar, Odisha
41. **Dr. Varsha Nakala** LM-1393
    Junagadh Agricultural University, Sangareddy, Telangana
42. **Mr. Tashi Dawa** LM-1394
    KVK Zanskar, Skuastk, Padum, Jammu and Kashmir
43. **Mrs. Cherukuri Naga Jyothi** LM-1395
    A.N.G.R.A. University, Guntur, Andhra Pradesh

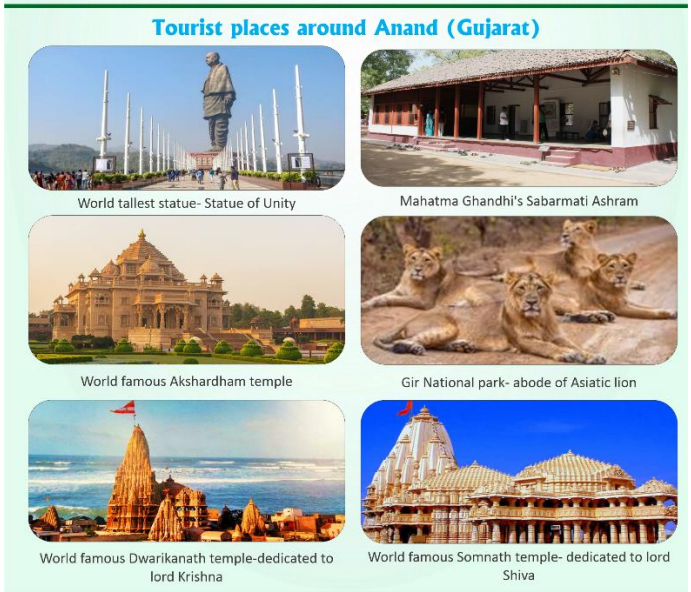
News and upcoming events

- The 30th German working meeting on issues relating to weed biology and control (weed conference) will take place from February 22 -24, 2022 in Braunschweig. (https://www.unkrauttagung.de)
- The 62nd annual meeting of the Weed Science Society of America (WSSA) is scheduled to be held during February 21-24, 2022 at Vancouver, British Columbia, Canada, to be organized jointly by the WSSA and the Canadian Weed Science Society (CWSS). https://wssa.net/2022-annual-meeting
- The European Weed Research Society (EWRS) will be hosting the 19th EWRS Symposium 2022 at Athens, Greece during June 20-23, 2022. (https://ewrs2022.org/)

- The Weed Management Society of South Australia (WMSSA), on behalf of The Council of Australasian Weed Societies (CAWS), will be hosting the 22nd Australasian Weeds Conference (22AWC) at Adelaide Oval during September 25-29, 2022. (https://wmssa.org.au/22awc/)
- Bioherbicides 2021: Overcoming the barriers to adoption of microbial bioherbicides to be held at Bari, Italy. As a consequence of the pandemics still severely affecting many countries all over the World, the event has been postponed to 2022. Information on the new dates for the event will be soon announced. (https://bioherbicides2021.wordpress.com/)
- Due to the recent spurt in COVID-19 case, the International Weed Science Society (IWSC) has decided to postpone the 8th International Weed Science Congress (IWSC 2020) with the theme "Weed Science in a Climate of Change" one more time to December 4-10, 2022. IWSC 2020 will be held at Marriott Marquis Queen's Park, Bangkok, Thailand. (https://www.iwsc2020.com/)

During the 2nd International Weed Conference held at ICAR - Directorate of Weed Research at Jabalpur in 2018, coincided with ISWS Golden Jubilee, it was decided to have 3rd International Weed Conference in 2022 to review and discuss the progress made in weed science to work out strategies to combat weed problems and challenges in weed management by generating new technologies through weed research. Under this background, the Indian Society of Weed Science has taken initiative to organize the 3rd International Weed Conference at Anand Agriculture University, Anand, Gujarat to provide an international platform to the weed scientists working world over to discuss the emerging Issues.

Category	Before 30 October 2022	1 to 30 November 2022	Spot Registration
Indian participants			
ISWS members	₹ 7000	₹ 7500	₹ 8000
Retired ISWS members	₹ 3000	₹ 3500	₹ 4000
Non-ISWS members	₹ 8000	₹ 8500	₹ 9000
Students (ISWS members)	₹ 3000	₹ 3500	₹ 4000
Students (non-ISWS members)	₹ 4000	₹ 4500	₹ 5000
Accompanying person	₹ 3500	₹ 3500	₹ 3500
Overseas participants			
ISWS members	US$ 300	US$ 325	US$ 350
non-ISWS members	US$ 400	US$ 425	US$ 450
Overseas students	US$ 150	US$ 175	US$ 200
SAARC countries	US$ 150	US$ 175	US$ 200
Accompanying person	US$ 150	US$ 150	US$ 150



Editorial

Dear Reader,

It is really a proud moment to share the information that ISWS is going to achieve another milestone while organizing 3rd International Weed Conference (3rd IWC) during 20-23 December, 2022 at Anand. Your enthusiasm and ardent interest for ISWS will be showcased in 3rd IWC. As your contribution and constant support has facilitated ISWS to reach into a new horizon and therefore, it is my privilege to reach out to all the members as well as whole fraternity of weed science for their contribution on the emerging issues and current challenges in the field of weed science for our newsletter. Our newsletter in nutshell is always projecting your research achievements in public domain. Suggestions from the members are always welcome in this regard.

We are again hit hard by the COVID-19 pandemic and we have found the ways to adapt and are progressing steadily to get over from this problem. Stay safe and healthy.

Last but not least I express my sincere thanks to all the members who contributed for the issue of newsletter.

Pijush Kanti Mukherjee

Editor

ISWS members are requested to contribute any major research finding as a news, awards obtained, Ph.D. obtained, forthcoming events on weed Science *etc.* to:

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