ISWS News Letter
A publication of Indian Society of Weed Science
April – June 2010 July - September

Message from the President

"Weeds are plants out of place. They compete with crops for light, space and nutrition". This copy book definition for weeds is understandable. But the crop loss due to weeds remains unseen. It is really very hard to realize the extent of crop loss caused by weeds. Weed is a silent killer of crop. Productivity goes down. In India, on an average 37% of the total annual loss in crop productivity is due to weed. However, under certain situations the losses may go up to total failure of crop. The average loss due to weeds amounts to nearly Rs. 1, 00, 000 crores in field crops alone. Our Hon'ble DG Dr. S. Ayyappan expressed his concern over this huge crop loss due to weed infestation in an interface meeting of Directors and Project Coordinators of Crop Science and Horticulture Divisions held at Directorate. It was really a fruitful meeting, where it was suggested to develop ways and means to minimize crop losses due to weed. Dr. Ayyappan emphasized on collaborative projects that can certainly produce the way out. The situation will be grimmer in future under changing climate. Some weeds are already showing their unusual ability to suit the higher concentration of CO_2 and higher temperature, though in experimental set up. Alien invasive weeds which include Phalaris, Parthenium, Lantana, Mimosa, and recently reported *Solanum carolense* are potent enough to jeopardize our country's economy. It is, therefore, the time to deliver united efforts under a nation wide programme.

But, dear friends, a void has been created by the rule of nature in the scene of Indian Weed Science, albeit untimely. Prof. S. Sankaran is no more. I can recall his advice during Coimbatore-conference for researchers to work united in solving problems of weeds. Now it is a tremendous responsibility for us to protect his laurel and to be united to fight against the evils. We will do it.

Jay G. Varshney

News

Interface meeting: Salvage the crop production from weeds

Interface meeting of Directors and Project Coordinators of Crop Science and Horticulture Divisions were convened at DWSR on 17-18 May 2010 at DWSR, Jabalpur. The Interface Meet was chaired by Dr. S. Ayyappan, Secretary, DARE and Director General, ICAR. Other dignitaries attended the interface were Dr S.K. Dutta, Deputy Director General (Crops), Dr H.P. Singh, Deputy Director General (Horticulture), Dr K.D. Kokate, Deputy Director General (Extension), Dr G. Kalloo, Vice-Chancellor, JNKVV, Dr T.P. Rajendran, Assistant Director General (Plant Protection), Directors and Project Coordinators of Crop Science and Horticulture Divisions, Dr Jay G. Varshney, Director and Scientists of DWSR, Jabalpur.

At the outset Dr Jay G. Varshney, welcomed the Director-General (ICAR) and all senior officers from ICAR HQ and the participating scientists. In his welcome address, Dr. Jay G. Varshney presented a detailed account of weed management scenario in the country.

He covered different aspects of weed problems, challenges, priorities, *vis-à-vis* research achievements and future research priorities. Dr. Varshney pointed out that the potential crop loss due to weeds per year comes to about Rs 1000 billion in field crops, *albeit* the fact that accurate studies based on crop-weed competition and other related factors need to be done for all agro-ecologies. He opined that the gap between demand and production of agricultural commodities can be minimized by checking the loss due to weed infestation. He explained the challenges to suppress weeds including invasive alien weeds, adverse effects of herbicides to agricultural ecologies, weed shift and climate change. He also explained the utility of herbicide tolerant GM crop, biological control of weeds, and the exploitation of weeds for useful purposes. To him the most important thing is to raise the awareness on efficient weed management strategies among farmers, under the given constraints of villages and the transfer of such technology to farmers' fields through regular farmers' field school system. To meet these challenges, DWSR has set priorities in research work. Those priorities include development of weed management technologies giving emphasis on under moisture stress condition, management of aquatic weeds, altered weed biology out of perceived climate change, weedy rice and threats out of quarantine weeds. During the occasion, the Director General, ICAR also released a publication "DWSR – Marching

ahead". Dr. S. Ayyappan, Director General in his inaugural address expressed his concern over huge yield losses due to weeds. He was also worried about the high extent of infestation of weeds by citing examples of submerged weed infestation in Dal Lake and Loktak Lake, causing hindrance to inland fisheries. He praised the awareness campaign made by DWSR citing the example of the books on Success Story in English as well as in Hindi. He justified the interface meeting as it would provide scientists to interact to know the real picture of weed problem and its management finally, put forth a suggestion to reconsider the name of DWSR so as to encompass weed management research. All the Directors and Project Coordinators delivered their institutes' experience on weed problems and the direction of management. Analyzing this gamut of lectures valuable recommendations on research and administrative aspects emerged.

Phytoremediation facility: inaugurated by DG

Dr. S. Ayyappan, Secretary, DARE and Director General, ICAR visited the DWSR farm on 18th May, 2010. DG inaugurated the recently developed "Phyto-remediation Facility". This facility is able to remediate the contaminated industrial waste water for the purpose of irrigation. *Arundo donax*, a weedy plant utilized in this facility is very much effective to purify waste water by removing heavy metals and inorganic radicals.

Research Notes

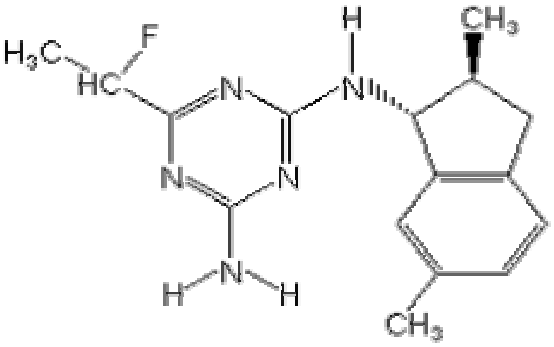
Sterilise weeds, not kill

To use herbicides to sterilize weeds could be more economical and environment friendly. Rangeland ecologist Matt Rinella and his team at the ARS Fort Keogh Livestock and Range Research Laboratory conducted the study. Rinella and his colleagues knew that when dicamba and other growth regulator herbicides were applied to cereal crops late in their growth stage, just before seed formation, the plants produced far fewer seeds. They decided to see if these herbicides had the same harmful late-stage application effects on the invasive weed Japanese brome. In greenhouse experiments, they tested dicamba (Banvel/Clarity), 2,4-D, and picloram (Tordon) at typically used rates. They found that picloram reduced seed production nearly 100 percent when applied at the late growth stage of the weed. Dicamba was slightly less effective, but still nearly eliminated all seed production, while 2,4-D was much less effective. Since annual grass seeds only survive in soil a year or two, it should only take one to three years of herbicide treatment at the right growth stage to greatly reduce the soil seed bank of annual weedy grasses without harming perennial grasses. (**Matthew J. Rinella, Marshall R. Haferkamp, Robert A. Masters, Jennifer M. Muscha, Susan E. Bellows, Lance T. Vermeire.** Growth Regulator Herbicides Prevent Invasive Annual Grass Seed Production. ***Invasive Plant Science and Management*, 2010; 3 (1): 12)**

Indaziflam-a new fluoroalkyltriazine herbicide

Bayer crop Science will shortly introduce the new herbicde molecule, Indaziflam in global market. Indaziflam, *N*-[(1*R*,2*S*)-2,3-dihydro-2,6-dimethyl-1*H*-inden-1-yl]-6-[(1*RS*)-1-fluoroethyl]-1,3,5-triazine-2,4-diamine, is a cellulose biosynthesis inhibitor of fluoroalkyltriazine class. The (1*R*)-1-fluoroethyl diastereoisomer

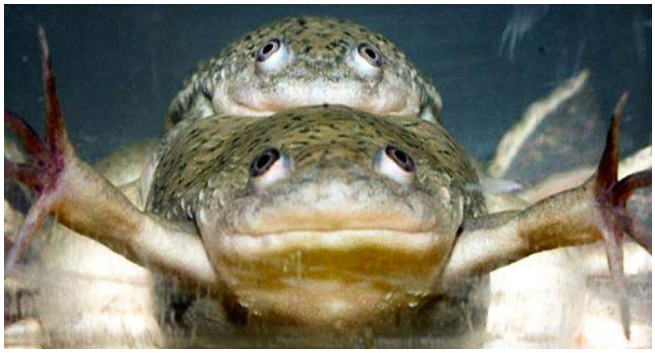
and the (1*S*)-1-fluoroethyl diastereoisomer have nearly the same biological activity. It has very favourable toxicological properties with no evidence of effects on immunotoxicity, developmental toxicity, genoyoxicity or carcinogenicity,



Source: www.bayercropscience.com.

Our stolen future

Atrazine, widely used herbicide in croplands, is an endocrine disruptor—a substance that interferes with animals' reproductive systems. A group of scientists of University of California, Barkeley led by Dr. Tyrone B. Hayes observed that atrazine-exposed males were both demasculinized (chemically castrated) and completely feminized as adults. Ten percent of the exposed genetic males developed into functional females that copulated with unexposed males and produced viable eggs. Atrazine-exposed males suffered from depressed testosterone, decreased breeding gland size, demasculinized/feminized laryngeal development, suppressed mating behavior, reduced spermatogenesis, and decreased fertility. These data are consistent with effects of atrazine observed in other vertebrate classes. The present findings exemplify the role that atrazine and other endocrine-disrupting pesticides likely play in global amphibian declines.



Source: ***Proceedings of the National Academy of Sciences*** **107** (10) **612-4617, (March,2010).**

Bio-safety research trial Level -1 for transgenic staked corn hybrids

The experiment was conducted at DWSR to study the bio-efficacy and residual study of glyphosate in transgenic corn (MON 89034X NK 603). Two transgenic corn hybrids, Hishell and 900M Gold, resistant to glyphosate as well as to stem borer (*Chilo partelus*) and cob borer (*Helicoverpa* sp), were tested and compared with its non-transgenic counterpart Proagro-4640 and HQPM-1. Observations were recorded on weeds, insect, growth parameter and yield attributes

Transgenic healthy cob showing no symptoms and Infestation of *Helicoverpa* on National check

Salient findings are:

- Major weeds present in experimental field were *Echinochloa colona, Cyperus iria, Corchorus sp., Phyllanthus niruri, Dinebra sp., Physalis minima, Commelina benghalensis, Alternanthera sessilis* etc. and major insects recorded were Coccinalid, Spider, Syrphids, Pollinator, Aphids etc.

- There was significant weed control (100%) in Hishell and 900M Gold transgenic hybrids receiving K salt of Glyphosate.

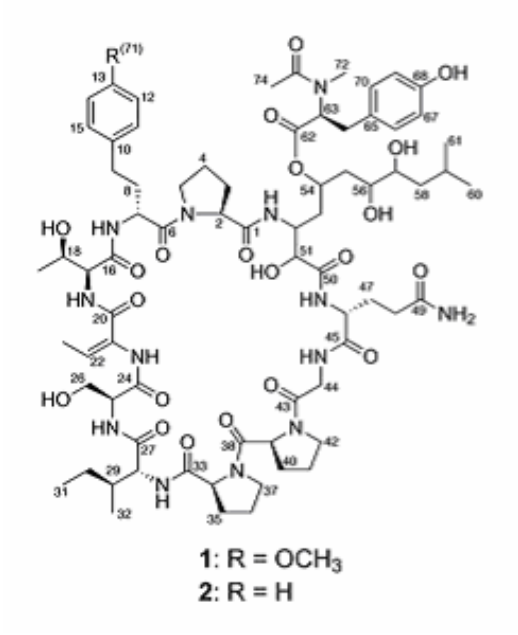
- There was no natural infestation of borers in transgenic and conventional hybrids. Hence *Chilo partelus* and *Helicoverpa* sp. were introduced artificially in all the treatments with a view to assess the resistance against stem borer incidence. Hishell and 900M Gold showed resistance to *Chilo partelus* and *Helicoverpa* sp. Where as in all other conventional entries stem and cob borer infestations were observed.

- Hishell and 900 M Gold transgenic hybrids performed better with regard to grain yield ranging between 6-8 t/ha which was approximately three times higher than the average yield of maize crop per hectare i.e. 2.30 t/ha.

Anil Dixit, MS Raghuvanshi, Sushilkumar and Jay G. Varshney, DWSR, Jabalpur, India

Allelochemicals from Cyanobacteria

Cyanobacteria are a prolific source of nearly 800 diverse bioactive secondary metabolites, originating mainly from nonribosomal peptide synthetase (NRPS) or mixed polyketide synthase (PKS)–NRPS biosynthesis. In a recent study, Pedro Lia and his group in University of California, San Diego, have isolated two bioactive compounds, Portoamides A (1) and B (2).



1: R = OCH_3
2: R = H

Pure **1** and **2**, a mixture of **1** and **2**, and the mixture of compounds extracted from spent medium were tested for growth inhibitory activity to *C. vulgaris* in a diverse range of concentrations. Strikingly, neither the pure compounds nor the mixture extracted from the spent medium exhibited appreciable activity. However, the mixture of **1** and **2** exhibited strong activity, completely inhibiting growth of the *C. vulgaris* at 30 $\mu g \cdot mL^{-1}$ and having an IC_{50} of 12.8 $\mu g \cdot mL^{-1}$. Similarly, the mixture of

compounds **1** and **2** inhibited the growth of the green microalgae *Ankistrodesmus falcatus* and *Chlamydomonas reinhardtii*, as well as the cyanobacterium *Cylindrospermopsis raciborskii*.

Source: ***Proceedings of the National Academy of Sciences*** 107(25):11183-8, **2010 Jun 22**

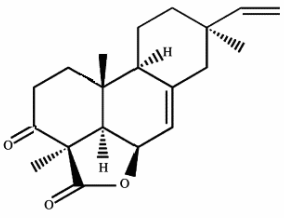
Herbicide application may improve the nutritional value of crops

In a recent study, Dean Kopsell and colleagues of Department of Plant Sciences, University of Tennessee, USA note that the application of herbicides increased the carotenoid content in sweet corn. The scientists exposed several varieties of sweet corn plants to the herbicide mesotrione or a combination of mesotrione and atrazine, another commonly used weed killer, and harvested mature corn 45 days later. Herbicide applications made the corn an even-better source of carotenoids, boosting levels in the mature kernels of some varieties by up to 15 percent. It specifically increased levels of lutein and zeaxanthin, the major carotenoids in sweet corn kernels, which studies have linked to a reduced risk of age-related macular degeneration.

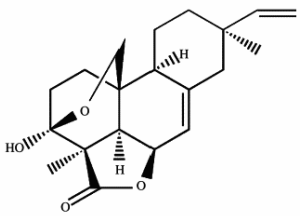
Source: *ScienceDaily (July 9, 2009)*

Momilactone B : probable lead molecule for grass killing herbicide

Kato-Noguchi and his team of the Department of Applied Biological Science, Faculty of Agriculture, Kagawa University, Miki, Kagawa 761-0795, Japan have observed that eight cultivars of rice (*Oryza sativa* L.) inhibited shoot and root growth of *Echinochloa crus-galli* when co-cultured with rice seedlings in a bioassay medium. Momilactone A and B were found in the bioassay medium of all rice cultivars, and concentrations of momilactone A and B in the medium were 0.21-1.5 and 0.66-3.8 micromol/L, respectively, indicating that all rice cultivars may secrete momilactone A and B into the medium. Exogenously applied momilactone A and B inhibited the growth of shoots and roots of *E. crus-galli* at concentrations greater than 30 and 1 micromol/L, respectively. The concentrations required for 50% growth inhibition of E. crus-galli shoots and roots, respectively, were 146 and 91 micromol/L for momilactone A and 6.5 and 6.9 micromol/L for momilactone B. Considering the growth inhibitory activity and concentrations found in the bioassay medium, momilactone A may have caused only 0.8-2.2% of the observed growth inhibition of *E. crus-galli* roots and shoots by rice. However, momilactone B in the medium was estimated to be able to cause 59-82% of the observed growth inhibition of *E. crus-galli* roots and shoots by the rice seedlings. In addition, the concentrations of momilactone B in the medium reflected the observed differences in the growth inhibition of *E. crus-galli* by the eight rice cultivars investigated. This suggests that the allelopathic activity of rice may depend primarily on the secretion level of momilactone B. Therefore, momilactone B may play a very important role in rice allelopathy.



Momilactone A



Momilactone B

Source: J Plant Physiol. **2010 Jul 1;167(10):787-91.**

Bangladesh rice seedlings possess allelopathic properties

M. S. Salam and H. Kato-Noguchi of the Department of Applied Biological Science,

Faculty of Agriculture, Kagawa University, Miki, Kagawa 761-0795, Japan conducted a study to evaluate the growth inhibitory effects of methanol extracts of 14 Bangladesh rice cultivars against the growth of three target plant species, cress (*Lepidium sativum* L.), crabgrass (*Digitaria sanguinalis* L.) and timothy (*Phleum pratense* L.). Methanol extracts of all rice seedlings showed inhibitory effects on shoot and root elongation of the three target species. The growth inhibitory activity was proportional to the extract concentrations. The effectiveness of all extracts on the roots of the target plant species was much higher than that on their shoots. The extracts obtained from rice cultivars BR16, BR22, BR26, BRRI dhan28 and BRRI dhan43 had relatively stronger growth inhibitory activity than those of other rice cultivars. The extract of rice cultivar BR17 had the strongest inhibitory activity against the root growth of all target plant species and the shoot growth of cress and crabgrass. These results suggested that methanol extracts of Bangladesh rice seedlings may contain allelopathic substances that can be isolated and identified to further use as bio-herbicides for weed control and BR17 may contain the greatest herbicidal substance.

Source: Asian J. Crop Sci., 2: 70-77, 2010.

Know the weed: *Buddleja davidii* from China

Buddleja davidii is a shade-intolerant woody weed from China, which, with small wind-dispersed seeds, rapidly colonises bare or disturbed sites. It is cultivated for ornamental purposes for its pretty flowers and ability to attract butterflies. It often takes hold in disturbed areas or open woodlands and has proven to be one of the worst weeds to forestry managers in New Zealand, where it out-competes Pinus radiata seedlings. Approval for release of a biological control agent, a leaf-chewing beetle *Cleopus japonicus*, has recently been given in New Zealand.

Buddleja davidii is a shrub between 1 and 5m in height with widely spreading branches. The foliage is semi-erect to falling. Branches are quite flexible quadrangular. Leaves: opposite, lanceolate, from 10 to 30cm length with slightly toothed edges, upper face dark green and shiny, lower face white with downy hairs. Flowers: gathered in dense and pointed inflorescences approximately 35cm long. Small, (10mm X 3mm) scented hermaphrodite flowers.

Hundreds of honey-scented flowers are borne in panicles (10-30 cm long) in early Summer. The small (3 mm) and hermaphrodite flowers produce nectar and are frequently visited by butterflies giving rise to it's common name of 'Butterfly bush'. Bees and other insects also frequent it. The seeds are contained in capsules and in Ireland these only release the seeds during dry spells in January-February (mid-winter). *B. davidii* starts flowering and fruiting after 1 year, although some panicles may be present within the first year. It has a large seed output at approximately 3 million seeds per 'average'

plant. The small and light seeds (50-100 per fruit and 315,000 seeds/kg) are wind-dispersed and occasionally by cars, and are easily carried to great distances. They have deep dormancy and may remain in the soil for many years.

(www.hortnet.co.nz/publications/nzpps/proceedings)

Climate Change May Wake Up 'Sleeper' Weeds

Scientists of CSIRO's Climate Adaptation Flagship in Australia feel that there are many weed species lying low now, but these lurking weeds will do under climate change. A recent CSIRO report for the Australian Government's Land and Water Australia looked at what effects climate changes anticipated for 2030 and 2070 might have on the distribution of 41 weeds that pose a threat to agriculture ("sleeper" species) and the natural environment ("alert" species). Karroo thorn (*Acacia karroo*), rosewood (*Tipuana tipu*) and kochia (*Bassia scoparia*) were found to pose the greatest threat under climate change while white weeping broom (*Retama raetam*) and fringed dodder (*Cuscuta suaveolens*) were predicted to have the highest risk of establishing in new areas. CSIRO team led by Dr. John Scott feels that climate change will cause most of these weeds to shift south, with wet tropical species making the greatest move – over 1000km.

Source: *Science Daily (Apr. 16, 2009)*

Future Events

Nov. 16-18, 2010: Canadian Weed Science Society Annual Meeting at Regina, Saskatchewan.

(The CWSS-SCM is widely recognized in Canada and beyond for its national leadership in bringing together research and information on science and management related to plants potentially impacting the environment, economy and society.) Contact: Ms. Anita Drabyk, P.O. Box 674.Pinawa MB R0E 1L0, tel: (204) 753-2915, fax: (204) 753-2363, assistant@cwss-scm.ca

November 1 – 5, 2010: Combined workshop on invasive weeds

The '8th IOBC International Workshop on Biological Control and Management of *Chromolaena odorata* and Other Eupatorieae' will be held jointly with the "1st IOBC International Workshop on Biological Control and Management of *Parthenium hysterophorus*" at the ICRAF (World Agroforestry Centre) auditorium, Nairobi, Kenya.

The intended purpose of the upcoming workshop on parthenium is to bring together international researchers working on this invasive weed, to disseminate information about its biology, occurrence and management, to increase collaboration amongst researchers regionally and globally, to optimise resources for the control of this weed, and for technology transfer (supply of biocontrol agents to other countries). Additionally, it is hoped that this workshop will raise awareness of parthenium weed for countries that are at risk, or that are in the early stages, of invasion by this weed. **http://www.arc.agric.za/home.asp?pid=5229 or, ZachariadesC@arc.agric.za**

November 30– December 1, 2010: Challenges in weed management in agro-ecosystems: Present Status and Future Strategies

Subject theme:
Weed flora shift and weed distribution, Herbicidal weed management, Biological control and non-chemical weed management, Parasitic weeds and their management

Biotechnological development of herbicide tolerant crops, Agronomic management of herbicide tolerant crops, Herbicide residue management, IWM

Venue: Tamil Nadu Agricultural University, Coimbatore

Organised by department of Agronomy, Directorate of Crop Management, Tamil Nadu Agricultural University, Coimbatore, weedconf@gmail.com

17-18 December,2010 : National conference on Biotechnology, Bioinformatics and Bioengineering

The following technical sessions have been arranged for oral and poster presentations:

Biochemical and Biomedical Engineering, Genomics and Proteomics, Enzyme and Protein Engineering, Nano- and Analytical Biotechnology, Animal, Aquaculture and Marine Biotechnology, Plant, Agriculture and Food Biotechnology, Environmental and Industrial Biotechnology, Pharmaceutical and Medical Biotechnology, Biotechnology Research and Opportunities

Organised by Society for Applied Biotechnology (India), *In association with* Cropgene Technologies (India), drdthangadurai@gmail.com

8-9 December 2010 : **21st Columa Conference: International Meeting on Weed Control**

Special emphasis will be put upon current areas of interest: evolution in plant protection legislation and impact on weed control, biodiversity, present and future solutions to prevent pollution in air, soil and water, genetic resistance of cultivated plants. The session tropical and Mediterranean Crops will be organized in cooperation with the French-speaking Association for Plant Protection (AFIPP), and a special attention will be paid to the weed management in the concerned areas. Venue: Dijon, France
More information can be found on the following website: **http://www.afpp.net/calendrier.htm**

The **ISWS Newsletter** is an electronic quarterly publication to foster better communication and give information to our members and others in the country interested in weed science. Information for publication in the ISWS Newsletter may be sent to the Editor at the following address:

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Design by : Mr. Sandeep Dhagat, Dr. M. S. Raghuvanshi

Obituary

In Memoriam

Dr. S. Sankaran
ISWS Honorary member

Dr. Subramaniam Sankaran, a renowned Weed Scientist and former Vice Chancellor of Tamil Nadu Agricultural University breathed his last on June 12, 2010 in Salem. He was 74. He is survived by his wife, Mrs. Balamani, a son, a daughter and 4 grandchildren.

Dr. Sankaran obtained his M.Sc in Agronomy with distinction in 1st Class from Madras University in the year 1967. He got ICAR Senior Fellowship to continue his studies at the Indian Agricultural Research Institute, New Delhi. His research on "Herbicides in Wheat based cropping system and their residues" lead to Ph.D. degree in 1970. During 1982, he was selected for Post-Doctoral Research at the International Rice Research Institute, Philippines to work on "Weed management in Upland Rice under varying moisture regimes". He amassed valuable experience on Weed Science from his Post Doctoral study and from his repeated visiting abroad. For his post graduate research and publications he was awarded 4 Gold medals by the State and National Scientific bodies.

To teach the students was his passion. To pursue research was the part and parcel of his teaching. And Weed Science was his medium for that. His zeal for Weed Science, especially for the ecological approach for the weed management has been manifested within 25 PhD and 36 PG students, 160 research papers and several books. His books on "Principles of Agronomy" and "Methods of Herbicide Residue Studies" are reference books for the graduate courses. He has contributed a chapter on "Weeds and Weed management in Upland Rice" in Advances in Agronomy, 1985.

Dr. Sankaran, the natural leader, became the Dean of the Agricultural College and Research Institute, Madurai and Coimbatore, the Director, Centre for Soil & Crop Management Studies and the Director of Extension Education of Tamil Nadu Agricultural University, and finally, he was selected for the position of Vice- Chancellor in the year 1993. During his tenure, the Agricultural College, Trichy and the Agricultural Engineering College, Kumulur and Horticulture College, Periakulam were started in Tamil Nadu State.

Dr. Sankaran has visited 25 countries to organize collaborative academic and research programs between Universities and also to present invitational papers. He was actively involved in establishing National Centre for Weed Science at Jabalpur as a member of the ICAR Site selection Committee and subsequently as Chairman of the Research Advisory Committee of the Centre. He has also served as the Chairman of the QRT, AICRIP (Weed Science) and President of the ISWS for three years. He was a Peer Review Committee member of ICAR to evaluate New Schemes in the field of Agronomy including Weed Science. The Government of Tamil Nadu nominated him as the Member of the Advisory Board for the Department of Environment and Forestry.

The ISWS and the Indian Society of Agronomy selected him as the Fellow of the Society and both recognized him with Gold medals. He was bestowed ISWS's "Life Time Achievement Award" at Patna meeting in 2008 for his outstanding contributions in Weed Science. In the same year the Crop and Weed Science Society of Bidhan Chandra Krishi Viswavidyalaya, Kalyani, West Bengal also awarded him "Life Time Achievement Award" for his premier contributions in Agronomy and Weed Science.

His presence was often in demand at National meetings on Weed Science. His words were always listened to with respect and admiration due to his unquenchable enthusiasm and brilliant capacity for summing up. His passing away is certainly a big blow for Indian Weed Science and its society.