Tête-à-tête with Dr. H.C. Sharma

EMINENT INDIAN ENTOMOLOGIST WHO FEATURED IN THE TOP 2% SCIENTISTS IN THE WORLD FOR HIS CONTRIBUTION TO INSECT SCIENCE.

Dr. Hari Chand Sharma, born on 15th June 1954, at Behra, Bilaspur, Himachal Pradesh, India, he has more than 40 years' experience in the field of Entomology. His research was focused on developing insect-resistant varieties, use of transgenic crops for pest management, biosafety of GMOs, climate change effects on agriculture, and sustainable crop production for food security. He did his B.Sc. (Ag.) and M.Sc. (Ag.) from College of Agriculture, Solan, under the jurisdiction of Dr. Y.S. Parmar University of Horticulture and Forestry (Himachal Pradesh), in 1974 and 1976, respectively. He was gold medalist in both bachelors and master's degree. Later, Dr. Sharma obtained his Ph.D. from the Indian Agricultural Research Institute, New Delhi in 1979 with Entomology as specialization.

He served as scientist S1&II (1979-1993), Senior scientist (1994-2001) and Principal Scientist (since 2001) at International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Patancheru, Telangana, India. From 2016-2019, he served as Vice Chancellor, Dr YS Parmar University of Horticulture & Forestry, Nauni, Solan, Himachal Pradesh, India. Dr. Sharma also served as a visiting scientist at the University of Wisconsin, Madison, USA (1986/87) and Queensland Department of Primary Industries, Toowoomba, Australia (1996).

Dr. Sharma is an excellent leader, he served as Coordinator of several projects at ICRISAT **(**Integrated pest management (1999/2000); Biotechnological applications for insect resistance (2003/06); and Genetic enhancement of cereals and legumes in Asia (2006/08). He supervised over 20 projects funded by the national and international funding agencies. He had close collaboration with scientists in USA, Australia, Germany, UK, Belgium, France, and Switzerland. He also undertaken collaborative research on crop production and pest management with over 20 National Agricultural Research Systems in Asia and Africa and Latin America. During his tenure as Vice Chancellor, the university has made tremendous strides in financial management from a net deficit to ample in short time. He was instrumental in many novel activities in university to mention few, setting up Botanical Center for North West Himalayan

Region with support from MoEFCC, and Center of Excellance in Climate Change Research in the Himalayas with support from DST are significant.

Dr. Sharma is a researcher par excellence and very well regarded both in the country and internationally. He published more than 700 scientific publications, in that 289 research papers have been listed in Thomson Science Citation Index/Web of Science with 7505 citations, Hi 42, and iH10 index of 172. His name figured among the top 2 percent scientists in the world, according to a study published by the Stanford University, USA.

To his contribution to insect science, Dr. Sharma has been conferred with several awards like the Consultative Groupon International Agricultural Research (CGIAR) outstanding scientist award 2001, International Plant Protection Award of Distinction 2007, Millennium ICRISAT Science Award 2001, Doreen Mashler Award 2002, Hari-Om Trust Award 2007 of ICAR, Prof. T.N. Ananthakrishnan Award 2002, Life Achievement Award 2019 by International Association of Plant Protection Sciences (IAAPS) and several others. He served as Editor and member of Editorial Boards in many national and international journals. Many professional societies conferred fellowship to Dr. Sharma, he is Fellow, Entomological Society of America (2014) and Fellow, National Academy of Agricultural Sciences (2012) to name a few.

He has served as President of the Council of the International Congresses of Entomology from 2008-16 and instrumental in organizing ICE2012 in Korea and ICE2016 in USA. He was also President for 19th International Plant Protection Congress (IPPC2019) held at Hyderabad in 2019. He served as Member – Governing Board, International Association of Plant Protection Sciences from (2008-15). He was a Co-Chair, Biological Consequences of Global Change, International Union of Biological Sciences (IUBS) during 2009 - 15. He was also a Member of AHTEG Committee of CBD – UNEP.

Dr. Sharma is also an excellent mentor and he has supervised more than 25 PhD scholars and more than 10 post-doctoral fellows/visiting scientists. Many of his students received distinction in thesis research and/or were awarded prizes in research paper/poster presentations and continuing as scientist in different national and international institutes.

Managing Editor of Indian Entomologist Dr. Shashank P.R. had a privilege to interact with Dr. H.C. Sharma and present his magnificent journey in the science and administration. The minutiae of the interview are presented below:

Dr. Shashank P.R. (SPR): Sir, on behalf of Indian Entomologists, I thank you for accepting our invitation. Can you share with us about your childhood and how you selected agriculture as main branch?

Dr. Hari C. Sharma (HCS): A suggestion was made by one of my seniors in the school that if we complete a 4-year degree in agriculture, we get a job of Agriculture Inspector, which sounded quite impressive, although I had no idea what it entailed, despite having been born in a farming family.

SPR: What made you to select entomology as your field of research?

HCS: In third year of BSc Ag, I listened to a presentation by Dr NC Pant, ex-Head, Division of Entomology, IARI, who had

joined HP University Shimla as Dean, Faculty of Agriculture in 1973 (He later became Director of Imperial Institute of Entomology, London, where I visited him in 1983). His presentation on Vitamin and amino acid requirements of insects was very interesting, and entomology appeared to be more scientific than some other subjects in agriculture. He also interviewed me for admission in the PhD program at IARI in 1976.

SPR: Can you share your early carrier experiences, what are the challenges and opportunities you have come across?

HCS: My MSc supervisor at College of Agriculture, Solan, Dr RL Adlakha, who was an Alumnus of California University, Berkeley, USA, made me to write my MSc thesis 4 times by hand before the typing the first draft. He made me to change the sequence of the sentences, and re-arrange the paragraphs each time. He ensured that I have the ability to express scientific findings in different styles. As result, I never had any hesitation in writing or presenting scientific findings, and I owe my ability to write scientific papers to Dr RL Adlakha.

Another of mentor was Dr RA Agarwal, former Head, Division of Entomology, IARI. He gave me more respect than my peers, and he was the happier than me when I told him that I stood first in ARS examination in 1978. It was because of his resourcefulness and help, that we established a lab for carrying out biochemical analysis of secondary metabolites that contribute to host plant resistance to insects.

I resigned the ARS job after 6 months, where I was asked to look after administrative business, and l moved to greener pastures at ICRISAT, which appeared to be so, little realizing that it was a huge challenge to sustain oneself under western working environment.

SPR: Your contribution in insect host plant resistant research is significant. In your view, how important is HPR research?

HCS: For a sustainable increase in crop production, the most important component is Variety. And the varieties to be cultivated by the farmers must have resistance or ability to tolerate abiotic and biotic stresses. The levels of resistance could be low, moderate or high., But they should not be more susceptible than the farmers landraces. When varieties with high levels of susceptibility to insects and diseases are released, they lead to disease and pest outbreaks. Under such situations, even the synthetic chemicals fail to control insect pests, and results in crop failures and farmers suicides. Therefore, development of insect-resistant varieties is of utmost importance for sustainable crop production and crop management.

SPR: What are the challenges you have faced in HPR research?

HCS: The major challenge in HPR research is the collaboration between entomology, breeding and biotechnology. It is important to have a clear understanding between different scientists about their role/ contributions, and finally sharing both the resources and the credit. Invariably, the resources are allocated to the breeding units, and they also pioneer the testing and release of varieties for cultivation by the farmers. While this is relatively easier in case of plant diseases, the process of ensuring adequate levels of insect pressure, collection of data, and its interpretation are much more complicated when we are breeding for insect resistance. In this case, there is greater need

for financial and human resources, and requires greater input by the entomologists. Progress in breeding for insect resistance can be made much more effectively when the trials are conducted by the entomologists, and the selections are made jointly by the breeders and the entomologists. We followed this process at ICRISAT in letter and spirit, and quite often, the collaborating breeders gave greater credit to the entomology, both in developing high yielding varieties, and in studying nature and inheritance of resistance to insects. In fact, the studies on genetics of insect resistance were largely pioneered by the entomology unit. And this system needs to be followed in All India Coordinated Research Projects on different crops to make HPR a reality in integrated pest and crop management for a sustainable increase in crop production. The major challenges are:

- Lack of appreciation by the breeders of the importance of, and contribution by the entomologists in developing insect-resistant cultivars.
- Lack of adequate funding, as most of the funding is given for breeding and biotechnology.
- Lack of importance/weightage given to pest resistance as compared to yield per se in identifying and releasing varieties for cultivation by the farmers.
- Unwillingness of the breeders to undertake development of varieties for pest resistance, as this is more challenging, tedious, and takes more time than developing varieties for high yield per se.

SPR: You have also worked on biosafety of GMOs and also involved in many committees, what is the major difficulty in convincing common people about GMOs?

HCS: We have been involved in development and evaluation of GMOs for pest resistance, and also evaluating them for their biosafety to nontarget organisms, and nutritional quality/ nutritional equivalence. Hundreds of meetings were held to discuss the biosafety of GMOs all over India and in the world, but hardly any funding was available to generate the data on biosafety. Much of the work that we did was funded by IndoSwiss project on biotechnology. Most of the noise on biosafety of GMOs is made by journalists, lawyers and NGOs, who have no knowledge of genes, gene products and their safety to the nontarget organisms including human beings. The scientists never spoke or wrote in general print media, and the misinformation was more widespread than the facts. More painful was the fact when some of the scientists, even the highly placed or respected ones, supported the non-scientific notions. However, the committees that I was involved in DBT, MoEFCC, and the AHTEG committee under Cartaghena protocol, all functioned systematically and scientifically to lay down the rules for testing and commercialization of GMOs. These guidelines/protocols were accepted by the concerned governments.

SPR: *Helicoverpa armigera* is used as a model insect in your lab for many studies, how important is it to select such a major pest for your research?

HCS: While *Helicoverpa* is one of the most important pests of field crops, my first few years in postgraduate research and at ICAR-CICR were focussed on cotton bollworms, and then I worked for nearly 20 years on insect resistance in sorghum /pearl millet to

shoot fly, stem borer, midge, and head bugs. In fact, my first project at ICRISAT was on pearl millet insects and *Mythimna*. While discussing the importance/implications of this research, my supervisor, Dr JC Davies, told me, it does not matter on which insect or crop we work, what matters is how we do it, and the outputs that we come up with. It was only in 1999 that I started working on *Helicoverpa*, and this certainly expanded my scope for research, and the outreach to the scientific community and the farmers. Developing robust protocols for rearing this insect continuously in the lab was a major challenge. It took us 2-3 years to develop robust protocols for rearing this and other five insect species in the lab, and this has been the key to the progress that we have made in HPR, transgenics molecular markers and biological control. And any research carried out on *Helicoverpa* as a model insect, certainly makes greater impact, than any other insect species.

SPR: Along with your research you have also been involved in IPM extension activities in India and abroad. Can you please explain your experiences and challenges in the extension work?

HCS: I have had limited involvement and experience in extension of IPM technologies. We largely tested insect-resistant varieties in the farmers' fields (ICSV 197 and ICSV 745 - resistant to sorghum midge; ICPL 88039, ICPL 332WR, and ENT 11 – low to moderate levels of resistance to pod borer in pigeon pea). Only 30 – 40% of the trials were successful. Here, we only provided seeds to the farmers. It did not involve the complex information and technology that we use in IPM. My learnings from this experience have made me to accept the results of 100 percent success in IPM and other trials with a word of caution.

"Any research carried out on Helicoverpa as a model insect, certainly makes greater impact, than any other insect species."

SPR: You have been involved in several projects in your carrier, how difficult is to manage multiple projects at a time?

HCS: It is not difficult to manage multiple projects at a given point of time. What we need is enough staff, and depending on the size and number of projects, the role of a principal investigator changes from a researcher to a manager. The most important component is the environment for freedom to operate.

SPR: Sir, you also served as President, Council of International Congresses of Entomology during 2008-16. What is your experience and suggestions?

HCS: It was a great opportunity and experience. First, a call from an unknown scientist, Dr Frantisek Sehna, Czech Republic, requesting me to be member of the Council of International Congresses of Entomology, and then going against the convention of Secretary General becoming the President of ICE, he persuaded me to take up the responsibility of chairing the council, which till then largely rested with scientists from the northern hemisphere. And with guidance and encouragement from Linn Riddiforld, Washington State, USA (who was president before Frantisek Sehnal) and Dr Sehnal, we steered the ICE with distinction for two congresses in 2012 in South Korea, and 2016 in USA. The last one being a benchmark, where the largest number of entomologists (nearly 7,000)

attended the congress in Orlando, USA. My only regret is that I tried to persuade the people in India to put up a proposal for holding the entomology congress in India, but nobody came forward. I wish, concerned entomologists do prepare a proposal to hold the congress in India in 2028 or 2032.

SPR: You have received many awards for your contribution to Entomology from different agencies, which award is close to your heart and why?

HCS: Awards and recognition are accidental. We don't work for them, but getting recognized and appreciated for ones' contributions is certainly heart-warming, and gives you a stimulus to perform better. Being selected for the Excellence in Science – Outstanding Scientist, among the 16 international institutes of Consultative Group on International Agricultural Research (CGIAR) was quite surprising and emotional one, as competing with scientists from centers like IRRI, CIMMYIT, IITA and ICARDA was quite satisfying.

Dr. P.R. Shashank (left) with Dr. H.C. Sharma at Division of Entomology, ICAR-IARI, New Delhi, India

SPR: You have worked in both the CGIAR system and SAU. How do you compare CGIAR with SAU?

HCS: The experience of working in ICRISAT and SAU is diametrically opposite. In ICRISAT, we pursued excellence in science and upright behaviour, and that determined the annual increments and promotions. In the SAUs, people feel that can get the things done through political pressure and patronage, which is unfortunate. For us to progress in the comity of nations, we must reward merit follow ethical behavior, and shun political interference.

SPR: Can you explain your take on work life balance, why it is important?

HCS: It the most important aspect of life. We as scientists, often overlook our responsibilities at home. As a thumb rule,

we used to go for a picnic or taking the lunch outside the home – largely home cooked food. And once in three months or whenever the children had school holidays, we used to go to nearby pilgrimage/ historical places. And a cocktail party with the staff and students once in a season was the most important component of what we did, and my appreciation to all the staff and students for their contributions and the role they played in this journey spanning over 4 dacades!!!

SPR: What is your vision for entomological research and extension in India? Suggestions to entomologists who look up to you?

HCS: Our younger generation is much more informed, than probably what we were, five decades back. They have a great challenge to handle in terms of climate change effects on insect biology and population dynamics, insect -host range interactions, expression of resistance to insects and other pest management technologies. We as entomologists must encompass and use modern tools of biotechnology, information technology and nanotechnology. Equally important is to enhance the collaboration with other disciplines/ institutes, and make a concerted effort to interact with entomologists globally. And we must improve our profile of publishing in high impact journals, filing patents, and make ourselves heard in various fora's. I wish a great future for our entomology fraternity in future.

Concluding remarks by Dr. Shashank: I am overwhelmed to meet Dr. H.C. Sharma for an interview. While doing my Ph.D. at UAS, Bangalore my supervisor Dr. A. K. Chakravarthy always tell me about Dr. Sharma and his work in Host Plant Resistance. I was always wanted to meet him and discuss his work, Indian Entomologist has provided this opportunity. When I contacted him over the phone, I introduced myself and explained about our Magazine. In a soft tone, he asked me are you Dr. Pathour from IARI? I was surprised and in a short conversation, I realized that he is well-informed about young entomologists across India. He agrees to an interview and I met him at the Division of Entomology, ICAR-IARI, New Delhi with Dr. M.K. Dhillon who is his doctoral student. I spent nearly three and a half hours with Dr. Sharma, I must say with no hesitation he was the most positive person I have met in recent times. It was a delight to meet him in person and listen to him for such a long period. He shared his journey from childhood to vice chancellor of SAU and beyond. I was really impressed by his jovial way of answering and even after retirement, he is so much enthusiastic about science. His journey will inspire many students who want to continue in science, especially entomology.

Dr. P.R. Shashank is working as Scientist at the Division of Entomology, ICAR-IARI, New Delhi. He is specialized in insect taxonomy and invasive pests. He is the Managing Editor of Indian Entomologist.
Email - spathour@gmail.com