

# Contributions of Dr. K.N.Mehrotra to the field of Entomology

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Kailash Narain Mehrotra, an esteemed scientist is acknowledged by his inevitable contributions in the field of entomology. He has inspired many through his excellent work in Insect Physiology and Insect Biochemistry. Due to his brave, unpredictable and confident nature he was regarded as “The Tiger” of the Entomology Division, IARI. His life journey has a truthful dedication to the field of Entomology.

## Early life of Dr. Mehrotra

On December 1, 1930 he was born to Mr. Srinarain Mehrotra and Mrs. Shyam Sundari Mehrotra at Kanpur, UP. He completed his early schooling at Etawah. Later, he pursued his B.Sc and M.Sc in Zoology at Banaras Hindu University, Varanasi . There he was influenced by Prof. A. B. Mishra, from whom he took first lesson in Entomology to continue his studies in the field of biology throughout his life. After a short stint as research assistant at IVRI, Izatnagar from 1954-1955, he proceeded to the University of Western Ontario, Canada in 1955 to do his Ph.D under the supervision of Prof. A.W.A. Brown. He initiated his work on “Development of cholinergic system in insect eggs” as studies on insect nervous system was on trend at that time. Due to the congenial atmosphere in the university along with guidance of experts like Drs. B.N. Smallman, William Chefurka, E.H.



Colhoun, Norman E. Good, E.Y. Spencer, R.D. O’Brien and Hubert Martin, a deep impression has been created on his mind to continue these studies as a postdoctoral fellow at the Cornell university, Ithaca, New York during 1959-1962 (Gujar, 1994 & Subrahmanyam, 2006)

## His professional career

In response to the strong call from the mother land, he returned India in 1962 and joined as a pool officer for a brief spell in the Department of Physiology, G.S.V.M Medical College, Kanpur. Finally, on the invitation of the then leading entomologists, Dr. E.S. Narayanan and Dr. S. Pradhan, he came to the Division of Entomology, IARI, New Delhi on November 4, 1963 as Insect Physiologist to work in the domain of Insect

Physiology at IARI in view of his vast expertise abroad. Later, he rose to the position of Senior Insect Physiologist (1969-1990). He was the third professor of the Division of Entomology and worked during 1973-1976. Twice he served as the head of the Entomology Division, IARI in the time period of 1977-1978 and 1980 and also the youngest person to reach that position. Later he succeeded Dr. D.N. Srivastava as Assistant Director General (Plant Protection) at ICAR in 1982. He was selected as Professor of Eminence in 1983 and continued to serve that position till 1986 and became the Principal Scientist of the division till his retirement in 1990. During his career, he has been honoured with fellowships of various academies like Indian National Science Academy, New Delhi; National Academy of Sciences, Allahabad; Indian Association for Advancement of Insect Science, Ludhiana, Punjab and as a Pitambar Pant fellow at BHU, Varanasi after his superannuation. (Gujar, 1994 & Subrahmanyam, 2006)

#### **Dr. Mehrotra as a mentor**

Dr. Mehrotra has been as outstanding teacher. In fact it was Dr. Mehrotra and Dr. N. C. Pant, his contemporary together has established Insect Physiology teaching and research at IARI that had helped in the development of vast human resource in this field in our country. Due to his efforts Insect Biochemistry has grown parallel to vertebrate biochemistry. He laid the foundation for the introduction of basic entomological courses *viz.*, Insect Physiology II, Insect Biochemistry and Biochemistry of Insecticides for M.Sc and Ph.D students. He established the research laboratory on Insecticide Resistance Management at BHU, Varanasi, UP and also

a section of Insect Physiology at IARI. His lectures were highly educative, thought provoking and up-to-date due to his in-depth knowledge of the subject. As a research guide, he has supervised 2 M. D. students at G.S.V.M medical college, Kanpur and 25 Ph.D. and 1 M.Sc students at IARI. He performed his part as a mentor very well by bringing best out of his students by providing them challenging topics. Many students have occupied higher positions in the field of agricultural education and research in India as well as abroad. Out of the students under his supervision, three of them continued their service at IARI *viz.*, Dr. P. J. Rao, Dr. Amrit Phokela and Dr. G. T. Gujar and promoted Insect Physiology as a “basic science with applied value”. In this respect Dr. M. S.Chadha called him as “True Guru” who created an active, professional and respectable school of Insect Physiologist in the country (Gujar, 1994 & Subrahmanyam, 2006).

#### **Major Research accomplishments**

Dr. Mehrotra was primarily concerned with studies on insect cholinergic system and effect of anticholinesterases from his early years till 1980. With his profound knowledge of the subject, he has published more than 170 research publications in well reputed journals like Nature, Pesticide Biochemistry & Physiology, Journal of Insect Physiology etc., and has been associated with the editorial boards of a number of research journals in India and abroad from time to time. His research work in collaboration with Prof. W.C. Dauterman on the characterization of acetyl cholinesterases and choline acetylase during his studies at Cornell University remains a highly quoted one in insect neurobiology. Because of his

dedication and devotion towards this work he referred that as “My baby”. Other prominent areas of research were characterization of carboxylesterase, physiological effects of insecticides, metabolism of insecticides, host plant–insect pest interaction, pheromones and kairomones and insect resistance to insecticides. Regarding acetylcholine metabolism in insect, he has identified the presence and time of occurrence of cholinergic elements such as acetylcholine (ACh), acetyl cholinesterase (AChE) and choline acetylase (ChA) in the developing eggs of housefly and milkweed bug and also characterized the enzymes, AChE and ChA using various pharmacological and biochemical techniques (Mehrotra, 1960). He also analyzed the substrate specificity of AChE using different analogues of Ach and revealed the difference in the shape and distance between the static and anionic sites in AChE which is the primary target of organophosphorous and carbamate insecticides (Mehrotra and Dauterman, 1963). At molecular level, he has shown the occurrence of various aggregates forms of different molecular weight of AChE which leads to the qualitative selectivity of the enzyme. Because of the importance of carboxylesterase (CE) in the metabolism of xenobiotics and insecticides, he demonstrated their presence, substrate specificity, kinetic properties in *Chilo partellus* Swinhoe, *Dacus dorsalis* Hendel, *Schistocerca gregaria* Forsk, *Lipaphis erysimi* Kalt. and the presence of extra anionic site in CE of *L. erysimi* (Mehrotra and Phokela, 1982). Extensive work was done by him on the metabolism of various insecticides viz., DDT, malathion, parathion and methyl parathion in the fat body of desert locust and also explained the role of the enzyme DDT- dehydrochlorinase in the

deactivation of DDT in desert locust. Despite the fact that the insecticides are extensively used in plant protection work, only little is known about their effects on the physiology of non-target species. He mainly worked to reveal those effects by finding the difference in the mechanism of action of anti AChE in house sparrow and desert locust and existence of an endogenous reactivator of AChE in birds (Mehrotra *et al.*, 1967). The host-plant relationship is mainly based on the interaction between biochemical systems of insects and those of plants, interlinked ecologically. In that case, he has found the phagostimulant activity of various edible oils and the phagodeterrent activity of *Calotropis gigantean* L. and neem (Mehrotra and Rao, 1972) towards desert locust, *Schistocerca gregaria*. Occurrence and efficacy demonstration of sex pheromone of female almond moth, *Ephestia cautella* Walker (Mehrotra *et al.*, 1967) and the demonstration on the presence of a kairomone in the hexane extract of *Corcyra cephalonica* Stainton for the parasitoid, *Bracon brevicornis* Wesmael has been considered as the significant ones. He also initiated studies on protein, amino acid and carbohydrate metabolism and also on insect behaviour. These basic studies were widened to include more and more of the applied developmental studies.

### **Other notable contributions**

Dr. Mehrotra during his tenure as ADG, was largely responsible for the formulation of the National Pesticide Policy through which several insecticides were phased out, new insecticides were synthesized and indiscriminate use of insecticides were discouraged. His efforts led to attainment of fair recognition of the science of plant protection in the agricultural

sector through the foundation of the Society of Pesticide Science in India in 1988. The main objective of this society is to put the use of pesticides in proper perspectives. The organisation of a symposium “Plant protection in 2000 A.D.” on the sponsorship of Indian National Science Academy in 1982 stands as a testimony to his efforts in this direction. He attended the meetings of Codex Alimentarius Commission which prescribes the permissible limits of pesticides in food held in France representing our country. Dr. Mehrotra along with Dr. V. K. Sharma, the former director of National Institute of Malaria Research, New Delhi has done a careful scientific analysis and ascribed the reason for malaria resurgence from intensive agriculture to several other socio-economic causes. When insecticide resistance has been already alarming in developed countries, he is one who brought to the fore, the development of pyrethroid resistance in *Helicoverpa armigera* Hubner nationwide and was responsible for initiating resistance monitoring studies (Gujar, 1994 & Subrahmanyam, 2006). He demised on 18<sup>th</sup> April of 1999. His student Dr. G. T. Gujar dedicated a book named “Recent advances in Insect Physiology & Toxicology” in his honour to portray his accomplishments. Till his last breath, he solely treasured his knowledge for the betterment of the field of Entomology which will remain as a milestone in the history of Entomology with potential agricultural application.

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