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OBITUARY

Ramesh Chandra Sinha (1934–2020)

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Ramesh Chandra Sinha, a highly respected internationally recognized plant virologist, died peacefully in Ottawa, Canada, on June 14, 2020. He was born on February 10, 1934, in Bareilly, India. His outstanding achievements include the identification of wound tumor virus (WTV) multiplication sites in its leafhopper vector and the development of cost-effective tools for the detection of phytoplasmas and mycotoxins. Additionally, his research findings on the economically important barley yellow dwarf virus (BYDV) laid the foundation for the control of diseases caused by this virus in cereal crops.

Ramesh received his M.Sc. in Botany in 1956 from the University of Lucknow, India, and after working there for one year, under the mentorship of Dr. S. N. Dasgupta, a well-known plant pathologist of his time, he joined, in 1958, the world-famous laboratory of Sir Frederick Charles Bawden, the grand pioneer of plant virus research, at the Rothamstead Experimental Station, Harpenden, UK. Ramesh obtained his PhD in 1960, working on red clover mottle virus. He showed clearly the importance of a plant virus passage through the midgut of its leafhopper vector for facilitating transmission to plants.

After his PhD in 1960, Ramesh came to the Department of Botany (now Plant Biology) at the University of Illinois at Urbana-Champaign (UIUC), to do research with Lindsay M. Black, another pioneer of plant virology and plant pathology; Black had proved conclusively that a plant virus can multiply in both leafhopper vectors and in plants. Here, Ramesh dug deeply into the nature of WTV transmission by leafhoppers, using an ingenious fluorescent antibody technique that he had developed and perfected working long hours in Morrill Hall at UIUC. Subsequently, this technique was widely used for the detection of viruses in vectors and plant tissues. In 1965, Ramesh was hired as a research scientist in what we call Agriculture Canada, run by the Canadian Ministry of Agriculture, located in Ottawa. Here, he led a highly active and top-ranking research group in plant virology until he retired in 1997. During his tenure at Agriculture Canada, Ramesh published close to 100 journal articles with more than 30 coauthors, and over 20 book chapters. We present below just a very few selected highlights of this remarkable period.

During the late 1960s and the 1970s, Ramesh and his associates concentrated on the plant viruses transmitted by leaf hoppers. He provided conclusive proof that "aster yellow disease" was caused by a phytoplasma, and not a virus. Ramesh was clearly a pioneer in studying, in toto, the many key aspects of how phytoplasmas are transmitted in plants, and how they can be serologically detected. His original research, dealing with the various aspects of the transmission of viruses as well as phytoplasmas, was submitted to the University of London (UK), for which he was awarded the Doctor of Science (DSc) degree in 1974.

Ramesh Sinha and his coworkers described the aphid vectors of BYDV, and their studies on epidemiology allowed strategies to be devised for controlling BYDV. At one time,

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wheat farmers all over the world had to deal with fusarium head blight (FHB) disease; the fungus *Fusarium graminearum* produces the mycotoxin deoxynivalenol (DON) in wheat grains, causing heavy damage. Research by Ramesh and his collaborators led to the development of a rapid serological method for cost-effective detection of DON. The overall technique was user-friendly and reliable, so that kits based on Ramesh's invention were made to detect DON and used worldwide.

In addition to his in-depth involvement with research, Ramesh served as an Associate Editor of Virology (1971–1974) and as a chairperson, in 1985, of the Plant Microbe Interaction Program at the Canadian Department of Agriculture, in Ottawa, and in the same year, he was elected to be a Fellow of the Royal Society of Canada for his outstanding achievements in the field of plant virology and phytoplasmology. After a stellar career, he retired from Agriculture Canada in 1997.

On the personal side, Ramesh was a friend to many in Ottawa and around the world. Cheerful, easy to approach, and always ready to help friends and strangers alike, his absence will be felt by all, but his friendship and ever-loving memories will remain with us. He was instrumental in introducing D. V. R. R. (co-author of this article) to virus research and provided guidance that led to a new technique for quantitative estimation of a virus in its leafhopper vector. We have received personal reminiscences about Ramesh's human and professional qualities from many friends worldwide, including Adrian Gibbs (Australia), K. M. S. Saxena (USA), D. Venkataram and Geetha Reddy (USA), Raj Prasad (Canada), John Aronson (Canada) and Mounir G. Abou Haidar (Canada).

Ramesh is survived by his loving wife of 63 years, Indu Bala Sinha; son, Sanjeev Sinha and daughter-in-law Sandhya Sinha; daughter, Sangita Srivastava and son-in-law Mahendra Srivastava; and five grandchildren.

We thank Christopher Brooke (USA) for reading this tribute, and we end it with a quote from a headstone in Ireland:

"Death leaves a heartache
no one can heal
Love leaves memory
no one can steal
We will love you forever"

Compliance with ethical standards

Conflict of interest Authors have no conflict of interest.