

## Javaregowda Nagaraju (1954–2012)

J. Nagaraju, staff scientist and chief of the Molecular Genetics Laboratory at the Centre for DNA Fingerprinting and Diagnostics (CDFD), Hyderabad, passed away on 31 December 2012. Death came rather unexpectedly and untimely on this emerging scientist while recuperating from a brief surgical procedure. He was passionately involved in carrying out research on the genetics and genomics of the silkworm at CDFD.

Nagaraju was born on 6 November 1954 in a small village (Agraharabachahalli) in Mandya District near Mysore in Karnataka. He had most of his education in and around Mysore. His Master's and Doctorate degrees were in zoology with genetics from Mysore University. He also underwent a three-year research training programme at the Centre for Genetics and Molecular Biology at the University of Lyon in France.

Nagaraju started his career in research at the Central Sericulture Research and Training Institute (CSB), Mysore. Later, he was instrumental in setting up the Seribiotech Research Laboratory under CSB in Bangalore, where he initiated several research projects on silkworm molecular genetics while serving as the Deputy Director. Subsequently he moved to CDFD to establish a vibrant research group working on the molecular genetics and genomics of silkworm. His intense efforts led to the establishment of a Centre of Excellence on Genomics and Genetics of Silkworms at CDFD.

Nagaraju embarked upon the analysis and mapping of differences in DNA between two geographically differentiated populations of tropical and temperate silkworm strains, which differ significantly in quantitative, qualitative, biochemical and physiological traits. A number of DNA marker technologies such as single-locus and multi-locus RFLPs, RAPDs and SSR were extensively exploited for strain-specific DNA profiling and construction of molecular maps for use in marker-assisted selection in silkworm breeding. He extended these studies later to other insects such as wild silk moths and agricultural pest insects.

Nagaraju also developed and improved upon anchored-SSR PCR to generate robust markers to map the silkworm genome. He then extrapolated this technique to distinguish closely related but disputed chilli varieties, and in the detection of adulteration in Basmati rice. He has successfully developed SilkSat DB, a silkworm microsatellite database and InSat DB, an interactive interface applicable to all insect genomes. In 2007, Nagaraju received the Tata Innovation Fellowship of the Government of India in recognition of his scientific contributions and development of commercial technology.



Nagaraju's group, in collaboration with French and Japanese researchers, developed methods to deliver exogenous DNA into silkworm eggs. The generation of virus-resistant transgenic silkworms using transposable elements coupled with RNA interference approach was a successful outcome of these efforts. Baculovirus infection is a major cause of crop loss in sericulture and Nagaraju could transgress the desirable trait of virus resistance into commercial races of silkworm to combine with high silk productivity. Earlier his research team also worked on the defence mechanisms operative in silkworms to resist bacterial infections.

Molecular analysis of W-chromosome of silkworm (the males are ZZ and females are ZW in silkworm) in female sex determination was one of the major

areas of research pursued by Nagaraju's group in recent years. The sex-limited strains carrying a trans-located autosomal dominant gene for larval marking, developed by him, has considerable economic importance in sericulture industry. This technique helps breeders and egg-producers in precisely separating the males and females at the larval stages itself, obviating the need for going to the cocoon stage.

Nagaraju was a dynamic individual and established an extensive collaborative scientific network with many leading scientists from Japan, France, USA and elsewhere. He was a fellow of all the three national academies of science in India. He was also a Fellow of the Genetic Society of America and the Japanese Society of Sericultural Science. He was honoured with the Biotech Product and Process Development and Commercialization Award of the Department of Biotechnology, New Delhi and the Best Scientist Award of the Federation of Andhra Pradesh Chambers of Commerce.

Nagaraju is survived by his wife, daughter and son as well as a large group of researchers whom he had been mentoring. He had successfully inculcated leadership skills among his lab members. His research colleagues and peers remember him fondly. Nagaraju's demise has been a big shock to both of us, to K.P.G. as a good friend and former collaborator, and to K.P.A.K. as Ph D guide and colleague at CDFD. His sudden and untimely demise has left a big vacuum in the emerging scientific community of India.

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