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A Letter to the Editor

Scenario of *Drosophila* research in India

Drosophila is a genus of flies of the family Drosophilidae (class: Insecta and order: Diptera). At global level 1579 species have been described^{1,2} and estimated to have several thousands³. So far 135 species of *Drosophila* have been reported from India which includes both new species and new record from India⁴. Rich species diversity has been reported from Hawaiian Islands where more than 500 species occur and picture-winged species provide unique opportunity to study evolution⁵. In India most extensively investigated species from evolutionary point of view is *Drosophila ananassae*, a cosmopolitan and domestic species endowed with many genetic peculiarities⁶.

Drosophila melanogaster was described for the first time by Meigen in 1830 and was used for experimental studies by Carpenter in 1905. Morgan was first to use *D. melanogaster* for genetical studies in 1909 and made important contribution in genetics e.g. theory of linkage and sex-lined inheritance. First spontaneous visible mutation (white eye) was detected in *D. melanogaster* by Morgan. Since then it has been extensively used at global level for studies of genetics, development, population biology, evolution and behaviour. In recent years, it is also being used for studies in the area of molecular biology. Due to the development of molecular techniques, DNA sequencing of genome of *D. melanogaster* and few other species has also been done. Thus it has proved to be one of the premier organisms for studies in biology and serves as model organism for such studies. *Drosophila* has certain advantages because of which it is used as a model organism for laboratory studies: cosmopolitan distribution, short generation time, easy handling, small size, easy rearing, high fertility, clear morphology, small number of chromosomes and presence of polytene chromosomes. Apart from these advantages, it is neither a vector nor a pest.

Although *D. melanogaster* is most extensively studied species, a number of other species have also been used for different kinds of studies: *D. simulans*, *D. mauritiana*, *D. ananassae*, *D. bipectinata*, *D. malerkotliana*, *D. pseudoobscura*, *D. persimilis*, *D. robusta*, *D. subobscura*, *D. nasuta* etc. Earlier studies employing *Drosophila*, were mainly concerned with linkage and crossing-over, gene mapping, mutations, sex-determination, chromosome maps, polytene chromosomes, chromosome replication, dosage compensation, puffing activity, chromosomal aberrations, population genetics, evolution, role of natural selection and genetic drift, behaviour, taxonomy, phylogeny, hybridization, sexual isolation, ecology etc. and in recent years *Drosophila* has also been found useful for studies in the area of molecular biology.

As far as my knowledge goes, *Drosophila* research in India began in 1920s at Kolkata with particular reference to taxonomy. Bezzi (see Sturtevant⁷) was the first person in this field who reported *D. repleta* from Kolkata . Bruneti⁸ for the first time described a new species, *D. prashadi* from Kolkata. As pointed out by Ray-Chaudhuri and Mukherjee⁹, the description of this species is not adequate and refers mostly generic characters. Duda¹⁰ reported *D. bipectinata* from Darjeeling (see Prashad and Paika¹¹). Sturtevant¹² reported four species of *Drosophila* from Chennai: *D. melanogaster*; *D. ananassae*, *D. montium* and *D. tristipennis*. Ray-Chaudhuri and Mukherjee⁹ reported two new species, *D. emulata* and *D. brunettii* from Kolkata. These two

species closely resemble *D. melanogaster* and *D. bipectinata*⁴. Thus all the three new species of *Drosophila* described from India are considered as invalid species⁴. Later on, *Drosophila* taxonomy research was carried out at Punjab University, Banaras Hindu University and Mysore University which resulted in the discovery of a large number of new species as well as new records from India (see Gupta⁴). Research in *Drosophila* genetics in India was initiated by Prof S P Ray-Chaudhuri at Zoology Department, Calcutta University in 1940s after obtaining Ph D under the supervision of Nobel Laureate Prof H .J. Muller from Edinburgh¹³. When Prof Ray-Chaudhuri moved to Zoology Department, Banaras Hindu University in 1960, he continued his research on *Drosophila* with particular reference to population genetics, crossing-over, mutagenesis, cytogenetics and taxonomy. The work on genetics of *D. ananassae* which he initiated at Calcutta University, was continued at Banaras Hindu University. During that period, research on *Drosophila* was also initiated at several institutions in India such as I V R I, Izatnagar, I A R I, New Delhi, Mysore University, T I F R, Mumbai and I I Sc, Bangalore. Presently, there are a large number of researchers employing *Drosophila* in their research working in different institutions of the country and focusing their research in various areas such as evolutionary genetics, behaviour, molecular genetics, ecological genetics, speciation, molecular biology, dosage compensation, biochemical genetics, cytogenetics, cell biology, developmental biology etc. *Drosophila* researchers in India have published a large number of papers and have made significant contributions in their respective areas. *Drosophila* research is being pursued at different universities and institutes in different places in India such as Varanasi, Kanpur, Kolkata, Rohtak, New Delhi, Mysore, Bangalore, Mumbai, Pune, Hyderabad, Jammu, Goa,, Lucknow, Bhopal, Mohali, Noida, Mangalore, Jhansi, Agra etc.

Michan , Sortibrán, Rodríguez-Arnaiz and Ayala¹⁴ published a bibliometric analysis of global *Drosophila* research from 1900 to 2008 in *Drosophila* Information Service (USA). Based on the data obtained from Pub Med and Science Citation Index, they investigated the scientific productivity of *Drosophila* research among researchers, countries, institutions, journals, and subject areas. A total of 36,486 documents were obtained from Pub Med and from Science Citation Index 48,981 documents were obtained. Their study included 4,600 institutions and 45,415 researcher names. Most prolific are 34 researchers with more than 100 research papers published by each researcher. In the list of most prolific *Drosophila* researchers at the global level, there is only one name (B. N. Singh) from India at 24th position. The ten countries with the highest number of publications are: USA, France, England, Japan, Germany, Canada, Spain, Switzerland, USSR and Australia. Maximum publications are from USA (21,508) but India does not come in this list. There are 501 different institutions such as universities, institutes, departments and corporations. The most productive institutions are the Russian Academy of Sciences, the C N R S, France, and Harvard University, USA. No institution from India comes in the list of 50 institutions shown by Michan et al.¹⁴. Presently, about 75 researchers in India are using *Drosophila* (as per list prepared by Prof S C Lakhota of Banaras Hindu University, personal communication). *Drosophila* is a very good model organism for studies in biology and more researchers should use this dipteran insect endowed with many advantages which will enhance the scientific productivity of *Drosophila* research in India because the scenario of *Drosophila* research in India encompassing about eight decades shows that we are lagging

behind from many countries of the world.

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