

Karyotype of rice gall midge, *Orseolia oryzae* Wood-Mason

The somatic chromosome number of the rice gall midge, *Orseolia oryzae* Wood-Mason was determined from the metaphase plate of the cerebral ganglia cells of late second stage larvae. The males possess six chromosomes while the females have eight.

The Asian rice gall midge, *Orseolia oryzae* Wood-Mason, is one of the most destructive pests of irrigated and shallow water rice ecosystem in south and south-east Asia including China, causing 10–100% yield loss¹. Resistance against the pest is well distributed in cultivated rice² and mostly conditioned by a single dominant or a few dominant/recessive genes^{3,4}. Successful utilization of the host resistance in breeding is complicated due to the presence of biotypes of the pest in field populations² and the presence of mixed populations in a locality⁵. A single report exists on the gene-for-gene relationship between resistance in host and virulence in the pest⁶. No work has been done on the basic cytogenetics of the pest, which is essential in devising proper breeding strategies to evolve stable resistant varieties. We have initiated cytological studies in the rice gall midge to get an insight into its mitotic and meiotic systems and chromosomal mechanism of sex and biotype differentiation.

The rice gall midge used in this study belongs to biotype-2 collected from the Central Rice Research Institute farm and reared in the net-house of the Division of Entomology following Perera and Fernando⁷. One male and three females were allowed to mate and single gravid females were confined for oviposition on the susceptible rice cultivars, T(N)I, grown in earthen pots and covered with an insect-proof net. Second instar larvae were collected during September–November when the female emergence increases and from December to January when maximum emergence was towards maleness (Rajamani, personal communication).

For mitotic chromosome preparations, cerebral ganglia from 12-day-old larvae (second instar) were dissected in a drop of Belar's saline, stained in 2% aceto-lactic-orcein for 10 minutes, destained in acetic acid and restained for 40–45 minutes⁹. Preparations were warmed slightly and squashed gently by giving slight pressure on the cover slip by the thumb. Chromosomes were analysed under an Olympus light microscope. Photomicrographs were taken with bright field optics using 105 ASA ORWO black and white films.

The rice gall midge showed a karyological sexual dimorphism. Six chromosomes were present in the metaphase ganglionic cells of larvae from populations generating more males (Figure 1a), eight chromosomes in larvae of populations generating more females

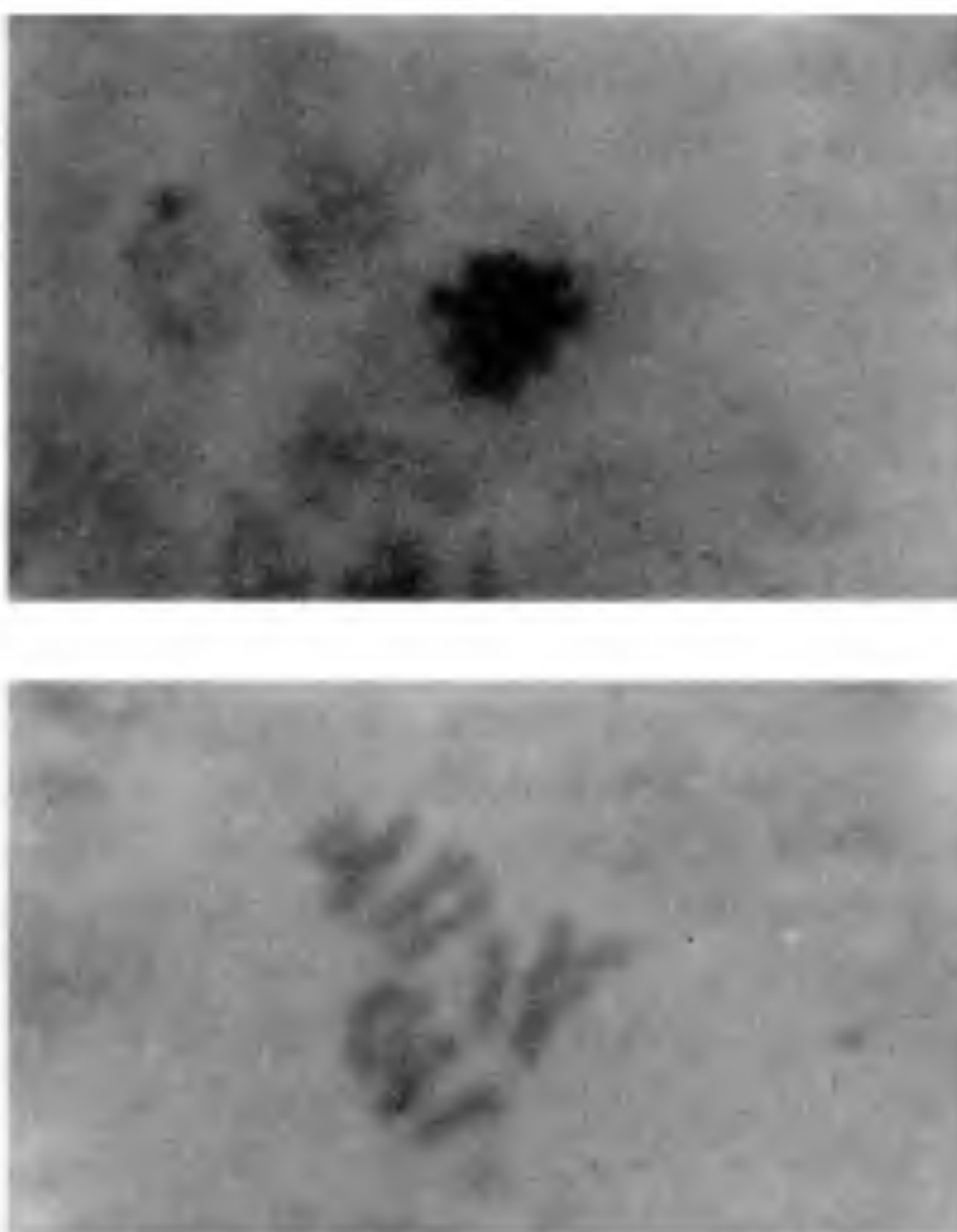


Figure 1a, b. Somatic chromosome number of the rice gall midge, *Orseolia oryzae* Wood-Mason, a, male-generating second stage larvae; b, female-generating second stage larvae.

(Figure 1b). This type of sexual dimorphism has also been observed in the Hessian fly, belonging to the Cecidomyiidae family⁸ where females have 2 pairs of autosomes and 2 pairs of sex chromosomes while males have 2 pairs of autosomes and 2 monosomic sex chromosomes.

Further work on polytene, autosome and sex chromosomes may elucidate the chromosomal mechanism of sex and biotype differentiation.

1. Mathur, K. C. and Rajamani, S., *Proc. Indian Acad. Sci. (Anim. Sci.)*, 1984, 93, 283–292.
2. Heinrich, E. A. and Pathak, P. K., *Insect Sci. Appl.*, 1981, 1, 123–132.
3. Sastry, M. V. S., Prakash Rao, P. S. and Seetharaman, R., *Indian J. Genet. Pl. Breed.*, 1975, 35, 156–165.
4. Chaudhary, B. P., Srivastava, P. S., Srivastava, M. N. and Khush, G. S., in *Rice Genetics*, International Rice Research Institute, Los Banos, Philippines, 1986, pp. 523–528.
5. Kalode, M. B. and Bentur, J. S., *Insect Sci. Appl.*, 1989, 10, 219–224.
6. Bentur, J. S., Pasalu, I. C. and Kalode, M. B., *Indian J. Agric. Sci.*, 1992, 62, 492–493.
7. Perera, N. and Fernando, H. E., *Int. Rice Comm. Newslett.*, 1969, 18, 6–8.
8. Stuart, J. J. and Hatchett, J. H., *J. Heredity*, 1988, 79, 184–189.
9. Breland, O. P., *Ann. Entomol. Soc. Am.*, 1961, 54, 360–375.

ACKNOWLEDGEMENT. This work was supported by a grant from the Rockefeller Foundation, USA.

S. C. SAHU
L. K. BOSE
J. PANI
S. RAJAMANI
K. C. MATHUR

Central Rice Research Institute,
Cuttack 753 006, India