

A primary investigation into the diversity of *Quadruspinospora* species in the Orthopteran insects of the Bankura district, West Bengal

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Abstract

The genus *Quadruspinospora* was established by Sarkar and Chakravarty (1969). Septate gregarines belong to the genus *Quadruspinospora* are found in the midgut and hepatic caeca of orthopteran insects, particularly in grasshoppers, and show some unique characteristics, like four long spines remain present in the oocyte, two on each pole, and the epimerite in most cases containing a variable number of stumpy digitiform processes. The genus *Quadruspinospora* contains sixteen species as of now. During our survey in the Bankura district, a total of six species of *Quadruspinospora* have been found from grasshoppers collected from the different habitats.

Keywords: *Quadruspinospora*, Orthoptera, grasshoppers, septate gregarines, Apicomplexa.

Introduction

Bankura district, the red soil land contains patches of tropical deciduous forest, grasslands, and agricultural lands, which are home to various grasshopper species, host of different species of *Quadruspinospora* septate gregarines. Septate gregarines are parasitic protozoan groups found primarily in the midguts of arthropods, and mainly in insects. They are part of the Phylum Apicomplexa and the class Conoidasida. *Quadruspinospora* was established by Sarkar and Chakravarty (1969) as a new genus of septate gregarine specifically found in the midgut and hepatic caeca of orthopteran insects, which belongs to the family Actinocephalidae Léger, 1892. The members of the genus *Quadruspinospora* show some specific features, like oocysts have four long spines, two on each pole, and the epimerite may contain a variable number of stumpy digitiform processes (Haldar and Chakraborty 1975) or even no digitiform processes at all (Kundu and Haldar 1983; Datta *et al.* 1990). Till now genus *Quadruspinospora* contains sixteen species, *Quadruspinospora aelopii* Sarkar and Chakravarty, 1969; *Quadruspinospora chakravartyei* Chakraborty and Haldar, 1976; *Quadruspinospora indoaiolopii* Haldar and Chakraborty, 1976; *Quadruspinospora acridii* Haldar and Chakraborty, 1976; *Quadruspinospora megaspinospora* Haldar and Chakraborty, 1976; *Quadruspinospora attractomorphii* Haldar and Chakraborty, 1976; *Quadruspinospora dichotoma* Kundu and Haldar, 1983; *Quadruspinospora platyepimerita* Datta, Ghosh and Haldar, 1990; *Quadruspinospora adigitalis* Datta, Ghosh and Haldar, 1990; *Quadruspinospora gesonulae* Datta, Ghosh and Haldar, 1990; *Quadruspinospora jalpaiguriensis* Datta, Ghosh and Haldar, 1990; *Quadruspinospora hieroglyphae* Mandal & Ray, 2007;

Quadruspinospora caudate Modak, Basu & Haldar, 2008; *Quadruspinospora cloptoni* Modak, Basu&Haldar, 2008; *Quadruspinospora oxyae* Yumnam and Mohilal 2016; *Quadruspinospora Mexicana* Medina-Durán *et al.*, 2019.

Objective

In this study, we aim to survey the diversity of the *Quadruspinospora* septate gregarine in the orthopteran insects of the Bankura district of West Bengal.

Materials and method

Orthopteran insects, especially grasshoppers, are collected through insect collecting nets by the swiping method from different habitats in the Bankura district of West Bengal. Insects were brought alive in the laboratory in a suitable container. The insects were dissected out and the whole intestine was removed, which was then put on a glass slide containing a drop of saline water. Intestinal contents were dissected out by using a needle and making a thin smear. A photograph of the fresh specimen of the septate gregarine was taken. When the smear became semi-dried, fixation was done by using Schaudinn's fixative for 20 min. For staining, Heidenhain's haematoxylin (Kudo 1966) was used. In order to measure, an ocular micrometre calibrated by a stage micrometre is preferred. For identification of the different species belonging to the genus *Quadruspinospora*, standard literature has been used (Haldar and Chakraborty 1976, Datta *et al.* 1990, Kundu and Haldar 1983, Modak *et al.*, 2008).

Result and Discussion

A total of 128 grasshoppers belonging to different species were examined for septate gregarine, of which 89 grasshoppers were found to be infected by different species of *Quadruspinospora*. It has been shown that there are six different species of *Quadruspinospora* that are: *Quadruspinospora acridii*, Haldar and Chakraborty, 1976 (Fig. 1. A); *Quadruspinospora adigitalis*, Datta, Ghosh and Haldar, 1990 (Fig. 1. B); *Quadruspinospora hieroglyphae*, Mandal & Ray, 2007 (Fig. 1. C); *Quadruspinospora cloptoni*, Modak, Basu & Haldar, 2008 (Fig. 1. D); *Quadruspinospora dichotoma*, Kundu and Haldar, 1983 (Fig. 1. E); *Quadruspinospora platyepimerita*, Datta, Ghosh and Haldar, 1990 (Fig. 1. F). The two most frequently encountered species of *Quadruspinospora* are *Quadruspinospora adigitalis* and *Quadruspinospora cloptoni*.

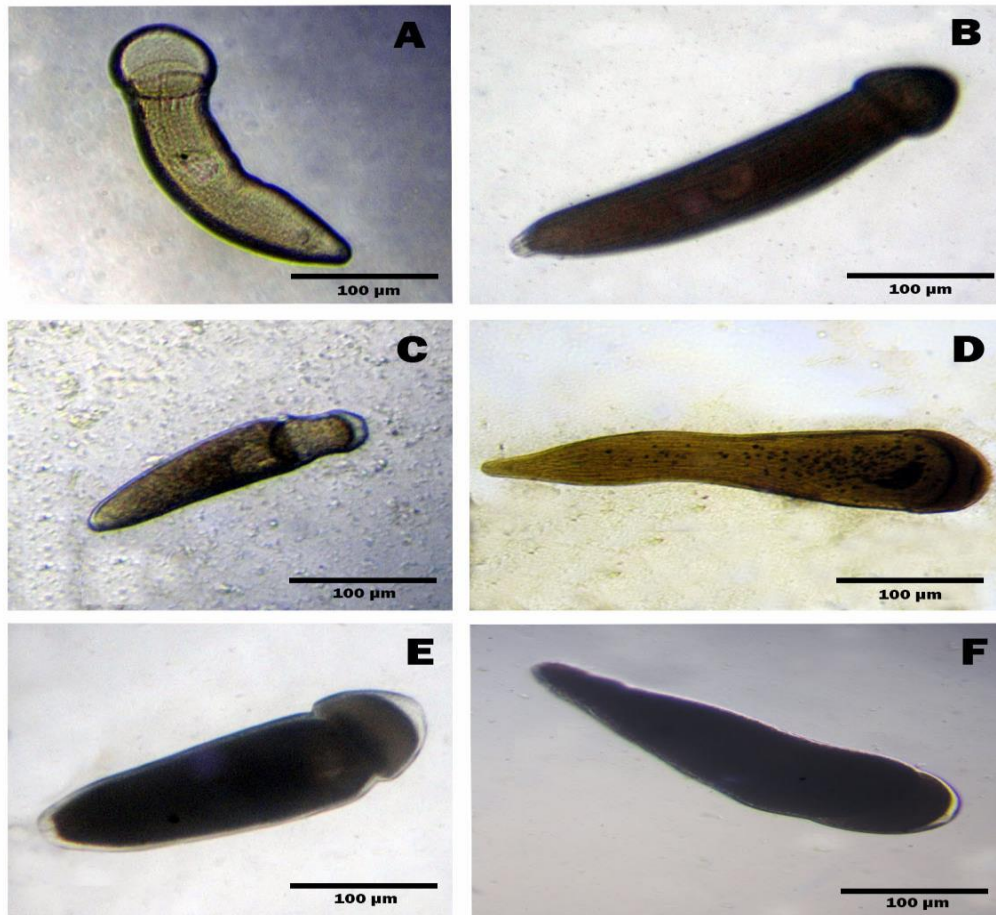


Fig. 1. Light micrographs of the *Quadru-spinospora septate gregarine* inhabiting the gut lumen of Grasshoppers. A. Photomicrographs of the gamont stage of *Quadru-spinospora acridii*, Haldar and Chakraborty, 1976. B. Photomicrographs of the gamont stage of *Quadru-spinospora adigitalis*, Datta, Ghosh and Haldar, 1990. C. Photomicrographs of the gamont stage of *Quadru-spinospora hieroglyphae*, Mandal & Ray, 2007. D. Photomicrographs of the gamont stage of *Quadru-spinospora cloptoni*, Modak, Basu & Haldar, 2008. E. Photomicrographs of the gamont stage of *Quadru-spinospora dichotoma*, Kundu and Haldar, 1983. F. Photomicrographs of the gamont stage of *Quadru-spinospora platyepimerita*, Datta, Ghosh and Haldar, 1990.

Conclusion

The number of infected grasshoppers in our study is high, with 69.53% of the grasshoppers showing at least one *Quadru-spinospora septate gregarine*. The most abundant species detected in this study is *Quadru-spinospora cloptoni* Modak, Basu & Haldar, 2008.

Due to diverse human activities, the loss of numerous genetic resources is on the rise in the modern world. Human beings may benefit from these genetic resources in the future. Hence, a comprehensive list of our flora and fauna must be compiled, and these bio-resources must be protected in the highest regard.

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