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Study of Genital Variations among the Earthworms of Genus *Pheretima* Inhabiting the Soil of Islamabad

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Abstract: External genital markings are supposed to be the key character of speciation and slight variation leads towards the differentiation among individuals of the same species. Such striking variations exist in the genital papillae of earthworms of genus *Pheretima*. This study was based on the exploration of soils of Islamabad to hunt the variations in number and position of genital papillae of earthworms belonging to genus *Pheretima*. A total of ten new variants were found, that were previously undescribed, including six variants of *P. posthuma*, three of *P. morrisi* and one of *P. hawayana*.

Key words: Earthworm taxonomy, genital papillae, variations, *Pheretima*

INTRODUCTION

Earthworms are major soil dwelling organisms and constitute the large biomass of soil invertebrates. Earthworms are diverse and more than 3,000 species are known world wide (Morgan, 2002).

Earthworms are hermaphrodite having both male and female reproductive organs in the same individual. Cross fertilization and copulation are observed in earthworms and the gonads are provided with special ducts. The clitellar glands secrete cocoons in which young develops clitellum and genital setae secure the copulating partners by secreting mucus (Wilmoth, 1967).

Various markings possessed by earthworms at sexual maturity are in the form of tubercles, ridges and papillae on the anterior ventral surface. For systematic purposes and accurate description of papillae, ridges, pits and other genital markings is a vital phenomenon as these are often variable to some extent and are important factors in characterization and classification of an organism (Mayr and Ashlock, 1991).

Variations are observed in number and position of genital papillae in earthworms. These papillae are round disc like in appearance present on ventral body surface. Functionally these are the openings of accessory glands and help in copulation (Edwards and Bohlen, 1996).

Poinar *et al.* (1988) worked upon Nematodes and explored the taxonomic importance of genital papillae. Bhatti (1962) studied variations in number and position of genital papillae in *P. morrisi*. He reported three variants of *P. morrisi*. Sahar (1999) worked on five species of genus *Pheretima* and studied inter and intra specific variations in number and position of genital papillae with respect to

highest percentage occurrence. The present study was conducted for further exploration of genital variations among the earthworms of genus *Pheretima* inhabiting the grassy lawns and pond banks of Islamabad.

MATERIALS AND METHODS

The earthworms were collected from the grassy lawns and pond banks in and around NARC, Islamabad. Samples were taken randomly by digging a quadrat of 1x1x1 ft³ area by means of a hoe. Collection was done by simple hand sorting method as described by Noreen (1997). Each specimen of earthworm was washed with tap water and anaesthetized in 10% ethyl alcohol for 15 minutes. Then they were straightened and killed by pouring 10% formalin solution. After 24 h they were washed with water and permanently preserved in 5% formalin solution. Examination of specimens was done by using a stereomicroscope (Wild M7A) with 10x to (6-21)x magnification. Various morphological characteristics were recorded. The data obtained was then used in identification and classification of the earthworms with the help of keys provided by Stephenson (1923), Bhatti (1962) and Sims and Gerard (1985). The earthworms of genus *Pheretima* were separated from the rest and their genital characters were studied thoroughly. The number, position and arrangement of genital papillae was recorded and drawings were made for comparison.

RESULTS AND DISCUSSION

The presence of genital papillae represents the sexual maturity marking. In the present study the variations in

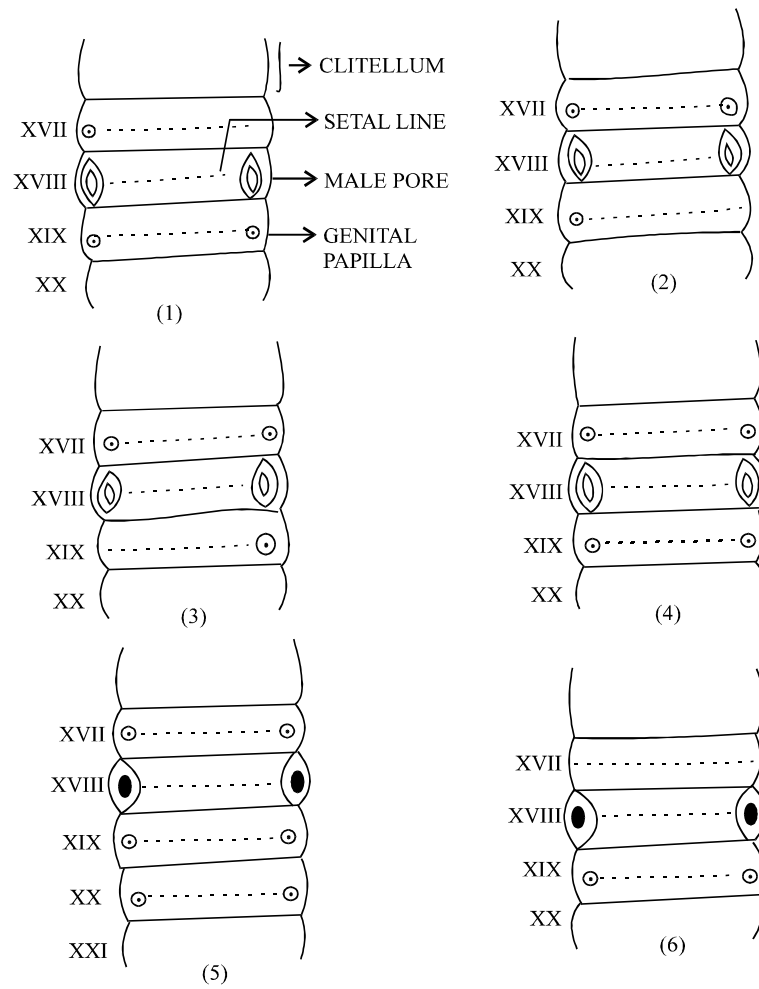


Fig. 1: Post clitellar genital variations in *Pheretima posthuma*

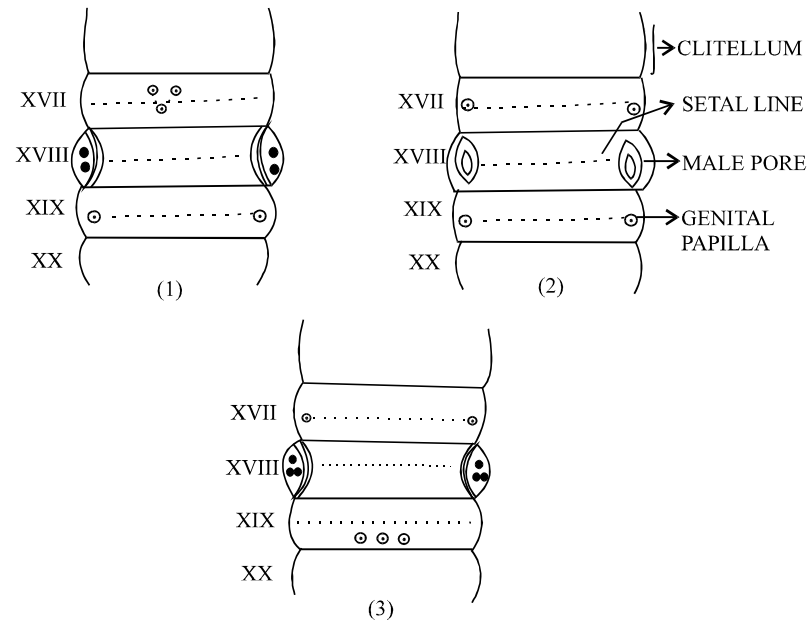


Fig. 2: Post clitellar genital variations in *Pheretima morrisi*

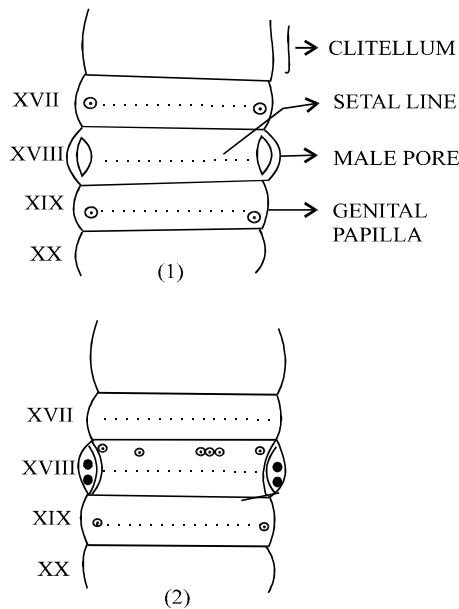


Fig. 3: Post clitellar genital variations in *Pheretima hawayana*

number and position of these genital papillae have been described in three species of genus *Pheretima*. Six variants were found in *P. posthuma* (Fig. 1), three variants in *P. morrisi* (Fig. 2) and two variants in *P. hawayana* (Fig. 3).

Variations in genital papillae were previously described by Bhatti (1962), who described three variants in *P. morrisi* from Lahore and Sahar (1999), who worked on five species of genus *Pheretima* i.e. *P. posthuma*, *P. minima*, *P. morrisi*, *P. hawayana* and *P. differengens* and reported twenty four variants of *P. morrisi* from Islamabad. Two out of three variants of *P. morrisi* found in this study are other than that of Sahar (1999). Similarly five variants out of six of *P. posthuma* and one out of two of *P. hawayana* do not match with the previously described ones and hence are reported here.

Reproductive isolation is an essential property of species (Mayr *et al.*, 1953). The reason of reproductive isolation is the difference in sex organs of species, which are important taxonomic characters for their classification. Associated organs are also vital and must not be neglected as they assist the process of reproduction and their number and position alter their respective function. In earthworms genital papillae assist in reproduction. The enormous variation found in the number and position of there is astonishing as the real cause of this intrapopulational variation is still not known. This may be genetic or non genetic. Habitat and climate also affect populations and changes in hormonal level also induce variations (Mayr *et al.*, 1953). Any of these factors might be the cause of such genital variations found in earthworms.

Study of variations among different individuals of same species is the foremost task for a taxonomist (Mayr and Ashlock, 1991). Therefore the variations in the genital papillae should not be neglected. It is necessary to find the role of these variations in reproductive as well as in taxonomic system as they are a vital part of both systems and slight change in their role may prove a major alteration in an individual. In this respect, extensive work has to be done by the taxonomists of the time to determine the origin, fate and importance of these variations in heritage.

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