

Relationship between seasonal population of earthworm and abiotic factors in pineapple plantations

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Abstract

The study showed that 10 year pineapple plantation had the highest number of earthworms which was followed by the 5 year and 1 year plantation soils. Soil temperature and moisture showed significant correlation with the seasonal variation in the earthworm population. Two way analysis of variance revealed that season as well as plantation age significantly affected the earthworm population.

Introduction

Importance of earthworms for soil fertility has been known since the period of Darwin. Most of the earlier studies were conducted in agriculture¹, forest², and grassland soils³. The earthworm populations under orchard crops have not received due attention. Keeping this in mind it was thought necessary to estimate the earthworm population under pineapple orchards for possible utilization of earthworms in evolving better land management strategies.

Material and Methods

Study site : The study was conducted at Pineapple Research Station, Nayabunglow (latitude 25°44'N, longitude 91°53'E) at an altitude of 800 m in the East Khasi Hills District of Meghalaya about 30 km north of Shillong. The soil is a red sandy loam of laterite origin (oxisol) and acidic. The months from May to September represent wet season although occasional showers are received during October to April. June and July are the wettest months. The annual rainfall during the study period (1986-1987) was 2300 mm. The average maximum and minimum ambient temperatures of the study site were 27°C and 7°C, respectively. The percentage relative humidity reached 84% during the rainy season.

Soil temperature was recorded with a soil thermometer. Moisture content in the soil was estimated by drying the sample at 105°C for 24 hours in a hot air oven. The soil pH was determined in 1 : 5 soil water suspension with the help of electric digital pH meter. Earthworm population was estimated by hand picking method⁴ following randomized sampling

procedures and considering a size of 25 cm cubes of soil. Randomly 20 quadrates (25 × 25 × 25 cm) were dug up by the soil digger and earthworms were sorted out carefully by hand.

Each value reported is the mean of triplicate analysis. Correlation coefficient (r) values were calculated between earthworm population and soil moisture, temperature and pH. Data were also analysed by two way analysis of variance.

Results and Discussion

Soil temperature and moisture content recorded from the studied plantations ranged between 11-33°C and 12-28.8%, respectively. The soil pH ranged from 4.5 to 6.6 (Fig. 1).

Maximum population (7 worms/25 cm soil cube) of earthworms was recorded from the 10 years plantation soil. 5 year and 1 year plantations soils harboured lesser number of earthworms (Fig. 2). Five species of earthworms were recorded during the sampling period. These were *Amyntas alexandri*, *Drawida assamensis*, *Megascolides antrophyes*, *Metaphire*

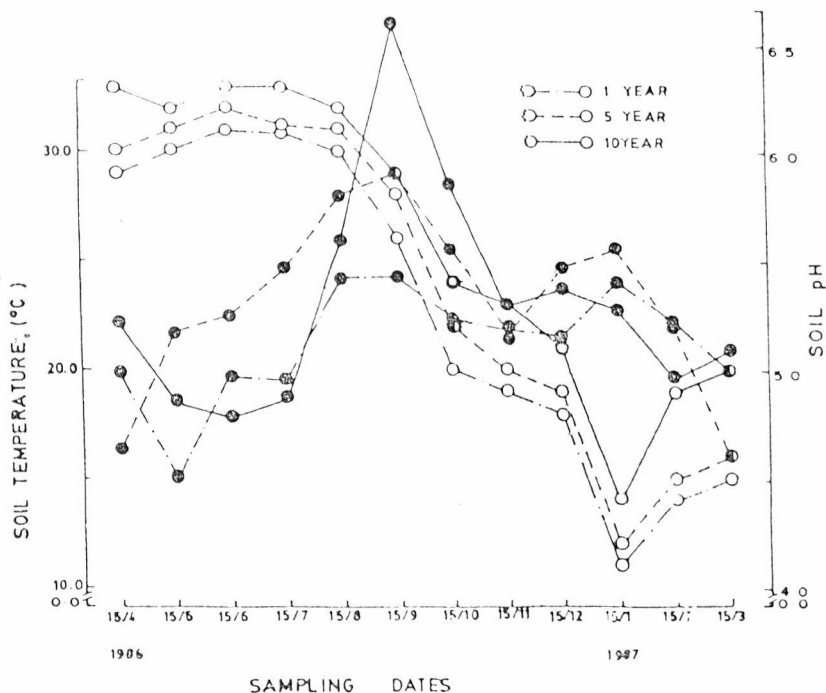


Fig. 1. Monthly variation in temperature and pH of different plantation soils. Open circle : soil temperature, closed circle : soil pH.

houletii and *Nellosocolex strigosus*. *Drawida assamensis* was the dominant species. Higher earthworm population in 10 years plantation soil may be due to generally higher soil temperature and moisture content (Figs. 1, 2). Shiptitalo *et al.*⁵ reported that earthworm population, their survival and feeding activity was highly dependent on diet which they ingest. Higher amount of litter accumulation and less degree of disturbance may also be one of the reasons for the higher earthworm population in 10 year plantation⁶. Low population in 5 year and 1 year plantation soil might be due to low soil temperature, moisture and less accumulation of litters in the soil of these plantations. Degree of disturbance during the time of transplantation has also been reported to be the reason for low counts of the earthworms⁶.

The earthworm population was recorded during rainy summer season of the year (April–November). Gates⁷ also reported the earthworm population activity in the humid subtropics of India during the same period. During dry winter no population of earthworm was recorded (Fig. 2). Low population levels during winter may be due to the unfavourable temperature and moisture conditions to the worms and also that they may have become quiescent^{8,9}. Increase in earthworm population after 15th March, 1987 can be attributed to increase in soil temperature (Fig. 1). Maximum earthworms during July, 1986 might be due to higher moisture¹⁰.

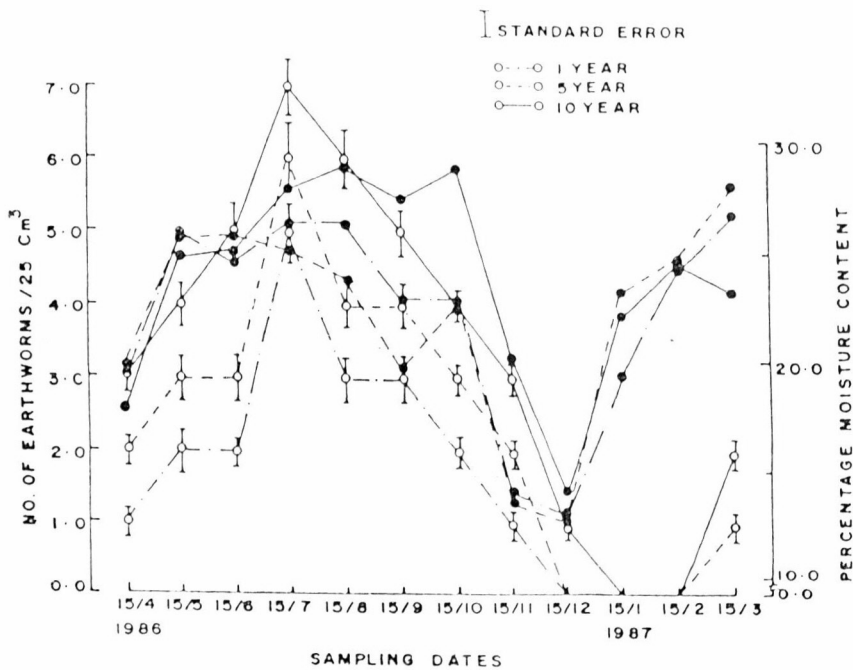


Fig. 2. Monthly variation in earthworm population and moisture content of different plantation soils. Open circle : earthworm population, closed circle : soil moisture content.

A positive correlation was observed between earthworm population and soil temperature, moisture and pH. It is inferred that the soil temperature and moisture were the most important abiotic factors responsible for the seasonal variation in the earthworm population (Figs. 1,2). Variation in earthworm population with time (6.37, $P < 0.01$) as well as due to plantation age (8.23, $P < 0.01$) were statistically significant.

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