Studies on Population Dynamics of Pratylenchus *sp.* (Filipjev, 1936) about Soil Abiotic Factor in the Mulberry Field at Aurangabad, Maharashtra, India

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***Avhad Sunil B**
Department of Zoology
Annasaheb Vartak College of Arts, Kedarnath Malhotra College of Commerce
E.S. Andrades College of Science, Vasai Road, Palghar (M.S), India

Hiware Chandrashekhar J
Department of Zoology
Dr. Babasaheb Ambedkar Marathwada University, Aurangabad (M.S), India
**For correspondence (e-mail: drsunilavhad@gmail.com)*

Abstract

In the present study, the monthly population fluctuation of Pratylenchus sp. (Filipjev, 1936) is ascertain about soil temperature, moisture, pH in mulberry (Morus alba L.) field with economic importance within the sericulture. The studies target is to grasp the influence and impact of those soil abiotic factors on the population of those plant-parasitic nematodes and Correlation coefficients (r) between mean population Pratylenchus spand different soil abiotic factors in Aurangabad Mulberry garden.

Keywords: Pratylenchus sp. (Filipjev, 1936), Population fluctuation, Soil abiotic factors

Introduction

Sericulture has socio-cultural implications. Studies have established scale employment generation potential and high-income generation potential of sericulture (Hanumappa, 1986). Mulberry is a plant within the economy as a result of silk production depends on the nourishing quality of the leaves, which is affected by infective agent attacks (like nematodes, fungus, virus, bacteria, insects, etc.). These pathogens are the most obstacles inflicting considerable loss in yield and nourishing price of mulberry foliage. Feeding of the infected leaves effects on the health of the silkworms adversely; therefore, the cocoon yield is quality and amount. The dearth of standard and systematic studies on the incidence of diseases and epidemics is accountable for the revenant loss in leaf yield (Powell, 1971; Sengupta et al.1990; Teotia and Sen S.K, 1994; Datta et al., 1997; Datta, 2007; Datta and Datta, 2008).

Soil borne diseases caused a significant downside for mulberry cultivation throughout nursery plantation and established gardens,

which cause severe loss in revenue generation of mulberry growers compared to foliar diseases and numerous affect mulberry. Among them, root-knot and plant disease affect the established plantation leading to severe loss in leaf yield, excluding deterioration in leaf quality, which could be a pre-requisite in roaring sericulture to induce the quality cocoons. Besides, stem-canker, cutting rot, collar rot, plant disease affects the survivability of mulberry plantation in a nursery. The matter is troublesome to handle, thanks to the complicated nature of the disease and conjointly involvement of organic phenomenon and abiotic factors because the production of quality cocoons depends upon the standard and number of mulberry leaves, timely management measures for the defense of mulberry plants from totally different soilborne diseases are essential (Sharma et al., 2003).

Lesion nematodes, Pratylenchus species area unit migratory endoparasites. The higher than ground symptoms aren't identifiable and area unit a manifestation of the wrong of roots. These embrace acrobatics, yellowing of leaves, defoliation, not fully mature and plant disease however, show separate elliptical lesions within the initial stages of infection. The lesions coalesce because the infection spreads, resulting in girdling of the roots thanks to in-depth sphacelus. The death lesions area unit is typically settled by secondary pathogens, and decay sets. Besides roots, lesions might also be fashion on pods and tubers. Pratylenchus coffeae could be a significant issue of low plantations in Mysore. In step with Van Berkum and Seshadri (1971), this roundworm causes annual an associate loss of Rs. 20 million thanks to a 33 % reduction in warheads and a55% decrease in the rice grain yield in Orissa.

The soil abiotic factors that show an effect on the population of nematodes are temperature and moisture. In the present work is soil temperature, moisture, pH has been studying. Temperature and moisture have a relation in controlling the activity and metabolism of animal communities with that of nematodes. pH has a little direct impact upon the higher and lowers the animals, but for soil-borne microorganisms, hardly we can neglect their impacts. These three soil parameters namely soil temperature, moisture, pH consider to assess their impact upon the soil nematodes (Avhad Sunil B. and Hiware C.J, 2018).

The population density of nematode varies considerably due to several factors like availability of host plant, soil type, soil moisture, soil temperature, rainfall, many other extrinsic factors (Norton, 1979). The present investigation study shows that, change in a population of Pratylenchus spp. was observe about Soil temperature, moisture, pH in the mulberry field during the study. The objective of the study influence and effect of soil abiotic factors on the population of Pratylenchus spp.

Material and Methods

Soil sample collection and nematode extraction for the count: The soil samples collect from the different Mulberry gardens from Aurangabad tehsil of Aurangabad Districts. In soil variables namely Temperature, pH, Soil moisture is noted during soil sampling time. Soil samples from different farms were pooled, mixed before taken 200 cm3 of the sample with Baermann funnel techniques used for nematode extraction using Cobbs sieving and decanting method.

Preservation and mounting of nematode: Batch wise extracted nematodes were inactivated in the water bath at 60-70 ºC and fixed in FA 4:1 fixative cleared in a glycerol-ethanol solution and stored in anhydrous glycerol. Microscopic examination and photographing of the nematodes done in glycerol mounts.

Estimating soil abiotic factors of the mulberry field: Soil samples collected from mulberry garden for ecological studies, estimating the soil abiotic factors like moisture, pH, temperature. The methods of estimation as follows:

Preparationof soil for testing: The soil samples were air – dried and grinded into fine particles, and was passed through 2mm pore size sieve. The soils were stored and labeled their locality and month of collection for analysis.

Estimation of Soil Temperature: Soil temperature was recorded every month from the mulberry field at collecting soil samples time is between 11 AM to 12 PM with a soil thermometer. The thermometer was pushed into the soil until a constant temperature reached then only readings records.

Estimation of Soil pH: The soil pH is notes on the field with a soil pH meter during samples collection time.

Estimation Soil moisture: 10 gm of soil is Weight and put in the oven at a temperature 105°C overnight and take weight again.

$$\text{Soil moisture (\%)} = \frac{\text{Wet soil weight (gm) - Dry soil weight (gm)}}{\text{Dry soil weight (gm)}} \times 100$$

Results and Discussion

From Aurangabad tehsil mulberry garden, the maximum total population of the totality of all (Juveniles and adults) Pratylenchus spp. Nematodes was observed in September among all 24months of observations, the mean of the total population being 128 / 250 gm of soil in September 2009, 79/ 250 gm in September 2010. The minimum total population was the record for April and May 2010-11, with the mean population being 6 and 3, 8 and 3 respectively. The data regarding the monthly population fluctuation of Pratylenchus spp nematodes in Aurangabad mulberry garden is shown in Figure. 1.

The most abundant population densities of Pratylenchus spp occur in June, July, August, September when the soil temperature, moisture, pH ranged between 25-28^{o}C, 26-36%, 6.2-6.5 respectively. They reached the lowest level of their abundance in March, April, May when the soil factor ranged between 29-34^{o}C, 8-14%, 6.6-6.8, respectively (Figure. 1) in the rest of the month's population fluctuated without any abrupt increase or decrease in the presence of comparatively lower temperature, and moisture with higher pH.

In the present investigation, the high population density was discovered in optimum temperature and high moisture share; thus, Khan and Sharma (1990) correlative the fluctuation of population densities of Helicotylenchus dihystera and Meloidogyne incognita additional with the temperature than with soil moisture, whereasthe variation within the population densities of Tylenchorhychus mashhoodi and Pratylenchus pratensis wasn't explained by the variation in temperature and moisture that is additionally true just in case of the present study. Griffin et al. (1996) over that a positive relationship exists between high soil water and most population densities of Tylenchorhynchus acutoides. Madan Lal and Jauhari (2007) additionally show the result on Pratylenchus penetrans has shown most population 1912 at 25ºC in sandy-clay whereas 1692 at 30ºC in sandy-clayless population 129 at 35ºC in sandy-clay soil and 250 in sandy soil at 35ºC.

The present study supports the findings of Das et al. (1984) that the adults and larval populations in soil within their report fluctuate nearly in a similar fashion June to September also as of November to Jan in exaggerated trend shows each peak, however, they additionally noted the low level of the adults and larval population throughout February to August. Within the present investigation, the high population density was discovering in optimum temperature and high moisture, thus Khan et al.(1971) reportable the optimum temperature of 25ºC for the increment of nematodes. Ramana et al. (1978) additionally showed 21-26ºC soil temperature to be favorable for lance nematode worm in monsoon areas that contradict the current investigation.

The correlation (r) shows a positive relationship between fluctuations of population density of Pratylenchus spp. therewith of soil temperature (r = -0.307; P=0.144) drawn by the linear regression equations, Y=-2.147+80.80xand pH (r = -0.603; P=0.002) drawn by the linear regression equations,

Y=-49.76+402.5x. (Figure No. 2 and 3) within the total amount of study with a negative correlation. On the other hand, a directly proportional relationship was found between the population abundance and soil moisture with a positive correlation (r = 0.653; P= 0.001) drawn by the linear regression equations, Y=-21.63+1.810x. (FigureNo.4). Youssef (1998) additionally shows the same results on the seasonal fluctuation of plant nematodes Rotylenchus reniformis related to mulberry shows negatively correlative (r = 0.03) with the current soil temperature. Paratylenchus sps how a peak in June, May, July that was negatively correlative (r = 0.01) with soil temperature.

Ghosh and Manna et al. (2008) shows similar results that the soil moisture maintained nearly a continuing correlation with the nematode worm population even in continuous follow the amount of paddy crop field to frequent rain in the state. It should be over that thanks to enemy cropthe. soil moisture couldn't facilitate to create – up the nematode worm population and also the correlation was negatively insignificant in each year's underneath study.

Annamalai et al.(1996) additionally similar findings for the population of Pratylenchus jordanensis in soil didn't vary considerably and was high throughout the year. However, the population was less in May and August at the primary and second sites, severally. The correlation between nematode worm soil populations and soil temperature wasn't major (P >0.05). In distinction with American state soil population, nematode worm populations in roots fluctuated greatly with a definite high from July to November at each location, which coincided with higher soil temperatures. Despite a high nematode worm population within the soil, the population in roots was observed low in month of December to June, coinciding with lower soil temperatures. These findings were also confirmed that the positive correlations in between populations in roots and soil temperature is (r = 0.433 and 0.324; P = 0.01), drawn by the linear regression equations Y=78.45+29.43x. and (r = -0.603, P= 0.002). The high population of nematode from July to November suggested that the penetration of P.jordanensis into rootsfavorablewith high soil temperature.

Similar observations are creating with those species of Pratylenchus that are sometimes present in warm regions. P. brachyurus was find to breed on Soyabean in large numbers at 29°C in comparison with cold levels (Lindsey and Cairns, 1971). Similarly, P. negleetus, discovered on several field crops in the interior region of Oman (Anon., 1993), additionally penetrated maize roots in high numbers at 30°C (Townshend, 1972) and also the rate of similar was higher at 38°C than at different temperatures (Mountain, 1954).

Kable et al. (1968) additionally show that the rate of population increase of Pratylenchus penetrans is at moderate soil moisture tensions (pF 2-3) is least at low or high. In general, the quantity of nematodes living in soil decreases with increasing moisture and temperature on top of temperature reduction. No nematodes survive fifteen days at 15°C or 37° C. The experimental results indicate that the widespread prevalence of high Pratylenchus spp. populations in sandy soils are often explain in terms of the interaction of soil moisture with soil sort. Gantait V.V et al.(2006) has created an effort to correlate the population modification of the species with soil factors and organic carbon content. Temperature, moisture, organic carbon shows a direct correlation with the population, whereas pH showed an indirect correlation.

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Figure No. 1: Mean population size (adults and juveniles) of each of the Pratylenchus sp. / 250 gm of soil in mulberry garden at Aurangabad tehsil.

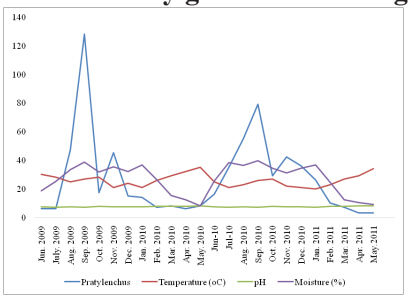
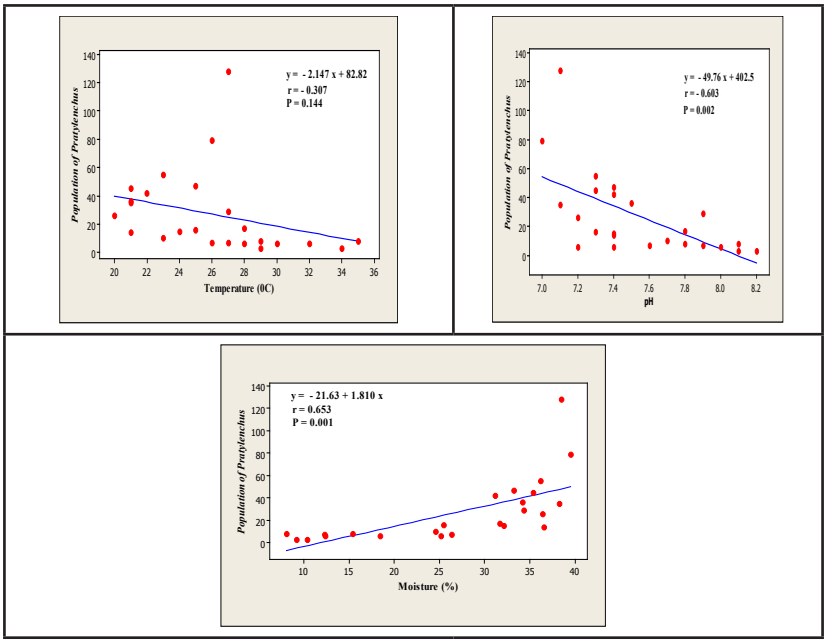


Figure No. 2, 3,and 4: Correlation coefficients (r) between Mean population Pratylenchus sp. and different soil abiotic factors in Aurangabad Mulberry garden. (*Significant correlation ≤ 0.05).



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