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Effect of soil types on nematode population(s) in Kangra valley (Himachal Pradesh)

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ABSTRACT

The soil samples infested with nematodes were collected from the four localities *viz*. Rani Sidhpur (Palampur) around the root zone of *Zingiber officinale*, Tanda (Kangra) around the root zone of *Cucurbita maxima*, Jhikley Beth (Baijnath) around the root zone of *Cucurbita maxima* and Bairghat (Jaisinghpur) around the root zone of *Calocasia antiquorum* in Kangra Valley (Himachal Pradesh). Each thoroughly mixed composite sample was brought to central soil and water Conservation Research and Training Institute (ICAR), Dehradun (Uttatranchal). The Physicochemical analysis of the soils was done with the help of technicians. Analysis of soil samples collected from Rani Sidhpur, Tanda, Jhikley Beth and Bairghat in the Kangra Valley indicated high values of clay (37.5%), WHC (82%), EC (0.435 mili/M/cms) and organic carbon (3%) and low values of particle density (2.10 g/cc) and Bulk density (1.00 g/cc) in the Jhikley Beth area where highest percentage population (52.84%) was recorded when compared to the populations of the above studied areas. Similarly, lowest population (7.76%) was recorded in the Bairghat area that may be due to high values of clay (37.5%) and pH (7.43).

Key words : Physicochemical analysis, Soil samples, Nematodes, Kangra Valley.

INTRODUCTION

Soil type and other abiotic conditions prevailing in the valley favour diverse population(s) of nematodes as per survey. Mittal and Dhawan (1991), Srivastava and Sethi (1984) as well as Tard *et al.* (2005) has also studied the effect of soil types on multiplication and development of nematodes. In the present investigation, Mechanical, Physical and Chemical analysis of soils was done to study their effect on the population(s) of nemic fauna in the Kangra valley (Himachal Pradesh).

MATERIALS AND METHODS

Four soil samples were collected from the four selected localities in Kangra valley. Each thoroughly mixed composite sample was brought to central soil and water conservation Research and Training Institute, Dehradun. The Physicochemical analysis of the soils was done with the help of technicians. The soil analysis was done by different techniques. International pipette method for the determination of percentage of sand, silt and clay, graduated cylinder method for particle density, core method for Bulk density, EC meter for the determination of electrical conductivity and wet oxidation of walkley and Black method for the determination of organic carbon Black (1965).

Soil samples were collected from same selected plots at the different depths 0-10cm, 10-20 cm, as well as at one constant depth of 0-15cm of the crop field in the year 2004. The soils of all the plants taken from one field was mixed thoroughly. All the samples collected were brought to the laboratory for processing. To isolate the nematode population(s) only 200 g was processed from each thoroughly mixed composite sample. The extraction of nematodes from soil was done by the method of washing soil. The nematodes along with minute soil particles were collected on fine sieves. Decantation and sieving were done as given by Dasgupta (1997)). Used a binocular microscope to count the nemas. Multiplied the count by the total volume (ml) of the original suspension in the vial to obtain the number of nematodes extracted from the sample.

RESULTS AND DISCUSSION

The effect of soil types collected from the four different studied areas was observed in respect of nematode population(s) in Kangra Valley. The physico-chemical studies of soil revealed the high values of WHC (82%), porosity (53%), pH (7.10) and organic carbon (3%) in the Jhikley Beth region favouring high nematode population (52.84%). On the other hand, the lowest population (7.76%) was recorded in the Bairghat area that may be due to high values of clay (37.5%) and pH (7.43) (Table 1).

The investigation showed high nematode population in Jhikley Beth, 483/200 g soil at vertical depth of 20-30 cm and (344/200 g soil) at vertical depth of 0-10 cm soil and low population in Tanda (79/200 g soil) at vertical depth of 20-30 cm and 58/200 g soil at vertical depth of 0-10 cm soil. The results may be due to high values of

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Table 1 : Analytical data of physicochemical analysis of soils in Kangra Valley, Himachal Pradesh

Sr. No.	Description	Mechanical analysis			Physical analysis				Chemical analysis		
		Sand (%)	Silt (%)	Clay (%)	P.Density (g/cc)	WHC (%)	B.Density (g/cc)	Porosity (%)	pH (1:2.5)	EC (Mili M./cms)	OC (%)
1.	Rani Sidhpur	30.5	32	37.5	2.50	68.0	1.15	54.20	7.30	0.304	1.96
2.	Tanda	51.0	20	29.0	2.35	53.5	1.16	50.64	5.30	0.261	0.64
3.	Jhikley Beth	34.5	28	37.5	2.10	82.0	1.00	53.00	7.10	0.435	3.00
4.	Bairghat	32.5	30	37.5	2.32	59.5	1.13	51.73	7.43	0.401	1.60

WHC, porosity, pH and organic carbon of Jhikley Beth soil (sandy-clay) as compared to Tanda region (sandy). However, Tard *et al*. (2005) reported maximum number of eggs and larvae persist in sandy-loam soil (234.6) followed by sandy clay loam (221.4) while the minimum were present in clay-loam soil (206.8) in Rajasthan. Mittal and Dhawan (1991) as well as Srivastava and Sethi (1984) had also found highest cyst production of *H. sorgh*i and *H. zeae* in sandy loam soil.

However, sand, silt and particle density factors are specific for each nematode species, whereas rainfall following a long dry spell increased egg hatch and activity as the highest population (515/200 g soil) has been recovered around the rhizosphere of maize crop in Rani Sidhpur in the rainy season. Similarly, Byerly *et al.* (1976) have shown a direct effect of temperature an egg laying, rate of development and survival. The movement is inhibited when the pore neck diameter is narrower than the nematode body diameter. Hence, porosity percentage is also specific for different nemas. The pH itself is a complex factor which decreases with soil carbon dioxide released from all organisms including nematodes. Root knot nematodes can survive, hatch and reproduce at pH 4.0-8.0, even 10.0 (Swarup and Dasgupta, 1986). The pH value (7.10) of Jhikley Beth soil may, however, be suitable for high population of nemas in the present studies. In the same way Ohba and Ishibashi (1982) investigated population problems related to pH and reported standard deviations in egg production from 20% to 100% within their populations. Fertility status may influence the population and activities of nematodes as the highest percentage of organic carbon. (3%) may be one of the factor for high population in the Jhikley Beth area. Similar studies have also been reported by Dasgupta (1997).

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