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STUDY OF PHYSIO-CHEMICAL PARAMETER OF SOIL AND NEMATODE DIVERSITY OF POMOGRANATE CROP FROM NORTH AHMEDNAGAR DISTRICT, INDIA

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AUTHORS' CONTRIBUTIONS

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

Presented work had done from 1st August 2020 to 30th February 2021. The study was conducted to investigation of status of soil nematode communities in pomegranate crops in Rahata & around villages. The fertility of soil depends on the concentration of N, P, K organic and inorganic material and water conductivity. The physiochemical parameter such as moisture content specific gravity, nitrogen as a fertilizer required for the growth of plant and potassium is used for growth of root in plants. Nematode occurs in both aquatic and terrestrial ecosystem, some adapting a parasitic habit invertebrates, invertebrates and plants.

Nematode diversity shows their interaction with plant, plants pathogens and other organism. They are involved in energy Lux, carbon minerlations and other nutrients cycle and as plant parasite. In the present investigation the recorded nematodes species are *Meloidogy incognita, M. javanica, M. arenaria, Pratylenchus projectus, P. scribneri*, *P. penetrans*, *P. hexincisus*, *Heterodera glycans*, Dityl4enchus dipsaci. From these most dominant species are *M. incognita*, *M. javanica* found in all pomogrante crops.

Keywords: *Meloidogyne hapla*; *Ditylenchus dipsaci*; nematode community; orchid crops; parameter.

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INTRODUCTION

A Soil sample collected from pomegranate crop of Nimgaon Jali Sangamner taluka (MS) India Derde, Kopargaon taluka (MS) India which represent soil of that region the soil sample were collected by standard procedure and collected in polythene bag and the all samples were collected in different session. These soil sample were analyzed in laboratory to measure various physical and chemical parameter by the standard method analysis soil is carried for the studies of various parameter like texture, colour moisture, pH temperature, electric conductivity, nitrogen, phosphorus, potassium organic carbon, calcium magnesium etc [1]. The fertility of soil depends on the concentration of N, P, K organic and inorganic material and water conductivity. The physiochemical parameter such as moisture content specific gravity, nitrogen as a fertilizer required for the growth of plant and potassium is used for growth of root in plants [2,3].

Nematode: - For thousands of years natural products have played plant parasitic nematodes are one of the measure pests comforting agriculturists throughout the world. For the evolutionary and biodiversity perspectives the nematodes are one of the most successful of the non-segmented invertebrate phyla. Soil nematode respond rapidly to environment disturbance since they are present at high diversity and abundance in soil and survive differentially according to habitat condition among the plant parasitic nematode root knot nematodes is found to be world-wide in distribution and affects many economically important crops (Sasser JN and Freckman DW 1979) [4,5]. Many species of parasitic nematods are associated with pomegranate in India (Chadha KL and Pareek OP 1993) and some of species are highly damaging to pomegranate production.

As a result, they form an important component of the carbon and other soil nutrient cycle [6]. In turn, they are parasitized by bacteria and fungi and preyed upon by mites Annelids, tardigrades and other nematodes all through all most species are vermiform and relatively mobile in the soil phase, many plant parasitic species are endoparasites or semi endoparasites in plants roots and in highly evolved forms, may become obese and lose their mobility in on stages expect for the infective juvenile and adult male, if present, The degree of damage done depends upon the pathogenic potential and population growth of nematode which are greatly infused by their initial population density (Chandra et.al.2010). The abundance and distribution of plant parasitic nematodes in turn are in luenced by the soil texture, crop cycle and anthropogenic factor [7,8].

Our objectives for these studies are as below

- This study determines the nutrients status of soil.
- It is useful to know which types of fertilizer apply to crop and their quantity.
- It gives the basic knowledge regarding about cultivation of specific crop in that soil.
- The present study indicates that the given soil is more suitable for crop like sugarcane, wheat,
- pomegranate, tomato and fruit plant.
- The most are phytonematod species recorded in the present study are highly pathogenic.
- There occurrence may pose a serious thread to affected crop plant species.

2. MATERIALS AND METHODS

A soil sample collected from orchid plant of Rahata and around village India from Aug 2020 to Dec 2020 which represents soil of that region. The soil samples were collected monthly by standard procedure in polythene bags. The entire samples were collected in different season.

2.1 Methodology for Soil Analysis

Collection of soil sample: The soil sample were collected in the depth of 5 cm to 30 cm from thesurface of soil from the different places of Ahmednagar from Aug 2020 to Dec 2020. The instrument used for soil collection is spade. The soil samples were collected in polythene bag about 1 kg. The samples were collected in zigzag manner in crop field.

This soil samples were preserved in polythene bag for further analysis.

2.2 Soil Analysis

The standard instrumental and non-instrumental methods were used for estimation of soil samples and there of parameters. It includes texture, colour, pH, temperature, E.c, N, P, K carbon, total hardness using by standard protocols [9,10]. The given soil parameter was estimated by following methods:

Table 1. Method used for estimation of soil parameter

SR. No	Parameter	Methods
1	pH	pH meter
2	Temperature	thermometer
3	Electric conductivity	Condoctometry
4	Nitrogen (N)	Volumetric method
5	Phosphate (p)	Spectrophotometry
6	Potassium(K)	Flame photometry
7	Carbon	Volumetric method
8	Calcium	Volumetric method
9	Total Hardness	Volumetric method
10	Magnesium	Volumetric method

STUDY AREA

2.3 Methodology for Nematode Extraction and Identification from Soil

For nematode extraction 2gm of soil sample was taken Baermann funnel technique. The soil is taken in to muslin cloth was wrapped around these soils and tide with help of thread and these soils with muslin cloth kept in to the funnel. The one end of funnel was packed with pinch-cock and funnel filled with water until up to the deep muslin cloth within the water and soil becomes weighed. This discovered unbroken to the safe place with non-disturbance for 24 hours. After that removed the pinch- cock and the nematode suspension was poured in to a collection bottle and allows setting. Once the supernatant was removed and also the remaining suspension that contains nematodes. Then this suspension was poured in to the Nematodes investigation and examined under light microscope for identification and photography. Nematodes are identified by using different identification keys (Quiser H. Baqure Padma Bohra 2005, Padma bohra 2011 and ZSI report of Maharashtra 2012).

3. RESULTS AND DISCUSSION

Soil Analysis For assessment of the soil richness status of the study area texture, color, pH, temperature, E. c, N, P, K, Carbon, Calcium, total hardness from the soils were determined and the values of physicochemical parameters are presented in Tables 2 & 3.

1. Soil Temperature

Soil temperature is one of the most important soil properties that effect crop growth. The major source of heat are sun and heat generated by the chemical and biological activity of the soil is negligible. The temperature of soil in study area is ranged between 24.10ºC to 290ºC. It is a normal range to increase crop productivity. Soil temperature fluctuates with season, time of day and local climatic conditions. The major source of soil heating is solar radiation and heat generated by the biochemical activities of the soil.

2. PH

The soil reaction or pH is meant to express the acidity or alkalinity of the soil. The lowest value of pH is 7 and highest value of pH in result is 8.67. The limit of pH value for soil Acidic < 6.5-7.8, Alkaline 7-8.67, Alkali > 8.67. It indicted the soil is neutral. pH is a most important physical property of soil and encouraging the plant nutrient accessibility. It has great effects on solute concentration and absorption in soil.

Electric conductivity (EC) is very quick, simple and inexpensive method to check the health of soil. It is measure of ions present in solution. The EC of soil solution increases with increased concentration of ions. EC varies with depth, slope of land surface, high permeability, high rainfall, responsible for leach out alkali and alkaline base. Total soluble salts are estimated from electrical conductivity (EC) of aqueous soil extracts. Standard value of EC in soil Normal < 0.8 dsm-1, critical for salt sensitive crops, critical for salt sensitive crops, critical for salt tolerant crops 1.6-2.5 dsm-1, Injurious to most crops > 2.5 dsm-1. In the study area during the study EC values between 0.8 dsm -1 to 1.24 dsm-1. It measures the soil properties such as soil texture, cation exchange capacity, drainer condition, organic matter level, and the salinity and subsoil characteristics.

3. Soil Nitrogen:

Nitrogen is a mobile nutrient in the soil. In the present study the value of nitrogen level in soil of Ahmednagar and around region is between 0.021% to 0.067%. The sewage water significantly increased the

nitrogen in the soil (Baddesh et al., 1997). Nitrogen as a fertilizer required forthe growth of plant.

4. Phosphate:

Phosphate was found in the range of low, medium, high. Inorganic phosphorus as orthophosphate plays a dynamic role in aquatic ecosystem. Phosphorsthe most important micro nutrient, is utilized by plant in the form of H_2PO_4 and HPO_4. The percentage of phosphate in soil of study area is the range from 0.021 to 0.067 %. Most soil P is tightly bound to soil particles or contained is relatively insoluble complexes in alkaline soils are very different than those in neutral or acidic soils**.**

5. Potassium:

The presence of potassium (K) in the soil is in the form of bounded potassium between the layers of soils. The range of potassium in the study area is between 0.70% to 1.22%. Potassium is not integral part of any major plant component but it plays a key role in the physiological process, plant growth, protein synthesis and maintenance ofplant water balance. It involves in many plants' metabolism reaction, ranging from lignin and cellulose used for formation of cellular structural component, to regulation of photosynthesis and production of plant sugars. The high content of available potassium on surface soil may be attributed to the application of potassium fertilizers and manures addition. Potassium fixation occurred when soil dry and the potassium is bounded between layers of clay.

6. Organic Carbon:

Organic carbon is the index for nitrogen content in the soil. In present investigation organic carbon values are ranges from 0.25% to 0.37%. The source of organic carbon in the cultivated soil included crop residue, animal manure, cover crops, green manure and organic fertilizer etc.

7. Calcium:

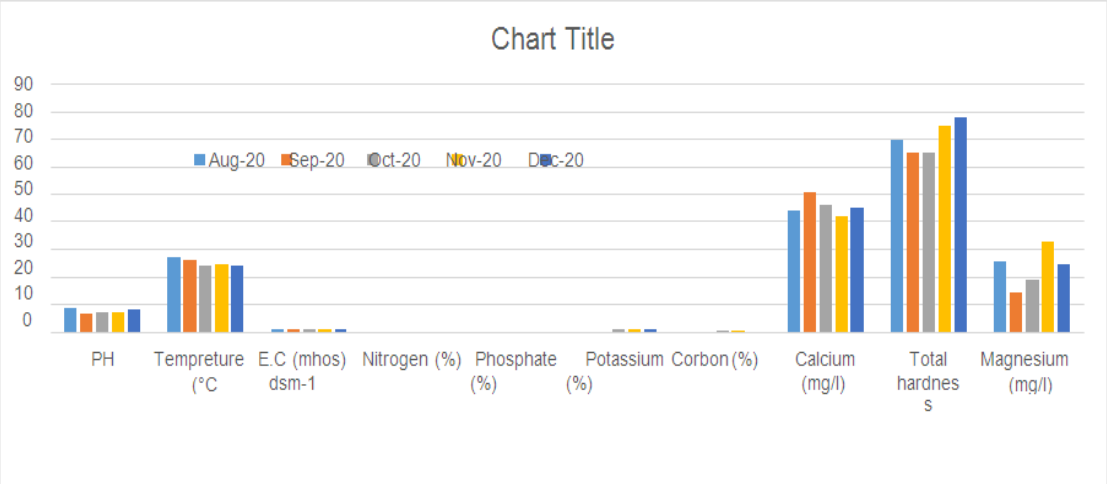
Calcium ranges from 40.08 ml/100gm. Soil Calcium (Ca) is present in adequate amount in most of the soil. Calcium is a component of several primary and secondary minerals in the soil. These minerals are the original source of available forms of calcium. Calcium is not considered as leachable nutrient. In agriculture Ca is essential for soil porosity, plant cell growth, neutralized the excess acid of alkaline, amphoteric, stringent cell wall structure.

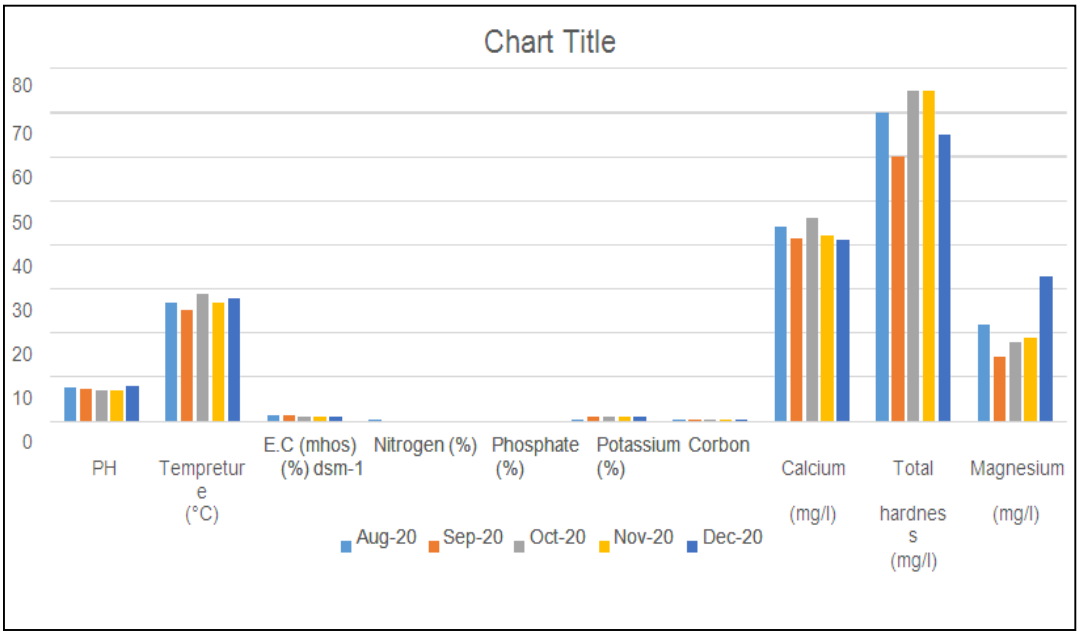
Table 2. Physico-chemical analysis of soil sample at nimgaon jali

Sl. No.	Parameter	Aug-20	Sep-20	Oct-20	Nov-20	Dec-20
1	PH	8.71	7	7.1	7.1	8.1
2	Temperature (°C)	27	26.2	24.2	24.7	24.1
3	E.C (mhos) dsm-1	1.01	1.09	1.017	1.021	1.05
4	Nitrogen (%)	0.034	0.029	0.031	0.04	0.039
5	Phosphate (%)	0.021	0.032	0.067	0.041	0.039
6	Potassium (%)	0.074	0.032	1.01	0.89	1.22
7	Corbon (%)	0.31	0.256	0.368	0.375	0.276
8	Calcium (mg/l)	44.08	50.5	46.09	42.08	45.08
9	Total hardness (mg/l)	70	65	65	75	78
10	Magnesium (mg/l)	25.92	14.5	18.91	32.92	24.92

Table 3. Physico-chemical analysis of soil sample at derde korale

Sl. No.	Parameter	Aug-20	Sep-20	Oct-20	Nov-20	Dec-20
1	PH	7.6	7.18	7.1	7.1	8.1
2	Temperature (°C)	27	25.2	29	27	28
3	E.C (mhos) dsm-1	1.22	1.22	1	0.9	1.12
4	Nitrogen (%)	0.3	0.029	0.031	0.04	0
5	Phosphate (%)	0.021	0.03	0.06	0.041	0.05
6	Potassium (%)	0.4	1.01	1.08	1.01	0.89
7	Corbon (%)	0.325	0.356	0.368	0.371	0.216
8	Calcium (mg/l)	44.08	41.5	46.09	42.08	41.08
9	Total hardness (mg/l)	70	60	75	75	65
10	Magnesium (mg/l)	21.92	14.5	17.91	18.9	32.9





8. Magnesium:

Magnesium available to plants as the ions Mg, Magnesium content in the soil samples ranges from 13.04 mg/ml to 32.92 mg/ml.

9. Total Hardness:

Total hardness depends on the calcium and magnesium hardness. The total hardness of soil sample ranged from 65 mg/ml to 80 mg/ml.

B) Nematode diversity of pomegranate crops in Ahmednagar region Nematode occurs in both aquatic and terrestrial ecosystem, some adapting a parasitic habit invertebrates, invertebrates and plants.

Nematode diversity shows their intern action with plant, plants pathogens and other organism. They are involved in energy Lux, carbon minerlations and other nutrients cycle and as plant parasite. In the present investigation the recorded nematodes species are *Meloidogy incognita*, *M. javanica*, *M. arenaria*, *Pratylenchus projectus, P. scribneri*, *P. penetrans*, *P. hexincisus*, Heterodera glycans, Dityl4enchus dipsaci. From these most dominant species are *M. incognita*, *M. javanica* found in all pomogrante crops.

Table 4. Nematode diversity of pomogrante crop

Soil Sample	Orchid crop	Common Name	Scientific name	Family
1	Pomogrante	Root knot nematode, Rainy form nematode, Lancene nematode	*Meloidogyne incognita, M., Rotylenchulus reniformis, Hoplolaimus indicus*	Meloidogynida, Hoplolaimidae
2	Pomogrante	Root knot nematode	*Heterodera glycines, Meloidogyne incognita*	Hoplolaimidae
3	Pomogrante	Root knot nematode	*Meloidogyne incognita*	Meloidogynidae
4	Pomogrante	Root knot nematode, Stubby Root Knot nematode, Stam and Blub nematode.	*Meloidogyne incognit,* M. Javanica, M. Hapla, *Paratrichodorus sp, Ditylenchus dipsaci*	Meloidogynidae
5	Pomogrante	Root knot nematode	*Meloidogyne incognita, M.,*	Meloidogynidae

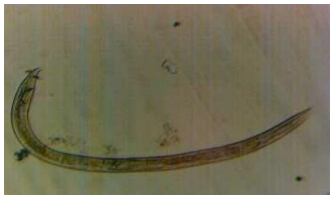
1. Rotylenchulus Reniformis

2. Meloidogyne Hapla

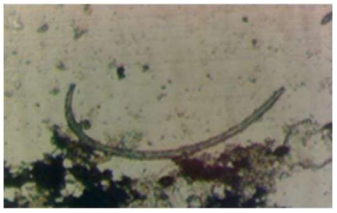
3. Ditylenchus Dipsaci

4. Paratrichodorus sp,

5. Meloidogyne Incognita

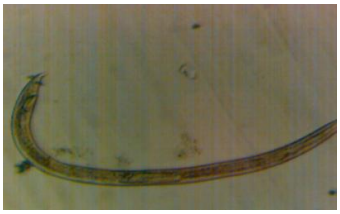


6. Heterodera Glycines



7. Meloidogyne Nassi

8. Ditylenchus Destructur



9. Heterodera glycines

The selected pomogrante crop when the diversity of Phyto nematodes was wide amount the pomogrante crops species, it was founds to be diverse with various nematodes species. The meloidoyne incognita is the common species of nematodes on the pomogrante crop. The species are found all over the world and also found in pomogrante crop of study area. It is also called root-knote nematodes.

There are two types of nematodes present in the soil. Same are parasitic same are beneficial to plant growth (23). Most of the quantity of nematodes present in soil is parasitic. The plant parasitic nematodes are slender, unsegmented usually shorter than 2mm in length with serpentine mode of locomotion. The Meloidogyne sp. Nematodes are wide spread through India. (24).

4. CONCLUSION

A physio chemical study of sample for the pomegranate crop from Ahmednagar region show that all the soil parameter such as EC, pH, percentage of N, P, K, C, Ca, Mg are normal range. The studies give

information about nature of soil, present nutrient in soil according to this information farmer arrange the amount of which fertilizer and nutrient needed to soil for increase the percentage yield of crop, the most of the Phyto nematode species recorded in the present study are highly pathogenic. There occurrence may pose serious threads to the affected crop plant species and need argent attention of farmland owners and researcher's special emphasis must be given to the hotspots of nematodes attack identified in the percent case. In the present investigation the recorded nematode species are M*eloidogyne incognita, M. javanica, M. arenaria, prtylenchus projectus, P. scribneri, P. penetrans, P. hexincisus, heterodera glycines, Ditylenchus dipsaci*. From the these most dominant species are *M. incognita*, *M. javanica* found in promogranate crops.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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