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PHYSICO-CHEMICAL ANALYSIS OF PADDY FIELD SOIL SAMPLES FROM WARORA TAHSIL, DISTRICT CHANDRAPUR, MAHARASHTRA, INDIA

Dr. S. D. Petkar
Dept. of Botany,
Anand Niketan College, Warora, Dist. Chandrapur, Maharsahtra, India
Email: takshusimi@gmail.com

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ABSTRACT: In the present investigation physico-chemical status of paddy field soil samples from Warora Tahsil, District Chandrapur, Maharashtra, India has been studied for the period of 2 years from February 2020 to February 2022. Warora Tahsil has an area of 1028.93 km2, the area under cultivation is around 54602 hectors. Warora Tahsil has rice cultivation area of 2884 hectors. Soil samples were collected from Temurda, Khairgaon, Shegaon BK, Chargaon BK, Arjuni, and Dadapur to study the physico-chemical status like colour, pH, electrical conductivity (EC), nitrogen, phosphorus and potassium from paddy soil of Warora Tahsil. This study finding of soil analysis revealed that colour of soil ranges from blackish brown to red, pH (7.4 to 7.77), electrical conductivity (0.2 to 0.5 mS/cm), Nitrogen (112-118 kg per hectare), Phosphorus (10.4 to 11.7 Kg per hectare) and Potassium (240 to 290 kg per hector). Result of this investigation will help farmers to solve the problems related to the soil nutrients and better management of fertilizers in paddy fields.

Key words: - Paddy, Physico-chemical, Electrical conductivity, Nitrogen, Potassium, Phosphorus

INTRODUCTION :

Soil is a composite, collection of very fine mineral particles. Soil contains air, water, dead organic matter and various type of living organism. The creation of soil is influenced by climate, organisms, topography, organic particles which provide number of soluble nutrients. It is the primary source of carbon and nitrogen required for plant nutrition. It improves soil structure which is necessary for plant growth (Pidwimy, 2006), soil is a natural body of mineral and organic material differentiated into horizons which differ among themselves as well as from underlying materials in their morphology, physical makeup, chemical composition and biological characteristics (Solanki and Chawda 2012).

The intensive search on soil microorganism during the 19th century has shown that the soil is a dynamic medium in which plants and microorganisms co-exist. They're mutually related in more than one way. They are symbiotically or mutually co- related with each other and benefit each other to maintain the cycle. Much of theearlier knowledge on soil science in relation to plant growth was due to lack of experimental evidence on generation study. Plant nutrient were thought of principles in rain water, in soil and in plant and animal remains until the German Chemist Liebig , (1840) attempted chemical analysis of plants and soils and arrived at the conclusion that chemical elements in plants came from soil and air. Gilbert, (1952) produced superphosphate by chemical treatment of crushed bones with sulphuric acid. The experiments conducted in the 20thcentury showed the distinction between major and minor nutrients.

Recent reports indicated that the crop production is suffering due to problems in the soils and insufficient management of fertilizers, insecticides and pesticides even though several

technologies have been developed in recent years for adoption by farmers (Sharma P.K. 2004)

In view of the above importance an attempt has been made to know the soil Physico chemical parameters and nutrients availability in paddy field area of Warora taluka, District Chandrapur, Maharashtra, India

MATERIALS AND METHODS:

Soil Samples Collection:

Soil Samples were collected from various sites of Warora taluka. The selected sites were:

Procedure :

In a composite sample, small portion of soil was collected from depth of 15to 20cm by means of stainless-steel augers from 15to 20 well distributed spots, moving in zig-zag manner from each individual sampling site after scrapping off the surface litter, if any, without removing soil.

Soil collected from entire area of same site was mixed thoroughly by hands on a clean piece of cloth. About 500g of soil was sided by quartering process in which entire soil was spread, divided into four quartering two opposite one is discarded and remaining two were remixed. This is repeated; up to about 500g soil was left. Discarded soil was used for other experiments. Both part of soil samples was stored in polythene bags and properly labeled with necessary information of field.

Preparation of soil samples:

Before analyzing it is necessary to prepare the samples in proper way.

Procedure:

Soil samples were air dried in shade. Soil clouds were lightly ground with the help of wooden pestle and mortar. Entire quantity of soil was sieved through 2mm stainless steel sieve and then remixed.

RESULTS AND DISSCUSSION:

Physico-Chemical parameters of soil samples:

Colour: Colour of soil samples A, B, C, E and F were blackish brown and D reddish in colour.

pH:Soil samples A, B, C, D, E, F have the pH 7.5, 7.6, 7.4, 7.6, 7.5 and 7.7 respectively.

Electrical conductivity: soil samples A, B, C, D, E, F have the E.C 0.2, 0.4, 0.4, 0.3, 0.3 and 0.5 respectively.

Nitrogen: Soil samples A, B, C, D, E, F have the kg/h nitrogen 116, 112, 114, 112, 118 and 113 respectively.

Phosphorous: Soil samples A, B, C, D, E, F have the kg/h phosphorous 10.5, 10.4, 11.2, 11.7, 10.9 and 11.5respectively.

Potassium: Soil samples A, B, C, D, E, F have the kg/h potassium 240, 265, 282, 290, 275 and 287 respectively.

The results are summarized in table 1.2

Soil is asubstrate which is a complex entity with balanced chemical, biological and physical interactions. The balance is extremely necessary to obtain an expected crop produce.

Soil analysis is a valuable tool for determining the inputs required for economical and efficient production of crops. Soil testing prior to the other major decisions of cultivation will help the farmers to ensure proper fertilization enough to meet the needs of crop while taking advantage of the nutrient content of the soil.

A proper detailed soil analysis will help in appropriate recommendation of fertilization and to assess the macro and micro nutrients needs of the cropping systems in that place. It benefits the farmers in the forms of improved and increased yields, reduced operating costs, superior environmental risk management. Additionally, it improved crop maturity, increased growth, higher quality and tolerance to pest and diseases.

Soil color: -

Soil color in the Warora Tehshil varies from blackish brown to reddish.

pH: -

The pH range of soil is between 7.4 and 7.7.Variation in the pH of the soil may be due to phosphorous level of soil. The pH greatly affects

solubility of minerals and other parameters also. The highest pH was recorded in soil E and lowest pH in soil C. It is similar with results of. Madhavi et al. (2018) reported pH range in 7.4 to 7.8 in soil under rice cropping system of Yelamanchili, Vishakhapatnam district, Andhra Pradesh. Chandak et al. (2017) reported soil of Kadi city Gujarat having pH between the range 7.4 to 7.9. It is also similar with the result of Arshi Iram and Khan (2018) reported the soil of Sawai Madhopur Tehsil, Rajasthan was 7.04 to 8.3. Shirgawe et al. (2015) recorded the pH value of Arjun Nagar, district Kolhapur soil was 7.1 to 8.7.

Electrical Conductivity:

Estimation of EC gives us an idea about the soil concentration of soluble salts at a specific temperature. The variability in EC is a result of higher ionic content in the solution and is proportional to soluble salt concentration. The highest value of EC was recorded in soil F and lowest was in soil A. It is similar with Shinde et al. (1996) reported soil from Padgaon had EC of 0.5 dsm. It is also similar with the results of Dalal [2004]. Similar results were obtained by Chandak et al (2017) reported that soil of Kadi City, Gujarat had electrical conductivity of 0.3 to 0.6dsm. It is also similar with the results of . Uma Devi and. Muthuchelian (2019) who reported paddy soils of Theni District, Tamil Nadu to have E.C. of 1.11 to 1.31.

Nitrogen:

Nitrogen is a crucial component for plant sustainability and proper growth. Nitrogen is an essential part of all living cells and is also necessary part of all proteins, enzymes and metabolic processes involved in the synthesis and it plays a major role in transfer of solar energy into chemical energy. Nitrogen is a part of chlorophyll; the green pigment of the plant that is responsible for photosynthesis. It helps the plants for rapid growth, increasing seed and fruit production and improving the quality of leaf and forage crops. In the present investigation nitrogen value is in the range of 109to 121 Kg/h. It was maximum in soil E and minimum in soil B and soil D. these results are similar with Arshi Iram et al. (2018) who studied soil of Sawai Madhopur Tehsil, Rajasthan their observed Nitrogen value was 13.8 to 218.60 kg/h. These results are also similar to Uma Devi and. Muthuchelian (2019) who recorded nitrogen values with 223kg/h in paddy soils of Theni District, Tamil Nadu. These results correspond to the findings of Thakare et al. (2012) who reported nitrogen value 140 to 222 kg/h from black soil of Wardha region.

Phosphorous:

Phosphorous is another major element essential for the process of photosynthesis. Also, it is involved in the formation of all oils, sugar, starches, etc. It helps in the transformation of sunlight into energy; proper plant maturation; increased vigour, promotes the disease resistance, encourages flowering and growth of root systems. Phosphorous is one of the major soil elements. The available forms of Phosphorous are as phosphate ions (H_2PO_4 and HPO_4). In the present investigation, values of phosphorous range from 10.4 to 11.7 kg/h. The maximum value is found in soil D and minimum in soil B. Our observations are similar with results of Chandak et al (2017) who found the phosphorus levels to be 7.77 to 23.31 kg/h in soil of Kadi City, Gujarat, similar kind of results were noted by Ganorkar et al. (2017) who recorded the value of phosphorus was 10.23 to 170.11 kg/h from the soil of region of Hiwarkhed, Amravati district, Maharashtra

Potassium:

Potassium is another major nutrient required for proper plant development. It helps plants in building of protein, photosynthesis, fruit quality and reduction of diseases. Potassium is largely absorbed by plants than other elements except nitrogen and in some cases calcium. Potassium

helps plants in building of protein, photosynthesis, fruit quality and reduction of diseases. Potassium in the soil is calculated as the amount of non-exchangeable or fixed form in soil. In present investigation values of potassium in soil ranges from 240 to 290 kg/h. It was maximum in soil D and minimum in soil A. High values suggest healthy development of plants. Our results are similar with the studies of Sebastian (2017) with potassium values 159 to 578 kg/ha from the paddy field soil of Kuttanadu wetland agro-ecosystem similar results were observed by Chandak et al. (2017) who recorded values of potassium to be 188.48 to 243.04 kg/ha. Our present results also correspond to the findings of Shirgawe et al. (2015) with values of potassium between 123.66 to 460.92 kg/ha soils of Arjun nagar, District Kolhapur, Maharashtra. Thakre et al. (2012) recorded 287-389 kg/ha potassium from the black soils of Wardha region of Maharashtra.

CONCLUSION:

A proper and detailed soil analysis will help in appropriate recommendation of fertilization and to assess the macro and micro nutrient needs of the cropping systems in that place. It benefits the farmers in the forms of improved and increased yields, reduced operating costs, superior environmental risk management, additionally, improved crop maturity, increased growth, higher quality and tolerance to pest and diseases. Soil testing prior to the other major decisions of cultivation will help the farmers to ensure proper fertilization enough to meet the needs of crop while taking advantage of the nutrient content of the soil.

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Table 1.1: Soil collection from study areas

Temurda area	Soil Sample A
Khairgaon area	Soil Sample B
Shegaon BK area	Soil Sample C
Chargaon BK area	Soil Sample D
Arjuni area	Soil Sample E
Dadapur area	Soil Sample F

Table 1.2 Physico Chemical parameters of Soil samples

Parameters	**Soil A**	**Soil B**	**Soil C**	**Soil D**	**Soil E**	**Soil F**
Color	**Blackish brown**	**Blackish brown**	**Blackish brown**	**Reddish**	**Blackish brown**	**Blackish brown**
pH	7.5	7.6	7.4	7.6	7.5	7.7
EC	0.2	0.4	0.4	0.3	0.3	0.5
Nitrogen (Kg/h)	116	112	114	112	118	113
Phosphorus (Kg/h)	10.5	10.4	11.2	11.7	10.9	11.5
Potassium (kg/h)	240	265	282	290	275	280