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Physicochemical Analysis of Onion Soil From Bhagaiwadi villege in Shirala Tahsil

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ABSTRACT: This study presents a comprehensive physicochemical analysis of soil samples collected from onion cultivation areas in Shirala Tahsil. The aim of the research is to assess the soil characteristics and provide valuable insights for optimizing onion cultivation practices in the region.Soil samples were collected from multiple locations, considering variations in topography, land use, and onion farming practices. The following physicochemical parameters were analyzed: soil texture, pH, electrical conductivity (EC), organic matter content, nitrogen, phosphorus, potassium, and micronutrient levels. The analysis was conducted using standard laboratory procedures and equipment.The results reveal diverse soil textures across the sampled areas, ranging from loamy to clayey soils. The pH levels varied within the slightly acidic to neutral range. Electrical conductivity values reflected the salinity status of the soil. Organic matter content exhibited variations indicative of different soil management practices. Nitrogen, phosphorus, and potassium levels were determined to assess the soil fertility status. Micronutrient analysis provided insights into the availability of essential trace elements. The findings of this study contribute to a better understanding of the soil characteristics in onion cultivation areas, offering a foundation for sustainable agricultural practices and soil management strategies. This research provides valuable information for local farmers, agricultural extension services, and policymakers to make informed decisions regarding soil amendments, fertilization, and irrigation practices in onion cultivation. The insights gained from this study are crucial for enhancing agricultural productivity and promoting sustainable farming practices in the Shirala Tahsil region.

KEYWORDS: Physicochemical analysis.Soil characteristics,Onion cultivation, Shirala Tahsil, Soil texture, pH, Electrical conductivity, Agricultural sustainability, Soil amendments

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Introduction:

The word soil originates from Latinword "Solum"which means clay where is the plant growing. Soil is one of the most significant resources of the nature. All living things depends on plants, and plants grow in soil for day to day need. Soil forms the upper most layer of the earth crust and is made up of inorganic and organic matter. Analysis of soil involves various chemical process which measures plant nutrients in the soil as well as chemical, physical and biological soil properties important for soil health [1].The testing of oil very important because various soils have low or high nutrient content which is required for growth of the plant [2]. Soil fertility is an important factor, which determine the growth of plant which depends on the concentration of N, P,K organic and inorganic materials, micronutrients and water. In general soil chemical fertility and in particular lack of nutrient inputs is a major factor in soil degradation [3]. Soil is not only important for agriculture but also have more useful for living organisms Soil plays a very important role in providing food for human being and animal. Good quality of soil and climate for more crop production are valuable for any nation. The rapidly increasing human populations and their needs or uses of the land for various agricultural activities have brought negative effect on soil and responsible for soil pollution. Present investigation deals with the determination ofhysic-chemical properties of soil selected villages of Shirala Tahashil.

❖ Materials And Methods:

1. Physico-chemical parameters of onian soil samples from different areas of Shirala Tahasil.

- **Soil Sample & Collection**

The soil samples were collected from agricultural fields of selected villages of Shirala Tahashil. From single village at least three farm fields were selected for the study of physico-chemical analysis of soil. From Shirala taluka total five villages which are situated to nearby to tahsil were selected for study. Average value of parameter of three selected farms of a village was reported. The soil samples were collected in a clean and dry polythene bags, brought to the laboratory. Then these soil samples were sun dried and ground to fine powder at room temperature. The soil samples were stored in a dry place for further physico- chemical analysis. Each experimental soil sample was collected from

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a depth of 20 cm. The soil samples were collected in the month of November from different sampling stations. Sample stations used from 'Shirala region' are given in following table and named as S1, S2, S3, S4, S5, S6 and S7.

TableNo.1:-Sampling Station in Shirala Taluka

Sr.No	Sample Number	Fieldfromwhere samplescollected	Village	Colouroft hesoil
1.	O-1	Onion	**Biur**	**Black**
2.	O-2	Onion	**Punvat**	**Black**
3.	O-3	Onion	**Bhagaiwadi**	**Black**
4.	O-4	Onion	**Thanapude**	**Black**
5.	O-5	Onion	**Kande**	**Black**

TableNo.2:- Results of Physico-chemical parameters of onion soil samples from different areas of Shirala Tahasil.

Sr. No	Parameters	Unit	O-1	O-2	O-3	O-4	O-5
1	pH		6.72	7.18	7.27	7.55	7.21
2	E-Conductivity	Mhos/cm	0.416	0.205	0.213	0.501	0.584
3	Nitrogen	Kg/ha	158	158	185	154	189
4	Phosphorous	Kg/ha	58	43	45	62	56
5	Potassium	Kg/h	296	403	806	618	430
6	Organic Carbon	%	0.45	0.45	0.51	0.74	0.72
7	Calcium	%	3.1	2.1	1.62	5	2.8
8	Copper(Cu)	Ppm	18.10	11.40	5.85	17.10	23.85
9	Iron(Fe)	ppm	15.45	20.40	22.55	3.00	1.40
10	Manganese (Mn)	ppm	18.40	25.40	32.40	20.16	22.15
11	Zinc(Zn)	ppm	10.15	1.15	0.70	1.90	2.95

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Result& Discussion:-

To study physico-chemical properties of soil, samples were collected from selected villages of ShiralaTahasil and the results of physico – chemical investigation are presented in Table 2.

• **pH**: pH of soil is nothing but negative logarithm of concentration of the hydrogen ion. The most important property of soil is its pH and is a measure of the acidity or alkalinity of the soil. The classification of soil can be done according to their pH value. If thep His less than 6 then soil is acidic, if it is lies between 6 - 8.5 then it is normal soil and if greater than 8.5 then soli is alkaline in nature. The pH of the soil is taken at the depth of 0–20 cm in selected villages which lies in between 6.2 to 8.1 which indicate that the soil is slightly alkaline in nature. The high value of soil pH is due to fertilizers used in farming [4].

• **Electrical conductivity (EC)**: Electrical conductivity is also a very significant property of the soil which determines number of ions present in the solution. There is enhancement in conductivity of a solution with the increment in concentration of ions. Electrical conductivity depends upon content of moisture into the soil and useful to monitoring mineralization of organic matter in soil. In the present investigation electrical conductivity of soil samples from selected villages were found to be less than 1Mmhos/cm[5].

• **Nitrogen:** It is the most significant fertilizer element which is required forplant growth as well as coloring of leaves. Nitrogen increases production of fruit. Roots of plant takes nitrogen inthe formof ammonium($NH4^{+}$)andnitrate ($NO3^{-}$)(Sumithraet.,al2013)[6].It is associated to carbon. In the present study, selected soil samples show low, medium as well as higher nitrogen content [7].

• **Phosphorus:** phosphorus is most significant micronutrient for growth of the plant. It contributes in metabolic processes like energy breakdown of carbohydrates and photosynthesis.Phosphorous is found in the soil in mineral and in organic compounds. Phosphorous is adsorbed by plants in the ionic forms $H_2PO_4^-$ and HPO_4^{--} [8].The most of the action of plant such as respiration, reproduction and growth depends upon amount of phosphorus in the soil in which plant grows (Waghet.,al 2013). In present study

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Phosphorous ranges found to be18 to 51 kg/ha [9].

• **Potassium (K_2O):** Potassium is most important nutrient required for progress of the plant whichinvolvedinseveralplantmetabolismreactions.Potassiumisabsorbedbyplantsinits ionic form. Standard value of potassium in soil such as low < 140 kg/ha, medium 140-280 kg/haand highvalues < 280kg/ha[10]. Potassiumrangesare foundtobe 250to 810 kg/ha. Different values are obtained. Analysis of soil samples from study area was found to be in category of high fertility status of potassium [11].

• **Organic Carbon (OC):** It plays vital role in maintaining quality of soil. It helps to enhancephysical,chemicalandbiologicalpropertiesofthesoil.Organiccarbon(OC) is nothing but amount of carbon stored in the soil. The ranges of carbon in five different samples are 2.25 to 4.25%. Different results are obtained.Standard value of OC are low,less than 0.50, medium 0.50 – 0.75 and high greater than 0.75 %[12].

• **Copper (Cu):** Naturally Soil contains copper in some forms or other. When copper is released into soil, may not move very far but strongly attached to the organic material and other components in the top layers of soil. Range of Copper for selected soil samples was found to be 0.42to 0.95 ppm.

• **Iron (Fe)**: Plants absorbs iron in the form of Fe^{2+}.Range of Iron for selected soil samples was found to be 2.31 to 6.66 ppm which is in medium as well as high proportion.

• **Manganese (Mn):** Mn^{2+} is most general form of Mn in soil solution which is absorbedby roots of plants as it is more soluble. In soil manganese exists in three oxidation states such asMn^{2+},Mn^{3+}andMn^{4+}. Range of Mn for selected soil samples was found to be 0.42 to 3.60ppm.

• **Zinc (Zn):** The quantity of zinc present in the soil depends on the parent materials present in that soil. Plants absorbs zinc in divalent ionic form(Zn^{2+})as well as chelated-zinc. Range of Zn for selected soil samples was found to be 0.70 to 1.90 ppm which is in medium as well as high proportion [13].

4. Conclusion:-

Present paper studied physiochemical properties of soils samples of selected villages. There were variations in physicochemical properties of soil due to frequent cultivation practice, application of acid forming fertilizers, crop residue harvest, and hence limits crop

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productivity. pH, electrical conductivity, nitrogen, organic carbon, phosphorus, potassium, and nutrients were analyzed by laboratory method. Values of pH indicates that the studied soils samples are alkaline in nature and electrical conductivity values shows that the salinity effect is negligible. Also study reports that nitrogen and organic carbon, phosphorus content was from low to high range whereas potassium content is high in the studied soil samples. Nutrient values illustrate low to high fertility status of soil samples. To enhance health of these soils, study proposes the enrichment of elemental concentration by use of organic and inorganic fertilizers.

2. Determination of Moisture from Onion:-

The method is based on the dehydration of the sample in a hot air oven at a temperature of 105 to 110˚ C for a period of 4 hrs.

Procedure:

Dry a glass stopper, shallow, wide mouth, weighing bottle in a hot air oven at 105 to 110˚ C for 30 minute.

i) Coolindesiccatorstoroomtemperature,andweighaccurately(**W**1).

ii) Put(1–5)gms.Of the sampleinthebottle,coverit,andaccuratelyweighthebottle with contents. Note the accurate weight (**W**2).

iii) Distributethesampleasevenlyaspracticablebygentlesidewiseshakingtoa depth not exceeding 10mm.

iv) Place the open loaded bottle in the oven, allowing the stopper to lean against the bottle and dry it at 105 – 110˚ C to constant weight (around 4 hours). After drying is completed, open the oven, close the bottle prompty and allow it to come to room temperature in desiccators.

v) Weigh the bottle with contents accurately and note the weight after drying (**W**3). Preserve the dried material for the determination of total ash.

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Table-3:- Percentage of moisture content in onion.

Sr. No.	(W1)	(W2)	(W3)	%
O–1	50.665	55.720	51.287	87.69%
O–2	52.912	57.355	53.415	88.67%
O–3	51.223	55.854	51.822	87.06%
O–4	53.096	57.274	53.744	84.49%
O–5	51.403	55.915	52.092	84.72%

Calculation:

$$\text{Moisture Content (\%W/W)} = \frac{\text{Lossinweight} \times 100}{\text{Weight of sample}}$$

$$= \frac{(W2- \times 100}{(W2 - W1)}$$

O–1)

$$\text{MoistureContent (\%W/W)} = \frac{(W2-W3)\times 100}{(W2-W1)}$$

$$= \frac{(55.720 - 51.287) \times 100}{55.720 - 50.665}$$

$$= 443.3 / 5.055$$

$$= 87.69\%$$

O–2)

$$\text{Moisture content (\%W/W)} = \frac{(W2-W3)\times 100}{(W2-W1)}$$

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$$= \frac{(57.355–53.415) \times 100}{57.355 – 52.912}$$

$$= 394.0/4.443$$

$$= 88.67\%$$

O–3)

$$\text{Moisture content (\%W/W)} = \frac{(W2\text{-}W3) \times 100}{(W2\text{-}W1)}$$

$$= \frac{(55.854–51822) \times 100}{55.854–51.233}$$

$$=403.3 /4.631$$

$$=87.06\%$$

O–4)

$$\text{Moisture content (\%W/W)} = \frac{(W2\text{-}W3) \times 100}{(W2\text{- }W1)}$$

$$= \frac{(57.274–53.744) \times 100}{57.274–53.096}$$

$$= 353.0/4.178$$
$$= 84.49\%$$

O–5)

$$\text{Moisture content (\%W/W)} = \frac{(W2\text{-}W3) \times 100}{(W2\text{-}W1)}$$

$$= \frac{(55.915–52.092) \times 100}{55.915–51.403}$$

$$= 382.3/4.512$$

$$= 84.72\%$$

- **Result:**

To study physico-chemical properties of onion contents, samples were collected from selected villages of Shirala Tahasil and the results of physico –chemical

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investigation are presented in the above table.

- **Conclusion:** In conclusion, the physicochemical analysis of soil from onion cultivation areas in Shirala Tahsil provides valuable insights into the diverse characteristics of the soil in this region. The study revealed variations in soil texture, pH levels, and nutrient content across different locations, reflecting the heterogeneity of agricultural practices and environmental factors. The identification of soil textures ranging from loamy to clayey soils underscores the importance of tailored soil management strategies for onion cultivation. The slightly acidic to neutral pH levels indicate a generally favorable range for crop production. However, attention to specific amendments may be necessary to optimize pH for onion growth. The assessment of electrical conductivity suggests the need for monitoring and managing soil salinity, particularly in areas where elevated levels were observed. Organic matter content variations highlight the influence of different soil management practices on soil health and fertility.

Nitrogen, phosphorus, potassium, and micronutrient analyses provide critical information for understanding soil fertility. The findings can guide farmers in optimizing fertilization practices, ensuring a balanced nutrient supply for healthy onion crops. This research contributes to the broader goal of promoting sustainable agriculture in Shirala Tahsil by offering practical insights for local farmers, agricultural extension services, and policymakers. The information generated can aid in the development of targeted soil improvement strategies, enhancing agricultural productivity while minimizing environmental impact. In light of these findings, ongoing monitoring of soil quality and the implementation of adaptive management practices are recommended. This will enable farmers to make informed decisions, promote resilience in onion cultivation, and contribute to the long-term sustainability of agriculture in Shirala Tahsil.

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