IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.67
Volume 5, Issue 1, March 2025

Determination of Available Nitrate, Phosphate and Sulphate in Soil Samples around Gummidi Poondi Area Near Chennai

V. Nandhini[1] and M. A. Rajalakshmi[2]
Research Scholar, Department of Chemistry[1]
Assistant Professor, Department of Chemistry[2]
Kamban College of Arts and Science for Women, Tiruvannamalai, Tamil Nadu

Abstract: *Soil is the importance function and resource that support life on earth. It plays vital role in construction and agriculture farming. This study is about physical and chemical parameters of soil sample EHS360/TR/2024-25/N13669 near Gummidipoondi area. The study reveals that the soil sample tested contains N, P, S, Organic Matter, Water Content, and is traces of heavy metals. It is suitable to growth agricultural crops like cotton, betelvine, guava, barley, and some types of vegetable and flowers such as hibiscus, chrysanthemum, verbena.*

Keywords: trace elements, agricultural crops, construction

I. INTRODUCTION

Soil is a natural body comprised of solids (minerals and organic matter), liquid, and gases that occurs on the land surface, occupies space, and is characterized by one or both of the following:

Horizons, or layers, that are distinguishable from the initial material as a result of additions, losses, transfers, and transformations of energy and matter or the ability to support rooted plants in a natural environment. Soil has many properties, including physical, chemical, and biological properties. These properties affect how soil functions and how it's used.

The properties of soil are determined by the composition of the soil, depending on different amounts of biotic and abiotic components. The combinations of these components determine the physical and chemical properties of soil. Optimal physical and chemical soil properties will lead to optimal soil biological properties and ideal soil health and productivity. Soil health indicators are used to assess physical, chemical and biological properties that lead to optimal soil functions such as efficient filtration, soil structure, nutrient and water cycling.

Soil, in general, is classified into four different types depending on its composition and the size of particles. The four types of soil are

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.67
Volume 5, Issue 1, March 2025

Soil is an important element essential for the survival of living organisms. The importance of soil is mentioned below:
The topsoil supports certain life activities The fertile soil helps in the growth and development of the plants. The plants thus produced are healthy and provide food, clothing, furniture, and medicines.
It supports many life forms including bacteria, fungi, algae, etc. These microbes, in turn, maintain environmental balance by retaining the moisture and decaying the dead organisms.
such as reproduction, hatching, nesting, breeding, etc. of a few organisms.
The organic matter present in the soil increases the fertility of the soil which is responsible for the growth of the plants. It also contains certain minerals and elements that are necessary for the plants to carry out their cellular activities.

II. EXPERIMENTAL SECTION

pH

Take 15g of soil sample. Add 37.5ml distilled water. Stir well using glass rod. Cover it with aluminium foil and keep it in mechanical shaker for about 30 mins. After shaker filter and collect the liquid. Liquid is used to analysis the pH.

ELECTRICAL CONDUCTIVITY

Add 10g of soil sample in 100ml beaker. Add 20ml of distilled water. Cover it with aluminium foil. Keep in mechanical shaker for about 30 mins. After 30 mins collect the liquid to analysis the EC value.

AVAILABLE PHOSPHOROUS

Weigh 5.0 g soil sample in 250 ml Erlenmeyer flask. Add 100 ml of $NaHCO_3$ extracting solution to it. Shake on a mechanical shaker for 30 minutes.Filter the suspension through Whatman No. 40 filter paper into clean and dry 125 ml Erlenmeyer flask. Shake the suspension by hand immediately before pouring it into the funnel and discard the first 5 to 10 ml of filtrate if turbid. Transfer 10.0 ml of filtrate to a 50 ml volumetric flask; acidify to pH 5 by adding 1.0 ml of 2.5 M H_2SO_4. Swirl carefully in the beginning, then vigorously to remove residual carbonates. Make volume to 40 ml with distilled water; add 8 ml of the ammonium molybdate – ascorbic acid solution. Bring the volume to 50 ml, mix well, and let stand for 10 minutes. Read absorbance at 882 nm on the spectrophotometer. The colour is stable for 24 hours and maximum intensity is obtained in 10 minutes.

Water Holding Capacity

Take 25g of soil sample. Transfer it to the funnel using filter paper no 40/41 and pour the soil sample into it. Add 50ml water to the funnel. Collect the water by using measuring cylinder (50 or 100ml)

SOIL NITROGEN

Weigh 10 g of soil (which has been passed through a 20-mesh sieve) and transfer into an 800 ml Kjeldahl flask. Add 50 ml of sulphuric-salicylic acid mixture to the flask and swirl to bring the sample quickly into intimate contact. Allow it

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.67
Volume 5, Issue 1, March 2025

to stand overnight. Add 5 g of sodium thiosulphate and heat gently for about 5 minutes, taking care to avoid frothing. Cool the flask, add 10 g of the sulphate mixture and digest on the Kjeldahl apparatus gradually raising the temperature until the digest becomes clear. Digest further at full heat. Cool, add 300 ml of distilled water and mix. Slowly add 100 ml of concentrated sodium hydroxide by letting it run down the neck and settle in the bottom of the flask. Add a large piece of mossy zinc and a spoon of glass beads, connect the flask to the distillation unit, shake by swirling, turn on heat, and distil 150 ml into an Erlenmeyer flask containing 50 ml of 4 percent boric acid solution. Add 10 drops of bromocresol green-methyl red indicator and titrate with the 0.05 M standard sulphuric acid solution to the first faint pink. Titrate a blank prepared in the same manner but without adding a soil sample.

SOIL MOISTURE

Weigh accurately a metal can with lid (W1). Place about 50 g of soil in the can and weigh accurately along with the lid (W2). Place the can with the lid under it in a drying oven at 105°C for 24 – 48 hours, or until constant weight is reached. Remove the can from the oven, cover it tightly with the lid, and place in a desiccator to cool. After cooling, weigh the can accurately with the oven-dry soil in it. Record the weight (W3). Compute percent moisture content on oven-dry basis.

III. RESULT AND DISCUSSION

Report No	EHS360/TR/2024-25/N13669	**Report date**	20- 12- 2024
Discipline	chemical	**Group**	**Pollution and Environment**
Sample name	Soil	**Sample code**	**EHS360/N13669**
Sample description	soil	**Sampling date**	09-12-2024
Qty. of sample Received	2KG	**Sample receiving date**	09-12-2024
Sample condition	Fit for analysis	**Test commenced on**	10-12-2024
Sampling location	Near Labour Camp	**Test completed on**	19-12-2024

S.NO.	PARAMETERS	UNIT	TEST METHOD	RESULT
1.	pH value	-	IS 2720 (Part 26): 1987	8.21
2.	Specific Electrical Conductivity	µs/cm	IS 14767: 2000	923
3.	Sulphate	mg/100g	Food and Agriculture Organisation of the United Nation Rome	18
4.	Soil Moisture	% %	IS 2720(Part 2)	2.4
5.	Bulk Density	g/cc	Food and Agriculture Organisation of the United Nation Rome	2.1
6.	Soil Nitrogen	%	Food and Agriculture Organisation of the United Nation Rome	0.16
7.	Ammoniacal Nitrogen	mg/kg	IS 14684: 1999	83
8.	Organic Carbon	%	IS 2720(Part 22): 1972	1.4
9.	Organic Matter	%	IS 2720(Part 22): 1972	1.6
10.	Available phosphorous	µg/g	Food and Agriculture Organisation of the United Nation Rome	62
11.	Magnesium	meq/l	Food and Agriculture Organisation of the United Nation Rome	4.3
12.	Calcium	meq/l	Food and Agriculture Organisation of the	1.6

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.67
Volume 5, Issue 1, March 2025

			United Nation Rome	
13.	Chloride	meq/l	Food and Agriculture Organisation of the United Nation Rome	2.5
14.	Carbonate	meq/l	Food and Agriculture Organisation of the United Nation Rome	Nil
15.	Bicarbonate	meq/l	Food and Agriculture Organisation of the United Nation Rome	Nil

IV. CONCLUSION

Soil is a vital natural resource supports life on earth. It provides nutrients, water and structure for the plants and animals. Soil is also a raw material for Industrial activities, Agriculture and Construction. In the soil samples EHS360/TR/2024-25/N13669 presence of various chemical parameters such as Nitrate, Phosphate, Sulphate content for determined in nearby area of industrial sites which shows elevated levels of certain elements due to industrial activity. The overall soil quality remains largely unaffected. So, the soil is suitable for building construction and agriculture.

REFERENCES

[1]. Deb, B.G. and Chadha, S.P. 1970. Mechanical analysis of calcareous soils and distribution of CaCO3 in various fractions. Journal of Indian Society of Soil Science, 18:227-232.

[2]. Jump, R.K. and Sabey, B.R. 1989. Soil test extractants for predicting selenium in plants. Pages 95-105 in L.W. Jacobs, Ed: Selenium in agriculture and the environment. Am. Soc. Agr. Inc; SSSA Spec. Publ. 23 Chapter 5

[3]. Norvell, W.A. 1973. Equilibria of metal chelates in soil solution. pp.115-138. In: Micronutrient in Agriculture, J.J. Mortvedt, P.M. Giordano, and W.L. Lindsay (eds). Soil Sci. Soc. Am. Inc., Madison, WI, USA.

[4]. Pierzynski, G.M., Sims, J.T. and Vance, G.F. 2000. Soils and Environmental Quality. CRC Press Washington DC, USA.

[5]. Soltanpour, P.N., Fox, R.L. and Jones, R.C. 1988. A quick method to extract organic phosphorus from soils. Soil Sci. Soc. Am. J., 51:255-256.

[6]. Sparks, D.L. (ed). 1996. Methods of Soil Analysis, Part three, Chemical Methods. ASA, Madison, Wisconsin, USA.

[7]. Tan, K.H. 1994. Environmental Soil Science. Marcel Dekker Inc., New York, NY.

[8]. Tan, K.H. 1995. Soil Sampling, Preparation, and Analysis. Marcel Dekker Inc., New York, N.Y. USA.

[9]. Vieillefon, J. 1979. Contribution to the improvement of analysis of gypsiferous soils. Cahiers/ORSTOM, Serie Pedologie, 17:195-223.

[10]. Walkley, A. 1947. A critical examination of a rapid method for determining organic carbon in soils. Effect of variations in digestion conditions and inorganic soil constituents. Soil Sci., 63:251-263.

[11]. Waynick, D.D. 1918. Variability in soils and its significance to past and future soil investigations. Univ. of California Pub. in Agr. Sci., 3:243-269.