The Pharma Innovation Journal 2022; SP-11(5): 1175-1177

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; SP-11(5): 1175-1177

www.thepharmajournal.com
Received: 08-03-2022
Accepted: 13-04-2022

Balu Ram
Department of Agriculture, Adoptive Trial Center, Abusar Jhunjhunu, Rajasthan, India

Corresponding Author
Balu Ram
Department of Agriculture, Adoptive Trial Center, Abusar Jhunjhunu, Rajasthan, India

Physio-chemical properties for fertility evaluation of different area of Jhalawar district Rajasthan

Balu Ram

Abstract
An analysis was conducted on soil testing laboratory Jhalawar, Rajasthan, during-2016-2017. The soil samples were collected from grid basis map of district Jhalawar. Where irrigated area soil sample collected form 2 hector soil sample unit and unirrigated areas soil sample collected a 10 hector sample unit, with an objectives mapping, analysis of chemical properties of soil, i.e. of different depth 0-15 from the different blocks of Jhalawar district in terms of soil chemical properties and crop production. Soil samples were analysis and prepare soil health card by soil testing laboratory Jhalawar.

Keywords: Soil sampling, chemical properties and soil health card

Introduction
Soil analysis is one or more physical, chemical and biological testing of one of several different possible reasons. It conducted soil tests possibly the most widely are those done to estimate concentrations of different available plant nutrients, then after fertilizer recommendations for different corps and varieties. Soil testing refers to chemical testing of soils for evaluating their fertility status with the objective of making recommendations of fertilizers. It is also includes testing of soils for other properties like texture, pH, CaCO3 content, lime requirement, gypsum requirement etc. Soil testing laboratories established in different regions undertake this work and give recommendations to the farmers. The main aim of soil testing is grouping of soils in to classes relative to the levels to the nutrients for suggesting fertilizer recommendation. Predicting the probability of getting profitable response. Helping to evaluate soil productivity determining the specific soil conditions like alkali, salinity and acidity. Soil testing is a program that may be divided in to four phases: Collecting the soil sample, Extraction and determining the available nutrients, Calibrating and interpreting the analytical results and Making fertilizer recommendations.

Materials and Methods
The soil samples were collected from grid basis map of district Jhalawar, where irrigated area soil sample collected from 2 hector soil sample unit and unirrigated areas soil sample collected a 10 hector sample unit by the Agriculture supervisor of Agriculture departments Jhalawar. Sample Received in soil testing laboratory Jhalawar by Agriculture supervisor. Sample the surface mulch separately and the take the remaining samples to represent 6 inch (15 cm) layer as desired. Enough core should be taken and combine the soil of each core and mix thoroughly in a tray and take about 500 g soil, as representative of the original. Cores or furrow slice should be taken as random if the previous crops were grown broadcast or in a zigzag way if previous crops were grown in rows. Generally 5 to 6 cores should be taken from a field of one acre but this number can be increased depending up on the size of field. Put the sample in cloth bag, Label clearly with depth of sample, location and complete address and transport to the laboratory. Samples from unusual or abnormal spots of soil unit should not be collected such as near building, near field boundary, near water channels, manure heap, under tree of field etc. For most field crops, soil should be sampled every 2 to 3 years. Soil should be tested before planting the crops and soil sample may be taken at any time preferably at least a fortnight before the crop sowing, when the field is vacant. Soil Sample Preparation; in generally a soil should be analysis without disturbing chemically and physically process of sample preparation. Now a day's soil sample should be a homogenous mix of soil, dried and Crush and Sieve. The suitable chemical methods for determination of soil nutrient supply power with respect to N, P, K and other crops and types of soils have been evolved on the basis of field experimentation.

Walkley and Black method for organic carbon determination, Olsen's P for alkaline soil and 1N neutral ammonium acetate extractable K for available potassium are suitable for predicting these nutrient in soils. For micronutrients, DTPA extraction is considered to be a good method. Soil pH: A soil-water suspension was prepared in the ratio of 1:2.5 (10 g soil with 25 mL of distilled water) and pH was measured with the help of pH meter (Chopra and Kanwar, 1982) [2]. Electrical conductivity: The soil water suspension prepared for determination of pH was used to estimate the electrical conductivity of the soil. Soil suspension was allowed to settle till supernatant become clear. Electrical conductivity was measured with the help of EC meter and expressed as dS m-1 (Sparks, 1996) [7]. Organic carbon (Walkley and Black, 1934) [8] Procedure: One g of soil was taken in a 500 mL of conical flask. Ten mL of 1 N K2Cr2O7 solution was added and mixed. Then 20 mL of Conc. H2SO4 was added, the flask was swirled 2-3 times and allowed to stand for 30 minutes on an asbestos sheet for the reaction. The suspension was diluted with 200 mL of distilled water. Ten mL of 85% H3PO4 and 1 mL of diphenyl indicator were added and titrated against the solution of 0.5 N Ferrous Ammonium Sulphate till colour changed from violet to bright green. A blank titration was also carried out. Available phosphorus content of soil was determined by Olsen's method (Olsen, 1954) [6]. Firstly reagent A was prepared by using ammonium molybdate, antimony potassium tartarate and H_2SO_4. Then reagent B was prepared with the help of reagent A. Two gram of soil was taken in a 150 mL conical flask, a pinch of Darco G-60 and 40 mL of Olsen's reagent (0.5 M $NaHCO_3$) was added to it. It was then shaken for 30 minute on mechanical shaker and the suspension was filtered through Whatman No. 1 filter paper. Five mL of filtrate was transferred in a 25 mL volumetric flask and was acidified with 2.5 M H_2SO_4 to pH 5.0 and 20 mL distilled water was added followed by 4 mL of reagent B. After waiting for 10 min the intensity of blue colour was measured on spectrophotometer at 882 nm. Simultaneously a blank was also run. Available potassium content of soil was determined by Flame Photometer (1 N ammonium acetate extract) method (Jackson 1973) [3]. Five g soil was transferred in a 100 mL conical flask and 25 mL of 1 N ammonium acetate solution was added and it was shaken for 5 minutes. The suspension was then filtered through Whatman No. 1 filter paper and potassium concentration in the filtrate was measured using flame photometer. Available sulphur content in soil as extracted by 0.15% $CaCl_2$ (Williams and Stembergs (1959) [9] was determined by Turbidity method (Chesin and Yein, 1952) [1]. Five g of soil was taken in a 100 mL conical flask and 25 mL of 0.15% $CaCl_2$ solution was added to it. Then it was shaken for 30 minutes on a shaker and the suspension was filtered through Whatman No. 42 filter paper. Then 10 mL of the aliquot was transferred to a 25 mL volumetric flask and 1 g of the sieved $BaCl_2$ crystals were added and it was shaken for 1 minute. One ml of 0.25% gum acacia solution was added and the volume was made to the mark. It was shaken for one minute and the turbidity was measured after 25 to 30 minute on spectrophotometer, using a blue filter at a wavelength of 420 nm. Simultaneously a blank was also carried following same procedure. DTPA extractable micronutrients: Available Zn, Fe, Cu and Mn in soil samples was determined by the method of Lindsay and Norvell (1978) [5]. In this method, 10 g of soil was extracted with 20 mL DTPA extracting solution by shaking for 2 hrs on a shaker. The suspension was then filtered and trace elements were determined by atomic absorption spectrophotometer (UNICAM-969) using respective cathode lamps. First standard reading was taken followed by sample reading.

Result and Discussion

Table: 1, 2 and 3 Soil pH (1:2 W/V) The soils were neutral to alkaline in reaction normally 5% sample fall under neutral and 95% in alkaline range so in this condition recommendations of application of gypsum @ 250 Kg/ha every three year. EC (dS m^{-1}) all sample were found in normal range. Organic Carbon (%) status were low in district Jhalawar here 78% sample under low, 19% under medium and only 5% soil sample under high here we were recommendations application of organic manure FYM, Compost, Vermicompost and Green Manure. Available Phosphorous (kgha^{-1}) in the district were found under medium range here 10% sample under low, 85% under medium and only 5% sample under high range here we recommendation of Phosphorus through organic and inorganic manure and fertilizer like DAP content 46% P_2O_5, SSP content 16% P_2O_5. Available Potassium (kgha^{-1}) 92% soil sample were under high in available k_2o and only 8% sample under medium no low range found. Available Sulphur in Soil (ppm) were found sufficient in range but only 5% sample under deficient. Micronutrients in Soils of district were Manganese in soil (ppm) and Cupper in Soil (ppm) in sufficient range no need to any Mn and Cu fertilizer but Zinc in soil (ppm) 33% sample under deficient and remaining under sufficient range so recommendations of zinc sulphate as Basal or Foliar spray and Iron in Soil (ppm) 45% sample under deficient and remaining sample under sufficient range so recommendations of ferrous sulphate as soil or foliar spray.

Table 1: Percent status of soil

Properties	Low	Medium	High	Remark
Organic Carbon, (%)	78	19	5	Low
Available P_2O_5 (Kg ha^{-1})	10	85	5	Medium
Available K_2O (Kg ha^{-1})	-	8	92	High

Table 2: Soil Chemical Properties

Properties	Range	Average Value	Method followed
1. Soil pH (1:2.5)	7.7-8.2	7.9	Glass electrode digital pH meter (Chopra and Kanwar, 1982) [2]
2.Electrical conductivity (dSm^{-1}) (1:2.5)	0.20-0.60	0.32	Using EC meter (Sparks, 1996) [7]
3. Organic Carbon, (%)	0.25-0.76	0.35	Walkley and Black (1934) [8]
4. Available P_2O_5 (Kg ha^{-1})	10-58	22	Olsen's colorimetric method (Olsen *et al*., 1954) [6]
5. Available K_2O (Kg ha^{-1})	140-400	290	Flame photometric method (Jackson, 1973) [3]
6. Available S (Kg ha^{-1})	08-38	20	Turbiditymetric method (Chesin and Yein, 1952) [1]
7. Zink (PPM)	0.30-0.70	0.40	DTPA Extraction method (Lindsay and Norwell, 1978) [5]
8. Ferrous (PPM)	2.90-4.10	3.50	DTPA Extraction method (Lindsay and Norwell, 1978) [5]
9. Copper (PPM)	0.40-0.60	0.50	DTPA Extraction method (Lindsay and Norwell, 1978) [5]
10. Mn (PPM)	4.20-5.88	5.00	DTPA Extraction method (Lindsay and Norwell, 1978) [5]

Table 3: Status of soil

Properties	Deficient	Sufficient	Remark
1. Soil pH	-	-	Neutral to alkaline
2.Electrical conductivity (dSm^{-1})	-	-	Normal
Available S (Kg ha^{-1})	5	95	Sufficient
Zink (PPM)	33	67	Medium
Ferrous (PPM)	45	55	Medium
Copper (PPM)	-	100	Sufficient
Mn (PPM)	-	100	Sufficient

Summary and Conclusion

During the present investigation, soil sampling was taken on grid basis from different location of district Jhalawar, Rajasthan. These samples were analyzed at soil testing laboratory Jhalawar for various physic-chemical properties. pH of soil sample under high pH it mean alkaline soil so recommendations of gypsum for improve physical properties of soil but electrical conductivity under normal range. Organic carbon under low in range so recommendations of organic manure. Availability of nutrients like Phosphorus was under medium in range so application of inorganic Phosphorus fertilizer recommended and Potash under high in range. Availability of Micronutrients Zinc and Iron were found deficient so recommendation of Zinc and Iron in soil as well as foliar spray but other Copper and Manganese were sufficient in district Jhalawar.

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