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ASSESSMENT OF PHYSICO-CHEMICAL PROPERTIES OF IRRIGATED SOIL IN KOTA CITY OF RAJASTHAN

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Abstract-Due to the rapid industrialisation and construction activities and use of huge amount of fertilizers for crop production, the quality of soil is deteriorating day by day. And by the continuous practice of irrigation there is a chance to increase in saline and sodic property, which also prevent crops yield. The samples have been collected from 7-April-2015 to 21-June-2015 from seven different identified locations that are Kota thermal, Ganeshpal, Badana Rangpur road, Tathed, Rasulpur, Raipura, Kota stone industrial area. The soil samples have been collected from above these locations and taken up to three months. The collected Soil samples of seven different points are analysed thoroughly and taken one average value of one month for representation in simple manner. the obtained result shows in three graph for each month separate and collectively representing the value of all seven location that the soil were found moderately polluted where the industries are very near and the soil were irrigated with contaminated waste water as values of some micronutrient were high in those sampling site.

1. INTRODUCTION

For agriculture, growth of plants depends on two important natural resources, are soil and water. Mechanical and nutrient support provided by soil is essential for plant life process. For crop production, effective management of these natural resources is requires the farmer to understand relationships between soil and plants. Soil is affected by the physical, chemical and biological degradation. Some of the agricultural activities contribute to these negative effects. Major factor which affects are industry, urbanization, road construction, fire, other human activities and, demographic pressure and climate changes are among.

1.1 Geography of Kota

Kota is located along eastern bank of the Chambal River in the southern part of Rajasthan. It is the third largest city of Rajasthan after Jaipur and Jodhpur. The cartographic coordinates are 25°11′N 75°50′E/ 25.18°N 75.83°E. It has an average elevation of 271 metres (889 ft). It covers a geographical area of 5198 sq.km and is bounded in the north and north west by Sawai Madhopur, west by Bundi district, west by Chittaurgarh and Baran district in east, south by Mandsore district of Madhya Pradesh and south east by Jhalawar district 249 meters or 816 feet elevation above the sea level. Total population of the Kota is nearly about 1,5,68,525**.** The population of the district possess predominantly a rural in character. The population of the district has increased by more than four times in the present century.
It has fertile land and greenery with irrigation facilities through canals and ground water. Kota is one of the industrial hubs in northern India, having with chemical, engineering and power plants, thermal as well as nuclear well known for Rawatbhatta. The rail junction, a road hub, lies 4.8 km (3 mi) to the north.

1.2 Quality of Soil in Kota City

The soil of the Kota City district is characterized by deep, medium and black shallow alluvium soils. These soils ranges in depth from shallow to very deep with lime concretion or lime encrusted gravels at varying depths. The soils in general are clay loam to clay in texture and moderately to less permeable and developing cracks in dry season. The soils can be classified as Chromusterts great group of Vertical's order.

1.3 Soil Quality for Irrigation

For irrigation purposes, it is important to remember water is absorbed and moves slowly through clay soils, but once the soil wet they retain significant amounts of moisture. Water is absorbed and moves quickly through sandy soils, but they retain very little. This means water applied quickly to clay soil has a tendency to run off rather than move into the soil. Therefore, while irrigating on clay soils, water should be applied slowly over a long period but then the site may not need irrigation for several days. Irrigation on sandy soils should be applied quickly but for short periods because it moves speedily due to large voids. Irrigation times on sandy sites should be shorter, otherwise water moves beyond the root zone, becoming unavailable to the plant and contributing to soil leaching. For efficient water use under certain weather conditions, sandy sites may need daily irrigation for short periods. Clay soils have greater capillary (sideways and upward) movement than do sandy soils. Quick water application on sandy soils will contribute to a broader wetting area, providing more soil volume for roots to exploit.

2. MATERIAL & METHODOLOGY

This includes the methodology adopted for the sample collection, sample analysis, procedure followed, equipment's and chemicals used.

2.1 Sampling Procedure for Soil

Sampling procedure of soil is, one hectare of a cultivable land is dug at a depth of one foot at five different points and collected one kilogram of soil from each point. Then the collected Soil samples of five different points are mixed thoroughly and taken one kilogram of soil for laboratory analysis from there. This sampling procedure is followed by seven different identified locations, which is mention above and repeated twice in a month for three months. Sampling should be done with the tool that is most appropriate for the soil conditions.\

2.2 Apparatus Used for Analysis

To analyze physical and chemical characteristics of Soil samples following apparatus materials have been used in this study. this instrument were calibrated with standard solution specified for each specific tools. Different standard solution has been prepared to carry out the study in laboratory. for AAS it is required to calibrate with different metals standard in different different concentration so that the followed method produce a genuine data.

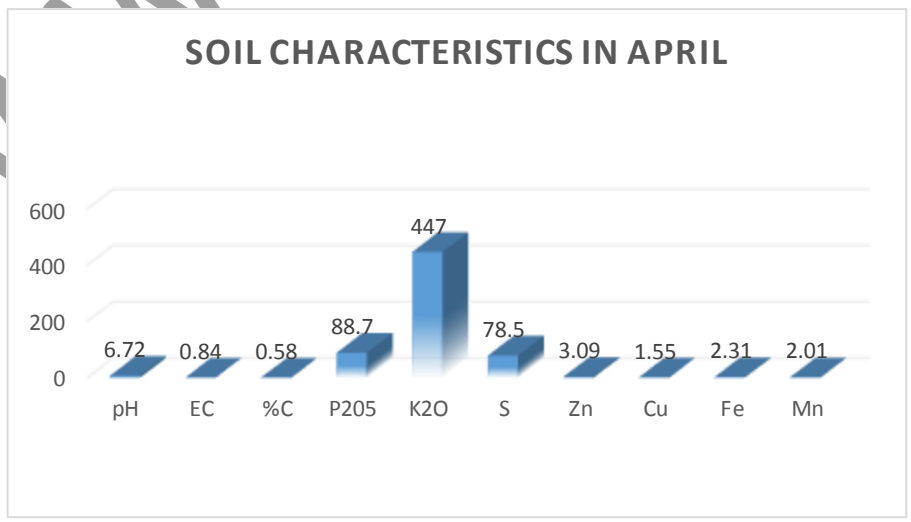
- Atomic Absorption Spectrophotometer (AAS)
- pH Meter
- EC Meter
- Flame Spectrophotometer

2.3 Chemical Used for Analysis

- Manganese Sulphate ($MnSO_4$)
- EDTA solution
- Ammonium chloride
- Standard sulphuric acid
- Silver Nitrate
- Potassium chromate (K_2CrO_4)
- Buffers solutions
- Different metallic standards

RESULT & DISCUSSION

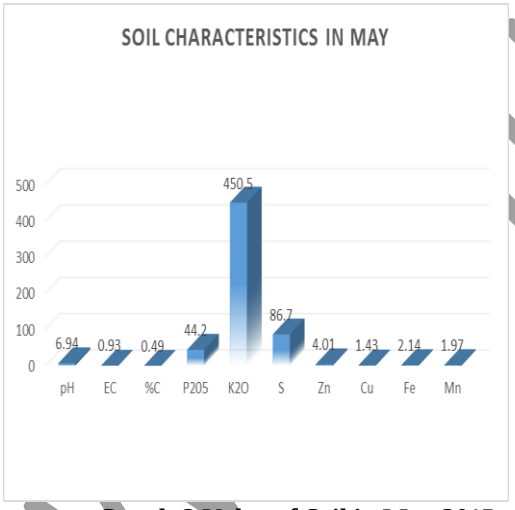
For Assessment of quality analysis, samples of soil were collected in the sampling locations and stored in the ADL (Agriculture Development Laboratory) of Chambal fertilizers at Kota. The soil testing of these samples was carried out after sieve analysis & results of different parameters of soil are carried out. In the study a total 7 sampling stations have been selected, here in graph1,2,3 the obtained result has representing the average value of all seven location which has been taken every month from April to June 2015.



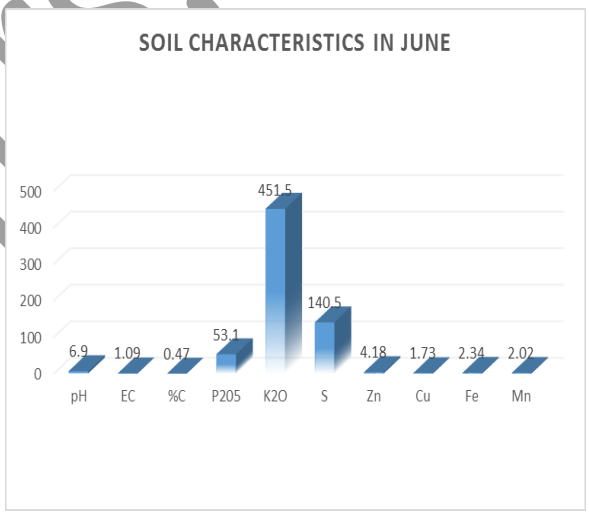
Graph-1 observed Value of Soil in April Month 2015

The following values were observed in **Soil** are:

I. **pH** value of soil has been observed between 6.72 to 6.92 at all sampling station which is under acceptable limit. Maximum observed in month of June. the permissible limit is between 7-8.5 so its clear that pH of soil were recorded in limits.
II. **EC** value ranges observed 0.84 to 1.09 which is in normal condition. The EC observed maximum at 1.09 dS/m, It creates the restriction of yield of the crops. the acceptable limit set by BIS for conductivity is between -50 to 1.0 ds/m, in samples it reaches up to 1.09 slightly more than the permissible limit.
III. **$P_2 0_5$** value ranges for soil is 53.1 to 88.7. The amount of $P_2 0_5$ is observed maximum is 88.7 Kg/ha which create problem to some sensitive to agricultural crops.it is also required by crop as food material but if reached upto high level than will be hazardous to crop results in crop failure etc.
IV. **K_2O** value ranges for soil is 447 to 451 the amount of K_2O is observed 451 Kg/ha in June which is very high tends to leads Bio magnification.
V. **S** value ranges for soil 78 to 146.1 ppm. The amount of S is observed 146.1 ppm usually higher than the required.
VI. **Percentage of Carbon (% C**) value ranges for Soil is 0.47 to 0.54. The low amount of % of carbon is 0.47 which shows the calcareous problem in soil.
VII. **Zn** value range around the month is lies 3.09 to 4.28. The amount of Zn is observed maximum 4.28 mg/kg which comes under acceptable condition & suitable for growth.
VIII. **Cu** value ranges for soil is found ranges in 1.28 to 1.73 ppm. The amount of Cu is comes under acceptable condition.
IX. **Mn** value ranges for soil is found 1.97 to 2.02 ppm. The low Mn value is mainly responsible for the restriction of plant growth.
X. A **Fe** value range for soil lies in analysis is 2.31 to 2.34. The high amount of Fe is found 2.34 ppm which comes below the acceptable limit. It is essential element for growth of plants and crop.



Graph-2 Value of Soil in May 2015



Graph-3 Average Value of Soil in June

CONCLUSION

The soil were found moderately polluted where the industries are very near and the soil were irrigated with contaminated waste water as values of some micronutrient were high in those sampling site. The problems have arisen in this area because of the use of fertilizers in an unskilled way or by frequent irrigation by the farmers. There are many sources of pollution which affect the soil quality unfit for agriculture are stationary sources: point sources (industrial processing, power plants, fuel combustion like coal, oil, and gas), area sources (residential and commercial & institutional heating of coal, gas and oil, open burning) and mobile sources: line sources (highway vehicles, railways locomotives) of pollution. It has been found that, by the frequent irrigation there has been a chance of increase in salinity of the soil at later or sooner In spite of those agricultural practices are taken place to fulfil the needs farmer. If this be couldn't cure or proper steps will be taken to drain the salt from the crop lands then the crop yield will reduce as well as soil fertility and may be barren at finally.

Most of the soil parameters are not in the permissible limit. Nutrient of soil like potassium, zinc, iron, copper, manganese are above the permissible limit, but electrical conductivity and phosphorous is below the permissible limit at most of the sample collected area. Though, the quality parameters are also not suitable irrigation, but salt

tolerant and partially salt tolerant crops can be grown but salt sensitive crops cannot be grown at most of the area. Area like Badana Rangpur road and Raipura is not suitable for cultivation.
Salt tolerant crops are Barley, Wheat, Mustard, Spinach, Millet, Cotton, Date, Alma etc. Partially salt tolerant crops are Sorghum, Guava, Cauliflower, Peas, Maize, and Cabbage etc. Salt sensitive crops are rice, groundnut, pulses, mango, papaya etc. contamination of soil may pose risks and hazards to humans and the ecosystem through: direct ingestion or contact with contaminated soil, the food chain (soil-plant-human or soil-plant-animal- human), drinking of contaminated ground water, reduction in food quality (safety and marketability) via phytotoxicity, reduction in land usability for agricultural production causing food insecurity, and land tenure problems. The adequate protection and restoration of soil ecosystems contaminated by heavy metals require their characterization and remediation. Contemporary legislation respecting environmental protection and public health, at both national and international levels, are based on data that characterize chemical properties of environmental phenomena, especially those that reside in our food chain.

SUGGESTION AND RECOMMENDATION

It is suggested to the farmers of the following areas that, they should check their soil quality at regular interval. According to the requirement of the soil nutrients they have to use proper fertilizers in their crop fields for better yield. If any sources of pollution like stationary or mobile sources of pollution are there then proper mitigation measures should be taken by the farmers. Perforated pipes can be installed in the crop field to drain dissolve salts but it is costlier. Farmers can divert the pollutants from their cultivation fields. If anybody is violating the norms of pollution control board to dispose the pollutants then he should be penalised or to reduce the impact of pollutants, violators can use treatment techniques or equipment's.

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