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EVALUATION OF SOIL NUTRIENT CONTENT FROM AGRICULTURAL FIELDS NEAR SUGAR FACTORY AT PURNA MAHARASHTRA

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Abstract:

Soil is one of the most significant ecological factors, on which plants depend for their nutrients, water and mineral supplementation. Soil is having living organisms and products of their decay intermingled, which plays a significant role and acts as a manure. The Present study is conducted to identify the possible impact of Sugar factory, near Purna city and its effluents on the soil nature. Analysis was carried out of few selected chemical parameters of soil, here we selected few soil nutrients. The effluents from sugar factory are they affecting the quality of soil, as we decided to investigate it. For the present study we have selected soil nutrients like sulphate, phosphate, nitrite-nitrogen and ammonia etc. A field study for soil and its various materials was carried out at surrounding farmland near Sugar factory at Purna, during the period January 2019 to December 2019. The soil is mainly alluvial in nature. The observed values of soil chemical characteristics were studied for causing pollution if any. Our objectives are to evaluate the chemical characteristics of this soil. Standard analytical methods were applied for soil analysis. The analysis of soil was carried out during entire year of 2019 and the expressed in respective units.

Keywords: Soil chemical analysis, Sugar factory, Spectrophotometer method.

Introduction:

The major inorganic constituents of soil are of Al, Si, Ca, Mg, Fe, and K. However, it also contains minor quantities of B, Mn, Zn, Cu, Mo, Co, I and F. The main organic constituent of soil is humus. The essential plant nutrient elements apart from carbon, hydrogen and oxygen are primarily supplied from the soil. These three, usually make up more than 90% of the mass of fresh plant tissue, differ in that, they come from atmospheric carbon dioxide or water. The

soil derived essential elements and their important forms in soils are N, P, S, K, Ca, Mg, Fe, Mn, Cu, Zn, Mb, B, Cl, Co and Se (Johns, 1982).

It is presumed that certain native trees and differences in vegetation type are likely to impart soil properties. This is for the fact that soil supports flora and fauna (Wild, 1993).

Accumulation of variety of elements in agricultural soils is a subject of increasing concern due to food safety issues and potential health risks as well as detrimental effects on soil ecosystem (Sharma, 2001). Plants grown on a soil polluted with municipal, domestic or industrial wastes can absorb elements in the form of mobile ions present in soil solution through their roots or through foliar absorption. These absorbed elements get bioaccumulated in the roots, stems, fruits, grains and leaves of plants. Both industry and agriculture have contributed to increase the concentration of environmentally important trace elements, nutrients through many ways such as waste disposal, atmospheric deposition, fertilizers, pesticide use and other media, in many areas around the world (Soil Analysis Report, 2010).

Salt accumulation in soils is a major threat to agricultural production and ecosystem sustainability. Globally, 100 million ha (5%) of arable land are damaged by high salt concentrations (Lugtenberg, 2002). In Australia, it is estimated that more than $130 million of agricultural production are lost annually from salinization. The National Land and Water Resources Audit reported that 5.7 million hectors have a high potential for the development of dry land salinity and predicts this to rise to 17 million ha by 2050. Copper which is an active ingredient of fungicides is reported as one of the most toxic metals to soil microorganisms and soil health.

It is well known that soil organic matter is a reservoir for plant nutrients, enhances water holding capacity, protects soil structure against compaction, erosion and thus determines soil productivity. All agriculture to some extends depends on the content of soil organic matter as well as the soil nutrients. Maintenance of organic matter is critical for preventing land degradation. Salts in soil cause osmotic stress, which can reduce crop yields (Lugtenberg, 2009). Furthermore, the procedure used in the present study can be applied in many areas that bear similar characteristics with the study area of the present work.

Material and Methodology:

Study Area:

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Purna is a town with a Municipal council in Parbhani district in the Indian state of Maharashtra. Purna is located at 19.18°N 77.05°E. Purna has an average elevation of 386metres (1266feet). Purna is one of Taluka in Parbhani district the Marathwada region of state of Maharashtra. It is a town with good agricultural land with good human population. The observed and we fixed the soil sampling sites for the present study. Here, we noticed that major occupation is agriculture, whereas major people's production is Cotton, Sugarcane, Turmeric, Pulses etc.

Purna Sahakari Sakhar Karkhana is an important milestone in Agro-industries. Purna Sugar Factory is like a KALPAVRUKSHA for the people of the area around which he has visualized the flow of economic opportunities. It has identified for several interconnected plans and programmers which include production of spirit and other Chemicals, Co-generation of electricity plant, Agricultural information services for Farmers respectively.

Fig 1: Map of Study area showing Google image near Purna city of Maharashtra.

Fig 2: Collection of Soil sample form site 1.

Fig 3: A view showing Sugar factory.

Fig 4: Soil sample collection at site 2.

Fig 5: A view of factory near Purna city.

Sample collection: Soil samples were collected from the agricultural farmlands using plastic bags and brought in the laboratory. These polythene bags labeled properly as per the sites and were analyzed further for selected parameters. The determination of pH was carried out, first the soil samples were thoroughly mixed, dried and passed through a mesh sieve. The samples were used for subsequent chemical characteristics analysis by following the Standard methods by using UV Spectrophotometer.

Determination of chemical parameters of the soil:

The chemical parameters of the soil samples were performed according to standard method (APHA, 2000) and (Trivedy and Goel 1998). All required solutions, reagents, other required chemicals were prepared according to each parameter procedure using distilled water. The required amount of soil samples was weighed as per procedure.

The soil is dried in an oven to remove the moisture content. Phosphate, Sulphate, Nitrite-nitrogen, Ammonia was taken for estimation with help of Spectrophotometer which is popularly known and applicable largely (Jackson, 1973). The results obtained from the analysis of these soil samples was noted as in mg/L.

Results and Discussion:

The Present study was conducted to identify the possible impact of sugar factory on the soil with analysis of various chemical parameters of soil. The effluents from sugar factory coming out, actually are they affect the soil quality is our objective. All the chemical parameters and obtained values of the soil samples were shown in Table, Graphs and Figures respectively.

Soil structure refers to the aggregation of individual soil particles into compound groups or clusters of particles. These are separated by natural lines, zones or surfaces of weakness. Individual aggregates are referred to as peds. The grade, class and type of structure is usually described for each sample. If a sample lacks structural arrangement, it is considered to be structureless (Bhairab and Sharma, 1984).

Mahajan and Billore (2014), assessed the physical, chemical characteristics of soil from Nagchoon Pond Khandwa, Madhya Pradesh, India during the period of July 2008 to June 2009. They recognized the minimum sulphate in soil samples during research was 5.34 mg/L during month of July and the maximum 13.56mg/L was observed in the month of December. The maximum sulphate value was noted in winter season while minimal in rainy season respectively.

Shivanna and Nagendrappa (2014), Evaluated the chemical analysis of soil samples concern to its fertility status of command areas of three tanks at Tiptur taluk of Karnataka, India. They analyze and found the lowest nitrogen as 54.825kg/ha and maximum were 85.72kg/ha respectively. The perception of soil fertility not only includes the quantity of nutrients which a soil contains but also how well the nutrients are covered from leaching process, how they available and how easily roots of plants can functions (Sanda and Ismail (2012).

Shaikh et.al., (2012), worked on microbiological and physical, chemical evaluation of soil near Bhokar, Maharashtra. They have carried out the work on Phosphorous content from the soil during the period of September 2010 to August 2011 and values noted as 0.33mg/kg to 3.72mg/kg.

Shaikh et.al., (2012), estimated the physical, chemical analysis on soil near Bhokar of Maharashtra. They noted the concentration of Sulphate minimum as 48mg/kg and maximum 1843mg/kg from the soil, this study was carried out in the period of September 2010 to August 2011. Ganorkar and Chinchmalatpure (2013), Assessed physical, chemical characteristics of soil at Rajura bazar in Amravati district of Maharashtra in the month of February 2013. They analyzed and found the lowest phosphorous values was 18.5kg/hect and highest as 25kg/hect respectively.

Osakwe (2014), Evaluated the physical chemical characteristics of soil in the flood disaster affected areas of is a poor region of Delta State Nigeria. He revealed the minimal concentration of Phosphorus and found as 0.44mg/kg and maximum were 26.54mg/kg

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respectively. Chaudhari (2013), Studied physical chemical parameters of soils of Bhusawal, district Jalgoan, Maharashtra. It observed that the lowest level of Nitrogen content found as 0.036mg/kg and highest was 0.049mg/kg while minimal phosphorous was observed 0.023mg/kg and maximum were 0.036mg/kg.

Table 1: Showing the average values observed of Soil samples from different sites in (mg/L) during year 2019

Month	Phosphate (mg/L)	Sulphate (mg/L)	Nitrite-nitrogen (mg/L)	Ammonia (mg/L)
Jan	0.88	42	24	0.14
Feb	0.84	40	22	0.12
Mar	0.92	36	23	0.14
Apr	0.92	38	24	0.15
May	0.88	34	22	0.14
Jun	0.86	34	24	0.13
Jul	0.88	36	25	0.14
Aug	0.94	38	23	0.16
Sept	1.12	32	24	0.18
Oct	0.98	34	24	0.16
Nov	0.88	34	22	0.14
Dec	0.84	32	22	0.14

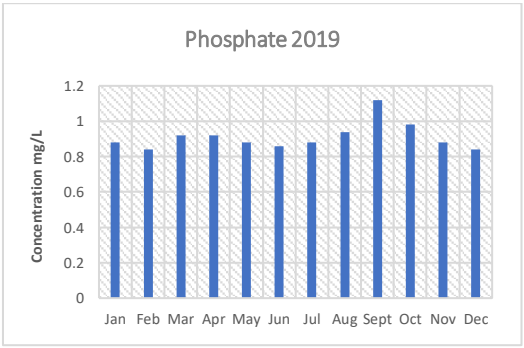

Fig 6: Values of PO_4 content from the Soil.

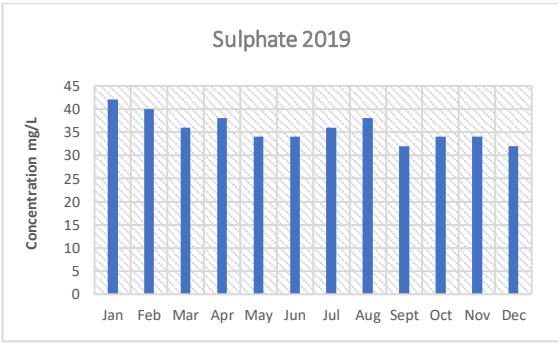

Fig 7: Values of SO_4 content from the Soil

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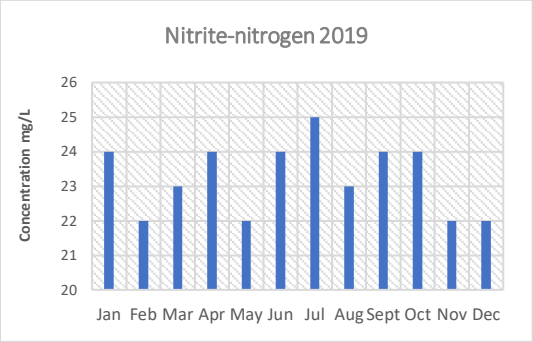

Fig 8: Values of NO_2^-N content from Soil.

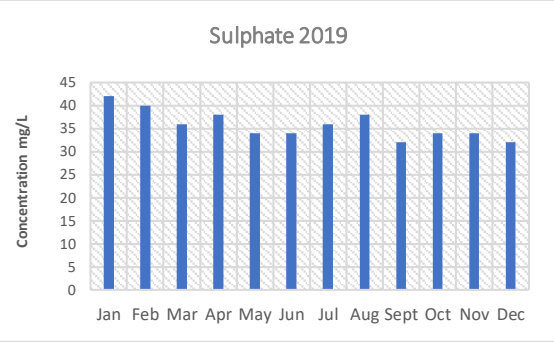

Fig 9: Values of NH_3 content from the Soil.

Conclusion:

From this study it was concluded that Purna has black cotton soil, which is rich in calcium and magnesium with organic matter. The soil is mainly alluvial in nature. From the result and values obtained the nutrients which are carried out during this investigation, it is clear that the excess amount of soil nutrients was not observed.

With overall data received of Phosphate, Sulphate, Ammonia and Nitrite-nitrogen and its concentration is in the permissible limit, the soil is not affected by any effluents from sugar factory. Hence our study with systematic analysis of soil samples collected for this present work were acts as a macro fertilizer. The values obtained and compared with standard permissible level also present noted data will be highly useful for knowing the health status of soil of this arena.

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