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Physicochemical Status of Fertile Soil around Arjunnagar, District Kolhapur, Maharashtra, India

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Abstract
The present paper deals with some parameters of soil samples, a systematic study has been carried out to explore the quality of soil, hence the objective of present paper is to estimate the relationship of eight soil samples. Soil chemistry is affected by mineral composition, organic matter and environmental factors. The soil samples have been collected in September 2014 from eight differents sites around arjunnagar (i.e. Benadi, Kognoli, Soundalga, Belewadi, Jatrat, Akkol, Sidanal, and Lakhnapur). During this study it has been found that there are marked variations in physical and chemical parameters. These parameters such as pH, dissolved oxyge, Nitrogen, phosphorus, calcium, magnesium, potassium, sulphur, chlorine, (There were significant variations were found from site to site. All the values within the permissible limits, the physicochemical analysis of soil samples of different villages around arjunnagar were collected and analyses for different parameters and nutrients. In case of above soil samples it was found that there was a marked variation in nutrients and parameters of various sample around arjunnagar.

Keywords: Soil samples, Chemical parameters, Micronutrients, pH, Nitrogen in soil.

1. Introduction
Soil generally loose material composed of weathered rock and other minerals and the partly decayed organic matter that covers large parts of earth. Plants like all other living things need food for their growth and development. Plant require 16 essential elements like N, P, K, Ca, Mg, S, Fe, Zn, Mn, Cu, B, Molybdenum and chlorides are supplies either from soil minerals and soil organic matter or by organic and inorganic fertilizers. Soil properties has high importance in many human activities such as agriculture forestry, landscaping, environmental protection, recreation and civil engineering, soil survey for different applications requires quick and when possible non disturbing estimations of numerous soil properties. An accurate evaluation of soil properties completed by the nature of their variability however conducting soil measurement with a high sampling density is costly and time consuming, conventional methods of soil analysis mostly required disturbing soil, removing soil samples and analyzing them in the laboratories [1].The soil engineering properties and soil strength has been recently reported by Ronald Roopnarine *et al.* [2].

2. Materials and Methods
The soil samples were collected in the depth of one foot from the surface of land at eight different sites in the polythene bags. The pH was measured by calibrated pH meter. The dissolved elements in the extract (water extract) were measured by calibrated atomic absorption spectrophotometer from department of Agrochemicals and Pest Management, Shivaji University, Kolhapur. Reagents used for this work were AR grades and chemicals other than reagents are LR grade manufactured by sd-fine, LOBA and Merk fishcer, the soil samples were dried in oven for 95 ^{0}C about 24 h and grind more finely. The analyses of various physicochemical parameters were carried out with the help of soil analysis kit (ORLAB Laboratory) standard methods [3].

3. Results and Discussion
3.1. pH
The pH value of soil is a measure of soil acidity or alkalinity, soil pH directly affects nutrients availability. The pH scale manages from 0 to 14 with 7 as a neutral; number less than 7 indicates acidity while number greater than 7 indicates alkalinity. The pH value of soil varied

from 7.1 to 8.7 with an average value of 7.875. The average value of pH indicates that soil is in alkaline nature, pH values of all the soil samples were found in normal range. Ramteke *et al.* [4] has reported the significant results of seed germination of spinach at different pH in fertile soil.

Table 1: Physical composition of soil in collected sample around Arjunnagar

Parameters	Average Range	Normal Range	Sites around Arjunnagar from the samples to be collected							
			Benadi	Kognoli	Soundalga	Belewadi	Jatrat	Akkol	Sidanal	Lakhnapur
pH	7.875	8.5-9.0	8.5	8.7	8.2	7.6	7.4	7.1	7.9	7.4
Electrical Conductivity	0.5825	>1ppm	0.4	0.54	0.51	0.92	0.98	0.07	0.83	0.41
TDS	1.035	-	0.53	0.35	0.33	1.59	1.91	1.95	1.31	0.31
Salinity	0.365	-	0.34	0.4	0.38	0.47	0.28	0.41	0.32	0.32
D.O.	-525.5	-	-288	-1018	-1108	-468	-471	-376	-467	12

Table 2: Chemical composition of soil in collected sample around Arjunnagar

Parameters	Average Range	Normal Range	Sites around Arjunnagar from the samples to be collected							
			Benadi	Kognoli	Soundalga	Belewadi	Jatrat	Akkol	Sidanal	Lakhnapur
Nitrogen (Nitrate)	237.67	216.7-272kg/ha	264.72	226.24	230.72	298.89	208.32	223.72	211.56	235.2
Nitrogen (Ammonia)	305.68	272-544 kg/ha	423.11	339.36	309.12	272.76	271.84	274.05	272.89	292.3
Phosphorus	45.85	22.5-56 kg/ha	34.86	66.88	33.44	52.56	40.8	55.09	28.8	33.44
Calcium	37.75	30-40 mg/100g	45	65	60	25	30	30	25	22
Magnesium	9.87	10-15 mg/100g	10	10	15	5	15	5	10	9
Potassium	245.16	150-340 kg/ha	328.51	123.66	460.92	198.4	325.05	325.06	265.64	326.09
Sulphur	12.33	0-10 kg/ha	7.59	7.18	8.14	16.9	12.8	14.06	15.6	16.2
Chloride	23.75	20-50 mg/100g	25	25	25	10	15	50	15	25

3.2. Electrical conductivity

Electrical conductivity is one of the important parameter of soil sample because it shows the salinity of soil, the influence of electrical conductivity of soil on some factors of soil have been reported [5, 7]. In the present study conductivity of sample ranged from 0.07 to 0.98 µs (9.8 ms/cm) with an average of 0.5825 ms/cm). All soil samples are within the permissible limit and all are good for germination of seeds and growth of any type of plants.

3.3. Nitrogen

Small changes in nitrogen content for some crops can result in large effects on plant growth and the quality of forage and fruit. So it is important that the nitrogen level be maintained within the prescribed limits of sufficient range by the proper use of nitrogen fertilizer. The critical level of nitrogen in many plants is around 3% for several crops, when the nitrogen level in leaves drops below 2.75 % nitrogen deficiency symptoms appear, the yield and quality decline. The primary exceptions are for the very young plants when the critical level may be 4% or more for some tree fruits and ornamental nitrogen levels may be as low as 2% before deficiency occurs. Deficiencies of nitrogen as well as excess amount also can be a problem. In the present paper, nitrogen values ranges between 208.32 kg/ha to 298.89 kg/ ha with an average of 237.67 kg/ha. Sample No. 5 and sample No.6 shows the values below normal range while sample No.4 exceeds from normal range.

3.4. Phosphorus

Phosphorus available to plants as orthophosphate ions, in the photosynthesis and respiration phosphorus plays a major role in energy storage and transfer as ADP and ATP, DPN and TPN. It is a part of the RNA and DNA structures, which are the major components of genetic information. Phosphorus aids in root development flower initiation and seed and fruit development. Lack of phosphorus can cause delayed maturity and poor seed and fruit development. In the present study the phosphorus values ranged from 28.8 kg/ha to 66.88 kg/ha with an average value 45.85 kg/ha. All values are within the permissible limit except soil sample No. 2 which is exceeds the limit.

3.5. Potassium

In photosynthesis potassium has the role of maintaining the balance of electrical charges at the site of ATP production. It promotes the translocation of photosynthesis for plant growth or storage in fruits or roots. It also involved in the photosynthesis plants lacking potassium will slow and stunted growth, stems are weak and size of seeds, fruits and the quantity of their production is reduced. In this study potassium values ranged from 123.66 to 460.92 kg/ha with an average value 245.16 kg/ha. Sample No.3 observed exceed limit while sample No. 2 is below permissible limit, except sample No. 2 and 3 all values are in normal range.

3.6. Calcium

Calcium has a major role in the formation of the cell wall membrane and its plasticity it acts as a detoxifying agent by neutralizing organic acids in plants. It is used as secondary nutrients in sufficient calcium cause young leaves to become distorted and turn abnormally dark green leaf tips often becomes dry or brittle and well eventually wither and die, stems are weak and germination is poor. In this survey, calcium value range between 22 to 65 mg/100g with an average of 37.75 mg/100g. Sample No.1, 2 and 3 were exceeds

the permissible limit. Sample No. 4 to 8 was within the normal range.

3.7. Magnesium

Magnesium is a constituent of the chlorophyll molecule which is the driving force of photosynthesis. It is also essentials for the metabolism of carbohydrates. It is an enzyme activator in the synthesis of nucleic acids (DNA and RNA) magnesium value ranged between 5 to 15 mg/100g with an average of 9.87 mg/100g all values from sample No.1 to 8 were within the permissible limit.

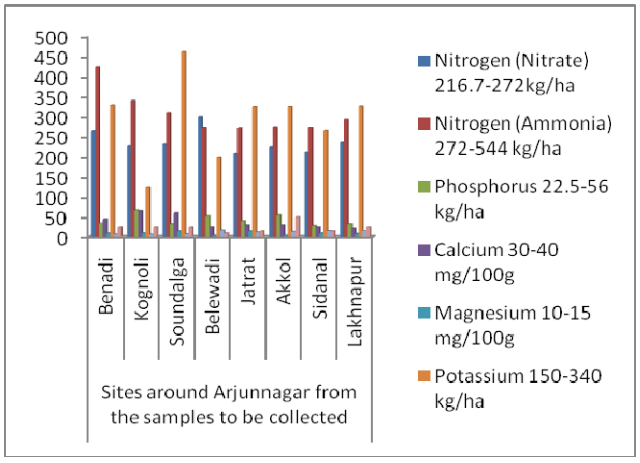

Fig 1: Comparative study of chemical composition in soil of collected sample around Arjunnagar

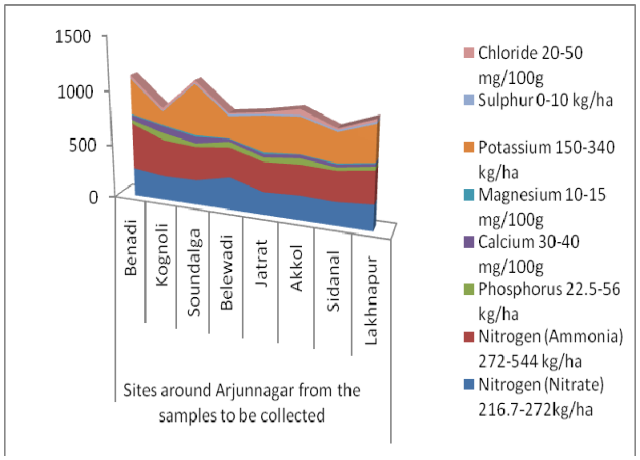

Fig 2: Comparative study of chemical composition in soil of collected sample around Arjunnagar

3.8. Sulphur

Sulphur is an essential constituent of certain amino acids and proteins. It is available in fertilizers such as potassium and magnesium sulphate, gypsum (calcium sulphate) and elemental sulphur plants deficient in sulphur tend to be spindly and small and stems are often thin. Sulphur value range between 7.18 kg/ha to 16.9 kg/ha with an average of 23.75 kg/ha, sample No.4, 5, 6, 7 and 8 were exceeds normal range and remaining samples were with permissible limit.

3.9. Chloride

Chloride is required even smaller amount than secondary nutrients so called micronutrients. Chloride found in many bacteria and fungi, it reduces the severity of certain fungal diseases. Deficiency of chloride causes chlorosis of younger leaves and wilting of the plant. Due this the chloride values range in the soil is greatly important. Chloride value range from 10 to 25 mg/100g, sample No. 4 and 6 are below permissible limit and remaining samples were within the normal range.

3.10. Salinity

Soil salinity is the salt content in the soil, as soil salinity increases, salt effects can result in degradation of soil and vegetation. Salinity from irrigation can occur over time wherever irrigation occurs, since almost all water sources contain some dissolved salts. When the plants use the water, the salts are left behind in the soil and eventually begin to accumulate. Since soil salinity makes it more difficult for plants to absorb soil moisture these salts must be leached out of the plant root zone by applying additional water [8] Textbook of soil chemistry, pp. 130 to 132, L. Bhattacharya]. In the present paper the salinity values range from 0.28 to 0.47 ppm with an average of 0.365 ppm. The TDS value range from 0.31 to 1.195 with an average of 1.035 and DO range from -1108 to 12 with an average value -525.5.

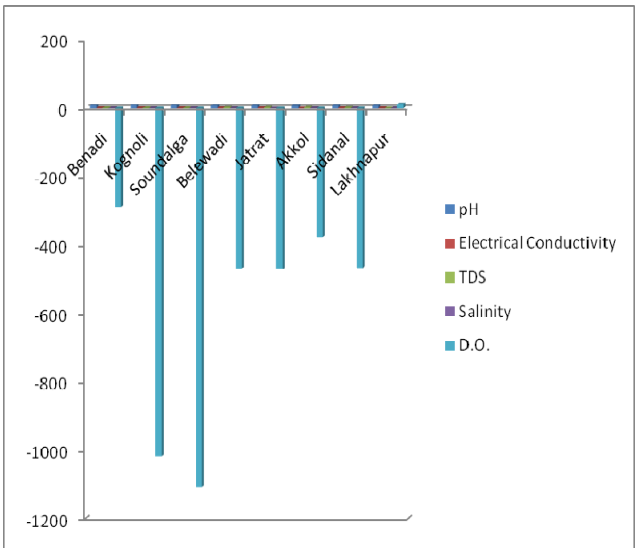

Fig 3: Comparative study of physical composition in soil of collected sample around Arjunnagar

4. Conclusion

In the present paper reported the ranges of the following parameters of the soil and on basis of these reported results, described the status of soil in the region of Arjunnagar, District Kolhapur Maharashtra, India i.e. pH value of soil found and varied between the ranges 7.1 to 8.7 with an average value of 7.875. The average value of pH indicates that soil is in alkaline nature, pH values of all the soil samples were found in normal range. The electrical conductivity of sample found in ranged from 0.07 to 0.98 µs (9.8 ms/cm) with an average of 0.5825 ms/cm). All soil samples electrical conductivity is within the permissible limit and all are good for germination of seeds. Recently, Ramteke *et al.* [9] have been studied the significant effect of some fertilizers on vegetable plants. In the present study, nitrogen values found between the ranges from 208.32 kg/ha to 298.89 kg/ ha with an average of 237.67 kg/ha, except the soil sample no. 5 and sample no.6 shows below normal range while sample no.4 exceeds from normal range, if the nitrogen is present in soil in above or below the normal ranges, its problematic for soil. The found values of phosphorus were between the ranged from 28.8 kg/ha to 66.88 kg/ha with an average value 45.85 kg/ha. All obtained values of phosphorus

are within permissible limit except soil sample no. 2 which exceeds the limit. The potassium values found between range from 123.66 to 460.92 kg/ha with an average value 245.16 kg/ha. Sample no.3 observed exceed limit while sample no. 2 is below permissible limit, except sample no. 2 and 3 all values are in normal range. The calcium value found in between the range 22 to 65 mg/100g with an average of 37.75 mg/100g but sample no.1, 2 and 3 were exceeds the permissible limit and sample no. 4 to 8 was within the normal range. The magnesium found in range between 5 to 15 mg/100g with an average of 9.87 mg/100g all values from sample no.1 to 8 were within the permissible limit. Sulphur found in the soil between range 7.18 kg/ha to 16.9 kg/ha with an average of 23.75 kg/ha, sample no.4, 5, 6, 7 and 8 were exceeds normal range and remaining samples were with permissible limit. Chlorides found between ranges from 10 to 25 mg/100g and sample no. 4 and 6 are below permissible limit and remaining sample was within the normal range. Salinity values found in the soil between ranged from 0.28 to 0.47 ppm with an average of 0.365 ppm. TDS of soil were reported between ranged from 0.31 to 1.195 with an average of 1.035 and D.O. range from -1108 to 12 with an average value -525.5. On basis of reported results concluded that, the status of the soil around the Arjunnagar, found well for agriculture purposes because of all the parameters within in permissible limits. Out of all eight collected soil samples, the soil samples collected from Belewadi, Soundalaga and Benadi villages have highly fertile soil as well as nutritious soil for crop plants hence, it is recommend using for agricultural purposes.

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