PHYSICO-CHEMICAL ANALYSIS OF SALT AFFECTED CROPLAND FROM TAKERKEDA SHAMBHU, DISTRICT AMRAVATI

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ABSTRACT

Nearly 20% of the world's cultivated area and nearly half of the world's irrigated lands are affected by salinity. Salinity may develop with the origin of soil or may result through human activities. Salt comes in the soil in many forms such as calcium and magnesium carbonate, sodium chloride, bicarbonates and sulphates. Soil salinity not only affects other soil properties but also reduces crop quality and production. Most of the Indian states facing salinity problems since long time but does not got proper guidelines up till now. Present investigation tried to focus over the physicochemical strength of different cropland soils from Takarkheda shambhu, one of the salinity affected towns of Amravati district.

Keywords: *Saline soil, Bicarbonates, Plant Nutrients, Physicochemical analysis.*

Introduction

Soil is the most vital and precious natural resource that sustain life on earth. The pedosphere is the envelope of the earth where soil occurs and soil forming factors are active (Ugolini and Spaltenstein, 1992). Soil provides ecosystem services critical for life; soil acts as a water filter and a growing medium provides habitat for billions of organisms, contributing to biodiversity; and supplies most of the antibiotics used to fight diseases. However, salinisation, water logging, depletion of plant nutrients, depletion of soil structure, desertification and pollution reduces the soil fertility. The degradation of soil has stared occurring both due to natural and human induced factors which in turn affecting the productivity.

Soil salinity greatly affects growth and development of vegetation (Joshi *et al*., 2009). Salt comes in the natural environment in many forms such as calcium and magnesium carbonate, sodium chloride, bicarbonates and sulphates. The pH of saline soil is generally below 8.5 which substantial higher than the desired range 6.0 to 7.0. Many landscapes are naturally saline, but secondary salinity isn't so natural occurring when salts from deep within the earth are dissolved and deposited into soil and water as a result of human activity. If we do not improve the productive capacity of our fragile soil, we cannot continue to support the food and fibre demand of our growing population.

The problem of salt affected soil is a case of global occurrence and it affects developing as well as well as developing countries. Nearly 20% of the world's cultivated area and nearly half of the world's irrigated lands are affected by salinity (Sehmi *et al.*, 2000).

In India about 8.6 million ha of land area is affected by soil salinity particularly in Uttar Pradesh, Gujarat, west Bengal, Rajasthan, Punjab, Maharashtra, Harayana, Orissa, Delhi, Kerala and Tamil Nadu. In Maharashtra also the fine grained black soil do not allow penetration of water, leading to continuous build up salts levels in the top soils (Pathak *et al*., 2013).

According to GSDA report (1996), the soil of Amravati, Akola and Buldhana district of Vidharbha around Purna river belt is saline. About 547 villages from 14 tahsil of 3 districts comes under salinity belt. The high salinity of Purna river belt, makes the soil infertile, reduces crop yield and makes water non-portable.

As the selected area comes under saline tract and there is a considerable effect of salinity on crop cycle, there is need of regular physico-chemical analysis as well as proper treatment procedures. The analytical research will be beneficial to the related farmers for taking proper crops with irrigation facility.

The present investigation aims to analyse some physical as well as chemical properties of soil from salinity affected town in Amravati rural area. It is also aim to propagate the soil testing requirement among farmers for agricultural well being.

Review of Literature

Recently soil analysis especially from saline tract is the common practice in both developed as well as developing countries with respect to agricultural management. According to the literature cited, the investigations related to soil analysis related to saline tract are as under.

Bridges *et al*. (1997) has pioneerly worked out the science of pedology. According to them, the physical, chemical and biological composition of soil as well as its classification and distribution plays significant role in crop science. Bentham *et al*. **(**1992) emphasized on soil physico-chemical assessment from different natural sides of Nottingham. According to them the size, activity and composition of the soil microbial community determine the characteristics of soil from different natural habitats. Pandeeswari and Kalaiarasu (2010) investigated the physico-chemical properties of sunami affected soil from Tamil nadu. According to their observation the soil from the affected areas turned saline due to in inundation of sees water. Resel *et al*. (2013) investigated the soil and water soil salinity as well as its effects on crop production from the sunder ban area of Bangladesh. Their study revealed that the soil as well as water salinity decreases the rate of crop production.

Recently Ganorkar and Chinchmaltpure (2013) studied the physic-chemical properties and micronutrients of soils from six different locations of Rajura Bazar. The study reveals that the soil from the investigated area shows alkaline nature with moderate amount of micronutrients. Mali *et al.* (2012) studied the seasonal variations in physicochemical properties and mineral composition of the agriculture supporting salt affected soil from Barhanpur sites. According to their study the analyzed indicates high salinity and

dominance of Na+ and Cl- resulted in SAR values in summer. It was recommended that farmer should avoid over irrigation, stop using chemical fertilizers, use drip irrigation system and apply biological fertilizers. Chaudhari and Jichkar (2012) investigated the nutrients and some parameters from soil in Warud Taluka, District Amravati. According to their investigations the soils under Citrus cultivation are rich in nitrogen potassium and phosphorus content.

From the literature cited it was realized that the saline tract soil analysis is not done properly so far. Thus as far as crop production and rural development is concern it is must.

Materials and methods

The above said investigation was carried out during the months of October to march 2014.

Site location

The investigated town Takerkeda shambhu is a village of Bhatkuli tehsil in Amravati district of Maharashtra state. The village is 30 km away from the district place and comes under salinity zone considered as a “Kharpanpatta”. The geography of village Takerkeda shambhu remains associated with the other villages such as Saur, Aashti, Rama, Devari, Khartalegaon, Waigaon and Lashpur.

Sample collection

In the primary phase of investigation frequent surveys were made over the site location to observe the soil diversities as well as their potentiality under different crops. During the survey the administrative documentation were collected from the related government offices. According to the documentation the sites of investigation was finalized. The information regarding to the agricultural land and the crop cultivation were worked out.

Depending upon agricultural land and the crop cultivation, the sampling sites were selected. Soil samples were collected from the selected sites in the cloth bags at the depth of 20 cm according to standard procedure. The selected sites were the soyabean, gram and the vegetable crop lands. The samples collected from the study area later proceed for Physico-chemical analysis. Photographic evidences are also collected during the survey.

Physico-chemical Analysis

The samples were analysed in Government Agricultural Soil Analysis Laboratory with respect different parameters. The analysis was carried out as per the Agricultural standard methods given below

- The soil pH of the samples was estimated by pH meter in the saturation paste (1:5 suspensions).
- In the same suspension electrical conductivity was also measured using conductivity meter (Equip-Tronics, EQ-660A).
- Soil organic carbon was estimated by Walkley-Black method (Jackson, 1967), available phosphorous was determined by Olsen’s method (Olsen, *et.al.* 1954),
- Available potassium estimated by leaching the soil with in ammonium acetate and the determination of potassium by using flame photometer as per the standard method.

- Available nitrogen was estimated by Kjeldhal method.
- Free calcium carbonate ($CaCO_3$) and phosphate were determined by rapid titration method (Piper, 1966).
- The temperature of soils was taken at the spot using soil thermometer.
- Water holding capacity of soils was measured by micro-sieve method.

The data collected regarding to all parameters of soils finally compared, correlate with the earlier research observations as well as with the authorized standards and finally used for making conclusions.

Observations and Results

It was observed that most of the fields from saline tract area represent black cotton soil. Since known time the farmers taking crops based on rain water only because of high salinity. Recently some farmers tend to experiment rabbi crops using modern irrigation facilities but does not have satisfactory results.

The analyzed data of soils from different crop related farms are as under.

Physical Parameters

Colour of the soil: The soil sample No.1, which was collected from soya been cultivated farm was black cotton soil. Sample No. 2, which was collected from Gram cultivated farm was Faint black in colour. Sample no.3, which was collected from vegetables cultivated farm was black cotton in colour.

Temperature: The temperature of soil samples was found in ranges of 28°c to 35°c. Maximum temperature was found 35°c (vegetable) and minimum temperature was found to be 28°c. (Soya been).

Water holding capacity: The water holding capacity of soil was found in the ranges of 40% to 45%.maximum water holding capacity was found 45 % (soya been) and minimum temperature was found to be 40 % (gram).

PH: pH of soil sample was found in the ranges of 7.58 to 8.37.The soil samples was slightly alkaline in nature. Maximum pH was found 8.37 (soya been) and minimum pH was 7.58 (gram).

Electrical conductivity: The conductivity of soil samples was found in the ranges of 0.38 m mhocm¹ to 0.44 m mhocm¹. Minimum electrical conductivity was found 0.38 (gram) and maximum was found 0.44 (Soya been).

Organic matter: The organic matter in the soil samples was found in the ranges 0.81% to 1.23%. Maximum organic matter was found to be 1.23 (gram) and minimum was found 0.81 (Vegetables).

Calcium carbonate: The calcium carbonate in the soil studies samples was found in the ranges 3.65% to 4.53%.maximum calcium carbonate was found to be 4.53 (soya been) and minimum was found 3.65 (Vegetables).

Available phosphorus: The phosphorus content in the soil samples ranged between samples 2.62mg/100 to 33.8 mg/100. Maximum Available phosphorus was found to be 33.8 (soya been) and 2.62 (Gram).

Table: Physico-chemical parameters of saline tract cropland soils at Takerkheda Shambhu.

Sr. No.	Parameters	Soil Samples from different crop fields		
		Soyabeen	**Gram**	**Vegetables**
1	Temperature	28°	35°	33°
2	Water holding capacity	40%	45%	42%
3	pH	8.37	7.58	7.79
4	Electrical conductivity	0.44m mho cm^{1}	0.38m mho cm^{1}	0.41m mho cm^{1}
5	Organic matter	0.90%	0.81%	1.23%
6	Caco3	3.65%	3.87%	4.53%
7	Available phosphorus	33.8mg/100	2.65mg/100	19.2mg/100
8	Available potassium	45mg/100	36mg/100	34mg/100
9	Exchangeable calcium	69.25meq%	96.39meq%	85.95meq%
10	Exchangeable magnesium	11.68meq%	6.25meq%	5.64meq%
11	sodium	284ppm	152.8ppm	85ppm

Available potassium: The available potassium content in the soil samples ranged between 34mg/100 to 45mg/100. Maximum available potassium was found to be45 (soya been) and 34 (Vegetables).

Excheangble calcium: The exchangeable calcium content in the soil samples ranged between 69.25meq% to 96.39meq%. Maximum exchangeable calcium was found to be 96.39(gram) and minimum was found to be (Vegetables).

Exchangeable magnesium: The exchangeable magnesium content in the soil samples ranged between 6.25 meq % to 11.68 meq %.Maximum exchangeable magnesium was found to be 6.25(gram) and minimum was found to be 11.68 (Soya been).

Sodium: The sodium content in the soil samples ranged between 85 ppm to 284 ppm. Maximum sodium was found to be 85 (Vegetables) and minimum was found to be 284 (Soya been).

Discussion and Conclusion

According to the physico-chemical, characteristics of salt affected soil collected from Takerkeda shambhu, indicated moderate salinity. The soil is alkaline in nature with pH ranges from 7.9 to 8.37. The EC of the soil is found to be 0.38 to 0.44 m mho cm^{-1}which indicate soluble salt in the studied soil samples. Organic carbon ranges from 0.81 % to 1.23%, however low status of organic carbon was noticed in the part of the study area. The available phosphorus in the soil is in low category. However, higher content of K was observed in the soil. The high values of K in the soils are attributed to release of K from clays under high pH conditions besides the use of potassic fertilizers.

Laboratory analysis

It is recommended that farmer should avoid over irrigation, stop using chemical fertilizer, use drip irrigation system and apply biological fertilizers.

From the result this study concludes that majority (70.00%) of the farmer have medium level of knowledge with low level of adoption (79.07%) regarding all selected land care technique for Purna Valley. Major constraints faced by the farmers were unavailability of gypsum, unavailability of soil testing lab at nearby places and lack of knowledge about the important of micronutrients in study area.

The government should enhance the Gypsum availability to the farmers and create more soil testing facilities in Purna valley. Development and implementation of adaptation policies and taking initiatives for mitigation measures are the right ways to respond to salinity level rise impacts. More research is indispensable to find solutions over potential problems, in practice and to develop salinity to learnt species for agriculture and fisheries sectors.

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