SOIL RECLAMATION USING TANK SILT,VERMICOMPOST AND NEEM COMPOST AMENDED THERI SOIL IN TUTICORIN DISTRICT

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Abstract

A special type of Red sandy dunal soil [Theri-soil] of Tamil Nadu is called Theri-soilsTheri-soils. (Theri-soil) are located in Tuticorin, Tirunelveli and Kanyakumari districts of Tamil Nadu. The Merits of Theri lands are deep sand zone, good permeability and quality ground water. The Demerits of Their lands are un suitable for agriculture, the surface of the soil is not plane, higher level of soil erosion, sand dunes, from the top to the bottom only sand , low nutrients and minerals and Low water holding capacity. Tank Silt,Vermicompost and neem compost are the materials used for the amendment of the Theri soils selected for the study to improve the fertility constraints of the soil. Measurements were made on the physico chemical and physical properties such as pH, EC, Particle density , Bulk density, Porosity, Water holding capacity, Organic carbon content , and Hydraulic conductivity . To convert this soil into a cultivable land, attempts were made to improve the soil moisture characteristics of the of the soil using soil amendment.

Key words: *Theri soils,Tank Silt Vermicompost. Neemcompost*

Introduction

. *Theri-soil* occupy about 20,000 hectares in Tuticorin, Tirunelveli and Kanyakumari districts. . Tuticorin district has the highest area 11,200 ha.Theri (mettu) lands are deep land zones**.** About 20,000 hectares of Theri-lands are left unused in the aforesaid three districts.These are considered to be unsuitable for continuous irrigation.The mean annual rainfall of the area is between 610 to700mm.(Jawahar et al.,1999 a).

Fertility capability classification indicated that these are not suitable for agriculture but can easily be brought to use through appropriate soil management technologies and conservation. (Janakiraman et al., 1997)

The organic wastes and residues offer the best possible means of restoring the productivity of severely eroded agricultural soils or of reclaiming marginal soils. The proper use of organic amendments is utmost important in maintaining the soil moisture level and hence the fertility and the productivity of the soils and in minimizing the wind and water erosion. . The desired increase of water holding capacity will improve the ability to supply nutrients to the soil.Nowadays,the cultivable lands are gradually becoming the sites for constructing houses and industries. Due to the emergence of population, we need more cultivable lands. Bringing Theri soils to cultivation will add to the development of the economy of the country. Reclamation of soils without environmental pollution is the urgent need of the hour.

Materials and methods

This study was undertaken in parts of Tuticorin district located in Tamilnadu which lies between 73° 1'and 73° 4'E longitude and 8°33'and 8°28'N latitude. The study area has semi-arid tropical climate. The average

annual rainfall is 630mm. The material used is *theri*-soil collected from an area of the village called Sawyerpuram that is 26 Km in the west from Tiruchendur in Tuticorin district of Tamil Nadu. The soil samples were taken from the top surface of the soil to a depth of 15 cm. Tank Silt,Vermicompost and Neemcompost in equal proportions were used in the study . For amendments, tank silts of nearby tanks were collected, dried and powdered and used. Before using them, all the powdered tank silt particles were passed through 2mm sieve for ensuring uniformity in size.Vermicompost and Neemcompost were prepared according to the advice given by the Agriculture department. Let T be *theri*-soil. Ten different combinations viz : T+ 5% of Amendment, T+ 10% of Amendment, T+ 15% of Amendment, T+ 20% of Amendment, T+ 25% of Amendment, T+ 30% of Amendment, T+ 35% of Amendment, T+ 40% of Amendment, T+ 45% of Amendment, T+ 50% of Amendment on volume basis were made. The different combinations were thoroughly ameliorated mechanically before use. For example, in T+10% of amendment, 450 cc of amendment was mixed with 4500 cc of T. The volume of the soil is fixed. The different combinations of amendments were thoroughly mixed mechanically before use. Each treatment (combination) was replicated five times in pots to minimize error. The mixtures were subjected to sustainable wetting with water and allowed to settle for a period of 60 days without allowing them to get dried. After this incubation period, the mixtures were removed from the pots and once again dried and powdered. For each replication, measurements were made on the physico chemical and physical properties such as pH, EC (dSm^{-1}), Particle density (g/cm^3), Bulk density (g/cm^3), Porosity (%), Water holding capacity (%), Organic carbon content (%), and Hydraulic conductivity (mm/hr).(Piper,1966)

To study the cause and effect of the various parameters measured, simple regression equations were tried. Simple regression analysis shows that the variations in the properties of Tank Silt,Vermicompost and Neem Compost amended theri soil can be best represented by the linear model,

$$Y= a+ b x$$

pH

It is observed from the correlation table that pH has positive association with Bulk density (0.9172), Electrical conductivity (0.9139),Hydraulic conductivity (0.8364) and Particle density (0.8755) and negative association with Organic carbon (0.8877), Porosity (0.9615) and Water holding capacity (0.8914).
The best equation selected is

y = 8.1547 -0.0125**x ; R2 = 0.815**

Electrical conductivity (EC)

The correlation table reveals that the Electrical conductivity has positive association with bulk density (0.9983), Hydraulic conductivity (0.9192), Particle density (0.9912) and pH (0.9139) and negative association with Organic carbon (0.9970), Porosity (0.9842) and water holding capacity (0.9971). The best equation in the case of Electrical conductivity is

Y = 0.8507 - 0.0128**x; R2 = 0.995**.

Particle density

The correlation table reveals that the particle density is positivelyrelated to bulk density (0.9909), Electrical conductivity (0.9912), Hydraulic conductivity (0.9087) and pH (0.8755) and negatively associated with organic carbon (0.9934), Porosity (0.9685) and water holding capacity (0.9958).
The fitted equation is
y = 2.7413 - 0.0065**x ; R2 = 0.998**.

Bulk density

From the correlation table, we observe that the bulk density ispositively related to Electronic conductivity (0.9983), Hydraulic conductivity (0.9238), Particle density (0.9909) and pH (0.9172) and negatively related to Organic Carbon (0.9963), Porosity (0.9864) and Water holding capacity
(0.9976).

In the case of Bulk density, the fitted best equation along with the R-Square values and the significance of the coefficients is:

Y=1.8520 - 0.0112**x; R2 = 0.998**

Porosity

The porosity of the soil has got positive association with Organic carbon (0.9733) and Water holding capacity (0.9751) and negative association with Electrical conductivity (0.9842), Bulk density (0.9864), Hydraulic conductivity (0.9137), Particle density (0.9685) and pH(0.9615).
The best equation fitted in this case is
y= 38.3933 + 0.1755**x ; R2 = 0.961**

Water holding capacity

The correlation table reveals that the water holding capacity has negative association with Bulk density (0.9976), Electrical conductivity (0.9971), Hydraulic conductivity (0.9240), Particle density (0.9958) and pH (0.8914) and positive association with Organic carbon (0.9987), and Porosity (0.9751).
The best equation fitted in this case is
y = 28.3267 + 0.3310**x ; R2 = 0.999**

Organic carbon

The organic carbon has negative association with bulk density (0.9963), Electrical conductivity (0.9970), Hydraulic conductivity (0.9288) particle density (0.9934) and pH (0.8877) and positive association with porosity(0.9733) and water holding capacity (0.9987)
The best equation fitted is
y = 0.1173 + 0.0296**x ; R2 = 0.997**

Hydraulic conductivity

Hydraulic conductivity is another important factor deciding plant growth in soil. This has negative association with organic carbon (0.9288), porosity (0.9137) and water holding capacity (0.9240) and positive
association with Electrical conductivity (0.9192), bulk density (0.9238),
pH (0.8364) and particle density (0.9087).
The best fitted equation is
y = 152.373 – 1.9899**x ; R2 = 0.858**

TABLE
Theri Soil +Tank silt +Vermicompost+Neem compost (T+S+V+N)

Percentage	pH	EC dSm^{-1}	Particle Density g/cm^3	Bulk Density g/cm^3	Porosity (%)	Water holding capacity (%)	Organic Carbon (%)	Hydraulic conductivity (mm/hr)
5	8.30	0.80	2.70	1.81	38.00	30.30	0.30	143.0
10	8.00	0.72	2.67	1.74	40.80	31.50	0.41	130.8
15	7.85	0.65	2.65	1.67	41.50	33.20	0.56	120.6
20	7.83	0.57	2.62	1.62	42.30	35.00	0.70	110.9
25	7.80	0.55	2.58	1.57	43.00	36.50	0.80	110.0
30	7.74	0.46	2.56	1.52	43.70	38.00	1.02	100.2
35	7.70	0.40	2.50	1.47	44.40	40.00	1.14	90.3
40	7.67	0.35	2.49	1.41	45.40	41.50	1.31	40.1
45	7.62	0.28	2.46	1.35	46.00	43.20	1.44	70.2
50	7.60	0.20	2.40	1.29	47.10	45.10	1.62	60.4

CORRELATION TABLE 4.7.1-(T+S+V+N)

	Bulk Density	EC	Hydraulic Conductivity	Organic Carbon	Particle density	pH	Porosity	Water holding Capacity
Bulk Density	1.0000	0.9983	0.9238	-0.9963	0.9909	0.9172	-0.9864	-0.9976
EC	0.9983	1.0000	0.9192	-0.9970	0.9912	0.9139	-0.9842	-0.9971
Hydraulic Conductivity	0.9238	0.9192	1.0000	-0.9288	0.9087	0.8364	-0.9137	-0.9240
Organic Carbon	-0.9963	-0.9970	-0.9288	1.0000	-0.9934	-0.8877	0.9733	0.9987
Particle density	0.9909	0.9912	0.9087	-0.9934	1.0000	0.8755	-0.9685	-0.9958
pH	0.9172	0.9139	0.8364	-0.8877	0.8755	1.0000	-0.9615	-0.8914
Porosity	-0.9864	-0.9842	-0.9137	0.9733	-0.9685	-0.9615	1.0000	0.9751
Water holding Capacity	-0.9976	-0.9971	-0.9240	0.9987	-0.9958	-0.8914	0.9751	1.0000

Results and Discussion

Addition of the amendment with Theri soil decreases the bulk density, particle density, pH, Electrical conductivity and hydraulic
conductivity but increases the Porosity, Water holding capacity and organic carbon. In this study, the convenient root growth condition for the plants is achieved for T + 20%, T + 25%, T + 30% and T + 35%
treatments. In all the treatments porosity value ranges from 38% to47.1%. The value of pH for all amendments is favorable for cultivation purpose. The major soil physical constraints identified are low water
retention and high permeability. The desired increase of water holding capacity will improve the ability to supply the nutrients to soil. The hydraulic conductivity is considerably controlled from very rapid stage to moderately rapid stage. Here in all the treatments, water holding capacity
increased and attained the maximum value of 45 % cent and the hydraulic conductivity reduced to the minimum value of 60 mm/hr. T + 20%, T +25%, T + 30% and T + 35% combinations were better than the other
combinations for the purpose of cultivation. Increase of organic Carbon improves the growth condition of the crops. Giving more importance to the major soil physical constraints namely the root growth, the water retention and the permeability,
T + 35% amendment treatment could be predicted as the best among all the treatments

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