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RESEARCH ARTICLE

SOIL FERTILITY STATUS OF FIVE MAJOR MULBERRY CULTIVATED DISTRICTS IN TAMIL NADU

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Abstract

The available nutrient status of surface layer (0-30 cm) soils of mulberry gardens of Erode, Krishnagiri, Namakkal, Dharmapuri and Salem districts of Tamil Nadu were evaluated. Samples were collected and analyzed for 12 chemical properties. Of the 1250 soil samples tested, 100 % fell under the alkaline pH category (>8.2) and normal in Electical Conductivity (0.125 - 0.273mmhos/cm). Organic carbon content was low in 80 % of the soils (<0.5 %) and 20 % fell under a high range (>1.0 %). 80% and 20% of the samples were found moderately high (270-550 kg/ha) and high (>550 kg/ha) in available nitrogen. Available phosphorus (P_2O_5) were low (<22 kg P_2O_5 / ha.) in 40 % and medium (22-55 kg P_2O_5 /ha.) in 60 % of the samples. Similarly, available potassium (K_2O) content was moderately high in 60 % (240-300 kg K_2O/ha.) and high in 40 % (> 300 kg K_2O/ha) of the samples. Available sulphur were low (< 10ppm) in 20 % and medium (>15 ppm) in 80 % of the samples. While DTPA extractable micronutrients were found in low to sufficient category such as Mn low in 40% (<4ppm) and sufficient in 60% (>4ppm) of the soil samples, B found low in 80% (<0.5ppm) and sufficient in 20% (> 0.5-1.0ppm) of the samples. 60% and 40% of the samples found as sufficient (> 2.5 ppm) to low in Fe (< 2.5 ppm). 100 % of the soil samples deficient (< 2.0 ppm) and sufficient (> 0.2 ppm) in available Zn and Cu content in five major mulberry cultivated districts of Tamil Nadu. Hence, maintenance of optimum level of organic carbon content in the soil through application of optimum quantities of organic manures is recommended. Use of S containing fertilizers and FYM, green manuring is suggested to reduce the pH.

Introduction:-

In India total area of agriculture crop cultivated around 82.6 million hectares (215.6 million acres) in that Tamil Nadu 48.92 lakh hectares used for agriculture. Whereas Tamilnadu is the second large producer of silk cocoon followed by Karnataka, mulberry cultivated around 46,570.25 acres in Tamil Nadu. Soil fertility management is one of the major factor in production of sustainable level of crop, it also defined as the ability of soil to provide all the essential plant nutrients in available form, in right quantity and time. Soil fertility is determined by the presence or absence of nutrients i.e., macro and micro nutrients. Out of 16 nutrients macronutrients are required in medium to large quantity (Rajkumar *et al*., 1996) whereas micronutrients as trace amount (mg/kg) for plant growth and it

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plays important role in enzymatic system of plants. Whenever micronutrients are deficient abnormal growth of plant, sometimes it causes complete failure of crop plants. Availability of micronutrients is sensitive to change in soil environment and it is correlated with soil pH, lime, organic matter content etc. (Sheeja *et al*., 1994). Soil erosion is a serious problem, currently there is widespread interest in developing sustainable sericulture that less dependent on external inputs. If a soil is deficient in any nutrient it exhibits its deficiency symptoms and so it is essential that the crop plants should be fed with all nutrients (Rana *et al*., 2014). These observations are of special significance since mulberry leaves are the sole food of silkworm *Bombyx mori L.* and the stability of silkworm crop greatly depends on the quality of mulberry leaves (Aruga, 1994; Subbaswamy *et al*., 2001). The present study was taken up with an objective to assess the available macro and micronutrients status in mulberry garden soil of 5 major districts of Tamil Nadu.

Materials and Methods:-

The study was conducted during 2017-2018 at Regional Sericultural Research Station, Salem. Soil samples collected in five major mulberry cultivated districts of Tamil Nadu viz., Erode, Krishnagiri, Namakkal, Dharmapuri and Salem, 250 samples were collected per district covering tota of 1250 samples. The samples were analyzed for 12 chemical properties viz., pH and EC analyzed in 1:25 ratio (soil: water) by Jackson (1978) method. Organic carbon estimated by titration method (Walkley and Black, 1934), Nitrogen content was analyzed by Kjeldahl's method (Kjeldahl, 1983), Phosphorous by Olsen method (Olsen *et al*., 1954), Potassium by Flame photometer method (Jackson, 1973), Sulphur by Black (1965) turbidometric method at 440 nm and micronutrients such as Zn, Cu, Mn, Fe were analyzed by Atomic Absorption Spectrophotometer -DTPA (Diethylene triamine penta acetic acid) extract method (Lindsay and Norwell, 1978), Boron analyzed by Azomethine-H reagent method (John *et al*., 1975). The data were analyzed using One-way analysis (ANOVA).

Results and Discussion:-

Based on the available nutrients in five district of Tamil Nadu, the soil samples were categorized into low, medium and high as recommended by CSR & TI, Mysuru for sustainable mulberry cultivation.

Soil fertility status in Erode district:

The results of soil analysis revealed that majority of the soils from Erode district recorded alkaline in pH (8.20-8.35), neutral in salinity (< 1.0 mmohs/cm), high in organic carbon (> 1.0 %), high in available nitrogen (> 550 kg/ha) low in available phosphorus (< 22 kg P_2O_5/ha), high in available potassium (> 300 kg k2O /ha) and sufficient in available sulphur (> 15 ppm) contents. DTPA-extractable micronutrients were found deficient in Zn, B (< 2.0 and < 0.5 ppm) and sufficient in Fe, Mn and Cu (> 2.5, > 4 and > 0.2 ppm). Zn deficiency is a widespread micronutrient disorder in different agro-climatic regions of the world and maximum accumulation of these metals Fe, Mn and Cu was observed in zinc deficient soils. This result is in conformity with the observation of Chitdeshwari *et al*., 2019; Chitra, 2020).

Soil fertility status in Krishnagiri district:

The results of soil analysis revealed that majority of the soil from Krishnagiri district recorded moderately high in pH (8.02), neutral in salinity (< 1.0 mmohs/cm), low in organic carbon (< 0.5 %), moderately high in available nitrogen (300-550 kg/ha), medium in available phosphorus (22-55 kg P_2O_5/ha), moderately high in available potassium (240-300 kg k_2O /ha) and sufficient in available sulphur (>15 ppm) contents. DTPA-extractable micronutrients were found deficient in Zn, B (< 2.0 and < 0.5 ppm) and sufficient in Fe, Mn and Cu (> 2.5, > 4 and > 0.2 ppm). Maximum accumulation of these metals (Fe, Mn and Cu) was observed in zinc deficient soils. This results are in accordance with the findings of Maragatham *et al*., 2014; Chitdeshwari *et al*., 2019).

Soil fertility status in Dharmapuri district:

The results of soil analysis revealed that majority of the soils from Dharmapuri district recorded alkaline in soil reaction (8.26 pH), neutral in electrical conductivity (< 1.0 mmohs/cm), low in organic carbon (< 0.5 %), moderately high in available nitrogen (300-550 kg/ha), low in available phosphorus (< 22 kgP_2O_5/ha), high in available potassium (> 300 kg k2O /ha) and sufficient in available sulphur (> 15 ppm) contents. DTPA-extractable micronutrients were found deficient in Zn, Fe (< 2.0 and < 2.5 ppm) and sufficient in Mn, Cu and medium in B (> 4, > 0.2 and 0.5-1.0 ppm). This result is in conformity with the observation of earlier workers Maragatham *et al*., 2014; Jegadeeswari *et al*., 2017; Chitdeshwari *et al*., 2019).

Soil fertility status in Salem district:

The results of soil analysis revealed that majority of the soils from Salem district recorded alkaline in soil reaction (> 8.2), neutral in salinity (< 1.0 mmohs/cm), medium in organic carbon (> 0.5 %), moderately high in available nitrogen (300-550 kg/ha), medium in available phosphorus (22-55 kg P_2O_5/ha), moderately high in available potassium (240-300 kg k_2O /ha) and deficient in available sulphur (<10 ppm) contents. DTPA-extractable micronutrients were found deficient in Zn, B and Mn (< 2.0, < 0.5 and < 4.0 ppm) and sufficient in Fe, and Cu (> 2.5 and > 0.2 ppm) which are in conformity with the observations of Jegadeeswari.*et al.*, 2017; Maragatham *et al*., 2014; Chitdeshwari *et al*., 2019.

Soil fertility status in Namakkal district:

The results of soil analysis revealed that majority of the soils from Pennagaram district recorded alkaline in soil reaction (> 8.2), neutral in salinity (< 1.0 mmohs/cm), medium in organic carbon (> 0.5 %), moderately high in available nitrogen (300-550 kg/ha), medium in available phosphorus (22-55 kg P_2O_5/ha), moderately high in available potassium (240-300 kg k_2O /ha) and sufficient in available sulphur (> 10 ppm) contents. DTPA-extractable micronutrients were found deficient in Zn (< 2.0ppm), B (< 0.5 ppm), Fe (< 2.5ppm) and Mn (< 4.0 ppm) and sufficient in Cu (> 0.2 ppm). These results are in corroboration with the findings of earlier workers Maragatham *et al*., 2014; Chitdeshwari *et al*., 2019.

Micronutrients are required in traces for plant growth and they play a vital role in enzymatic activity of plant. Organic carbon showed positive correlation with N, Fe, Cu and negative correlation with pH, EC, P, K, S, B, Zn and Mn. Moderately alkaline soil i.e., pH above 7.5 showed negative correlation with S, Zn and Mn whereas, potash showed positive correlation with B and S but negative correlation with P, Cu and Organic carbon.

In the present study most of the soils are red in colour and alkaline in nature and normal in electrical conductivity, low in Organic carbon (80%) of the samples. 80% and 20% of the samples were found moderately high and high in Available nitrogen. Available phosphorus ranged from low (40 %) to medium (60%) status (Prabhuraj *et al*., 2000). Similarly, available potassium content was moderately high in 60 % and high in 40 % of the samples. Available sulphur was low in 20 % and medium in 80 % of the samples. This result is in accordance with the findings Tandon, 1992; Thimmareddy *et al*., 1999; Shruti *et al*., 2017 and Sudhakar *et al*., 2018 & 2019 in mulberry growing soil of Karnataka. While DTPA extractable micronutrients were found in low to sufficient category such as Mn low in (40%) to sufficient in (60%) of the soil samples (Prameena sheeja, 2015), B found low in (80%) and sufficient in (20%) of the samples. 60% and 40% of the samples found as sufficient and low in Fe. 100 % of the soil samples deficient and sufficient in available Zn and Cu content in five major mulberry cultivated district of Tamil Nadu.

Parameters	Erode	Krishnagiri	Dharmapuri	Salem	Namakkal
pH	8.34 ± 0.25	8.02 ± 0.52	8.26± 0.61	8.40 ± 0.43	8.28 ± 0.59
EC (millimohs/cm)	0.186 ± 0.18	0.125 ± 0.09	0.79 ± 0.67	0.217 ± 0.14	0.273 ± 0.25
OC (%)	1.56 ± 1.39	0.48 ± 0.27	0.43 ± 0.18	0.58 ± 0.30	0.53 ± 0.31
N (kg/ha)	782.22±667.86	431.28±284.23	370.23 ± 301.00	499.38 ± 336.77	456.33±280.64
P (kg/ha)	17.17± 14.09	26.82 ± 21.19	12.20 ± 8.56	31.52 ± 10.72	32.06 ± 16.42
K (kg/ha)	392.45 ± 250.31	258.04 ± 182.71	476.67 ± 394.41	263.78 ± 220.84	282.24 ± 234.12
S (ppm)	45.68 ±42.00	25.98 ± 21.83	47.31 ± 45.09	9.86 ± 4.68	10.23 ± 4.55
Zn (ppm)	0.68 ± 0.57	1.23 ± 1.14	0.71 ± 0.68	0.40 ± 0.37	0.53 ± 0.52
B (ppm)	0.35 ± 0.28	0.39 ± 0.33	0.58 ± 0.48	0.33 ± 0.24	0.21 ± 0.16
Fe (ppm)	3.46 ± 2.87	3.06 ± 2.56	1.86 ± 0.70	2.50 ± 1.96	1.34 ± 1.11
Mn (ppm)	8.68 ± 3.89	8.76 ±5.10	5.66 ± 3.54	2.19 ± 2.07	2.39 ±2.12
Cu (ppm)	1.41 ± 0.71	1.29 ± 0.71	0.88 ± 0.46	1.26 ± 0.82	1.33 ±0.69
SE ±m	8.57	5.78	11.41	6.33	8.24

Conclusion:-

Thus the compilation of soil test results showed that majority of the mulberry growing areas of Tamil Nadu were optimal for mulberry growth. Moderately alkaline to alkaline in soil reaction and neutral in electrical conductivity. Low in Organic carbon moderately high and high in available nitrogen and potash. low to medium in available

phosphorus and sulphur. Similarly DTPA extractable micronutrients viz., Mn, B and Fe were found in low category whereas Zn and Cu content were in sufficient category in all the five major mulberry cultivated districts of Tamil Nadu. Therefore, maintenance of optimum level of organic carbon content in the soil through application of optimum quantities of organic manures is recommended. Use of S containing fertilizers is suggested to reduce the pH. Manage the soil fertility by soil test once in two years and soil health card scheme.

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