Effect of Potassium Applications to Tung Trees on the Exchangeable Cation Content of Red Bay Fine Sandy Loam

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Abstract

Analyses were made for exchangeable potassium, magnesium, and calcium, exchange capacity, and organic matter in the soil at depths of 0 to 6, 6 to 12, and 12 to 18 inches, on samples taken in August, 1942, before treatments were applied and again in August, 1946, after four annual soil applications of different levels and sources of potassium.

The data show a decrease in exchangeable K in the surface soil from 0.15 to 0.08 m.e. per 100 grams in the check treatment (0.28 pound K₂O per tree per year). The annual application of 0.66 pound K₂O, however, increased the exchangeable K content of the soil from about 0.10 m.e. per 100 grams to about 0.20 m.e. to a depth of 12 inches, and 1.32 pounds K₂O applied yearly trebled the exchangeable K content to a depth of 12 inches. This latter amount of applied K₂O also increased the K content in the 12- to 18-inch layer from 0.1 to 0.25 m.e. per 100 grams. Vetch mulch failed to increase the exchangeable K content of the soil, while crotalaria mulch increased the exchangeable K content somewhat in the lower layers but decreased that of the 0- to 6-inch layer.

There was a statistically significant positive correlation between the exchangeable K content in the 0- to 6-inch layer and the K content of the leaves (1945 sampling) when the two mulch treatments were excluded. When these two treatments were included the correlation coefficient was not quite significant at the .05 level.

The mulch treatments increased the exchangeable Mg content of the 0- to 6-inch layer from 0.30 m.e. to 0.70 m.e. per 100 grams, all other treatments causing a decrease. The higher K treatments decreased the exchangeable Mg content more than the lower K treatments.

Exchangeable calcium was increased in the 0- to 6-inch layer under all treatments, but generally decreased at the lower depths.

There was a general increase in organic matter under all treatments, and consequently of the exchange capacity.

The total potassium in this soil varied from 1.3 to 3.0 m.e. per 100 grams, which is very low though more than 10 times as much as the exchangeable K.

Extractions with 0.5 N HCl failed to extract other than the exchangeable K, indicating that either this method as recommended by Attoe and Truog failed to extract the moderately available nonexchangeable K or else the exchangeable K is the only fraction available. Strong HCl acid extractions at elevated temperatures released about one-third to one-fourth of the total K present in the soil.

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3 The complete paper will be published in the Journal of the American Society of Agronomy.