FOREST SOIL FERTILITY STUDIES

by

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Chemical Characteristics

In a chemical study made of DeKalb and Upshaw forest soil profiles from Pennsylvania and of Olympic and Aiken soil profiles from the Oregon State College, or “Peavy Arboretum”, it appears (1) that the organic matter extends deeper in the western Oregon profiles and nitrogen carries down with it the maximum nitrogen content in each of the forest soil profiles is approximately at the F-H boundary zone. (2) Base exchange capacity also reaches a maximum at about this zone, where the major part of the colloidal material is organic and intimately mixed with minor amount of inorganic soil colloids. (3) DeKalb soil seems more aged and lower in base exchange capacity than the others.

Nitrate Supplying Power

A study made of nitrate supplying power of organic materials from two Oregon soil profiles made by adding sufficient material from each horizon to supply one and one-half grams of nitrogen in 3800 grams of quartz sand, using growth of oats as an indicator, indicates maximum nitrogen supplying power in the H or HS layer as judged by dry matter yield and nitrogen content therein.

A parallel series of fallow jars similarly prepared and leached each two weeks for two months yielded similar relative amounts of nitrate. Liming appears to have increased the yield of nitrate slightly.

Fertilizer Requirements Of Forest Soils

Nitrate need of fir seedlings grown on Aiken silty clay loam was further tested in beds 100 by 25 by 25 centimeters on each of which 21 year fir seedlings were grown. Two checks was added at rates of 8, 16, 32, 64, 128, and 256 p.p.m. nitrogen, also 32 p.p.m. in the forms of ammonium sulfate, bloodmeat and forest litter. Increase in diameter, height and weight of Douglas fir seedlings indicate 64 p.p.m. nitrogen gave maximum growth. The heaviest application was excessive. Organic forms of nitrogen appear very suitable. A pupil, H. J. Stewart, cooperated in this test.

In a triangle fertilizer experiment with holly seedlings, potassium sulfate yielded a maximum increase in height on Newberg fine sandy loam. Mr. Robert Brown, a student, cooperated in this experiment.

A fertilizer experiment with Douglas fir seedlings conducted on Olympic silty clay loam at the College Arboretum nursery in 1932 and 1933 indicates that well decayed nitrogenous organic matter, or conifer litter and nitrate are more effective in inducing growth than chemicals supplying phosphorus and potassium.

Microbial Characteristics

Numbers of bacteria, actinomycetes, and molds were most abundant in the F and H layers, generally being slightly more numerous in the former.

DeKalb horizons gave unusual results in that molds exceeded bacteria in both F and H horizons and actinomycetes were found only in the litter. The Olympic seriges gave much higher counts of bacteria and actinomycetes than did Aiken horizons, although the numbers of molds were similar in both. In general, bacteria were twice as numerous as actinomycetes while molds, as determined separately on an acid medium, made up from one to five per cent of the total.