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ABSTRACT

Soil samples from the 0-10-cm and 10-20-cm depths were obtained from nine of the 11 soil associations of Arkansas. Sites sampled had a heavy forest cover and showed no evidence of cultivation. Routine soil tests showed that pH values ranged from a low of 4.38 for the Loessial Hills to 5.83 in the Ozark Highlands. Potassium ranged from 69 to 206 kg/ha. Phosphorus was very low in nearly all sites; the extremes were 9 and 83 kg/ha, but most values were less than 30 kg/ha. Calcium ranged from 122 to 1,523 kg/ha. The data indicate that when woodland areas are cleared for cultivation in these nine soil association areas, the soil fertility level will be low.

Large trees commonly are thought to be indicative of a fairly high soil fertility level. A study was undertaken to determine some of the extractible nutrients and the pH values in wooded areas with large trees in nine of the soil associations in Arkansas.

METHODS AND MATERIALS

Site selection was accomplished by using the generalized soils map of Arkansas (SCS, 1967) which gives the boundaries of the soil association groups. After determining which Arkansas counties are included in each of the nine different soil associations, the writers selected physical sites for sampling. Each site selected was in native vegetation and showed no evidence of cutting or cultivation. It also was of sufficient size that four different sampling areas of 83.6 m^2 could be obtained. Soil samples were taken randomly from the top 10 cm and the 10-20-cm zone of each area, labeled, and stored in plastic bags for transportation to the laboratory. Two or more different sampling sites were selected in each soil association area.

Soil sample preparation involved air drying and crushing to pass through a 10 mesh sieve to obtain a uniform size sample.

Soil pH values and extractible potassium, calcium, and phosphorus were determined according to the procedures described in the Southern Cooperative Series Bulletin No. 102 (Page, 1965). Soil pH values were determined by pH meter from a 1:1 soil-water dilution. Potassium and calcium were determined by extraction with neutral normal ammonium acetate with a shaking time of 5 min. After filtration the bases were determined by flame analysis.

Phosphorus was extracted by 0.03 normal ammonium fluoride in 0.025 normal hydrochloric acid with a shaking time of 0.67 min. The filtrate was treated with ammonium molybdate and 1,2,4-aminonaphthol sulfonic acid, and the blue color developed was read in a colorimeter.

The soil analysis values from each soil association were averaged and are given in Tables I-IV.

RESULTS AND DISCUSSION

Table I shows that all pH values were below 6.00. The highest pH value was 5.83 for the Ozark Mountain 0-10-cm sample and the lowest pH value was 4.38 in the Loessial Hills 10-20-cm sample.

Table I. Average of pH Values of Nine Arkansas Soil Associations

Soil Association	Surface Sample	Sub Sample
Loessial Hills	4.63	4.38
Bottomland	4.83	4.78
Loessial Terraces	4.58	4.63
Ozark Mountains	5.83	5.78
Ozark Highlands	4.90	5.00
Arkansas Valley	5.08	5.17
Boston Mountains	5.50	5.35
Ouachita Mountains	5.03	5.06
Coastal Plains	5.49	5.42

Table II. Average Potassium (Kg/Ha) for Nine Arkansas Soil Associations

Soil Association	Surface Sample	Sub Sample
Loessial Hills	148	93
Bottomland	123	74
Loessial Terraces	105	55
Ozark Mountains	206	162
Ozark Highlands	95	69
Arkansas Valley	170	126
Boston Mountains	186	132
Ouachita Mountains	196	117
Coastal Plains	106	132

Table III. Average Calcium (Kg/Ha) for Nine Arkansas Soil Associations

Soil Association	Surface Sample	Sub Sample
Loessial Hills	480	143
Bottomland	1320	1077
Loessial Terraces	644	307
Ozark Mountains	1523	1194
Ozark Highlands	272	122
Arkansas Valley	760	586
Boston Mountains	1273	721
Ouachita Mountains	1494	720
Coastal Plains	289	166

Table IV. Average Phosphorus (Kg/Ha) for Nine Arkansas Soil Associations

Soil Association	Surface Sample	Sub Sample
Loessial Hills	13	9
Bottomland	83	71
Loessial Terraces	27	17
Ozark Mountains	16	15
Ozark Highlands	16	26
Arkansas Valley	18	14
Boston Mountains	13	13
Ouachita Mountains	32	41
Coastal Plains	16	19

The amounts of extractible potassium ranged from a low of 55 kg/ha to a high of 206 kg/ha as shown in Table II. The Ozark Highlands had less than 100 kg/ha in both the 0-10-cm and 10-20-cm samples. All other soil association areas had more than 100 kg/ha of potassium in the 0-10-cm samples. Only one soil association area had more than 200 kg/ha, the Ozark Mountain area.

Extractible calcium, as shown in Table III, generally varied directly with the pH values for each soil association area. Areas with low pH values were also low in extractible calcium content. The 0-10-cm samples had the greatest amount of calcium. The lowest amount found was 272 kg/ha in the Ozark Highlands and the greatest amount was 1,523 kg/ha in the Ozark Mountains. The 10-20-cm samples were even lower in extractible calcium. The Ozark Highlands with only 122 kg/ha was low. The greatest amount found, 1,194 kg/ha, was in the Ozark Mountains.

Table IV gives the average kilograms per hectare of extractible phosphorus. One area, the Bottomlands, had 83 and 71 kg/ha of phosphorus in the 0-10-cm and 10-20-cm samples. The Ouachita Mountains association was also higher in phosphorus than most of the other soil associations; it contained 32 kg/ha in the 0-10-cm sample and 41 kg/ha in the 10-20-cm sample. The lowest value was 9 kg/ha in the 10-20-cm sample from the Loessial Hills; the Loessial Terrace 0-10-cm sample had 27 kg/ha.

SUMMARY

In the nine soil association area sampled, it was found that pH values and calcium, potassium, and phosphorus content were lower than those soil test values normally found in cultivated and improved grasslands soils in the same soil associations. The findings indicate that when woodland areas first are cleared in Arkansas the native soil fertility level will be low.

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