Soil Test Levels in Indiana in Relation to Plants to be Grown

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Introduction

Soil test summaries made by the Purdue University Soil Testing Laboratory and reported by Barber and Bronson (1,2) for 1952-1954, included average fertilizer rates of P_2O_5, and K_2O for corn by county and by soil group or region. In their soil test frequency distribution for 1962, Hood and Stivers (5) included N fertilizer recommendations for wheat (*Triticum aestivum* L.), and oats (*Avena sativa* L.) as well as for corn (*Zea mays* L.). In his 1970 soil test summary Hood (4) included soil sample data intended for use in growing corn, soybeans (*Glycine max* L.), forage crops, and hay or pasture in selected Indiana counties. In their 1972-1974 soil test summary, Hood and Stivers (6) separated samples for growing corn and/or soybeans from forage crops.

The specific purpose of this report is to determine from a group of selected crops, those having the highest percentages in either very high levels or in very low soil test levels of pH, available P, and available K.

Materials and Methods

The data used in this report are products of the public services of the Purdue University Plant and Soil Analysis Laboratory. Laboratory chemical procedures used were reported by McLean (8) for soil pH, by Knudsen (7) for Bray-1 P, and by Carson (3) for soluble and exchangeable K.

Crops to be grown following soil testing were the first ones listed on the information sheet accompanying the soil samples.

Statistical summaries of the soil test data by level of the test, by county, and by crop were prepared using a computer program written by Philip J. Hess. Five levels of soil pH, five levels of available P, and five levels of available and water soluble K were used.

The eight crops or plantings compared in this report were chosen because of the large numbers of samples of corn and soybeans or because of the large variation from the mean of the six remaining crops—turf, vegetable gardens, grass-legume seedings, grass-legume maintenance, ornamental plantings, and tobacco.

The three sampling period used for this study were April 17, 1979 through July 2, 1979; July 3, 1979 through July 1, 1980; and April 1, 1981 through June 26, 1981. There were 2,995 soil samples tested in the first period, 13,168 were tested in the second period, and 3,022 were tested in the third period.

Large variations among the three sampling periods with respect to percentages of samples found in the highest level of soil pH, the highest level of available P, and the highest level of available and water soluble K for areas intended to grow soybeans and/or tobacco were found. In addition, there were large variations among the three samplings periods in percentages of samples in the lowest level of P which were intended to maintain grasses and legumes. Therefore, the data for the three sampling periods were not combined so that these variations could be seen.

The summary for the 25 crops or plantings included, in addition to those listed above, the following crops or groups with the total number of samples tested for each as follows: miscellaneous, 481; wheat, 404; legume maintenance, 278; no recommendation requested, 263; grass maintenance, 218; oats, 113; grass seeding, 88; roses, 40; corn silage, 24; popcorn, 22; tomatoes (*Lycopersicon esclentum* L.) 22; wheat-soybeans double crop, 12; grain sorghum (*Sorghum biclor* L.), 10; sudan grass (*Sorghum sudanense* P.), 10; rye (*Secale cereale*), 5; barley (*Hordeum vulgare* L.), 4.

Results and Discussion

Numbers of soil samples tested for the eight crops or plantings compared in this study are given in Table 1. The 7,178 soil samples tested for corn was greater in number than those of any other crop or planting. The 17,091 samples tested for these eight crops were 89.1% of the 19,185 samples tested for all 25 crops.

TABLE 1. *Crop or planting to be grown and numbers of samples tested in three sampling periods of 1979-1981*

Crop or planting	No. of samples	Percent of all samples	Crop or planting	No. of samples	Percent of all samples
Corn	7,178	37.4	Grass-legume maintenance	1,054	5.5
Soybeans	2,607	13.6	Ornamental plantings	276	1.4
Turf	2,168	11.3	Tobacco	143	0.8
Vegetable garden	1,859	9.7	All others	2,094	10.9
Grass-legume seedings	1,806	9.4	All 25 crops or plantings	19,185	100.0

Differences in soil pH in relation to crops to be grown are given in Table 2. In all sampling periods percentages of soil samples with a pH of 6.6 or higher were greater for turf, vegetable gardens, and ornamental plantings than for corn, soybeans, tobacco, grass-legume seedings, or grass-legume maintenance crops. Information given on turf, garden, and landscape information sheets indicated that many producers, particularly of vegetable gardens, applied limestone without having test information indicating that the limestone was needed. Also, lawns, golf greens, and ornamental plantings are often sprinkler irrigated with hard water which makes the soil more alkaline.

Percentages of soil samples at the lowest end of the soil pH range, 0-4.7, were very small. They were greatest for tobacco (2.4%) and for ornamental plantings

TABLE 2. *Percent of samples having a soil pH of 6.6 or higher classified by crop to be grown and sampling period*

Crop or planting	4/17/1979 to 7/2/1979	7/3/1979 to 7/1/1980	4/1/1981 to 6/26/1981
	%		
Corn	26.6	41.8	29.4
Soybeans	22.7	42.3	33.6
Turf	79.4	78.6	75.5
Vegetable gardens	74.2	75.8	73.9
Grass-legume seedings	39.0	44.2	34.0
Grass-legume maintenance	49.1	57.1	39.3
Ornamental plantings	67.5	79.6	76.0
Tobacco	52.9	29.4	31.7
All 25 Crops or plantings	38.2	50.3	44.8

(2.0%) in the last sampling periods. For all other crops percentages were lower than 2.0 in all sampling periods. Corn which was in this group, was more uniform that other crops, that is in percentages among the three sampling periods.

Crops having a high percentage of soil P tests > 70 pp2m of P (considered very high) included tobacco and vegetable gardens (Table 3). Turf and ornamental plantings were higher than the average of all 25 crops but lower than tobacco and vegetable gardens. Information sheets received in the laboratory with the soil samples indicated that application of chemical fertilizers generally had been generous. Tobacco and vegetable gardens are frequently heavily fertilized because they are high value crops. Generous amounts of chemical fertilizer also had been applied to turf and ornamental plantings, apparently to improve growth and appearance.

TABLE 3. *Percent of samples having a phosphorus test greater than 70 pp2m of P classified by crop to be grown and sampling period*

Crop or planting	4/17/1979 to 7/2/1979	7/3/1979 to 7/1/1980	4/1/1981 to 6/26/1981
	%		
Corn	44.5	35.2	35.3
Soybeans	34.3	29.8	26.9
Turf	50.2	53.5	44.2
Vegetable gardens	73.8	70.9	66.3
Grass-legume seedings	23.9	13.6	23.1
Grass-legume maintenance	24.2	12.0	15.4
Ornamental plantings	60.0	52.7	56.0
Tobacco	64.7	61.2	80.5
All 25 Crops or plantings	41.0	37.6	39.8

Crops having the most soil samples with very low P tests, (0-10 pp2m of available P) were grass-legume seedings and grass-legume maintenance (Table 4). Grass-legume maintenance samples had 29.9 to 47.8% in the very low P level, while 25.9 to 37.4% of soil samples for grass-legume seedings were in this very low P level. For the other six crops listed in Table 1, the highest percentage of samples in this very low level was 13.4, and the lowest was 2.4. Some probable reasons for these low P tests for grass-legume seedings and for grass-legume maintenance have been given in the information sheets accompanying the soil samples. They

TABLE 4. *Percent of samples having a phosphorus test of 0-10 pp2m of P classified by crop to be grown and sampling period*

Crop or planting	4/17/1979 to 7/2/1979	7/3/1979 to 7/1/1980	4/1/1981 to 6/26/1981
	%		
Corn	5.0	8.0	10.2
Soybeans	3.1	5.8	4.8
Turf	12.3	7.2	5.1
Vegetable gardens	3.6	5.3	3.6
Grass-legume seedings	33.9	37.4	25.9
Grass-legume maintenance	47.8	41.2	29.9
Ornamental plantings	12.5	13.4	4.0
Tobacco	11.8	2.4	2.4
All 25 Crops or plantings	13.5	12.6	9.8

were (1) prior to these soil tests this land had been in pasture where little commercial fertilizer or limestone had been applied or, (2) the land had been recently cleared from woods, or (3) the land had not been farmed for many years prior to making the grass-legume seeding.

Crops having the highest percentages of soil samples with K tests greater than 300 pp2m (classed as very high) in K were vegetable gardens and tobacco (Table 5). Ornamental plantings were not as high as expected, although the trend seemed to be higher in each succeding sampling period.

TABLE 5. *Percent of samples having a potassium test greater than 300 pp2m of K classified by crop to be grown and sampling period*

Crop or planting	4/17/1979 to 7/2/1979	7/3/1979 to 7/1/1980	4/1/1981 to 6/26/1981
	%		
Corn	28.4	20.8	21.3
Soybeans	28.1	11.0	14.1
Turf	20.9	24.5	16.4
Vegetable gardens	50.8	51.4	54.9
Grass-legume seedings	14.0	13.5	15.6
Grass-legume maintenance	18.0	15.2	22.2
Ornamental plantings	25.0	33.3	34.0
Tobacco	41.2	35.3	56.1
All 25 Crops or plantings	26.3	22.2	25.1

Grass-legume seedings and grass-legume maintenance crops also had the highest percentages of soil samples with very low K tests, that is 0-80 pp2m of available K, in two of the three sampling periods. Percentages in this level of K were 8.6 to 9.9% for grass-legume seedings and 8.8 to 10.6% for grass-legume maintenance. These percentage values were relatively very small in comparison to the percentages in the very low P level for the same two crops. In the April 1, 1981, through June 26, 1981, sampling period, turf was highest with 6.3% in the 0-80 pp2m of K level.

When the soil samples from all 25 crops or plantings were considered, the percentages of samples in the highest levels of soil pH, available P, and available K were 47.5, 38.5 and 23.3 respectively.

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