Chemical Characteristics of Important Tazewell County Soils

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Research Report No. 29 **July 1959**

Virginia Agricultural Experiment Station

Virginia Polytechnic Institute

Blacksburg, Virginia

CHEMICAL CHARACTERISTICS OF IMPORTANT TAZEWELL COUNTY SOILS*

Introduction

A soil survey of Tazewell County made cooperatively by the Virginia Experiment Station and the Soil Conservation Service was completed in 1938. To get the greatest value from the county soil surveys, studies are made of the physical and chemical properties of the soils.

The soil survey map shows the extent and location of the various kinds of soil in the county. The soil survey report classifies these kinds of soils or groups them according to use and management classes for specific purposes. These groupings are based upon interpretations of their morphological, genetic, and physico-chemical properties.

As a help in classifying the different soils and in making interpretations for use and management, laboratory studies were made during the progress of the survey. On completion of the field mapping soil samples were collected for chemical and physical analysis. The chemical data presented here supplement that included in the soil survey report and related publications.

Explanation of Tables

When a proper balance of plant food and organic matter is maintained in the surface 7 inches of a well drained soil, optimum plant growth may be expected. Certain properties of the soil profile such as effective

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* Authors acknowledge the help of R. E. Devereux in preparing this report and H. E. Dailey, Laboratory Technician, for running the chemical analyses of soils listed in Table 1.

depth, structure, texture, and consistency are also quite important. These characteristics largely determine water storage and movement, and crop adaptation to the soil. The parent material, designated by the C horizon in Table 1 is in some cases quite important as a source of plant nutrients.

In Table 1 the A_0 horizon is not true soil but consists of partly decomposed plant remains. The A horizon includes the portion of the soil which is plowed and, in Virginia, is that layer of the soil which is affected most by leaching and erosion. The B horizons represent layers of subsoil, the B_2 ordinarily being finer than the rest of the soil. Soil parent material is the C horizon, and where this is layered, C_1, C_2, etc., are used.

Degree of soil acidity is expressed by pH. The following descriptive designations have been applied to pH values:

Extremely acid	Below 4.5
Very strongly acid	4.5 - 5.0
Strongly acid	5.1 - 5.5
Medium acid	5.6 - 6.0
Slightly acid	6.1 - 6.5
Neutral (Essentially)	6.6 - 7.3
Mildly alkaline	7.4 - 7.8
Moderately alkaline	7.9 - 8.4
Strongly alkaline	8.5 - 9.0
Very strongly alkaline	9.1 and higher

Truog phosphorus which is dilute acid soluble phosphorus, is an estimate of the amount of phosphorus readily available to plants in acid soils. Generally, it is considered that 25 ppm. (50 lbs./acre) is adequate for most crops grown in Virginia.

Calcium, magnesium, and potassium, which are exchangeable cations, are important plant nutrients. When these elements are in exchangeable form, they are available to plants to varying degrees. Potassium is generally more available and calcium less available than magnesium. As these bases are removed by plants, aluminum and hydrogen ions take their place. Because aluminum acts as an acid like hydrogen, the exchangeable hydrogen reported includes exchangeable aluminum. The percent base saturation is the proportion of the total cations that is made up of exchangeable calcium, magnesium, and potassium. For Virginia conditions a fertile soil usually has a high percent base saturation.

The sum of the exchangeable cations, including aluminum and hydrogen, is equal to the total cation exchange capacity of the soil. The value is usually high when there is higher clay or organic matter content in the soil. Certain types of clay yield a higher value than others, but with few exceptions, humus or organic matter give a higher value, pound for pound, than clay. The higher the cation exchange capacity, the greater the nutrient holding capacity of the soil. When a soil contains few plant nutrients, these are more readily available to plants grown on a soil with a low exchange capacity. It is much easier to raise the pH of a low exchange capacity soil.

The notation milli-equivalents per 100 grams of soil can be converted to pounds per acre of soil on the basis that an acre of soil 6 or 7 inches deep weighs approximately 2,000,000 pounds. One m.e./100 gms. is equal to 940 pounds of potash or 1,000 pounds of limestone ($CaCO_3$) or 840 pounds of magnesium carbonate.

In Virginia a condition of at least 50 percent base saturation is desired in the surface 6 to 7 inches. These bases should be present in a proportion of about ten times as much calcium and two times as much magnesium as potassium as long as there is a minimum of 0.3 m.e. of potassium. A soil with a total of 10 m.e. of exchangeable cations would have a good nutrient condition if there were 5 m.e. hydrogen, 4 m.e. calcium, 0.7 m.e. magnesium, and 0.3 m.e. potassium. If the soil has a higher cation exchange capacity, it would be important to have much more calcium and slightly more potassium and magnesium. If the soil has a smaller cation exchange capacity, the calcium requirement is less, but the magnesium and, most important, the potassium level should be the same. Many cultivated soils in parts of Virginia contain a high proportion of magnesium as a result of the widespread use of dolomitic limestone. This may be unfavorable if the build-up of magnesium continues.

Table 1 gives chemical characteristics of the soils mapped in the Soil Survey of Tazewell County. These soils are important throughout the limestone valley of Virginia as well as in Tazewell County.

TABLE 1

Horizon	Depth (in.)	pH	Truog P (ppm)	Organic Matter (%)	Exchangeable Cations[1/] Ca	Mg	K	H	Total*	Base Saturation (%)
					ATKINS FINE SANDY LOAM (1)					
A	0-10	4.93	25.8	5.85	2.32	0.66	0.13	10.81	13.92	22.34
B	10-35	5.12	6.1	1.09	2.71	0.30	0.05	5.66	8.72	35.09
C	35-45	5.05	4.6	0.89	2.26	0.22	0.06	2.91	5.45	46.61
					BOLTON LOAM (22)					
A_1	0-3	5.76	12.9	10.07	11.78	1.27	1.70	12.26	27.01	54.61
A_2	3-8	5.59	5.0	4.40	4.55	0.48	0.52	11.84	17.39	31.91
B	8-28	5.62	3.1	0.69	4.90	0.51	0.35	7.79	13.55	42.51
C	28-42	5.15	---	---	3.56	0.83	0.32	6.96	11.67	40.36
					BURGIN SILTY CLAY LOAM (6)					
A	0-10	5.22	32.1	4.95	15.19	0.74	0.20	12.16	28.29	57.02
B	10-28	5.81	19.2	3.87	18.04	0.42	0.13	5.87	24.26	76.00
C	28-38	6.01	25.6	3.44	17.45	0.33	0.14	4.88	22.80	78.60
					CARBO SILTY CLAY LOAM (70)					
A	0-6	5.47	13.8	8.14	8.42	1.16	1.51	10.03	21.12	52.51
B_1	6-18	5.17	2.6	1.55	8.26	0.92	0.42	4.83	14.43	66.53
B_2	18-32	4.77	2.2	0.79	9.40	0.99	0.54	7.84	18.77	58.23
C	32-35	4.85	2.2	0.53	8.64	0.71	0.23	5.35	14.93	64.17
					DUNMORE SILT LOAM (36)					
A_1	0-2	5.70	19.7	7.12	6.84	0.55	0.39	6.70	14.48	53.73
A_2	2-8	5.43	7.7	3.20	3.11	0.26	0.10	3.27	6.74	51.48
A_3	8-15	4.87	3.7	0.72	1.87	0.18	0.09	1.30	3.44	62.21
B	15-32	4.56	2.4	0.26	1.39	0.71	0.25	5.56	7.91	29.71
C	32-45	4.52	2.4	0.35	1.12	1.16	0.44	11.69	14.41	18.88
					DUNNING SILTY CLAY LOAM (7)					
A	0-10	5.07	22.5	5.85	10.03	0.33	0.26	11.22	21.84	48.63
B	10-32	5.30	9.0	2.08	9.57	0.37	0.12	7.58	17.64	57.03
C	32-42	5.45	5.0	1.28	7.60	0.20	0.12	5.40	13.32	59.46

Horizon	Depth (in.)	pH	Truog P (ppm)	Organic Matter (%)	Exchangeable Cations[1/] Ca	Mg	K	H	Total*	Base Saturation (%)
					EMORY SILT LOAM (2)					
A	0-15	5.92	45.7	4.08	7.35	0.67	0.25	7.38	15.65	52.84
B	15-28	5.41	5.5	1.12	4.93	1.47	0.29	5.51	12.20	54.84
C	28-42	4.78	4.8	1.02	3.35	1.34	0.30	7.48	12.47	40.02
					GREENDALE SILT LOAM (30)					
A_1	0-6	5.12	13.3	4.57	2.11	0.54	0.27	6.60	9.52	30.67
A_2	6-10	4.91	3.7	1.01	2.12	1.08	0.45	2.96	6.61	55.22
B	10-34	4.66	2.2	1.07	2.07	1.36	0.68	11.38	15.49	26.53
C	34-54	4.78	4.4	0.35	0.47	0.83	0.22	6.91	8.43	18.03
					GREENDALE SILT LOAM (62)					
A	0-7	5.70	10.7	3.71	5.50	2.29	0.11	5.25	13.15	60.08
B	7-32	5.10	8.1	0.65	5.66	2.38	0.17	7.95	16.16	50.80
C	32-35	4.71	6.3	0.42	1.64	2.33	0.23	8.78	12.98	32.36
					HAGERSTOWN SILT LOAM (18)					
A	0-6	6.95	46.1	4.25	17.07	2.71	0.89	2.91	23.58	87.66
B_1	6-20	6.47	8.1	1.10	8.66	2.98	0.66	5.40	17.70	69.49
B_2	20-50	4.75	5.5	0.63	2.26	0.79	0.36	12.31	15.72	21.69
C^2	50-72	4.74	6.3	0.62	1.25	0.84	0.48	12.36	14.93	17.21
					HAYTER FINE SANDY LOAM (90)					
A	0-8	4.87	8.3	3.11	1.25	0.40	0.26	7.12	9.03	21.15
B	8-30	4.62	2.6	0.83	1.71	0.33	0.22	4.83	7.09	31.88
C	30-42	4.81	2.4	0.75	2.05	0.39	0.19	1.61	4.24	62.03
					HAYTER LOAM (14)					
A	0-12	5.41	7.7	3.39	4.89	0.39	0.14	9.87	15.29	35.45
B	12-35	5.19	2.2	1.27	4.40	0.38	0.12	4.99	9.89	49.54
C	35-50	5.27	2.0	0.75	4.04	0.60	0.12	3.01	7.77	61.26
					HOLSTON LOAM (39)					
A	0-8	6.22	10.7	3.66	8.33	0.85	0.16	1.09	10.43	89.55
B	8-35	4.88	2.0	0.41	1.31	0.29	0.13	0.99	2.72	63.60
C	35-52	4.62	---	1.15	0.98	0.50	0.19	2.96	4.63	36.07

Horizon	Depth (in.)	pH	Truog P (ppm)	Organic Matter (%)	Exchangeable Cations[1/] Ca	Mg	K	H	Total*	Base Saturation (%)
					LEADVALE SILT LOAM (32)					
A	0-8	4.80	12.5	2.73	1.20	0.14	0.15	4.42	5.91	25.21
B	8-35	4.67	2.4	0.26	0.42	0.21	0.16	5.35	6.14	12.87
C	35-42	4.74	2.0	0.24	0.34	0.23	0.15	1.97	2.69	26.77
					LEHEW VERY FINE SANDY LOAM (63)					
A_1	0-2	4.72	28.6	4.69	1.68	0.40	0.34	7.01	9.43	25.66
A_2	2-8	4.52	21.2	1.66	1.83	0.52	0.20	7.43	9.98	25.55
B	8-28	4.46	16.8	0.89	0.29	0.23	0.20	7.22	7.94	9.07
C	28-40	4.34	2.4	0.46	0.28	0.21	0.20	9.09	9.78	7.06
					LODI LOAM (3)					
A_1	0-2	5.96	33.9	9.77	12.88	1.08	0.62	9.04	23.62	61.73
A_2	2-8	4.92	16.4	1.50	0.78	0.43	0.15	5.09	6.45	21.09
A_3	8-11	4.74	11.8	0.57	1.23	0.67	0.13	5.82	7.85	25.86
B	11-35	4.93	3.9	0.49	3.10	0.59	0.18	5.61	9.48	40.82
C	35-60	4.58	2.4	0.30	1.22	1.31	0.35	12.05	14.93	19.29
					MUSKINGUM LOAM (24)					
A_1	0-1	4.70	4.8	3.75	1.77	0.45	0.17	9.77	12.16	19.65
A_2	1-6	4.82	4.4	3.78	1.26	0.22	0.10	9.04	10.62	14.88
B	6-24	4.73	1.7	0.50	0.42	1.13	0.43	3.69	5.67	34.92
C	24-35	4.75	1.7	0.57	0.31	1.35	0.45	6.08	8.19	25.76
					MUSKINGUM VERY FINE SANDY LOAM (13)					
A_1	0-1	4.80	6.3	7.73	1.52	0.55	0.38	10.60	13.05	18.77
A_2	1-6	4.68	4.8	3.18	0.42	0.30	0.28	8.10	9.10	10.99
B	6-28	4.63	2.6	0.41	0.34	0.34	0.21	4.99	5.88	15.14
C	28-42	4.56	4.2	0.51	0.46	0.21	0.24	6.08	6.99	13.02
					PHILO FINE SANDY LOAM (50)					
A	0-15	5.07	19.5	4.03	2.71	2.28	0.13	3.58	8.70	58.85
B	15-35	4.79	5.9	1.90	0.87	2.06	0.06	4.83	7.82	38.24
C	35-42	4.75	4.6	1.10	1.65	2.20	0.13	6.08	10.06	39.56
					POPE FINE SANDY LOAM (8)					
A	0-10	4.83	8.3	3.56	2.64	0.71	0.14	9.14	12.63	27.63
B	10-32	4.61	2.6	1.26	2.30	0.51	0.14	10.70	13.65	21.61
C	32-50	4.65	2.6	0.47	1.19	0.44	0.08	5.09	6.80	25.15

Horizon	Depth (in.)	pH	Truog P (ppm)	Organic Matter (%)	Exchangeable Cations[1/] Ca	Mg	K	H	Total*	Base Saturation (%)
					TUMBEZ SILTY CLAY LOAM (53)					
A	0-6	5.88	24.3	6.56	2.63	2.18	0.15	5.77	10.73	46.23
B	6-15	6.62	32.1	1.90	23.11	2.53	0.27	1.92	27.83	93.10
C	15-20	7.03	180.8	1.75	28.18	2.60	0.29	1.61	32.68	95.07
					WESTMORELAND SILTY CLAY LOAM (162)					
A_1	0-2	5.29	70.2	8.53	4.56	2.35	0.22	12.00	19.13	37.27
A_2	2-5	4.99	51.8	4.91	5.06	2.44	0.09	10.75	18.34	41.38
B	5-24	4.39	59.2	0.84	0.66	2.26	0.15	15.01	18.08	16.98
C	24-35	4.36	60.5	0.44	0.37	0.20	0.22	17.40	18.19	4.34

1/ m.e./100 gms. soil

* Summation of exchangeable cations.