intra-uterine growth aside from its function as a transfer system.

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THE EFFECT OF DRAINAGE ON SOIL ACIDITY

For the purpose of studying the effect of drainage on soil acidity, samples of soil were taken in October, 1916, from three of the experiment fields of the Purdue Agricultural Experiment Station. These fields are located near Westport, North Vernon and Worthington. The soils of these fields are all heavy silt loam, very low in organic matter and naturally poorly drained and quite acid in reaction. All of these fields have been thoroughly tile drained from three to five years. A portion of the Westport field is undrained and there are adjacent undrained, untreated areas alongside the North Vernon and the Worthington fields.

TABLE I

RELATIVE ACIDITY OF DRAINED AND UNDRAINED SOILS

Field and Soil Treatment	Lbs. $CaCO_3$ Needed per 2,000,000 Lbs. Soil	
	Drained	Undrained
Westport field:		
Limestone	40 #	760 #
Limestone, phosphate and potash	30 #	360 #
Untreated	860 #	1,280 #
North Vernon field:		
Untreated	1,880 #	2,840 #
Worthington field:		
Untreated	740 #	1,600 #

Table I. shows the acidity of the soil as determined by the potassium nitrate method. Without entering into a discussion of the merits of different soil acidity methods, it may be said that on these soils, which are low in organic matter, there is no great difference in the degree of acidity shown by this method and the lime water and calcium salt methods. These results are consistent enough to indicate that drainage has a material influence on the acidity of soil of this type.

Farmers often refer to wet, poorly drained land as sour. While agricultural writers have placed little or no emphasis on such a correlation, it is quite probable that soils in general will tend to become less acid when thoroughly drained, and vice versa; they will tend to become more acid when water-logged and poorly aerated. In testing soil acidity at different seasons of the year the results often vary quite a little in samples from the same plots of soil. These differences can not be attributed altogether to errors in sampling. The writer believes that at least part of the change of acidity is due to difference in aeration and moisture content of the soil at different seasons. Lipman and Waynick,[1] in an investigation of the effect of climate on soil properties, report that Maryland soil, which shows an acid reaction in its original location, when transported to Kansas or to California becomes neutral or slightly alkaline. It is quite probable that the better drainage and aeration of the soil when placed under less humid conditions could account very largely for the changes in reaction.

Considering SiO_2 an acid-forming oxide, practically all soils except those very high in the basic reacting elements, have a potentially great capacity for developing an acid reaction.

The writer believes that the constitution of the silicates of aluminum has more to do with injurious soil acidity than any other single factor. The acidity of aluminum silicates varies both with the relative proportion of SiO_2 to Al_2O_3 and with the amount of combined water in the silicate.[2] The weathering and changing of soil silicates under poorly drained or well-drained conditions would undoubtedly vary the constitution of the silicates and also vary the degree of soil acidity. It is quite true that certain types of well-drained sandy soils are acid. It is true also that a number of other factors besides drainage conditions affect soil acidity, but it is probable that the most acid soils are formed in poorly drained areas.

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[1] Lipman, C. B., and Waynick, D. D., *Soil Science*, Vol. I., No. 1, p. 5, 1916.

[2] Conner, S. D., "Acid Soils and the Effect of Acid Phosphate and Other Fertilizers upon Them," *Jour. Ind. and Eng. Chem.*, Vol. VII., No. 1, p. 35, 1916.