The percentage base saturation and pH are of considerable practical importance in relation to liming, nutrient conservation, and plant growth. In order to correlate some of these soil properties with plant nutrition, it is essential that the pH be measured over a wide range of base saturation and that the relation to soil type be established. If the percentage base saturation and pH vary in relation to the nature of the base exchange colloids present in different soils, a valuable criterion for use in connection with plant nutrition studies would be established. Vandecaveye (26), for example, recently reviewed the literature and attempted to correlate the influence of soil type to the chemical composition of forage and small grain crops. He concluded that, "The chemical composition of grasses, small grains, and legumes is influenced to a significant extent by certain broad soil properties, but it is obvious also that the specific soil factors which are responsible for changes in the composition of these crops need further investigation."

Pierre (20) in 1931 concluded that base saturation of soils is a valuable criterion for the growth of certain plants. The importance of percentage base saturation in relation to plant nutrition has been brought into focus by Horner (8), Albrecht and Horner (1), and Jenny and Ayres (10). There have been no reports on systematic investigations dealing with the percentage base saturation and pH in relation to soil type.

In a previous study with the percentage base saturation-pH relationship it was shown that the nature of the curves expressing this relationship varied widely with different soils (17). It was shown also that appreciable similarities in these relationships were encountered between certain soils and some base exchange minerals. Furthermore, the advantages of expressing the titration curve in terms of the relation between base saturation and pH rather than between absolute amounts of bases added and pH were illustrated. As long as the nature of the base exchange colloid in the soil is the same, the amount of titration needed by colloidal factors for a given reaction of the soil will be relatively the same. These reactions have a common H-1 ion or hydroxyl ion titration curve, which is dependent upon the pH and the base saturation of the colloid. Therefore, the nature of the curve expressing the relationship between percentage base saturation and pH is of interest in connection with the use of such curves in plant nutrition studies. In this paper results are discussed dealing with (a) further details regarding the technic of measuring percentage base saturation and pH, and (b) the significance of percentage base saturation and pH in relation to soil type.

Preparation of Hydrogen Soil

Unless a soil is naturally low in exchangeable bases, it is essential that a H soil be prepared. The usual methods employed are electrodialysis or leaching with weak acids. By leaching with a quantity of 0.05N HCl, irrespective of the amount of exchangeable bases present, it was found that with some soils appreciable quantities of Al would go into solution and that the excess acid was difficult to remove. This was particularly serious with soils rich in aluminum (beidellitic colloids). These difficulties were eliminated when the amount of 0.05N HCl used for leaching was varied in relation to the base content of the soil. After some preliminary trials it was found that when leached with an acid which was twice as concentrated as the total exchangeable bases present, the soils were found to be in nearly all cases less than 10% saturated. Results of this kind with a few soils are presented in Table I.