THE OXIDATION-REDUCTION POTENTIAL OF ALKALINE CALCAREOUS SOILS IN RELATION TO PUDDLING AND ORGANIC MATTER DECOMPOSITION

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Although the study of redox potentials of soils has in recent years received attention at the hands of numerous investigators (1, 3, 8, 15, 18, 21, 23), such studies have been confined almost entirely to soils of humid regions and to the behavior of soils under water-logged conditions. By way of contrast, the alkaline calcareous soils of the desert present certain characteristics which offer opportunity for application of the redox potential method. They contain an exceedingly active microflora and the decomposition of organic matter proceeds at a very rapid rate, as has been shown by Oberholzer (14). Because of their low organic matter content, such soils easily pass into the puddled state when cultivated under irrigation, as found by McGeorge (11). Under such circumstances anaerobic conditions have been shown to exist by Breazeale and McGeorge (4) with attendant loss of nitrogen by denitrification and serious inhibition of plant growth. These authors showed further that the incorporation of organic matter in a puddled soil will not of itself correct the puddled condition and that the toxic substances formed in the anaerobic decomposition are at times so stable that they are not readily oxidized to non-toxic forms when the soil is allowed to dry out and become thoroughly aerated.

It seemed of interest, therefore, to apply this method to some typical desert soils in their normal and puddled states, and in the presence and absence of actively decomposing organic matter. The present paper presents the results of certain phases of this investigation. For purposes of comparison a similar study was conducted on a typical soil from a humid region.

1Contribution from the Department of Agricultural Chemistry and Soils, Arizona Agricultural Experiment Station, Tucson, Ariz. Published with approval of the Director. Also presented before the Western Society of Soil Science, Stanford University, Palo Alto, Calif., June 26-28, 1939. Received for publication August 15, 1939.
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3Figures in parenthesis refer to "Literature Cited", p. 914.