DISTRIBUTION OF SUGARS, ROOT ENCLOSED, IN THE SOIL FOLLOWING CORN AND SORGHUMS AND THEIR EFFECTS ON THE SUCCEEDING WHEAT CROP

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STRONG competition for available plant nutrients, particularly nitrates, between the growing crop following sorghums and the soil micro-organisms living on the sugars and possible other carbonaceous residues of the dead sorghum roots was suggested (1) several years ago as one of the causes of the injury of sorghums to succeeding crops. More recently, the writer has reported (5) analyses of roots of sorghums showing at maturity total sugars on the basis of dry organic matter, varying from 15 to 55%, and roots of corn (a crop causing little or no injury) ranging from less than 1 to about 4.5%. Assuming that the amounts of roots were the same for the two crops, these data give added support to the hypothesis that the injury is caused in part by the sugar residues.

After sorghums, the good growth of inoculated legumes, and the response of nonlegumes to nitrogenous fertilizers, in both nitrate and ammonium forms (2, 3) cast considerable doubt on the presence "toxic bodies" originating from the decomposition of the sorghum residues as the cause of the sorghum injury, but they suggest rather an insufficiency of nitrogen as a major part, at least, of its cause. Two factors, sorghum plant absorption, unusually complete perhaps by virtue of the vigorous growth of the sorghums, and competitive absorption by soil micro-organisms, undoubtedly greatly stimulated by feeding on the dead sorghum plants later, may contribute to this dearth of nitrogen available to the next crop.

So far in the field it has been difficult to distinguish between these two factors as they both tend to decrease yields of succeeding non-leguminous crops. This paper presents data on the effects of the decay of the sorghum residues themselves, first by giving figures on the amount and distribution of sugars left in the soil by the sorghum crop and then by comparing the areas of high residual sugars in the soil with those of decreased crop yields.

In writing of the residual sugars left in the soil in this paper it is assumed that the sugars are enclosed within living or dead roots, and not free in the soil, as in the latter condition they would without a doubt disappear rapidly because of microbial activity.

LABORATORY TECHNIC

In determining the amount of sugar left in the soil by any crop, at least two methods of procedure are possible. In one, the roots could be separated from a

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3Reference by figures in parenthesis is to "Literature Cited", p. 483.