EFFECTS OF ORGANIC AMENDMENTS UPON THE MICROFLORA OF THE RHIZOSPHERE
OF COTTON AND WHEAT

Abstract
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INVESTIGATIONS were made of soil and root microfloras following manurial treatments of the types reported to give successful control of certain soil-borne root-rotting fungi parasitic to wheat or cotton. Studies on the rhizosphere of wheat were made in the greenhouse; a soil naturally infested with the wheat take-all fungus, Ophiobolus graminis Sacc., was employed under the following conditions: untreated; fertilized with chicken manure or chopped green alfalfa (one part in six by volume); or steam-sterilized. Studies on the rhizosphere of cotton were made in field plats near Greenville, Texas, infested with the cotton root-rot fungus, Phymatotrichum omnivorum (Shear) Duggar; certain of the plats had been fertilized prior to or at the time of cotton planting with stable manure, sorghum bundles, straw, or cotton seed meal or hulls. Microbiological studies were made by cultural methods; the dilution series for plate counts were prepared immediately after collection of soil and root materials.

Although the organic amendments employed produced striking changes in the micropopulations of the earthy mass, very little change was effected in the micropopulations associated with the crop roots themselves. The root micropopulations of plants growing in fertilized soils showed close agreement with the micropopulations associated with roots obtained from the corresponding untreated check soils. To exemplify, root micropopulations of 1,150-, 1,165-, and 1,123-millions were determined for wheat roots 43 days old, grown in chicken-manured, alfalfa-treated, and untreated soils which showed micropopulations of 408-, 122-, and 53-millions respectively. For cotton, root micropopulations of 62.0-, 66.0-, and 60.7-millions were encountered in soils showing bacterial populations of 92.8-, 44.3-, and 8.5-millions, respectively. Root population differences were encountered in plants of different ages and in different regions of the root systems of individual plants. The presence of disease also produced differences in rhizosphere populations.

In the consideration of results from the point of view of soil hygiene, the stability of the root surface microflora following fertilization, in contrast to the responsiveness of the soil microflora, suggested that the activities of the soil microflora were of primary importance, insofar as microbiological factors are concerned, in the manural control of root-rotting parasites. Whether the possible sanitation effects are accomplished in a non-specific and quantitative manner, or whether they result from the inter-actions of but a few species offers a field for further investigations; thus far, antagonism due to any particular species has not been found sufficient to account for the results obtained. Even though experimental controls of root-rotting parasites may be obtained by the inoculation of infested soil with saprophytic microorganisms or filtrates thereof, it is questionable whether root surfaces can be protected on any practical scale in the field by inoculation procedures with common soil saprophytes. Once the root-rotting parasite reaches the roots, factors of virulence of the causal organism, or factors of host resistance or host nutrition, are probably of more importance than microbial competition or microbial by-products or activities on root surfaces, or at least more important than microbial factors which may be ascribed directly to manural treatments.—Author abstract.