SENSITIVITY OF THE POTATO PLANT TO SOIL AERATION

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IN a fertilizer experiment at Wooster, started by Thorne in 1894, potatoes have been grown in a 3-year rotation with wheat and clover. On the well-fertilized plats the wheat and clover have yielded well, but the potato yields have been below expectation.

The soil is mainly Wooster silt loam, characterized by excellent capillarity and a well-oxidized subsoil. For general agricultural purposes it is rated as one of the best soil types of eastern Ohio.

For many years the low yields of potatoes were attributed entirely to the prevalence of insects and diseases, but even when these were more and more successfully combated by spraying and the use of certified seed, the yields still failed to come up to expectation. By 1928 it was clear that either the rotation or the fertilizer treatments were not suited to potatoes.

On nearby fields a number of different rotations were then started. It was found that satisfactory yields could be obtained by heavy applications of manure or by large crops of green manures. Also, an extensive series of special tests was conducted within the fertilizer block itself on strips originally designed as roadways but which had been continuously cropped. These roadways were divided into 54 plats, each 10 by 15 feet. On some of these plats the less common fertilizer elements were added; on others new combinations of ordinary fertilizers were applied; on others the soil reaction was altered; and on still others the physical condition was changed by addition of sand or agricultural slag. Of all these special tests, the only ones giving yields distinctly higher than the ordinary fertilizers were the ones which received the applications of sand or of slag. Evidently, the problem was one of physical condition rather than of chemical relations in the soil.

RESULTS FROM SANDED PLATS

The initial tests with sand in 1929 and 1930 were applications about an inch thick spread on after plowing and disked into the top 3 inches of soil. The increases in yield were consistent but not large. The following seasons the sand was applied both before and after plowing and was thoroughly mixed through the plowed layer. The benefits were then more conspicuous (Table 1).

The problem seemed of sufficient importance to justify analyzing it a step further. To account for the benefits from the sand, three hypotheses seemed reasonable, as follows: First, moisture might have been conserved in the subsoil, due to rapid percolation of rain through the porous surface soil, followed by slower evaporation resulting from reduced capillarity; second, the porosity of the sanded soil might

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