

Conditions Favoring Phosphate Deficiency in Sugar Beets

H. E. MORRIS¹

Abstract

Sugar beets grown in the heavy irrigated soils in Montana often develop symptoms of phosphate deficiency, as the available phosphate is not sufficient for their normal development.² This condition was observed many times at the Huntley Branch Station near Billings, Montana, when beets were planted immediately following a 2-year crop of alfalfa.

A study of Montana soils indicated a phosphate deficiency in certain areas, as the total phosphorus (P_2O_5) content ranges from 0.04 to 0.45 percent.³ In a more intensive investigation, the results obtained showed that a majority of the soils investigated responded to a phosphate fertilizer by increasing both the yield and phosphorus content of the crop.⁴

Alfalfa is a heavy feeder of phosphates, as a 4-ton crop of hay will remove approximately 40 pounds of phosphorus (P_2O_5), but at the same time the nitrogen content of the soil is maintained due to the nitrogen-fixing bacteria in the nodules on the alfalfa roots. When beets follow alfalfa, the ratio between the available phosphorus and nitrogen is unbalanced, and many young beets succumb to black-root diseases; those that survive develop symptoms of phosphate deficiency.

In fall-plowed alfalfa ground only a small amount of available nitrogen is present in early spring, as most of the nitrogen is present in an unavailable form, and conditions for nitrification are not favorable. Sugar beets in the early stage of development require a considerable amount of available nitrogen, for their normal development, otherwise they grow slowly and become susceptible to seedling diseases. Later in the season nitrification is rapid, and the available nitrogen is sufficient. But the supply of phosphorus is low[†], and acute phosphate deficiency of sugar beets develops usually in July or August.

Sugar beets may produce a low yield, due to a soil of low fertility, and not develop phosphate-deficiency symptoms because the ratio of nitrogen to phosphorus is balanced.

The proper balance between nitrogen and phosphorus is necessary for the normal development of beets, however, the yields may vary according to the different levels of fertility maintained.

¹Botanist, Montana Agricultural Experiment Station.

²Plant Disease Reporter, 25:414, 1941.

³Montana Agricultural Experiment Station Bui. 159.

⁴Montana Agricultural Experiment Station Bui. 240, 259, 280, 296, 316, 334, 356, 369, 378, 395.