RESULTS OF SPINACH TOPDRESSING STUDIES WITH THREE NITROGEN MATERIALS

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The problem of supplying nitrogen to green leafy vegetables is of extreme importance and is complicated by soil factors and weather conditions. There are very few crops which require more liberal applications of nitrogen than spinach. Growers in the Tidewater section of Virginia may apply from 125 to 200 pounds of nitrogen per acre on a spinach crop, and it is not uncommon to apply as much as 200 to 300 pounds of nitrogen per acre on the lighter soils during rainy seasons. The nitrogen is generally applied as a topdresser in from two to five applications of from 50 to 75 pounds of nitrogen each. In the past, growers have relied chiefly upon sodium nitrate as a source of nitrogen.

With the prospect of large supplies of new ammonium nitrate materials becoming available for agricultural purposes in the near future, field experiments were begun in the fall of 1943 to test the relative merits of sodium nitrate, a neutral ammonium nitrate, and an ammonium nitrate treated with an inert material to improve its physical condition for topdressing spinach.

In order for a material to be used for topdressing spinach, a crop which is harvested from 50 to 60 days after planting, the nitrogen must be in a form which is available to the plant or becomes available in a short time, and must not stick to the plant and injure the foliage. The material is applied on the surface and only in very few cases is the soil cultivated thereafter.

The work of Zimmerley (8, 9) indicated that organic nitrogen materials are too slow in action to be used in fertilizing spinach. However, his work did indicate that some ammonium nitrogen along with nitrate nitrogen was desirable especially when the harvesting of the crop was delayed. He also noted that heavy applications of sodium nitrate on spring spinach on nearly neutral soil (pH 6 or above) caused a chlorosis which somewhat resembled manganese deficiency, while nitrogenous materials with an acid reaction produced spinach with a dark green color.

Much work has been done in determining the role of sodium in plant metabolism. The literature on this subject is reviewed by Willis (7). Harmer (2) lists several crops which he has found were benefited by fertilizing with sodium salts and several crops which were not benefited. Spinach was listed among the latter. Unpublished work of the authors also indicates that the addition of sodium to a soil low in this element will increase the yield of spinach.

EXPERIMENTAL PROCEDURE

In the fall of 1943 spinach in fields were topdressed with (a) sodium nitrate, (a neutral ammonium nitrate, 20.5% N), and (c) Nitraprills • (granulated ammonium nitrate treated with petroleum, 34.0% N). Each treatment was made 15 and 30 days before harvest. Each application of approximately 1,000 pounds of the mixture was used at about the time the crop was thinned.

During the fall, rainfall was very heavy falling from November 1 to December 15.

In the spring of 1944 a study was made of the influence of the three nitrogen materials applied at different levels on the yield and appearance of spinach and of the soil. The spinach crop had been made 15 and 30 days before harvest with an 0-7-7 fertilizer at the rate of 1,000 pounds to the acre. Rainfall was heavy during the late winter and early spring with an average of 15 inches falling from February 1 to March 31. Nitrate and ammonium nitrogen determinations were made on various depths from representative samples from plots treated with the materials. Soluble nitrogen determinations were made by Carolus's method (1). Determinations were made by the glass electrode method (5) with a soil water ratio of 1:2.

RESULTS AND DISCUSSION

The yield data from the five experiments are summarized in Table 1. The yield response is higher on plots treated with Nitraprills than on plots receiving sodium nitrate or Cal-nitro, but the differences are not significant even at these two locations.

Due to a shortage of labor the spring crop could not be harvested in the usual manner, so only yield data are available.