Effect of Fertilizers and Lime on Emergence, Nitrogen Content, and Roots to Tops in Hairy Vetch

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In conducting work on the use and adaptation of legumes for soil improvement during the last 10 years, the Department of Agronomy, Texas Agricultural Experiment Station, has found it desirable to determine the amount and nitrogen content of the vegetable matter plowed under. Previous investigations showed that the application of phosphate and potash greatly increased the yield of hairy vetch but had no significant effect on the percentages of nitrogen and phosphorus in the top growth (10).3

A large amount of work has been done to determine the proportion of roots and tops, and consequently the proportion of nitrogen in the roots and tops, of different legumes in various parts of the world. It has been shown that the distribution of nitrogen in different parts of the plant varies widely with the species, stage of growth, and the kind of soil on which the legume is grown. The distribution of nitrogen in different parts of the plant is important, especially in the use and management of legumes for soil improvement. For this reason the problem has been studied extensively by a number of workers. Brown and Stallings (5) conducted some of the most comprehensive work on the distribution of dry matter and nitrogen in legumes, using alfalfa and sweetclover. Pieters (9) gave an excellent review of the work done along this line up to 1927. He pointed out in general that biennial and perennial legumes, such as alfalfa and the clovers, have a larger proportion of their total dry matter and nitrogen in the roots than do the annual legumes, as vetches, peas, and soybeans. Fred, Baldwin, and McCoy (6) also gave a comprehensive review of work done on the distribution of nitrogen in tops and roots of legumes.

Andrews (2) found that basic slag applied at the rate of 400 pounds per acre in contact with or below vetch seed was superior to side placement. Andrews (1) also reported that the roots of vetch contained 35% of the nitrogen in the whole plant.

Rogers and Sturkie (12) in Alabama studied the effects of different methods of applying fertilizers on the nodulation, growth, and nitrogen content of hairy vetch. A combination of basic slag and muriate of potash was the best fertilizer used and there was little difference in yield of vetch whether the fertilizer was in contact with or separated from the seed. Superphosphate alone, however, produced considerably smaller muriate of potash, or a mixture of superphosphate, dolomite, and potash. In this experiment, superphosphate also had considerable influence on the percentage of roots to tops. The tops contained 62 to 86% of the dry matter of the plant, the percentage varying with the fertilizer treatments.

Work was begun at College Station, Tex., during the winter of 1946 to determine the effect of fertilizers on the germination of vetch seed, on the dry matter in roots and tops, on the percentage of roots and tops, and consequently the nitrogen content of vetch. It is the purpose of this paper to report the results of this work.

Materials and Methods

The work was conducted on Lufkin fine sandy loam at College Station, Tex., during the winter of 1946-1947. The experiment was set up in a randomized split-plot design with four replications. The main plot treatments were lime and no lime. The subplot treatments were (a) 40 pounds of available phosphoric acid (P₂O₅) per acre, (b) 40 pounds of available phosphoric acid and 20 pounds of nitrogen, (c) 40 pounds of available phosphoric acid and 40 pounds of potash (K₂O), and (d) ammonium nitrate and hydrated lime was applied to supply the equivalent of calcium carbonate per acre. The lime was applied on the surface and the land was bedded. Nitrogen was supplied as ammonium nitrate, phosphoric acid in 20% superphosphate, and muriate of potash in 60% muriate of potash. These fertilizers were applied in the drill rows with the vetch seed when planted on beds October 9, 1946.

The amounts of soluble phosphorus and exchangeable potassium were not determined on the plots used in these experiments. The plots were joining plots of the same soil type in another experiment, however, untreated soil contained 10 to 15 ppm of phosphorus and 25 ppm of potassium. The plots were divided into subplots, and the subsoil was removed. The subsoil was then excised and the tops and roots were separated and weighed. The yield of tops or forage was determined by cutting the seedlings that emerged.

The yield of tops, or forage, was obtained by harvesting the crops off at the surface of the soil. The proportion of roots and tops obtained by excavating square foot areas to a depth of 12 inches in the subsoil on each plot, washing the soil from the roots and tops, and weighing the roots and tops. The percentage dry matter of the plant contained in the roots and tops was then computed. The vetch was harvested April 11, 1947.

Results

EFFECT OF FERTILIZERS ON GERMINATION OF HAIRY VETCH SEED

Published August, 1950