

Protein content of the plant

- a. Significant differences between the varieties. (Variety Rowena the highest.)
- b. Significant differences between the treatments, except for the last fresh harvest.
- c. N application and Rhizobium inoculation increase the protein content.
- d. Interaction between harvest and variety.

Seed yield

- a. Significant differences between the varieties (Variety Minica the highest).
- b. Significant differences between the treatments only on sandy soil.
- c. Rhizobium increases the yield on sandy soil.

Protein content of the seed

- a. Significant differences between the varieties (Variety Rinal on clay soil and variety Rowena on sandy soil the highest).
- b. Significant differences between the treatments only on clay soil.
- c. N application and Rhizobium inoculation increase the protein content.

Discussion

The cross breeding and selection program is not yet far enough along to give definite results, but it is expected that in a few years, material can be produced with a stable yield of 6-7 tons seed/ha. For fields where a bacteria population can be expected, it will be difficult to find new strains of Rhizobium increasing the yield. However, from the described experiments it is clear that positive effects can be gained for varieties and treatments. It is worthwhile to continue these investigations.

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MORPHOLOGICAL DIFFERENCES IN ROOTS
OF SOME BLACK BEANS

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Few researchers have looked at morphological differences in roots of dry beans. Tanaka (1) has classified legume crops into alfalfa, vetch, and soybean root developmental types. In a later paper (2) he reported roots of 25 legume crops differed in their ability to elongate, branch, and thicken.

Our preliminary investigations have shown that four numbered black bean lines (70001, 70002, 70003, 70004) with erect growth habit and high yields have higher root weights than Black Turtle Soup (BTS) or Strain 39 (a Univ. of California selection out of BTS), which have prostrate and semi-prostrate growth habits, respectively. The purpose of this investigation was to determine if root morphological differences occur within these lines and cultivars under field conditions. Measurements were made during vegetative, full bloom, pod elongation, seed initiation, and fully filled immature pod growth stages.

Total root weight was partitioned into weight of adventitious roots (those arising from the upper hypocotyl just below the soil surface); basal roots (those arising from the basal portion of the hypocotyl); and taproot (including any lateral roots arising from it). Basal roots were counted, and the sum of their diameters at the point of attachment to the base of the hypocotyl was determined.

Basal root weight was found to comprise the highest portion of the total root biomass. Significantly higher basal root weights were obtained for all numbered lines as compared to BTS and Strain 39. Similar results were found for taproot weight, with the exception of 70002 and Strain 39 which were not significantly different from each other. No differences in basal root numbers were found, although total basal root diameters were significantly higher for all numbered lines when compared with the two commercial cultivars. There were no significant differences with regard to adventitious root weight.

When pooled over all entries, basal root weights and taproot weights increased up to the seed initiation stage, then significantly decreased between that stage and the fully filled immature pod stage indicating that root senescence had begun.

Our data indicate that basal root thickening rather than number is responsible for higher basal root weight. The erect growth habit of the four numbered lines may have resulted from higher basal root weight. Higher taproot weight may also have contributed to the erect growth habit in some lines.

Literature cited

1. Tanaka, N. 1964. Studies on the three types of root system formation in leguminous crops plants. Agri. Bull. Sage Univ. 30:31-34.
2. _____, 1977. Studies on the growth of root systems in leguminous crops. Agr. Bull. Sage Univ. 43:1-82.

RELATIONSHIP OF ROOT SIZE TO LODGING AND SEED YIELD IN SOME BLACK BEANS

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Direct harvesting of dry beans is beginning to gain acceptance among commercial growers. Uprightness of plants (lodge resistance), a desirable