2. Seed introduced from high rainfall areas should be assumed to be infected with pathogenic bacteria and should be planted in a greenhouse and the plants inspected before the line is taken to the field. If the seed producer in Idaho does not have this capacity, the individual or organization sending the seed should make the greenhouse increases.

Bean growers in Idaho have been fortunate in the apparent absence of strains of BCMV that cause black root at low temperatures. The establishment of such a strain in susceptible dry bean classes would be disasterous, and greenhouse and field plants should be inspected and rogued for symptoms of BCMV or other virus diseases.

In summary, those of us involved in bean seed production in southern Idaho should consider the region as a valuable resource, one that can be spoiled for everyone by careless or inconsiderate introduction of seed.

References

1. Butcher, C. L., L. L. Dean, and J. W. Guthrie. 1971. Halo blight incidence in Idaho bean seed crops during 1969. Plant Dis. Rep. 55: 54-55.

2. Webster, D. M., J. D. Atkin, and J. E. Cross. 1983. Bacterial blights of snap beans and their control. Plant Dis. 67: 935-940.

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EVALUATION OF BREEDING LINES FOR NITROGEN FIXATION POTENTIAL IN COMMON BEAN (*Phaseolus vulgaris* L.)

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Our work reported here includes field evaluation of breeding lines as well as field and greenhouse experiments conducted to evaluate methodology and criteria that should be considered during selection for enhanced nitrogen fixation potential in common bean.

An inbred-backcross (IB) method of population development was used to develop five different populations of approximately sixty nearly-homozygous lines each that were similar in most traits to the respective recurrent parent. In all five populations 'Puebla 152' was the high nitrogen fixing donor parent, while the recurrent parent was 'Jamapa', 'Porrillo Sintetico', 'ICA Pijao', 'Ex Rico', or 'Sanilac'. When these populations were evaluated for nitrogen fixation ability by the acetylene reduction assay (AR) and yield under field conditions, considerable variation in both traits was found, and transgressive segregation was evident. The results indicated that the IB method was effective in transferring quantitative traits, such as high nitrogen fixation, into agronomically acceptable cultivars, and in developing populations of recombinant families useful in genetic and physiological studies.

In population 24 in which 'Sanilac' was the recurrent parent, nearly homozygous lines were identified as having various combinations of high and low AR values and yield. Seven of these lines plus 'Sanilac' were used in subsequent studies to evaluate methodology for field screening. These lines were inoculated with Rhizobium phaseoli and grown under three levels of added nitrogen (0, 40, and 80 kg N per ha) to study the effects on nodulation and nitrogen fixation, the performance of the lines under different N levels, and the changes of dry matter content in plant organs. The reduction in nodule growth and function caused by added N was observed to be influenced by plant genotype. It was hypothesized that a shortage in the supply of photosynthates to the nodules was present in plants grown with added N, and it was observed that a greater shoot growth than root growth was present under these conditions. Added N promoted larger shoot:root and root:nodule ratios, which were found to be negatively correlated to nitrogen fixation. Screening of previously selected lines under different levels of added N would avoid negative selection for response to N fertilizer which could occur if breeding lines are only evaluated under low N conditions.

We also observed positive correlations between greenhouse and field studies for nodule dry wt., AR value and nodule score, root dry wt., and root:nodule ratio. Our results indicated that possibility of using greenhouse facilities during the process of selection of superior breeding lines to reduce the number of materials that need to be evaluated under field conditions.

Nodule dry wt. and AR values were found to be correlated to a visual nodulation score under both greenhouse and field conditions. This simple method is suggested along with seed yield evaluation under low N field conditions, as useful approaches to estimate N_2-fixation potential in breeding programs.

The results obtained in several studies indicated that breeding for improved nitrogen fixation potential in common bean would require selection for large and well-nodulated root systems to be present in vigorous plants that have high AR values and high seed yielding ability under both low and high soil and fertilizer N conditions.

Literature

Graham, P. H. and J. C. Rosas, 1977. J. Agric. Sci. Camb. 88:503-508.

Graham, P. H., 1981. Field Crops Res. 1:295-317.

McFerson, J. R., F. A. Bliss and J. C. Rosas, 1982. In: Biological Nitrogen Fixation Technology for Tropical Agriculture, CIAT Series No. 03E-5(82), Cali, Colombia, pp.39-44.

McFerson, J. R., 1983. Ph.D. Thesis, Univ. of Wisconsin, Madison, 144pp.

Rosas, J. C., 1983. Ph.D. Thesis, Univ. of Wisconsin, Madison, 127pp.