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Field emergence of sugarbeet varieties and relationship to laboratory germination.

ABSTRACT

Sugarbeet growers in Nebraska, Colorado, and southeast Wyoming raised concerns in the mid-1990's about the performance of current sugarbeet varieties. Regional sugarbeet yields were decreasing compared to a gradual yield increase in previous years. During this same time period, growers were changing from plant-to-thin production practices, to plant-to-stand and were becoming more aware of field emergence issues. Specific concerns that growers related to varieties included field emergence, seedling vigor, resistance to disease and insect pests, and overall yield performance.

To help address this concern of "seed and variety performance", the University of Nebraska developed a three year, three state, sugarbeet variety performance project. One objective of this project was to compare final field emergence among the included varieties, and to relate field emergence to laboratory germination for individual varieties. Commercially available seed from a range of varieties was planted in a total of 19 grower fields in Nebraska, Colorado, and southeastern Wyoming during 1998, 1999, and 2000. Seed from 28 varieties was planted in five fields in 1998, seed from 38 varieties was planted in eight fields in 1999, and seed from 42 varieties was planted in six fields in 2000. Most varieties were currently approved for the growing area but some varieties were in the approval process. Several European varieties were included each year primarily for emergence and yield comparison. All seed was pelleted, and where possible, was obtained from local seed distributors to be representative of the seed planted by area growers.

Each variety was replicated six times in each field. Individual field plots for each variety were 50 ft. long and three rows wide. Where possible, growers provided all field operations except planting and harvesting. The University of Nebraska planted all plots with a planter of known and accurate seeding rate. Final emergence (stand) was measured in all rows of all plots at the two-four true leaf stage of growth. Samples of the seed were also sent to an independent seed testing laboratory for a laboratory germination test using a standard laboratory germination procedure for pelleted sugarbeet seed.

Final field emergence, averaged over all fields and all varieties included in the respective years, was 74% in 1998, 75% in 1999, and 63% in 2000. There were statistically significant differences in field emergence among varieties within all 19 fields. The difference in final field emergence between the variety with highest field emergence and the variety with lowest field emergence in a given field, averaged over all fields within a year, was 16% in 1998, 29% in 1999, and 25% in 2000. The relative ranking of individual varieties for field emergence was highly consistent among fields within a year, and among years averaged over all fields.

The 63% average final field emergence in 2000 excludes four trial sites where either the entire field was abandoned or was replanted. These fields had severe soil crusting created by heavy rains after planting, and had resulting low field emergence. Final field emergence was measured in two of these sites where the entire field was abandoned and replanted to another crop. The final field emergence in these two sites averaged over all 42 varieties was 22% and 25%. The range of field emergence for individual varieties was 12% to 32% and 14% to 38% for these two fields, respectively. Relative emergence performance among varieties for these fields with low overall emergence was similar to the other fields with higher overall field emergence.

There was a statistically significant linear regression relationship between final field emergence and ten day standard laboratory germination for individual varieties each year. The coefficient of determination (R^2) for the linear regression of final field emergence averaged over sites within a year and ten day laboratory germination of the seed used in the respective year was 0.61 for 1998, 0.49 for 1999 and 0.54 for 2000. This indicates there was a relationship between field emergence and lab germination. However, the relationship was not sufficiently reliable to precisely predict the ranking of varieties for field emergence.

These data were collected using one container of seed for each variety per year. It cannot be determined from this study whether the differences in field emergence among varieties were caused by the inherent attributes of variety, by the particular container of seed provided for this study, or by some combination of both. Regardless, it was representative of seed planted by local growers. A difference in final field emergence of 16%-29% (averaged over sites within a year for each of the three years) between two boxes of seed (or varieties) is excessive for a single factor that is within our control, whether the issue is "variety" or "seed quality". Most of the varieties (or seed) used in this three year study provided potential for high stand establishment. Some varieties (or seed) caused low stand establishment which suggests associated reductions in overall crop productivity and profitability. The sugarbeet production industry should strive to minimize this production problem.