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A PROGRESS REPORT ON GENETIC VARIATION, GENETICS AND BREEDING FOR SEED COAT CRACKING RESISTANCE, BRIGHTER WHITENESS AND LOW SEED COAT HARDNESS IN GREAT NORTHERN DRY BEANS (Phaseolus vulgaris L.)

Safi S. Korban, Dermot P. Coyne and John L. Weihing
University of Nebraska
Lincoln, Nebraska, USA 68583

Seed coat cracking, splitting and the presence of hard seeds in Great Northern dry bean varieties (Phaseolus vulgaris L.) has been a serious problem. Bean seed color is also a significant factor affecting bean quality. This research was undertaken to identify genetic sources with seed coat cracking resistance, brighter white seed coat properties and with a low percentage of hard seeds. The inheritance and the genetic inter-relationship of the traits - seed coat crack resistance, brighter whiteness of seed coats and low seed coat hardness will be investigated for the Ph.D. thesis.

Seed samples of current Great Northern and Pinto varieties were equilibrated to a uniform moisture content and cracked on a rotating disk (Adams and Popa, BIC Repr. 1974, p. 12-14); other samples were cracked by dropping them onto a steel plate from a predetermined height (Dickson and Boettger, BIC Repr. 1977, p. 38-39). A Vogel thresher was used as the third method of cracking. Then the percentage of cracked and split seeds were determined on samples used in the three methods. The soaking test was conducted on non-cracked seeds collected after the cracking test to determine cracked seeds which could not be determined earlier. Seed whiteness was measured using a Hunter Color Difference Meter.

The Vogel thresher caused extensive seed and seed coat cracking. GN1140 and GN Star had the greatest amount of split and cracked seeds, whereas GN Nebraska #1 and GN Valley were the most crack-resistant varieties using this method.

Similar results were obtained when those lines were impacted on a rotating disk. There were no significant differences among varieties in the percent of cracked seeds after soaking of those seeds which showed no visual cracking in the cracking tests. Pinto varieties, when damaged similarly on

a rotating plate, showed differences for the different types of seed damage. Pinto UI 114 had the lowest percentage of visibly damaged seed, but after soaking Pinto line 3439 had the lowest number of injured seeds.

Dropping bean seed 150 cms onto a metal plate caused considerable damage, especially among GN UI 59, GN ~~Emerson~~, GN Star, GN Tara and GN Nebraska #1 varieties. Unexpectedly, GN 1140 which was classified as susceptible to cracking in the previous methods of impactation was not significantly different from the near-isogenic determinate GN Nebraska #1 in its resistance to cracking.

All three methods of cracking reflect some differences in the performance of the varieties to mechanical abuse, and further investigation into the seed coat properties will be employed.

The Hunter Color Difference Meter was unable to detect differences in the seed coat whiteness of the different Great Northern dry bean varieties. Therefore, other methods for detecting differences will be used.

Anatomical and physiological studies of the seed coat of the different varieties is being conducted.

Crosses were made between selected GN parents and the parents F₁ and F₂ seeds were planted June 1978 in the field. Seed coat cracking and seed whiteness is being recorded on a per-plant basis in these populations. Moreover, more crosses will be made to obtain enough seed for the diallel experiment which will be planted in the field in the summer of 1979 to study the inheritance of these characters.

Acknowledgement

We have appreciated advice and/or assistance received from Dr. M. W. Adams, MSU, Dr. George Hosfield, USDA and MSU and Dr. M. H. Dickson, Cornell University, during the course of this investigation.

RESISTANCE TO LEAFHOPPER *Empoasca fabae* IN SNAP BEANS

M. H. Dickson and C. J. Eckenrode
New York State Agricultural Experiment Station
Geneva, New York

In 1978 a collection of about 220 lines of beans was unexpectedly infested with leaf hoppers in the field. Damage was very severe on susceptible lines. It was encouraging that most, but not all, snap bean varieties were resistant or intermediate in susceptibility. However, the five root rot tolerant lines widely used in breeding programs were very susceptible. These were PI 165426 W&C, PI 165435, PI N203 and Cornell 2114-12. A collection of PIs selected for root rot tolerance varied from resistant to highly susceptible as did a collection of dry beans.

Seventy root rot tolerant selections included in the trial were gener-