

IOWA STATE UNIVERSITY  
Ames, Iowa  
Department of Agronomy

1. Reduction of *ga* pollen contamination in double-cross hybrids made up with one *ga ga* inbred and 3  $Ga^S Ga^S$  inbreds.

Seed contamination of sugary, pop, and waxy endosperm types of corn by pollen of other corns is a serious problem in some seed production areas. This problem may be alleviated by the use of a gametophyte factor which prevents fertilization of  $Ga^S Ga^S$  genotypes by pollen from *ga ga* genotypes.

Since new lines isolated from *ga ga* populations may be used commercially before being converted to  $Ga^S Ga^S$ , the problem may continually exist. However, where double-cross hybrids are used commercially, one line of the *ga ga* genotype may be used and the danger of contamination may be reduced materially. Only the  $Ga^S$  pollen from a heterozygous single cross  $Ga^S ga$  is effective on  $Ga^S Ga^S$  silks. Accordingly, an inbred, *ga ga*, may be used as one of the parents of a single-cross pollinator in double cross hybrid production.

In case of polygenic inheritance, there is little concern over limiting the functional pollen of the male single cross with a gametophyte factor. However, if a simply inherited character were linked to the *ga* locus, its transmission to the double-cross would be limited by close linkage.

Prior to 1958, a few reciprocal crosses of popcorn ( $Ga^S Ga^S \times Ga^S ga$  and  $Ga^S ga \times Ga^S Ga^S$ ) were observed on a limited basis. No evidence was present suggesting differences of any magnitude. However, 12 hybrids of this type were made reciprocally and compared in a split plot design using hybrids as main plots and reciprocals as sub-plots. Measurements made were popping expansion, yield, per cent stand, 100 ear weight, weight per unit volume, plant height, ear height, broken stalks, days from planting to mid silk, and earring.

Two of the crosses involved were 3-way crosses. Accordingly, this seed from the cross of  $Ga^S Ga^S \times Ga^S ga$  was produced on an inbred line. Stands were 84% as compared to 93% in the reciprocal cross. This was not surprising but the average stand of the  $Ga^S Ga^S \times Ga^S ga$  crosses was consistently higher than the reciprocal type even though the seed was all produced the previous year. No plausible explanation is offered for this difference. Yields were not significantly different when adjusted for stand differences.

Table 1. Means and ranges of 12 popcorn hybrids and their reciprocals for 10 characters.

| Character                 | Type of Cross  |       | Type of Cross  |       |
|---------------------------|--|-------|--|-------|
|                           | Ga <sup>S</sup> Ga <sup>S</sup> x Ga <sup>S</sup> ga | mean  | Ga <sup>S</sup> ga x Ga <sup>S</sup> Ga <sup>S</sup> | mean  |
| Popping expansion         | 902-1031   | 966   | 910-1001   | 967   |
| (cu. in/Lb)               |  |       |  |       |
| Yield (lbs./acre)*        | 4228-5121  | 4706  | 4402-5179  | 4832  |
| Stand (%)                 | 81-98  | 91.5  | 86-98  | 94.7  |
| Earring (ears/100 plants) | 106-153  | 120   | 111-140  | 123   |
| Ear size (lbs/100 ears)   | 24.1-31.6  | 27.4  | 23.2-31.3  | 27.1  |
| wt. per 8566 (grams)      | 154-159  | 154.8 | 153-158  | 154.7 |
| Plant height (feet)       | 5.9-7.0  | 6.6   | 6.1-7.0  | 6.6   |
| Ear height (feet)**       | 2.9-3.9  | 3.6   | 3.1-4.0  | 3.7   |
| Broken Stalks (%)         | 17-39  | 23    | 10-40  | 21    |
| Mid-silk (days)           | 76-80  | 78.1  | 76-80  | 78.1  |

\* Difference between reciprocals significant at 5% level  
 \*\* " " " " " " at 1% level.

Most of the Ga<sup>S</sup>Ga<sup>S</sup> lines were isolated from sources which were relatively low eared while lines of the ga ga genotype were from sources with high ear placement. If factors for low ear placement were associated with the Ga<sup>S</sup> genotype, selection against ga pollen may account for significantly lower ear placement in crosses where the seed parent was of the Ga<sup>S</sup>Ga<sup>S</sup> genotype.

The effect on ear height was relatively small and the effect of the direction of the cross on other measurements was essentially negative. Accordingly, use of double crosses of the genotype Ga<sup>S</sup>Ga<sup>S</sup> x Ga<sup>S</sup>ga, using the Ga<sup>S</sup>ga type as the pollinator, appears feasible to reduce contamination by foreign pollen in seed production blocks until the gametophyte factor can be transferred into new ga ga lines.

W. I. Thomas\*  
 J. C. Eldredge

\*Present Address: Department of Agronomy  
 Pennsylvania State University  
 University Park, Pennsylvania