

5. Mutagenic Effect of Mustard Gas on Yield in Inbred Lines.

The effect of nitrogen mustard gas [methyl-bis (β -chloroethyl) amine] on the yield of two unrelated inbred lines of yellow dent corn, W22 and W23, was studied. Two groups of sublines from W22, descendants from separate ears, and one group from a single ear of inbred W23 were used. Freshly collected pollen was exposed to near-lethal doses of the gas vapors for three successive generations, using the procedures described by Gibson, Brink and Stahmann (1950).

Yield comparisons of two kinds were made: (1) treated selfs were compared with the corresponding untreated selfs and (2) hybrids between the treated and the corresponding untreated selfs, were compared with the respective sibbed untreated inbreds; in addition W23 was also compared with the selfed control.

Treated selfs vs. Untreated selfs

Sixteen sublines of each of the three groups were tested against four sublines of the corresponding control in a split-split plot design experiment, replicated six times. The results are as follows: Inbred W22: The first group yielded 103.1% of the control, with eleven sublines exceeding the control, but only five of the differences were significant. In the second group, all the sublines yielded less, but only eleven were significantly less, and the average of the group was 90.6% of the control. Inbred W23: The average yield for the group was 102.8% of the control. Thirteen sublines yielded higher than the control, two of the differences were significant.

Treated x untreated vs. Untreated controls

Inbred W22: Sublines, previously screened for fertility, of each group were put in two randomized complete block design experiments, in comparison with the sibbed control. The first group yielded 96.1% of the control and only two of the twenty-eight sublines tested yielded slightly more, but not significantly more, than the control. The twelve sublines of the second group average 67.1% of the control. All the differences were highly significant. Inbred W23: Two yield trials were conducted, one comparing the sublines against the selfed control in a split plot design trial. The average yield was 102.% with twelve out of the sixteen sublines yielding more than the control. Three of these differences were statistically significant. The second yield trial compared the sublines against their sibbed control in a randomized complete block design experiment. The mean yield was 101.7% of the control. Twenty-three from the thirty-two sublines tested yielded more than the control, but only three were significantly higher.

There were no conspicuous morphological differences between the treated groups and the untreated inbreds from which they were derived. But in regard to yield, it would seem possible to conclude that inbred W22 behaved differently, and was more susceptible to the gas damage and less stable than inbred W23. Moreover, the data indicate that, at least with inbred W23, favorable yield mutations were induced by the nitrogen mustard gas. There is

no clear-cut evidence whether genes showing dominance or over dominance, or both, are responsible for the increased yields.

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