BEAR HYBRID CORN COMPANY, INC.
Decatur, Illinois

1. Radiation as a breeding tool.

The primary aim of this project was to investigate radiation as a practical method of inducing endosperm and plant mutations in agronomically desirable corn inbred lines.

During the summer of 1954, Dr. W. Ralph Singleton, then associated with the Brookhaven National Laboratory, was kind enough to assume responsibility of the irradiation and pollination of three inbred lines, B14, $Hy_2$, and 07. Seeds from these irradiated plants were grown and selfed in our nursery in 1955.

Additional lines, M14 and C103, as well as B14 were sent to Brookhaven for irradiation in 1955. Also in 1955, we grew inbred lines M14, B14, and C103 in buckets and through the courtesy of St. Marys Hospital in Decatur and Dr. Glenn E. Ross, radiologist, tassels of these plants were exposed to 600r and 700r from a General Electric deep therapy x-ray machine seven days prior to pollen shed. Seeds from all of these irradiated plants were grown and selfed in 1956.

Listed are observations made on the 1955 and 1956 plantings:

| 1955 Data | B14 | Hy | 07 | |
|---|---|---|---|---|
| Total Plants Observed | 522 | 239 | 124 | |
| Plant Aberrations | 103 | 49 | 24 | 19.9% |
| Total Selfed, Ears Screened | 143 | 115 | 42 | |
| Ears with Endosperm Segregations | 3 | 4 | 1 | 2.7% |

1956 Data

Plant Aberrations - Seed from Irradiated Generation

| Inbred Line | M14 | B14 | C103 | 07 | % Aberrations by Method |
|---|---|---|---|---|---|
| Thermal Neutrons (BNL) | | | | | |
| Normal Plants | 75 | 103 | 28 | | |
| Aberrant Plants | 29 | 29 | 81 | | 27.7% |
| 1300r ♂ and ♀ (BNL) | | | | | |
| Normal Plants | 57 | | | | |
| Aberrant Plants | 6 | | | | 9.5% |

Plant aberrations - Seed from Irradiated Generation (Cont'd)

| Inbred Line | M14 | B14 | C103 | 07 | % Aberrations by Method |
|---|---|---|---|---|---|
| 1300r ♂ (BNL) | | | | | |
| Normal Plants | 62 | | 35 | 101 | |
| Aberrant Plants | 22 | | 11 | 8 | 17.2% |
| 600r X-ray | | | | | |
| Normal Plants | 63 | 121 | | | |
| Aberrant Plants | 12 | 17 | | | 13.6% |
| 700r X-ray | | | | | |
| Normal Plants | 56 | | 87 | | |
| Aberrant Plants | 0 | | 12 | | 7.7% |
| % Aberrations by Line | 18.0% | 17.0% | 22.7% | 7.3% | |

Endosperm Segregations - Selfed Ears from Irradiated Generation

| Inbred Line | M14 | B14 | C103 | 07 | % Segregations by Method |
|---|---|---|---|---|---|
| Thermal Neutrons (BNL) | | | | | |
| Normal Plants | 71 | 89 | 17 | | |
| Endosperm Segregates | 2 | 2 | 1 | | 2.8% |
| 1300r ♂ and ♀ (BNL) | | | | | |
| Normal Plants | 55 | | | | |
| Endosperm Segregates | 2 | | | | 3.6% |
| 1300r ♂ (BNL) | | | | | |
| Normal Plants | 56 | | 26 | 40 | |
| Endosperm Segregates | 2 | | 2 | 0 | 3.3% |
| 600r X-ray | | | | | |
| Normal Plants | 66 | 111 | | | |
| Endosperm Segregates | 1 | 1 | | | 1.1% |
| 700r X-ray | | | | | |
| Normal Plants | 51 | | 78 | | |
| Endosperm Segregates | 1 | | 2 | | 2.3% |
| % Segregations by Line | 2.7% | 1.5% | 4.1% | 0% | |

Aberrant plant types include several different categories. For example, M14 plants irradiated by thermal neutrons in 1955 and grown in 1956 had 29 aberrant plants in a total population of 104. In classification, some plants were listed under two categories.

| | | | |
|---|---|---|---|
| Plants shorter than normal - | 7 | Completely sterile tassels - | 10 |
| Very narrow leaves --------- | 1 | Kernels formed in tassel --- | 1 |
| Extremely late ------------ | 7 | Shoot with no silks -------- | 1 |
| Semi-sterile tassels ------- | 10 | | |

Endosperm segregations observed in all lines included wx, su1, Y, and various defective types. Differences in aberration rates were noted according to inbred, type of irradiation, and amount of irradiation.

Difficulty was encountered in obtaining good seed sets by selfing even when the pollen appeared normal and abundant. The low number of ears classified for endosperm segregations in relation to the plant characters classified both in 1955 and 1956 bears this out.

The $S_2$ generation from plants irradiated in 1954 were grown in 1956 to observe possible desirable recessive plant characteristics. In this material we noticed several ear-rows which were segregating for various plant characteristics. We did not keep detailed data on obvious deleterious segregations -- our main screening was to detect obvious improvements of undesirable line characteristics. We found none.

As we see it, the chief objection to using radiation as a breeding tool is the same as is encountered with many other breeding techniques, namely, the testing of a large progeny to identify desirable agronomic characteristics.

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BLANDY EXPERIMENTAL FARM
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1. The Blandy Experimental Farm.

The Blandy Experimental Farm has joined the ranks of research institutions working on corn. Although it has been in operation for some 30 years comparatively little corn has been grown. Research at the Farm has consisted mainly in genetics, cytogenetics, and cytotaxonomy. Men who have taken their degrees at the Blandy Experimental Farm are now holding positions of responsibility in all sections of the country, particularly in the South.

The Blandy Experimental Farm is located in the Shenandoah Valley of Virginia. It consists of slightly more than 700 acres, 100 acres of which is the Orland E. White Arboretum named after the first director of the Blandy Experimental Farm. This arboretum consists of more than