REPORT ON SUNFLOWER RESEARCH IN ARGENTINA

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Argentina is the second largest sunflower seed producer in the world. During the period 1948-1952, it produced an average of 870,000 short tons on a mean of 2,630,000 acres. The main use is for the production of edible oil.

Sunflower Breeding Program at Pergamino

I. Utilization of heterosis:

A sunflower breeding program commenced at the Experimental Station at Pergamino in 1939.

Inbreeding with selection was started in open-pollinated varieties and old populations (presumably derived from Mammoth Russian). Utilizing lines with 8 to 10 years of selfing, single cross combinations were produced by hand pollination and F_1 was tested in 1952. The high yield obtained with many of these hybrids encouraged us to continue with this method. But in the same year, sunflower rust appeared for the first time in Argentina, and strong epiphytotics were observed the following years. The hybrids were completely susceptible to rust.

In 1953, we received from Dr. Putt the rust resistant line 953-102-1-1. With this line a program was started in an attempt to incorporate rust resistance to our best lines using the backcross method.

In 1959, using the new rust resistant lines, the same hybrid combinations made in 1952 were repeated. The percentage of hybrid plants ranged from 70 percent to 90 percent and the yield from 167 percent to 208 percent in comparison with Klein (100 percent).

The same hybrids were made again the following year, and the yield test of the F_1's show percentage of hybrid plants ranged from 28 percent to 66 percent, and the yield from 40 percent to 136 percent in comparison with Klein (100 percent).

As a result of this test, we realize that the percentage of hybrid plants is not constant from year to year, and that it would be a serious problem under commercial production.

At this time, single hybrids cannot be economically produced with success. Until cytoplasmic male sterility can be found, synthetic varieties seem to offer a good opportunity for the controlled utilization of an appreciable amount of heterosis.

II. Cytoplasmic male sterility:

The solution for the economical production of sunflower hybrids is by the use of cytoplasmic male sterility. Perhaps the best illustration of purposive plant breeding to produce cytoplasmic male sterility is that of the common garden Petunia.

Everett and Gabelman produced male sterility by means of genome transfer from the cytoplasm of one species into the cytoplasm of another. We are trying to duplicate their work with sunflower. The species we are using are: H. debilis ssp. cucumerifolius, H. argophyllus, H. petiolaris, wild H. annuus and the commercial variety Klein.

III. Breeding for disease resistance:

It is interesting to bring out here that in 1940 the average yield in all the country was 900 pounds per acre and now it ranges around 500 pounds per acre.

Two principal factors are responsible for the decrease in yield;
1. incidence of rust and root rot diseases and
2. the adoption by many farmers of the following practice: instead of planting sunflower in September or October, which give the highest yield, they plant in December or January after wheat harvest. The yield depends on the weather conditions, and because of the later planting, the yields are generally low.

A. Rust (Puccinia helianthi)

Because of the severe damage this disease has caused in the past several years, priority has been given to breeding for rust resistance.

In addition to the program to incorporate rust resistance to the lines which formed the high yielding hybrids mentioned before, a similar program was initiated in 1956 to improve the varieties Klein and VNIIMK 1646. In 1962, one of the rust resistant lines obtained from the "Klein program" was released as a variety and named "Pergamino Guayacan." It yields 20 percent more than the Klein variety, which is a mean taken from tests conducted at three locations during a three-year period.

Lines obtained in both programs will be utilized in synthetic varieties.

B. Root rot (Peste negra)

Root rot, possibly caused by Sclerotium bataticola, is another important disease which produces severe damage in Argentina.

Introductions and local varieties were tested under field conditions, and some resistance was found only in the late-maturing strains. Search for resistant genes is underway in segregating progenies of crosses between cultivated H. annuus and other species of this genus.

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