

ADVANCES IN SUNFLOWER BREEDING BY INDUSTRY
IN THE UNITED STATES AND SOUTH AMERICA

By

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Most of you are aware that there are several industry groups involved in sunflower breeding. Partial lists were given during the last two conferences and are found in those proceedings. The following brief list includes those companies working with oilseed sunflowers. There are three companies in Argentina--DeKalb (who has a representative here at the conference), Cargill S.A. and Forestall Pergamino. Pacific Oilseeds, Inc., a subsidiary of Pacific Oilseed is working in South Africa. In the United States, Pacific Oilseeds, Inc. and Northrup King in addition to Cargill, Inc. are doing some work.

There are some industry groups who are working primarily with the birdseed and/or confectionery type. Dahlgren and Company of Crookston, Minnesota, Lyng and Company, Modesto, California and Northrup King and Company of Woodland, California have active breeding programs.

To date, as far as I am aware, the only firm having full-time sunflower breeders is Cargill, Inc. Osvaldo Monge-Navarro and myself head sunflower research for Cargill in Argentina and the United States. Some of you perhaps know that the Argentina (INTA) breeding program has essentially been terminated. They are doing cultural studies plus maintaining some of the lines, but are not actively involved in sunflower breeding.

Since I don't have the current status for some of the other commercial interests, let me just tell you briefly what we at Cargill are doing. Basically we are working to develop hybrids of both short and long season maturities. We are looking at the early-maturing hybrids for the Red River Valley or the North Central Plains of the United States and as a second crop in The Argentine. We are breeding sunflowers with later maturity to be used in The Argentine and hope that they might possibly have application in California and the Southern United States. Just to give you a brief idea of the size of our research program we bag (either selfing or crossing) about 150,000 plants per year.

Our primary breeding goal is to increase production of oil per acre. We have tested a number of breeding systems by which to produce hybrids. I have worked rather closely with Dr. Kinman, Dr. Putt, Dr. Enns and Dr. LeClercq, and certainly appreciate the help that these and other researchers with governmental agencies have given us. We have tested both the self-incompatibility and genetic male sterile systems and feel that these were not suitable for extensive commercial production. We have also considered the partial genetic male sterility of Dr. Putts. Again we made the same conclusion. We have been most hopeful in working with the linked red marker genetic sterile system. Perhaps my topic should have been "Advances and

Setbacks", because we had anticipated having several thousand acres of hybrid seed production this year utilizing the linked marker system. We had some difficulty; as Dr. LeClercq pointed out, you must have isolation. The most important system is the cytoplasmic sterility which is now available. This is especially true since genes giving fertility restoration have been found. Drs. Kinman, Enns and myself independently last winter found restorer genes, which appear to occur quite widely throughout both Helianthus Annuus and Helianthus Petiolaris. A few inbred lines of good agronomic type have been identified as also carrying genes for restoration. Currently we are in the process of sterilizing a number of inbred lines of both early and late maturities. Additionally we are working with disease resistance. We've been incorporating rust resistance along with downy mildew and verticillium wilt resistance into a number of lines. This slide shows a line which is segregating for resistance to verticillium wilt. We appreciate the assistance of Dr. Orellana in running these tests. You can see that the techniques he has developed for screening give some very definite results without much of a problem in identification.

One of the tools that I think would be very useful in sunflower hybrid production would be the utilization of the recessive, multiple-flowered gene in parental male lines. As breeders, we realize that one must have a nick or a match of flowering of the parental lines at pollination time for efficient hybrid seed production. By using a multi-flowered line one can, thereby, automatically get a much longer time of pollen shed. Therefore, fewer males would be needed to give a wider range of hybrids.

We are most hopeful and very encouraged from the experimental hybrids we have produced to date. Many of the hybrids give at least a 30% increase in yield above the best varietal checks. An occasional hybrid has exceeded the check by 50%. I'm not speaking of yield of hybrid over the yield of it's inbred parents, because it is not a fair comparison, but the increasing of yields over the best of commercial varieties. We are also very encouraged by the apparent heterotic response of oil content. Crosses in which only one parent has a high oil content have hybrids with oil contents equal to that of Peredovik.

In summary, we certainly believe that hybrids have a very important role in the future and that this future is not very far away. We are most encouraged in sunflower breeding; I think that others who are working in this field feel the same. In the next one or two conferences the story is going to be "What Hybrids Have Done in Production."

Thank you.

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