

## PRESENT SITUATION OF SUNFLOWER BREEDING IN ARGENTINA

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Argentina is the world sunflower second producer with 1.5 million hectares as the average cultivated area for the last five years and 750 kg/ha seed yield. The oil percentage obtained in industry is about 36%. The best varieties, used in the country, as far as oil percentage is concerned, reach 43% oil in seed. These figures prove to be lower to those got by other important world producers. A number of ecologic and cultural practice problems explain this fact.

Among the ecologic ones we have a very large tillage area (from 23 to 38 degrees of south latitude) with great variability of environmental conditions. This demands a high adaptability in widespread varieties or a different type production for each region. Very good environmental conditions are not present in all these regions so that varieties cannot express all their genetic potential. They are linked, in turn, to diseases which cause serious damage in our country, particularly black pest and sunflower black rust.

Finally, the Argentine climate allows a second annual sowing, after wheat harvesting. Because of sunflower resistance to adverse conditions, its low production cost and good selling price, it becomes a speculative crop. Owing to this it is usually sown in a soil where other crops are not so profitable and out of the best season. Particularly in long cycled varieties this feature makes the sunflower maturity coincide with environmental conditions under which diseases develop. This late sowing practice is used in about 70% of the area where the crop is overspread.

It has been observed that when sunflower is sown in the right time in well prepared fertile soils and free from weeds, our best varieties can yield about 2,000 kg/ha.

This prospect makes difficult the breeding work development of this species, which has been fulfilled in the country in a consistent way since fifteen years.

The breeding works are carried out at present, as far as state programme is concerned, in the Pergamino and Manfredi Experimental Stations depending on the National Institute of Agricultural Technology. These works are also developed in five private breeding fields.

At the National Institute of Agricultural Technology, several aspects are taken into account : high yield varieties developed by mass selection ; synthetic varieties and hybrids adapted to different ecological areas and sowing seasons, and resistant to diseases. Priority has been given to the production of hybrids through genetic cytoplasmic male sterility and to resistance to diseases.

Before 1970, works on hybrid development were performed through the use of autoincompatibility and genetic male sterility methods. In 1970 having genetic cytoplasmic male sterility at our disposal, efforts were turned to it because of its greater possibilities particularly at the seed production level. Some medium cycled lines of greater adaptability to our environment were developed. Male sterility has been included to them. The search for fertility restorers was started.

A number of inbred lines has been raised and a fertility restorer has been isolated from the Argentine variety Pehuen INTA. Besides it is possible to rely on other restorer sources from other origins.

Although some hybrids combinations have been already tried, they have not given very good results yet. Restoration has been found in lines derived from one of the best Argentine varieties. This is the reason for which it may be possible to speed up the process of getting hybrids suited to our conditions. It is still necessary to carry out the combining ability trials with a larger number of lines to which the available resistance to diseases factors must be added.

This year, private breeding companies have enrolled the first hybrids produced on male sterility type.

The compromising disease problem is repeated every year and with greater effect in the late sowings. It is mainly composed by black pest and sunflower black rust (*Puccinia helianthi*).

In general our crops show a good disease behaviour and high yielding perspectives till they reach the prematurity stage. From this moment onwards they start falling off quickly because of plant death and abrupt maturity, caused by the black pest.

The first symptoms are observed in the leaves, which die from bottom to the top. They keep stuck to the stalk. They are dry, dark coloured and longitudinally wrinkled. This process can be completed in a few days or can go on until the maturity stage is got. This depends on the intensity of the attack.

During the previous process, some dark stains turn up on the stalk. Later they cover it completely. Then the stem gets dry from top to bottom and the head reduces and loses weight.

The pathogenic scene of this disease has not been clarified yet, in spite of the works done about it in our country. It seems to be caused by a pathogenic complex, to which *Verticillium dahliae*, *Sclerotium bataticola*, *Fusarium moniliforme*, *Phoma oleracea*, *Helminthospor-*

*rium helianthi* would meet in a changeable degree, according to the prevailing environmental conditions. Up to now, the resistance sources have not been found, but a better behaviour in the long vegetative cycled forms has been attained.

This could be due to the difficulty in isolating resistance genes, during an attack of several simultaneous pathogens. For this reason, we have started the search, through artificial infection separately, with each of the corresponding agents.

Till 1969 our varieties and inbred lines showed resistance to the 1 and 2 sunflower rust international races (*Puccinia helianthi*) present in our country at that time. This resistance was incorporated using the Canadian 953-102-11-22 source.

Since 1969 a new form appeared. It was identified as corresponding to the international race 3, to which the material showed sensitivity. The search of resistance was immediately started and it was isolated in interspecific populations.

The plant progeny which offered resistance, was artificially inoculated and selected. Two generations a year were got, one of them in the greenhouse. At present these lines are on the last stage of their selection.

Owing to the fact that *Puccinia helianthi* can produce new races by mutation and somatic and sexual hybridization, it was necessary to study the local races and to search for material resistant to this disease. These studies were carried out by the Plant Breeding Institute from the Genetic Research Center of the National Institute of Agricultural Technology.

The other diseases which affect sunflower in Argentina are less important such as *Sclerotinia sclerotiorum* (white rot), *Sclerotium rolfsii* (bottom of the stalk rot and wilt), white sunflower rust (*Albugo trago-pogonis*). Mildew (*Plasmopara halstedii*) has caused much damage in other sunflower producing countries, where resistance sources have been found. This disease can be seen in our country only in a low percentage.