

# REPORT ON TRAVEL TO ITALY, SPAIN AND PORTUGAL (June, 1983)

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In the period June 13—22, 1983 I travelled to Italy, Spain and Portugal within the FAO Sunflower Subnetwork on "Collection, evaluation, and conservation of wild species and their use in sunflower breeding programmes".

ITALY. From June 13 to 15, 1983 I stayed at the Institute of Agronomy of Pisa University. I had detailed discussions with Prof. Dr. A. Benvenuti, Director of the Institute, Dr. G. P. Vannozzi and Mr. R. Paolini about their sunflower research programme and possible forms of co-operation with the FAO Sunflower Network.

The Institute of Agronomy of Pisa University entered the FAO Subnetwork on wild species in 1982.

Researches have been carried out at the Institute starting from 1981, the first year having been spent in observing the most important biological and morphological characters of 24 wild species of the genus *Helianthus*. Self-compatibility and cold requirements for germination of the same entries were also tested in 1981—1982. Work was carried out not only on the original material received in 1981 from the USA but also on some *H. rigidus*, *H. maximiliani*, and *H. annuus* entries received at the beginning of 1982 from Dr. Škorić (Yugoslavia). Pertinent data were sent to the co-ordinator of the corresponding FAO Subnetwork.

The programme, which should last for at least four years, takes into account different aims:

### a) Research for new sources of *cms*.

Crosses of *H. bolanderi*, *H. debilis* sp. *debilis*, *H. debilis* sp. *silvestris*, and *H. mollis* have already been obtained in 1983; this research topic has to go on in 1983—84 with some other species, such as *H. maximiliani*, *H. rigidus* sp. *rigidus*, *H. resinosus*, *H. argophyllus*, *H. eggertii*, *H. laevigatus*, *H. nuttallii* sp. *nuttallii*, *H. salicifolius*, and *H. mollis* which should be crossed in the course of 1983.

Cytoplasmically male sterile plants of the interspecific hybrids are being researched on by both selfing and sibbing (taking into account their very low autogamy degree), and

crossing with different *petiolaris* male sterility maintainers; at the same time, they are crossed to different inbred lines. Owing to the marked earliness of both hybrids and many of the pollinator strains (at least for the already obtained hybrids) two generations per year may be obtained (May-end of July, end of July-first weeks of October, by transplanting).

Starting from late 1984, embryo culture will also be used for growing interspecific hybrids.

Corresponding sources of restoration will be looked for by alternating cycles of selfing and back-crossing on the branched hybrids (very early inbred lines will be used in the second case). Some already obtained unbranched interspecific hybrids will be only backcrossed with the cultivated type in 1983, while the corresponding female parent will have to be both selfed and crossed with the cultivated sunflower in the course of 1983 and 1984. For this work two generations per year will probably be available.

The Institute's collection of wild species will be enlarged in 1984 by seed samples asked for from Bushland (USA), Montpellier (France), and Novi Sad (Yugoslavia).

b) Research for sources of resistance to diseases (*Sclerotinia sclerotiorum* and *Macrophomina phaseolina*).

F<sub>2</sub>, BC<sub>1</sub> and F<sub>1</sub> plants will be tested for resistance to *Sclerotinia sclerotiorum* and *Macrophomina phaseolina* starting from early spring of 1984 and the complete line of work will be: cross-embryo culture (if necessary) — testing for resistance to diseases — transplanting — field job.

This part of the programme will be executed in co-operation with the Institute of Plant Pathology of Perugia (Prof. A. Zizzerini).

c) Research for sources of resistance to drought.

The root system development of *H. argophyllus* as compared with that of the domesticated sunflower started to be studied in 1982. The equipment used consists of a series of box units where the colonization of the soil at dif-

ferent stages may be studied (as both length and weight of the roots per unit of volume of the soil). Nitrogen uptake and water use at different growth periods are also observed. In 1984, the work will include the species *H. ciliaris* and *H. deserticola* which should be supplied by the Liaison Center.

The programme looks also for obtaining new sources of *petiolaris cms* restoring lines among different wild species. The crosses obtained in 1981 showed clearly the ability of *H. debilis* sp. *debilis*, *H. debilis* sp. *silvestris*, and *H. praecox* sp. *praecox* to restore the fertility of pollen of *cms* lines coming from *H. petiolaris*. The screening goes on both by backcrossing different *cms* lines and by selfing the up to date  $S_1$  (in the latter case, unbranched types are looked for). Apparently, the latter way is more useful in the development of lines which could be included in the commercial hybrid seed production in two or three years.

It may be seen from the above programme that wild species are intensively used in the sunflower breeding programme of the Institute of Agronomy in Pisa. To reach the desired goal faster, it is necessary to include a larger number of wild species into the programme, as well as to increase the staff, both the number of researchers and auxiliary workers. It is also advisable to increase the number of plants of each wild species in order to secure the necessary genetic variability within each species.

My hosts acquainted me in detail with the complete programme of sunflower genetics and breeding and took me to see their field experiments.

SPAIN. From June 16 to 19, 1983 I stayed at INIA — Departamento Nacional de Plantas Oleaginosas — in Cordoba. On June 18 I paid a visit to "Koipesol" Company near Sevilla.

In Cordoba I met Dr. J. Fernandez-Martinez and Dr. J. Gimenez-Dominguez who reviewed for me their programmes on sunflower genetics and breeding, placing emphasis on the programmes within FAO framework.

The use of wild sunflowers in their breeding programme develops in two ways:

a) Use of wild species in determining sources of drought resistance.

b) Use of wild species in breeding for high protein content in seed.

The researchers at Cordoba Institute make use of 19 wild species totalling 73 entries. In the course of 1982 they made a large number of crossings between wild species and the domesticated sunflower. Particularly interesting are the combinations of the domesticated sunflower and the following wild species: *H. exilis*, *H. anomalus*, *H. argophyllus*, *H. niveus* subsp. *canescens*, *H. neglectus*, *H. paradoxus*, and *H. salicifolius*. It is uncertain as yet if the crossings *H. annuus* x *H. deserticola* and *H. gi-*

*ganteus* were successful. The majority of these interspecific hybrids had the domesticated sunflower as both mother and father components.

The crossings were still in course at the time of my visit but it is reasonable to expect that a number of crossings will yet be made by the end of the year. Furthermore, backcrossing of the interspecific hybrids with the domesticated sunflower was in progress at the time of my visit.

*H. deserticola* and *H. argophyllus* are of special interest in breeding for drought resistance. The researchers in Cordoba have preference to these two species in their programme.

Similarly to the state of affairs in Pisa, Cordoba Institute should increase the number of researchers working on the programme of wild species use because it is of general interest that the targets set are reached as soon as possible. It is also necessary to design suitable methods of testing the available breeding materials for drought resistance. It is a must to assess the behaviour of generative plant parts of interspecific hybrids in conditions of soil and air drought in order to try to reduce the percent of blind seeds in future sunflower hybrids.

Besides the programme on wild sunflower species, Cordoba Institute has a programme of development of sunflower hybrids which includes abundant breeding material. There are new early hybrids which, in conditions of drought present in Spain, looked much better than the hybrids in the commercial production. The new early lines hint at the development of still better sunflower hybrids.

The available breeding material intended for the development of high protein hybrids is rather ample, indicating that the objectives outlined could be realized in near future.

The breeding programme of the company "Koipesol" in Sevilla is not old. Although it was started only in recent years, it may be expected to turn out good hybrids very soon. Its leader, Dr. C. Alonso chose a sound approach to the problem and collected divergent genetic materials, especially some early lines.

I concluded on the basis of this and earlier visits to Spain that the main objective of sunflower breeding there is the development of early hybrids resistant to drought. Perhaps it would be advantageous for all sunflower breeding institutions to make a larger use of certain wild sunflower species in their work on the determination of sources of drought resistance because these sources do not exist in the domesticated sunflower.

PORTUGAL. From June 19 to 22, 1983 I visited several Portuguese institutions which deal with sunflower promotion and improvement.

Mrs. M. Lewes de Barros acquainted me with the sunflower programme of Missão de Estudos

Agronomicos do Ultramar, Lisbon. The programme is concerned with agrotechnical experiments and sunflower diseases in Portugal.

I saw several sunflower fields in the vicinity of Evoro and Revitheiro. The fields suffered from drought. Furthermore, the soil is poor in some microelements, e.g., molybdenum, which causes disturbances in plant nutrition resulting in retarded growth and low yields of sunflowers.

During the visit to Estação Nacional de Melhoramento de Plantas in Elvas, Mr. M. T. Barados, Director, acquainted me with the general activities of the Institute and Mrs. M. Y. Vivas informed me of their sunflower programme. A wish was expressed to start a sunflower bre-

eding programme based on the use of wild species.

In Portugal, sunflowers are grown in extremely arid conditions. The first step in sunflower breeding should therefore be the development of early varietal populations resistant to drought. Simultaneously with that programme it is necessary to test wild sunflowers for drought resistance and use them to develop drought resistant hybrids.

To start a successful production of sunflowers in Portugal, it is necessary to gain knowledge of soil deficiency in microelements and develop methods of soil improvement by mineral nutrition.