HELIA, **21**, Nr. 29, p.p. 137-144, (1998)

UDC 633.854.78(87)
Report

THE PRESENT STATUS AND PROSPECTS FOR SUNFLOWER IN VENEZUELA

H. Fernández[1,2*], E. Soto[1]

[1] *Departamento de Recursos Fitogenéticos IIA-CENIAP, FONAIAP, P.O. Box 4653, Maracay 2101, Estado Aragua, Venezuela*
[2] *Dipartimento di Produzione Vegetale e Tecnologie Agrarie, Facoltà de Agraria, Università degli Studi di Udine. Via delle Scienze 208, 33100, Udine, Italy*

Received: June 18, 1998
Accepted: December 2, 1998

SUMMARY

The Venezuela areas with soils classified as Inceptisols, Vertisols and Alfisols, present in Barinas and Portuguesa States, are most suitable for sunflower crop. Soil pH is more than 5.8, with moderate to high moisture retention, and textures varying from loam, sandy loam to clay loam. The climate is tropical with a 12-12.5 h day/dark photoperiod. The average experimental yield is 1,500 kg ha^{-1}. Sunflower is sown after a main crop (corn, rice) usually in October-November in high areas, and November and December in low areas. Harvest occurs at the beginning of year, in the absence of rainfall. The main problems are: selection and soil preparation, planting dates, hybrids not adapted to tropical conditions, and the high price of seed, which is imported.

Key words: Sunflower, potentials and limitations

INTRODUCTION

The Venezuelan oil industry is highly dependent on import. In 1995, 260,000 t of oil was imported, of which 144,100 t was sunflower oil. Many attempts have been made to grow annual crops such as peanut (*Arachis hypogaea* L.), sesame (*Sesamum indicum* L.) and sunflower (*Helianthus annuus* L.) but without success for economic reasons. By-products of maize (*Zea mais* L.) and cotton (*Gossypium hirsutum* L.) have been used as edible oils, but it is very expensive to produce oil from them, besides the fact that a larger area would be needed to meet the national demand. Perennial crops such as coconut (*Cocos nucifera* L.) and oil palm (*Eleaeis guinensis* L.) are well adapted but there are limitations in their oil quality.

A reduction is needed in the cost of production of sunflower and other alternative crops, and a solution is sought in breeding programs. Peanut requires tolerance to leaf spot and soil adaptation both to low calcium levels and acidity. Sesame

* Corresponding author

needs to double yields and to overcome seed indehiscence, a trait under polygenic and environment control.

The results of a research carried out on sunflower for several years showed the adaptability in some Venezuelan areas and in this paper, a summary is presented of the potentials and limitations of this crop. Data were mainly collected from the FONAIAP Research Institute since 1985. Agronomic and breeding activities were carried out at the Universities of Venezuela (UNELLEZ, U.C.V. and U.D.O.).

EVOLUTION AND PRODUCTION AREAS

Sunflower production in Venezuela occurred in three main periods, as described below.

Introduction 1970-1986. During this time varieties, (Mazzani, 1970) and hybrids were tested. The first report of hybrid adaptation was given by Voinea (1976) and Mazzani and Voinea (1977). Commercial areas under some foreign hybrids reached up to 2,000 ha. The main areas spread out in the States of Portuguesa, Barinas, Center of Guarico, Aragua, Center of Monagas, and Anzoategui, in the North-Eastern area. Other potential areas were identified by Voinea (1976) in the north of Apure, south of Barinas, some valleys in Tachira, Merida, and Trujillo, in the western parts of Falcon and eastern Guarico, Yaracuy, Lara and Monagas States.

Table 1: Evolution of the planting area and sunflower production in Venezuela

Year	Harvested area, in 1000	Production, 1000 mt	Yield, kg ha^{-1}
1986	15	11	733
1987	45	34	755
1988	115	98	852
1989	115	85	739
1990	138	123	891
1991	41	38	926
1992	26	26	1000
1993	22	25	1136
1994	25	27	1080
1995	18	13	738
1996	17	11	662
1997	12	8.6	714

Source: FAO

Expansion consolidation 1986-1990. The contingency policy adopted by the government after the occurrence of a deficit in raw oil materials enhanced the production area. However, many cultivars, although they were known at that time, were not managed adequately. The sunflower area reached 115,000 ha in the 1989-1990 season. The Portuguesa and Barinas States were the main producers, although

profits were not completely satisfactory for the industry due to low yields (Table 1). In some areas, however, farmers produced as much as 2,300 kg ha^{-1}.

Sunflower in the 1990s. Once the government changed its policy, the industrial sector reduced the financial aid. Consequently, sunflower production was continued only in the most suitable areas. The total area was reduced to only 20-30,000 ha, located mainly in the States Barinas and Portuguesa.

AGROECOLOGICAL CONDITIONS

As stated above, the production area is now concentrated in the States of Barinas and Portuguesa, on specific soils given in order of adaptation - Inceptisols, Vertisoles and Alfisols. The soil series (Fanfurria, Torunos, Baronero, series 2, 3 and 4 from the Dolores and Guamo sector) are characterized by high to medium natural fertility, loam, sandy loam, and loam clay textures, with pH higher than 5.8, deep, with moderate to high moisture retention (Velazquez, 1990; Santos, 1990). The altitude ranges from 50 to 500 m, the latitude from 5 to 7 degrees North. The climate is tropical, with average temperatures of 26-27°C, with a minimum of 18°C and a maximum of 32°C. The annual rainfall varies between 1200 and 2000 mm, concentrated during 6 to 8 months, mainly between April and August. The relative humidity is 70%, the photoperiod 12-12.5 h, and the potential annual evaporation varies from 1630 to 2450 mm.

FARMING SYSTEMS

The farming system used for sunflower may be classified as a mechanized production of an annual crop, with use of fertilizers, pesticides and no irrigation. Weeds are controlled chemically during the first few days of plant development and mechanically, usually one or two times before flowering.

Sunflower is considered as a catch crop in the dry season after maize, and in some cases after rice, allowing the use of labor and equipment associated with the main crops. The sowing date falls between October and December.

The farmers who are currently sowing sunflower depend on the oil industry. Only a few of them can sustain the cost themselves, and they need a guarantee that they will be paid at least the cost of producing the crop.

The average sowing area is 100 to 200 ha per farmer, who typically own the land, but some rent land, and most of them are exclusively dedicated to agricultural activity.

SEED MANAGEMENT AND BREEDING PROGRAMS

The genetic materials used by the farmer are hybrids produced by private companies, mainly in Argentina and the U.S.A. They have a 95- to 120-day cycle and the

oil content ranges from 38 to 48%. Attempts have been made to produce seed in Venezuela, after an examination of the local and international markets. There is a good possibility of producing hybrid seed although tests of synchronization and adaptation of the parental lines needs to be performed.

In the expansion and consolidation period, the variety under study was the 3-way hybrid Continental P81, used for its adaptability. After several years of regional trials (Soto, 1987; Rincon, 1991) the Argentina hybrid M-738 showed a better adaptability than the old varieties and it is now used as the control. Concurrently with the regional trials, a local breeding program was carried out to produce experimental open pollinating varieties and hybrids with good adaptation characteristics. However, more work needs to be done to search for material with the following traits: drought resistance and precocity to avoid the drought in critical growth stages and the risk of rain in the harvest period, and higher yield possibly obtained with high oil and oleic acid content varieties.

Presently, there is a bilateral project between the FONAIAP Institute and the University of Udine (Italy) which has introduced important genetic material, allowing the breeding program to continue, exchange of information and training of a working group of Italian and Venezuelan sunflower researchers.

PESTS

Aponte *et al.* (1988a) reported that leaf spot caused by *Alternaria helianthi* (Hansf. Tubaki et Nishihara) is a widespread disease in most sunflower-growing areas, but there is no great damage when the disease occurs at late stages of plant development. Several authors (Betancourt *et al.*, 1987; Aponte, 1989b; Pineda, 1989; Hidalgo, 1989) reported the most common diseases in different sowing areas of Venezuela. They highlighted the soil-borne diseases, charcoal rot (*Macrophomina phaseolina* (Tassi) Goid.) and stem rot (*Sclerotium rolfsii* Sacc.). These diseases are important as they have a wide range of hosts. Their incidence is increasing annually. In some areas, charcoal rot causes more than 20% mortality. The black stem spot, caused by *Phoma oleracea* var. *helianthi-tuberosi* Sacc., and stem rot, caused by the bacterium *Erwinia* spp., are related to leaf spot and, in many cases, depending on climatic conditions, are hard to distinguish in the field. Less frequent diseases are: plant wilt (*Fusarium* sp.) powder mildew (*Erysiphe cichoracearum* D.C.), head rot (*Rhizopus* spp.), bacterial firebrand (*Pseudomona helianthii*) and leaf spot caused by *Phomopsis* spp.

In the initial stages of the plant development, attention has to be paid to cutters and drillers. Aponte (1990) and Burgos (1990) reported the genus *Systena* spp. (*Coleoptera, Alticidae*) and *Spodoptera frugiperda* (*Lepidoptera, Noctuidae*) as important pests. However, in the 1990s, white fly (*Bemisia tabaci* Gennadius) become the most harmful insect. This insect is very difficult to eradicate completely or to keep its population low due to the fact that it may have more than 100 hosts (Arnal, 1992). Burgos (1990) and Arnal (1989) reported on secondary pests such

as: *Oncometopia* spp (*Coleoptera*, *Alicidae*), *Chlosyne lacinea* Saundersii (*Lepidoptera*, *Nymphalidae*), *Heliothis* spp. (*Lepidoptera*, *Noctuidae*), *Trichoplusia ni* (*Lepidoptera*, *Noctuidae*).

AGRONOMIC CONSIDERATIONS

In Venezuela, some agronomic factors have caused various reductions in the production capacity of sunflower hybrids. One of the most important factors is the sowing date, which normally depends on the availability of credits. Experience has shown that the sowing after November causes inappropriate plant density and considerable yield reduction. The recommended density is 50,000 - 60,000 plants ha^{-1}, but these data come from tests carried out in areas at other latitudes and the hybrids behave quite differently in tropical areas.

Generally, the farmers have successfully controlled weeds, but special attention had to be paid to *Cyperus rotundus* L., which is the most difficult weed species to eradicate, especially at harvest time in fertile soils. It is sometimes necessary to apply a herbicide to control *Centrosema* spp. and *Rhyncosia minima* (Mancilla, 1990)

CONCLUSIONS

Research and farm yield results have shown that it is possible to produce sunflower in Venezuela with economically viable profit, by using adequate agronomic management and material with recognized adaptation. Currently, 140,000 ha of suitable land for this crop is available. Sunflower has been well accepted by the producers, as it represents a profitable alternative in the corn-sesame rotation system. Thus the land is used better and the incidence of pests and diseases is reduced. One of the main agronomic limitations is the late sowing date. It is necessary to obtain national varieties which would decrease the dependence on foreign seed and make this material available to farmers at a reasonable price.

ACKNOWLEDGMENT

The authors would like to thank to Prof. Angelo M. Olivieri for his valuable suggestions.

REFERENCES

Aponte, A., 1989b. Enfermedades del girasol detectadas en Venezuela. FONAIAP Divulga, 7 (32) : 25 - 27.

Aponte, O., 1990. Situación Entomologica del girasol en el Estado Portuguesa. FONAIAP, Estación Experimental de Barinas. Analisis de la Tecnologia sobre el cultivo de Girasol en el Estado Barinas. Memorias. Barinas., p. 163-164.

Arnal, E., F. Ramos., 1990. Insectos relacionados con el cultivo de girasol FONAIAP Divulga, 8 (33) : 31 - 35.

Arnal, E., F. Ramos y E. Debrot., 1993. Plantas hospederas de la mosca blanca Bemisia tabaci en Venezuela. Agronomia Tropical 43 (5 - 6) : 267 - 285.

Burgos, H., 1990. Diagnostico de plagas del cultivo de girasol en el Estado Barinas. FONAIAP, Estación Experimental de Barinas. Analisis de la Tecnologia sobre el cultivo de Girasol en el Estado Barinas. Memorias. Barinas, p. 161-162.

Betancourt, G, E. Soto y L. Subero., 1987. Observaciones sobre la incidencia de enfermedades en Girasol (*Helianthus annuus* L.) en Venezuela. Trabajo M 17. Sociedad Venezolana de Fitopatologia. X Seminario Nacional de Fitopatologia. Resumenes. Maracay ,Venezuela.

Hidalgo, W., 1989. Incidencia y severidad de enfermedades en siembras comerciales de girasol (*Helianthus annuus* L.) en el estado Portuguesa, Venezuela durante los ciclos 1987-1989. Sociedad Venezolana de Fitopatologia, XI Seminario Nacional de Fitopatologia, Universidad de los Andes, Trujillo, Resúmenes. 1989.

Mancilla, L. E., 1990. El Girasol. Estudio agroeconomico. Edicanca. Caracas.

Mazzani, B. y J. Allievi., 1970. Comportamiento de un grupo de variedades de girasol en Maracay. Agronomia Tropical. V 20 (4). p. 275-283.

Mazzani, B. y S. Voinea., 1977. Ensayos comparativos de cultivares de girasol (*Helianthus annuus* L.) en diferentes regiones de Venezuela. Agronomia Tropical, 27 (5) Sep-Oct, 1977, p. 517-528.

Pineda, J., 1989. Enfermedades detectadas en girasol en el estado Portuguesa. En: El girasol, su cultivo. FONAIAP. Araure, Noviembre 1989, p. 15-20.

Rincón, C.A. y W. Pacheco., 1991. Ensayos regionales de Girasol 1991. FONAIAP. 14 p. (Serie D N×11).

Salas. S., 1990. Limitaciones y potencialidades de los suelos de los llanos occidentales para el desarrollo agropecuario y zonificación del cultivo de girasol. An·lisis de la Tecnologia sobre el cultivo de Girasol en el Estado Barinas. FONAIAP, Estación de Barinas. Memorias. Barinas. 1990, p. 24.

Soto, E.,1987. Ensayos regionales de girasol año 1986. Fondo Nacional de Investigaciones Agropecuarias (FONAIAP) CENIAP. Informe tècnico. Mimeografiado 29 p.

Voinea, S., 1976. Cuatro años de investigación en girasol, 1973-1976, Araure. Centro Nacional de Investigaciones de la Región Occidental. 25 pp. Publicación miscelanea n×1.

Velàzquez, L., 1990. Tecnologias disponibles sobre el cultivo de girasol para el Estado Barinas. Anàlisis de la Tecnologia sobre el cultivo de Girasol en el Estado Barinas. FONAIAP, Estación Experimental de Barinas. Memorias. Barinas 1990. p. 15.

SITUACION ACTUAL Y PERSPECTIVAS PARA EL GIRASOL EN VENEZUELA

RESUMEN

Las zonas de Venezuela con suelos clasificados como Inceptisols, Vertisols y Alfisols presentes en los estados de Barinas y Portuguesa son las más adecuadas para el cultivo de girasol. El ph del suelo es más de 5.8, con retención de agua de moderada a alta y texturas oscilando de limosa limosa-arenosa a limosa-arcillosa. El clima es tropical con 12 a 12.5 h. de fotoperíodo. El rendimiento medio experimental es de 1.500 kg ha^{-1}. El girasol se siembra después de un cultivo principal (maíz, arroz), normalmente en Octubre-Noviembre en las zonas altas y Diciembre en las zonas bajas. La recolección tiene lugar al principio del año, en ausencia de lluvia. Los principales problemas son la selección y preparación del suelo, fechas de siembra, híbridos no adaptados a las condiciones tropicales y el alto precio de la semilla, que es importada.

STATUT ACTUEL ET PERSPECTIVES DE LA CULTURE DE TOURNESOL AU VENEZUELA

RÉSUMÉ

Les zones du Venezuela avec des sols de type Inceptisols, Vertisols et Alfisols localisés dans les états de Barinas et de Poruguesa sont les plus favorables à la culture du tournesol. Le PH du sol est supérieur à 5.8, avec une capacité de rétention de l'eau modérée à forte et des textures de sol variant de limoneux, sablo-limoneux à argilo-limoneux. Le climat est tropical avec une photopériode jour/nuit de 12-12.5 H. Le rendement moyen expérimental est de 1500 kg ha^{-1}. Le tournesol est habituellement semé après une culture principale (maïs, riz), en Octobre-Novembre dans les zones d'altitude et en novembre dans les zones de plaine. La récolte a lieu en début d'année, en l'absence de pluie. Les problèmes principaux sont: le choix et la préparation des sols, les dates de semis, l'inadaptation des hybrides aux conditions tropicales et le prix élevé de la semence importée.