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Caribbean Food Crops Society

XVI REUNION ANUAL
XVI REUNION ANNUELLE
XVI ANNUAL MEETING

SANTO DOMINGO, REPUBLICA DOMINICANA

VOL. XVI. 1979

SUNFLOWER PRODUCTION PROBLEMS IN NORTH–CENTRAL FLORIDA

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INTRODUCTION

Prior to 1977, the only sunflower crops produced in Florida were used as windbreaks among green bean rows in the Everglades Agricultural Area, in rows in home gardens for very minor production of bird seed, in individual or small groupings of plants as ornamentals, or in growout tests near Home-stead to ascertain the degree of hybridization or purity of northern-grown seed. In 1977, following failures of field corn crops, about 1500 acres were grown to attempt to recover costs associated with the corn crops. These August plantings were fairly successful and led to the planting of about 20,000 acres of oilseed hybrids in north-central Florida. Since hardly any research had been performed on the needs of the crop in Florida, the dangerous techinique of technology transfer was employed with Varying degrees of success. Most of the plantings grew to, the flowering stage with great success and really beautified the monotonous landscape during the flowering period. However, problems arose subsequent to flowering that led, in many cases, to almost complete failures to produce marketable achenes. Some of these problems are outlined in this paper

PROBLEMS ENCOUNTERED

Most of the acreage was planted to a single hybrid, USDA 894, which provided a very narrow gene base even for this first undertaking a new crop in an area far removed from the sunflower belt and its scientists.

This is analogous to the problems encountered in the Great Corn Blight of 1970 when *Helminthosporium* disease caused an epiphytotic in field corn beginning in south Florida and spreading rapidly northward throughout the entire corn producing area in material produced largely from the cytoplasmic male sterility technique on hybrids containing far too few inbreds for an entire industry so important to the American economy.

One of the first problems to be encountered was a lack of planter plates and planters suitable for planting the various sunflower seed sizes that were available in the infant industry here. This resulted in much replanting and even then in poor or thin stands of plants. However, the stands produced attractive plants with some of the largest leaves and flowers ever produced in the USA. Leaves 18 in. long and 12 in. wide on plants with 15 in. diameter flowers were not uncommon.

Micronutrient and nitrogen needs of the plants on Florida sands had not been researched prior to the commercial plantings and there were undoubtedly instances of deficiencies of especially zinc and boron. Some of the fields of sunflower were overfertilized with nitrogen while some did not receive enough nitrogen at the correct times.

An experiment planted in mid-August 1977 showed that nematodes could become a problem in sunflower culture but the first test with nematicides was not planted until much of the commercial acreage had already been planted by the farmers.

Although information had been made available that sunflower was very resistant in the seedling stage to the lowest average temperatures and even light frosts common to this area, most farmers did not plant early enough to obtain the high yields afforded by early February plantings.

Most of the seed arrived in the area untreated against attacks by soil insects and fungi and most of this seed was planted in the untreated condition. It would seem that all seed intended for planting in cold, moist soil should have been treated at the point source, and failing that, by the farmer who intended to plant it. This practice should tend to insure better stands in such soil by reducing attacks from soil-borne fungi and soil insects.

Although no 1978 plantings suffered appreciably from lack of soil moisture, very few of the acres planted could have been irrigated had the need arose. In fact, sunflower seems to be very well adapted to the deep Florida sands. A 17 August 1978 planting grew to maturity whith only 0.84 in. of rainfall supplemented with only 1.5 in. of irrigation water 16 days following emergence to assure adequate moisture as the plants entered the grand stage of growth. As the entire planting was irrigated, there is no way to know if the irrigation was really needed. However, future commercial plantings could need irrigation and plans should include this eventuality.

Very few combines were fitted with seed saving pans and had high yields ensued, much of the harvest would have been lost to seed spilled on the soil surface.

Very little experience with the use of Paraquat and other leaf dessicating chemicals was available in the area and some yield and quality was probably lost through the premature use of these agents before the achenes had fully matured causing chaffy or light seed.

Had not the yields been shipped directly from the combine to market, a shortage of drying and storage structures might have resulted in damp achenes which would have caused spoilage or rancidity, and hence, a loss in quality.

The most serious problem encountered in Florida sunflower culture was an epiphytotic, probably of a fungous nature and strongly resembling the damage caused by *Alternaria* species, that attacked every planting during the flowering stage. Until and during flowering the plantings were veritable model fields of large leafed, beautifully flowered plants, which at late flowering were turned to plants with heavily flecked leaves and blackened stems in a very short period of time, usually about a week. The later the attack, the more of the head had filled with good achenes. The achenes formed as the flowering proceeded from the outer edge near the ray flowers as usual, but the flowers persisted above the unfilled achenes, which remained empty. Many farmers did not notice this condition until harvest time when the combines failed to fill the bins thereon in the expected time period or distance traversed within a field. Closer examination of the seed heads revealed the empty central portions. Since this disease was not expected and was not even predicted due to its obscurity in sunflower culture, no tests had been made with possible control measures. Future tests beginning in 1979 will might be obtained for sunflower for materials already in current use on other crops common to the area.

Weed problems were not severe and the weeds emerging in plantings were those that would have normally been encountered regardless of the crop that would have been planted or that might have been growing from February through harvest of the sunflower crop. Treflan controlled all weed species except wild mustard, a weed that even the producer does not claim it will control, but which is a common field inhabitant during late winter and spring. It was, however, controlled satisfactorily with shallow cultivations using sweeps in the row middles while depositing soil along the rows of sunflower plants. The rapid covering of the sunflower canopy on the soil between rows provided sufficient shade to control weeds until maturity, even on 36-inch rows after lay-by. It would seem that 30-inch rows would have done even a better job, but operations at the Agronomy Farms are set to wider row widths.

Insects have not been problems yet, but the large number of wild members of the *Compositae* plant family stand as a threat since they can act as secondary hosts for a myriad of insecsts that could attack cultivated *Helianthus*.

EFECTS OF EARLY PLANTING

Table 1, made from unpublished data of G.B. Killinger, shows the yields of the earliest formal sunflower tests in Florida with the newer varieties and hybrids. The data clearly show the value of very early planting here. These extremely high yields have not been reproduced in Florida, and a re-calculation of the methods and results show that, indeed, these yields of oven-dry achenes were obtained from plantings at Gainesville on February 1, 7, 11, and 16. These data were made known to the farmers annually as they became available, and were provided in summary form two years before the commercial plantings ensued.

Figures 1 through 5 from Florida Agricultural Experiment Stations Bulletin 796, September 1978, help to explain the reasons that make late winter and early spring plantings more successful than those planted later, which are often failures. Figure 1 shows the average monthly precipitation for this area. Clearly, sunflower grown between February and May, inclusive, is exposed to a more favorable moisture regime within the limits of tolerance than at other times of the year when the plants would be exposed to root rots and high relative humidities of the air, and hence, disease inducing.

Figure 2 show the average evaporation from an open pan, which is a good indication of the extent of solar radiation conditions. It is not unusual for the open pan figure to exceed the precipitation figure on a time basis, which it does in the case of the Gainesville, FL location. Figure 3 depicts the average monthly solar radiation for Gainesville in langleys over a 20 year period. The graph shows that the total radiation is almost linear from January through May and hence very conducive to the growth and development of sunflower plants. The plants are continually exposed to increasingly longer days during this period of fairly clear skies and increasingly warmer weather that favor plant growth with a minimun of conditions that would favor the development of plant diseases.

Figure 4 shows the average and extreme air temperatures for the area. These figures are almost linear between the suggested dates for sunflower culture, February through early June. The yield figures bear this out. The data in Figure 5 of soil temperatures show that these figures are within the recommended range for planting sunflower, 45-50 F. for germination, at all times of the year. Even February 1 plantings have germinated well and had good seedling vigor. When seedling vigor was poor, it was due to extremely cold air temperatures, below 28 F.

Table 2 shows the meteorological conditions accompanying the 1978 tests. Rainfall was extremely low during the cropping seasons for all tests and some irrigation water was added to supplement the rainfall to insure success of the tests with the many hybrids and varieties under test. Since there is low correlation between total radiation and growth of sunflower, the data in this table show that figure in megajoules per meter square plus photosynthetically active radiation in einsteins per meter square. Growing degree days are shown that are calculated from a 32 F. base since sunflower grows well even at that temperature and above, especially in this area where warm middays accompany cool night temperatures, as a rule.

Table 3 shows a comparison of several quality-determining factors found in sunflower experiments conducted in north-central Florida from 1976 to 1978. These data and those in Table 1 show that February plantings always yield higher than those in March, April, or August. Those planted in other months are always failures. Values for test weights for plumpness of the achenes, and hence oil percentages, are always higher in the February plantings. Kernel weight of 200 achenes were higher in a March planting than in an April planting, the only data having been collected in 1978 as part of the data required in the National Sunflower Oilseed Tests. Test weights of Florida grown sunflower are always below those used as standards in the Red River Valley production.

The effects of late plantings on certain characters useful in determining quality at an oilmill from sunflower achenes grown in north-central Florida in 1978 are shown in Table 4, and represent the composition of 7 samples as received in boxcars in july and August at Augusta, GA by Buckeye. The foreign matter average of 5.7% represents combine run production since no cleaning accompanied the loading. Moisture averaging 9.7% was the moisture as combined as no drying of the product artificially was performed. The free fatty acid content, averaging 1.1% was well within the tolerance of 3.0% allowed for rancidity from germinating and moist seed. Oil content was well below the standard of 40% that was contracted for due to the *Alternaria*-like disease that attacked the 1978 crops. The ammonia content of the meal was quite satisfactory from a quality standpoint, averaging 3.48% ·

Table 5 shows that the confection hybrid achenes suffered the same effects as did those of the oilseeds. Seedhead or flower diameters were much reduced. Test weights and number of heads per row were reduced somewhat and yields were much reduced in April plantings when compared to March plantings. Yields of the March planting was 3.2 times that of the April planting.

It has been stated that the prevalence of the Alternaria disease in the USA does not yet justify efforts to develop resistant varieties (NDSU Ext. Bul. 25 (Rev.), July 1978), the same month that the disease ravaged the Florida plantings. This same thought process, or the lack thereof, was prevalent inmediately prior to the national epiphvtotic of southern corn leaf blight that rapidly spread from south Florida to states including Minnesota and the Dakotas in 1970. With the correct conditions of wind and temperature, it is conceivable that the sunflower disease could follow the same disasterous route to those states with the most acreage of sunflower suffering the disaster much greater than those minor sunflower states from which it came. Figure 6 shows the effect from a moderate attack to a head.

To this end, or rather to prevent this end, or at least a severe loss and setback of the industry I am making a strong appeal for breeders in the sunflower belt to make a number of test crosses that can be evaluated in this area of north-central Florida where we know that the disease is surely to occur from May, June, and July flowerings. In this way, the industry can be assured of having resistant material that can be useful in the sunflower belt. This scheme worked in the corn blight disaster because the USDA had tested materials for many years in south Florida before the corn blight struck, and the year 1971 was a bumper year as regards corn production in the year following the blight.

This material must be grown in the spring and early summer, not in November through March as is the northern growout material at Homestead, a time when the area is usually free of the disease.

While some land may be available on properties of the University of Florida, financial aid and technical assistance by the cooperating agencies and seed companies will be necessary to insure sucess of the effort.

TABLE 1
Seed yields of open-pollinated varieties and USDA hybrids in the early 1970 at Gainesville from February plantings.

Variety or hybrid	Yields during indicated growing season 1/			
	1971	1972	1973	1974
	kg/ha			
Krasnodarets	2710	2170	2960	——
Peredovik	2640	2410	3720	3620
Northrup-King HO–1	2860	3830	3740	——
Record	——	3510	2530	3990
HS 52 (Romsun)	——	4350	3190	4230
Issanka	——	——	——	4540
USDA 8946	——	——	——	5140
USDA 896	——	——	——	3640

1/ Yields rounded to the nearest 10 kg/ha. Planted I Feb 1971; 7 Feb 1972; 16 Feb 1973; and 11 Feb 1974. Detailed cultural practices are outlined in Agronomy Research Reports AG 72-5; 73-3; and 75-3, Agronomy Department, University of Florida, Gainesville, FL 32611.

Table 2.
Meterological conditions accompanying the 1978 sunflower tests in north-central Florida: Rainfall, Solar radiation, and Growing Degree Days.

Tests and Dates	Rainfall mm	Solar Radiation 1/ PAR E/m2	Total MJ/m2	Growing Degree Days; Base 32F	Remarks
Greenacres Early Test					
February 14-28	13	369	184	580	
March	30	1030	515	870	
April	9	1347	688	1082	
May	94	1349	668	1328	
June 1–12	64	455	217	525	
Total	210	4550	2272	4384	
Agronomy Farm Test					
February 24–28	3	150	75	103	
March	115	1030	515	925	
April	16	1347	688	1135	
May	88	1349	668	1364	
June 1–14	89	544	260	527	
Total	311	4420	2206	4054	
National Test 8278					
March 14–31	5	669	337	518	Same as March Confectionery Test
April	9	1347	688	1082	
May	94	1349	668	1328	
June 1–19	90	775	374	887	
Total	198	4140	2067	3815	
June 20–26	8	295	143	329	
Total	206	4435	2210	4144	
National Test 8378					
April 13-30	9	824	419	629	Sane as April Confectionery Test
May	94	1349	668	1082	
June	99	1259	610	1328	
July 1–25	126	1005	484	1204	
Total	328	4437	2181	3243	

Greenacres Late Test

August 17–31	3	602	299	630
September	17	1044	515	1378
October	–	901	448	1127
November	63	702	347	1001
December 1–5	3	97	48	187
Total	87	3346	1657	4323

Data collected in the Agronomy Department, courtesy of Drs. D.E. McCloud and G.M. Prine.

1/ PAR=Photosynthetically active radiation; E/m2=Einsteins per square meter; MJ/m2=megajoules per square meter. 2/ GDD data have been historically reported in Fahrenheit degrees, and are done so here. PAR was recorded with a Licor Quantum Sensor and integrator. Total radiation was recorded with a Licor Quantum Sensor and integrator. Total radiation was measured with an Eppley Pyranometer and recorded on a Kipp and Zonen integrator

Table 3
A comparison of several quality determining factors recorded in sunflower experiments in north-central Florida, 1976-1978

Test	Yield of achenes, Kg/Ha. @ 10%	Total Oil Content, @ 10%H20, %	Test Wight for plumpness Wt/Bu 1/	Kg/Hl 1/	200 Kernel Weight 2/
1976					
April 14	1280	47.7	26.8	167.7	——
1977					
February 18	2220	48.3	31.0	194.0	——
August 8	560	42.7	——	——	——
1978					
February 14	2230	44.7	24.9	155.8	——
February 24	2580	42.9	23.4	146.5	——
March 14 (8278)	1720	39.8	23.7	148.3	8.01
April 14 (8378)	450	34.9	19.2	120.2	6.55
August 17	1130	43.5	30.6	191.5	10.23

1/ The ideal weight of sunflower achenes at 10 to 12 percent moisture cleaned of all trash or dockage and free from all other crop seeds should be between 30 and 32 pounds per bushel, or 187.7 and 200.2 kilograms per hectoliter.

2/ These data were not determined until 1978 when required by the National Cooperative Sunflower Tests as a measure of density, and hence, oil yielding ability.

Table 4.
Composition of sinflower seed samples received at Buckeye Cotton Oil Division, Augusta, GA from north-central Florida in July and August of 1978.

Item analyzed	Carload No.	1	2	3	4	5	6	7	Avg.
Foreign matter, dockage %		6.0	5.3	5.7	4.8	6.1	6.1	5.8	5.7
Moisture, percent		8.6	9.3	9.7	10.4	9.5	9.0	11.4	9.7
Free fatty acid content, % 1/		0.9	1.1	1.1	1.8	0.6	0.9	1.6	1.1
Oil, Percent		36.4	47.1	35.8	36.8	34.8	35.8	35.0	36.0
Ammonia content in meal, % 2/		3.51	3.53	3.56	3.57	3.15	3.57	3.49	3.48

1/ Free fatty acid contents below 3.0% yield oils free from rancidity and germinating seed action.

2/ The higher the ammonia content of the meal, the higher the crude protein content. E.G., 3.42% NH_3= 17.56% crude protein.

Table 5.
Comparsion of several characteristics recorded in the March and April plantings of sunflower confecction and bird seed hybrids ncar Galnesville, Florida in 1978.

Brand and Accession Number C	Hybrid Desig- nation	Seedhead Diameter, centimeters		Test Weight for Plumpness Pounds/Bushel		Kg/HI		Number of Heads per row		Yields, Kg per ha @10%	
		March	April	March	April	March	April	March	April	March	April
12. SIGCO	924	26.4	12.2	19.1	16.5	119.52	103.25	4.9	5.4	4010	1020
10. SIGCO	852	30.7	13.7	16.1	13.9	100.75	86.98	4.4	5.1	3610	950
2.Dahlgren	D-717	21.8	14.5	18.0	17.0	112.64	106.38	6.8	6.5	3100	1340
1. Dahlfren	D-715	24.4	16.5	16.6	16.5	103.88	103.25	6.3	5.0	3000	860
8. Sheyenne	883	22.9	12.4	19.3	17.5	120.78	109.51	5.7	5.0	2970	730
3. Dahlgren	D-818	20.6	13.5	20.0	16.8	125.16	105.13	7.5	5.0	2930	840
5. Dahlgren	D-821	24.6	15.0	18.1	16.0	113.27	100.12	5.8	5.0	2840	970
9. Sheyenne	923	23.1	14.2	17.1	13.9	107.01	86.98	6.8	5.7	2830	950
11. SIGCO	923	29.0	13.0	14.5	13.9	90.74	86.98	3.3	5.0	2810	950
7. Sheyenne	853	20.6	13.0	19.3	15.5	120.78	96.99	7.8	5.1	2670	880
6, Dahlgren	D-823	21.6	15.2	17.8	16.0	111.39	100.12	7.0	6.8	2430	930
4. Dahlgren	D-719	20.6	14.0	19.5	16.0	122.03	100.12	4.7	5.4	1950	670
Test Average	-----	23.9	14.0	18.0	15.8	112.64	98.87	5.9	5.4	2930	910
Std. Dev. %		3.3	1.2	1.6	1.3	10.20	7.82	1.4	0.6	520	170

Planting: March 14 and April 13, 1978.

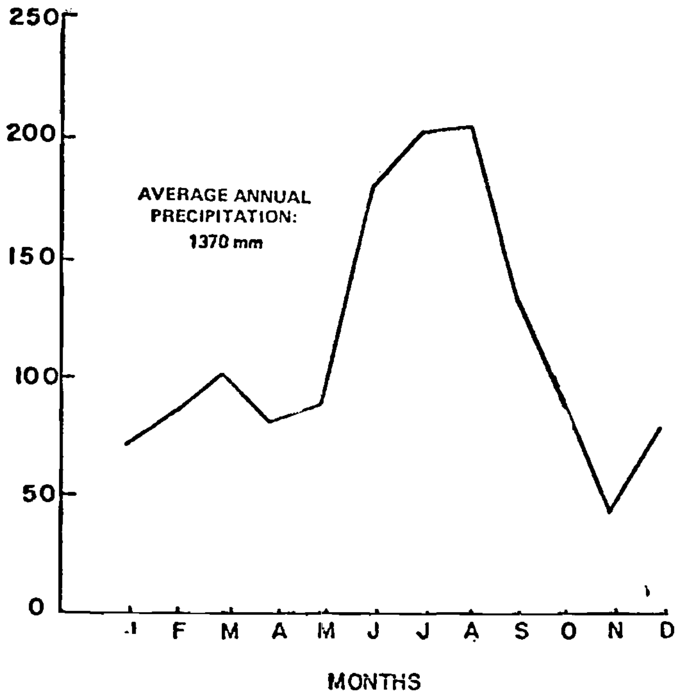

Figure 1. — Average monthly precipitation for Gainesville in millimeters (30 years record — NOAA).

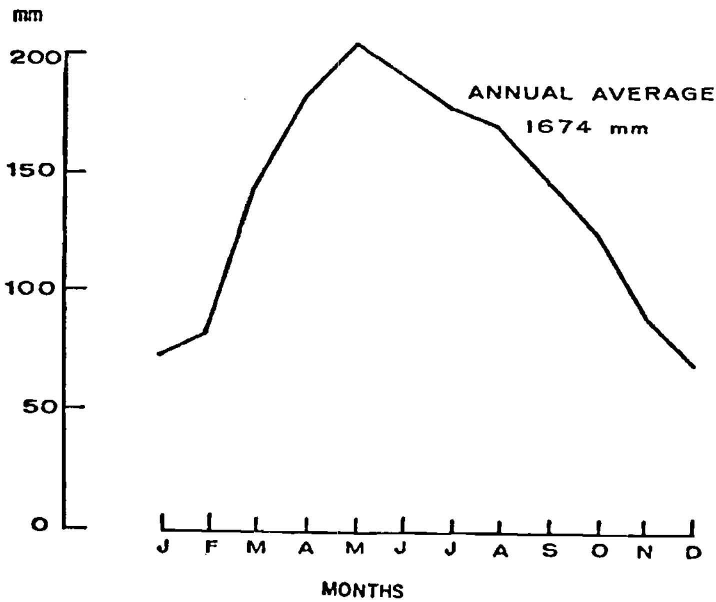

Figure 2. — Average pan evaporation for Gainesville in millimeters (22 year record, 1954-1975, IFAS).

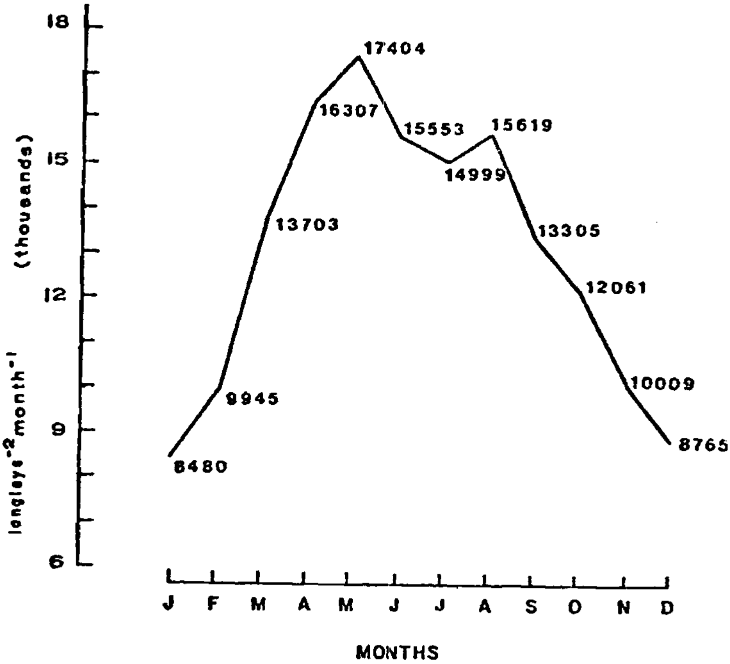

Figure 3. — Average monthly solar radiation for Gainesville in langleys (20 year record, 1955-1975, Solar Rad. Lab.).

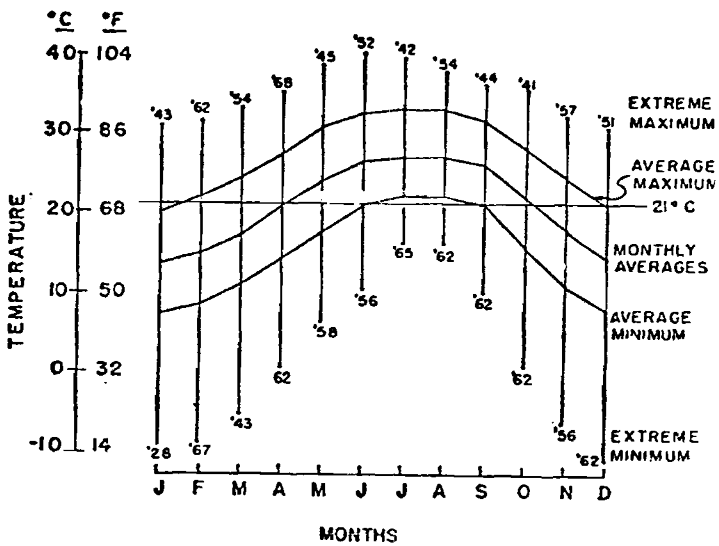

Figure 4. — Average, maximum and minimum air temperature for Gainesville in °C (30 year record, 1939-1968, NOAA). Extreme maximum and minimum temperatures shown with year of occurrence. 21°C Average Annual Temperature.

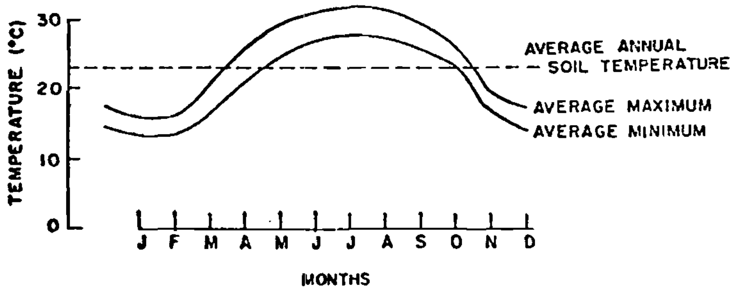

Figure 5. — Average monthly maximum and minimum soil temperatures for Gainesville for 10 cm depth under short pensacola bahia grass sod. (5 year record, 1969-1975, IFAS).

PROBLEMAS EN LA PRODUCCION DE GIRASOL EN LA REGION NORCENTRAL DE LA FLORIDA

Victor E. Green Jr.

RESUMEN

En 1977, después del fracaso de las cosechas de maíz debido a sequía, los agricultores de la región norcentral cultivaron aproximadamente 600 ha de girasol con éxito moderado de julio a diciembre. Consecuentemente, sembraron alrededor de 8160 ha en 1978. Como muy poca investigación había precedido este cultivo, se empleó la peligrosa técnica de la transferencia de tecnología, con diversos grados de éxito. La tecnología utilizada en este caso fue la del Red River de los estados de Minnesota/Dakotas. Todos los cultivares utilizados procedían de los programas de mejoramiento de esa área de producción. Las plantas se desarrollaron hasta la etapa de floración con gran éxito, y ciertamente embellecieron el paisaje con sus flores. Sin embargo, surgieron problemas subsecuentes a la floración que condujeron, en muchos casos, al fracaso casi total en producir aquenios comerciables. Algunos de estos problemas se esbozan en este trabajo y se ofrecen soluciones a algunos de ellos. Se puede llegar a la solución única a muchos de estos problemas recurriéndo a plantaciones tempranas, aun antes de finalizar la época en que se producen las heladas y las temperaturas de congelación. La plantación temprana del cultivo de girasol, el cual es muy resistente al clima frío, tanto en su etapa de plántula como en la de maduración, permite a las plantas escapar de los daños producidos por la mayoría de las enfermedades, insectos y los pájaros que comúnmente perjudican al cultivo en la región norcentral de la Florida.

LES PROBLEMES DE PRODUCTION DE TOURNESOL DANS LA FLORIDE DU CENTRE NORD

Victor E. Green Jr.

RESUME

En 1977, aprés l'échec de la production de maïs causé par la sécheresse, les culti-

vateurs du Centre Nord produisirent prés de 600 ha de tournesol avec des résultats modérés, de Juillet á Décembre compris. A la suite de ces résultats ils ont planté prés de 8160 ha en 1978. Puisque trés peu de recherches avaient précédé cette production, la technique dangereuse du transfert de technologie était employée avec des degrés de réussite variés, en utilisant la technologie de l'American Red River du Minnesota/ Dakotas. Tous les cultivars employés étaient le resultat des programmes de phytogénétique dans cette zone de production. Les plants parvinrent au stade de la floraison aec d'excellents résultats, embellissant le paysage de leurs fleurs. Cependant des problémes ont surgi aprés la floraison menant dans beaucoup de cas á un échec complet en ce qui concerne la production de graines commercialisables. Quelques uns de ces problémes sont esquissés dans cette communication ainsi que quelques éléments de solution. On peut envisager comme seule solution á beaucoup de ces problémes la plantation précoce du tournesol, lequel résiste aux temps frods tant au stade de la semence qu'au stade de la maturation, permettant aux plants de se soustraire aux dommages causés par les maladies, les insectes et les oiseaux propres á la Floride du Centre Nord.