

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search http://ageconsearch.umn.edu aesearch@umn.edu

Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.



SUNFLOWER PRODUCTION PROBLEMS IN NORTH-CENTRAL FLORIDA

Agronomy Department, Institute of Food and Agricultural Sciences, University of Florida, Gainesville, FL 32611.

Víctor E. Green Jr.

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 technique 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 movering 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 over-fertilized 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 36inch 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 epiphytotic 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 1 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 success of the effort.

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

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

 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 Ra PAR E/m2	adiation 1/ Total MJ/m2	Growing Degree Days; Base 32F	Remarks		
Greenacres Early T	est						
February 14-28 March April May June 1–12	13 30 9 94 64	369 1030 1347 1349 4 55	184 515 688 668 217	580 870 1082 1328 525			
Total	210	45 50	2272	4384			
Agronomy Farm T	est						
February 24–28 March April May June 1–14	3 115 16 88 89	150 1030 1347 1349 544	75 515 688 668 260	103 925 1135 1364 527			
Total	311	4420	2206	4054			
National Test 8278	3						
March 14–31 April May June 1–19	5 9 94 90	669 1347 1349 775	337 688 668 374	518 1082 1328 887	Same as March Confectionery Test		
Total June 20–26	198 8	414 0 295	2067 143	3815 329			
Total	206	443 5	2210	4144			
National Test 8378	3						
April 13-30 May June July 1–25	9 94 99 126	824 1 34 9 1259 1005	419 668 610 484	629 1082 1328 1204	Sane as April Confectionery Test		
Total	328	4437	2181	3243			

Greenacres ate	ate Test 11 3 602 299 630 17 1044 515 1378 - 901 448 1127 63 702 347 1001 -5 3 97 48 187										
August 1731	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.

Table 3A 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 Wig Wt/Bu 1/	ht for plumpness Kg/H1 1/	200 Kernel Weight 2/
1976			26.0	167.7	
April 14	1280	47.7	26.8	107.7	
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.

^{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 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, doo	ckage %	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 con	tent, %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 i	n 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% NH3=17.56%crude protein.

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

ds, Kg	@ 10%	April	1020	950	1340	860	730	840	670	950	950	880	930	670	910	170
Yiel	per ha (March	4010	3610	3100	3000	2970	2930	2840	2830	2810	2670	2430	1950	2930	520
r of Heads	row	April	5.4	5.1	6.5	5.0	5.0	5.0	5.0	5.7	5.0	5.1	6.8	5.4	5.4	0.6
Numbei	per	March	4.9	4.4	6.8	6.3	5.7	7.5	5.8	6.8	3.3	7.8	7.0	4.7	5.9	1.4
less	=	April	103.25	86.98	106.38	103.25	109.51	105.13	100.12	86.98	86.98	96.99	100.12	100.12	98.87	7.82
r Plumpr	H/g/H	March	119.52	100.75	112.64	103.88	120.78	125.16	113.27	107.01	90.74	120.78	111.39	122.03	112.64	10.20
'eight fo	s/Bushe	April	16.5	13.9	17.0	16.5	17.5	16.8	16.0	13.9	13.9	15.5	16.0	16.0	15.8	1.3
Test W	Pounc	March	19.1	16.1	18.0	16.6	19.3	20.0	18.1	17.1	14.5	19.3	17.8	19.5	18.0	1.6
Diameter,	neters	April	12.2	13.7	14.5	16.5	12.4	13.5	15.0	14.2	13.0	13.0	15.2	14.0	14.0	1.2
Seedhead	centir	March	26.4	30.7	21.8	24.4	22.9	20.6	24.6	23.1	29.0	20.6	21.6	20.6	23.9	3.3
Hybrid	Desig-	nation	924	352	D-717	D-715	883	D-818	D-821	923	923	853	D-823	D-719		
Brand and	Accession	Number C	12. SIGCO	10. SIGCO	2.Dahlgren	1. Dahlfren	8. Sheyenne	3. Dahlgren	5. Dahlgren	9. Sheyenne	11. SIGCO	7. Sheyenne	6, Dahlgren	4. Dahlgren	.Test Average	Std. Dev. %

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 vear 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 seguía, 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.

RESUMF

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

vateurs du Centre Nord produisirent prés de 600 ha de tournesol avec des résultats modérés, de Juillet à 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 à la Floride du Centre Nord.