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STUDIES WITH THE GLADIOLUS
IN SOUTH LOUISIANA

by

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INTRODUCTION

The gladiolus is one of the most popular and generally known flowers. It is not difficult to grow when good corms, often called bulbs, are planted and conditions for growth are favorable. It is used primarily as a cut flower and as such it has few rivals. The fact that gladiolus flowers usually have no odor may be considered a disadvantage, but no odor is often better than too much, especially around the sick room.

In the lower South the gladiolus is extensively grown in home yards and for local sales. For several years it has been grown on a large scale as a commercial cut flower to be shipped to other parts of the country during the winter and spring seasons. The gladiolus does not thrive under hot, dry weather conditions. It will stand light freezes and frosts without serious injury especially when the plants are small, but will be injured or killed by hard freezes.

The work reported in this paper was conducted largely for the home gardener, but it is hoped that it may be of some value to all interested in growing gladiolus in the lower South. Gladiolus are said to "run out" if grown continuously in this part of the country for several years. It is known that Irish potatoes grown in the spring in the South, kept in cold storage and used as seed potatoes the following spring do not produce as well as potatoes grown from new seed from the North. In Irish potatoes the length of dormant period of the tubers used for seed materially affects the character of the plant growth. It was thought that the gladiolus might be similarly affected. Spring grown gladiolus in the South mature corms in the summer under conditions not favorable to the gladiolus. Corms produced from blooming plants under such conditions are always very flat. There was a general belief that the height of crown of the corm had a marked influence on the plant produced, but the work of Grove (2) did not confirm this belief. Apart from the running out effect, information was desired on the size of corm to plant, effect of flowers on corm production, production of corms from cormels, storage of corms and adaptability of varieties to this area.

Procedure

All of the work was conducted on grounds of the experiment station. The same soil was planted to gladiolus every other year, which was not a good thing to do from a disease control standpoint. Twenty corms were planted to each plot, which was three and one-half feet wide by 10

feet long. Five replications were used per treatment and as corms were planted six inches apart in the row, 100 were used per treatment or type. A 4-12-4 fertilizer was applied at the rate of 800 pounds per acre before planting and after the plants had come up to a stand they were top dressed with nitrate of soda at the rate of 200 pounds per acre. Unless otherwise stated corms were set out the last of January or early in February. The Picardy variety was used almost exclusively except for the variety studies. The term "new corms" is used in this bulletin to indicate those obtained from the North which were grown from cormels, to differentiate them from the corms grown in Louisiana.

"Running Out" or Deterioration

Many people plant mixed varieties of corms and save those produced to plant year after year. After a few years only a few inferior kinds remain, but these have often increased until about the same number or more are planted each year. They are usually of the more hardy primulinus types. The better varieties have been lost due to insect or disease injury or failure to increase themselves. Because the better varieties have been lost and the ones remaining may not look exactly as they did at first, the belief is sometimes held that varieties have actually changed to other kinds. This of course does not happen.

Grove (2) states that it is conceivable that if grandiflorus types of gladiolus were subjected to optimum environment and horticultural treatment, the condition of "running out" should not be prevalent. Disease complicates the determination of deterioration of a variety of gladiolus when grown for several successive years in south Louisiana. Gladiolus of the Picardy variety were grown to get information on this problem. New corms were obtained and planted each year from 1938 through 1942. Corms produced each year were planted the following year. Thus corms that were obtained in 1938 produced corms for four years in Louisiana in this experiment, those obtained in 1939 produced corms three years, etc. Each year the production of 100 new corms was compared with that of 100 corm lots grown in Louisiana. Only No. 1 size selected corms were used. For the first three years corms were stored at 40°F during the dormant period, but the fourth year they were kept in common storage.

The results of bloom production are shown in Table 1. The number of flowers from 100 new corms varied considerably, though they always bloomed well and produced good bloom spikes. The results from the Louisiana grown corms were variable, but as long as corms were stored at 40°F fair results were obtained. When stored in common storage corms which had been grown for more than one year in Louisiana produced plants that were severely damaged with fusarium wilt. So few corms were produced that this experiment had to be discontinued. Many blooms from Louisiana grown corms were good, but they were not consistently as good as those from new corms. There were more faulty flowers and the opening of individual florets was often not as good.

Two other varieties, the Minuet and Margaret Fulton, were grown continuously in Louisiana for five years, but only observations were made on them. They were not as badly injured from fusarium as was the Picardy variety, but they did deteriorate over the period of years. This was

TABLE 1. Production of Blooms From 100 New Corms Compared With That From Corms Which Had Been Grown in South Louisiana From One to Four Years.

YEAR	BLOOM PRODUCED FROM 100 CORMS				
	New corms	YEARS CORMS GROWN IN LOUISIANA			
		1	2	3	4
1938	126				
1939	145	89			
1940	110	143	126		
1941	165	98	115	96	
1942	115	139	11	17	37

especially true with the Minuet. Though they came from good size sound No. 1 corms the plants were very small with short, compact flower spikes, and they bloomed late.

It appears from results obtained that flowers of some varieties of gladiolus did deteriorate when grown for several years under the conditions of this experiment. It seems likely that other varieties will also. This means that it would probably be best to get new corms every second or third year. It is probable that the maturity of corms under the unfavorable conditions of mid-summer play a part in the deterioration. Best results can be obtained with gladiolus in South Louisiana if healthy new corms are planted each year. This would tend to reduce injury from disease, make possible cutting with longer stems, and would allow the removal of the plants as soon as blooms are cut, thus preventing the plants having to remain for six weeks or more after the blooming season. It also prevents care of the corms over the dormant season. This cannot be generally recommended because of the cost.

Size of Corm

Usually three sizes of corms, No. 1's, No. 2's, and No. 3's, are offered for sale as blooming size. Sometimes giant sized corms are sold. The smaller sizes have at times been recommended because they were said to produce good blooms over a longer period of years. To get information on the production of the different grades, new corms were planted each year from 1938 through 1942. The results are shown in Table 2.

The No. 1 size corms produced significantly more blooms than did the No. 2's and No. 3's. The former also bloomed earlier and the average size was larger than that from the latter. The data show that for best re-

sults No. 1 corms should be planted. They cost more, though, and if transportation is paid by the purchaser it is more than for the smaller sized corms. There was no consistent difference in the production from the No. 2 and No. 3 corms. The four year average showed that the No. 2's

TABLE 2. Effect of Size of Corm Planted on Number of Blooms and Size of Plants.

YEAR GROWN	NO. OF BLOOMS PRODUCED			AVE. HEIGHT OF PLANT			AVE. NO. OF FLORETS		
	No. 1	No. 2	No. 3	No. 1 cm.	No. 2 cm.	No. 3 cm.	No. 1	No. 2	No. 3
1938	126	96	..	108.9	76.9	15.1	10.9
1939	145	97	90	121.0	107.4	110.5	15.7	13.9	13.9
1940	110	88	65	99.5	93.1	93.0	13.4	12.2	11.9
1941	161	71	84	104.8	102.1	102.1	13.9	13.6	13.5
1942	115	94	81						
	143	88	80	108.4	100.9	101.9	14.3	13.2	13.1
	(4 yr. ave. 1939-1942)			(3 yr. ave. 1939-1941)			(3 yr. ave. 1939-1941)		

TABLE 3. Number of Blooms Produced From the Corms that Came From 100 Each of No. 1, No. 2, and No. 3 New Corms.

Year corms were new	Year grown in La.	From No. 1	From No. 2	From No. 3
1941	2nd	327	82	137
	3rd	187	66	54
1942	2nd	114	50	74

gave a few more blooms than the No. 3's, but there was no difference in the average size of blooms. The data show that if the smaller corms are planted a larger number will be required to give the same number of blooms as if No. 1 corms were used. That was because the larger size gave a better stand and had more corms that produced two and three shoots. The blooming season of a given variety of gladiolus may be extended somewhat by planting different sizes of corms at the same time. If No. 2 or No. 3 corms are obtained care should be taken, if possible, to be sure that the smaller size is not due to disease.

To determine the comparison of Nos. 1, 2, and 3 sized corms for increase, all the corms produced from lots of 100 of each grade planted from new corms in 1941 were kept and planted in 1942 and all that they produced were planted again in 1943. Similar data were obtained from corms in 1943 produced from new corms planted in 1942. The results are shown in Table 3. While the number of blooms for the different years varied considerably the data show clearly that from the standpoint of increase the No. 1 corms were far superior. This might be expected for No. 1 corms produce more double and triple shoots than the smaller ones and unless a shoot is produced no corm can be formed.

No tests were made with extra sized corms, but observations indicate that it is not worth while to pay a premium for sizes larger than good No. 1 corms.

Date of Planting

Young gladiolus plants will stand frost and light freezes without appreciable injury. The plants grow best at moderate temperatures and do not bloom satisfactorily in very hot weather. For this reason it is well to plant early for best results. Most of the plantings here reported were made early, either in the last few days of January or early in February. A March 10 planting of 100 corms each year was made for four years. Comparison of the two times of planting are given in Table 4.

TABLE 4. Number of Blooms and Time of Blooming From Early and Late Planted Corms.

TIME OF PLANTING	Year	Number of blooms	TIME BLOOMS WERE CUT						
			May 1-10	May 11-20	May 21-31	June 1-10	June 11-20	June 21-30	July 1-7
Early.....	1938	127	77	36	7	7	0	0	0
March 10.....		107	0	0	70	37	0	0	0
Early.....	1939	144	0	16	77	31	12	8	0
March 10.....		121	0	0	3	62	44	12	0
Early.....	1940	111	0	12	38	30	15	12	4
March 10.....		81	0	0	2	40	22	13	6
Early.....	1941	158	0	0	59	39	36	24	1
March 10.....		118	0	0	0	31	56	28	3

The early planted corms consistently produced more flowers than those planted later. The early plantings produced blooms earlier than the later ones and by making the two plantings the blooming season in quantity was extended. The blooming seasons tended to overlap and it is doubtful if more times of planting in between those used would have been of great value. Later plantings would not likely have been successful since blooms would have opened under unfavorable conditions. Size of blooms was apparently more affected by rainfall and temperature than by date of planting.

Corms from Cormels

Gladiolus varieties are increased mainly from cormels. These are produced in varying quantity and size around the corm. The amount of cormel production and the ease of growing corms from them largely determine the cost of corms of a variety. In this experiment cormels were used for the production of corms for three years. It was thought that corms grown from cormels here would give satisfactory production. The first year cormels were used, some good sized No. 1, very high crowned corms were produced. They were from plants that grew late in the season

and did not bloom. Some of them are shown in Fig. 1 in comparison with new No. 1 corms and some grown for one and two years in Louisiana. It was thought that the corms produced by plants grown from the very high crowned corms might not be as flat as those from ordinary No. 1 corms. Some average diameters and heights of corms and diameter/

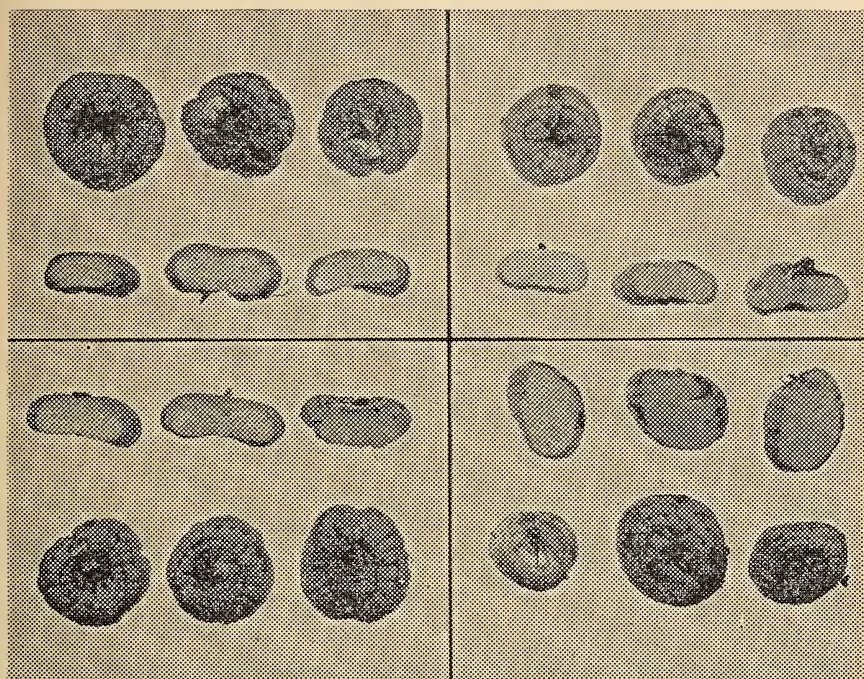


FIGURE 1. Upper right new No. 1 corms from the north. Upper left Louisiana grown one year. Lower right grown from cormels in Louisiana. Lower left Louisiana grown two years.

height ratios are given in Table 5. The data show that regardless of the shape of the corms planted those produced by flowering plants under the conditions of this experiment were flat.

Plants from many of the larger sized cormels bloomed, but this was not desirable because the corms produced were flat and small. No. 1 corms were easily produced from cormels of the Picardy variety in one season. A few cormels of two other varieties, Minuet and Margaret Fulton, were planted and it took two growing seasons to produce No. 1 corms.

Flowers from corms grown from cormels, especially the Picardy variety, were disappointing. This was partly because large sized corms tended to produce too many shoots with consequent small blooms. Fusarium wilt was present in corms grown from cormels and this of course

TABLE 5. Average diameters and heights and diameter/height ratios of gladiolus corms grown in Louisiana and from the North.

SOURCE OF CORMS	Season grown	Size of corm	Ave. diameter of 100 corms cm.	Ave. height of 100 corms cm.	D/H
Grown in La. from cormels (Very high crowned)	1939	No. 1	4.78	4.08	1.17
Grown in La. from new corms	1939	No. 1	5.58	2.18	2.56
New corms from north	1939	No. 1	5.01	2.17	2.31
Grown 2 yrs. in La.	1940	No. 1	5.80	2.19	2.65
From very high crowned cormels in 1939	1940	No. 1	5.44	2.22	2.45
From new No. 1 in 1939	1940	No. 1	5.55	2.00	2.78
New corms from north	1940	No. 2	3.86	2.14	1.80
Grown in La. from cormels (Very high crowned)	1940	No. 2	3.71	3.08	1.20
From No. 2's new in 1940	1941	No. 1	6.18	2.42	2.55
From very high crowned No. 2 cormels in 1940	1941	No. 1	6.77	2.60	2.60

affected the results obtained. If irrigation were available and the plants could be made to grow and mature corms in the fall, they might be very satisfactory.

Effect of Flowers on the Production of Corms

Cochran and Vereen (1) showed that the production of blooms of Easter lilies affected bulb production and recommended that blooms be removed where lilies are grown for the bulbs. As gladiolus are grown mainly as a cut flower it seemed worthwhile to determine the effect of cutting the blooms on corm production. To get information on this subject new No. 1 corms of the Picardy variety were planted and the following treatments as regards flowers were given: Blooms were not cut; blooms were cut as cut flowers but very little of the foliage except that on the bloom stalk removed; bloom stalks were removed as soon as they appeared without injury to the foliage on the plant. Yield records were kept of number, size, and weight of corms produced. The results of three years are given in Table 6. The data show that when the blooms were kept removed before they opened, the yield of corms was greater than that from the other two treatments. There was no significant difference in yield between plots where blooms were not cut and where they were cut as cut flowers. Fair production of corms was obtained in both cases. The foliage that is left when the bloom is cut produces the corm for the next year, so if most of the plant is removed when the flower is cut, no corm of any size can be expected. Varieties that bloomed late did not produce good sized corms.

Varieties

There are a very large number of varieties of gladiolus of many colors and shades and several different types. Individual preference as to va-

TABLE 6. Corms production from 100 corm lots of gladiolus receiving various bloom stalk treatment.

Year grown	TREATMENT	No. 1		No. 2		No. 3		Cormels Wt. in gms.
		No.	Wt. in gms.	No.	Wt. in gms.	No.	Wt. in gms.	
1938	Flowers uncut.....	85	4572	10	234	3	40	758
1939	“ “	91	4192	22	474	4	45	992
1940	“ “	87	3528	6	87	944
1941	“ “	121	6991	12	254	17	170	1584
	Ave.....	96	4821	12.5	262	6	64	1069
1938	Flowers removed before opening.....	86	5362	6	132	6	60	1087
1939	“ “	106	5723	9	183	8	113	1928
1940	“ “	77	3380	7	125	6	52	659
1941	“ “	127	8241	10	201	15	195	2435
	Ave.....	99	5676	8	160	8.8	105	1527
1938	Cut as cut flowers.....	84	4538	8	188	3	36	874
1939	“ “ “ “	98	4596	13	278	8	96	1149
1939	“ “ “ “	75	2769	2	27	4	29	857
1939	“ “ “ “	119	6887	8	189	17	189	1563
	Ave.....	94	4697	7.8	170	8	87	1111

rieties will of course vary. Only a limited number of varieties have been tested in this work and many of these for only one year. Some varieties tend to bloom for a long period while others tend to bloom all at once and are soon gone. Varieties that bloom over a long period might not be as desirable for commercial shipment as those that bloom more or less at one time, but might be better for home yards or for local markets.

Of the varieties tested the Picardy, a large shrimp pink color, is somewhat in a class by itself. Next to Picardy the Maid of Orleans, a fairly large cream white color, is recommended. Minuet, a light lavender color of medium size, comes next. Margaret Fulton, a coral pink color, has done exceptionally well but while its color is excellent it is not an exhibition type and may not be as generally liked as the three varieties named above. It is believed that the above four varieties can be generally recommended in south Louisiana.

The following varieties are considered worthy of trial:

- Royal Oak—Yellow with a tinge of pink
- Beacon—Showy orange red with light throat
- Bagdad—Smoky Rose
- Emile Auburn—Rose

A number of other varieties have been grown.

Red: The following red varieties have been tested. Dr. Bennett, Wuertembergia, Red Phipps, Rewi Fallu, Big Red, Bill Sowden, Com-

mander Koehl, and Flaming Sword have been tried. All have produced some beautiful flowers, but none was dependable. Flaming Sword is a primulinus type.

White: Besides Maid of Orleans the following have been tried: Mammoth White—a large beautiful white but falls over too easily; Albania—blooms well but was small; Albatross.

Yellow: No yellow grown was thought to be entirely satisfactory. Miss Bloomington was considered best with Mary Shary next. Golden Eagle bloomed well but was small. Golden Chimes was a light yellow, but was fairly good. Golden Dream was also grown.

The following varieties of various colors have also been tried. Betty Nuthall, Los Angeles, Edith Mason, Charles Dickens, W. H. Phipps, Ave Maria, Knudson, Peggy Lou, Pelligrina, Early Rose, Morocco and Berty Snow.

If individual varieties of gladiolus are to be grown in the home yard, not less than 25 of a kind should be planted and 50 would likely be more satisfactory.

Diseases and Insects

These problems were not studied experimentally and so will not be discussed at length. The most serious disease encountered in this investigation was fusarium wilt. When home grown bulbs were kept in cold storage it was not as serious a problem as when they were kept in common storage. This disease is soil borne as well as being carried on the corm. Gladiolus should not be planted on the same soil year after year. From the behavior of corms during the course of this work, it seemed that disease free corms planted on infested soil gave very good results.

Thrip infestations occurred five years out of seven. Apparently thrips came in on new corms from the North. While no controlled experiments were run, members of the station entomology staff cooperated in observations on thrips. In no case were thrips found to live over the summer. In one instance corms from heavily infested plants were planted without treatment on the same soil and no thrips were found. This is in line with results of Wilson (3) in Florida. In Florida, however, thrips did live on the plants grown in the winter. Where plants were set six inches apart in 3.5 feet rows damage from spread of thrips from sources of infestation was not as severe as in thickly planted beds. The best control of thrips is to plant thrip free corms. For detailed information concerning gladiolus diseases and insects reference is given to U.S.D.A. Farmers' Bulletin No. 1860.

General Recommendations for Growing Gladiolus in South Louisiana

1. Obtain disease and thrip free corms grown where they do not mature in the middle of the summer. No. 1 size of corms is preferable.
2. Get varieties adapted to this area—Picardy, Maid of Orleans, and Minuet have been found to be very satisfactory.

3. Prepare ground well in advance of the time of planting.
4. If planted in rows fertilize similarly to Irish potatoes. On $3\frac{1}{2}$ foot rows apply 4-12-4 fertilizer at the rate of 800 pounds per acre before planting and top dress with 200 pounds of nitrate of soda per acre when the plants come up to a stand. This is at the rate of about 6.5 pounds of 4-12-4 and 1.6 pounds of nitrate of soda per 100 feet of row.
5. Plant corms as early as possible for plants not to be injured by cold when they come up. In south Louisiana early planting should be made the first week of February. Planting after the middle of March is not recommended. Corms should not be set closer than six inches apart in the row and should be covered with three to four inches of soil.
6. Staking and tying will prevent plants falling over, but should not be necessary if corms are planted deep enough and sturdy varieties are grown. Where large numbers of gladiolus are grown staking is almost impossible.
7. Dry weather materially reduces the size of plants and blooms. Gladiolus should be planted where they can be irrigated, if possible. Water thoroughly when it is done.
8. Leave as much foliage as possible when flowers are cut, if corms are to be produced for planting next year. This can be done and blooms still cut with long stems.
9. Dig corms when plants are nearly dead and cut tops off about an inch above the corm. Remove old corms and roots. Place corms at once in a cool, well ventilated place for a week or ten days, then store in cold storage at 40°F. If no cold storage is available continue to store in rather shallow trays in cool, well ventilated dry common storage. Do not allow corms to freeze.
10. Do not plant the same soil to gladiolus oftener than every fourth year. This is a disease control precaution.
11. Best results will be obtained by getting new corms every year if this can be afforded. Then the gladiolus plants may be dug up and removed as soon as flowers are cut. New corms should be obtained at least every third year if they are not gotten every year.

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