

Table 7. Projected income statement for first and fifth year of a bedding plant operation, small Florida nursery, 1977.

Item	Amount	
	First Year	Fifth Year
	Dollars	
Income:		
Plant Sales	13,232	13,232
Expenses:		
Cell paks	1,036	1,036
Open flats	1,626	1,626
Pre-mix	260	260
Seeds	1,194	1,194
Tags	746	746
Growth regulator	90	90
Insecticides	50	50
Hired labor	1,200	1,200
Fuel	450	450
Electricity	600	600
Taxes, licenses, bonds	166	166
Insurance	250	250
Repairs	450	450
Depreciation	1,236	1,236
Total Expenses	9,354	9,354
Net Returns	3,878	3,878
Less interest paid	636	0
Net Income	3,242	3,878
Less note payment	3,000	0
Retained income	242	3,878

recovered in year three with a 5.7 percent or lower discount rate. The net cash flow to the owner could be \$1,480 annually for the first four years, then increase to \$5,116 for the six months operation during year five. The net worth could increase from \$7,242 at the end of the first year of the project to \$20,846 at the end of the fifth year, assuming no owner salary was withdrawn from the business during this time.

This could be a suitable investment for someone with land and time on their hands, and who is able to forego an income stream for the first four years. Otherwise, it would not be recommended that this venture be undertaken on the scale investigated in this study. On a larger scale, a healthy return could perhaps be generated. However,

Table 8. Projected statement of financial position, small Florida bedding plant nursery, 1977.

Balance Sheet Item	End of First Year	End of Fifth Year
Assets		
Current Assets:		
Cash	6,285	15,833 ²
Total Current Assets	6,285	15,833
Fixed Assets:		
Book value of fixed assets	11,193	11,193
Less—Accumulated deprec.	1,236	6,180
Total Fixed Assets	9,957	5,013
Total Assets	\$16,242	\$20,846
Liabilities		
Current Liabilities:		
Taxes payable	0	0
Total Liabilities	0	0
Long Term Liabilities:		
Notes payable	9,000	0
Total Liabilities	\$ 9,000	\$ 0
Net Worth		
Total Net Worth	7,242	20,846
Total Liabilities & Net Worth	\$16,242	\$20,846

²Sum of total cash difference Table 3, line 29 of 6,285 and annual cash flows for years 2 through 5 from Table 4.

different production techniques, hence capital requirements and operating expenses mean alternative size operations would need to be evaluated in the same manner as the operation evaluated in this report before a decision was made.

Literature Cited

1. Hopkin, J. A., P. J. Barry and C. B. Baker, *Financial Management in Agriculture*, The Interstate Printers and Publishers, Inc., 1973.
2. Gunter, Dan L., *Business Analysis of Foliage Nurseries in Florida*, 1976, Food and Resource Economics Department, IFAS, University of Florida, Gainesville, October, 1977.

Proc. Fla. State Hort. Soc. 92:313-316. 1979.

PIXIOLA: A NEW CUT FLOWER FOR FLORIDA¹

GARY J. WILFRET
IFAS, University of Florida,
Agricultural Research & Education Center,
5007 - 60th Street East,
Bradenton, FL 33508

Additional index words. corm, cormel, miniature gladiolus, standards.

Abstract. Thirty-eight Pixiola (small-flowered gladiolus) cultivars were evaluated for their flower and corm productivity in Florida. Criteria (i.e. spike length, flower size, etc.) were established to define a Pixiola for use as a new cut-flower crop for Florida production. Spike length among

cultivars ranged from 31.6 inches ('Monkey Face') to 46.1 inches ('Jackpot'). These 2 cultivars also produced the extreme rachis (flowerhead) lengths of 11.9 and 20.3 inches, respectively. Only 17 cultivars had flowers with a maximum diameter of 3 inches, the limit established for a Pixiola. 'Gallery' produced the most spikes per corm planted but 'Cheerleader' produced the greatest number of marketable spikes. Corm yields were proportional to number of flower spikes produced.

Gladiolus (*G. hortulanus*) have been developed through interspecific hybridization over the past 173 years into one of the major cut flowers grown in the United States (4). Over 148 million gladiolus spikes were sold in the U.S. in 1978, with a wholesale value of 16.2 million dollars (9). Historically, most breeders selected gladiolus plants with

¹Florida Agricultural Experiment Stations Journal Series No. 1966.

the tallest spikes and largest flowers to exhibit and sell. These gladiolus cultivars were accepted readily by the consumer. But, by the nature of their 3-5 foot spikes with 4-6 inch florets, gladiolus were used primarily in large arrangements for weddings and funerals. Unfortunately, they have become known as "funeral flowers." Since the number of large funerals has decreased, the use and popularity of gladiolus have declined steadily.

During the gladiolus hybridization boom of the 1930's, a few breeders felt a need to retain the smallness of gladiolus flowers for use in small arrangements or landscape plantings. They crossed *G. natalensis* (misidentified as *G. primulinus*) and *G. psittacinus* with the larger-flowered cultivars to produce plants with slender graceful spikes and small flowers (7). In 1945 the first ruffled small-flowered gladiolus ('Crinklette') was released and a new race of gladiolus called "Rufmins" developed. Many of these are the forefathers of the miniature gladiolus available today. Consumers generally are unaware that the miniature or small-flowered gladiolus exist since they are available in small quantities only during late spring and summer. Prior to 1977 few were grown in Florida, which provides most of the gladiolus flowers available in the U.S. in the fall, winter, and early spring.

Since miniature gladiolus have a use separate from the large-flowered type, they should not compete with one another in sales. They should complement each other (5), just as miniature and standard carnations, hybrid tea and sweetheart roses, and standard and pompon chrysanthemums. For promotional purposes and to prevent the possible misconception that the small-flowered gladiolus were culls or poorly grown large-flowered types, the Commercial Growers Division (CGD) of the North American Gladiolus Council (NAGC) initiated a contest in 1977 to find a new name for miniature gladiolus (1). "Pixiola" was the name selected by the CGD judging committee in 1978 and industry was encouraged to use this name in all promotions of miniature gladiolus (2).

Although a name was given to the small-flowered gladiolus, no standards were set to define a Pixiola. It was agreed that it should not be a large-flower type grown from a small corm or just a small spike from a poorly grown plant. It should be a type distinct in itself. For a commercial cut flower grown in Florida, the author suggests that a Pixiola should meet 6 criteria:

1. The spikes should be cut an overall length of 28 inches.
2. The rachis (flowerhead) length should be between 12 and 16 inches.
3. The flower number should be between 12 and 16.
4. The flower size should be no greater than 3 inches in diameter.
5. The spike should be produced from a 1-inch diameter (Grade #3) corm.
6. The flowers should open when cut in the "tight-bud" stage (0.25 inch of color visible in the basal flower).

The purpose of this study was to evaluate some of the small-flowered gladiolus cultivars which are available commercially and to compare them with the criteria established for the Pixiola.

Materials and Methods

Corms of 38 Pixiola cultivars (Table 1) obtained from commercial propagators in Minnesota and New Jersey were stored for 3 weeks at 38°F and 60 percent relative humidity at Bradenton. One day prior to planting, the 1-inch diameter corms were removed from cold storage, immersed in an agitated solution ($75 \pm 2^\circ\text{F}$) of benomyl

(0.83 lb ai/100 gal) and chlorothalonil (0.75 lb ai/100 gal) for 15 minutes and allowed to drain overnight. Dolomitic limestone was broadcast at 1000 lb/acre prior to rotovating the Myakka fine sand to obtain an initial pH of 6.2. Ground beds were prepared on 4.5 foot centers and a 6-inch wide furrow was cut down the center of each bed. Corms were planted at 6 per foot in 2 staggered rows in the furrow on March 5, 1979. Beds were side-dressed with 6-6-6 (30% organic) fertilizer, covered to a depth of 5 inches above the corms, and treated with alachlor (1.5 lb ai/acre) for weed control. During the growing season the plants were side-dressed with 6-6-6 three additional times for a total of 180 lb N/acre. A preventive disease and insect spray program was used twice weekly. Watering was by open ditch seep irrigation. The experimental design was a randomized block of 3 replications, with 8 corms/plot.

Flower spikes were measured at the "tight-bud" stage of development (0.25 inch of color visible in the basal floret) and data were recorded daily. Specific flower characteristics measured were date of flowering, total spike length (from ground level to rachis terminal), rachis (flower-head) length, number of florets, and diameter of basal floret when fully open. All corms were dug, cleaned, counted, and weighed and cormels were saved and weighed. A marketable spike was established by subtracting 4 inches from the total spike length (simulating field cutting and final trimming) and then determining if the spike met 3 criteria: 1) Total length at least 28 inches, 2) Rachis at least 12 inches, 3) Floret number at least 12. Significant differences among cultivar means for each of the parameters measured were determined by Tukey's original honest significant difference (HSD) test.

Results and Discussion

A full range of colors from white to dark lavender was exhibited by the cultivars evaluated (Table 1). Mean number of days to flower ranged from 70 ('Coral Seas' and 'Fraulein') to 94 ('Baby Bunting'), with the majority of the cultivars averaging 73 to 79 days. In general, flowering within any one cultivar was concentrated over a 10-14 day interval. Exceptions to this were plants which showed symptoms of *Fusarium* (*F. oxysporum* f. sp. *gladioli* Snyder & Hans. and other *Fusarium* species (6) and viruses (Cucumber and Bean Yellow Mosaic (3)). These plants had delayed flowering and produced short, malformed flower spikes.

Spike length was variable among the cultivars and ranged from 31.6 to 46.1 inches, represented by 'Monkey Face' and 'Jackpot,' respectively. Although a minimum field height should be 32 inches to be able to market a 28-inch spike (the 4 inches are lost to cutting and trimming the spike), a maximum height is more difficult to define. If only the spike, devoid of leaves, were marketed, then no maximum height need be established. Traditionally, gladiolus spikes are sold with 2-3 leaves subtending the base of the flower spike and the consumer expects these leaves. The maximum height then must be that which will yield a 28 inch spike and still include 2-3 leaves. Depending somewhat upon the cultivar, this maximum field height was observed to be about 40 inches. Five of the 38 cultivars evaluated were taller than this maximum field height.

The cultivars ranged in rachis length from 11.9 inches ('Monkey Face') to 20.3 inches ('Jackpot'). The rachis length should be in balance with the overall spike length but its proportionate length may not be the same as for the large-flower gladiolus which are used in big arrangements and need a long stem. In a "fancy grade" of the large-flower gladiolus, between 40 and 45 percent of the overall spike

Table 1. Inflorescence characteristics of 38 Pixiola cultivars grown at Bradenton, Spring 1979.

Cultivar	Color	NAGC classif. number	Days to flower ²	Spike length (in.)	Rachis length (in.)	Number florets	Floret diam. (in.)
Baby Bunting	Light yellow	212	94	36.4	13.9	16.8	3.1
Bit O'Honey	Light peach	320	82	37.5	16.1	13.6	3.2
Bonfire	Orange scarlet	354	71	42.7	17.3	15.7	3.4
Bravo	Medium red	353	85	37.9	15.2	16.2	3.3
Break O'Dawn	White w/gold CT ³	301	78	41.0	17.1	12.6	3.5
Bugs	Orange and yellow	225	76	36.8	15.0	14.2	3.5
Cheerleader	Yellow w/red CM ³	215	73	39.1	16.9	16.3	2.7
Confetti	Lavender w/violet CM	375	79	33.0	16.2	13.8	3.6
Coral Seas	Coral w/orange CM	327	70	35.4	13.7	12.0	3.8
Cupcake	Apricot w/yellow CT	233	75	32.8	13.5	14.8	3.0
Foxfire	Orange scarlet	226	75	36.3	13.5	12.4	2.9
Fraulein	Light yellow	212	70	40.0	15.2	15.2	3.2
Funny Face	Rose w/dk rose CM	265	81	40.2	18.9	18.4	3.1
Gallery	Pink w/rose CM	343	76	33.9	14.1	13.0	4.0
Geminese	Lavender w/white CT	374	79	33.0	14.8	14.6	3.3
Green and Gold	Orange w/green CT	225	75	36.5	14.7	17.2	2.5
Greenbriar	Yellow-green	304	71	35.7	15.6	14.4	3.8
Hummingbird	Lavender w/white CT	275	73	32.6	15.0	15.3	2.9
Irish Lace	Light green	204	77	32.6	14.7	17.8	3.0
Jackpot	Orange w/yellow CT	233	79	46.1	20.3	18.7	2.9
Junior Miss	Pink w/white CT	340	85	36.0	16.2	14.9	3.3
Lavender Petunia II	Lavender w/white CT	276	73	33.7	14.3	13.8	3.2
Little Jewel	Medium red	255	72	34.3	14.2	12.8	3.1
Little Sweetheart	Rose-red	264	77	35.9	13.3	14.1	2.4
Little Tiger	Orange w/dark CM	399	72	38.5	14.7	9.5	3.1
Littlest Angel	White w/yellow CT	201	77	37.6	16.5	13.0	3.4
Majorette	Salmon w/yellow CT	235	73	44.6	20.0	20.7	2.7
Monkey Face	Brown w/yellow CT	397	78	31.6	11.9	10.8	2.8
Nugget	Medium yellow	216	93	36.7	14.5	14.5	3.0
Oriental Ruby	Yellow w/rose CM	205	84	39.1	16.6	11.5	2.5
Perky	Apricot w/yellow CT	220	77	32.2	13.3	13.5	3.0
Pinkie	ink w/white CT	243	75	34.0	14.3	14.7	3.2
Red Bantam	Light red	252	72	34.9	13.6	13.7	2.5
Skipper	Orange w/dark CM	225	78	35.8	13.6	11.6	2.9
Spring Green	Light green	204	72	36.2	12.6	12.8	3.1
Titmouse	Medium salmon	236	78	33.8	15.4	17.7	2.5
Welcome	Pink w/cream CT	245	76	39.6	17.3	16.4	2.9
Zing	Yellow w/red CM	215	71	31.7	13.2	13.6	2.7
Tukey's HSD, 5% level			7.2	5.4	2.7	2.8	0.9

²Mean of 3 replications with eight 1-inch diameter corms planted per replication.³CM = Conspicuous Mark, which designates a lip mark or blotch; CT = Contrasting Throat color or floret.

length is rachis (8, 10). Since the Pixiola is to be used in small arrangements, between 45 and 60 percent of the 28 inch spike should be flowers. The minimum length (12 inches) was achieved by all the cultivars except 'Monkey Face' which measured only 11.9 inches. Many of the cultivars had a rachis greater than 60 percent (16 inches) of the trimmed stem. This was expected since most of these were bred and selected for exhibition flowers, where a long rachis and many flowers are preferred. Number of flowers was closely related to rachis length and only 4 of the cultivars averaged less than 12 flowers per spike (Table 1).

Flower diameter is one of the most important parameters that would limit the cultivar in being considered a Pixiola. One of the initial criteria established in the definition of a Pixiola was a flower size equal or less than 3 inches in diameter. Only 17 of the 38 cultivars met this requirement (Table 1). The smallest flowers were 2.4 inches in diameter ('Little Sweetheart') and the largest were 4.0 inches ('Gallery'). Once the flower surpasses 3 inches in diameter, it would be too large for the other flowers (i.e. *Gypsophila*, *Gomphrena*, *Dianthus*, etc.) used in small arrangements and would be competitive with the large-flower gladiolus in use and sales.

Flower spike production is indicative of the health of the corm and the number of spikes should be equivalent to or greater than the number of corms planted. Yields of flower spikes ranged from 1.7 ('Nugget') to 12.7 ('Gallery') per 8-corm plot (Table 2). 'Nugget' showed typical *Fusar-*

ium symptoms in the field and most of the corms produced plants only to the 2 to 3 leaf stage before they died. Corms of 'Gallery,' which was grown from corms which were slightly oversized but not in the next higher grade, had a tendency to produce multiple shoots, indicative of a weak dominance of the terminal vegetative bud. In this cultivar, flower development was extended over a 30-day period, with many of the later maturing flower spikes short and not marketable. Only 16 of the cultivars produced a flower spike for every corm planted, which might suggest that corms of many cultivars contained latent disease-causing organisms which killed the plants prior to flowering.

Number of marketable flowers produced is vital for the commercial cut-flower grower. Means of marketable flowers among cultivars ranged from 0.3 to 11.3, with the extremes represented by 'Little Tiger' and 'Cheerleader,' respectively. Although 'Little Tiger' produced almost 1 spike per corm planted, the low floral bud count was unacceptable. Ten of the cultivars produced a minimum of 1 marketable spike per corm planted.

Corm yields, by number and weight, were proportional to number of flower spikes produced. Corms were not discarded unless they showed extreme disease symptoms, such as vascular rotting. Cormel yields are of vital importance to the corm propagator. Since 1-inch diameter corms can be produced from cormels in 1 season's growth, the more cormels harvested, the greater the potential corm stock the following year. Cormel yields ranged from 0.2 ounces ('Con-

Table 2. Spike, corm, and cormel yields of 38 Pixiola cultivars grown at Bradenton, Spring 1979.

Cultivar	Total flower spikes ^z	Marketable flower spikes ^y	Corms dug		Weight cormels dug (oz)
			Number	Weight (oz)	
Baby Bunting	7.0	6.7	8.3	6.7	1.9
Bit O'Honey	8.3	7.7	8.0	10.9	1.5
Bonfire	8.7	8.7	8.7	9.8	1.4
Bravo	7.0	7.0	8.7	5.5	2.7
Break O'Dawn	8.3	6.0	9.3	7.1	2.2
Bugs	7.3	7.3	8.3	9.1	2.4
Cheerleader	11.7	11.3	11.0	14.7	1.7
Confetti	5.3	3.7	5.3	3.1	0.2
Coral Seas	6.3	4.0	5.3	6.5	0.4
Cupcake	8.3	5.7	8.3	6.2	1.0
Foxfire	5.7	4.3	6.0	6.0	1.3
Fraulein	8.0	8.0	7.0	6.1	0.5
Funny Face	8.3	8.3	8.3	7.4	1.0
Gallery	12.7	8.0	12.3	12.0	2.0
Geminese	11.7	9.3	11.7	11.4	0.6
Green and Gold	7.7	7.0	7.7	9.8	0.7
Greenbriar	5.3	4.0	2.3	2.6	0.4
Hummingbird	7.7	6.3	7.7	6.2	1.9
Irish Lace	5.7	4.7	7.0	8.8	0.4
Jackpot	9.3	8.7	11.3	15.1	3.3
Junior Miss	7.3	6.7	7.7	7.6	0.8
Lavender Petunia II	7.0	5.3	7.0	7.0	0.7
Little Jewel	6.7	5.0	6.3	5.7	0.7
Little Sweetheart	10.0	7.7	11.3	8.6	0.5
Little Tiger	7.7	0.3	9.0	12.5	1.2
Littlest Angel	7.7	7.0	8.0	7.0	1.1
Majorette	10.7	10.7	11.0	10.2	3.1
Monkey Face	8.3	1.7	6.7	3.7	0.7
Nugget	1.7	1.7	1.3	0.8	0.2
Oriental Ruby	6.3	3.3	5.7	4.5	0.3
Perky	6.3	5.3	7.0	5.0	0.9
Pinkie	8.3	6.7	7.7	8.0	1.3
Red Bantam	9.0	8.0	8.7	8.1	1.8
Skipper	10.3	5.3	11.0	8.3	1.1
Spring Green	7.7	6.7	8.7	7.1	4.5
Titmouse	8.0	6.3	8.0	5.2	0.4
Welcome	9.0	8.7	13.0	13.2	1.9
Zing	7.1	4.3	7.3	5.9	0.5
Tukey's HSD, 5% level	3.8	3.7	4.1	4.0	1.2

^zMean of 3 replications with eight 1-inch diameter corms planted per replication.

^yMarketable spike defined as having at least 12 florets on a minimum 12-inch rachis and a minimum overall length of 28 inches.

fetti' and 'Nugget') to 4-5 ounces ('Spring Green') per 8-corm plot. Although cormel production is related to corm health, it is also a heritable characteristic (author's unpublished data).

It was apparent from this study that a wide variation in flower color, height, health, and reproductivity exists among small-flowered gladiolus cultivars. The cut-flower producer needs to be selective in what he grows, being cognizant of the criteria established for a Pixiola. Some of the cultivars evaluated which met these criteria were: 'Cheerleader,' 'Majorette,' 'Red Bantam,' 'Spring Green,' and 'Welcome.' Several other factors should be considered for the Pixiola as a Florida commercial cut flower:

1. It should flower within 80 days from planting.
2. Flowering should be concentrated over a 10 day period from a single planting.
3. Each corm should produce at least one marketable flower spike.
4. Each corm should regenerate an equal or greater size daughter corm.
5. Each corm should yield at least 0.25 ounces of cormels.
6. Individual flowers should be flat and not hooded.
7. Individual flowers should face forward (not up, to the side, or all around the stem).
8. Flowers should not be widely spaced on the rachis.
9. Corms, foliage, and flowers should be highly tolerant of insects and diseases.

Pixiola flowers offer Florida growers a new crop for the floricultural trade. These flowers can be useful not only to the retail florist for inclusion in small arrangements but also can be utilized in the mass marketing operations which are prevalent in the U. S. and Europe.

Literature Cited

1. Baldrige, S. L. 1977. Name the small glad contest. *North Amer. Glad. Council Bull.* 130:78.
2. ———. 1978. Pixiola is new name for small glads. *North Amer. Glad. Council Bul.* 133:61.
3. Beute, M. K., R. D. Milholland, and G. V. Gooding. 1970. A survey of viruses in field-grown gladiolus in North Carolina. *Plant Dis. Rptr.* 54:125-127.
4. Buch, P. O. 1972. The species. Chapter In: *The World of Gladiolus* (N. Koenig and W. Crowley, eds.), pp. 2-7. Edgewood Press, Md.
5. Fairchild, L. 1978. The trials and tribulations of a small gladiolus. *North Amer. Glad. Council Bul.* 133:60.
6. Forsberg, J. L. 1955. Fusarium disease of gladiolus: Its causal agent. *Bul. Ill. Natl. Hist. Survey* 26:447-503.
7. Garrity, J. B. 1975. Gladioli for Everyone. David & Charles (London). pp 145-156.
8. Jenkins, J. M. 1963. Some characteristics of commercial gladiolus varieties. *North Amer. Glad. Council Bul.* 75:37-38.
9. USDA. 1979. Floricultural crops—production area and sales, 1977 and 1978. Intentions for 1979. *USDA Economics, Stat., and Crop Serv.* SpCr 6-1(79). 17 pp.
10. Wilfret, G. J. 1970. A critical evaluation of the commercial gladiolus cultivars grown in Florida. *Proc. Fla. State Hort. Soc.* 83:423-427.