

Table 3. Consumer preference ratings of marigolds near midseason.

Marigold cultivar	Plant height ^z	Flower cover ^y	Flower color ^y	Attractiveness of foliage ^y	Best liked ^x
<i>Tagetes erecta</i> (African)					
Gold Coins					
Mixture F ₁	2.1	3.9	4.4	3.4	4
Merrymum F ₁	2.6	4.1	3.0	3.5	1
Snowbird	3.6	2.4	1.8	1.5	0
Viking F ₁	3.3	3.6	3.1	3.5	1
<i>Tagetes patula</i> (French)					
Boy O' Boy Mix	3.3	4.1	3.6	3.8	1
Gypsy Sunshine	3.1	4.4	3.6	4.3	2
Harvest Moon					
Improved	3.0	5.0	5.0	4.5	3
Janie Flame	3.3	4.5	3.8	3.9	3
Janie Yellow	4.5	4.0	3.4	2.4	0
Queen Sophia	3.3	3.8	3.8	4.0	5
Spinwheel	2.5	4.3	4.1	3.9	5
Tiger Eyes	2.9	4.4	3.6	3.9	1
Torch	3.0	4.1	3.8	4.0	2
Yellow Boy	3.0	4.3	4.1	4.3	1
Yellow Jacket	3.0	3.8	3.5	4.0	2
<i>Tagetes tenuifolia</i> (Signet)					
Gem Mixture	3.4	4.0	3.5	3.1	0.5
Signata Bicolored Mixture	3.6	3.4	4.0	3.4	1.5
Triploids (3N)					
Encore F ₁	3.1	3.6	3.4	2.1	0
Hi-G Yellow F ₁	2.9	4.5	3.5	4.0	2
Nell Gwyn F ₁	2.4	3.4	3.4	3.6	0
Orange Fireworks					
F ₁	3.0	5.0	4.9	4.8	7
Suzie Wong F ₁	3.0	3.8	3.1	3.0	0
LSD (5%)	0.6	0.7	0.9	0.8	—

^zEvaluation scale: 1 = too tall, 3 = acceptable, 5 = too short.

^yEvaluation scale: 1 = very undesirable, 3 = acceptable, 5 = very desirable.

^xFrequency of response among 8 people surveyed when asked "Which 5 cultivars do you like best?". One respondent chose 6 and equated desirability of Signet types.

Table 4. Consumer preference ratings of zinnias near midseason.

Zinnia cultivar	Plant height ^z	Flower cover ^y	Flower color ^y	Attractiveness of foliage ^y	Best liked ^x
<i>Zinnia elegans</i>					
Ambrosia Mix F ₁	1.9	2.9	3.1	2.5	2
Big Red F ₁	2.1	3.3	3.6	2.4	1
Bouquet Hybrid					
F ₁	2.0	3.0	3.3	2.4	2
Burpeeana Giant	2.4	2.6	2.7	2.0	1
Dasher Scarlet F ₁	3.7	4.4	3.6	3.6	3
Peter Pan Mix F ₁	3.7	3.6	2.6	2.4	0
Peter Pan Scarlet					
F ₁	4.6	3.4	3.0	2.4	1
Pulcino Mix F ₁	3.3	4.9	4.3	4.3	6
Ruffles, Pink F ₁	2.7	4.0	3.6	3.9	4
Ruffles, Scarlet F ₁	2.6	3.1	5.0	3.7	3
Ruffles, Yellow F ₁	2.7	3.7	3.0	3.3	3
Small World					
Cherry F ₁	3.4	5.0	4.9	4.7	7
State Fair Mixture	2.0	3.0	3.3	2.7	0
LSD (5%)	0.6	1.0	1.1	1.1	—

^zEvaluation scale: 1 = too tall, 3 = acceptable, 5 = too short.

^yEvaluation scale: 1 = very undesirable, 3 = acceptable, 5 = very desirable.

^xFrequency of response among 7 people surveyed when asked "Which 5 do you like best?". Two respondents only chose 4 cultivars.

more disease resistant than other cultivars.

Consumers selected 'Small World Cherry' and 'Pulcino Mix' most often as their favorites. These two ranked high in flower number, flower color and foliage cover (Table 4).

These marigold and zinnia cultivars will be the subject of a second trial in the fall of 1982 as a seasonal comparison.

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GROWTH AND FLOWERING CHARACTERISTICS OF CANNA CULTIVARS IN SOUTH FLORIDA^{1,2}

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Abstract. Fifty-two cultivars of cannas were grown under field conditions for 1 yr to determine their growth and flower-

ing characteristics in south Florida. Six replicate clumps of each cultivar were measured for total height and scored for rate of spread, floriferousness, and seed set 3 times during 1982. Cultivars varied in mean height from 60-176 cm. Rate of spread ranged from very slow to extremely aggressive, while rate of flowering ranged from almost none to excellent. Few cultivars regularly set seed. Flower color in cannas includes white, yellow, salmon, pink, orange, scarlet, rose and red/yellow bicolors. Leaf color can be either green or reddish. Thus, within each color category it is possible to select cultivars with desirable growth and flowering characteristics.

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for their brilliant flowers and bold, tropical-looking foliage. There are hundreds of varieties in cultivation with either green or reddish foliage and flowers ranging from solid white, yellow, orange, pink and red to bicolored from which to choose. Most cannas are interspecific hybrids (*Canna* X *generalis* L. H. Bailey), but some unimproved *Canna* species are also commercially available (2).

Although cannas are perennials and bloom throughout the year in frost-free climates, they have not been used much in south Florida, perhaps because of several serious pests of the plant in this area. The canna leafroller (*Calpodex ethlius* Stoll) is a destructive chewing insect which rapidly defoliates cannas (1, 3). Canna rust, a disease caused by the fungus *Puccinia thaliae* Dietel produces orange-colored pustules on the lower surface of the leaves (1). Eventually this causes the leaves to turn black and die. Canna mosaic virus, a systemic disease present in some plants, can be spread to healthy plants by sucking insects or pruning. Symptoms of the virus range from light streaking or distortion of the leaves to death of the plant (1).

Since a large number of varieties of cannas are commercially available, we wanted to determine if genetic resistance to any of these 3 pests existed. In addition to screening for pest resistance, it is important to know the horticultural characteristics of the various cultivars under south Florida conditions. It is this aspect of the study that will be reported here.

Materials and Methods

Approximately 60 varieties of cannas were grown in 20-liter containers for 1 yr and were then planted in a ground bed 23 m square. Plants were spaced 1 m apart in rows 1.5 m apart in native white, sandy soil. Six replicate plants of each variety were planted in a completely randomized experimental design. All plants were fertilized every 3 months with a 10-5-5 fertilizer containing magnesium and all essential micronutrients, and were kept weed free by mulching with wood chips and spraying with glyphosate. After the plants reached an equilibrium height they were measured for height and evaluated subjectively for rate of spread, rate of flowering, and seed set on 3 dates during 1982.

Although 60 cultivars were purchased, it became apparent that some varieties were synonyms existing under several different names. The cultivars 'Mohawk' and 'Wyoming' were indistinguishable in all respects, including resistance to the 3 pests listed above and were therefore combined for analysis. The same was true for 'Double Orange' and 'Orange Beauty' (also known as 'Orange King Humbert') and for 'Yellow King Humbert', 'Richard Wallace', and 'Florence Vaughn'. The cultivar 'Los Angeles' is also sold as 'Pink President' and 'Miss Oklahoma'. Thus, nomen-

clature of canna cultivars is a source of confusion for researchers and canna growers alike.

Results and Discussion

Canna cultivars evaluated are divided into 3 major categories based on average total height of the plants growing under south Florida conditions: tall varieties (>140 cm), medium varieties (90-120 cm), and low growing varieties (<90 cm). For convenience, the 3 categories will be discussed separately.

Tall varieties. In this category, 6 green- and 2 red-leaved cultivars were tested (Table 1). Among the green-leaved cultivars, 'Orange Beauty' (= 'Double Orange' = 'Orange King Humbert') grew the tallest, spread at a fairly rapid rate, produced orange flowers consistently, and produced no seeds. The variety 'Omega' has small, light salmon-orange flowers and is an unimproved *Canna* species. Although this flower color is not common among cannas, this variety is not recommended since it spreads extremely rapidly, forming large, sparse clumps. It readily invades clumps of other varieties of cannas and also produces a fair number of seeds.

The cultivar 'Lalony' has scarlet flowers and grows fairly tall. Its rate of spread and flowering rate are moderate and no seeds are set. 'Yellow King Humbert' (= 'Florence Vaughn' = 'Richard Wallace') has bright yellow flowers and rapidly forms dense clumps of rather upright foliage. It produces an average number of flowers, but no seeds are set. 'Satan's Revenge' has light red flowers, but spreads rapidly and almost invariably sets large numbers of seeds. This variety is not recommended. 'Cleopatra' is a sport of 'Yellow King Humbert' and frequently reverts back to that form. It has mostly yellow petals speckled with red, but scarlet petals or parts of petals are typical for the variety and red streaks in the foliage may also occur. It is quite floriferous, has a moderate rate of spread, and produces no seeds.

Two tall red-leaved cultivars were evaluated, 'Ambassador' and 'Gladside'. 'Ambassador' is a very tall, attractive, scarlet-flowering variety which is moderately aggressive, but produces no seeds. 'Gladside', on the other hand, is an unimproved *Canna* species. It produces a few light orange colored flowers, but these invariably set seeds. The foliage is sparse, light red in color and unattractive. This canna is not recommended for south Florida landscapes.

Medium height varieties. Twenty-nine cultivars of medium height (90-120 cm) were evaluated (Table 2). Two of these, 'Red King Humbert' and 'Black Velvet' have red foliage. These 2 varieties, like the green-leaved varieties in this size category, are generally less vigorous than the tall varieties. This applies to rate of spread as well as height. Both of these red-leaved varieties produce an average number of flowers, but neither sets seed.

Table 1. Growth and flowering characteristics of tall (>140cm) canna varieties in south Florida.

Variety	Leaf color	Flower color	Height (cm)	Rate of spread ^a	Rate of flowering ^b	Rate of seed set ^c
'Orange Beauty'	Green	Orange	168	2.8	2.2	0
'Omega'	Green	Lt. Salmon	163	3.0	1.5	1.2
		Orange				
'Lalony'	Green	Scarlet	155	2.2	1.7	0
'Yellow King Humbert'	Green	Yellow	144	2.8	1.6	0
'Satan's Revenge'	Green	Lt. Red	141	2.7	1.8	3.2
'Cleopatra'	Green	Yellow/Red	140	2.3	2.3	0
'Ambassador'	Red	Scarlet	176	2.7	1.5	0
'Gladside'	Red	Lt. Orange	147	2.4	1.2	3.5

^a0 = no spread, 3 = very aggressive.

^b0 = no flowers, 3 = very floriferous.

^c0 = no seed set, 5 = seeds always set.

Table 2. Growth and flowering characteristics of medium height (90-120cm) canna varieties in south Florida.

Variety	Leaf color	Flower color	Height (cm)	Rate of spread ^z	Rate of flowering ^y	Rate of seed set ^x
'Red King Humbert'	Red	Red	118	1.8	1.3	0
'Black Velvet'	Red	Red	118	1.8	1.5	0
'Marjorie Korn'	Green	Pink	122	1.7	1.7	0
'City of Portland'	Green	Pink/Yellow Throat	120	1.8	1.8	1.3
'Madame Butterfly'	Green	Dark Pink	119	2.0	1.5	0
'Orange Sherbert'	Green	Orange/Yellow Throat	119	2.3	1.0	5.0
'LaBoheme'	Green	Dark Pink	118	1.8	1.7	0
'Los Angeles'	Green	Dark Pink	117	1.8	1.5	0
'Eureka White'	Green	Cream	117	2.1	2.1	0.6
'Jimmy Carter'	Green	Lt. Yellow/Pink Spots	115	1.7	2.0	2.0
'The President'	Green	Scarlet	112	1.7	1.7	0
'Louis Cayeaux'	Green	Dark Pink	111	1.8	1.8	0.7
'Polly White'	Green	Orange/Yellow Throat	109	2.8	1.8	0
<i>C. indica</i>	Green	Scarlet	108	2.2	.7	5.0
'Stadt Fellbach'	Green	Orange	107	1.8	.8	0
'Aida'	Green	Lt. Pink/Lt. Yellow Throat	106	1.8	1.3	0
'Gayle's Primrose'	Green	Lt. Yellow/Salmon	106	1.7	1.5	0
'Maurine's Pink'	Green	Light Pink	104	2.0	1.2	0.2
'Firebird'	Green	Light Red	103	2.0	2.3	0
'Golden Sunshine'	Green	Lt. Yellow	103	2.3	2.0	0
'Rosen Cavalier'	Green	Dark Pink	101	2.0	1.6	0
'Chinese Coral'	Green	Lt. Salmon	99	1.8	1.5	1.0
'Copper Giant'	Green	Scarlet	97	1.6	1.2	0
'Pink Gem'	Green	Lt. Pink	96	1.7	1.0	0
'Mrs. Pierre S. DuPont'	Green	Pink	101	1.7	.7	0
'Malcomb's Red'	Green	Lt. Rose	96	2.0	1.0	0
'Lucifer'	Green	Scarlet/Wide Yellow Edge	92	1.5	1.7	0
'Rosamond Cole'	Green	Scarlet/Yellow Edge	95	1.3	.5	0
'Mignon'	Green	Dark Pink	92	1.7	1.5	0

z0 = no spread, 3 = very aggressive.

y0 = no flowers, 3 = very floriferous.

x0 = no seed set, 5 = seeds always set.

A great variety of flower colors exist among the green-leaved cultivars in this size category. Cultivars with predominantly pink flowers include 'Marjorie Korn', 'City of Portland', 'Madame Butterfly', 'La Boheme', 'Los Angeles' (= 'Pink President' = 'Miss Oklahoma'), 'Louis Cayeaux', 'Aida', 'Maurine's Pink', 'Rosen Cavalier', 'Chinese Coral', 'Pink Gem', 'Mrs. Pierre S. DuPont', and 'Mignon'. None of these is very aggressive with respect to rate of spread and none is exceptionally floriferous. 'Mrs. Pierre S. DuPont', 'Pink Gem', 'Maurine's Pink' and 'Aida' were below average with respect to flower production. 'City of Portland', 'Maurine's Pink', and 'Chinese Coral' set some seeds, but seed set was not a serious problem for any cultivar in the pink flowering group.

'Orange Sherbert', 'Stadt Fellbach', and 'Polly White' have orange or orange and yellow flowers. 'Orange Sherbert' produced fewer than average flowers, spread very rapidly, and set seeds more often than any other variety. This variety cannot be recommended very highly for south Florida. 'Polly White' is another unimproved *Canna* species. It is extremely aggressive, but does not set seeds. The flowers are numerous, but small. 'Stadt Fellbach' is much less vigorous than the previous 2 varieties, but is very attractive.

Three cultivars, 'The President' and 'Copper Giant' and the species *C. indica*, all have predominantly scarlet flowers. 'The President' has a moderate rate of spread and better than average flower production. 'Copper Giant' produces fewer flowers, but they are quite large and showy. *C. indica*

is an unimproved species which is aggressive, invariably sets seed, and produces few flowers, that are quite small and nondescript compared to most hybrid varieties. It is not recommended as an ornamental.

Both 'Lucifer' and 'Rosamond Cole' have bicolored flowers with scarlet petals edged with bands of yellow. The yellow is fairly extensive in 'Lucifer', whereas it is restricted to the outer 1 mm in 'Rosamond Cole'. Both of these cultivars have moderate rates of spread, but 'Lucifer' is the more floriferous of the two. Neither set seeds in our plantings.

'Malcomb's Red' and 'Firebird' are light red to light rose colored cultivars. Both have moderate rates of spread. 'Firebird' produces more flowers than 'Malcomb's Red', but they are much smaller and less attractive.

Several varieties have light yellow flowers, often shaded or spotted with pink. 'Jimmy Carter' is an excellent cultivar in all respects although our plants sometimes set seed. 'Golden Sunshine' and 'Gayle's Primrose' are also attractive and free-flowering, but with moderate rates of spread and no seed set.

'Eureka White' was the only white or cream-colored cultivar tested. It had a moderate rate of spread and was fairly floriferous, but seeds were occasionally produced by this cultivar.

Low-growing varieties. Fifteen low-growing cultivars were evaluated (Table 3) but only one of these, 'Wyoming' has red foliage. This orange-flowered variety is supposed to

Table 3. Growth and flowering characteristics of low growing (<90 cm) canna varieties in south Florida.

Variety	Leaf color	Flower color	Height (cm)	Rate of spread ^z	Rate of flowering ^y	Rate or seed set ^x
'Confetti'	Green	Cream/pink spots	87	1.3	.7	0
'Pride of India'	Green	Pink	86	2.0	1.0	0
'King City Gold'	Green	Golden Yellow	86	1.7	1.3	0
'Primrose Yellow'	Green	Lt. Yellow	85	1.8	1.3	0
'Halloween'	Green	Yellow/red buds	81	1.2	1.6	0
'Pink Bow Knot'	Green	Salmon Pink	79	1.7	.5	0
'Porcelain Rose'	Green	Rose	78	1.3	.8	0
'Iridescent'	Green	Rose	78	1.3	1.0	0
'Freckles'	Green	Lt. Yellow/ Red Flecks	76	1.3	1.2	0
'Cupid'	Green	Pink/White	75	2.0	1.0	0
'Salmon Pink'	Green	Salmon Pink	74	1.3	.8	0
'Crimson Glory'	Green	Rose	71	1.7	.8	0
'Cherry Red'	Green	Rose	66	1.7	1.2	0
'Crimson Beauty'	Green	Rose	61	1.0	1.2	0
'Wyoming'	Red	Orange	81	1.7	.2	0

^z0 = no spread, 3 = very aggressive.

^y0 = no flowers, 3 = very floriferous.

^x0 = no seed set, 5 = seeds always set.

be tall growing, but since it is so highly susceptible to the canna leafroller, it seldom grew tall enough to flower before being completely defoliated. It is not recommended for that reason.

Among the green-leaved varieties, 'Porcelain Rose', 'Iridescent', 'Crimson Glory', 'Crimson Beauty', and 'Cherry Red' all have rose-colored flowers. None of the low-growing varieties, including these, produced as many flowers as the larger varieties. Their rates of spread were also lower and seeds were never observed to set on these cultivars. 'Salmon Pink', 'Pink Bow Knot', 'Pride of India', and 'Cupid' all have pink flowers. 'King City Gold', 'Primrose Yellow', 'Halloween', and 'Freckles' all have yellow flowers, the latter being speckled with red. 'Confetti' has cream colored flowers speckled with pink. All of these green-leaved, low-growing varieties had similar rates of spread and flowering.

In summary, within each height category there are usually both green- and red-leaved cultivars with orange, red, pink, or yellow flowers which are suitable for use as ornamentals in south Florida. Generally, rate of spread and

floriferousness are correlated with height, the larger varieties being more vigorous overall. Rapidly spreading varieties should be avoided as they are difficult to confine to their bed and may form large, sparse, and unattractive clumps, rather than desirable compact clumps. Most of these aggressive varieties also have rather unattractive flowers and frequently set seed which further detracts from their desirability. Germination of canna seeds in the beds is seldom a serious problem in south Florida, but the energy diverted for the production of seeds is used in non-seeding plants to produce more flowers.

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SUSCEPTIBILITY OF THE MAHOGANY WEBWORM¹ TO INSECTICIDES²

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Abstract. The mahogany webworm, *Macalla thrysisalis* Walker, is an annual defoliating pest of the West Indian

mahogany, *Swietenia mahagoni* (L.), Jacq., in Florida. Acephate (Orthene®), chlorpyrifos (Dursban®), fenpropathrin (Meothrin®), and fenvalerate (Pydrin®), provided 96% or better control of the tested larvae. Also, 87% or better control was provided by single treatments of either bendiocarb (Ficam®), diazinon, malathion, methomyl (Lannate®), permethrin (Ambush®), or resmethrin (SBP-1382). The paper bag test system was an ideal procedure for efficacy testing with the mahogany webworm and should be acceptable for handling other highly mobile foliage feeding insects.

West Indian mahogany, *Swietenia mahagoni* (L.) Jacq. is a widely planted shade tree in southern Florida, and constitutes an important crop in nursery production. Chellman (1) reported insect pests of West Indian mahogany in Florida to include mahogany tip moth, *Hypsipyla grandella* (Zeller); mahogany notcher, *Copturus floridanus* (Fall);

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