of these varieties yielded the fungus on reisolation (Table 1). Three of 11 varieties grown in soil infested with *Cylindrocladium scoparium* exhibited reduced and discolored root systems, six varieties had discolored roots only, one variety appeared to have healthy roots from which the fungus was isolated, and one variety had apparently healthy roots from which the fungus could not be isolated (Table 1). As in leaf pathogenicity tests, the isolate of *C. scoparium* was the most virulent.

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EVALUATIONS OF EASTER LILY AND HYBRID LILY CULTIVARS FOR COMMERCIAL FLOWER PRODUCTION IN FLORIDA

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ABSTRACT

Two plantings of seven cultivars of diploid and tetraploid Easter lilies and three plantings of ten hybrid lily cultivars were evaluated in field (saran-house) culture at Bradenton. The diploid 'Georgia' averaged 10.0 flowers on 71 cm stems and flowered in 168 days from the October planting and in 154 days from the November planting. Flowering of the tetraploids ranged from 160 to 222 days and between 3.6 and 5.4 flowers were produced on 57 to 93 cm stems.

'Enchantment' and 'Harmony' were the most promising hybrid lily cultivars for potential cut flower use. Flower shape and placement, fragrance, bud count and disease tolerance were major problems which would limit use of most of the remaining 8 cultivars. Only 'Enchantment', 'Limelight', 'Helios', and 'Black Dragon' returned as many bulbs at digging as were planted. Disease losses were high with 'Cinnabar', 'Harmony', and 'Sonata'.

INTRODUCTION

The Florida cut-flower industry, with annual sales greater than 32 million dollars, is heavily concentrated on two floral crops, chrysanthemums and gladiolus. These comprise over 80 per cent of total flower sales in the state (4, 5). Many flower firms are beginning to diversify, growing crops which a few years ago were considered of less value and importance. Some of these "minor" crops grown for cut-flower production are: statice (*Limonium*), Baby's Breath (*Gypsophila elegans*), asters (*Callistephus chinensis*), carnation (*Dianthus caryophyllus*), snapdragon (*Antirrhinum majus*), and delphinium (*Dephinium elatum*). In addition to these, over 25 acres of Easter lilies (*Lilium longiflorum*) and a small acreage of hybrid lilies are grown for cut-flower sales. 'Georgia' is the principal Easter lily cultivar grown but numerous hybrid lily cultivars are grown.

Within the past 20 years major advances have been made in the development of tetraploid Easter lilies, with the release of 9 tetraploid cultivars by the United States Department of Agriculture. Eight were hybrid selections and the last was an autotetraploid of 'Georgia', called 'Georgia Tetra'. These tetraploids had larger but fewer flowers than the diploids. Interspecific crosses of lily species have produced some spectacular hybrids with many different flower shapes and colors.

Some evaluation of hybrid lilies for plant culture has been conducted (2) but little use of the hybrids has been made in the U.S. commercial cut-flower industry. Potential for commercial use exists as evidenced by success elsewhere, such as in Japan where lilies are grown year round and constitute one of the three most important cut flower crops. The potential is also indicated by the fact that several million bulbs of American hybrid lilies are shipped to Europe each year and are rapidly

Florida Agricultural Experiment Stations Journal Series No. 4207.

growing in popularity as forced cut-flowers. Few hybrid lilies are grown as garden subjects in Florida and no reports are available on their production potential when grown under Florida field conditions.

The purpose of this study was twofold: 1) to compare the tetraploid Easter lilies with the stanlard diploid 'Georgia' for flower and bulb production; and 2) to evaluate some of the newer hybrid lily cultivars for their production potential as commercial cut flowers.

Methods and Materials

General. Two experiments were arranged in split plot designs with planting dates as whole plots and cultivars as subplots. Each subplot in both tests contained 8 bulbs. The Easter lilies were replicated three times and the hybrid lilies were replicated four times. Bulbs were immersed in Benlate (1 lb/100 gal) for 15 minutes and allowed to drip dry one day prior to planting. Lilies were planted in Vorlex fumigated (35 gal/A) saranhouse beds of Leon fine sand to which peat had been added at the rate of 400 bales/A. Beds were 36″ wide and bulbs were spaced 6″ x 8″ by planting through commercial bedding wire which was raised during the growing season to support the plants. Dry fertilizer 6-8-8 30% organic plus trace elements was incorporated into the beds preplant at 500 lb/A. Subsequent fertilization was accomplished by drenching the plants with a water soluble 20-20-20 fertilizer at 100 lb/A/week. Watering was by subsurface irrigation.

Data on plant height at time of flowering, and number and size of flowers was recorded. Bulb and bulblet yields were recorded at time of digging.

Easter lilies. Medium bulbs (ca 5 cm in diameter) of one diploid and six tetraploid cultivars (Table 1) were dug and cleaned in June and were held in storage at 23 C prior to planting on October 12 and November 9.

Hybrid Lilies. Large bulbs size 6 to 8 (15-20 cm in circumference) of 10 hybrid lily cultivars selected by the Oregon Bulb Farms for trial were shipped from Oregon by truck after digging and were placed in 5 C storage at Bradenton for 6, 9 and 12 weeks prior to planting in the field on November 20, Dec. 12, and January 5.

Results and Discussion

Easter Lilies. Production data on the 7 cultivars are summarized in Table 1. In the October planting average number of days to flower ranged from 168 to 222, representing 'Georgia' and Tetras 6-8, respectively. The differences in flowering time among the cultivars was much less for the November planting. 'Georgia' again flowered the earliest, 154 days, whereas 'Tetra 8' flowered in 190 days.

Table 1. Growth characteristics of 7 Easter lily cultivars in two planting dates when grown in field culture at Bradenton, Florida.

Cultivar	Number of days to flower		Height (cm)		Number of flowers		Number of bulbs and bulblets	
	10/12*	11/9	10/12	11/9	10/12	11/9	10/12	11/9
Tetra 4	212c	182b	92c	70b	5.4a	4.3a	26b	27b
Tetra 5	214c	185b	81bc	71b	5.0a	4.9a	26b	18a
Tetra 6	222d	186b	80bc	73b	3.8a	3.6a	16a	24b
Tetra 7	222d	189b	87c	77b	5.0a	4.6a	16a	16a
Tetra 8	222d	190b	93c	30b	5.1a	3.9a	15a	11a
Ga. Tetra	180b	160a	61a	57a	4.4a	3.9a	38c	29b
Georgia	168a	154a	71ab	69ab	10.0b	8.2b	42c	40c

*Numbers followed by the same letter are not significantly different at the 5% level.

No significant difference in flowering time was observed between 'Georgia' and 'Georgia Tetra' in the second planting although the difference was significant in the early planting. The net effect of holding 'Georgia' bulbs 28 days longer at 23 C prior to planting was a delay of only 14 days in flowering as compared to the October planting. Apparently,natural vernalization by the cool night temperatures in the second planting hastened the flowering, as has been previously reported (6). Bulbs of 'Tetra 8' flowered in approximately the same number of days, irrespective of planting date.

Plant heights at the time of flowering did not differ significantly between 'Georgia' and 'Georgia Tetra' in either planting. Significant differences in plant height were observed among 'Georgia Tetra' and the remaining 5 tetraploids. For cut-flower purposes, either as individual flowers or multiple flowers on a stem, plant heights above 40-50 cm is of little importance. This quality is of much more concern when the bulbs are grown for pot plant sales.

Number of flowers produced per stem is the single most important factor when growing lilies for cut-flower sales. The diploid 'Georgia' far surpassed the tetraploids in number of flowers produced. 'Georgia' had almost twice as many flowers as the tetraploids in either planting. Continued storage of the bulbs at 23 C also reduced the number of flowers per stem, as has been reported by Brierley (1). Flower size varied little among 14.5 cm and floral tube length was 16.9 cm. The autotetraploid ('Georgia Tetra') had approximately the same flower length, 17.0 cm, but was not as wide, only 13.6 cm in diameter. This reduced diameter is reflected in its diploid counterpart, 'Georgia' which was 13.4 cm wide and considerably shorter, 15.8 cm.

The regenerative capabilities of the various cultivars is reflected in the number of *bulbs and* bulblets dug after flowering. The column in Table 1 labeled "Number of bulbs and Bulblets" indicates the sum of the large bulbs and the smaller bulblets (15 g) produced. Least number of bulbs and bulblets were recovered from the 'Tetras 6-8' while the most were from both 'Georgia' and 'Georgia Tetra' in the early planting. In the plots planted in November, 'Georgia' produced more bulbs and bulblets than the remaining cultivars.

From the economic viewpoint, the standard diploid 'Georgia' far surpasses the tetraploids in net return. For cut-flower production, 'Georgia' produces almost twice the number of cut-flowers as any of the tetraploids. 'Georgia' also produced more bulbs for future flower production than any of the tetraploids.

Hybrid Lilies. Tables 2 and 3 present flower and bulb production data for the 10 cultivars in each of the three planting dates. Hybrid lilies are considerably more variable in growth and production than are Easter lilies. Table 4 illustrates the variability in time to flowering which existed in this trial. In individual plantings of cultivars there was a variation of from 8 to 72 days in time to flowering among the 32 bulbs planted. The least variation (corresponding to a low state of dormancy) in time to flowering occurred with the Mid-Century hybrids ('Cinnabar', 'Harmony' and 'Enchantment') and the reflexed or flared trumpet cultivars ('Sonata', 'Limelight' and 'Helios'). The trumpet flowered cultivars ('Golden Splendor', 'Pink Perfection', and 'Black Dragon') all were variable in time to flower (64-72 days) in the first planting where only 6 weeks of cold storage was given. As cold storage was extended the variation in time to flowering decreased.

Yield characteristics of the 10 cultivars were as follows:

Table 2. Growth characteristics of 10 hybrid lily cultivars from 3 planting dates in field culture at Bradenton, Florida.

Cultivar	Number of days to flower			Height (cm)			Number of flowers			Flower bud length (cm)		
	11/20	12/12	1/5	11/20	12/12	1/5	11/20	12/12	1/5	11/20	12/12	1/5
Cinnabar	85	81	93	28	29	31	6.5	5.6	5.2	8.0	8.0	8.0
Harmony	87	79	96	32	31	35	13.5	11.8	10.1	7.5	7.2	7.0
Enchantment	96	87	99	38	35	37	8.6	7.5	7.4	8.4	7.8	7.8
Sonata	104	92	103	69	61	69	7.9	9.8	9.6	6.7	6.6	7.2
Limelight	119	94	118	56	56	57	2.2	2.2	2.2	14.4	15.5	15.7
Golden Splendor	127	108	119	76	77	78	3.1	3.2	3.6	14.2	15.4	15.1
Pink Perfection	130	113	126	86	85	84	3.1	2.6	2.8	14.2	15.1	15.5
Helios	140	118	124	93	89	91	3.2	3.7	2.8	15.5	15.3	15.6
Black Dragon	160	121	129	98	88	84	2.8	2.0	1.9	18.5	19.7	19.5
Imperial Crimson	169	142	164	56	44	45	1.4	1.3	1.6	13.4	13.5	13.7
Avg. all Cultivars	122	104	117	63	60	61	5.2	5.0	4.7	12.1	12.4	12.5

Table 3. Bulb yields of 10 hybrid lily cultivars from 3 planting dates in field culture at Bradenton, Florida.

Cultivar	Number of bulbs harvested[1]			Avg. weight/bulb (g)			Number of bulblets harvested[1]		
	11/20	12/12	1/5	11/20	12/12	1/5	11/20	12/12	1/5
Cinnabar	28	53	75	23	26	27	159	138	194
Harmony	75	66	72	27	28	21	350	325	269
Enchantment	106	97	113	41	41	36	956	916	916
Sonata	34	75	81	56	58	51	3	106	9
Limelight	131	100	94	69	60	60	131	113	81
Golden Splendor	84	94	109	76	90	71	153	200	188
Pink Perfection	97	94	94	123	118	131	30	119	81
Helios	100	100	100	172	166	150	38	125	50
Black Dragon	100	106	97	146	188	175	41	269	47
Imperial Crimson	94	91	97	88	81	74	69	66	59
Avg. all cultivars	85	88	93	82	86	80	193	238	189

[1]Number of bulbs and bulblets harvested from 100 bulbs planted.

1. 'Cinnabar': Maroon-red upright facing flower with moderate bud count; color fades in sun; shortest stem of 10 cultivars; earliest flowering; greatest disease losses of any cultivar tested.

2. 'Harmony': Orange upright facing flowers; best bud count of cultivars tested; good flower head for cut stems in arrangements; good bulblet production but significant reduction in bulb yields from disease losses.

3. 'Enchantment': Orange-red upright facing flowers with good bud count in a fairly tight flower head useful for cut stems in arrangements; early; medium height; little disease; vigorous growing with good bulb production and best bulblet production of cultivars tested; best potential for commercial cut lily.

4. 'Sonata': Orange-salmon recurved flowers on long pedicels in loose flowerhead; good bud count but flower placement, shape, and color not satisfactory for use as commercial cut or corsage flower; medium season on medium height stems; heavy disease losses.

5. 'Limelight': Lime-yellow semi-trumpet (petals separate but trumpet shaped) flowers facing to side or downward; awkward placement for use of entire stem in arrangements; buds in "orchid tubes" would be showy; low bud count; medium season and height; good bulb and bulblet production.

6. 'Golden Splendor': Yellow-gold trumpet facing to side; commercial use as individual buds; low

Table 4. Variation in time to flowering of 10 hybrid lily cultivars from 3 planting dates in field culture at Bradenton, Florida.

Cultivar	Avg. days to flower[a]	Earliest & latest days to flowering[b]			Days difference between earliest and latest flw.		
		11/20 E - L	12/12 E - L	1/5 E - L	11/20	12/12	1/5
Cinnabar	86	73 -100	72 - 91	88 - 98	27	19	10
Harmony	87	82 -101	75 - 83	91 -104	19	8	13
Enchantment	94	92 -108	83 - 93	94 -106	16	10	12
Sonata	100	92 -115	85 -107	97 -109	23	22	12
Limelight	110	108 -130	104 -120	113 -123	22	16	10
Golden Splendor	118	104 -175	93 -132	111 -134	71	39	23
Pink Perfection	123	109 -173	99 -145	115 -143	64	46	28
Helios	127	125 -155	108 -130	120 -130	30	22	10
Black Dragon	137	120 -192	109 -135	118 -143	72	26	25
Imperial Crimson	158	154 -193	130 -153	133 -153	39	23	20
Average					39	22	16

[a]Overall average for all plants of all three plantings.
[b]Days to flowering of first and last plant to bloom of each cultivar at each planting date.

bud count (but best of trumpets); medium season and height; good bulb and bulblet production.

7. 'Pink Perfection': Pink shades - variable in intensity; trumpet facing to side; commercial use as individual buds; low bud count; medium-late season and tall; good bulb production; moderate bulblet production.

8. 'Helios': Yellow semi-trumpet flowers facing slightly downward; commercial use as individual buds; low bud count; late season and tall; good bulb production with few bulblets.

9. 'Black Dragon': White trumpet with shades of brown on reflex of petals; facing to side; largest flowers of cultivars tested; commercial use as individual buds; low bud count; late and tall; good bulb production.

10. 'Imperial Crimson': Pink through red bowl shaped flowers facing to side; good potential for sales as individual flowers; very showy; strong fragrance may be overpowering in enclosed areas; latest cultivar to flower; lowest bud count of cultivars tested; good bulb production with few bulblets.

Bud count on all hybrid lily cultivars in this trial were considerably below that achieved in northern garden culture with only one-half to one-third the 'normal" flower load. Forcing of Easter lilies for earlier flowering normally leads to reduced bud counts (3, 6) and this may account for reduced bud number attained here.

'Enchantment' and 'Harmony' offer the greatest promise for use as cut stems in arrangements. 'Imperial Crimson' is a showy flower which could be handled as individual buds in "orchid tubes" for use in arrangements or bud vases.

ACKNOWLEDGMENTS

Appreciation is expressed to Mr. Zilles of Sarasota, Florida for supplying the Easter lily bulbs and to Oregon Bulb Farms, Gresham, Oregon for supplying the hybrid lily cultivars.

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PROPAGATION AND MORPHOLOGY OF THE FALSE ARALIA

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ABSTRACT

It has been found that propagation of the false aralia from cuttings rather than as seedlings has several advantages when the plants are being produced on a commercial scale. Plants grown from cuttings attain a marketable size more rapidly, show better root production and have more attractive leaves than when grown from seed. A detailed discussion of propagation techniques is included as well as a discussion of the vegetative and floral morphology of the false aralia.

INTRODUCTION

The unusual foliage of the false aralia has led to its rather extensive use both as a patio or indoor plant and in landscape plantings. The purpose of this paper is primarily to describe a technique found very successful in the propagation of the false aralia from softwood cuttings and to discuss briefly some of the morphological aspects of this plant.

The confusion which exists in the literature dealing with the taxonomy of the Dizygothecas is probably due in part to the wide variation in the appearance of the foliage of juvenile and mature plants. Bailey (1) describes *D. Kerchoveana* and *D. elegantissima* as both having strongly notched