longevity. Flowers held in DICA during simulated shipment and subsequently in DICA + sucrose had excellent flower quality for 7 days.

Additional research is needed to establish all the parameters responsible for the release of chlorine by DICA in cut flower water.

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PROBLEMS IDENTIFIED IN AN EXTENSION-OPERATED CLINIC FOR COMMERCIAL FOLIAGE PLANT PRODUCERS

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Abstract. **In an effort to better service some of the production problems generated by the concentrated foliage plant industry in central Florida, a clinic was initiated in January 1976 by extension personnel to operate one-half day per week. Since that time, findings from the clinic have been tabulated according to plant type, nature of problem and seasonal distribution of problem. Major problem plants and problem categories—cultural problems, diseases, insect, mite and related pest injury, and phytotoxicity are presented in tabular form.**

The clinic has evolved into an efficient mechanism for handling the volume of plant problems and questions which are generated by a large industry.

The concept of a clinic to serve primarily the commercial foliage plant producers in central Florida was formulated to more efficiently serve the foliage industry which has grown from an estimated 11.7 million dollar industry in 1966 (1) to an estimated 110.6 million dollar wholesale value produced in central Florida during 1976 (2). Since the expansion rate was not paralleled with additional supporting positions and facilities in the areas of Extension, it was felt necessary to pool identifiable resources and proceed to assist the industry with their numerous problems. This young industry has experienced many problems due to a very diverse product mix, in terms of plant species, container sizes, systems of environmental control, and cultural techniques employed.

The initial plan for the clinic, which is still in effect, consists of concentrating the effort of Extension personnel staffing the clinic into one 3-hour period each week, Wednesday afternoons. By informing the central Florida growers in Orange, Seminole, Polk, Volusia, Lake, Brevard and Marion Counties of the clinic plan their participation in diagnostic services offered by Extension was successfully channelled into the 1 time frame per week. Since many of the central Florida foliage growers frequently sought technical advice from Extension and Research faculty stationed at the Agricultural Research Center, Apopka and due to its central location, this center was selected as the most appropriate clinic location. The clinic has been operated by the county extension horticulturists cooperating on a regional basis.

The data presented in this paper were collected from January 1976 when the clinic was initiated through June 1977. The data was generated from information provided to the staff by the growers completing the clinic form. This clinic form provided a format for inquiring about cultural, environmental, pest control, and other techniques utilized by the grower. These forms were then completed by the Extension staff with diagnostic information and recommendations.

The data were organized into quarterly periods and then subdivided into 4 major categories of foliage plant problems. The designated categories were cultural, diseases, phytotoxicity, and insect, mite and related pest injury. This information is given in Table 1 as a percentage of the total problems examined during the quarterly periods. No particular trend was observed for any of the problem categories in relation to quarterly time periods.

The data were also analyzed by plant genera (Table 2). The diverse nature of the plant material being grown in the central Florida area is shown by the 29 genera listed. The 29 genera listed were submitted by the growers and diagnosed 10 or more times during the 18 months. These

Table 1. Major categories of foliage plant problems listed by frequency and season (January 1976-June 1977).

Period	Distribution of problems (% of 6-quarter total)				
	Cultural	Diseases	Phyto-toxicity	Insect, mite etc. injury	All problems
1976					
Jan.-March	15.6	13.6	17.4	13.7	15.0
April-June	16.5	15.7	16.9	27.4	17.4
July-Sept.	20.0	20.8	16.9	22.2	20.0
Oct.-Dec.	21.0	21.1	23.2	13.7	20.6
1977					
Jan.-March	15.0	16.4	13.4	6.0	14.3
April-June	11.9	12.3	12.2	17.1	12.6
Total problems	461	389	172	117	1139

Table 2. Major genera of foliage plants with 10 or more problems diagnosed during the 1 1/2 yrs of clinic operation (January 1976-June 1977).

Genus	Problems				
	Cultural	Disease	Phyto-toxicity	Insect	Total
Aeschynanthus	2	4	4	5	15
Aglaonema	23	15	1	3	42
Aphelandra	15	10	7	9	41
Araucaria	7	4	0	2	13
Asplenium	9	7	14	2	32
Begonia	13	7	2	1	23
Brassaia	13	18	11	5	47
Calathea	7	3	5	2	17
Chamaedorea	8	6	4	2	20
Chlorophytum	9	3	3	0	15
Chrysalidocarpus	13	10	2	2	27
Cordyline	11	5	0	1	17
Dieffenbachia	34	30	12	4	80
Dracaena	19	24	5	3	51
Episcia	13	2	0	2	17
Fittonia	5	7	5	1	18
Gynura	6	11	1	2	20
Hedera	4	11	2	5	22
Hoya	4	4	6	1	15
Maranta	35	11	13	12	71
Peperomia	69	49	29	15	162
Philodendron	60	62	14	12	148
Pilea	7	8	3	7	25
Plectranthus	5	0	5	2	12
Polystichum	4	2	1	3	10
Scindapsus	44	50	16	5	115
Spathiphyllum	6	3	1	1	11
Syngonium	12	18	5	6	41
Zygocactus	4	5	1	2	12
TOTAL	461	389	172	117	1139

genera were also divided into the 4 problem categories. A total of 1139 individual problems indicated that the most frequent problems were associated with cultural practices. Disease related problems were second most prevalent. The remaining categories represented a combined total of 289 or 25% of the total.

The cultural problem category represented 461 samples with the majority being distributed among 10 genera (Table 3). The distribution of problems by genera was not equal. *Peperomia, Philodendron* and *Scindapsus* were most frequently diagnosed and accounted for 38% of the total, while *Aphelandra, Brassaia* and *Chrysalidocarpus* only represented 9%. Other genera not listed generated 29% of the cultural problems.

The disease category resulted in 389 samples. In Table 4, the 10 most frequent genera are listed. Also in this case, the distribution is not equal. However, *Philodendron,*

Table 3. Ten genera of foliage plants most frequently diagnosed with cultural problems (January 1976-June 1977).

Ranking	Genus	No. problems diagnosed	% of total problems
1	Peperomia	69	15
2	Philodendron	60	13
3	Scindapsus	44	10
4	Maranta	35	8
5	Dieffenbachia	34	7
6	Aglaonema	23	5
7	Dracaena	19	4
8	Aphelandra	15	3
9	Brassaia	13	3
10	Chrysalidocarpus	13	3
11	Others	136	29
	TOTAL	461	100

Table 4. Ten genera of foliage plants most frequently diagnosed with disease problems (January 1976-June 1977).

Ranking	Genus	No. problems diagnosed	% of total problems
1	Philodendron	62	16
2	Scindapsus	50	13
3	Peperomia	49	13
4	Dieffenbachia	30	8
5	Dracaena	24	6
6	Brassaia	18	5
7	Syngonium	18	5
8	Aglaonema	15	4
9	Hedera	11	2
10	Maranta	11	2
11	Others	101	26
	TOTAL	389	100

Scindapsus and *Peperomia* were again the most frequent, producing 42% of the total disease cases. The bottom 3 genera of *Aglaonema, Hedera* and *Maranta* resulted in only 8%, while others not listed generated 26%.

The phytotoxicity category (Table 5) indicated that the top 3 genera represented 34% of the problems. The one notable change in the top 3 genera is the addition of the genera *Asplenium* in contrast to the top 3 genera in Tables 3, 4 and 6. Again, the other genera not listed produced 27% of the problems and the bottom 3 genera accounted for only 10% of the total.

The last and smallest category area designated as insect, mite and related pest injury represented 117 samples and is shown in Table 6. The top 3 genera again represented 33% of the total with *Maranta* being the only genera not previ-

Table 5. Ten genera of foliage plants most frequently diagnosed with phytotoxicity from pesticides, fertilizers, etc. (Jan. 1976-June 1977).

Ranking	Genus	No. problems diagnosed	% of total problems
1	Peperomia	29	17
2	Scindapsus	16	9
3	Asplenium	14	8
4	Philodendron	14	8
5	Maranta	13	8
6	Dieffenbachia	12	7
7	Brassaia	11	6
8	Aphelandra	7	4
9	Hoya	6	3
10	Syngonium	5	3
11	Others	45	27
	TOTAL	172	100

Table 6. Ten genera of foliage plants most frequently diagnosed with insect, mite, nematodes and related pest injury (Jan. 1976-June 1977).

Ranking	Genus	No. Problems diagnosed	% of total problems
1	Peperomia	15	13
2	Maranta	12	10
3	Philodendron	12	10
4	Aphelandra	9	8
5	Pilea	7	6
6	Syngonium	6	5
7	Aeschynanthus	5	4
8	Brassaia	5	4
9	Hedera	5	4
10	Scindapsus	5	4
11	Others	36	32
	TOTAL	117	100

ously listed in this frequency grouping. The remaining genera listed and the other unlisted genera each represented approx 33%.

The 10 most problem prone genera (Table 7) have an interesting relationship to the plant product mix being offered in the central Florida area (3). The most frequent problem genera, *Peperomia,* resulted in 13.5% of the cases but only accounts for 4% of the foliage plants sold, while the no. 2 problem genera, *Philodendron,* was diagnosed with 12.4% of the total with a 28% share of the market. *Scindapsus* accounted for 4% of the market but 9.6% of the problems. The total of the top 3 again represented approx 33% of the problems and 33% of the market. However, there was a disproportionate number of problems for both *Peperomia* and *Scindapsus* in relationship to their market position. The remaining genera generally had approx the same percentage of the market as their percentage of plant problems.

Table 7. Ten genera of foliage plants most frequently diagnosed with problems (1/76-6/77) and the proportion each genus displaces in the total foliage plant product mix in Central Florida (1976).

Genus	No. of plant problems	% of total plant problems	% product mix in Central Fla.
Peperomia	162	13.5	4
Philodendron	148	12.4	28
Scindapsus	115	9.6	4
Dieffenbachia	80	6.7	6
Maranta	71	5.9	5
Dracaena	51	4.3	6
Brassaia	47	3.9	2
Aglaonema	42	3.5	2
Aphelandra	41	3.4	3
Syngonium	41	3.4	4
Others	398	33.3	—

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TISSUE CULTURE PROPAGATION OF SOME FOLIAGE PLANTS[1]

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Additional index words. Dieffenbachia, Yucca, cloning.

Abstract. **Rapid** in vitro **propagation systems have been determined for** Dieffenbachia **sp. and** Yucca **sp. Sterile, axillary buds were used as the primary explants, and these were inoculated onto modified Murashige and Skoog basal medium containing 6-benzyl amino purine (BA)** (Dieffenbachia) **or α naphthalene acetic acid (NAA) and 6-benzyl amino purine** (Yucca)**. Details of the procedures and proliferation rates are presented.**

The foliage plant industry of Dade County has become very much aware of some of the commercial benefits of plant tissue culture propagation. *In vitro* systems for the mass propagation of many foliage plants have been published, and are currently being exploited (1). However, many plants have not yet been considered, and some of the currently utilized tissue culture propagation systems are slow or otherwise unsatisfactory. Although many of the Liliaceae and Araceae have been successfully propagated using plant tissue culture, there have been no published reports in which systems for *Yucca* and *Dieffenbachia* sp. have been described.

Because many growers are interested in improving their production systems, and in rapidly increasing disease indexed stock, formultions were devised and tested for the clonal propagation of these plants.

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Materials and Methods

Yucca. Small, unopened lateral buds from stem pieces of *Yucca* sp. were removed and any discolored leaves were excised. After a brief rinse in absolute alcohol, the buds were sterilized by immersion in 20% (v/v) Clorox for 10-12 minutes, stirred occasionally and were rinsed with three changes of sterile, distilled water. The explants were transferred into test tubes containing modified Murashige and Skoog basal medium (2) with 30 g/liter sucrose, to which had been added various concentrations of kinetin (5-50 μM), 6-benzyl amino purine (0.4-10 μM) and α naphthalene acetic acid (0.5-50 μM).

Dieffenbachia. Primary explants were obtained from vigorously growing *Dieffenbachia* plants. The leaves were removed from the main stem, and the small lateral buds at the base of each leaf were excised. The tissue pieces were transferred into 20% (v/v) Clorox for 12-15 minutes, and were subsequently rinsed in three changes of sterile distilled water. Following sterilization, the lateral buds were further dissected with the aid of a binocular microscope until buds 2.5-3.0 mm in length were obtained. The buds were reimmersed in 5% (v/v) sterilant for 2-3 minutes, subsequently rinsed with sterile, distilled water, and were placed into culture media. Growth media based on the modified Murashige and Skoog formulation with 30 g/liter sucrose and added cytokinin (0.2-9 μM BA) were used.

The media were solidified with 8 g/liter Difco Bactoagar and the pH was adjusted to 5.7 with KOH before sterilization. The cultures were maintained in an air conditioned room at 28° C with 16 hr light (3500 lux) and 8 hr darkness.

Results

Yucca. There was little difficulty in obtaining sterile