Table 9. Ten genera of foliage plants most frequently diagnosed with entomological injury. January, 1976 - December, 1978.

Ranking	Genus	No. problems diagnosed	% of total problems
1	Maranta	22	12
2	Philodendron	22	12
3	Peperomia	20	10
4	Brassaia	14	7
5	Dieffenbachia	13	7
6	Aphelandra	12	6
7	Epipremnum	9	5
8	Pilea	8	4
9	Asplenium	7	4
10	Syngonium	6	3
11	Others	57	30
	Total	190	100

Table 10. Ten genera of foliage plants most frequently diagnosed with problems. January, 1976 - December, 1978.

Ranking	Genus	No. problems diagnosed	% of total problems
1	Philodendron	258	13
2	Epipremnum	204	11
3	Peperomia	201	10
4	Dieffenbachia	165	9
5	Maranta	130	7
6	Dracaena	101	5
7	Brassaia	89	5
8	Aglaonema	76	4
9	Aphelandra	61	3
10	Asplenium	52	3
11	Others	574	30
	Total	1911	100

Epipremnum and *Peperomia* accounted for far more problems than is indicated by their market position. Most of the remaining genera had the same percentage of the market as their percent of plant problems.

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EVOLUTION AND EVALUATION OF PESTS OF ORNAMENTAL PLANTS IN FLORIDA. A RESEARCH PRIORITY TOOL, A PRODUCTION PLANNING TOOL, A FIELD DIAGNOSIS TOOL

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Abstract. **An integrated listing of the various potential pest problems (insect, mite, disease, nematode) of each ornamental genus has heretofore been unavailable. Utilizing current information, the universe of potential pest problems for each of the major ornamental (Tropical Foliage, Fern, Woodies) genera was gathered. This information was then assembled as a Problems by Plant Genus listing and, as the reverse, a Plant Genera Susceptible to an Individual Pest Problem listing. This paper will discuss how and why this information was gathered, and specifically how it can be utilized for setting research priorities, for developing pest management programs for nurseries, and for aiding 'on location' diagnosis of plant problems.**

This paper reviews for ornamental researchers and commercial nurserymen the new booklet *Pests of Ornamental Plants in Florida.*[1] In steps, the information to be covered includes: 1. An explanation of contents; 2. Reason for development; 3. Utilization in the setting of research priorities and maximizing research efficiency; 4. Utilization in the developing of pest management systems for nurseries; and 5. Utilization in diagnosing plant problems 'on location.'

Step 1. What is the booklet and what does it contain? *Pests of Ornamental Plants in Florida* is a compilation of the pest problems (i.e. diseases, insects, mites, and nematodes) for each of 59 ornamental plant genera. These 59 include the most grown genera from the tropical foliage, woody ornamental, and the cut fern industries in Florida. As a total they represent an estimated 85% of the plants produced. With this new universe of plant genera to work with, 59 rather than ad infinitum, a listing of the disease problems, the insect and mite problems, and the nematode problems inherent to each plant genus was made. This information was collected primarily from various departments within the University of Florida and the Florida Department of Agriculture and Consumer Services. Specific acknowledgments to major contributors are made in the booklet. The result, current with presently available information, is a "universe" of pest problems for each plant. Let me point out, for those who are wondering, that for the diseases and nematodes, pathogenicity has not been confirmed in all cases. Organisms, known to be associated with a given genus are included in the listing, except where non-pathogenicity has been confirmed. Within each listing, some further division of the pest groups were made. Disease problems were divided between foliage/stem diseases and root/crown diseases. Each group was then alphabetized and the most common diseases were so labeled; basic macroscopic appearance was also keyed-in for each disease. Insect and mite pests are listed in approximate order of importance, and nematode problems were labeled as endo or ecto parasites. In columns corresponding with each pest group are appropriate control agents from Du Pont, then cross-hatched from each problem and

[1]Published by E. I. du Pont de Nemours & Co., Inc. Wilmington, Delaware—August 1979.

product is a notation on that product's activity and labeling status for that pest and plant.

Step 2. Why was this booklet developed? The purpose for assimilating this information was to give us (Du Pont) a direct reading on the pest control needs of the ornamentals industry, to isolate particular gaps in our product labeling, and to set priorities on the test work needed to fill those gaps.

Step 3. How can this booklet be utilized for setting research priorities and maximizing research efficiency? In addition to readily showing each plant genus' pest control needs, the booklet shows which organisms affect the most plants. To facilitate a clearer look at that information, we reversed the 'problems by plant' listing into 'plants by problem.' The result, which was supplied to Florida research personnel, is contained in these three booklets: *Fungal and Bacterial Disease Organisms and the Major Florida-Grown Ornamental Genera Susceptible to Each, Insect and Mite Pests and the Major Florida-Grown Ornamental Genera Attacked by Each,* and *Nematodes and the Major Florida-Grown Ornamental Genera Which are Susceptible to Each.* In this form, it is very easy to see which problems affect the most plants. Considered in conjunction with degree of control difficulty, this information drops priorities, for helping the ornamentals industry, neatly into place. In addition to establishing priorities, research efficiency can be maximized by consulting this listing. The least significant variable in almost any test is the number of plants (i.e. it is much easier to add more plant species than to add organisms for infestation or infection, or to add different environments or microclimates). Therefore, given an experimental project on the control of a given pest, the listing shows all the major plants on which that data would be valuable. Conversely, it also shows the plant/pest combinations that are difficult and/or non-productive for experimentation.

Step 4. How can this booklet be utilized in developing pest management (Prevention/Control) programs for and in the nursery? When considered in conjunction with three factors: cultural practices, seasonal occurrence pattern of each pest, and the properties of available control agents; the information in this booklet provides the necessary input for developing a pest prevention/control program for a given nursery. When developing a basic program for a nursery, I have found that it is simplest to initially develop a program for each plant genus raised. With that done, the individual plant programs can generally be found to fit into a few basic program groups. With slight adjustments to facilitate consolidation, effectiveness can be maintained and efficiency greatly enhanced. Let's rough out an example for a fictitious nursery operated by nurseryman Smith. Taking the plant genus *Philodendron spp.* we find in the book this page (See Fig. 1). This gives us a problem "universe" from which to work. With this we can readily see which problems are the most significant and common, and which need to be concentrated on. By reviewing the Smith Nursery cultural practices and production schedule we can add more information on individual pest significance. For example, with nurseryman Smith we may find that he practices excellent sanitation, uses a sterile soil media, buys clean 'Philly' cuttings which are nematicide/fungicide dipped,

FIGURE 1

PLANT GENERA	DISEASES PROBLEMS	Benlate®	Manzate® 200	INSECT PROBLEMS	Lannate®	Vydate® L	NEMATODE PROBLEMS	Vydate® L
Philodendron spp.	FOLIAGE & STEM							
	@ Botrytis cinerea M	X	/	Thrips	X	/	Belonolaimus spp.(sting)	X
	Cephalosporium cinnamomeum LS	/	/	Mealybugs		/	Dolichodorus spp. (awl)	
	@ Cercospora sp. LS	X	/	Fungus Gnats	/	/	Meloidodera spp.(cystoid)	
	Colletotrichum philodenori A	X	/	Root Mealybugs		/	*Meloidogyne spp. (root knot)	X
	@ Dactylaria humicola LS	/	X				*Pratylenchus spp.(lesion)	X
	Erwinia spp. LS,R						*Rodopholus similis(burrowing)	X
	Gloeosporium sp. LS	/	/				*Rotylenchulus reniformis (reniform)	/
	Glomerella cingulata LS	/	/				Scutellonema spp. (spiral)	/
	Phyllosticta sp. LS		/				Trichodorus spp. (stubby root	/
	Phytophthora nicotianae LS		X				Tylenchorhynchus spp. (stunt)	/
	Pseudomonas cichorii LS						Tylenchulus semi-penetrans (citrus)	/
	@ Rhizoctonia solani R	X	/					
	@ Sclerotium rolfsii B							
	Xanthomonas dieffenbachiae LS		/					
	ROOT							
	Erwinia spp. R							
	@ Pythium sp. R							
	@ Rhizoctonia solani R	X						
	@ Sclerotium rolfsii R							

and he turns his production no less often than every 12 weeks. With *that* information, we could disregard the potential nematode problems in our pest prevention program, as infestation or injury from them would be highly unlikely in this situation. The disease and insect problems in the listing would still be a concern, the optimum plant environment and Florida's climate being favorable to them as well. The next consideration involves reviewing the history of pest infestations and cycles in nurseryman Smith's area, along with the basic traits of the disease and insect pests. Our goal in this step is to quantify simple seasonal occurrence patterns for each pest. With that done, we turn to the available control agents, identify the products needed, and learn their properties; specifically their degree of effectiveness, application method, speed of action, length of residual, and safety to the plant and also people. That completes the information required to develop a program for a plant. A typical worksheet would look something like this (See Fig. 2).

Step 5. How can this booklet be utilized for diagnosing plant problems 'on location'? The individual pest universe, provided in *Pests of Ornamental Plants in Florida,* for each plant genus narrows the possibilities considerably. Basic injury differences between pest problems narrows the choices even further, and the specific traits of several organisms and their injury allows even further use of the elimination process. I have found my 'on-site' diagnoses, utilizing this process, to be very accurate when followed up with lab analysis. In addition, a given pest control recommendation will usually have activity on several organisms, making it possible to control the problem properly even when your diagnosis could not narrow the problem down to one primary cause. The value of accurate 'on-site' diagnosis, particularly to nurserymen, goes without saying; pests (whether disease, insect, mite, or nematode) become more difficult to control the longer they have to establish themselves, and naturally do more damage as time and populations progress. Laboratory diagnosis will continue to be the only proof positive diagnostic procedure. However, the process of elimination using close scrutiny, common sense, and the listings in *Pests of Ornamental Plants in Florida* oftentimes produces the same answer and more importantly, the proper corrective measures much sooner.

Summary. In summary, nothing magical or extraordinary was developed in the booklet *Pests in Ornamental Plants in Florida*; rather, information that was heretofore available only from a large number of sources was compiled together. The information it includes can be a valuable tool to researchers and nurserymen alike; and when used as a foundation for additional information, can do much to increase efficiency, maximize quality, and minimize time in both experimentation and production. I intend for this booklet to be a dynamic entity, and request your help in keeping it updated with new information as it develops.

FIGURE 2