



IR-4 Ornamental Horticulture Program Grower & Extension Survey Summary 2013 – US Respondents *Revised 2/2014 for corrected weed grouping*

The intent of the Ornamental Horticulture Survey was to poll growers, landscape care operators, researchers, extension personnel and others affiliated with this industry on needs and issues related to disease, insect, and weed management. The responses from the survey feed directly into how IR-4 allocates its research budget for ornamental horticulture projects.

Demographics of Survey Participants

The purpose for several questions in this survey was to describe the demographics of participating growers, landscape care personnel and others in the green industry. The survey participants came from across the United States with 46% originating in the Northeast Region (Table 1). Fifty-four percent were growers with the next largest segment being lawn care professionals at 16% (Table 2). The operation type most represented was greenhouse followed by nursery container growers (Table 3). Those participants involved in field-grown nursery production or in the landscape represented a significant portion of the operation types. Very few survey participants selected more than one operation type (data not shown).

Relatively equal numbers of respondents identified themselves as using chemical control and/or IPM (Table 4). Twenty-six percent used biological controls while 15% of survey participants used organic tools. Many participants did not choose a philosophy for when to apply, but those that did make applications when needed rather than based on a calendar.

While respondents grew slightly more perennials than any other crop type, bedding plants, foliage plants, ornamental grasses, shrubs and trees were relatively evenly split among growers (Table 5). Fewer survey respondents grew seasonal potted plants, cut flowers, palms, and Christmas trees.

Table 1. IR-4 Region for survey participants.

Region	Count	Percent
NorthCentral	25	13%
Northeast	91	46%
Southern	66	33%
Western	16	8%
Total	198	100%

Table 2. Employment sector for survey participants (single selection option).

Segment	Count	Percent
Extension	20	10%
Government	12	6%
Grower	107	54%
Industry	9	5%
Interiorscaper	2	1%
LCP	32	16%
Researcher	16	8%

Table 3. Operation types (multiple selections).

Production Site	Count	Percent
Greenhouse	56	28%
Nursery Container	44	22%
Nursery Field	29	15%
Landscape	42	21%
Interiorscape	14	7%
Christmas Tree Farm	13	7%
Sod Farm	6	3%

Table 4. Disease, insect and weed management styles (multiple selections).

Management Styles	Count	Percent
Biological Control	52	26%
Chemical Control	68	34%
IPM	67	34%
Organic	29	15%
Weekly/Monthly Sprays	0	0%
Spray at Thresholds	42	21%

Table 5. Spectrum of crops grown (multiple selections).

Crop Type	Count	Percent
Bedding Plants	57	29%
Cut Flowers	20	10%
Christmas Trees	16	8%
Foliage Plants	46	23%
Perennials	63	32%
Ornamental Grasses	58	29%
Palms	20	10%
Seasonal Potted Plants	29	15%
Shrubs	57	29%
Trees	56	28%
Turf	29	15%

Research Direction/Type of Data Needed

Two questions solicited information on the general direction of research and the type of data needed in the program. The first question asked whether crop safety data was needed more than efficacy, efficacy more than crop safety, or both equally. Unlike the survey in 2010/2011 where respondents selected crop safety as the most needed option, the option for needing both crop safety and efficacy equally was highly selected (Figure 1). The next question asked for a ranking of 16 categories based on how much the information is needed for daily operations. This ranking was on a scale of 1 (not needed) to 5 (very important). Any categories that were unranked received a '0' if at least one category was ranked in that person's survey. In general, there were no major differences for research direction (Table 6). Studying new products tended to be numerically higher than expanding current products, and developing efficacy data was higher than developing phytotoxicity data. However, neither trend was particularly strong.

Ranking of Issues by Discipline

Each of the issues within the disciplines listed by participants was given a weighted ranking based on the order written. Each was also assigned to a group based on similar diseases, pests, or weeds. This section also examines the survey responses grouped by production site.

Figure 1. Counts on type of data to be generated.

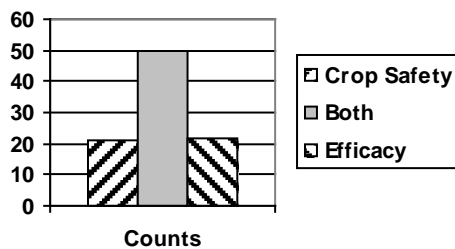


Table 7. Ranking of pests with limited management choices.

Pest Group	Weighted Ranking
Mites & Spider Mites	129
Thrips	100
Scale & Mealybugs	94
Borers & Beetles	75
Aphids	57
Whiteflies	52
White Grubs & Root Weevils	29
Lepidopterans	25
Turf Pests	14
Other	13
Fungus Gnats	13
Leafminers	13
Snails & Slugs	7
Lygus	4
Stink bugs	4
Leaf Hoppers	2
Nematodes	2
Gall Insects	1

Table 8. Ranking of diseases with limited management choices.

Disease Group	Weighted Ranking
Bacterial Diseases	68
Powdery Mildew	60
Crown & Root Rot	52
Downy Mildew	51
Leaf Spots & Anthracnose	46
Phytophthora & Pythium	42
Other	41
Nematodes	34
Botrytis	26
Foliar Blights	18
Turf Diseases	17
Virus	14
Rusts	14
Canker	13
Vascular Wilts	9

Table 6. Research direction for each discipline.

Research Direction	Disease	Insect	Weed	PGR	Ave
New Products	3.6 a	4.0 a	3.4 a	2.7 a	3.4 a
Expand Products	3.2 a	3.4 b	3.2 a	2.6 a	3.1 b
More Efficacy	3.7 a	3.9 ab	3.2 a	2.8 a	3.4 a
More Phytotoxicity	3.3 a	3.4 ab	3.1 a	2.6 a	3.1 ab

* Within columns, numbers followed by different letters are statistically different based on Fisher-Hayter at $p < 0.05$.

Entomology

When all responses were grouped together the top five pests of concern were mites & spider mites, thrips, scale & mealybug, borers & beetles, and aphids (Table 7 - p2). Note that the calculation for weighted ranking here removes any duplication for crop or production site.

When weighted rankings were calculated for categories of crops, the top 5 pests changed for each crop type (Table 10 - p4). One pest group was present in all five crop types: mites & spider mites. Three pest groups were present in at least four out of five crop types: thrips, whiteflies, and scale & mealybugs.

When the weighted rankings were calculated based on the production sites, there were some differences among the order, but 4 of the top 5 were similar (Table 11 - p4). Three pest types were in the top five for each primary production site: mites & spider mites, borers & beetles, and whiteflies. It was unexpected for borers & beetles to appear in the greenhouse production site; this seems to come from flea beetles and other coleopterans found in certain greenhouse crops along with some potential for respondents to include woody ornamentals grown for a portion of their crop cycle in hoop houses.

Plant Pathology

When all responses were grouped together, the top five diseases included bacterial diseases, powdery mildew, crown & root rots, downy mildew, and leaf spots & anthracnose (Table 8 - p2). The crown & root rot group contains diseases affecting roots, crowns, and lower trunks that are clearly not caused by *Pythium* or *Phytophthora*. Note that the calculation for weighted ranking here removes any duplication for crop or production site.

When the rankings were calculated based on the crop types there were some differences among the groups (Table 12 - p4). Crown & root rots and bacterial diseases were the only disease groups appearing in 4 of the crop types.

For the rankings grouped by production site, bacterial diseases, powdery mildew, *Phytophthora* & *Pythium* appeared in all four production sites while crown & root rots and leaf spots & anthracnose appeared in three (Table 13 - p4).

Weed Science

Although there were some variations between rankings whether the responses are grouped together or separated by crop or production site, there was a general trend with broadleaf perennials and broadleaf summer or winter annuals in the top five weed types across crops and production sites. (Table 9, Table 14 – p5, Table 15 – p5).

Among the broadleaf perennials Benghal dayflower, dollarweed and Florida betony ranked the highest. Eclipta was the highest ranked broadleaf summer annuals, and *Conyza* was by far the highest ranked broadleaf winter annual (Table 16 - p5). The top individual weeds mentioned were *Conyza*, nutsedge, liverwort, and grass species.

Table 9. Ranking of weeds with limited management choices.

Weed Group	Weighted Ranking
Broadleaf - Perennial	66
Grass	58
Broadleaf - Winter Annual	44
Other	44
Sedge & Nutsedge	33
Broadleaf - Summer Annual	18
Horsetail & Similar Weeds	17
Non-grass Monocots	16
Turf	15
Broadleaf - Annual/Perennial	15
Turf weeds	11
Liverworts & Moss & Algae	10
Fern	9
Broadleaf - Winter Annual/Biennial	8
Vine - Winter/Summer Annual	3
Vine - Perennial	3
Aquatic	2
Broadleaf - Annual	2

Table 10. Top 5 issues by crop for Entomology.

	Bedding Plants & Seasonal Potted Plants	Cut Flowers	Ornamental Grasses	Foliage & Perennial Plants	Shrubs, Trees, Palms & Christmas Trees
1	Mites & Spider Mites (76)	Thrips (29)	Thrips (19)	Mites & Spider Mites (67)	Borers & Beetles (69)
2	Thrips (74)	Mites & Spider Mites (16)	Mites & Spider Mites (12)	Thrips (32)	Scale & Mealybugs (68)
3	Whiteflies (31)	Aphids (9)	Scale & Mealybugs (4)	Scale & Mealybugs (22)	Mites & Spider Mites (47)
4	Aphids (29)	Whiteflies (6)	Fungus Gnats (4)	Whiteflies (21)	Whiteflies (25)
5	Scale & Mealybugs (25)	Lygus (4)	Snails & Slugs (2)	Aphids (18)	White Grubs & Root Weevils (25)

Table 11. Top 5 issues by production site for Entomology.

	Greenhouse	Nursery Container	Nursery Field	Landscape
1	Mites & Spider Mites (192)	Mites & Spider Mites (118)	Mites & Spider Mites (69)	Scale & Mealybugs (79)
2	Thrips (147)	Thrips (76)	Borers & Beetles (39)	Mites & Spider Mites (72)
3	Whiteflies (69)	Borers & Beetles (70)	Whiteflies (38)	Borers & Beetles (48)
4	Borers & Beetles (63)	Scale & Mealybugs (53)	Thrips (33)	Whiteflies (29)
5	Aphids (55)	Whiteflies (49)	Scale & Mealybugs (28)	Aphids (16)

Table 12. Top 5 issues by crop for Plant Pathology.

	Bedding Plants & Seasonal Potted Plants	Cut Flowers	Ornamental Grasses	Foliage & Perennial Plants	Shrubs, Trees, Palms & Christmas Trees
1	Downy Mildew (42)	Powdery Mildew (10)	Rusts (6)	Bacterial Diseases (38)	Bacterial Diseases (36)
2	Crown & Root Rot (35)	Botrytis (6)	Crown & Root Rot (1)	Crown & Root Rot (24)	Leaf Spots & Anthracnose (33)
3	Powdery Mildew (33)	Bacterial Diseases (6)	Downy Mildew (1)	Nematodes (23)	Powdery Mildew (21)
4	Bacterial Diseases (20)	Crown & Root Rot (5)		Leaf Spots & Anthracnose (20)	Phytophthora & Pythium (19)
5	Phytophthora & Pythium (19)	Downy Mildew (5)		Phytophthora & Pythium (14)	Foliar Blights (15)

Table 13. Top 5 issues by production site for Plant Pathology.

	Greenhouse	Nursery Container	Nursery Field	Landscape
1	Bacterial Diseases (88)	Bacterial Diseases (78)	Bacterial Diseases (53)	Bacterial Diseases (43)
2	Crown & Root Rot (59)	Crown & Root Rot (43)	Leaf Spots & Anthracnose (37)	Powdery Mildew (34)
3	Powdery Mildew (57)	Leaf Spots & Anthracnose (41)	Nematodes (27)	Crown & Root Rot (24)
4	Downy Mildew (46)	Powdery Mildew (39)	Powdery Mildew (25)	Nematodes (18)
5	Phytophthora & Pythium (45)	Phytophthora & Pythium (25)	Phytophthora & Pythium (18)	Phytophthora & Pythium (17) Leaf Spots & Anthracnose (17)

Table 14. Top 5 issues by crop for Weed Science.

	Bedding Plants & Seasonal Potted Plants	Cut Flowers	Ornamental Grasses	Foliage & Perennial Plants	Shrubs, Trees, Palms & Christmas Trees
1	Broadleaf - Perennial (16)	Horsetail & Similar Weeds (6)	Broadleaf - Summer Annual (8)	Broadleaf - Perennial (18)	Broadleaf - Winter Annual (40)
2	Sedge & Nutsedge (9)	Sedge & Nutsedge (6)	Broadleaf - Perennial (3)	Broadleaf - Winter Annual (18)	Broadleaf - Perennial (37)
3	Non-grass Monocots (6)	Broadleaf - Summer Annual (5)	Broadleaf - Winter Annual/Biennial (3)	Broadleaf - Summer Annual (13)	Grass (15)
4	Fern (6)	Broadleaf - Perennial (4)	Broadleaf - Winter Annual (2)	Liverworts & Moss & Algae (10)	Broadleaf - Summer Annual (15)
5	Broadleaf - Summer Annual (4) Broadleaf - Winter Annual/Biennial (4)	Broadleaf - Winter Annual (3)	Grass (2)	Sedge & Nutsedge (10)	Sedge & Nutsedge (10)

Table 15. Top 5 issues by production site for Weed Science.

	Greenhouse	Nursery Container	Nursery Field	Landscape
1	Broadleaf - Perennial (69)	Broadleaf - Perennial (58)	Broadleaf - Perennial (44)	Broadleaf - Perennial (24)
2	Broadleaf - Summer Annual (45)	Broadleaf - Winter Annual (55)	Broadleaf - Winter Annual (34)	Broadleaf - Winter Annual (21)
3	Broadleaf - Winter Annual (43)	Broadleaf - Summer Annual (45)	Broadleaf - Summer Annual (28)	Sedge & Nutsedge (17)
4	Sedge & Nutsedge (32)	Sedge & Nutsedge (23)	Sedge & Nutsedge (17)	Grass (17)
5	Fern (21)	Broadleaf - Winter Annual/Biennial (15)	Broadleaf - Winter Annual/Biennial (10)	Broadleaf - Annual/Perennial (9)

Table 16. Specific issues for each weed group.

Weed Group	Weed Name	Weighted Ranking
Aquatic	Duckweed	2
Broadleaf - Annual	Parthenium	2
Broadleaf - Annual/Perennial	Artillary Fern	3
	Malva	3
	Oxalis	9
Broadleaf - Perennial	Benghal Dayflower	6
	Brambles	3
	Chinese privet	2
	Clover	3
	Creeping Charlie	2
	Dichondra	1
	Dollarweed	6
	Florida Betony	6
	Ground Ivy	2
	Lesser Celendine	6
	Mikania micrantha	3
	Mugwort	5
	Multiflora rose	1
	Oriental Bittersweet	2
	Poison Ivy	4
	Skeleton-leaf Bursage	3
Thistle	3	
Violet	3	

Weed Group	Weed Name	Weighted Ranking
Broadleaf - Perennial	Virginia Creeper	2
	Yellowcress	3
Broadleaf - Summer Annual	Chamberbitter	1
	Chenopodium pumilio	2
	Conyza	1
	Eclipta	6
	Galinsoga	2
	Purslane	2
	Spurge	4
Broadleaf - Winter Annual	Conyza	26
	Garlic mustard	1
	Groundsel	7
	Russian thistle	1
	Wild Mustard	3
	Winter Annuals	6
Broadleaf - Winter Annual/Biennial	Bittercress	8
Fern	Dryopteris	3
	Tiller fern (Artillery)	6
Grass	Bermudagrass	6
	Crabgrass	12
	Dallisgrass	12
	Grass	10
	Poa annua	12
	Quackgrass	1
	Torpedograss	3
	Zoysiagrass	2
Horsetail & Similar Weeds	Equisetum	17
Liverworts & Moss & Algae	Liverwort	10
Non-grass Monocots	Gladiolus	6
	Onion	4
	Wild Garlic	6
Sedge & Nutsedge	Kyllinga	1
	Nutsedge	15
	Sedge	14
	Yellow Nutgrass	3
Turf	Dollarweed	9
	Florida Betony	6
	Bermudagrass in fescue	2
	Bermudagrass in St. Augustine turf	2
	Bermudagrass in Zoysia	3
	Crabgrass	2
	general weeds in turf	2
Vine - Perennial	Greenbriar	3
Vine - Winter/Summer Annual	Morning glory	3
Other/Comments	All of them especially with Methyl Bromide issue	3
	all weeds	3
	Broad spectrum post emergent during growing season	3
	cut flowers weed control in field grown	3
	Cyanobacteria	1
	Perennial peanut sod	2
	Post broadleaf weed control - landscape	2

Weed Group	Weed Name	Weighted Ranking
Other/Comments	Postemergence broadleaf weed control - Containers	6
	Pre-emergents for cactus and succulents	4
	various species	6
	Weed control in newly rooted woody plant liners	4
	Weeds in greenhouse	3
	white annual	4