Evaluating New Cut Flowers in the United States and Canada

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Abstract

The development of new and different cut flowers is increasingly important to stimulate customer interest and maintain sales. Each year a wide variety of new cultivars and species are released by plant breeders, propagators, and suppliers. In response the National Cut Flower Trials were established to evaluate new annual, perennial and woody cut flowers, foliage, fruits, and stems. The program consists of three trials focusing mainly on field-grown cut flowers, but also including high tunnel and greenhouse production. The program is a cooperative effort between the Association of Specialty Cut Flower Growers (ASCFG), cut flower breeders and suppliers, cut flower producers, and North Carolina State University (NCSU). The trial is coordinated by the ASCFG and NCSU. Breeders and suppliers provide plant materials, which are sent to commercial producers for evaluation. In addition, a few other universities participate in the trials. Up to 50 trialers from the United States and Canada evaluate seed-propagated materials and 10 to 20 trialers rate perennial and woody materials, so that plants are evaluated across a broad range of climatic conditions. Trialers return evaluations providing production information (yield, stem length), ratings (market appreciation, ease of cultivation, likelihood of commercially producing the cultivars again), and written comments (positive qualities, problems, similar species/cultivars, postharvest attributes). Plants are evaluated for one year in the annual trial, two years in the perennial trial and for up to five years in the woody trial. The trial programs provide 1. cut flower producers with new cultivars to test each year, 2. breeders and suppliers with publicity and performance information for their products, 3. the ASCFG with a member service, and 4. NCSU with information on the performance of new cut species and cultivars from a wide range of climatic conditions.

INTRODUCTION

Each year a wide variety of new cultivars and species are released by plant breeders, propagators, and suppliers. Most of the new cultivars are variations on cultivars already commercially available, for example, new colors or improved production characteristics. Other cultivars are new to the cut flower industry and were produced by hybridization, re-purposed from other floriculture sectors, or selected from the wild. The large number of potential cut flowers needs to be evaluated for commercial suitability. Each year producers are faced with the question of which of these new taxa are good and should be tested at their farms.

All producers test new cut flower species and cultivars on their farms, but they are usually able to test only a few cultivars at one time. As many farms do not have the personnel to adequately monitor and evaluate new cultivars, suitable cultivars may be deemed unsatisfactory due to lack of proper evaluation. Regardless of the quality of the evaluation program, results are rarely shared with other growers, resulting in much duplication of effort across farms.

Breeders and suppliers evaluate potential new cut flowers at their production facilities and at cooperating growers. While larger companies have the resources to do an excellent job evaluating new cut flowers, the results are only selectively shared, especially if the new cultivars are not better than those already on the market.

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University and governmental trial programs are typically able to conduct high quality, objective evaluations and provide the results to a wide range of producers, suppliers, final users through publications, websites, and presentations. However, such trials are usually limited to only one location or regional area and results may not be applicable to a wide range of growers. In addition, procedures may not be completely representative of commercial production and marketing conditions.

The ASCFG National Cut Flower Trials were established as a method for combining the advantages of the various agencies for evaluating new cut flowers and minimizing the negative aspects. The new cultivars are tested not only at numerous commercial growers in the United States and Canada, but all cultivars are also tested at NCSU and often at other universities such as Cornell.

History of the ASCFG National Cut Flower Trials

The first ASCFG National Cut Flower trial was conducted in 1992 by Allan Armitage, University of Georgia, and Judy Laushman, ASCFG. In 1993 the trials were formalized and administered by John Dole, originally of Oklahoma State University and now with North Carolina State University. In 2007 the administration of the trials was taken over by Judy Laushman, who coordinates the trialers and companies, receives the seeds and plants, mails plant materials to the trialers, and handles correspondence. John Dole collects data, summarizes results and writes the annual articles. The perennial and woody trials were initiated in 1998 and 2004, and various miscellaneous trials have been conducted over the last five years to evaluate plant materials that do not fit into the established trials, including greenhouse/high tunnel calla lilies (*Zantedeschia*), Chinese lantern lily (*Sandersonia aurantiaca*), lisianthus (*Eustoma grandiflorum*), and specialty chrysanthemums (*Chrysanthemum morifolium*). In 1999 the ASCFG Cut Flowers of the Year program was started, which relies heavily on those cultivars that do well in the ASCFG National Cut Flower Trial Program. In 2002 postharvest evaluations of the top performing cultivars were added to the NCSU portion of the trial, by means of additional funding from the American Floral Endowment and the ASCFG Research Fund.

TRIALING PROCESS

Seed Trials

Organization of the seed trials begins in the fall when the seed companies and participants are contacted. Seed companies are asked for the list of cultivars they will submit to the trial. Companies are asked to send at least 40 packets for each cultivar, with at least 100 seed in each packet. Companies are charged $50 per cultivar submitted. Participating growers are asked to list the taxa they would prefer to receive if available, to list taxa they would prefer not to receive, and the maximum number of cultivars they would like to evaluate.

Seed is sent to the ASCFG office in Oberlin, Ohio, where the trial package for each trialer is assembled based on his or her preferences and the available seed. In addition, each trialer receives one or more unrequested cultivars to ensure that all cultivars are tested in as many locations as possible. Packages are mailed to the trialers, who grow the plant materials with their established commercial crops.

In the fall, the trialers are asked to return evaluations of each cultivar, including yield/plant, stem length, and market appreciation ratings (1 to 5, with 5 best) for each type of customers to whom the cultivars are sold (direct retail to the general public, retailers, or wholesalers). Trialers are asked to rate (1-5) the ease of production and the likelihood they would grow the indicated species again. We also collect information on USDA cold hardiness zone, production method (direct seed or transplant), date of planting, and approximate spacing. Open-ended questions include recommendations for postharvest handling, good qualities, problems, similar species/cultivars, and additional comments. Trialers can submit their evaluations either by sending in hard copies of each evaluation sheet (one per cultivar) or entering their results directly into a database maintained at

NCSU.

Results are published annually in The Cut Flower Quarterly and in other trade journals. Results are also available online at www.ncsu.edu/project/cutflowers/.

Perennial and Woody Trials

Organization of the perennial and woody trials begins in the fall when the companies and participants are contacted. Companies are asked for the list of cultivars they will submit to the trial. Companies are asked to send at least 10 plugs or dormant bare roots for each perennial cultivar or 4 plants for the woody trials. Participants are charged $100 to participate in the trials. In the spring, plant materials are either sent directly from the company to the trialers or sent to the ASCFG, where boxes of cultivars are assembled and sent to the trialers. In the fall, trialers are asked to return evaluations of each cultivar similar to that indicated for the seed trials. In addition, trialers are asked to record the number of plants surviving the first summer (year 1) or the first winter (year 2). Each set of perennial are tested for two years and woody plants for five years; evaluations are returned each year.

Miscellaneous Trials

Other trials have been conducted examining new calla lilies, lisianthus, and non-traditional chrysanthemums for greenhouse or high tunnel production. The trials are conducted in a manner similar to the other trials. Since each trial was conducted only once, results have not been included in this paper.

ASCFG Cut Flowers of the Year

Based on trial results, the top five performers are automatically nominated for the ASCFG Cut Flower of the Year in the appropriate category: Fresh, Dried and Woody. The rankings are based on the combined ratings score: market appreciation (average of wholesale, florist, and consumer ratings) + repeat again rating + ease of cultivation rating. The ASCFG Board of Directors combines the cut flowers nominated from the trials with those nominated from the Board. Voting by the Board of Directors narrows the list to five selections per category. The ASCFG membership selects the Cut Flowers of the Year by electronic ballot. Generally, the winners are those cultivars that were introduced to the membership through the National Cut Flower Trials.

Postharvest Evaluations

Each year the most promising cultivars and species from the ASCFG National Cut Flower Trial Programs grown at NCSU are subjected to postharvest testing (Clark et al., 2010). Stems are harvested, sorted into four similar groups based on stem length and diameter, flower bud number, flower size, as appropriate for the cultivar, and trimmed to a consistent length for each species, 30-45 cm. Two groups of stems are placed in a commercial hydrating solution or deionized (DI) water for 4 hours, after which one group from each solution is placed in a commercial holding solution and the other in DI water.

RESULTS

In the seed trials, a total of 837 cultivars were evaluated from 1993 to 2011, averaging 44 cultivars per year and ranging in number from a low of 23 in 2006 to a high of 76 in 2002 (Table 1, Fig. 1). The number of participating companies averaged 6 per year, ranging from a low of 4 in many years to a high of 9 in 2009. The number of trialers averaged 40, ranging from a low of 27 in 1997 to a high of 59 in 2005. The number of surveys returned averaged 29 per year and ranged from a low of 18 in 2009 to a high of 40 in 2004. The percentage of trialers returning surveys averaged 73%, ranging from a low of 42% in 1996 to a high of 97% in 2001.

In the perennial trials, a total of 149 cultivars were evaluated from 1998 to 2010, averaging 14 cultivars per year and ranging in number from a low of 3 in 2005 to a high of 31 in 1998 (Fig. 2). The number of participating companies averaged 4 per year,

ranging from a low of 2 to a high of 6 in 2003. The number of surveys returned averaged 8 per year and ranged from a low of 6 in several years to a high of 10 in 1998.

In the woody trials, a total of 35 cultivars were evaluated; 17 in 2004, 8 in 2008, and 10 in 2010, and the numbers of suppliers were 3, 1, and 1, respectively. In 2004 and 2005 five producers returned surveys and in 2008 and 2009 only three producers returned surveys.

In the postharvest evaluations, the vase life of 121 taxa was determined from 2002 to 2010 (Clark et al., 2010). Of the 121 taxa tested, 16 had a vase life longer than 21 days for at least one of the treatments, 38 had a vase life of 14 to 21 days and 39 had a vase life of 10 to 14 days, indicating that most of the taxa tested would be suitable for commercial production. For the majority of taxa, either all treatments produced a similar vase life, or treatment with a holding preservative produced the longest vase. Commercial hydrators had a less positive effect on vase life as they increased the vase life of only four cultivars in three genera and reduced the vase life of 18 cultivars in 12 genera.

DISCUSSION

The ASCFG National Cut Flower Trial Programs have been running for 18 years and have evaluated hundreds of new cut flower cultivars and species. The program is a cooperative effort among plant breeders and suppliers, commercial cut flower producers, and universities and is administered by a trade organization. Each participant in the trial program benefits from the cooperative arrangement. The trial programs provide: 1. Cut flower growers with new cultivars to test each year; thus, they are the first in their area to have such cultivars. 2. Breeders and suppliers with publicity and performance information for their products. In addition, their new products are delivered directly to those producers most likely to want and grow new products – the trialers. 3. The ASCFG with a member service. 4. NCSU and other participating universities with information on the performance of new cut species and cultivars from a wide range of climatic conditions.

Species Evaluated

Of the 1021 cultivars evaluated from 1993 to 2010, the most common flower tested was lisianthus, with 121 cultivars tested over 16 years. The large number of submissions could be due to the fact that lisianthus is a high value species that is commonly grown in greenhouses, high tunnels and the field. Numerous companies are breeding and releasing new cultivars. The second most popular flower was sunflower (*Helianthus annuus*) with 80 submissions in 18 of the trials, covering all but one year of the trial program. Sunflowers are one of the most popular field cut flowers with some production under cover. Rounding out the top five genera submitted include snapdragon (*Antirrhinum majus*), annual asters (*Callistephus chinensis*) and carnations and sweet william (*Dianthus*).

Funding

The costs of the trials are spread over the four participating groups. Fees paid by the seed suppliers and by participants in the perennial and woody plant trials cover the administrative and shipping costs of each of the trials, with suppliers paying for the plant materials. The ASCFG provides up to $500/year to NCSU for the trials, but that is insufficient for data collection, website maintenance, and report preparation; the rest is funded by NCSU itself and donations.

Applicability of Results

A statistically valid experiment usually involves multiple replications, repetition over years or growing seasons, and proper randomization. While the National Cut Flower Trials has many replications, plants are not randomly selected or assigned. The upper Midwest and the South tend to have a higher number of trialers, while the western U.S. and Canada has fewer growers and fewer trialers. In addition, each participant is asked to select the species he or she would prefer to receive. During the seed distribution process

we add one or more cultivars to those sent to each participant to make sure that each cultivar gets as wide a distribution as possible. However, we do not send certain species to some climatic areas; for example, larkspur (*Consolida ambigua*) and stock (*Matthiola incana*) are generally not sent to trialers in the southern U.S., unless requested by the trialer. Other species are not able to be grown in some areas of the U.S. due to other issues; for example, annual asters and coneflower (*Echinacea*) cannot be grown in the central U.S. due to aster yellows mycoplasma, and warm temperature crops, such as zinnia (*Zinnia elegans*) and *Celosia* do not perform well in cool coastal areas of California, Oregon, Washington and British Columbia. In addition, most of the cultivars are not repeated for more than one year.

However, considering these limitations we feel the trials provide excellent data due to the large number of trialers for each cultivar. Even with the restrictions on distribution of certain species, most are trialed by most of the participants. Even those species that are limited to northern trialers are generally evaluated by 15 or more growers.

We feel that we have relatively few "false positives", meaning that if a cultivar scores well with a large number of participants it is likely to be an excellent cut flower. The nature of our trials, however, means that if a cultivar does not score well, it could still be an excellent cut flower, generating a "false negative". The low scores could be due to seed being received by a small number of trialers, who may not have handled the cultivar appropriately. In addition, since all trialers do not send in results, the cultivar may have done well for those who happened not to send in results that year.

For each cultivar we remove from the data set the highest and lowest scores for each measurement, such as length, to eliminate potential outliers. This reduces the likelihood that unusually high or low data will skew the averages. Secondly, we include growers' comments in the trial reports, which allow readers to place the data in context.

Survey Return Rate

With all trials, one major issue has been the difficulty in getting participants to return surveys. As with any project relying on citizen science, there are limited ways to persuade trialers to return results. Various inducements have been tried over the years. The best process appears to be to send periodic reminders. When the trials were first started, these reminders consisted of letters and phone calls. Now we send several emails. In 1996, we charged the participating trialers a $50 fee, with the hypothesis that only the serious trialers would then participate and this would result in fewer trialers, but a similar number of returned surveys. The charge reduced the number of participants, but also reduced the number of surveys returned. After two years the charges were dropped and the number of participants and returned surveys increased.

Inappropriate Format for Some Species

With the seed trial the seed is sent to growers in late December or January, which is too late for fall planting of cool weather crops in the southern U.S., such as *Ammi majus*, bells-of-Ireland (*Moluccella laevis*), *Delphinium*, carnations and sweet william, flowering cabbage and kale (*Brassica oleracea*), larkspur, and stock. In addition, arrival of the seed in December and January is too late for optimum production of those species, such as lisianthus, that require a relatively long time to produce plugs. Another trial should be set up to ship seed or plugs to trialers in early fall for these species.

Obtaining Suppliers for the Perennial and Woody Trials

The number of new releases for perennial and woody plants is much less than for the seed trials. Most seed companies tend to have at least a few new cut flower cultivars to test each year. However, with the perennial and woody ornamental companies, the number of new cultivars available each year is fewer, and of those, only a few cultivars are well suited to cut flower production. Thus, we typically use all of the appropriate new cultivars for any one company in a year or two, then we must find other companies to provide plants. With each new company, we have to work out a new set of logistics.

Thus, the overall administrative time required for perennial and woody trials is much greater than for seed trials. In addition, the cost per unit of plant materials is higher, and the shipping logistics are much greater for plugs and liners as opposed to seed.

ACKNOWLEDGEMENTS

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Literature Cited

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Tables

Table 1. Genera that have been evaluated by the National Seed, Perennial, and Woody Cut Flower Trials from 1993 to 2010. The first number after each name is the total number of cultivars evaluated; the second is the number of years the genus was trialed.

Abelmoschus (1, 1)	Centranthus (1, 1)	Heuchera (4, 2)	Physocarpus (1, 1)
Achillea (6, 5)	Chasmanthium (2, 2)	Hydrangea (1, 1)	Physostegia (1, 1)
Aconitum (2, 2)	Chelone (2, 2)	Hypericum (3, 2)	Prunus (1, 2)
Adenophora (1, 1)	Chrysanthemum (3, 2)	Iberis (3, 3)	Pycnanthemum (1, 1)
Agastache (5, 3)	Cirsium (1, 1)	Ilex (1, 1)	Rosa (6, 1)
Ageratum (6, 5)	Clarkia (6, 2)	Inula (1, 1)	Rudbeckia (7, 5)
Agrostemma (1, 1)	Cleome (3, 1)	Iris (2, 2)	Salix (1, 1)
Allium (3, 1)	Consolida (19, 8)	Kniphofia (3, 3)	Salvia (8, 5)
Amaranthus (6, 5)	Coreopsis (2, 2)	Lathyrus (1, 1)	Sambucus (1, 1)
Armeria (2, 1)	Cosmos (14, 4)	Lavatera (4, 2)	Scabiosa (9, 6)
Ammi (4, 4)	Cotinus (1, 1)	Lepidium (1, 1)	Schizachyrium (1, 1)
Ammobium (1, 1)	Crocosmia (2, 2)	Leucanthemum (3, 3)	Sedum (1, 1)
Anaphalis (1, 1)	Delphinium (25, 11)	Liatris (1, 1)	Setaria (1, 1)
Andropogon (1, 1)	Dianthus (37, 12)	Lilium (1, 1)	Sidalcea (1, 1)
Anemone (2, 1)	Digitalis (7, 4)	Limonium (24, 8)	Silene (2, 1)
Antirrhinum (69, 14)	Doronicum (1, 1)	Linaria (6, 3)	Solidago (1, 1)
Aquilegia (3, 2)	Echinacea (19, 5)	Lobelia (17, 9)	×Solidaster (2, 1)
Aronia (1, 1)	Echinops (1, 1)	Lupinus (2, 2)	Spiranthes (1, 1)
Artemisia (2, 1)	Eragrostis (1, 1)	Lysimachia (2, 2)	Stipa (2, 2)
Asclepias (6, 4)	Eryngium (4, 4)	Matricaria (10, 2)	Syringa (3, 1)
Aster (3, 1)	Eucomis (1, 1)	Matthiola (30, 11)	Tagetes (5, 1)
Astilbe (2, 1)	Eupatorium (4, 4)	Melica (1, 1)	Tanacetum (9, 3)
Astrantia (1, 1)	Euphorbia (2, 2)	Melinis (2, 2)	Thalictrum (2, 1)
Baptisia (2, 2)	Eustoma (121, 16)	Mentha (1, 1)	Thermopsis (1, 1)
Brassica (11, 8)	Gaillardia (2, 2)	Miscanthus (1, 1)	Trachelium (16, 5)
Buddleja (1, 1)	Gentiana (1, 1)	Molucella (1, 1)	Trachymene (6, 3)
Calamagrostis (1, 1)	Geum (1, 1)	Monarda (6, 5)	Tricyrtis (1, 2)
Calendula (5, 2)	Gomphrena (9, 5)	Nepeta (1, 1)	Verbascum (1, 1)
Callicarpa (1, 1)	Gypsophila (2, 2)	Nigella (1, 1)	Vernonia (1, 1)
Callistephus (42, 12)	Hedychium (1, 1)	Origanum (2, 1)	Veronica (4, 4)
Campanula (14, 8)	Helenium (3, 2)	Panicum (1, 1)	Veronicastrum (1, 1)
Capsicum (13, 5)	Helianthus (80, 18)	Papaver (3, 3)	Viburnum (1, 1)
Carthamus (7, 6)	Helichrysum (2, 2)	Patrinia (1, 1)	Viscaria (1, 1)
Caryopteris (2, 2)	Heliopsis (1, 1)	Pennisetum (2, 2)	Weigela (1, 1)
Catananche (3, 2)	Helipterum (3, 2)	Penstemon (5, 3)	Xanthisma (1, 1)
Celosia (37, 12)	Helleborus (2, 2)	Persicaria (3, 2)	Zantedeschia (1, 1)
Centaurea (2, 2)	Heptacodium (1, 1)	Phlox (6, 4)	Zinnia (36, 10)

Figures

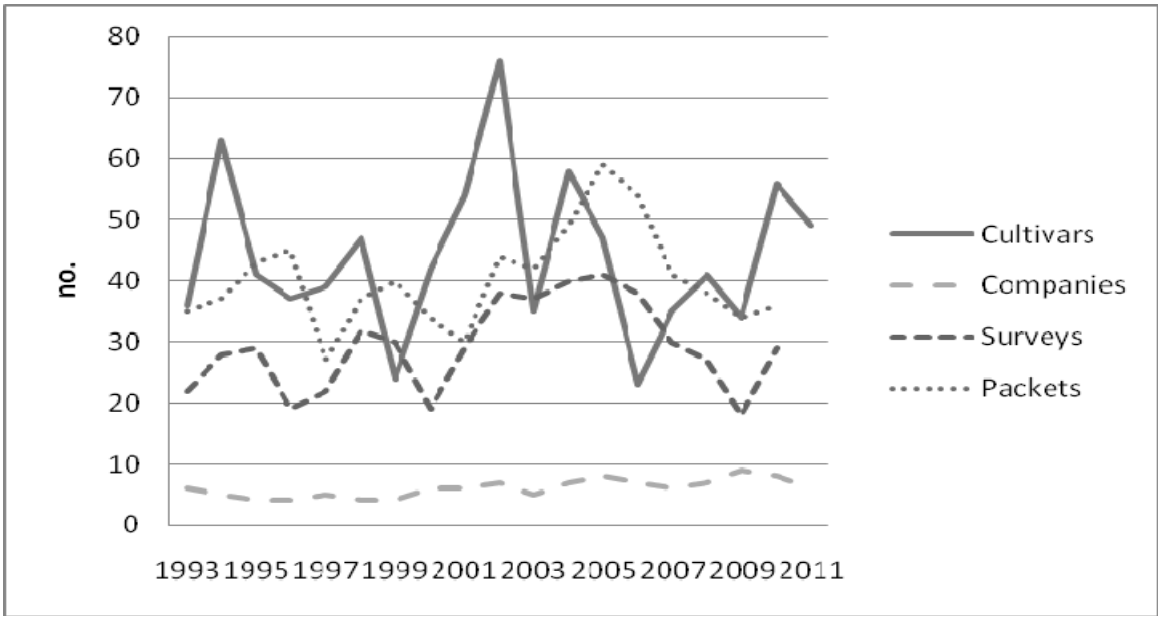

Fig. 1. Number of cultivars evaluated, companies participating, trialers receiving packets of seed, and surveys returned by trialers in the ASCFG National Seed Trial Program from 1993 to 2011. Surveys had not yet been returned for 2011.

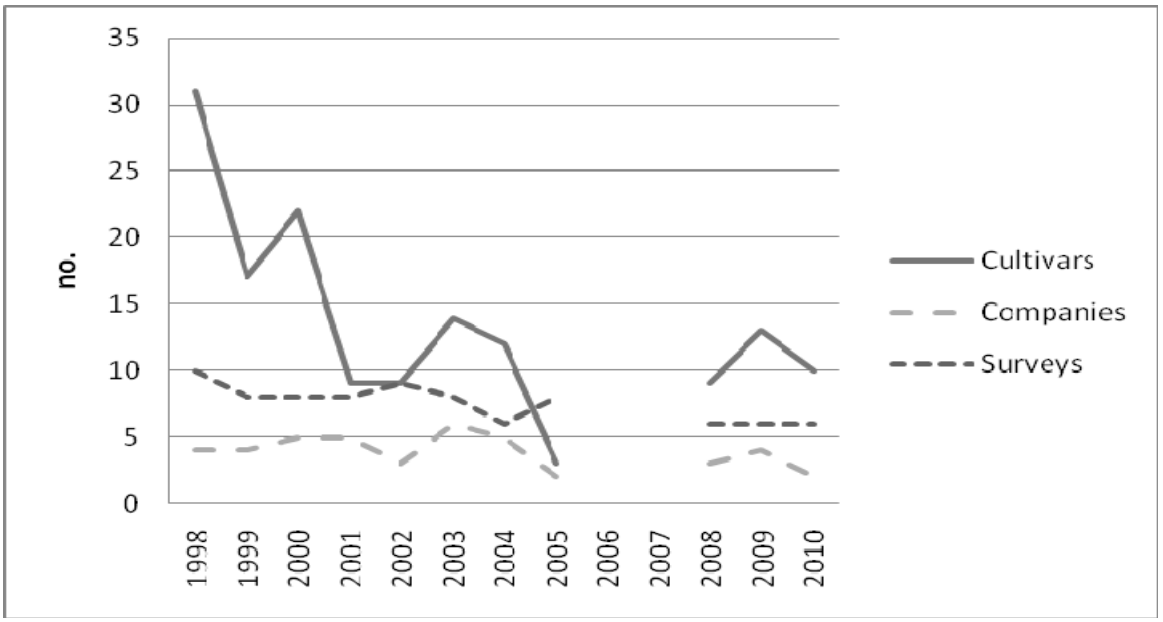

Fig. 2. Number of cultivars evaluated, companies participating, and surveys returned by trialers in the ASCFG National Perennial Trial Program from 1998 to 2010. No perennials were evaluated in 2006 and 2007.