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Propagation Time Affects Winter Survival and Finishing Date for Ornamental Grasses[1]

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Abstract

Five grasses: little bluestem, *Schizachyrium scoparium* (Michx.) Nash; prairie dropseed, *Sporobolus heterolepis* (A. Gray) A. Gray; feather reedgrass, *Calamagrostis xacutiflora* (Schrad.) DC. 'Karl Foerster'; redflame miscanthus, *Miscanthus* Anderss. 'Purpurascens'; and variegated Japanese silvergrass, *Miscanthus sinensis* Anderss. 'Variegatus'; were propagated in fall and spring by plugs or field divisions into 480 ml (4 in round), 2.7 liter (#1), or 6.2 liter (#2) nursery containers. Plants were evaluated for finish date and winter survival. Three fall handled species consistently finished as a salable plant within one year: *Schizachyrium scoparium* plugs, *Calamagrostis xacutiflora* 'Karl Foerster' divisions, and *Miscanthus* 'Purpurascens' divisions. *Sporobolus heterolepis* and *Miscanthus sinensis* 'Variegatus' grew faster and finished with significantly higher survival rates from spring divisions. Spring planted plugs of *S. heterolepis* and *S. scoparium* finished within 9 weeks. The two smaller container sizes finished significantly ahead of the larger size.

Index words: over-wintering, container production.

Species used in this study: little bluestem, (*Schizachyrium scoparium* (Michx.) Nash); prairie dropseed, (*Sporobolus heterolepis* (A. Gray) A. Gray); feather reedgrass, (*Calamagrostis xacutiflora* (Schrad.) DC 'Karl Foerster'); redflame miscanthus, (*Miscanthus* Anderss. 'Purpurascens'); and variegated Japanese silvergrass, (*Miscanthus sinensis* Anderss. 'Variegatus').

Significance to the Nursery Industry

Production schedules for ornamental grasses are new and unknown to many commercial growers. The wide variety of grasses now available and their cool and warm season growth patterns further confound simple guidelines for efficient propagation and scheduling. We compared spring and fall division as a possible efficient use of time and labor. One cool season grass, 'Karl Foerster' feather reedgrass, produced a salable plant faster from fall divisions, and two warm season grasses, redflame *Miscanthus* and little bluestem also grew well and were salable the spring following fall division. Two other warm season grasses: prairie dropseed, and variegated *Miscanthus*, grew faster from spring divisions and were slow to grow when propagated in the fall. Spring divisions survived over-wintering 100% of the time regardless of species. Grasses do not appear to be able to be categorized into spring or fall division simply based on their cool or warm season growth patterns. This information should be helpful for growers to schedule propagation and labor accordingly.

Introduction

The gardening public loves new plants and ornamental grasses are a popular new group of perennials (1). Grasses offer many landscape features including interesting form, texture, color, susurration, and visual movement in the wind (4).

General information is available on ornamental grasses including winter hardiness (5, 13) and ornamental value (4, 16). Propagation information on crown division (6) and forcing or division in early spring (7, 12, 14) has been described. Division size of grasses has been found to influence average leaf area, shoot and inflorescence number, and bud count (2, 8). Harvey and Brand (8) found 8–10 tiller bud divisions produced salable plants in one growing season. Growers have concerns about over-wintering losses due to fall propagation (9) and fitting grasses into existing production schedules (11).

Cool season grasses flower in the spring and grow vigorously in cooler conditions of spring and fall and are traditionally thought to be best divided in the fall. Warm season grasses produce most of their growth during the summer, are assumed to grow faster and survive better when propagated in the spring. With many new grasses on the market and growers uncertain of scheduling, propagation method, and size of divisions, we developed this study to examine the effects of propagation time and container size on over-wintering survival and time required to produce a finished plant for five popular ornamental grasses.

Materials and Methods

Plants selected for this study are some of the most popular grasses (1) with attractive landscape features, good winter hardiness, and easy availability in the nursery trade. One cool season grass: feather reedgrass, *Calamagrostis xacutiflora* 'Karl Foerster'; and four warm season grasses: prairie dropseed, *Sporobolus heterolepis*; little bluestem, *Schizachyrium scoparium*; redflame miscanthus, *Miscanthus* 'Purpurascens'; and variegated miscanthus, *M. sinensis* 'Variegatus', were selected for study. Prairie dropseed is native to central United States, little bluestem is native to eastern and central US; the other three selections are horticultural cultivars of species native to Europe (*Calamagrosits)* and Asia (*Miscanthus*).

Propagule sizes were standardized for each species by number of visible tiller buds or crown diameter. Divisions with 3–5 visible tiller buds from field grown plants at the University of Minnesota were used for redflame miscanthus and variegated Japanese silvergrass. Divisions of 4 cm (1.6 in) diameter feather reedgrass and 3 cm (1.2 in) diameter little bluestem were taken from field grown plants at the University of Minnesota or Bailey Nursery, St. Paul, MN. Purchased (Landscape Alternatives, St. Paul, MN) 96-cell flat plugs or liners (grown from seed) were used for prairie dropseed and little bluestem. Planting dates were October

[1]Received for publication March 29, 2002, in revised form September 6, 2002. Paper No. 021210106 Minnesota Experiment Station.

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Table 1. Interaction between species and division or planting time on over-wintering survival (%) of 5 ornamental grasses.

	% Winter survival						
Date	Little bluestem plugs	Prairie dropseed	Little bluestem divisions	Feather reedgrass	Variegated Japanese silvergrass	Redflame miscanthus	Mean
Fall 97	98a[z,y](a)[x]	32b(c)	90ab(a)	99a(a)	67b(b)	97a(a)	80b
Fall 98	100a(a)	90a(ab)	81b(ab)	98a(a)	39c(c)	74b(b)	71b
Mean	99a(a)	47b(c)	88b(a)	99a(a)	60b(b)	92b(a)	75b
Spring 98	100a(a)	100a(a)	100a(a)	100a(a)	100a(a)	100a(a)	100a
Spring 99	100a(a)	100a(a)	100a(a)	—	100a(a)	100a(a)	100a
Mean	100a(a)	100a(a)	100a(a)	100a(a)	100a(a)	100a(a)	100a

[z]Means followed by the same letter are not significantly different at P = 0.05.

[y]Letters not in parenthesis indicate comparisons between seasons or within a column.

[x]Letters in parenthesis indicate comparisons between species or within the row.

28–November 10, 1997; April 30–May 7, 1998; October 23–28, 1998; and May 1–10, 1999.

Propagules were planted in media with volume ratios (1:0, 1:1, 2:1, 3:1, and 0:1) of composted rice hulls and Hubbard loamy sand, field soil from the Sand Plain Research Farm at Becker, MN, characterized by a high bulk density, low pore space, pH 5.5, and low organic matter. Results of the media aeration effect on growth is reported elsewhere (3). Woodace 20–4–11, 8–9 month release (Vigoro Industries, Chicago, IL) fertilizer was incorporated into the media prior to planting at a rate of 10 lb/yd^3 (5.94 kg/m^3). Three container sizes: 480 ml (4 in round), 2.7 liter (#1), or 6.2 liter (#2) were used. Second year plantings involved only 2.7 liter (#1) containers based on first year results. Fifty propagules (10 from each grass) were randomly assigned to each container treatment. Plants were grown on a gravel pad in full sun and watered with overhead irrigation as needed throughout the growing season. For over-wintering, plants were covered with 30 cm (12 in) of straw between two layers of white plastic from the second week in November until the second week in April. Thermocouples were placed on the surface and 2.5 cm (1 in) deep in the soil of a centrally located container to measure air and soil temperatures under the cover (3).

Fall divisions were evaluated for winter survival six weeks after uncovering and for finish dates every two weeks thereafter. Finish dates, defined as the date plants were saleable, were based on a subjective rating where 0 was a dead plant; 1 = diffuse growth, crown less than half of container diameter; 2 = diffuse growth and crown diameter greater than half of container diameter, or extensive growth and crown diameter less than half of container diameter; and 3 = extensive growth and crown diameter greater than half of container diameter (15). Growers report plants as salable when 60–80% of a group of plants are finished (11). In this study, when a score of 3 was reached by 75% of a particular species and treatment, all of the plants of that species and treatment were considered finished. Spring plants that finished the same season they were divided had half of the plants randomly selected for harvest (to measure dry weights for another study) and the remaining plants were evaluated for over-wintering survival.

Data were subjected to analysis of variance procedures (ANOVA) for interaction between species and division time on over-wintering survival. Finish dates were compared based on division time, but were not analyzed statistically since even a 1-day difference in harvest would show a significant difference because each group (50 plants) was completely harvested when 75% of the group finished.

Results and Discussion

Fall versus spring division. Species and division or planting time interacted to influence over-wintering survival (Table 1). Feather reedgrass had high, 99% mean, survival rates from fall division, which was not significantly different from spring handling which had 100% survival. No data were available from the spring 1999 planting of this cultivar; divisions died due to field handling.

Little bluestem responded well to fall propagation. Neither fall 1997 plugs nor divisions over-wintering percentages were significantly different than the spring handled plants. Survival of fall 1998 divisions was significantly lower, although still at 81%, than both spring plantings, 100%. Prairie dropseed potted in fall 1997 had significantly lower over-

Table 2. Finish date of 5 ornamental grasses in 2.7 liter (#1) containers according to season of planting.

	Species					
Planting date	Little bluestem plugs	Prairie dropseed	Little bluestem divisions	Feather reedgrass	Variegated Japanese silvergrass	Redflame miscanthus
Fall 97	6/15/98	6/15/99	7/01/98	6/15/98	6/15/99	6/15/98
Spring 98	7/01/98	7/01/98	6/15/99	6/15/99	6/15/99	6/15/99
Fall 98	7/01/99	6/15/00	6/15/00	7/01/99	6/15/00	7/01/99
Spring 99	7/01/99	7/01/99	8/01/99	—	6/15/00	8/01/99

wintering survival , 32%, than fall 1998, 90%; or spring 1998 or 1999, 100%. The fall 1998 division of red flame miscanthus had a significantly lower over-wintering survival, 74%, than fall 1997, 97%, or the spring plantings, 100%. Variegated Japanese silvergrass performed poorly with fall divisions; over-wintering was 67% and 39%, for fall 1997 and 1998 respectively, significantly lower than spring divisions, 100% for both years. Over two years, prairie dropseed and variegated Japanese silvergrass had fall survival means of 47% and 60% respectively, indicating that fall handling is not reliable for these plants.

Another warm season grass, switchgrass, *Panicum virgatum* L., has been shown to begin developing tolerance to cold temperatures in late September and plateaus in November (10). Disturbance to prairie dropseed and variegated Japanese silvergrass may have affected the plant's ability to develop appropriate levels of cold hardiness, or the low survival rate may be due to the lack of sufficient food reserves prior to transplanting.

Spring divisions survived over-wintering 100% of the time, regardless of species. Spring division allowed establishment prior to over-wintering and optimized survival of all species. The traditional method of spring division by commercial growers is consistent with this study.

Finish dates. Finish dates for each species are listed (Table 2). Fall handled little bluestem plugs, feather reedgrass divisions, and redflame miscanthus divisions consistently finished within one year. Fall divisions of feather reedgrass finished faster than spring divisions; the fall 1997 divisions finished a full year ahead of those planted the following spring. Fall little bluestem plugs finished at the same time or earlier than spring plugs.

Spring planted plugs of prairie dropseed and little bluestem finished within 9 weeks. Spring plugs of prairie dropseed finished faster than fall plugs by approximately one and a half years. Little bluestem plugs finished earlier than divisions planted at the same time regardless of season. Small propagules finishing faster is consistent with other reports (2). Variegated Japanese silvergrass divisions took more than one year to finish regardless of spring or fall division.

Container size. Container size did not have a significant effect on over-wintering survival (data not shown), although, it did have a significant effect on finish date. Across all taxa, plants in 480 ml (4 in) and 2.7 liter (#1) containers had significantly earlier finish dates of 7/22/98 and 7/24/98 respectively than the largest containers, 6.2 liter (#2), which finished on 8/5/98 with salable plants.

Brand (2) showed small division size increased the number of new tillers and showed less signs of transplant stress in some *Miscanthus* cultivars. In the propagation of *Hakonechloa macra* 'Aureola', the ideal division size to finish in a 2.6 liter (Classic 300S) container was 8–10 tiller buds per division (8).

Conclusions. The only cool season grass in the study, feather reedgrass, survived well with fall or spring propagation, however, the fastest finishing time resulted from fall division. Growers should consider dividing this plant in the fall for sale the following spring. Fall propagation of two warm season grasses: divisions of red flame miscanthus and plugs of little bluestem, were successful, resulting in high over-wintering survival and quick finishing times. Prairie dropseed and variegated Japanese silvergrass had significantly lower mean survival rates from fall division than spring, so growers should not handle these plants in the fall if possible. Plugs of little bluestem and prairie dropseed handled in the spring finished in 9 weeks, over a year ahead of plants divided the previous fall. This information should be helpful for growers in determining propagation times for specific ornamental grasses.

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