Research Reports

Propagation of *Pennisetum setaceum* 'Rubrum' from Cuttings[1]

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Abstract

The effect of rooting medium, indole-3-butyric acid (IBA), and node position were studied on rooting of tender purple fountaingrass, *Pennisetum setaceum* 'Rubrum'. Three-hundred single-node culm cuttings were placed in a mist house in sand, peat, vermiculite, perlite, or a peat:perlite (1:1 by vol) mix. Within 42 days, 78% of the cuttings rooted, with the highest number of cuttings rooting in the peat or perlite media and the lowest number in the vermiculite medium. Cuttings from the most proximal node exhibited a significantly higher percentage of rooting and produced more roots than cuttings from more distal nodes. Rooting medium and nodal position of cutting interacted to affect root dry weight. IBA had no significant effect on rooting. Propagation of purple fountaingrass from culm cuttings offers an economically-attractive alternative to the conventional method of crown division.

Index words: ornamental grasses, purple fountaingrass, fountaingrass, herbaceous perennials.

Species used in this study: tender purple fountaingrass (*Pennisetum setaceum* 'Rubrum').

Significance to the Nursery Industry

Ornamental grasses have become popular herbaceous perennials because they provide movement, varying textures, form, and a natural look in the garden. They also require little maintenance, are relatively pest free, are drought tolerant, and survive in difficult sites (8). The most popular methods of propagating grasses are from seed and crown division. However, some grasses also may be propagated by other conventional vegetative methods such as cuttings. Vegetative propagation is required to maintain specific cultivars, and liner production of rooted cuttings would easily fit into other production schedules. This research found good success rooting culm cuttings of tender purple fountaingrass, with the proximal (basal) node showing highest rooting.

Introduction

Herbaceous perennials, particularly grasses, are increasing in popularity (5, 11). Tender purple fountaingrass, *Pennisetum setaceum* (Forsk.) Chiov. 'Rubrum', is hardy to USDA Zone 9 and is grown as a horticultural annual in most of the United States (1, 4). It is an attractive bunch grass with narrow, dark purple-red foliage approximately 1 m (3.2 ft) in height with an upright-arching growth habit and pink-red flower spikes to 30 cm (11.8 in) or longer. In the garden, it can be used as a specimen plant, in combination with other perennials, in containers, or in mass plantings (4). In Texas, *Pennisetum macrostachyum*, which resembles *P. setaceum* 'Rubrum', was rated as the most popular grass in ornamental plantings (17). Availability of tender purple fountaingrass

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Table 1. **Effect of media on the rooting percentage of *Pennisetum setaceum* 'Rubrum' cuttings 42 days after initiation of treatments.**

Treatment	Rooting (%)
Sand	83.3ab[z]
Peat:Perlite	75.0ab
Vermiculite	63.3b
Perlite	85.0a
Peat	85.0a
Overall mean	78.3

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

Table 2. **Effect of node position on the rooting percentage and number of adventitious roots of *Pennisetum setaceum* 'Rubrum' cuttings 42 days after initiation of treatments.**

Node	Rooting (%)	Number of roots
1[z]	96a[y]	3.0a
2	79b	2.3b
3	60c	1.8b
Mean	78.3	2.5

[z]Node #1 is proximal to the crown of the plant.

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

has been limited because it is a sterile hexaploid (12). It also is killed by frost, so stock plants must be overwintered for successful propagation. Thus this attractive, popular grass has not been widely available due to limited methods of propagation.

Several propagation methods have been reported for perennial grasses including seed, production of tillers, rhizomes, stolons, and vegetative proliferation by the formation of plantlets among the reproductive organs (10). Division has been recommended as the method of propagation for this cultivar (16). However, others have listed culm cuttings as a method of propagation (3, 14).

A culm is the flowering stem of a grass plant. Culms are generally hollow except at the nodes where there are transverse partitions (9). Adventitious roots readily form at the nodes of shoots of grasses in contact with the ground (6).

Cuttings are the most important means of vegetative propagation for both woody and herbaceous plant material. Advantages of propagation by cuttings include: 1) efficient use of space and plant material, 2) procedures are rapid, simple, and do not require special techniques, and 3) cuttings provide greater crop uniformity (7). Culm or shoot cuttings would seem to be a possible method to increase desirable ornamental grasses such as tender fountaingrass, which has limited propagation methods.

This experiment investigated the formation of *P. setaceum* 'Rubrum' shoots and roots from culm cuttings taken from three node positions, in different rooting media, and with or without the use of indole-3-butyric acid (IBA).

Materials and Methods

Forty *Pennisetum setaceum* 'Rubrum' stock plants in 10.7 × 12.5 cm (4.2 × 4.9 in) plastic containers were obtained at a local retail outlet on June 11, 1999. Plants were placed in a glasshouse at 22C (72F) day air temperature under natural photoperiodic conditions in St Paul, MN.

Three-hundred single-node cuttings were harvested from 100 flowering culms on June 23, 1999. Cuttings ranged from 6–9 cm (2.3–3.5 in) in length with the node 0.5 cm (1/4 in) from the bottom of the cutting. Three cuttings were taken from each culm. The first node was the node most proximal to the crown. The second and third node cuttings were sequentially distal to the first node. Cuttings were briefly dipped into 50% ethanol with or without 0.3% IBA (Sigma, St. Louis) and placed in one of five rooting media. The media used were: 1) sand, 2) coarse perlite, 3) sphagnum peat, 4) vermiculite, and 5) sphagnum peat:part coarse perlite (1:1 by vol). Cuttings were placed on a mist bench in a glasshouse at 22C (72F) air temperature under natural photoperiod. The mist rate was 8 seconds every 8 minutes from 6 AM to 10 PM.

Data were collected weekly on percent rooting and percent shoot development. Rooting was defined as presence of an adventitious root greater than 3 mm (1/8 in) in length. Final data on percent survival were collected 42 days after initiation of the experiment. Root dry weight and number of adventitious roots data were taken from all rooted plants. The experiment was organized as a split-split plot statistical design, with media as the whole plot and IBA treatment the first split plot. The IBA plots were again split by node position resulting in 30 treatment combinations, with 10 cuttings/treatment. Analysis of variance (ANOVA) and least significant difference (Tukey HSD) tests were performed.

Results and Discussion

After three weeks, 51% of all cuttings had rooted. Shoots developed approximately two weeks prior to root development. All cuttings that developed shoots later developed roots but shoot variation was minimal across treatments and is not shown. By six weeks, when the experiment was terminated, 78% of the cuttings rooted across all treatments (Table 1). Rooting percentage was highest in pure peat and pure perlite, and lowest in vermiculite (Table 1). Rooting success, root dry weight, and number of roots were unaffected by IBA treatment (data not shown).

Rooting success decreased as node position increased in distance from the crown (Table 2). Cuttings closest to the crown, or in the first position, had significantly more adventitious roots than the other two node positions (Table 2).

Rooting medium and node position interacted to affect root dry weight. First node cuttings in sand had the highest root dry weight, while the lowest root weights were in third node cuttings rooted in vermiculite (Table 3). Root dry weight was significantly higher in sand than perlite and vermiculite across all node positions. Across all treatments, dry weight varied among node position and was significantly higher for the first node (Table 3). Although sand, peat:perlite, perlite, and peat treatments all had a high percentage of cuttings root, the perlite treatment resulted in significantly lower root dry weights.

In general, roots of grasses are adventitious arising from the basal nodes (6, 9). The seedling root system consists of a primary root and a number of branches. Over time, this root system is replaced by adventitious roots that originate in peri-

Table 3. **Interaction between media and node position on root dry weight of *Pennisetum setaceum* 'Rubrum' cuttings 42 days after initiation of treatments.**

	Root dry weight (mg)					
	Media					
Node[z]	**Sand**	**Peat:Perlite**	**Vermiculite**	**Perlite**	**Peat**	**Mean**
1	85.5a[y,w](a)[x]	53.3a(ab)	35.7a(b)	33.9a(b)	73.2a(a)	57.7(a)
2	27.9b(b)	35.7a(ab)	33.3a(ab)	23.2a(b)	51.5a(a)	34.2(b)
3	38.3b(a)	33.0a(ab)	8.5a(b)	15.7a(ab)	31.5b(ab)	27.7(b)
Mean	55.3a	43.0ab	31.7bc	24.4c	54.1a	

[z]Node #1 is proximal to the crown of the plant.

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

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

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

cyclic regions (9) of stem nodes and push through the subtending leaf sheath (2). Thus older nodes, such as the proximal nodes in this experiment are more likely to develop roots than more distal nodes.

This work with tender fountaingrass found the older nodes to be the most successful in forming roots similar to other research on cuttings of 'Mott' elephantgrass, *Pennisetum purpureum* Schum., where planting date, number of nodes per cutting, and cutting position affected establishment (14, 18). Sollenberger et al. (13) suggests that the major limitation of establishing elephantgrass from stem cuttings in the field based on planting date is the degree the stem bases have matured and hardened. Woodard et al. (18) found that basal cuttings developed more primary shoots than apical cuttings.

This experiment demonstrated that the sterile *Pennisetum setaceum* 'Rubrum' can be successfully propagated from culm cuttings. Although all nodes showed potential for successful propagation, nodes proximal to the crown had a significantly higher percentage of rooted cuttings and adventitious roots.

As ornamental grasses continue to grow in popularity, more efficient methods of propagation, such as cuttings, could be useful to growers. Other genera such as *Miscanthus*, *Sorghastrum*, and *Schizachyrium* should be investigated for successful propagation from cuttings.

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