TECHNICAL NOTES

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PLANT MATERIALS Technical Note 16

SEED PRODUCTION OF TUFTED HAIRGRASS

by

Dale Darris, PMC Manager, Corvallis, Oregon
Scott Lambert, Plant Materials Specialist, Spokane, Washington
William Young III, Assistant Professor, Oregon State University, Corvallis, Oregon

Introduction: Tufted hairgrass (*Deschampsia cespitosa* (L.) Beauv.), is a native perennial, tussock-forming grass found along streams and in wet meadows, ditches and open areas surrounding lakes and ponds. Its occurrence is circumglobal, extending throughout cooler regions of the northern Hemisphere. In Oregon and Washington, sites with tufted hairgrass include seasonally wet soils in low lying areas of the western interior valleys, tidal mudflats and estuarine plant communities near the coast, poorly drained fields, and moist mountain meadows. It can form nearly pure stands in wet or intermittently flooded areas. The species is highly variable. Potential uses include wetland enhancement, restoration and creation, streambank and shoreline stabilization, filter strips, recreation area plantings, and native pasture. Known seed varieties: 'Nortran' (Alaska/Iceland hybrid) and 'Peru Creek' (Colorado). Ornamental (vegetative) varieties: 'Bronze veil' and 'Golden veil' (Germany).

The USDA Natural Resources Conservation Service (NRCS), Plant Materials Center (PMC) at Corvallis, Oregon has been evaluating and selecting ecotypes of tufted hairgrass since 1979 and growing two to three populations (accessions 9019731, 9019737, 9019749) for seed since 1984. This paper summarizes seed production methods used at Corvallis for increasing these materials. The methods may not apply as well to other selections or varieties. This information is intended only as a preliminary guide. Extensive testing is needed over time to determine the best management practices for optimal seed yield and quality (weed control, fertilization, irrigation, etc.)

Site Selection: Tufted hairgrass can be grown for seed on well drained medium to fine textured soils on uplands as well as on poorly-drained silts and clays in low lying areas. If seasonally flooded areas are to be used for seed production, fields must be firm enough to perform weed control measures and dry enough to windrow and harvest by as early as mid-June (western Oregon). This species is broadly adapted to soils that are acid to neutral (pH 4.5-7.0).

Tufted hairgrass is slow to establish compared to many introduced grasses grown for seed in the Willamette Valley, and as such does not compete well with volunteer seedlings of other species, particularly ryegrass (*Lolium spp*.). Therefore, fields previously used for ryegrass or other vigorous tame grasses should be avoided unless fallowed for several years.

Tufted hairgrass is a highly cross-pollinated species. If source identified strains are to be grown, minimum isolation distances similar to those for foundation, registered, or certified seed of other cross-pollinated grasses should be used (Table 1) (Oregon Seed Certification Handbook). Check for the presence of wild stands of tufted hairgrass that may occur on adjacent lands.

Seedbed Preparation: The seedbed should be moist, fine, very firm (adult footprint barely visible), weed-free, and depending on the drill used, mostly free of residue. Soils with high populations of any weed seed should be avoided. General Oregon State University (OSU) fertilizer recommendations for new seedings of tall fescue (*Festuca arundinacea*), are being used for tufted hairgrass at Corvallis until better information is known. Lime may not be necessary if soil pH is above 5.0. Traditional use of starter fertilizer, either preplant or at seeding, has been avoided at the PMC because of increased competition from broadleaf weeds. Our practice has been to prepare the seedbed, allow weeds to germinate, then kill emerging seedlings with Roundup (glyphosate) prior to sowing. A complete fertilizer (e.g. 200 lb/a 16-16-16) is applied broadcast after the grass seedlings are well established.

Seeding Dates and Methods: Spring seeding can be accomplished on upland sites from March through mid-April. Fall seeding has not been tried at Corvallis but may be possible in September with the use of carbon banding. Otherwise, do not fall sow unless the field has been fallowed for several years and is free of weeds or other crop seeds that can volunteer readily. In addition, it has not been determined if the species can develop sufficient vegetative growth in the fall to meet any obligate inductive requirements for subsequent flowering. However, fall seeding may still be required on seasonally flooded areas that are too wet in spring to plant.

Recommended row spacing is 18-30 inches for western Oregon. However, the PMC in Alaska uses a spacing of 40 inches to match their existing equipment and allow for cultivation between rows.

Tufted hairgrass has approximately 1.2 million seeds/lb. if the seed is clean, 1.4 million seeds/lb. if the seed is clean and delinted, and 1.8 million seeds/lb. if the seed is clean, delinted and dehulled (groated). Based on 60-120 pure live seeds per linear foot and a row spacing of 24 inches, the recommended seeding rate is 1-2 lb./a. It may be necessary to use the legume box of a grain drill or dilute the seed with sand or rice hulls to achieve low seeding rates, especially if delinted seed is used. Seeding depth must be very shallow and precise, preferably 1/4 inch. Depth bands on the disk openers are a good way to achieve consistent shallow seedings.

Stand Establishment: The high cost and limited supply of seed necessitates careful moisture, weed, and fertility management to ensure the success of the stand. Because of low seedling vigor and slow initial growth, periodic sprinkler irrigation during the months of May through August (Sept.) has proven highly beneficial in establishing spring seeded stands of tufted hairgrass on upland sites at Corvallis. Fall sown stands may benefit from spring-summer irrigation during the establishment year as well.

Management of Established Stands: Until further information is available, the fertilization program suggested for seed production of tufted hairgrass is the same as for tall fescue (OSU Extension Service Fertilizer Guide FG-36). Likewise, there is yet no data on the effect of irrigation or soil moisture stress on seed yield and quality. However, the adaptation of tufted hairgrass to moist habitats suggests that irrigation may be important if spring rains are lacking. Do not sprinkler irrigate two weeks prior to and through the pollination period. Established stands may benefit from irrigation in August and September following harvest.

Weed control is important, especially in new and developing stands. Annual bluegrass (*Poa annua*) and rattail fescue (*Vulpia spp*.) can be particularly troublesome and competitive the first year or two. Hand

hoeing or spot treatments with an approved herbicide may be used (Pacific Northwest Weed Control Handbook). Well established mature stands will shade out most annual bluegrass by the third growing season. Rattail fescue is generally more persistent and its elongate, awned seed more difficult to screen out during seed cleaning. Tufted hairgrass does not appear to volunteer as readily into existing stands compared to a number of other species.

Broadleaf weeds can be controlled with the herbicides (Pacific Northwest Weed Control Handbook). Refer to appropriate labels for species clearance and instructions. Consult with your extension agent before applying any chemical. There are no labels for any herbicide to control annual grasses in tufted hairgrass. Spot spraying, row cultivation and hand hoeing within rows may be alternative methods of control. Tufted hairgrass is a long-lived species. Well managed stands should be productive for at least five years.

Insect problems in seed production fields of tufted hairgrass have not occurred at the Corvallis PMC. In most years disease symptoms have also been minor. However, leaf rust (*Puccinea spp*.) was significant in 1992, possibly brought on by above normal spring temperatures. There are fungicides registered for control of certain diseases in grasses grown for seed (Pacific Northwest Plant Disease Control Handbook). Refer to labels for species clearance and instructions and consult with your extension agent before applying.

Harvest Techniques: Tufted hairgrass shatters readily at seed maturity (hard dough stage). At Corvallis, fields are windrowed (swathed) at soft dough stage (mid- to late June) and allowed to cure in the field for seven to ten days. Unless harvested promptly thereafter, seed will continue to be lost as it falls to the ground in the windrow. Seed moisture content at combining should probably be no greater than ten percent which is desirable for most grass seeds and allows for safe storage without supplemental air drying.

The seed stalks of tufted hairgrass are 3.5-5 feet high, stiff and very resistent to lodging. The foliage is almost entirely basal and 1.5-2 feet tall. Therefore, the herbage that must pass through combine can be greatly reduced if the swather is set to leave a stubble height of 12-18 inches.

Harvesting normally occurs in late June to mid-July at Corvallis. Combine modifications and pickup attachments are similar to those used for bentgrass (*Agrostis spp*.). Air and cylinder settings used for bentgrass may be a good starting point, but tufted hairgrass threshes and dehulls much more readily, requiring a gentler action. The Corvallis PMC uses an Allis-Chalmers Model K Gleaner combine with the cylinder gauge set at 1/4-3/8 inches, cylinder speed set at less than 600 rpm, and vents on the separator and cleaner fans completely closed or sealed off to minimize air blast. The chaffer is left 3/4 of the way open.

Post-Harvest Management: There are no scientific data on the effect of open field burning on seed yield of tufted hairgrass. However, in 1988 the PMC and Oregon State University evaluated thermal sanitation using a propane field-flamer after the residue had been bailed and removed and the stubble cut to a height of 3 inches. A visual evaluation of stand density between burned and unburned plots made the following spring estimated stand reduction at 25 percent due to burning. Mortality and injury may have been caused by excessively high temperatures at slow ground speed (1-1.5 mph) and/or the late burn date (Sept. 13) which damaged plants that had already begun to regrow. Seed yields the following year were lower in the burned than unburned plots for five of six plot samples. Any beneficial effects of burning may have been overshadowed by the choice of methods or poor timing. The Alaska PMC has tried burning their fields but can infer no advantage at this time (method unstated). Further studies are needed before any conclusions can be drawn.

For now it is suggested that post-harvest residue be bailed and removed and the stubble flail-chopped or rotary mowed to a height of 2-4 inches immediately following harvest. Thorough straw and chaff removal is known to increase herbicide effectiveness and improve the seed yields of many grasses.

Seed Cleaning and Conditioning: Tufted hairgrass seed needs to be cleaned using an air screen machine to remove weed seeds, empty hulls, straw and chaff. In addition, the seed hull is covered with fine hairs or pubescence which should be removed to improve seed flow characteristics. Delinting may be accomplished by using a standard debearder or a huller-scarifier like the Kamus-Westrup brush machine Model HA-400.

The Corvallis PMC has used a three-step process to clean and condition tufted hairgrass. Seed purities of over 99 percent have been achieved. The steps are as follows: 1) Scalp and remove fines with a model M2B, 2 screen cleaner (top screen: 3/64x5/16 oblong, bottom screen: 6x32 wire mesh or unperforated "blank"). Larger lots are cleaned with a three screen Clipper, Model Super 167 (top: #9 round, middle: 3/64x5/16, bottom: 6x32); 2) Delint with the Kamas-Westrup huller-scarifier using a #26 wire mesh mantle or cage; 3) Reclean with an M2B (top: 1/18 round, bottom: 6x38 or 6x40 wire mesh). NOTE: Avoid dehulling seed as much as possible during step 2. The brushes should barely touch the inside of the mantle (huller-scarifier). A high percentage of dehulled seed may coincide with a high percentage of damaged seed and reduced viability. However, some strains will dehull more readily than others without apparent injury.

A common weed seed contaminent is rattail fescue. This can be removed by using an indent cylinder or Carter-disk. The hairgrass seed is shorter and is lifted out by the indentations while the rattail fescue has a long awn and remains behind.

Seed Yields: Seed yields of tufted hairgrass at Corvallis have varied between 23 and 157 lb./a, with the average of three strains produced for three years (1988-1990) being 95 lb./a. Row spacing was 12 inches and no irrigation water was applied after the establishment year (1987). Improved cultural management should increase this average. Seed collected from small research plots has yielded more than 250 lb./a in some cases, suggesting that better mechanical handling alone may increase yields.

Seed Viability and Storage: Viability after harvest, conditioning and storage has been lower than anticipated. The highest germination percent for any seed lot produced at Corvallis has been 77 percent. Most lots have a germination rate of 60-75 percent after processing. The seed appears to be very short-lived. Germination can commonly decline by 25-50 percent in one year and may total only 15-20 percent after three years under warehouse conditions (no climate control). Climate controlled storage conditions (cool temperatures and low humidity) should decrease the rate of decline.

Table 1. Minimum Isolation Distances for Cross-pollinated Grasses (tall fescue, fine fescue, bentgrass, orchargrass)

	Seed Classes:		
Acres	Foundation	Registered	Certified
Less than 5	1320 ft	660 ft	330 ft
More than 5	900 ft	300 ft	165 ft

(Remarks: Trade names appearing in this document are provided for information purposes only and are not intended to be an endorsement of that product.)

General References:

William, R.D. and others (compilers) 1994. Pacific Northwest weed control handbook. Oregon State University, Washington State University, and the University of Idaho. 344 p.

Doerge, T., Gardner, H. and H. Youngberg. 1983 (rev.) Fertilizer guide: tall fescue (western Oregon-west of the Cascades). FG-36. Oregon State University Extension Service, Corvallis, Oregon. 2 p.

Koepsell, P.A. and J.W. Pscheidt (editors). 1994. Pacific Northwest plant disease control handbook. Oregon State University, Washington State University, and the University of Idaho. 349 p.

Oregon State University Extension Service. 1994. Oregon certified seed handbook. Corvallis, Oregon. 40 p.