

'HIGHLANDER' EASTERN GAMAGRASS

Tripsacum dactyloides (L.)L.

Plant symbol = TRDA3

Contributed by: Jamie L. Whitten Plant Materials Center

Key Web Sites

<http://muextension.missouri.edu/explore/agguides/crops/g04671.htm>

<http://www.sprrs.usda.gov/eastern.htm>



'Highlander' eastern gamagrass was released in 2003 by the United States Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS) Jamie L. Whitten Plant Materials Center (PMC) in Coffeeville, Mississippi with cooperation from the Mississippi Agricultural and Forestry Experiment Station (MAFES), Mississippi State, Mississippi, and the Jimmy Carter PMC, Americus, Georgia (Grabowski et al., 2005).

Uses

Highlander is recommended for forage production. It is best used as a hay crop; however, it can be grazed if given appropriate management (i.e. rotational grazing) to prevent overgrazing and damaging the plant stand. It also has potential as a perennial silage crop, a source of biomass for bioenergy production, and as a nutrient sink for water quality improvement. It can be used in many types of conservation plantings, such as buffers and vegetative barriers.

Status

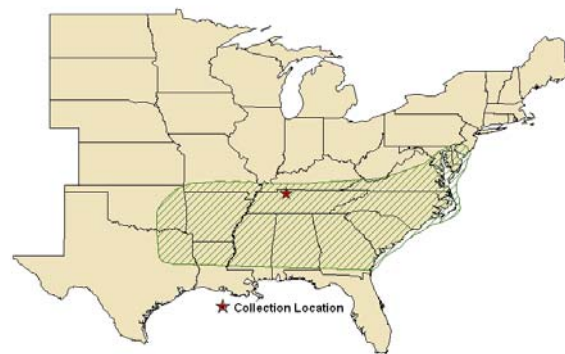
Please consult the PLANTS Web site (<http://plants.usda.gov>) and your State Department of Natural Resources for this plant's current status (e.g. threatened or endangered species, state noxious status, and wetland indicator values).

Environmental Concerns

Eastern gamagrass is native to the eastern US. It is fairly difficult to establish from seed and therefore has little potential to become a weed in most cropland or wild land settings.

Description

General: Highlander eastern gamagrass is a perennial grass that forms large clumps, with thick, knotty, rhizomes. Mature foliage height ranges from 1.5 to 5 feet tall. The foliage is bluish-green in color; the blades are jagged on the margins and range from less than 1/2 to slightly over 3/4 inch in width. Inflorescences are produced from June to August, with maximum seed production generally occurring in mid-July. Flower stalks are from 5 to 9 feet tall and may lodge when seeds mature. Inflorescence spikes are 6 to 10 inches long, with separate male flowers held above the female flowers. The seed grains are contained in a tough fruitcase. Highlander averages 3150 seed units (grain with fruitcase) per pound. Throughout the remainder of this document, seed units will be referred to as seeds.



Known range of adaptation for Highlander

Distribution: The original seed source for Highlander was collected on the Fort Campbell Army Base in Montgomery County, Tennessee. The area indicated on the map above represents its known range of adaptation. The northern boundary is an estimate because currently available testing has not completely ascertained the northern limit of its range.

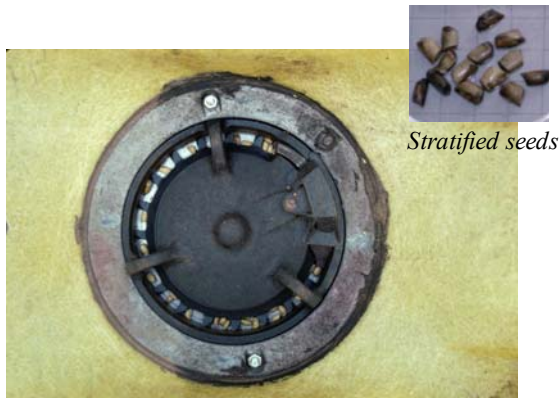
Adaptation

Highlander grows best on well-drained, fertile soils; however, it will tolerate heavier, more poorly-drained soils. It has fairly good flood and drought tolerance. It tolerates a wide range of soil pHs, from fairly acidic to moderately alkaline.

Establishment

Seed dormancy, caused by the hard fruit case, adversely affects establishment. To help overcome this dormancy, seeds should be given a 6 to 10 week cold, moist treatment (stratification) before planting. To stratify seeds, soak them in water for 24 hours, drain, and store them in a refrigerator or cooler set at 35 to 45°F. A fungicide [Thiram (tetramethylthiuram disulfide) is recommended] can be added to the soaking solution. Check the label for recommended treatment rates.

Stratified seeds germinate more quickly when soil temperatures are above 85°F (Anderson, 1985), so if soil moisture is adequate, planting in late spring to early summer is best. An earlier planting date is advisable if insufficient rainfall is expected during the optimum planting period as this will ensure that seeds will not dry out after planting. Fall plantings using non-stratified seeds have been successful in some regions of the country, but are not recommended in the southern portion of Highlander's range because the seeds may not receive sufficient exposure to cold, moist conditions to promote germination.



Highlander seeds in planter box of seed drill

Seeds should be drilled in rows spaced a minimum of 24 inches apart for forage production and a minimum of 36 inches apart for seed production. Table 1 lists bulk planting rates for various row spacings when 2 to 4 seeds (first and second number, respectively) are planted per foot of row. To determine the PLS seeding rate for the seed lot you will be using, multiply this rate by the percent PLS of the lot

divided by 100. Comparable seeding rates of 'Pete' eastern gamagrass (7200 seeds/lb) are provided for comparison purposes. Seed production requires more uniform stands of Highlander than are necessary for forage production. Therefore, planting more seeds per foot of row is recommended for seed production fields. A target stand for forage production would be approximately one seedling per 18 inches to 2 feet of row; for seed producers, a stand of approximately one seedling per 12 to 15 inches of row would be a desirable stand. Planting several seeds per foot of row compensates for the low germination ability of Highlander. However, if a seed lot has less than 50 percent viable seed, the seeding rate and the number of seeds per foot should be adjusted upwards accordingly.

Table 1. Recommended bulk planting rates for two eastern gamagrass cultivars when planted at various row widths.

Row Width (in)	Cultivar	
	Highlander (lb/ac)	Pete (PMK-24) (lb/ac)
25	13-27 [†]	6-12
30	11-22	5-10
35	9-19	4-8
40	8-17	4-7
45	7-15	3-6

[†] When 2 to 4 seeds (first and second number respectively) are planted per foot of row.



Establishment of Highlander seed production field

Seeds can be drilled into a prepared seedbed or into killed vegetation. A no-till drill should be used when plant residue is present. The seed metering device in the planter (e.g. plate, picker finger) and the planter settings will be similar to those used for large-sized corn seeds. The most accurate method to calibrate the planter would be to count the number of seeds metered per measured planting distance. However, an estimation of seed numbers can be obtained by weight. Stratified seeds are about 50% heavier than dry seeds and each 100 seeds will weight approximately 22 g. Stratified seeds must not be allowed to

heat up or dry out before planting or they could enter secondary dormancy that will delay germination until the following year. Seeds should be planted 1 to 2 inches deep to prevent drying in the field. Stratification will not overcome dormancy of all viable Highlander seeds, so additional germination often occurs in the year following planting.

Management

Harvest Management: Plants respond favorably to burning in late winter to remove dead leaves from the previous growing season. Highlander requires prudent management for maximizing forage yield and quality (Edwards et al., 2000). The number and timing of harvests depends upon rainfall and other environmental factors. The first harvest is generally made 30 to 40 days after the first application of N fertilizer (see *Nitrogen Fertilization*) with subsequent harvests at 45-day intervals. The final harvest of the growing season is usually made in mid-August or early September to allow the plants at least 6 weeks of regrowth prior to frost. In the mid-South this strategy typically results in three harvests per growing season. A 4 to 6 inch cutting height is recommended. More frequent harvests and cutting below 4 inches will severely damage plant stands.

Grazing: Highlander requires careful grazing management to prevent damage to the stand. Plants should not be grazed during the establishment year and a one-year-old stand should be grazed lightly because the plants are still becoming established. Animals can be put on Highlander in May to June. Once the plants have been grazed to 6 to 8 inches, the animals must be rotated off of the area for about 6 weeks to allow the plants to recover. Using cross-fencing to create several paddocks in the pasture or maintaining multiple pastures are ideal ways to manage Highlander for grazing. The plants should be fertilized using the same regime discussed for mechanical cuttings to ensure that the plants are growing actively.

Nitrogen Fertilization: Highlander responds to N fertilization (Douglas et al., 2002). The first application of N should be at a rate of 40-60 pounds per acre in the spring when regrowth reaches 10 inches. Subsequent applications of 40-60 pounds per acre should be made after each harvest for hay, silage, or grazing, except for the final harvest of the season. Both P and K should be maintained at medium to high levels according to soil test recommendations.

Seed Production

Foundation seed of Highlander is available from the MAFES Foundation Seed Stock for seed production purposes. A row spacing of 40 inches is used for Highlander seed production fields at the Jamie L. Whitten PMC. A single application of N at a rate of 50 to 70 pounds per acre is applied in the spring when regrowth reaches 10 inches (Douglas et al., 2004).



Typical inflorescence of Highlander

Prior to seed maturity, the staminate (male flower) portion of the seedhead will shed. Then the seeds will mature to a dark tan to bronze color. Mature seeds will begin to separate from the seedhead at the joints, beginning with the uppermost one progressing downward. This indeterminate maturity pattern requires fields be inspected regularly, beginning in late June, to assess seed maturity and shattering so that seed harvests can be maximized.

Highlander produces one terminal and three (occasionally four) axillary (lateral) seedheads along a single stem. Seeds of the terminal seedhead mature earlier and generally shatter before seeds on the lateral ones mature. Consequently, harvests should be timed to coincide with maturity of the lateral seedheads to obtain the highest potential yields.

A good indicator of optimum harvest period is when approximately 75% of the lateral seedheads have shed the staminate portion of the inflorescence. At this time, seeds are in different stages of development but it generally favors a higher percentage of the seeds being fully ripe. Combine settings used at the PMC are presented in Table 2 and these can be used as a guide for harvesting Highlander. Settings will vary depending on the make of your combine and physical condition of the seed crop.

Table 2. Recommended combine settings for John Deere 9410 combine for harvesting seed of Highlander eastern gamagrass.

<i>Fan RPM</i>	900-1050
<i>Cylinder Speed</i>	480-520
<i>Concave Setting</i>	12-16
<i>Chaffer</i>	16
<i>Extension</i>	14
<i>Sieve</i>	12

Seed Cleaning

Highlander seeds can be partially cleaned with an air screen cleaner. At the PMC, a Clipper two-screen cleaner with a size 20 round hole screen on the top and an 11 round hole bottom screen are used for this operation. We will usually run the lot through the cleaner twice using these same screens.

Research has shown that air screen cleaners are unable to make a distinct separation of complete seeds (fruitcase + caryopsis) from incomplete seeds (fruitcase + immature or no caryopsis). A gravity separator or air-fractionating aspirator is needed for the final step of the cleaning operation to remove incomplete seeds (Douglas et al., 2000). The PMC has achieved optimum seed separation with a Forsberg pressure gravity separator using a size 8 mesh corrugated deck. The separator ran at a speed of 480 rpm. Pitch and elevation of the deck and fan speed adjustments were based on the physical characteristics of the seed lot being cleaned.

Pests and Potential Problems

An ergot has been observed on seedheads of Highlander. Although it has not been positively identified, this ergot is believed to be *Claviceps tripsaci*, which has previously been reported on eastern gamagrass seedheads (Hardison, 1953). Krizek et al. (2002) discovered southern cornstalk borers (*Diatraea crambidoides*) as a pest in Pete eastern gamagrass in Beltsville, Maryland.

Control

Please contact your local NRCS Field Office, agricultural extension specialist or county weed specialist to learn what controls work best in your area and how to use them safely. Always read label and safety instructions for each control method. Trade names and control measures appear in this document only to provide general information. USDA, NRCS does not guarantee or warranty the products and control methods named, and other products may be equally effective.

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