UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
PLANT MATERIALS CENTER
KINGSVILLE, TEXAS

and

TEXAS AGRICULTURAL EXPERIMENT STATION
BEEVILLE, TEXAS

and

TEXAS A&M UNIVERSITY
KINGSVILLE, TEXAS

NOTICE OF RELEASE OF WELDER GERMPLASM SHORTSPIKE WINDMILLGRASS SELECTED PLANT MATERIAL

The Natural Resources Conservation Service (NRCS), U.S. Department of Agriculture (USDA), Texas A&M University-Kingsville, and the Texas Agricultural Experiment Station at Beeville, Texas announce the release of a selected plant material of shortspike windmillgrass (*Chloris subdolichostachya* Muller) for the south Texas ecoregion. Welder Germplasm was tested under the accession number 9085260 or 260.

As a selected plant material release, this plant will be referred to as Welder Germplasm shortspike windmillgrass. Welder Germplasm is released as a selected plant material class of certified seed (natural track).

This alternative release procedure is justified because there are no existing commercial sources of shortspike windmillgrass. The potential for immediate use is high especially for roadside plantings and critical site revegetation.

Collection Site Information: Accession 9085260 was collected in 1999 from native plants located near the Welder Wildlife Refuge, Sinton Texas, at 26° 06' N. latitude and 97° 25' W. longitude (MLRA 150A). It was growing on an Orelia sandy clay loam soil type with a 1% slope. Collection site elevation was 21 meters (69 feet) and average annual precipitation for this location is 76 centimeters (30 inches).

Description: Shortspike windmillgrass is a native grass hybrid that according to Gould (1975) is formed when hooded windmillgrass (*Chloris cucullata*) hybridizes with *Chloris verticillata* or *Chloris andropogonoides* in areas where their ranges overlap. The hybrids are generally intermediate morphologically between the parents. Tetraploid populations with regular meiosis and good seed set have been sampled in San Patricio and Brazos counties (*2n=40*). This species is a strongly stoloniferous perennial grass. Mature foliage height ranges from 30 to 90 centimeters (1.0 to 3.0 feet) tall. Leaves are glabrous and crowded towards the culm base with keeled and laterally compressed sheaths. The leaf blades are linear 10 to 30 centimeters (4 to 12 inches) long and 1.5 to 4 millimeters wide. Flowers can be produced from May to October but

are more prevalent from September to October. The inflorescence is variable in length, thickness, and arrangement of branches. Branches can be five or more, 3 to 17 centimeters long, bearing closely-placed spikelets to the base. Spikelets have a single rudiment, which is variable in length and width but is usually 0.5 to 1.4 millimeters wide with a truncate, cuneate or rounded apex. The lemma of the lower floret is 2.2 to 2.9 millimeters long and appressed-pilose on midnerve and margins with an awn 2 to 5 millimeters long. Mature florets are black or sometimes remaining light-colored at maturity. Shortspike windmillgrass is found in northeastern Mexico and throughout Texas except in the Pineywoods and Panhandle ecoregions.

Potential Uses: Welder Germplasm is recommended for roadside plantings, critical site revegetation and in range seeding mixes. It can be used in many types of conservation plantings, such as grassed waterways, streamside buffers, and pond embankments.

Method of Breeding and Selection:

Initial evaluation: Welder Germplasm was initially evaluated at the USDA-NRCS E. "Kika" de la Garza Plant Materials Center (PMC), Kingsville, Texas, from 2000 through 2001. A total of 43 accessions of windmillgrass were collected from throughout the state of Texas and were included in the study. From these initial evaluations, accessions 9085260 and 9085283 were determined to be the best accessions of shortspike windmillgrass for vigor, growth form and development (Table 1 and 2).

Table 1. Summary of Initial Evaluations of Windmillgrasses (*Chloris* spp.) from 2000 through 2001 on Clay Soils at Kingsville, Texas

Accession Number	Source (County)	Percent Survival	Foliage Density*	Seed Production*
9076951	Frio	100	5.2	3.9
9076977	Palo Pinto	95	6.5	4.5
9076946	Kleberg	100	5.3	5.4
9085229	Coleman	95	6.9	5.0
9085308	Lampasas	100	6.6	5.1
9085235	Lubbock	100	7.0	5.5
9085300	Bee	100	5.3	5.1
9085289	San Patricio	100	4.4	4.0
9085316	Kenedy	100	4.3	4.9
9085243	Burnet	100	6.1	3.7
9085285	Howard	100	6.2	4.8
9085288	Burleson	100	5.4	3.6
9085242	Austin	100	4.5	3.7
9085309	Kleberg	100	5.5	5.0
9085258	Goliad	100	4.6	4.8
9076968	Knox	100	7.0	4.3
9085264	DeWitt	100	4.4	4.8
9085260	San Patricio	100	3.1	3.8
9085240	Dimmit	95	5.3	4.5
9085234	Lubbock	100	7.4	4.8
9085301	Duval	100	5.4	4.7
9076971	Brown	100	6.5	4.3
9085313	Kenedy	100	4.6	5.0
9085245	Burnet	100	5.8	4.8
9076955	Kleberg	100	4.8	4.9
9085262	Refugio	100	2.9	4.3
BELL	-	100	3.3	4.2
9085265	DeWitt	100	4.1	4.8
9085259	Kleberg	100	4.4	4.8
9085271	Hidalgo	100	4.5	4.8
9085233	Andrews	100	7.4	3.8
9076974	Lubbock	100	7.7	4.5
9085283	Calhoun	100	3.7	3.8
9085276	Starr	100	5.3	4.3
9085291	Webb	100	4.9	4.8
Means	**All Counties**	**99**	**5.5**	**4.6**

*Ocular estimate (1 = Best)

Table 2. Summary of Initial Evaluations of Windmillgrasses (*Chloris* spp.) from 2000 through 2001 on Sandy Soils at Kingsville, Texas

Accession Number	Source (County)	Percent Survival	Foliage Density*	Seed Production*
9076951	Frio	100	6.4	5.3
9076977	Palo Pinto	85	7.1	4.7
9076946	Kleberg	95	5.5	4.5
9085229	Coleman	95	6.8	4.7
9085308	Lampasas	100	7.1	5.0
9085235	Lubbock	90	6.7	5.2
9085300	Bee	100	5.4	5.4
9085289	San Patricio	95	5.2	4.0
9085316	Kenedy	100	4.8	4.6
9085243	Burnet	100	6.3	4.0
9085285	Howard	80	6.6	5.5
9085288	Burleson	100	5.5	4.2
9085242	Austin	100	5.9	4.8
9085309	Kleberg	83	6.5	6.5
9085255	Jim Hogg	100	5.8	4.7
9076968	Knox	85	7.2	4.6
9085240	Dimmit	90	5.0	4.7
9085234	Lubbock	65	7.1	5.0
9085301	Duval	85	5.8	4.5
9076971	Brown	100	7.0	4.7
9085313	Kenedy	100	5.5	5.5
9085245	Burnet	80	6.5	5.5
9076955	Kleberg	81	5.8	5.9
9085262	Refugio	100	4.0	4.8
BELL	-	100	4.0	5.0
9085258	Goliad	100	5.3	4.6
9085265	DeWitt	100	5.5	5.1
9085259	Kleberg	100	5.7	4.8
9085271	Hidalgo	100	5.9	4.6
9085233	Andrews	60	7.5	5.6
9076974	Lubbock	100	7.5	4.4
9085283	Calhoun	100	4.5	5.0
9085276	Starr	100	5.8	4.9
9085291	Webb	80	6.1	5.0
9085264	DeWitt	100	5.3	5.3
9085260	San Patricio	100	3.8	5.1
Means	**All Counties**	**95**	**6.1**	**4.9**

*Ocular estimate (1 = Best)

***Advanced Evaluations**:* Advanced evaluation plots were established in 2002 at both the PMC in Kingsville and the Texas Agricultural Experiment Station (TAES) in Beeville. The Advanced evaluation plots at the PMC consisted of accessions 9085260, 9085283, 9085262, 9085289 and 9085316. The advanced evaluation plots at Beeville consisted of accessions 9085260, 9085262, 9085283, 9085300 and 9085289. Accessions 9085260 and 9085283 had the best field performance on these plots at the PMC during 2002 and 2003 (Table 3). Likewise, Dr. Bill Ocumpaugh ranked 9085260 and 9085283 as his top two accessions at Beeville in 2002. Seed production rankings appear to be the lowest for these accessions when one looks at Table 3. However, it became apparent in the following years that the stronger the hybrid was towards a "true" shortspike windmillgrass then it would only produce seed one time during the early Fall. If the hybrid was more like a hooded windmillgrass, then it would produce multiple harvests during the year. However, even with only one harvest, shortspike windmillgrass can produce as much seed as the annual production of hooded windmillgrass (Table 4).

Table 3. Shortspike Windmillgrass Advanced Evaluation in 2003 at Kingsville, Texas

Accession Number	Growth Habit	Percent Survival	Plant Vigor*	Foliage Density*	Seed Production*	Seed Shatter*
289	Bunch, some stolons	100	4.9	5.0	5.0	5.0
316	Bunch, some stolons	100	5.0	5.1	5.9	5.0
260	Very Spreading	100	5.0	5.0	6.8	5.0
283	Spreading	100	5.0	5.0	5.9	5.0
262	Spreading	100	5.0	4.9	5.1	5.0

*Ocular estimate (1 = Best)

Table 4. Shortspike Windmillgrass Seed Harvest and Germination from Beeville, Texas in 2003.

Accession Number	Total Grams Harvested	2-Day Germination %	Total Germination %
260	202	57	72
262	127	36	58
283	101	35	58
289	226	48	59

- 12 hours dark 20^{o}C (68^{o}F) / 12 hours light 30^{o}C (86^{o}F).

Initial seed germination results indicated low germination from harvested seed at the PMC (ATR, 2001). In order to understand the cause of the low germination results from harvested seed, samples of the 2002 harvest from accession 9085260 was sent to two seed labs. Hulsey Seed Lab got 58% germination and 26% dormancy and Giddings TDA Seed Lab got 37% germination and 15% dormancy. Upon further investigation it was discovered that the majority of the harvested seed did not contain filled seed. Germination tests previously had been run on spikelets (apparently mostly empty), not bare caryopsis. Seed was collected from each plant of the advanced evaluation plots at Beeville in 2003. This harvest was tested in 2004 (Table 4). All of the accessions appear to have good germination. Hooded windmillgrass appears to have a very high active germination (>90%) whereas shortspike windmillgrass will have an active germination of 60-70% and 20-30% dormant seed.

A field emergence study was established in May 2004 on a Victoria clay soil at the PMC. Ten by twenty foot flat plots were seeded at a rate of 20 PLS/ft^2 and replicated three times for accessions 9085260 and 9085283 and 9085313. These plots were not irrigated. Evaluation of these plots in November of 2004 (Table 5) indicated that accession 9085260 had the densest cover and foliage production based on ocular estimates with an average 60% cover.

Table 5. Windmillgrass Field Emergence Evaluation in 2004 at Kingsville, Texas

Accession Number	Rep	% Cover	Plant Vigor*	Foliage Density*	Foliage Production*	Uniformity *	Development Stage
260	1	50	4.0	4.0	4.0	4.0	Seed
260	2	60	4.0	4.0	4.0	4.0	Seed
260	3	70	2.0	2.0	2.0	2.0	Seed
283	1	35	4.0	4.0	4.0	4.0	Seed
283	2	30	5.0	5.0	5.0	5.0	Seed
283	3	70	3.0	3.0	3.0	3.0	Seed
313	1	15	6.0	6.0	6.0	6.0	Seed
313	2	35	5.0	6.0	6.0	5.0	Seed
313	3	15	6.0	6.0	6.0	6.0	Seed

*Ocular estimate (1= Best)

A second field emergence study was established in March 2005 into a treated buffelgrass pasture at the Bomer Wildlife Area in Duval County, Texas. Ten meter by ten meter plots were divided in half and random halves were sprayed with 64 ounces per acre of imazapyr in November, 2004. In March 2005, both the sprayed and the unsprayed plots were seeded with a seed mix of shortspike windmillgrass (Accession 9085260), switchgrass (*Panicum virgatum*), and 4-flower trichloris (*Trichloris pluriflora*) at a rate of 10 PLS/ft2 per species, replicated three times. These

plots on a sandy loam soil were not irrigated. Evaluation of these plots in November of 2005 (Table 6) indicated that shortspike windmillgrass was the only seeded species that became established.

Table 6. Species Evaluation of Imazapyr Treated Plots in November 2005 at the Bomer Wildlife Area, Duval County, Texas.

Rep	Species	% Cover on Sprayed Plots	% Cover on Unsprayed Plots
1	Buffelgrass	91	100
	Shortspike	41	0
	Annual forbs	0.3	0
2	Buffelgrass	90	97
	Shortspike	24	0
	Annual forbs	19	31
3	Buffelgrass	71	99
	Shortspike	27	2
	Annual forbs	18	11

Seed Production: Average annual seed yields of Welder Germplasm shortspike windmillgrass at Kingsville has been 245 pounds per acre (280 kg ha^{-1}) (Table 7). Unlike hooded windmillgrass (data not shown), shortspike produces seed only one time a year in late September or early October. Seed retention is fairly good reducing the risk somewhat for a single harvest species. Highway departments and landscapers will appreciate the lack of seed heads throughout most of the year.

Indeterminate seed maturity is a factor that may influence economical seed yields of shortspike windmillgrass. A typical combine-run harvest consists of complete seed units or filled seed, incomplete seed units or unfilled seed and other non-viable inert matter. Filled seed at Beeville, Texas ranged from 2% to 4% in 2003 (Table 8) and from 3% to 6% from an early May harvest in 2003 from Kingsville, Texas (Table 9). However, seed fill may be influenced by environmental conditions such as temperature and soil moisture. Data from hooded windmillgrass, accession 9085313, for both month of harvest as well as location shows a large variability in percentage of seed fill. Therefore, location and ability to irrigate may dictate where seed production fields of windmillgrass can be most economically grown.

Seed quality of harvested seed can be easily manipulated. Seed harvested by a combine at the PMC in Kingsville and then run through a *Westrup Laboratory* brush machine (used for

polishing, hulling or scarifing seed), a hammermill, and a tabletop C*lipper* seed cleaner produced 95% pure seed.

Table 7. Seed Attributes for Shortspike Windmillgrass Harvested in Kingsville

Acc #	Year Harvested	Harvest Weight (pounds/acre)	Clean Seed (pounds/acre)	Number of Seeds/Pound	Seed Rate (PLS pounds/acre)	Available Seed (pounds)
260	2004	250	12	3,060,414	0.25	1.6
260	2005	240	5	3,285,598	0.25	
283	2004	-	10	3,630,638	0.25	2
283	2005	227	3	2,662,256	0.25	

Table 8. Seed-Fill Percentages from Windmillgrass Harvest in 2003 from Beeville, Texas

Species	Acc#	Harvest Weight	Total Grams Clean	Seeds/ Gram	Germ Average	Seed-Fill
Shortspike	260	202	6	7237	72%	3%
Shortspike	262	127	2	8445	58%	2%
Shortspike	283	101	2	7997	58%	2%
Shortspike	289	226	9	5358	59%	4%

Table 9. Seed-Fill Percentages from Windmillgrass Harvest on May 21, 2003 from Kingsville, Texas

Species	Acc#	Harvest Weight	Total Grams Clean	Seeds/ Gram	Germ Average	Seed-Fill
Shortspike	260	56	3	6741	73%	5%
Shortspike	262	86	2	5858	78%	3%
Shortspike	283	78	2	5864	73%	3%
Shortspike	289	179	10	5548	75%	6%

Ecological Considerations and Evaluation: An Environmental Evaluation of Plant Materials Releases was completed using guidelines established by NRCS (USDA-NRCS, 2000), and the best available information for this species. Results of this evaluation determined that Welder Germplasm shortspike windmillgrass was suitable for release based on the criterion contained in this document. This conclusion is mainly due to the fact that shortspike windmillgrass is a naturally occurring species in Texas and planting it would therefore not constitute an introduction of an exotic species into local ecosystems. Any negative impacts on other native

plant species would likely be minimal to non-existent. Also, release of this species will make available an additional native species for rangeland planting, will provide a good seed source for quail and other birds and may provide unknown benefits by maintaining and contributing habitat that harbors beneficial insects and butterflies.

Conservation Use: Welder Germplasm shortspike windmillgrass will provide a new native species for rangeland planting, erosion control, wildlife habitat, and water quality improvement. It has quick germination, typically within the first 3 days, while still retaining some dormant seed to deal with unpredictable weather conditions. Its growth habit and strongly stoloniferous nature make it particularly suitable for competing with non-native species such as King Ranch bluestem (*Bothriochloa ischaemum*) and bermudagrass (*Cynodon dactylon*).

Area of Adaptation: Welder Germplasm shortspike windmillgrass is well adapted for use in the southern portions of Texas, coinciding with MLRA 83 (Rio Grande Plain) and MLRA 150 (Gulf Coast Prairies). Current testing has not completely substantiated the northern limit of its range of adaptation. Existing test sites in Texas (outside of the South Texas area) include Knox City, and Nacogdoches. Additional sites are planned in Stephenville, TX and in Oklahoma, Louisiana, and New Mexico.

Availability of Plant Materials: Breeder seed will be maintained by the USDA-NRCS E. "Kika" de la Garza Plant Materials Center, Kingsville, Texas.

References:

AOSA. 1992. Seedling Evaluation Handbook. Contrib. No. 35. 84-87. Association of Official Seed Analysts, Las Cruces, NM. 130 pp.

Correl, D. S. and M. C. Johnston.1996. Manual of the Vascular Plants of Texas. University of Texas at Dallas. Richardson, Texas. p. 238-242.

Brecke, B. J. and W. B. Duke. 1980. Dormancy, germination, and emergence characteristics of fall panicum (*Panicum dichotomiflorum*) seed. Weed Science. 28: 683-685.

Fulbright, T. E. and K. S. Flenniken. 1988. Causes of dormancy in *Paspalum plicatulum* (Poaceae) seeds. The Southwestern Naturalist 33(1): 35-39.

Gould, F. W. 1975. The Grasses of Texas. Texas Agricultural Experiment Station. Texas A&M University Press. College Station. p. 316-327.

Hitchcock, A. S. 1971. Manual of the Grasses of the United States, Volumes 1& 2, 2nd edition. Revised by Agnes Chase. Dover Publications, New York. 1051 pp.

Kelly, K. M., J. V. Staden, and W. E. Bell. 1992. Seed coat structure and dormancy. Plant Growth Regulation 11: 201-209.

SAS Institute. 2000. Multiple Comparisons and Multiple Tests Using SAS System: Workbook/Peter H. Westfall, D. Tobias. Cary, NC.

Simpson, G. M. 1990. Seed Dormancy in Grasses. Cambridge University Press, Cambridge, UK.

Prepared by:

John Lloyd-Reilley
USDA-NRCS E. "Kika" de la Garza Plant Materials Center
3409 N. FM 1355
Kingsville, TX 78413

Shelly Maher
USDA-NRCS E. "Kika" de la Garza Plant Materials Center
3409 N. FM 1355
Kingsville, TX 78413

Signatures for release of:

Welder Germplasm shortspike windmillgrass (*Chloris subdolichoastachya*, Muller)

Acting

John W. Mueller

SEP 0 1 2006

Dr. Larry Butler
State Conservationist
United States Department of Agriculture
Natural Resources Conservation Service
Temple, TX

Date

for Mark A. Hussey

8-23-2006

Texas Agricultural Experiment Station
College Station, Texas

Date

Fred Bryant

9/8/06

Dr. Fred Bryant, Director
Caesar Kleberg Wildlife Research Institute
Texas A&M
Kingsville, Texas

Date

Robert T Escheman

9-15-06

Robert Escheman
National Plant Materials Program Leader
United States Department of Agriculture
Natural Resources Conservation Service
Washington, D.C.

Date

TEXAS AGRICULTURE EXPERIMENT STATION
PLANT MATERIAL RELEASE NOTIFICATION
REPORT OF TECHNICAL COMMITTEE ON SEED RELEASE AND INCREASE

The attached proposal for plant release has been examined and reviewed by members of the TAES plant release committee. Based on this review, the following recommendations regarding release are made. Release procedures followed those given in the TAES Policy on the Management & Release of Plant Materials – 1995.

1. Species: **Shortspike Windmillgrass (*Chloris subdolichostachya*)**
2. Breeders: **William R. Ocumpaugh (TAES contact) et al.**
3. Type of Release: **Selected Native Germplasm**
4. Recommended for Release: **Yes**
5. Designation to be applied upon release: **Kika260 Shortspike Windmillgrass**
6. Distribution of Breeder's Seed: **Breeder**
7. Increase and maintenance of Foundation Seed Stocks: **n/a**
8. Responsibility for providing seed to state and federal seed laboratories: **Breeder**
9. Publicity (including Station Seed Leaflet):
10. Other Recommendations: lead is USDA-NRCS (see back)
11. Members of plant review committee considering release: **J. Betran, D. Byrne, J. Starr, G. Peterson, K. Crosby, W. Smith, L. Nelson, and J. Rudd.**

Forwarded by:

W.L. Rooney
Chair, Plant Review Committee

Date: August 21, 2006

Approved as Recommended:

Mark A. Hussey
Associate Director, TAES

Date: 8-21-2006

Changes in Release: none

PLANT MATERIALS RELEASE PROPOSAL

Date: **18 May 2006**

1. Crop: **shortspike windmillgrass (*Chloris subdolichostachya* Muller).**
   Type of Release: **Selected Plant Material**

2. Proposed name or identification: **Kika260 shortspike windmillgrass**

3. Designation or name in development stages: **9085260 or 260**

4. Primary features or advantages:

- **Native to and adapted to South Texas**
- **Strongly stoloniferous**
- **Good germination and seedling vigor**
- **Rapid germination (high 3-day germ)**
- **20-30% dormant seed**

5. Plant Variety Protection: **No**

6. Seed amount available and date: **3.6 lbs in February 2006, expect 25 lbs by November 2006**

7. Proposed seed distribution:

Foundation seed will be produced and maintained by E. "Kika" de la Garza Plant Materials Center in conjunction with *South Texas Natives* and Texas Foundation Seed Service.

There are no restrictions with regard to geographic area of certified seed production. Foundation and certified seed fields will be limited to 7 production years.

8. Royalty: **Yes**

9. Suggested fees:

10. Supportive documents attached: **Release Proposal: Yes**

11. Submitted:

Breeders and Scientists – Date	Unit Heads – Date
W M Ocumpaugh 5-26-06	Bobby R. Eddleman 5-30-06