THE
UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE

AND

UTAH AGRICULTURAL EXPERIMENT STATION
UTAH STATE UNIVERSITY
LOGAN, UTAH

AND

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

ANNOUNCE

THE RELEASE OF DOUGLAS CRESTED WHEATGRASS

DOUGLAS is the first hexaploid (2n=42) cultivar of crested wheatgrass [*Agropyron cristatum* (L.) Gaertner s. lat.] to be released in North America. It was developed by a research team at the USDA-ARS Forage and Range Research Laboratory, Utah State University, Logan, Utah and was evaluated as 6X-BLR. The cultivar was named in honor of Douglas R. Dewey, who established the germplasm base for the USDA-ARS grass breeding program at Logan. The breeding population was derived from hybrids between an accession from the former Soviet Union (PI 406442) and three accessions from Iran (PIs 401076, 401080 and 401085,) and one accession from Turkey (PI 173622). Accession 406442 is characterized by exceptionally broad leaves and was used as the female parent in all crosses to retain the cytoplasm of this accession in the breeding population. Two cycles of selection were completed in spaced-plant nurseries for the broad-leaf type, vegetative vigor, seed yield potential, and response to plant pests and drought. The second-cycle population was screened for seed size and emergence from a 7.6-centimeter seeding depth. Breeder's seed was produced from a composite of 10 selected OP progeny lines.

DOUGLAS has larger seed than diploid and tetraploid cultivars, and it has exhibited excellent establishment vigor in field-evaluation trials. Based on emergence from 7.6-centimeter planting depth, seedling vigor of DOUGLAS was significantly greater than the cultivars Nordan, Fairway, and Ephraim and equivalent to the cultivar Hycrest. Although it produces less total forage yield than other crested wheatgrass cultivars, it is leafier and its leaves remain green for a longer period during the growing season than other cultivars. Grazing animals also have preferred 6X-BLR over other crested wheatgrass cultivars under sward conditions. Results from a semiarid range site in western Utah indicate that the in vitro digestibility (IVDMD) of its forage is significantly higher than that of other crested wheatgrass cultivars, particularly during the later stages of the growing season.

DOUGLAS has excellent winter hardiness, but it is not as resistant to drought as cultivars such as Hycrest and Nordan. It is recommended for range sites receiving at least 25 centimeters (10 inches) of annual precipitation at altitudes below 2,100 meters (7,000 feet). When drilled under dryland range conditions, a seeding rate of 8 kilograms/hectare (7 pounds/acre) is recommended. Based on data from

seed-increase blocks, Douglas produces approximately 400 kilograms of seed per ha (360 pounds/acre) on dryland sites receiving 35 centimeters (14 inches) of annual precipitation. Supplemental irrigation would increase seed yields about 50 percent. This hexaploid cultivar will hybridize with other diploid and tetraploid forms of crested wheatgrass, although the fertility of the hybrid progenies is substantially reduced. Accordingly, isolation from all other crested wheatgrass plants, regardless of ploidy level, is required in seed production fields.

Breeder, Foundation, and Certified seed classes will be recognized. Breeder seed will be maintained by the USDA-ARS Forage and Range Research Laboratory at Logan, UT. Foundation seed will be produced by the USDA-ARS at Logan and distributed to seed growers by the Utah Crop Improvement Association. Protection has been applied for under the Plant Variety Protection Act of 1970. Conditions of this license specify that seed of the cultivar DOUGLAS can be marketed only as a class of certified seed. For information regarding supplies of foundation seed, contact:

Stanford Young
Utah Crop Improvement Association
Plants, Soils, and Biometeorology Department
Utah State University
Logan, UT 84322-4820
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Release date for publicity purposes shall be effective on the date of the final signature on the release notice.

APPROVAL SIGNATURES:

JUL 01 1994
Date

Howard J. Bracke
Administrator
for Agricultural Research Service,
U. S. Department of Agriculture

May 24, 1994
Date

Director
Utah Agricultural Experiment Station

June 22, 1994
Date

Chief
Soil Conservation Service
U. S. Department of Agriculture

Table 1. Percent emergence of crested wheatgrass cultivars and the hexaploid broadleaf breeding populations from a 7.6-centimeter (3-inch) planting depth.

Entry	Mean	Range	Mean of top 10
Douglas	16.0	6.5 - 35.3	26.2
6X-BL	13.0	3.8 - 27.5	19.3
Hycrest	16.5	----------	----
Nordan	9.8	----------	----
Fairway	0.0	----------	----
Ephraim	1.5	----------	----
LSD (0.05)	6.6		

Table 2. Stand and dry matter yield of 34 grasses evaluated at USU Blue Creek Experiment Station, which has a mean annual precipitation of 36.6 centimeters (14.4 inches).

	Stand				Dry matter yield		
	1990	1991	1992	1993	1991	1993	Mean
	Rating [1]				Kg/Plot		
BBWG Goldar	6.8	4.3	4.0	3.5	1.12	0.54	0.93
Douglas	5.8	5.5	6.0	6.8	1.30	1.67	1.49
CWG 6X-BL	5.8	6.5	6.3	6.5	1.50	1.68	1.59
CWG Ephraim	7.0	8.3	8.3	8.0	1.95	1.75	1.85
CWG Fairway	6.0	8.0	7.5	7.8	2.07	1.61	1.84
CWG Hycrest R89	8.8	9.0	9.0	8.8	2.81	1.89	2.35
CWG Hycrest NLF	8.5	8.8	8.3	8.8	2.61	2.12	2.36
CWG New Hybrid	7.8	8.5	8.0	8.5	2.24	1.82	2.03
CWG Nordan	5.5	7.3	7.3	8.5	2.36	2.00	2.18
CWG P_27	6.3	5.8	6.5	7.0	1.91	1.84	1.87
CWG R_(Iran Turf)	6.8	6.5	6.8	8.0	1.88	1.81	1.84
CWG Siberian Syn	7.0	7.3	7.5	8.0	1.87	1.86	1.86
L. ang Prairieland	3.5	5.3	4.0	4.0	0.70	1.01	0.86
L. angustus Hybrid	1.8	1.8	1.3	2.0	0.12	0.67	0.39
L. karelinii	3.0	4.5	3.0	2.0	0.56	0.58	0.57
LC Hybrid	6.8	7.0	5.5	4.3	1.56	0.51	1.04
P. nodosum	6.3	6.8	6.3	5.3	1.53	0.62	1.07
RS-1 Hybrid	7.3	5.3	4.8	5.0	1.48	0.88	1.18
RS-Hoffman	6.8	5.8	5.5	6.3	1.75	1.14	1.45
RS-Miles City	7.8	6.3	5.8	7.3	2.05	1.36	1.71
RS-Spic Type	4.5	4.8	3.8	5.3	1.68	1.30	1.49
RS-T Hybrid	7.3	5.0	5.0	7.0	1.74	1.47	1.61
RWR Bozoisky	6.3	7.8	7.8	8.3	1.20	1.05	1.12
RWR Cabree	6.8	7.5	7.0	7.5	0.96	0.80	0.88
RWR Syn-A (2)	6.8	7.3	7.5	8.0	1.24	0.91	1.07
RWR Syn-A (F)	6.3	7.8	7.8	8.3	1.31	0.81	1.06
RWR Tetracan	5.8	7.0	7.0	7.5	0.95	0.92	0.93
RWR Vinall	5.3	6.5	6.5	8.0	0.89	0.78	0.83
SL Hybrid	7.0	6.5	6.5	6.5	1.61	0.78	1.20
SRWG Secar	3.8	3.0	4.3	4.3	0.99	0.60	0.80
TSWG Critana	5.0	6.8	6.0	5.3	1.88	0.75	1.32
TSWG T-21076	5.8	6.8	6.5	6.3	1.78	1.22	1.50
WWG Rosana	3.3	6.5	7.5	8.5	1.37	1.64	1.50
WWG Syn	3.0	5.8	6.8	8.0	1.18	1.49	1.33
MEAN	5.9	6.4	6.2	6.6	1.53	1.25	1.39
LSD (0.05)	1.0	1.0	1.3	1.2	0.41	0.32	0.29

[1] 1 = worst, 9 = best

Table 3. Stand establishment and forage yield of 25 grasses evaluated at Curlew Grasslands site near Stone, Idaho at 25-30 centimeters (10-12 inches) annual precipitation.

	Stand				Dry Matter Yield		
	1990	1991	1992	1993	1992	1993	Mean
Entry	------ Rating [1/] -------				----- Kg/Plot ------		
BBWG Goldar	2.5	1.8	1.0	0.8	0.00	0.00	0.00
Douglas	**5.5**	**6.0**	**5.5**	**5.5**	**0.13**	**0.69**	**0.41**
CWG 6X-BL	5.3	6.3	5.5	5.5	0.19	0.88	0.53
CWG Ephraim	3.3	4.0	4.3	7.0	0.13	1.01	0.57
CWG Fairway	5.8	6.5	6.8	7.8	0.16	0.88	0.52
CWG Hycrest R89	6.5	7.8	7.8	8.3	0.31	1.07	0.69
CWG Hycrest NLF	7.8	8.0	8.0	9.0	0.33	1.30	0.82
CWG New Hybrid	7.0	7.5	7.0	8.5	0.26	1.15	0.71
CWG Nordan	6.0	7.0	6.8	5.0	0.22	1.05	0.58
CWG P-27	2.3	2.5	2.5	5.5	0.16	0.88	0.52
CWG R (Iran Turf)	5.5	6.5	6.0	7.3	0.10	1.14	0.62
CWG Siberian Syn	7.5	8.0	8.5	8.3	0.30	1.19	0.74
LC Hybrid	2.0	1.5	1.0	1.0	0.01	0.00	0.01
P. libanotica	2.0	0.5	1.0	0.8	0.00	0.00	0.00
P. nodosum	1.5	1.0	1.0	0.5	0.00	0.00	0.00
Pseudopyron	1.0	0.0	0.3	0.3	0.00	0.00	0.00
RWR Bozoisky	3.8	5.3	4.8	7.0	0.13	0.50	0.31
RWR Cabree	3.3	4.3	4.0	5.0	0.12	0.47	0.29
RWR Syn A	4.8	5.3	5.0	6.0	0.13	0.42	0.28
RWR Vinall	4.5	3.8	3.8	4.8	0.09	0.31	0.20
SL Hybrid	1.8	1.3	1.0	1.0	0.01	0.00	0.01
SRWG Secar	1.3	1.0	1.0	1.0	0.01	0.00	0.01
TSWG T-21076	3.0	2.5	1.0	1.0	0.02	0.00	0.02
WWG Rosana	1.0	0.5	1.0	1.0	0.01	0.00	0.01
WWG Syn	1.3	0.8	1.0	0.8	0.00	0.00	0.00
Mean	3.8	4.0	3.8	4.3	0.11	0.86	0.39
LSD (0.05)	1.4	1.2	1.1	1.5	0.04	0.28	0.14

[1/] 1 = worst, 9 = best

Table 4. Width and length of leaves, plant height, dry weight, crude protein, and IVDMD of crested wheatgrass cultivars and experimental strains. Data are from spaced plants at Evans Farm near Logan, UT, 1993.

	Leaf width	Leaf length	Plant ht	DW	Crude protein	IVDMD
	------ centimeters -------			grams/plot	-- percent --	
Douglas	0.95	15.1	63.8	0.81	10.2	41.5
6X-BL	0.92	14.9	54.3	0.49	8.7	41.2
Hycrest	0.76	17.0	65.1	1.20	9.1	40.0
Nordan	0.67	13.9	61.3	0.75	8.8	40.4
Fairway	0.66	13.2	48.5	0.83	9.3	40.3
Ephraim	0.64	12.1	59.0	0.83	9.3	39.5
Siberian	0.64	16.4	64.3	0.99	9.0	39.7
CWG-Turf	0.50	12.4	52.6	0.64	9.7	40.3
Mean	0.72	14.4	58.6	0.81	9.3	40.4
LSD (0.05)	0.08	1.3	6.6	0.35	ns	1.3

Table 5. Stand and dry matter yield of 15 grasses at Soda Lake, Wyoming [1/].

Entry	Stand 92 Rating	Stand 93 Rating	Dry Weight (93) grams/plot
BBWG Goldar	6.5	7.8	257.0
Douglas	6.0	6.8	193.0
CWG 6X-BL	6.2	6.2	154.5
CWG Hycrest R	7.5	8.2	414.2
CWG New Hybrid	5.0	6.8	244.2
CWG Nordan	6.0	7.8	414.0
CWG P-27	5.2	6.2	321.5
CWG Siberian Syn	8.5	7.5	373.8
CWG Turf (R)	8.0	8.2	207.2
RST Hybrid	3.8	5.0	180.8
RWR Bozoisky	5.5	7.0	230.0
RWR Syn-A (E-91)	7.5	7.5	225.2
SL Hybrid	2.8	4.0	179.8
TSWG Critana	4.8	5.0	154.0
TSWG T21076	6.0	7.5	248.0
Mean	6.0	6.8	253.2
LSD (0.05)	1.8	0.9	72.0

[1/] 1 = worst, 9 = best for stand data

Table 6. *In vitro* dry matter digestibility (IVDMD) and crude protein of crested wheatgrass strains and cultivars at Utah State University Blue Creek Experimental Farm at two harvest dates in 1991.

Entry	IVDMD 5/6	IVDMD 6/18	IVDMD Mean	Crude Protein 5/6	Crude Protein 6/18	Crude Protein Mean
Douglas	**53.4**	**50.3**	**51.9**	**14.9**	**14.2**	**14.6**
6XBL	52.4	49.6	51.0	13.5	13.0	13.2
CWG-R	47.4	45.1	46.1	12.6	12.1	12.3
Ephraim	47.9	46.3	47.1	12.6	12.6	12.6
Fairway	46.0	48.3	47.2	12.2	13.4	12.8
Frag-Syn	46.4	45.7	46.1	13.9	11.5	12.7
Hycrest NF	48.2	45.3	46.8	11.4	11.6	11.5
Hycrest RF	48.2	46.4	47.3	11.8	10.5	11.2
New Hybrid	49.0	48.0	48.5	11.4	12.1	11.7
Nordan	47.5	46.7	47.1	13.3	13.9	13.6
P-27	46.8	49.4	48.1	13.9	14.8	14.3
Mean	48.5	47.4	47.9	12.9	12.7	12.8
LSD(0.05)	4.1	4.0	2.6	2.7	2.5	1.4

Table 7. *In vitro* dry matter digestibility (IVDMD) and crude protein content of crested wheatgrass cultivars and experimental strains at Utah State University Blue Creek Experimental Farm at four harvest dates in 1993.

	IVDMD					Crude Protein				
Entry	6/11	6/25	8/4	9/1	Mean	6/11	6/25	8/4	9/1	Mean
Douglas	**46.2**	**41.9**	**34.2**	**32.5**	**38.7**	**10.6**	**8.8**	**4.0**	**4.5**	**6.9**
6XBL	46.6	42.4	35.8	35.4	40.1	9.6	8.6	4.3	4.4	6.7
CWG-R	43.5	37.2	29.1	26.9	34.2	9.8	6.9	3.8	2.6	5.7
Ephraim	45.2	37.4	28.2	27.3	34.5	11.4	7.1	3.3	3.1	6.2
Fairway	45.2	38.3	29.7	30.2	35.9	10.2	6.8	3.4	3.8	6.1
Frag-Syn	44.8	37.0	29.4	28.0	34.8	11.2	6.8	3.5	2.5	6.0
Hycrest NF	45.8	38.4	30.9	31.0	36.5	11.0	6.6	2.9	2.2	5.7
Hycrest RF	44.8	39.0	31.1	28.7	35.9	9.8	6.6	3.0	2.3	5.4
New Hybrid	44.8	38.4	30.5	29.4	35.8	9.4	6.5	3.3	2.5	5.4
Nordan	45.7	37.9	31.1	30.3	36.3	10.1	6.8	3.3	2.6	5.7
P-27	44.3	38.8	30.1	29.9	35.8	10.2	7.9	3.4	2.8	6.0
Mean	45.2	38.8	30.9	30.0	36.2	10.3	7.2	3.5	3.0	6.0
LSD(0.05)	ns	1.4	2.7	2.2	1.5	ns	0.6	ns	1.1	0.8