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MEMORANDUM

TO: Wheat Cultivar Release & Recommendation Committee

FROM: Phil Bruckner and Jim Berg, Winter wheat breeders

DATE: December 28, 2010

RE: Proposal for protected MAES public (F.2.b) cultivar release of MTS0713

The following motion and supporting documentation is presented for consideration at the 2011 MAES Cultivar Release and Recommendation Meeting in Bozeman:

Motion: That MTS0713 solid-stem hard red winter wheat be approved for release in 2011. That MTS0713 be named 'Judee' in honor of long-term extension educator and colleague Judee Wargo. And that Judee be recommended for wheat stem sawfly-infested areas of districts 3, 4, and 5.

Pedigree: MT0713 resulted from the single cross 93X312E14/NuHorizon made in the year 2000. 93X312E14 is an unreleased solid-stem Montana experimental line with the pedigree Vanguard/Norstar//Judith dwarf. NuHorizon is a semi-dwarf hard white winter line market by AgriPro.

Recommendation: Protected MAES Public Release (F.2.b).

Name: To be named 'Judee' in honor of long-time extension agent and collaborator, Judy Wargo.

Selection history: MT0713 originated from a single cross made in 2000. The F₁ population was grown in the 2nd cycle of the 2000 greenhouse. F₂ seed was grown as a space-planted population (00X14) at Fort Ellis in 2001 under stem rust selection pressure and with selection for stem solidness. The F₃, F₄, and F₅ bulk populations were grown at Fort Ellis, Loma, and Loma in 2002, 2003, and 2004, respectively, using a modified bulk breeding method, with mass selection for survival, reduced plant height, favorable head morphology, stem solidness, and kernel plumpness. One hundred heads which were selected from the F₅ population grown at Loma in 2004 were grown as F₆ headrows at Fort Ellis in 2005. Headrow 00X14E59 was selected based on evaluation of stem solidness and visual criteria for uniformity, productivity, and acceptable agronomic type and harvested in bulk. 00X14E59 was subsequently tested in the 2006 Sawfly Observation Nursery (SFO) grown at Bozeman, Havre, north Havre, and Fort Ellis. In 2007, 00X14E59 was designated MTS0705 [recoded to MTS0713 in 2008] and tested in the Sawfly yield trial at five locations distinguishing itself for outstanding yield performance. From 2007 through 2010, MTS0713 was evaluated in Sawfly nursery (15LY), from 2008 through 2010, MTS0713 was evaluated in the Montana Intrastate trial planted at eight locations (total 20 LY), and from

2009 through 2010, MTS0713 was evaluated in the Montana Off-station nursery planted at 14 on-farm locations (total 25 LY). Quality has been evaluated in multi-location Montana trials since 2007. In 2010, MTS0713 was an entry in the USDA Northern Regional Performance Nursery (NRPN) planted at approximately 20 sites across the Northern Great Plains.

Purification/seed stocks: Purification and increase of MTS0713 was initiated in 2009 when 105 F₅-derived F₁₀ headrows were grown at Bozeman with selection for stem solidness and visual uniformity and 78 linerows bulked as a source of breeder seed. In 2010, breeder seed of MTS0713 was increased at Yuma, AZ (Fig. 1) and the Bozeman Post Farm (~0.33 A). 23 red-chaff variants were removed from the Bozeman breeder seed increase prior to harvest. Foundation seed increases were planted from the 2010 Bozeman breeder seed increase lot. Foundation seed of Judee is planted at Havre (13.5A) and Bozeman (2.7A) for 2011 harvest. The Yuma derived breeder seed increase was used to plant field scale demonstration plots at Loma, MT.

Figure 1. Pure seed increase of MTS0713 at Yuma, AZ on May 7, 2010.



Description: Judee is an awned, white-glumed, solid-stem, semi-dwarf hard red winter wheat. Judee has medium maturity, 168.7 d heading from 1 January, similar to ‘CDC Falcon’ and about 0.6 d earlier than ‘Genou’ and ‘Rampart’ (Table 1). Judee is semi-dwarf (*Rht1*) and medium-short (31.9 inches, n=60), 1.6 inches taller than CDC Falcon and about 2.5 inches shorter than Genou and Rampart. Coleoptile length of Judee under controlled conditions is 3.7 inches, longer than that of CDC Falcon (2.8 inches) and slightly shorter than Genou (4.1 inches). Straw strength of Judee is good. Judee is susceptible to prevalent races of stem rust and leaf rust but resistant to stripe rust. Judee is solid-stemmed, averaging 20.1 on the 5 (hollow) to 25 (solid) stem solidness scale, significantly more solid than Genou (18.2) but less solid than Rampart (21.4) (Table 2). Cutting by wheat stem sawfly of Judee (18.1%, n=10) is intermediate to Genou (23.3%) and Rampart (8.0%, Table 3). Winterhardiness of Judee is medium to low, similar to Genou (Table 1). Judee is most similar to Genou and is targeted toward wheat stem sawfly-infested areas of north central Montana currently in Genou production.

Table 1. Agronomic characteristics of Judee (MTS0713) and check cultivars, 2007-2010.

Variety	Test weight lb/bu	Winter survival %	Heading date		Plant height in	Lodging %	Protein %	Sawfly cutting %	Stripe rust %	Coleoptile length in
			Julian	Calendar						
location-years	60	2	36		60	5	61	10	6	2
CDC Falcon	59.5	42**	168.5	18-Jun	30.3	8.2**	12.3	42	9	2.8
Genou	59.7	27	169.3	18-Jun	35.2	39.0	12.6	23	12	4.1
MTS0713	60.4**	23	168.7	18-Jun	31.9	18.0*	12.6	18*	2	3.7
Rampart	59.8	16	169.3	18-Jun	34.7	42.4	13.1**	8**	4	4.3
LSD (0.05)	0.3	11	0.5		0.5	22.0	0.2	11	8	0.3

** = indicates highest value within a column

* = indicates varieties with values equal to highest variety within a column based on Fisher's protected LSD (p=0.05)

Table 2. Stem solidness ratings of Judee (MTS0713) and check cultivars, 2007-2010.

	Stem Solidness Rating (scale 5-25, higher = more solid)					Stem Solidness by location, 2007-2010				
	2010	2009	2008	2007	2007-10	Bozeman	Conrad	Havre	Moccasin	Sidney
location-years	9	6	9	5	29	7	5	10	6	1
Rampart	20.3**	22.1**	21.4**	22.8*	21.4**	18.1**	23.5**	22.9**	21.0**	22.8**
MTS0713	19.2*	21.1*	20.7*	19.6	20.1	17.3*	21.6*	21.2	19.9*	22.8**
Genou	17.3	18.6	18.9	18.4	18.2	14.0	20.1	19.9	18.8*	19.2
CDC Falcon	7.0	7.9	6.7	7.2	7.1	5.9	7.0	8.1	7.1	6.7
LSD (0.05)	1.5	1.8	1.9	1.5	0.9	1.7	2.0	1.2	2.2	2.6

** = indicates highest yielding variety within a column

* = indicates varieties yielding equal to highest yielding variety within a column based on Fisher's protected LSD (p=0.05)

Table 3. Yield Performance of Judee (MTS0713) and % Sawfly Cutting in 10 north-central MT sawfly infested environments (ave. cutting>10%), 2007-2010.

Variety	Yield (bu/a)				Sawfly Cutting (%)			
	Havre	North Havre	Loma	Average	Havre	North Havre	Loma	Average
location-years	6	2	2	10	6	2	2	10
MTS0713	61.6*	58.5	50.2*	58.7**	7.2*	26.3	42.5	18.1*
CDC Falcon	62.5**	53.4	50.9**	58.4*	24.8	52.5	81.5	41.7
Genou	57.0	52.7	47.2	54.2	11.1*	32.5	50.9	23.3
Rampart	53.0	50.0	46.9	51.2	5.6**	10.0	13.4	8.0**
LSD (0.05)	3.5	ns	2.6	2.5	8.7	ns	ns	11.5

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Characteristics/comparisons:

Yield. In 60 location-years (LY) of testing in the Montana Winter Wheat Intrastate, Sawfly, and Off-station nurseries average yield of Judee (63.0 bu/a) was similar to the yield of CDC Falcon, but greater than the yields of Genou and Rampart (Table 4). In districts 4 and 5 where wheat stem sawfly is prevalent, Judee performed well, out yielding Genou at Moccasin (+3.0 bu/a) and Havre (+3.2 bu/a). In 10 north-central Montana sawfly-infested environments, Judee out yielded Genou by 4.5 bu/a (Table 3).

Table 4. Yield of Judee (MTS0713) and check cultivars, 2007-2010.

(Sawfly, 2007-2010; Intrastate, 2008-10; Off Stations, 2009-10)

Variety	Districts							All Locations
	1 Kalispell	2 Bozeman ^{1/}	3 Huntley ^{2/}	4 Moccasin ^{3/}	5 Conrad ^{4/}	5 Havre ^{5/}	6- Sidney & Williston	
location-years	3	7	14	12	7	13	4	60
CDC Falcon	122.1	77.6*	64.2	49.4**	64.4**	61.5**	44.4**	63.9**
MTS0713	129.2	83.5**	65.1	46.6	64.2*	60.1*	29.6	63.0*
Genou	117.7	76.3*	60.9	43.6	61.9*	56.9	29.8	59.1
Rampart	108.2	71.4	59.3	42.0	54.8	53.2	24.9	54.4
LSD (0.05)	ns	7.6	ns	2.6	5.2	2.8	8.0	2.0

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1/ includes data from Dry Creek, Willow Creek

4/ includes data from The Knees, Shelby

2/ includes data from Forsyth, Hardin area, Lodge Grass, Molt, Rapelje

5/ includes data from North Havre, Loma

3/ includes data from Denton, Geraldine, Winifred

Test weight. Test weight of Judee (60.4 lb/bu, n=60) was higher than check cultivars CDC Falcon, Genou, and Rampart (Table 1). **Grain protein content** of Judee is medium to high, lower than Rampart but similar to that of Genou (Table 1).

Milling and baking quality of Judee is acceptable and similar to currently deployed Montana cultivars (Table 5). A 1RS:1AL rye translocation carried by Judee does not appear to detrimentally influence quality. In summary, Judee is a hard red winter wheat with high PPO, intermediate flour yield and flour protein content, medium dough strength and water absorption, and high loaf volume similar to Rampart (Table 5).

Table 5. Milling and baking characteristics of Judee (MTS0713) and check cultivars, 2007-2009.

Variety	PPO ^{1/}	Kernel hardness	Flour yield %	Flour protein %	Flour Ash %	Mixograph mix time min	Mixograph absorption %	Baking mix time min	Baking absorption %	Loaf volume cc
location-years	18	18	18	18	18	18	18	18	18	18
CDC Falcon	1.046	67.6	65.5	11.3	0.43	5.4	62.3	10.0	72.1	1072
Genou	0.858	75.2	69.7*	12.0	0.42	5.4	64.1*	11.3	74.0*	1099
MTS0713	0.823	78.0	67.8	11.6	0.41**	6.1	62.8	9.0	72.7	1133**
Rampart	0.732	76.5	70.3**	12.4**	0.42	5.3	64.5**	10.4	74.7**	1132*
LSD (0.05)	0.124	2.4	0.7	0.3	0.01	0.5	0.9	1.5	1.0	28

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1/ low is best for noodles

Judee is proposed as a potential replacement for Genou, with higher yield potential, greater stem solidness, and shorter plant height.