University of Missouri, Agricultural Experiment Station
College of Agriculture, Food, and Natural Resources
Columbia, Missouri

Release of 'Truman' Soft Red Winter Wheat

The University of Missouri Agricultural Experiment Station announces the release of 'Truman' soft red winter wheat (experimental breeding line MO 980525). Truman was derived from the cross MO 11769/ Madison which was made in 1990. The pedigree for MO 11769 is Kawvale/Vigo//Directeur Journee/3/Hart sib W7510/4/ NS 314/Stoddard. Truman was selected as an F_7-derived F_8 line in 1996, grown as an individual head row in 1997, hand harvested, and entered into Preliminary Yield Trial No. 5 in 1998. It has been tested in the Missouri Winter Wheat Breeding Nurseries since that time. It has also been tested in the Missouri Winter Wheat Performance Tests since 2000 and was entered in the Uniform Eastern Soft Red Winter Wheat Nurseries (UESRWWN) in 2001 and 2002. Truman is being released for its excellent yield potential, test weight and broad-based resistance to Fusarium head blight (scab) caused by *Fusarium graminearum* Schwabe (teleomorph *Gibberella zeae* (Schwein.).

The line was named for Harry S. Truman, a farmer from Lamar, Missouri who went on to become the 33rd President of the United States.

Description: Truman is a white-chaffed, apically awnletted soft red winter wheat with long, mid-dense, tapered spikes. Kernels of Truman are soft, light red, and of moderate size. Plants are typically bluish green with more blue being apparent as the plant develops through to senescence. Leaves are long and wide. A waxy bloom is present on the spike and peduncle of the main tiller but is less pronounced on those of the secondary tillers, giving the appearance of a slight variation in canopy color. A physiological leaf speckling is often present on the leaves as they mature through heading towards physiological maturity.

Performance: Truman is a full season variety with a moderately long vernalization requirement. It heads approximately 5 days later than Pioneer ® Variety 25R47 and 6 days later than Roane. Although Truman heads later than most varieties, this difference is reduced by 2-3 days at maturity. It's maturity is comparable to Cardinal. It is moderately tall with good straw strength, and stands well in most environments. Truman has very good winter hardiness and is moderately tolerant of acid soils.

In Missouri breeding trials Truman had both excellent yield potential and high test weight. It has been evaluated in the Missouri Winter Wheat Performance Tests under the experimental number MO 980525 since 2000 where it has been compared to commercial soft red winter wheat varieties available to Missouri growers. In 2003, Truman placed 7th of 64 entries tested over 7 Missouri environments yielding 77.6 bu/acre with a test weight of 57.8 lb/bu. Truman's test weight was approximately 1.5 lb/bu better than Ernie and approximately 1 lb/bu lower than Roane (Table 1). Across 14 location-years of testing in the Missouri Winter Wheat Performance Tests (2002-2003), Truman was the top yielding variety in the test, averaging 70.4 bu/acre. Over the past 3 years (21 location-years) of testing, Truman was in the top yield group, averaging 68.3 bu/acre, not different from Pioneer ® Variety 25R37 and Pioneer ® Variety 25R78. In these trials, Truman has had very good test weight, averaging 58.2 in 2002, approximately 1 lb less than Roane (59.3 lb/bu) and 57.8 lb/bu in 2003, statistically equal to Roane (58.2 lb/bu). Overall, the stability of Truman for both yield and test weight has be notable. Regional data (Table 2) suggests it is adapted throughout Missouri. Complete data for the 2003 Missouri Winter Wheat Performance Tests can be found at: http://agebb.missouri.edu/cropperf/ under crop performance testing/soft red winter wheat.

Truman has broad adaptation across the Northern Corn Belt states including Illinois, Indiana, Ohio,

Michigan and Wisconsin. It is also adapted in Western Ontario, Canada. It was tested in the Uniform Eastern Soft Red Winter Wheat Nursery (UESRWWN) in both 2001 and 2002 under the experimental number MO 980525. Across all 26 locations of the UESRWWN in 2001, Truman finished second of 44 advanced lines tested with an average yield of 78.4 bu/acre (Table 3). Roane, a nursery check variety ranked 8thaveraging 76.8 bu/acre. In locations where the CV was less than 10% (14 locations), Truman and Roane tied for first place in the nursery with an average yield of 87.2 bu/acre. Their respective test weights were 59.0 lb/bu (Truman) and 60.4 lb/bu (Roane). In the 2002 UESRWWN, Truman ranked 12 of 44 entries averaging 70.4 bu/acre across all locations. Roane ranked 14th averaging 69.4 bu/acre. In locations where the CV was less than 10%, Truman yielded 81.7 bu/acre compared to 84.2 bu/acre for Roane.

Disease Resistance: Truman has a high level of broad-based resistance to Fusarium head blight (scab). In two years of testing in the US Northern Winter Wheat Fusarium Head Blight Nursery, it was among the most resistant winter wheats tested. It was superior to both the early and late resistant checks, Ernie and Freedom, respectively. Under inoculation, Truman had excellent type I and type II resistance as well as good kernel quality and low deoxynivalenol (DON) in the harvested grain. Of 49 lines evaluated in 2001, Truman was one of only 2 lines with low ratings in all 7 categories of resistance measured (Table 4). The other line was MO 981020, which is a full-sib of Truman. Truman is resistant to stripe rust (caused by *Puccinia striiformis* West.) but is considered susceptible to both leaf rust (caused by *Puccinia recondita* Rob. ex Desm. F. sp. *tritici*) and stem rust (caused by *Puccinia graminis* Pers. f. sp. *tritici* Eriks. & Henn.) in the Missouri field environment. It is considered to have above average resistance to Septoria leaf blotch (caused by *Septoria tritici* Roberge in Desmaz.). In the Missouri field environment, it's Septoria resistance is less than that of Ernie and equal to Roane. Truman is considered moderately resistant to soilborne mosaic virus and moderately susceptible to wheat yellow mosaic virus (wheat spindle streak mosaic virus). It is moderately susceptible to barley yellow dwarf virus, with resistance less than Ernie and comparable to Roane. Truman is susceptible to all races of Hessian fly (*Mayetiola destructor* Say).

Based on evaluations conducted at the USDA-ARS Soft Wheat Quality Laboratory in Wooster, OH, both milling and baking quality of Truman are similar to Ernie. Milling quality of Truman is similar Roane while baking quality is superior to Roane.

The development of this line was partially supported by funds from the U.S. Wheat and Barley Scab Initiative. Authorized seed classes will be breeder, foundation, and certified. Application for plant variety protection will be made under the Title V option. Breeder and foundation seed will be maintained by the Missouri Agricultural Experiment Station, University of Missouri, Columbia, MO 65211. A royalty of 1¢ per pound will be assessed on certified seed. No royalty will be assessed on the foundation class.

Table 1. Yield performance of Truman across Missouri locations in 2001 through 2003. Data for Truman are compared to public varieties and Pioneer varieties which are used in the Missouri wheat breeding program as yield and test weight checks. Where no data appears in the 2002-2003 or 2001-2003 columns, the variety was not tested over 2- or 3-years, respectively.

	Grain yield			Test
Variety	2003	2002-2003	2001-2003	weight
	---------- bu/acre ----------			----- lb/bu -----
Truman (MO 980525)	77.6	**70.4****	**68.3***	57.8
Ernie	62.7	60.9	58.5	55.4
Roane	70.8	65.6	64.8	58.2
Sisson	60.4	56.9	57.5	54.3
Pioneer Variety 25R37	**81.9****	**70.3***	**70.4****	57.3
Pioneer Variety 25R47	**83.7****	-	-	57.6
Pioneer Variety 25R49	78.1	67.4	67.6	55.5
Pioneer Variety 25R78	**80.2***	**70.2***	-	56.9
Test average	72.6	65.3	64.6	56.4
LSD (0.05)	3.7	2.8	2.4	0.4
CV%	9.8	11.5	12.4	1.3
Location years	7	14	21	7

** Indicates top yielding variety in the test

* Indicates variety did not differ from the highest yielding variety in the column, based on Fisher's protected LSD (p=0.05)

Table 2. Yield performance of Truman across the northern (Columbia, Novelty, and Trenton), southeastern (Charleston and Portageville), and southwestern (Lamar and Mt. Vernon) regions of Missouri, 2001-2003. Data for Truman are compared to public varieties and Pioneer varieties which are used in the Missouri wheat breeding program as yield and test weight checks. Where no data appears in the 2002-2003 or 2001-2003 columns, the variety was not tested over 2- or 3-years, respectively.

Variety	Northern region			Southeastern region			Southwestern region		
	2003	2002-03	2001-03	2003	2002-03	2001-03	2003	2002-03	2001-03
	---------- bu/acre ----------								
Truman (MO 980525)	90.8	**79.5***	**73.6***	64.3	62.7	65.4	71.2	**64.6***	62.7
Ernie	71.6	69.8	65.8	58.6	57.4	54.7	53.5	51.1	51.3
Roane	85.7	77.4	**72.1***	61.4	60.9	63.6	57.7	52.5	55.1
Sisson	65.4	63.0	59.8	60.9	57.6	61.1	52.3	47.1	50.4
Pioneer Variety	87.9	75.4	71.7	65.0	**65.2***	**71.0****	**89.8***	**67.6****	**67.9****
Pioneer Variety	**95.8***	-	-	**73.3***	-	-	76.0	-	-
Pioneer Variety	89.8	77.3	71.9	65.3	**63.7***	68.4*	73.3	56.4	60.3
Pioneer Variety	89.2	77.8	-	**66.7***	**-**	80.3	**61.6***	**-**	
Test Average	84.8	75.2	69.6	60.1	60.3	64.2	66.8	55.5	57.5
LSD (0.05)	5.1	3.9	3.4	7.2	4.6	4.5	7.5	6.3	5.1
CV%	7.6	9.1	10.6	12.8	11.1	12.4	11.4	16.2	15.7
Location years	3	6	9	2	4	6	2	4	6

** Indicates top yielding variety in the test

* Indicates variety did not differ from the highest yielding variety in the column, based on Fisher's protected LSD (p=0.05)

Table 3. Performance of Truman (MO 980525) in the 2001 and 2002 Uniform Eastern Soft Red Winter Wheat Nursery. Performance is compared to nursery check cultivars.

	2001 Yield		2002 Yield		2001 Test Weight	2002 Test Weight
Variety	All locations	Locations CV <10%	All locations	Locations CV <10%	All locations	All locations
	---------- bu/acre ----------				---------- lb/bu ----------	
Truman (MO 980525)	78.4	87.2	70.4	81.7	59.0	57.7
Caldwell	65.4	72.5	58.5	67.9	58.1	56.6
Foster	69.6	76.2	66.6	78.6	58.1	57.3
Patton	77.7	85.8	70.6	83.6	58.3	57.6
Roane	76.8	87.2	69.4	84.2	60.4	59.8

Table 4. Entry means for Truman (MO 980525) compared to checks in the 2001 Northern Uniform Winter Wheat Scab Nursery. Each entry was compared to the lowest (l) and highest (h) means in each column using the $LSD_{(0.05)}$. The number (#) of low scores is the number of disease traits for which an entry had resistance equal to the best line in the test while the # of high scores represents the number of disease traits for which an entry was as susceptible as the worst line in the test. Entries were considered moderately susceptible for a trait when that trait differed significantly from the most resistant and most susceptible based on the $LSD_{(0.05)}$. Patterson and Pioneer 2545 were the early and late susceptible checks, respectively, while Ernie and Freedom were the early and late resistant checks, respectively.

Cultivar	SEV	INC	Index	KR	% SS	DON	GH severity	# low scores	# high scores
	----------%----------			0-100	%	ppm	%	------- 0-7 -------	
Truman (MO 980525)	11.8 (l)	34.6 (l)	7.5 (l)	23.0 (l)	5.4 (l)	5.3 (l)	14.3 (l)	7	0
Patterson	38.4 (h)	61.6 (h)	34.1 (h)	31.0 (l)	14.7 (l)	6.9 (l)	52.4	3	3
Freedom	21.4	62.8 (h)	21.8	50.1	17.5 (l)	12.6 (l)	30.5	2	1
Pioneer 2545	39.8 (h)	71.4 (h)	40.7 (h)	66.5 (h)	26.8 (h)	16.2 (l)	55.8	1	5
Ernie	20.1 (l)	51.4	19.5 (l)	29.9 (l)	16.9 (l)	7.9 (l)	28.7	4	0
Mean	24.6	57.5	22.6	42.0	18.4	11.9	46.3		
$LSD_{(0.05)}$	9.3	15.0	10.5	17.1	15.0	14.2	18.9		
# Tests	9	8	8	4	3	3	5		

SEV = Disease severity from field trials. Generally a visually rated score that reflects % of infected spikelets in an infected head.
INC - Disease incidence which reflects the % of heads in a field plot with at least one infected spikelet.
Index - Disease index, calculated as (severity x incidence)*100
KR - Kernel rating which is a visual assessment of the percent infected seeds.
%SS - Percent scabby seed is the percentage of scabby seeds by weight.

DON - Deoxynivalenol is the amount of vomitoxin, measured in parts per million, in a grain sample from inoculated field plots.

GH severity - Greenhouse severity is a visually rated score that reflects the % of infected spikelets in a head, inoculated in the greenhouse using the point-inoculation technique.