

Bumper spring triticale

J. G. McLeod¹, H. S. Randhawa², K. Ammar³, J. F. Payne^{1,4}, and R. B. Muri¹

¹Agriculture and Agri-Food Canada, 1 Airport Road, Swift Current, Saskatchewan, Canada S9H 3X2;

²Agriculture and Agri-Food Canada, 5403-1st Avenue South, Lethbridge, Alberta, Canada T1J 4B1;

³CIMMYT, Apdo. Postal 6-641, Mexico, D.F., 06600, MEXICO; and ⁴Retired. Received 3 August 2010, accepted 22 October 2010.

McLeod, J. G., Randhawa, H. S., Ammar, K., Payne, J. F and Muri, R. B. 2011. **Bumper spring triticale**. Can. J. Plant Sci. **91**: 351–354. Bumper spring triticale (\times *Triticosecale* Wittmack) is well adapted to the Canadian prairies with high grain yield in each of the soil zones. It has shorter straw than the check cultivars and excellent lodging resistance. Bumper matures in a similar number of days as the check cultivars. It combines large heavy seed with test weight equal to the best cultivar AC Certa. Bumper is resistant to the prevalent races of leaf and stem rust and common bunt. Its reaction to Fusarium head blight is moderately resistant.

Key words: Cultivar description, triticale, spring (\times *Triticosecale* Wittmack), disease resistance, grain yield

McLeod, J. G., Randhawa, H. S., Ammar, K., Payne, J. F et Muri, R. B. 2011. **La triticale de printemps Bumper**. Can. J. Plant Sci. **91**: 351–354. Bumper (\times *Triticosecale* Wittmack) est une variété de triticale de printemps bien adaptée aux Prairies canadiennes. Le cultivar se caractérise par un rendement élevé dans chaque zone de sols. Sa paille est plus courte que les cultivars témoins et il possède une excellente résistance à la verse. Bumper prend à peu près le même nombre de jours que les variétés témoins pour parvenir à maturité. Bumper combine des graines de gros calibre à un poids spécifique équivalent à celui d'AC Certa, le meilleur cultivar. Il résiste aux races courantes de rouille des feuilles et de la tige ainsi qu'à la carie commune. Enfin, il est modérément résistant à la brûlure de l'épi par *Fusarium*.

Mots clés: Description de cultivar, triticale de printemps (\times *Triticosecale* Wittmack), résistance aux maladies, rendement grainier

Bumper spring triticale (\times *Triticosecale* Wittmack) originated from the International Maize and Wheat Improvement Centre (CIMMYT) triticale breeding program. It was introduced by the Semiarid Prairie Agricultural Research Centre (SPARC), Research Branch, Agriculture and Agri-Food Canada (AAFC), Swift Current, SK, as part of the Triticale Breeding Project, via the 34th International Triticale Screening Nursery (ITSN) in 2002 and further selected for uniformity and removal of off types. In February 2008, it received support for registration from the Prairie Grain Development Committee. Filing for Plant Breeders' Rights Protection (08-6463) was accepted, 2008 Oct. 30. Bumper received a restricted registration no. 6699 from the Variety Registration Office, Canadian Food Inspection Agency, 2010 Jan. 08.

Pedigree and Breeding Method

Bumper is a complete hexaploid triticale. It was developed through a "modified bulk" selection scheme from a simple cross made at CIMMYT's station of El Batán (2249 m altitude and 19.5°N latitude), between the lines DAHBI_6 and ARDI_TOPO 1419//ERIZO_9, the pollen donor, in the summer of 1993. The F₁ generation was sown in the fall of 1993 and harvested in bulk in the

spring of 1994 at the CIMMYT experiment station near Ciudad Obregon (40 m altitude and 27.5°N latitude) in the northern Mexican state of Sonora. Subsequent selection was implemented using the "shuttle breeding method" (Borlaug 1968) employed in CIMMYT cereal breeding programs (Rajaram 1995), which consists of alternating selection in segregating generations between the northern location of Ciudad Obregon and the central locations of either El Batán or Toluca (2640 m altitude and 18°N latitude). This approach enables plant breeders to select cultivars that are adapted to a wide range of biotic and abiotic stress. The space-planted F₂ generation was evaluated in Toluca during the summer of 1994 and a single plant (number 22) was selected and threshed individually to produce seed for the F₃ family, which was sown near Ciudad Obregon in the fall of 1994. From this F₃ family, spikes were bulked in the spring of 1995 to produce F₄ seed that were sown in the summer 1995 in El Batán. Spikes from this F₄ family were selected and bulked in the fall of 1995 to produce F₅ seed. The resulting F₅ family was sown in the fall of 1995 at the Ciudad Obregon station for single plant selection. In the spring of 1996, a single F₅ plant (number 2) was selected from this family, threshed individually to produce seed of the F₆ family, which was subsequently planted

as plant-row in El Batan in the summer of 1996. In the fall of the same year, the entire row was selected and harvested in bulk and considered a fixed line thereafter. During the winter-spring seasons from 1997 to 2000 it was yield-tested under different irrigation regimes near Ciudad Obregon. Yield testing included evaluation in replicated yield trials sown under full irrigation (no water stress, for yield potential assessment) and reduced irrigation (moderate to harsh water stress, for drought tolerance evaluation). Once selected for its superior performance under both environments, it was multiplied in bulk and distributed globally in 2002 through CIMMYT's International Nurseries system. In 2002 also, it was found to be resistant to a new race of yellow rust virulent on *Yr9*, which appeared in Mexico and was kept for further distribution as an improved source of resistance to yellow rust.

In 2002, it was introduced via the 34th International Triticale Screening Nursery (ITSN) as entry T0200A-040 and grown near Swift Current, SK, as a paired row plot. It was selected for further testing in Canada because it had large kernels and high grain yield and test weight, and shorter straw than other Canadian cultivars. In 2003, it was entered into the Triticale "A" Test grown at four locations near Swift Current, Stewart Valley, Regina and Indian Head, SK. It was advanced to the Triticale "B" Test in 2004 grown at seven locations near Swift Current, Stewart Valley, Regina and Indian Head, SK and Lacombe, Trochu and Olds, AB. T0200A-040 was tested as T196 in the Western Spring Triticale Co-operative Test from 2005 to 2007, inclusive. Tests were grown near Morden, MB; Indian Head, Saskatoon, Swift Current, Stewart Valley, Regina, SK; Lethbridge, Lacombe, AB, in 2005 to 2007, inclusively; and near Winnipeg, MB, in 2006 and 2007. Bumper was assessed for resistance to the prevalent races of leaf rust (caused by *Puccinia recondita* Rob. Ex Desm. f. sp. *tritici*), stem rust (caused by *P. graminis* Pers.:Pers f. sp. *tritici* Eriks. & E. Henn.) in inoculated nurseries near Glenlea, MB. It was assessed for resistance to common bunt [caused by *Tilletia foetida* (Wallr.) Liro and *T. caries* (DC) Tul.] in inoculated nurseries near Lethbridge, AB. *Fusarium*

head blight {caused by *Fusarium graminearum* Schwaub, GroupII [telomorph *Gibberella zeae* (Schwein) Petch]} was evaluated in inoculated nurseries near Carman and Glenlea, MB.

Performance and Adaptation

Bumper is well adapted to the soils of the Canadian Prairies. Averaged over 26 site years, the grain yield of Bumper was similar to that of the check cultivars, Pronghorn (Salmon et al. 1997), AC Certa (McLeod et al. 1996) and AC Ultima (McLeod et al. 2000) (Table 1). Similarly, the grain yield of Bumper was equal to that of the check cultivars in each of the soil zones.

Bumper headed and matured in about the same number of days as the check cultivars. Bumper was significantly shorter than all of the check cultivars (Table 2). The lodging resistance of Bumper was better than that of Pronghorn and equal to that of AC Certa and AC Ultima. The test weight of Bumper was equal to that of AC Certa, the best check cultivar and significantly greater than that of Pronghorn and AC Ultima. The kernel weight of Bumper was significantly greater than that of AC Certa and equal to that of

Table 1. Mean grain yield performance of Bumper compared with that of the checks, based on data from the Western Triticale Co-operative Tests, 2005–2007, inclusive

Cultivar	Yield (kg ha ⁻¹)			
	Zone 1 ^z	Zone 2	Zone 3	Mean ^y
Pronghorn	3680	3899	8531	4353
AC Certa	3788	4215	7487	4430
AC Ultima	3717	4110	8190	4430
Bumper	3988	4293	8428	4656
LSD (<i>P</i> = 0.05) ^x	446	569	954	409
No. of tests	11	12	3	26

^zZone 1, Black soils of Manitoba and Saskatchewan; Zone 2, Brown and Dark Brown soils of Saskatchewan and Alberta; Zone 3, Black Soils of Alberta.

^yAll means are weighted by the number of tests within a zone.

^xLSD of means was based on the checks and Bumper and calculated using the SAS PROC MIXED procedure (SAS Institute, Inc. 2006).

Table 2. Means for agronomic performance of Bumper compared with that of the checks, based on data from the Western Spring Triticale Co-operative Tests, 2005–2007, inclusive

Cultivar	Heading (d)	Maturity (d)	Height (cm)	Lodging (1–9) ^z	Test weight (kg ha ⁻¹)	Kernel weight (mg)	Hagberg falling number (s)
Pronghorn	56	101	103	5	67.9	41.1	74
AC Certa	55	102	104	4	72.7	40.4	75
AC Ultima	55	99	97	4	68.4	42.3	167
Bumper	56	100	92	4	71.7	42.6	95
LSD (<i>P</i> = 0.05) ^y	1	2	2	1	1.3	2.1	33
No. of Stations	12	20	23	4	25	25	25

^z= all plants are standing; 9=all plants are lying horizontally.

^yLSD of means was based on the checks and Bumper and calculated using the SAS PROC MIXED procedure (SAS Institute, Inc. 2006). Data consists of single measurements made for each site and year.

Pronghorn and AC Ultima. The Hagberg Falling Number of Bumper was significantly less than that of AC Ultima and equal to that of Pronghorn and AC Certa.

Disease Reaction

Bumper was resistant to the prevalent races of leaf rust, stem rust and common bunt (Table 3). Bumper was moderately resistant to Fusarium head blight.

End Use Suitability

Bumper is eligible for the Canada grades of triticale. It is suitable for use as an ultra-high-yielding feed grain, as a high-quality grain for ethanol feedstock and for specialty baked goods. The Hagberg Falling Number of Bumper was not as good as that of AC Ultima but somewhat better than that of AC Certa and Pronghorn.

Other Characteristics

Plant characteristics were recorded from greenhouse increases and experimental field plots grown in 2009 at Lethbridge, AB.

Seedling Characteristics

COLEOPTILE COLOUR: Anthocyanin colouration absent.

JUVENILE GROWTH HABIT: Erect.

TILLERING CAPACITY (AT LOW DENSITIES): Medium.

Adult Plant Characteristics

GROWTH HABIT: Intermediate.

FLAG LEAF: Dark green, weak auricle colouration, and auricle margins are glabrous. Flag leaf sheath has no waxy bloom.

FLAG LEAF ATTITUDE: Erect.

UPPER CULM INTERNODE: Curved at maturity. Hollow stemmed with a thin wall, pubescence of neck is sparse. MATURITY: Medium, 2 d earlier than Pronghorn and 2 d later than AC Ultima.

PLANT HEIGHT: Semi dwarf in height, about 16 cm shorter than Pronghorn and 11 cm shorter than AC Ultima.

LODGING RESISTANCE: Stronger straw strength.

Spike Characteristics

SHAPE: Tapering.

LENGTH: Medium, similar to AC Ultima, slightly smaller than Pronghorn.

DENSITY: Medium.

ATTITUDE: Erect.

COLOUR: White at maturity.

AWNS: Awned.

Spikelet Characteristics

GLUMES: Lower glume long, hairiness on external surface. Glumes white at maturity.

Table 3. Disease reaction of Bumper compared with the checks based on data from the Western Spring Triticale Co-operative Tests, 2005–2007, inclusive

Cultivar	Year	Rust ^z			Fusarium head blight			Common Bunt	
		Leaf	Stem	Glenlea, MB	Carman, MB	DON	Reaction	Class	
		Severity	Severity	%VRI ^y	%VRI	ppm	Reaction	Class	
Pronghorn	2005	0	20	14	—	—	0	R	
	2006	0	20	5	15	3.7	0	VR	
	2007	0	0	17	17	5.1	0	VR	
AC Certa	2005	5	1	26	—	—	0	R	
	2006	0.3	1	31	35	11.0	0	VR	
	2007	0	0	12	18	7.7	0	VR	
AC Ultima	2005	0	1	62	—	—	0	R	
	2006	0	1	50	35	14.0	0	VR	
	2007	0	0	30	34	14.9	0	VR	
Bumper	2005	0	1	19	—	—	0	R	
	2006	0	1	24	50	11.2	—	—	
	2007	0	0	26	18	11.0	—	—	

^zRust reaction: R = resistant; VR = very resistant; number indicates percent infection.

^yPercent VRI = severity estimate by visual rating index = (% infected spikelets × % infected spikes)/100.

*Resistance class, R = resistant; MR = moderately resistant; MS = moderately susceptible; S = susceptible; I = intermediate.

Kernel Characteristics

TYPE: Soft and red in colour.

SHAPE: Elliptical with rounded to slightly angular cheeks.

SIZE: Large sized with long length and mid-wide width.

BRUSH: Large-sized with mid-long to long brush length.

EMBRYO: Rounded to angular cheeks, crease is mid-wide and mid-deep.

GERM is large and oval in shape;

PHENOL reaction is black.

Seed Maintenance and distribution

Final seed purification of Bumper was started in 2005 with the selection of 200 single plants. These were sown as 3-m rows in 2006 near Swift Current. Rows with off types were discarded and 148 selected rows were harvested. Seed from each of the 148 rows was sown in a 15-m row in 2007 near Indian Head, SK. Again, rows with off types were discarded and 134 rows were harvested in bulk to form the Breeder seed lot of about 300 kg. Bumper has been released to SeCan Association, 501-300 March Road., Kanata, Ontario, Canada K2K 2E2, for multiplication, distribution and marketing. Breeder seed will be maintained by the Seed Increase Unit of the Experimental Farm, Research Branch, Agriculture and Agri-Food Canada, Indian Head, Saskatchewan, Canada S0G 2K0. Plant Breeders' Rights will be sought for Bumper.

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