Registration of ‘Guymon’ Wheat


ABSTRACT

‘Guymon’ (Reg. No. CV-1018, PI 643133) is a hard white (HW) winter wheat (Triticum aestivum L.) cultivar developed and released cooperatively by the Oklahoma Agric. Exp. Stn. (AES) and the USDA-ARS in 2005. It is recommended for areas of the southern High Plains centered by the city serving as its namesake, Guymon, OK.

‘Guymon’ is an F₂-derived line selected from the cross, OK95G701/WI89-163W, performed in 1995. OK95G701 was eventually released by the Oklahoma AES and the USDA-ARS as ‘Intrada’ (Carver et al., 2003), whereas WI89-163W was subsequently named and released by AgriPro-Coker as ‘Plate’ (R.G. Sears, personal communication, 2007). Single heads were collected from a F₂ bulk population grown at Stillwater, OK in 1997. In the following year, selection was imposed in Stillwater, OK on 96 F₂, head rows of this population based on late-spring freeze tolerance, stem extension, spike density and size, kernel size, uniformity of phenotype at harvest maturity, and consistent kernel color. An unusually high proportion of head rows (19%) was selected from this population due to desirable kernel color, color uniformity, and within-line plant uniformity. Fourteen head rows were advanced for progeny evaluation. The head-row progeny was evaluated in 1999 at Stillwater and Lahoma, OK and selected on the basis of forage accumulation, fall vegetative growth habit, simulated-grazing tolerance, spring green-up, heading date, test weight, grain yield, wheat protein content, kernel hardness, and kernel size. Subsequent generations were advanced by bulk-selfing in the field. Minimal roguing of slightly taller variants was performed each year until 2004 despite this line being F₂-derived. With an initial frequency of 1.5% red kernels, seed from the 2003 harvest were passed through a single-kernel sorter to reduce the frequency of red kernels to < 0.3% (Engineering Research Unit, USDA-ARS-GMPRC, Manhattan, KS). From a final breeder-seed increase in 2004, we detected 0.0 to 0.2% red kernels based on the NaOH-bleach test (Ram et al., 2002) of multiple samples. As of the 2006–2007 crop year, Guymon is a F₂-derived line in the F₄ generation.

Using OK00618W as the experimental designation, Guymon appeared in replicated breeder nurseries conducted throughout Oklahoma from 2000 through 2004, in the 2003 USDA-ARS Regional Germplasm Observation Nursery (entry 161), in the Southern Regional Performance Nursery (SRPN) in 2004 (entry 18) and 2005 (entry 37), and in the 2004 Hard Winter Wheat Milling and Baking Evaluation Program conducted by the Wheat Quality Council. It was also included in the Oklahoma State University Wheat Variety Trials (OWVT) beginning in 2004.

Guymon is a moderately tall, semidwarf wheat, with relatively early arrival to first-hollow-stem (FHS) stage but moderately late heading date. Averaged across two years (2004 and 2005), it reached the FHS stage in central Oklahoma 1 d later than the early FHS-stage cultivars, Jagger (Sears et al., 1997) and Intrada, but 16 d earlier than the late FHS-stage cultivar, ‘Trego’ (Martin et al., 2001). Heading date for Guymon is 2 d later than both Intrada and Trego, and 5 d later than Jagger. Similar to Intrada and Jagger, Guymon shows rapid stand establishment with low sensitivity to high temperature (35°C ambient temperature) during germination. Its semi-erect to erect vegetative growth habit (similar to Intrada, but appears slightly less aggressive in fall forage accumulation) is a distinguishing characteristic versus the prostrate growth habit and conservative growth pattern of Trego. Plant height of Guymon in Oklahoma is 80 cm, or about 2 cm taller than Intrada and Trego. Based only on environments with moderate to severe lodging, Guymon scored a mean rating of 2.4 on a scale of 1 (tolerant) to 5 (susceptible), compared with 2.7 for Intrada and 3.3 for Jagger. Guymon is susceptible to pre-harvest lodging.
Asian fresh noodle products based on evaluation of multi-locus effect of Barley yellow dwarf virus, Wheat spindle streak mosaic virus, Barley yellow dwarf virus, and to Hessian fly (Mayetiola destructor).

Flag leaves of Guymon at the boot stage are green, recurved, twisted, and non-waxy. spikes are white-chaffed, awned, oblong, lax, and recurved at harvest-maturity. Kernels are white, hard-textured, elliptical, and they have a midwide, shallow crease, angular cheeks, and large germ.

Across 30 grain-only sites of the 2004 SRPN, Guymon ranked 28th among 50 entries, with a mean yield of 3890 kg ha\(^{-1}\), compared with 131 g kg\(^{-1}\) flour yield and flour ash, respectively. Wheat and flour protein (140 g kg\(^{-1}\) moisture basis) averaged 130 g kg\(^{-1}\) and 116 g kg\(^{-1}\) for Guymon, respectively, compared with 131 g kg\(^{-1}\) and 117 g kg\(^{-1}\) for OK Bullet. Straight-dough baking quality of Guymon is considered above-average, with 616 g kg\(^{-1}\) bake absorption, mixing tolerance score of 3.0 on a 0 (poor)-to-6 (good) scale, 4.2 min bake mixing time, 925 cc loaf volume, 73 loaf-volume regression score, and 4.5 for crumb-grain score on a 0 (poor)-to-6 (good) scale. Corresponding values for OK Bullet were 674 g kg\(^{-1}\) bake absorption, 4.0 mixing tolerance score, 5.2 min bake mixing time, 857 cc loaf volume, 64 loaf-volume regression score, and 4.0 crumb-grain score.

The American Assoc. of Cereal Chemists (AACC) method 22–85 was modified by the HWWQL using ground wheat rather than whole-kernel samples to measure polyphenol oxidase (PPO) activity. Guymon's PPO score averaged 0.474 absorbance units, which may restrict its use in some Asian fresh noodle products such as white salted noodles. Procedures described by Guo et al. (2003) were adopted by the HWWQL to determine alkaline noodle color stability. Guymon showed a mean initial alkaline noodle brightness of 81.1 CIE L* units and a 24-hr decline in brightness of 8.35 CIE L* units. High-molecular-weight glutenin subunits which are present in Guymon at the Glu-A1, Glu-B1, and Glu-D1 loci are, respectively, 2*, 20x+20y, and 5+10 (Shan et al., 2007). Guymon is void of any wheat-rye translocation, and it contains no wx-B1 null allele at the granule-bound starch synthase (GBSS) locus based on the GBSS-gene specific primer no. 4 designed by McLauchlan et al. (2001).

Small quantities of seed may be obtained from the corresponding author for at least five years for research purposes, including use in development and commercialization of new cultivars. Seed has been deposited in the National Plant Germplasm System. Authorized seed classes are Breeder, Foundation, Registered, and Certified. The Oklahoma Agricultural Experiment Station will maintain Breeder seed. Application for U.S. Plant Variety Protection (Title V) has been filed (no. 200600257).

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References


