Description of cultivar

Faisán S2016: new variety of weak gluten flour wheat for El Bajío

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Abstract

Faisan S2016 is a variety of soft wheat whose flour is useful for the biscuit industry or for use in mixtures to improve strong gluten wheats. It is moderately resistant to yellow rust and shows great stability over a wide range of planting dates and irrigation schedules. Its yield exceeded by 16.8 and 18.6% the varieties of soft wheats Urbina S2007 and Maya S2007, released in 2007 and up to 21% Cortazar S94, the most sown variety in El Bajío. obtained the title of breeder, being protected until May 18, 2032; it is also registered and published in the national catalog of plant varieties, which makes it possible to consider it in the seed qualification and production programs.

Keywords: water use efficiency, wheat dryer, yellow rust.

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In accordance with the law of production, certification and trade of seeds in force in Mexico, and after having met the requirements set by the International Union for the Protection of Plant Varieties (UPOV), the variety Faisán S2016 obtained the title of breeder 1699 being protected in the national catalog of plant varieties (CNVV) by INIFAP until May 18, 2032.

The variety of wheat flour Faisán S2016 is of spring habit and was obtained in the Program of Genetic Improvement of Wheat of the INIFAP in the Experimental Field Bajío (CEBAJ), by hybridization and selection; through the method of mass genetic improvement with selection, through a cross between the parents PASA/CUBA//CIRA/3/LOTH/GRACIA, whose cross number and selection history is TR05CS191-3C-0R-0C-2RSE- 1CSE-0R.

During the selection process the F_1 generation was massively harvested in Celaya, Guanajuato. In F_2, the plant recognized as 3C was individually threshed in Texcoco, State of Mexico, F_3 was harvested massively in Celaya, Guanajuato. In the autumn-winter (AW) 2007-2008 cycle, F_4 was massively harvested in Texcoco, State of Mexico during the summer of 2008.

Generation F_5 was sown in Celaya, Guanajuato., in the 2008-2009 AW cycle and spike selection was applied in the selected families, in this case the spike identified as 2RSE was advanced as line F_6. In the F_6 generation, spike selection was applied in the selected families, in this case the spike identified as 1CSE was advanced as the F_7 line. Finally, in the AW 2009-2010 cycle, the F_7 generation was massively harvested in Celaya, Guanajuato., having found no appreciable phenotypic differences. As of 2010-2011, performance testing was carried out in the CEBAJ and in the 2013-2014, 2014-2015, 2015-2016 and 2016-2017 cycles in different locations in the El Bajío region.

The variety Faisán S2016 is a habit of growth of spring, semi-dwarf, 92 cm high, its vegetative cycle is intermediate, with 78 days to flowering and 132 days to physiological maturity. The stem of the Faisán S2016 variety is strong, hollow, cream colored and moderately resistant to the finish. The spike is light colored, pyramidal, with beards and medium length. It usually produces three grains per spikelet at the base, four in the middle and three at the apex.

The glumes are white, short-billed, slightly curved. The predominant shape of the shoulder is straight and of medium width. The extent of glume's internal hairiness is weak. The grain is white, ovoid, rounded edges and weak endosperm, with a response to medium phenol.

The seedling resistance of Faisán S2016 was determined by inoculating with 18 breeds of leaf rust. In the variety Faisán S2016, the presence of 5 resistance genes in the seedling state was postulated: Lr3, Lr13, 16, 17 and 23. Of all the postulated resistance genes, only Lr16 is effective in seedling and confers partial resistance in plant adult Lr3, 13, 17 and 23 are not effective against the two most common races in Mexico that are MBJ/SP and MCJ/SP.

In adult plants, Faisán resistance S2016 is based on the action of three to four additive effect genes. One of these genes is the Lr46 gene located on chromosome 1BL and initially identified in the Pavón F76 variety (William *et al*., 2003). Lr46 has been associated with leaf tip burn (Rosewarne *et al*., 2006) and its presence was determined by the use of a molecular marker. Lr46 is present in varieties such as Salamanca S75 (Kolmer *et al*. 1998) and Alondra F2014 (Solis *et al*., 2016).

The new variety bases its resistance to linear rust on at least three slow-growing genes in an adult plant (Singh *et al*. 2001), one of them the Yr29 gene linked to the leaf rust gene Lr46 (William *et al*. 2003) and also associated with leaf tip burn (Rosewarne *et al*., 2006) and the second is Yr30 linked to the stem rust resistance gene Sr2 (Singh *et al*., 2005).

The variety Faisan S2016 presented a moderate resistance to the drying of the wheat caused by the fungus *Fusarium proliferatum*, the damage in the root did not exceed 25%, however, Urbina S2007 obtained up to 50% of infection in the root, for the rot of the crown caused by this same fungus Faisan S2016 reached up to 27% infection while Urbina S2007 presented 44%.

In wheat producing regions where there are problems with the wheat dryer, it is recommended to supplement the sowing of Faisán S2016 with a seed treatment using either the fungicide Carboxim + Thiram (Vitavax®) at a dose of 250 mL in 100 kg of seed or Chlorothalonil at a dose of 250 g in 100 kg of seed.

The potential yield of Faisán S2016 is greater than 9 t ha^{-1}, its optimum planting period is from December 1 to 15, although it is suggested to sow it from November 16 to December 31, it can still be sown in January where it exceeds all commercial varieties

When comparing on planting dates the average yield of Faisán S2016 with that obtained by the varieties recommended for El Bajío, during the autumn winter cycles 2013-2014 to 2016-2017 it was observed that the new variety exceeded Eneida F94 with 41.3%, a Luminaire F2012 with 31.8%, to Salamanca S75 with 28.1%; to Barcenas S2002 with 17.5%; to Cortazar S94 with 17.3%, to Maya S2007 with 15.7%; at Urbina S2002 with 14.4% and Alondra F2014 with 7.5%, its yield was superior to any variety in both early and late planting dates.

In evaluations under restricted irrigation, with two irrigations it obtained a yield of 5 831 kg ha^{-1}, 1.2% higher than the commercial variety with the greatest yield potential (Alondra F2014) and 18.5% the Cortazar S94 variety, the most widely planted in El Bajio. With three risks, it obtained a yield of 7018 kg ha^{-1}, 7 and 14.1% higher than Alondra F2014 and Cortazar S94, respectively. Faisan S2016 was evaluated in 14 locations of the Bajío in the 2013-2014 to 2016-2017 cycles, in these tests it exceeded the performance of Urbina S2007, Barcenas S2002, Cortazar S94, Alondra F2014, Maya S2007, Salamanca S75 and Luminaire F2012 with 7, 5.3, 13.1, 5.3, 9.3, 13.3 and 19.8%, respectively.

The new wheat variety Faisan S2016, like the Urbina S2007 and Barcenas S2002 varieties is white grain. The average hectolitic weight of Faisan S2016 (77.5) is 2 to 3.8 kg hL^{-1} higher than that of the Maya S2007, Barcenas S2002 and Urbina S2007 control varieties. Faisan S2016 grain is soft, according to its average pearl index, greater than 60%. Faisán S2016 has an average grain protein content (12.3%), similar to the Barcenas S2002 control variety (12.5%) and 0.6-0.8% lower than that of the Maya S2007 (12.9%) and Urbina S2007 (13.1%) varieties, respectively.

The dough obtained from the Faisan flour S2016, presented an average gluten strength (W) of 150 $x10^{-4}$ J, which allows it to be characterized as a weak gluten wheat, a condition consistent with the smoothness of the grain. The average gluten strength of Faisán S2016 was lower than that of the

control varieties Urbina S2007, Maya S2007 and Barcenas S2002 (W from 160 to 192 x 10^{-4} J). The gluten strength of Faisán S2016, was located in the values corresponding to weak gluten wheats (W <200 x 10^{-4} J). Faisán S2016 presented an average P/L index value of 1, which corresponds to a balanced gluten; while the control varieties of weak gluten: Urbina S2007, Maya S2007 and Barcenas S2002, presented extensible gluten (P/L from 0.5 to 0.7).

The biscuit factor of the Faisán S2016 variety was similar to that of the control variety Maya S2007, but less than that of the control varieties: Urbina S2007 and Barcenas S2002. In spite of the above, the biscuit factors of the new Faisán S2016 soft wheat variety and the three control varieties, corresponded to the "very good quality of biscuit" rating. Therefore, the new variety of Faisán S2016 soft wheat has the quality characteristics of flour suitable for use in cookie making. Faisán S2016 presents GAPM where the Glu A1 2^{*}, Glu B1 7+9 and Glu D1 2+12, subunits predominate, which have been associated with weak gluten wheats, which have adequate dough strength for cookie making (Martínez *et al*., 2013).

The new variety of Faisán S2016 soft wheat presents commercial quality parameters that ensure its competitiveness in the market, industrial quality that ensures its aptitude to be used in the production of products that demand weak gluten meal as raw material and finally, strength properties and gluten extensibility that favor its use as a tenacious strong gluten flour improver.

The new Faisán S2016 variety is recommended for the El Bajío region, which includes part of the states of Guanajuato, Michoacán, Jalisco and Querétaro, with heights of 1 500 to 1 800 masl, average temperature of 20 ºC and precipitation of 450 to 650 mm. Faisán S2016 basic seed is available at INIFAP-Experimental Field Bajío for sale to seed producing companies that request it since December 2017.

Conclusions

The variety Faisán S2016 exceeded the yield of commercial varieties currently in use in trials at planting dates, is more efficient in the use of water, moderately resistant to yellow and leaf linear rust, is more resistant to wheat drying and Its cookie quality is similar to that of weak gluten varieties.

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