



CULTIVAR RELEASE

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IPR CATUARA TM – new cultivar of high gluten wheat

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Abstract – *The wheat cultivar IPR Catuara TM, obtained from a cross between the line LD 975 and the cultivar IPR 85, exhibits high gluten strength, which will allow the milling industry to supplement flours from wheats with weaker gluten strength, resulting in better quality products for the final consumer.*

Key words: *Triticum aestivum, genetic breeding, gluten strength.*

INTRODUCTION

Brazilian agricultural research has contributed significantly to increasing the yield and quality of Brazilian wheat. According to Marchioro et al. (2013), the processing quality at the time of wheat sale has gained importance and the value of certain cultivars can be improved for this trait. A leap in yield may be seen in data from CONAB (2014), which show a mean yield of 655 kg ha⁻¹ in 1977 and a projection of 2816 kg ha⁻¹ for the 2014 crop season. This corresponds to an increase in the volume of production from 2 million tons to approximately 7.3 million tons (estimate for 2014) in this same period.

The development of new wheat cultivars has been one of the main goals of the Winter Cereal Crop Program (Programa Cereais de Inverno – PCI) and Plant Breeding and Genetics Area (Área de Melhoramento e Genética Vegetal – AMG) of the Instituto Agronômico do Paraná – IAPAR over the past three decades (Moda-Cirino et al. 2012). They have been contributing to the stability of the chain of production of this important winter cereal crop in Brazil in a significant way (Riede et al. 2001). The following key objectives may be highlighted: an increase in grain yield, improvement in technological and nutritional quality, resistance to prevalent diseases, and tolerance to environmental stresses, such as aluminum (Costa et al. 2003) and pre-harvest sprouting (Pagliosa et al. 2014).

BREEDING METHODS USED

The wheat (*Triticum aestivum* L.) cultivar IPR Catuara TM was developed by IAPAR in partnership with the Fundação Meridional de Apoio à Pesquisa Agropecuária, arising from the single cross between the line LD 975 (PF 853048/IAPAR 18 – Marumbi) and the cultivar IPR 85 (IAPAR 30 – Piratã/BR 18 – Terena), codified with no. 22246, in chronological order of wheat crosses at IAPAR, carried out in the 1998 crop year, and whose genealogy or derivation process is IP9822246-2L-1L-1L-4L-0L. The letter L refers to Londrina, PR, Brazil, the location where the crossing and selection processes were carried out, and the numbers refer to the selection method used (0 = mass selection, and 1L, 2L, and 4L refer to the number of plants selected by the pedigree method).

The Genealogical genetic breeding method was used and, as of the F₂ generation, individual plants were selected whose progenies were evaluated, re-selected, or discarded in the successive generations of self-pollination up to the F₆ generation. The line LD 081102 was developed from this process and evaluated over a one-year period in augmented blocks design and two years in Preliminary Trials for Grain Yield, comparing it to 4 control cultivars (Riede et al. 2001).

As the line LD 081102 stood out in the previous evaluations, it was promoted to Regional VCU (Value for Cultivation and Use) Trials, conducted by the partnership network IAPAR x Fundação Meridional x Embrapa Soja in the different regions of adaptation of the states of Parana São Paulo, Mato Grosso do Sul, and Santa Catarina, in the

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2008 to 2010 crop years. Diverse analyses of Technological Quality were carried out simultaneously.

The line LD 081102 passed through a meeting for ranking of lines, and its release as a new cultivar, called IPR Catuara TM, was determined. The name Catuara means “good ear” in the tupi-guarani indigenous language, and the abbreviation TM indicates *Trigo Melhorador de Qualidade* (wheat with high gluten strength).

PERFORMANCE

The cultivar belongs to the bioclimatic group of spring wheats, exhibiting, in the mean value of the experiments in which it was evaluated, an early cycle (59 days from emergence to heading and 112 days to maturity), medium stature (87 cm), moderate susceptibility to lodging, and moderate resistance to natural shattering. According to Marchioro (2014), producers are generally interested in early-maturity cultivars, in order to anticipate wheat harvest and the sowing of the following crop.

The heads have awns, light colored, and fusiform. The grains are oval shaped, reddish in color, and hard textured. It showed moderate aluminum tolerance, and moderate resistance to moderate susceptibility to pre-harvest sprouting.

In relation to the main diseases occurring in the regions of evaluation, it showed moderate susceptibility to leaf rust (*Puccinia triticina*), to powdery mildew (*Blumeria*

graminis f.sp. tritici), to leaf spotting complex (*Drechslera tritici-repentis*, *Bipolaris sorokiniana*, and *Stagonospora nodorum*), and to wheat blast (*Pyricularia grisea*); moderate resistance to SBWV (Mosaic Virus) and to BYDV (Barley Yellow Dwarf Virus); and susceptibility to head blight (*Gibberella zeae*).

The grain yield observed in 71 VCU Trials, conducted in the regions of adaptation 1 (South), 2 (Center-West), and 3 (North) of Parana, as well as 3 (Mato Grosso do Sul), are shown in Table 1. The mean superiority of grain yield in these regions was 6%. The greatest yields were obtained in regions 2 and 1 of Parana. In addition, 12 VCU Trials were conducted in adaptation regions 2 and 3 of São Paulo, and 1 and 2 of Santa Catarina, showing superiority of 1% in the four regions (Table 2). The greatest yield was obtained in region 2 of São Paulo, under complementary irrigation conditions (Table 3).

Technological quality was evaluated in 16 tests as shown in Table 4. It is a cultivar classified as High Gluten Wheat, exhibiting a mean alveograph value (W) of 407×10^{-4} J, P/L ratio of 0.93, characterizing balanced gluten strength (AACC 1995). In relation to data on quality per region of adaptation, due to the large effect of the genotype x environment interaction for this trait for regions 1 of PR and SC, the cultivar may be classified as bread wheat. IPR Catuara TM exhibits glutenin subunits (high molecular weight) 1, 17 + 18, 5 + 10, indicating excellent quality.

Table 1. Mean grain yield (kg ha⁻¹) of the cultivar IPR Catuara TM in VCU regions of the states of Parana and Mato Grosso do Sul, Brazil

VCU	Trials ¹	UF	2008	2009	2010	Mean	%T ⁶
R1	8	PR ²	5012	4214	3800	4410	98%
R2	22	PR ³	5102	4013	4660	4615	105%
R3	31	PR ⁴	4513	3550	4728	4286	113%
R3	10	MS ⁵	3139	3021	3445	3195	109%
Total	71	Mean	4442	3700	4087	4126	106%

¹ Number of trials per region of adaptation

² Trials in the locations of Ponta Grossa, Guarapuava, and Irati

³ Trials in the locations of Campo Mourão, Mauá da Serra, Cascavel, Pato Branco, and Tibagi

⁴ Trials in the locations of Cruzmaltina, Cambará, Londrina, Warta, and Palotina

⁵ Trials in the locations of Dourados, Maracajú, and Antonio João

⁶ Percentage of yield in relation to the mean value of the two best controls of the trials, IPR 85 and BRS 220

Table 2. Mean grain yield (kg ha⁻¹) of the cultivar IPR Catuara TM in VCU regions of the states of São Paulo and Santa Catarina, Brazil

VCU	Trials ¹	UF	2008	2009	2010	Mean	%T ⁶
R1	3	SC ⁴	4873	4517	2837	4076	100%
R2	3	SC ⁵	3835	3794	3857	3829	100%
R2	3	SP ^{2*}	5799	3523	6943	5422	94%
R3	3	SP ³	3932	3021	2429	3127	108%
Total	12	Média	4610	3714	4017	4114	101%

¹ Number of trials per region of adaptation.

² Trials in the locations of Itaberá, conducted under complementary irrigation conditions

³ Trials in the locations of Ibirarema

⁴ Trials in the locations of Campos Novos

⁵ Trials in the locations of Campo Erê

⁶ Percentage of yield in relation to the mean value of the two best controls of the trials, IPR 85 and BRS 220

Table 3. Mean grain yield (kg ha⁻¹) of the cultivar IPR Catuara TM in the VCU macroregions in Brazil

VCU	Trials ¹	2008	2009	2010	Mean	%T ²
R1	11	4943	4366	3319	4209	99%
R2	28	4912	3777	5153	4614	100%
R3	44	3861	3197	3534	3531	110%
Total	83	4572	3780	4002	4118	103%

¹ Total number of trials per region of adaptation

² Percentage of yield in relation to the mean value of the two best controls of the trials, IPR 85 and BRS 220

Table 4. Evaluation of technological quality of the wheat cultivar IPR Catuara TM in three VCU regions over two crop seasons (2008 and 2009)

VCU	UF	PROT	FN	P	L	P/L	W	AA ¹
R1	PR+SC	17.55 %	473	74	128	0.63	257	2
R2	PR+SP	18.35 %	501	104	149	0.73	461	6
R3	PR+SP	18.51 %	521	120	114	1.22	425	8
		18.23 %	505	105	130	0.93	407	16

¹ Number of environments of evaluation

PROT: refers to the percentage of protein in the grain; FN: Falling number (seconds); P: tensile strength or maximum force of rupture; L: extensibility (mm); P/L: tensile strength / extensibility ratio; W: gluten strength (x 10⁻⁴ joules)

In conclusion, the wheat cultivar IPR Catuara TM represents an excellent contribution to the Wheat Chain of Production, providing a greater economic return to the wheat grower. The milling industry will have grain of excellent quality improvement, i.e., high gluten strength, which will allow its flour to be used in mixtures with weaker gluten wheat flours (domestic, all-purpose wheat flours) and the consumer will have a product of better quality, uniformity, and flavor.

SEED PRODUCTION AND DISTRIBUTION

The wheat cultivar IPR Catuara TM is registered in

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the Ministério da Agricultura Pecuária e Abastecimento (MAPA) [Ministry of Agriculture] under no. 27495, and the certificate of protection issued by the National Cultivar Protection Service under no. 20120180, with the period of protection beginning on 16/02/2012.

Foreseeing seed commercialization in 2011, there was an initial stock of 600 50-kg bags (30 tons) of basic seed. New multiplication of genetic and basic seeds were carried out in the 2012 and 2013 crop seasons, with approximately 1000 bags made available to seed producers. Various field days, with demonstration units of the new cultivar, have been carried out since 2011, seeking to pass this new option for the wheat crop on to producers.