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Cultivar Wheat BRS 264: precocity, industrial quality and high yields for the Cerrado of Central Brazil

Julius Caesar Albrecht



Cultivar Wheat BRS 264: precocity, industrial quality and high yields for the Cerrado of Central Brazil¹

Introduction

In the Cerrado region of Central Brazil, the area cultivated with wheat in the rainfed (safrinha) and irrigated production systems, in 2020, was around 230 thousand hectares. This area has been growing significantly each year. The average productivity of rainfed production is approximately 1.5 t/grains/ha and of irrigated production is 6 t/grains/ha. The area with potential to produce wheat in the region is approximately 2.5 million hectares.

Embrapa, believing in this potential, has been developing research work in the region since the mid-1970s.

Embrapa, through the Wheat Genetic Improvement Program for Brazil, has been launching, in the Cerrado region, super-early cultivars, with greater productivity, resistance/tolerance to environmental stresses and diseases and with ideal characteristics for each industrial class of wheat. At the *Meeting of the Brazilian Commission for Research on Wheat and Triticale*, the network of experiments, conducted in the Cerrado of Central Brazil, indicated to wheat growers the most suitable cultivars for each wheat growing region for rainfed cultivation (safrinha) or for the cropping system irrigated.

The cultivars indicated by Embrapa for Central Brazil have a high productive potential, with possibilities of reaching up to 8 t/grains/ha with excellent industrial quality for breadmaking. However, Embrapa has always been renewing and ensuring diversification, launching new wheat cultivars that adapt to different growing conditions, ensuring greater production stability.

¹ **Júlio César Albrecht**, agronomist, master in plant breeding, researcher at Embrapa Cerrados, Planaltina, DF.

In 2006, Embrapa launched the BRS 264 wheat cultivar, a genetic material with high productive potential, wide adaptability, satisfactory agronomic characteristics, mainly very early cycle, grain color, grain hardness and lodging tolerance, in addition to industrial quality. for baking.

BRS 264 has been the most used wheat cultivar in the Cerrado region in the last 10 years (2010 to 2020), it was the most planted cultivar in the wheat growing region of DF and GO; occupies approximately 75% of the cultivated area in that region. It stands out for its high productivity, precocity, tolerance to aluminum toxicity, tolerance to brown spot, adaptation to higher temperatures and water deficit. For this reason, it continues to be used in large areas of wheat cultivation.

The objective of this publication was to present the main characteristics of the BRS 264 cultivar and some information about its cultivation, with a view to helping producers, wheat research professionals, technical assistance agents and students in adopting more appropriate practices so that this cultivar to express all its genetic potential of productivity and quality of grains for bakery.

Historic

The wheat cultivar BRS 264 comes from the crossing Buckbuck/Chiroca// Tui, carried out by the International Center for the Improvement of Corn and Wheat (CIMMYT) in Mexico, and selection from the F2 population, carried out at Embrapa Cerrados, in Planaltina, DF . The F2 population was sent by CIMMYT to Embrapa Cerrados and sown under field conditions in 1992 and conducted by the mass breeding method. In 1993 and 1994, the F3 and F4 generations were carried out in Planaltina, DF, by the genealogical method, respectively, when agronomically superior plants were selected. After grain selection, the seeds of a plant selected in F4 gave rise to populations F5 and F6, which were conducted by the mass improvement method in Planaltina, DF, at Embrapa Cerrados, in the years 1995 and 1996. In 1997 , the seeds originating from a plant selected in the F6 population were sown in the field (F7 generation) and after evaluation, the strain called CPAC 98222 was selected,

which was multiplied in 1998, in the F8 generation. After multiplication, this lineage was promoted to the preliminary tests of the first year of evaluation of grain yield, in which it stood out in terms of plant uniformity and tolerance to lodging, continuing until the Value of Cultivation and Use (VCU) tests for Region IV (Hot, Dry-Cerrado – São Paulo, Mato Grosso do Sul, Mato Grosso, Minas Gerais, Goiás, Federal District and Bahia), conducted in 27 environments between 2002 and 2005, in partnership with the following institutions : Embrapa Rice and Beans, Agricultural Research Company of Minas Gerais (Epamig), Higher School of Agricultural Sciences of Rio Verde (ESUCARV), Agricultural Cooperative of the Federal District Region Ltd (COOPADF), Mixed Agricultural Cooperative of the Directed Settlement Program of the Alto Paranaíba Ltda (COOPADAP) and University of Viçosa (UFV).

Due to its performance in the VCU tests, the cultivar BRS 264 (experimental lineage CPAC 98222) was approved by the Brazilian Commission for Research on Wheat and Triticale – CBPTT, at its 13th Meeting held in Goiânia, GO, in December 2004, with indication for irrigated cultivation in the dry season, in the states of Minas Gerais, Goiás, Bahia, Mato Grosso and the Federal District, as of 2006 (Reunião...2004).

The characterization of the cultivar's distinguishability, homogeneity and stability (DHE) was carried out by Embrapa Cerrados and Embrapa Trigo, resulting in the description presented to the Brazilian Commission for Research on Wheat and Triticale (Reunião, 2004). To evaluate the cultivar, a comparison was made with the most cultivated Embrapa 22 cultivar at the time. The information obtained allowed the description of the cultivar BRS 264, presented below.

Botanical and agronomic characteristics

- Bioclimatic group: spring wheat.
- Cycle: super super early (50 days from emergence to heading and 105 days from emergence to maturation).
- Average plant height: 90 cm.

- Position of the flag leaf: predominantly pendulous (82.5%), upright (10%) and intermediate (7.5%).
- Coloring of the Auricles: predominantly slightly colored (57.5%) and colorless (42.5%).
- Corner edge: edged.
- Shape of the spikes: fusiform.
- Cob length: short (< 75 mm).
- Cob density: semi-dense (40 mm – 44 mm).
- Glum tooth length: long.
- Grain shape: oval.
- Grain length: medium (6 mm to 7 mm).
- Grain texture: hard.
- Grain color: red.
- Behavior regarding lodging: resistant.
- Behavior of the cultivar in relation to natural threshing (natural threshing): resistant.
- Behavior of the cultivar in relation to natural germination on the ear: moderately susceptible.

BRS 264 is resistant to lodging due to the good agronomic type of the plants, tolerating higher doses of nitrogen with the use of a growth reducer.

reaction to diseases

Cultivar BRS 264 has shown resistance to stem rust (*Puccinia graminis tritici*) under field conditions, however, in tests carried out by Embrapa Trigo, in seedlings, under controlled conditions, it showed

susceptible. As for leaf rust (*Puccinia recondita*), the cultivar was susceptible under field conditions, however, in tests carried out by Embrapa Trigo, on seedlings, under controlled conditions, it proved to be resistant to races B27 and B33. The cultivar showed susceptibility to powdery mildew (*Erysiphe graminis tritici*) and helminthosporiosis (*Bipolaris sorokoniana* (Sin.

Helminthosporium sativum)) and wheat blast (*Pyricularia grisea*), therefore, in crops where climatic conditions are favorable for the development of blast, preventive control is necessary through fungicide applications, indicated by the Comissão Brasileira de Pesquisa de Trigo e Triticale, at the beginning of heading, complemented by a second application, 10 to 12 days later. As for abiotic factors, the cultivar has moderate resistance to blight caused by the occurrence of acidity and toxic aluminum in the soil.

grain yield

Cultivar BRS 264 was indicated for cultivation, by CBPTT (Reunião...2004), for the wheat growing regions of Minas Gerais, Goiás, Bahia, Mato Grosso and Distrito Federal, based on the results of the final trials of Value of Cultivation and Use (VCU).

In the states of Minas Gerais and Goiás and in the Federal District, the average grain yield of BRS 264, in 12 environments, was 6,511 kg ha⁻¹, 6% higher than the average of the best control, cultivar BRS 207, 13% higher than the average for the Embrapa 22 cultivar, and 14% higher than the average for the Embrapa 42 cultivar (Table 1). In some environments, grain yield was greater than 7.5 t/ha⁻¹, reaching up to 7.9 t/ha⁻¹ in Unaí, MG.

industrial quality

In Brazil, wheat cultivars are classified, according to industrial quality, in the Improver, Bread, Domestic, Basic and other uses classes, according to the Wheat Technical Regulation published in the DOU of 12/01/2010, Normative Instruction n. 38, of November 30, 2010, of the Ministry of Agriculture, Livestock and Supply (Mapa). The classification of cultivars in the respective commercial classes is based on gluten strength data, evaluated by alveography, stability, farinography and number of falls.

According to data obtained at the Grain Quality Laboratory of the Centro National Wheat Research, in samples produced in the state of Minas Gerais and in the Federal District, the cultivar BRS 264 presented the following characteristics:

- Test weight: average of 80 kg hL⁻¹.
- Grain hardness: hard.
- Protein content: average of 10.8%, ranging from 9.1% to 12.3%.
- Overall gluten strength (W): average of 241 x 10⁻⁴Joules, variation notes from 200 to 314 x 10⁻⁴ Joules.
- Number of drops: average of 390 seconds, ranging from 300 to 450 seconds.
- Flour extraction: average of 66.4%, variation observed between 63.3% and 68% (base 14% moisture).

According to the Technical Wheat Regulations of Mapa, the cultivar BRS 264 is classified as Bread Wheat. It is suggested that this industrial grade be used in the manufacture of pasta, crackers, industrial bread (sliced bread) and mixtures for baking purposes. It is important to point out that the commercial classification estimates the genetic potential of the cultivar, when cultivated under appropriate conditions. The classification may suffer variations according to weather conditions, cultivation, drying and storage of wheat.

Indications for cultivation

Altitude limits

Cultivar BRS 264 is recommended for irrigated cultivation in Minas Gerais, Goiás, Bahia, Mato Grosso and the Federal District, at altitudes greater than 500 meters.

sowing time

As it is a very early cultivar, BRS 264 allows greater flexibility in the sowing period. For irrigated wheat, sowing from April 10th to May 31st is indicated for conditions in the Federal District, Goiás and Minas Gerais, central-Brazilian wheat growing region. Research has shown that, at this indicated time, irrigated wheat finds the best conditions in the Cerrado of Central Brazil for good development, being favored by low temperatures in the months of May, June and July. The temperature factor is an important climatic component for wheat, especially in the tillering and grain filling stages, phases that require milder temperatures. It should be noted that sowing during this period generally yields a harvest before the rainy season.

Density, spacing and sowing depth

BRS 264 should be sown with a spacing between rows of 17 cm, a depth of 5 cm, with a distribution of 80 and 90 viable seeds per linear meter and a population density of 400,000 to 450,000 plants per hectare.

It is important to point out that the high density used by many producers increases the production cost and the possibility of lodging. In the irrigated cultivation system, lodging is one of the main causes of losses in grain yield and industrial quality.

Top dressing nitrogen fertilization

Due to the high productive potential and greater resistance to lodging, the topdressing nitrogen dose indicated for BRS 264 is approximately 100 kg ha⁻¹, using a growth reducer for the cerrado region.

Topdressing nitrogen fertilization should be applied until the beginning of tillering, a stage that occurs approximately 15 days after emergence.

In order to explore higher yields, the producer can use a higher coverage nitrogen dose, around 120 kg ha⁻¹ of N, as long as he uses the growth reducer.

disease control

For the BRS 264 cultivar, disease control must be preventive, following the CBPTT indications.

It is important to point out that sowing before April 25th increases the potential for blast to occur, depending on weather conditions.

In this case, chemical control with a preventive/eradicator application at the booting stage is justified. In the initial preventive application, a contact fungicide is indicated. The second and/or other applications a systemic fungicide, the triazole group are the most indicated. An application must be carried out at flowering, thus protecting the phase of greatest risk of damage to the crop. The third application must occur 14 days after the second. A fourth application is only justified if the climate favorable to the disease persists and the crop has a high productive potential. Blast infection can occur while there is green tissue in the ears, but the later it happens, the less damage will be done.

The results of the “cooperative network blast trials” are available in the publication *Efficiency of Fungicides for the Control of Wheat Blast* (SANTANA et al., 2019).

irrigation management

To facilitate irrigation management, Embrapa Cerrados developed the *Irrigation Monitoring Program*, a management and decision-making tool (Reunião...2005). The program is dynamic, updated and enriched annually, with free access. The purpose of this program is to provide irrigating producers with liquid irrigation depths and irrigation shifts for wheat cultivars indicated for the Cerrado region.

To use the online Irrigation Monitoring program, simply access the Embrapa Cerrados portal at: <https://www.embrapa.br/cerrados>.

The excess of water applied by many producers, in addition to increasing the cost of electricity – which is an important factor in the cost of production – tends to increase the possibility of lodging, incidence of diseases and loss of nutrients by leaching. On the other hand, the applied water deficiency can lead to significant losses in grain yield.

Harvest

BRS 264 should be harvested around 110 days after sowing, depending on the climate during the crop cycle. When harvesting to obtain good quality wheat seeds, it should be harvested in periods free of rain, therefore, the indicated sowing date should be strictly followed. The grains must be harvested in the initial stage of maturation with humidity around 13%, which is the ideal humidity for storage of the harvested material.

It is advisable to start harvesting at 10 am, so that the grains are drier with less moisture.

Final considerations

In order to obtain high grain yields and production of good industrial quality, it is necessary to use all the technology indicated by the CBPTT for wheat cultivation.

At Embrapa Cerrados, technical assistance agents and publications with all the CBPTT indications for wheat cultivation in the Cerrado region are available to producers and other interested parties.

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Embrapa Cerrados BR
020 Km 18 Rod. Brasília/Fortaleza PO Box
08223 CEP 73310-970,
Planaltina, DF Phone: (61) 3388-9898
Fax: (61) 3388-9879
www.embrapa.br
www.embrapa.br/fale-conosco/sac

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