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CULTIVAR RELEASE

BRS Alvorada and BRSGO Guará – irrigated rice cultivars for the states of Goiás and Tocantins

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ABSTRACT – *BRS Alvorada and BRSGO Guará were developed from backcrosses of the commercial Metica 1 and the blast-resistant cultivars Huan-Sen-Go and 5287, respectively. The cultivars combine blast-resistance with high yield and characteristics superior to Metica 1.*

Key words: blast-resistant, backcross, yield.

INTRODUCTION

In the state of Goiás, rice crop used to play a leading role in the state economy. Around a million hectares of rice were planted statewide in 1986. Since then, according to data of the Companhia Nacional de Abastecimento (Conab 2005) there was a significant shrinking of this area. In 2004/2005 only 182,300 ha were planted which produced 381,000 tons, falling short of the mark to supply the entire rice industry of the State, which imports paddy rice mainly from the southern regions of Brazil.

In awareness of the socioeconomic importance of this crop the State government is making attempts to restore the rice crop in Goiás. As a part of the rice crop recovery program, two projects of irrigated rice are currently being implanted. The project Luiz Alves de Araguaia in the mid-region of Araguaia will, once fully operating, comprise a cultivated area of 15,500 ha. The first stage with 1,730 ha is complete and in production. The second phase that will cover 7,000 ha is now being implanted and the third will include another 6,500 ha. This project has a remarkable social aspect, since it can create an estimated 1500 direct and four to six thousand indirect new jobs, which would include building up regional processing industries. The Project Flores de Goiás is drafted for the valley of Paranã River, in northeastern Goiás and will comprise a total area of 26,500 ha. The region is the poorest in Goiás, so the Project Flores, designed to benefit hundreds of smallholders, will have a great social impact.

In the state of Tocantins irrigated rice still stands out amongst other annual crops from the economic and social point of view. It is one of the traditional staple

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foods of the state population and represents one of the main food energy sources. Irrigated rice plantations cover an area that oscillates between 45,000 and 60,000 ha approximately, with a mean yield of about 4,500 kg ha^{-1}.

With the appropriate climate for rice cultivation, a plain topography, water in abundance and a strategic position in relation to big capital cities in the North and Northeast, the state of Tocantins is presently one of the most promising regions for an expansion of the Brazilian rice crop and could become the main rice supplier for the centers of consumption in the North and Northeastern regions.

Despite the immense potential for plantations of irrigated rice and the large agro-industrial projects implanted in the counties of Formoso do Araguaia, Lagoa da Confusão, Cristalândia and Pium that are already in full production, the region needs more aggressive research, able to make a competitive product available that would meet the needs of the consuming market of mainly the regions Central-West, North and Northeast regions.

The break-up of the resistance against blast *(Pyricularia. grisea* (Cooke) Sacc. [teleomorph *Magnaporthe grisea)* in the released cultivars after one to two years of cultivation is one of the limiting factors for rice planting in Goiás and Tocantins, since the disease control drives the production costs 15 to 18% higher while the yields do not exceed rather low standards. The ongoing search for novel cultivars and strategies targeting a stable resistance has been the main objective of the genetic improvement of irrigated rice for these states (Rangel 1995).

The fungus *Pyricularia grisea* is a highly variable organism and the existence of many physiological races foil improvement focusing on resistance against it. The predominance of certain races in a given area is mainly consequence of the planted cultivar. Brondani et al. (2000) analyzed 96 isolates derived from blast-infected commercial rice plantations, in the state of Tocantins, using molecular microsatellite markers. The analysis of locus MGM-1 demonstrated the presence of at least seven alleles in evidence of a high polymorphism. The high temperatures and relative air humidity during the year make the state climate a pathogen-friendly environment.

IMPROVEMENT METHOD

The cultivars BRS Alvorada and BRSGO Guará were developed through the backcross method. The program started in 1995 based on a combination of the commercial cultivar Metica 1 and the blast resistance sources Huan-Sen-Go and 5287, respectively. After three backcross cycles with selection of individual blast-resistant plants, performed in beds under strong selection pressure to this disease, the following lines were established: CNAx 7155RC3-15-B-B (Metica 1^3/ Huan-Sen-Go) denominated CNAi 9025 and CNAx 7147RC3-7-B-B (Metica 1^3/5287) denominated CNAi 9018. In 1988/1999 the lines were subjected to new evaluations for blast resistance in beds and on the field, and tested for other agronomic characters such as cycle, plant height, lodging resistance, and grain yield and quality in trials conducted in the states of Goiás and Tocantins.

From 1999/2000 to 2002/2003 the lines CNAi 9025 and CNAi 9018 were evaluated in trials of Value of Cultivation and Use (VCU) in different environments in these states and released for cultivation under the names BRS Alvorada and BRSGO Guará, respectively.

Performance Traits

In 23 trials conducted from 1999/2000 to 2002/2003 in Goiás and Tocantins, BRSGO Guará presented mean yields of 7,257 kg ha^{-1}, significantly different from the other three cultivars by the Tukey test at 5% probability (Table 1). BRS Alvorada with 6,600 kg ha^{-1} produced as much as Metica 1 (6,667 kg ha^{-1}) and outmatched BRS Formoso statistically with 6,041 kg ha^{-1}. The high yields of both released cultivars evidence their production potential in stressful environments such as the tropical lowlands. Both appeared quite similar to the recurrent parent Metica 1, flowering in the mean for 100 days and attaining a plant height of around 105 cm and a high lodging resistance. Besides, both cultivars presented modern plant architecture with erect leaves and exposed panicles, above the leaf canopy, which reinforces the efficiency of chemical products, mainly those used for pest and disease control in the panicles.

Table 1. Mean grain yield, flowering mean, plant height, whole grain yield (INT) and total (TOT), amylose content (AC), gelatinization temperature (GT), and white core (WC) of the cultivars BRSGO Guará and BRS Alvorada in relation to the controls Metica 1 and BRS Formoso in 23 trials conducted in the states of Goiás and Tocantins in the cropping seasons 1999/00 to 2002/03

Cultivars	Grain yield (kg ha^{-1})	Flowering (days)	Plant height (cm)	INT (%)	TOT (%)	AC (%)	GT	WC
BRSGO Guará	7257 a	99	107	57	70	31	3	3
BRS Alvorada	6600 b	100	104	58	69	32	3	3
Metica 1	6667 b	100	106	62	71	32	3	3
BRS Formoso	6041 c	100	96	53	68	32	3	3
CV%	7							

Means followed by the same letter did not differ from each other in the Tukey test at 5% probability

In the evaluations of the industrial and chemical grain traits (Table 1) the whole grain and total yield, amylose content, gelatinization temperature and white core of the cultivars BRS Alvorada and BRSGO Guará were similar to the commercial controls Metica 1 and BRS Formoso.

An important trait that is being included in the new irrigated rice cultivars released for cultivation is the requirement of a shorter storage time after harvest to guarantee separate but soft grains after cooking. BRS Alvorada and BRSGO Guará presented a mean storage time of 60 and 115 days, respectively, less than the 140 days of cultivar Metica 1, from which they were derived (Table 2).

In evaluations performed in 32 environments for four years (Figure 1), BRS Alvorada and BRSGO Guará presented lower blast incidence on leaves than Metica 1 and BRS Formoso. The resistance of the cultivars to this disease, main constraint for rice cultivation in these states, would allow the implantation of cheaper plantations owing to a reduced use of fungicides, besides causing a lower environmental impact.

Table 2. Cooking tests performed several days after harvest with the cultivars BRS Alvorada and BRSGO Guará in relation to the controls Metica 1 and BRS Formoso

Cultivars	Days after harvest				
	30 days	60 days	80 days	115 days	140 days
BRS Alvorada	S	SE	SE	SE	SE
BRSGO Guará	S	S	S	SE	SE
Metica 1	VS	VS	S	S	SE
BRS Formoso	SE	SE	SE	SE	SE

VS = Very sticky; S = Sticky; SE = separate

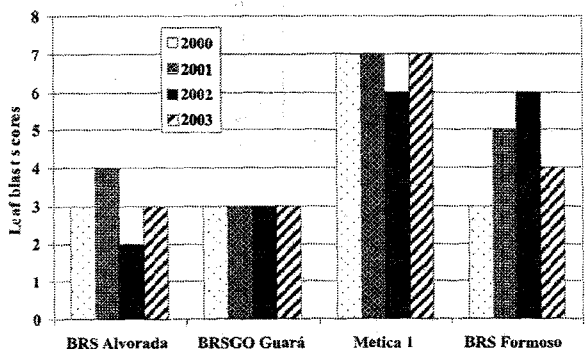

Figure 1. Reaction to blast on the leaves of four irrigated rice cultivars in 32 environments in four years

SEED MAINTENANCE AND DISTRIBUTION

Genetic seed of cultivars BRS Alvorada and BRSGO Guará is maintained by Embrapa Arroz e Feijão; BRS Alvorada base seed is available at Embrapa Transferência de Tecnologia; and BRSGO Guará at the Agência Goiana de Desenvolvimento Rural a Fundiário – Agenciarural.

PARTNER INSTITUTIONS

Embrapa Arroz and Feijão was in charge of the development and release of the cultivars BRS Alvorada and BRSGO Guará.

Agência Goiana de Desenvolvimento Rural and Fundiário – Agenciarural, acted as partner institution in the development and release of cultivar BRSGO Guará.

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