

## BRSMG Relâmpago: an early upland rice cultivar with high grain quality

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Received 27 August 2009

Accepted 2 January 2010

**ABSTRACT** - *The uneven rainfall distribution in Minas Gerais increases the risks of growing upland rice. An alternative to minimize these risks is to plant early cultivars that are more likely to escape the dry spells that are most frequent in February and especially in March. For this purpose, is been releasing 'BRSMG Relâmpago', an early cultivar with high yield potential and good cooking quality.*

**Key words:** *Oryza sativa*, genetic improvement, dryland rice.

### INTRODUCTION

The high risk of growing upland rice has caused producers, particularly smallholders, to use earlier cultivars as a mechanism of escape from dry spells, to mitigate these risks. The Universidade Federal de Lavras (UFLA), in partnership with Empresa de Pesquisa Agropecuária de Minas Gerais (EPAMIG), Universidade Federal de Viçosa (UFV) and Embrapa Arroz e Feijão, initiated a breeding program in 1998, aimed at cultivars that would unite the desirable characteristics of high-quality grain with earliness, disease and lodging tolerance with a high yield potential.

### MATERIAL AND METHODS

'BRSMG Relâmpago' was obtained from a cross between the cultivars Carajás and BRS Primavera, at Embrapa Arroz e Feijão, in 1998. 'BRS Primavera' stands

out for quality and yield and 'Carajás' for hardiness, earliness and disease tolerance. Therefore, the objective of the cited cross were lines with all the good traits of the parents. The seeds of the F<sub>2</sub> generation from this cross were sent to Minas Gerais in 1999, where the selection process was initiated, using the modified bulk and conventional bulk improvement methods. The selected line that gave rise to 'BRSMG Relâmpago' has the following pedigree: CNAx 7393-MG-BM-B-P-3. In 2002/2003, this line was coded as MG 1094, and initially assessed in the preliminary test and, from 2003-2004, in the network of tests of value for cultivation and use (VCU).

The field evaluations (growing season 2003/2004) in 24 tests were conducted in several upland environments of Minas Gerais, in Felixlândia (2), Lambari, Patos de Minas, Patrocínio, Piumhi, Uberaba, and Viçosa. In the following growing season (2004/2005), the tests were conducted in Felixlândia, Lambari (2), Lavras (2), Patos de Minas (2),

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Patrocínio, Uberaba, and Viçosa. In 2005/2006, the tests were installed in Lambari, Lavras, Patos de Minas (2), Patrocínio, and Piumhi. The tests comprised 20 entries each year and were evaluated in a randomized block design with three replications. Plots consisted of five 5-m-long rows, spaced 0.4 m apart (10.0 m<sup>2</sup>), at a density of 70 seeds per meter. For the evaluations, the four central meters of the three internal rows were harvested (4.8 meters).

The field tests were performed between the last third of October and the first third of December of each year, depending on the climatic conditions. Fertilization consisted of 300 kg ha<sup>-1</sup> of 8-28-16 NPK fertilizer plus 0.5% Zn in topdressing at planting and 40 kg ha<sup>-1</sup> N, 40 days after sowing. In Lavras, topdressings with a total of 60 kg ha<sup>-1</sup> of N were applied, split in two applications, 30 and 60 days after sowing, respectively. For preventive pest control, seeds were treated with carbofuran-based products (1.5 L pc per 100 kg of seeds), and weeds were controlled with herbicides and hand weeding. Diseases were not controlled, to allow an outbreak and disposal of susceptible lines.

The following characteristics were evaluated: leaf color, pubescence, flag leaf angle, tillering; glume color; apex color at maturity; presence of beard; grain loss; grain yield; plant height; cycle until flowering and until maturity; lodging; disease incidence of leaf blast, neck blast, brown spot, grain blight and leaf scald; dimensions of milled grains, 1000-grain weight, milling yield: percentage of whole and broken grains and milling yield, grain class, gelatinization temperature and amylose content. These assessments were performed according to the Manual of Methods for Rice Research of Embrapa Arroz e Feijão (Embrapa 1977).

Statistical analysis was performed for the trait grain yield for each growing season and combined analysis for the nine common genotypes in three years, that is, cultivar BRSMG Relâmpago, lines MG 1096, MG 1089, and 10227 CNAs and 10217 CNAs and the control cultivars (BRSMG Conai, Charisma, and Canastra Caiapó).

## RESULTS AND DISCUSSION

The main characteristics of 'BRSMG Relâmpago' are reported in Table 1. The cultivar belongs to the modern group, i.e., has upright leaves, intensive tillering, medium size, but is moderately susceptible to lodging. The cycle until maturity is approximately 109 days, so this is a super early cultivar, which tends to have an even shorter cycle in regions of warmer weather. Given the moderate

**Table 1.** Characteristics of cultivar BRSMG Relâmpago in the tests of value of cultivation and use (VCU), conducted at different upland sites in Minas Gerais, from 2003/2004 to 2005/2006

Characteristics	Description
Leaf color	Green
Pubescence	Glabrous
Angle of flag leaf	Erect
Tillering	Mean
Mean flowering – 50%	79 days
Compleat maturity	109 days
Plant heigh	102 cm
Lodging	Moderately susceptible
Leaf blast	Moderately resistant
Neck blast	Moderately susceptible
Brown spot	Moderately resistant
Grain spot	Moderately resistant
Leaf scald	Moderately resistant
Glume color	Straw-colored
Apex color at maturity	White or brown
Presence of beard	Absent
Grain drop	Easy
Mean panicle length	22.5 cm
Length of milled grain	7.91 mm
Width of milled grain	2.13 mm
Thickness of milled grain	1.77 mm
Length/width ratio	3.71
Weight of 1000 unmilled grains	26.8 g
Class	Long-fine
Whole grains (%)	44.3
Broken grains (%)	26.7
Milling yield (%)	71.0

susceptibility of 'BRSMG Relâmpago' to panicle blast, chemical control with specific fungicides is required in environments of high disease pressure.

The grain quality of 'BRSMG Relâmpago' was analyzed at Embrapa Arroz e Feijão, Goiânia. The results indicated an amylose content of 22.8% and intermediate gelatinization temperature (score 5.0), attributing good cooking quality, similar to the grain of 'BRS Primavera' (one of the parents), which is the national standard of grain quality for upland rice. Similarly to 'BRS Primavera', 'BRSMG Relâmpago' is intolerant to any harvest delay, in other words, to obtain maximum industrial rice yield, it is recommended to harvest grains at a moisture content of 20-23%.

Evaluations of 'BRSMG Relâmpago' (Table 1) indicated that the grains are long and thin, popularly called "Agulhinha", the most demanded on the market. The average milling yield was 44.3% of whole and 26.7% for broken grains. The late harvest of the most early cultivars, commonly practiced in most trials, was the main cause of

the low average yield of whole grains. In some tests, the whole grain yield exceeded 55%.

The average yield of 'BRSMG Relâmpago', promising lines and comparative controls (BRSMG Conai, Charisma, and Canastra Caiapó) was assessed in 24 field trials (Table 2). Note that 'BRSMG Relâmpago', with 4232 kg ha<sup>-1</sup>, exceeded BRSMG Conai (3.1%) and Charisma (5.5%) and in greater magnitude Canastra (9.2%) and Caiapó (18.8%), in the mean of the 24 trials. However, 'BRSMG Relâmpago' was statistically ( $p < 0.05$ ) similar to the lines MG 1096 (4655 kg ha<sup>-1</sup>) and MG 1089 (4368 kg ha<sup>-1</sup>), which have a longer cycle. Consequently, despite its earliness, the potential yield of 'BRSMG Relâmpago' is high, associated with good grain quality and is therefore an excellent alternative crop for uplands, particularly for small farmers.

Studies of grain yield stability indicated that 'BRSMG Relâmpago' is also highly stable, as demonstrated by Soares et al. (2007), with 13 cultivars in two growing seasons (2003-2005). By the method of Lin and Binns (1988), a Pi of 1995000 was evaluated, with a contribution of only 2.25%

to the interaction and by the method of Annicchiarico (1992),  $I_i = 103.99$ , or at worst, with a probability of 75% to produce 3.99% more than the mean of the environment. This characteristic assures producers with a high probability of a good grain production of this cultivar.

In view of the good performance of 'BRSMG Relâmpago' in various environmental conditions of Minas Gerais, combined with good physical and chemical grain quality and earliness, the new rice cultivar is launched for all upland regions of the state.

## ACKNOWLEDGEMENTS

The authors thank Fundação de Amparo à Pesquisa do Estado de Minas Gerais (FAPEMIG) for funding the Research Project Genetic Improvement of Rice for Highlands in Minas Gerais, resulting in the release of 'BRSMG Relâmpago' in the state, and the Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq), for the research fellowship of the coordinator of this project.

**Table 2.** Mean grain yield (kg ha<sup>-1</sup>) of BRSMG Relâmpago, promising lines and control cultivars in Minas Gerais

r	Cultivars/Lines	2003/2004 <sup>1</sup> (8 tests)	2004/2005 (10 tests)	2005/2006 (6 tests)	Mean <sup>2</sup> (24 tests)
	MG 1096	5035 a	4782 a	3937 a	4655 a
	MG 1089	5085 a	4238 b	3628 a	4368 a
	BRSMG Relâmpago	4185 b	4579 b	3716 a	4232 a
	BRSMG Conai (T)	4405 b	4490 b	3065 c	4105 b
	CNAs 10227	4633 b	4277 b	2989 c	4074 b
	Carisma (T)	4053 c	4300 b	3476 a	4012 b
	CNAs 10217	4284 b	4089 c	3034 c	3890 b
	Canastra (T)	3981 c	3884 c	3720 a	3875 b
	Caiapó (T)	3663 d	3649 d	3281 b	3562 c

<sup>1</sup> Means in the columns followed by the same letter do not differ statistically by the Scott-Knott test ( $p < 0.05$ ).

<sup>2</sup> Weighted mean.

(T): control cultivars.

## BRSMG Relâmpago: cultivar de arroz de terras altas, precoce e de alta qualidade de grãos

**RESUMO** - A distribuição irregular de chuvas em Minas Gerais aumenta os riscos de cultivo do arroz de terras altas. Uma das alternativas para minimizar esses riscos é plantar cultivares precoces que têm maiores chances de escape dos veranicos que são mais freqüentes nos meses de fevereiro e, sobretudo, em março. Visando superar esses riscos foi lançada a cultivar BRSMG Relâmpago que agrega precocidade com alto potencial produtivo e grãos de boa qualidade culinária.

**Palavras-chave:** *Oryza sativa*, melhoramento genético, arroz de sequeiro.

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