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CULTIVAR RELEASE

SCS118 Marques – New rice cultivar obtained through induced mutation

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Abstract – *The new rice cultivar, SCS118 Marques, was obtained through gamma irradiation of SCSBRS Tio Taka cultivar. SCS118 Marques presents modern architecture, lodging resistance, late maturity cycle, moderate resistance to blast, high yield potential, long grains and very high cooking quality. Industrial tests performed with SCS118 Marques showed that grains are suitable for parboiling and white rice, and it is recommended to all rice-producing regions of Santa Catarina.*

Key words: Oryza sativa*, gamma rays, mutant cultivar.*

INTRODUCTION

Induced mutation is used with great success by different breeding programs for developing new cultivars. Through mutation breeding, several rice mutant lines have been successfully produced. The method commonly used for promoting mutation in rice is seed treatment with ionizing radiation, such as gamma rays (Qosim et al. 2011, Tulmann-Neto et al. 2011).

Epagri's rice breeding program has been working since 1985 in collaboration with the Center of Nuclear Energy in Agriculture (CENA/USP) for the development of new cultivars. SCS118 Marques is a new irrigated rice cultivar developed by Epagri and released for cultivation in Santa Catarina for the pre-germinated crop system. The cultivar was developed through gamma irradiation of the original cultivar SCSBRS Tio Taka at Itajaí Experiment Station (EEI)/Epagri, Santa Catarina State, Brazil. It has resistance to lodging, high yield potential and long grains with superior quality.

PEDIGREE AND BREEDING METHOD

SCS118 Marques was obtained through gamma irradiation of SCSBRS Tio Taka seeds (Rangel et al. 2007) at the Center of Nuclear Energy in Agriculture (Cena) in 2000, and the selection was performed at EEI. Three hundred grams of seeds were irradiated with 250 Gy of gamma rays. After irradiation, seeds were sown in trays with sandy soil. At the 2-3 leaf-stages, seedlings were handly transplanted to the field, plant by plant, forming the M_1 population with approximately 8,000 plants. At maturity, three panicles were harvested from each plant, and from each panicle five seeds were used to form the M2 population, comprising approximately 10,000 plants, which were selected for the agronomic traits of interest. Generations M3 to M5 were implemented in plots with 220 plants, which were annually evaluated and selected for obtaining homogeneous lines (M6). During these stages, the populations were subjected to favorable conditions to the occurrence of blast (*Pyricularia oryzae*), for enabling selection of genotypes with disease tolerance. In parallel, experiments were carried out for evaluating populations' tolerance to iron toxicity, according to Bacha et al. (2005). Starting at M6 generation, in season 2005/2006, lines were evaluated for yield potential, lodging resistance and grain quality, and SC 471 line was selected and registered in Epagri's genebank. From 2007/08 to 2009/2010, SC 471 line was planted in regional trials for evaluation under different environments in the state of Santa Catarina. These trials were conducted using the water-seeding system at five sites (Itajaí, Massaranduba, Pouso Redondo, Tubarão and Turvo) during three

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cropping seasons. Each line was planted in plots of 60m^2, distributed in random blocks, with three replications. Data of grain yield (kg ha^{-1}), lodging, plant height, tolerance to iron toxicity and blast incidence were collected. SC 471 was considered promising in the preliminary yield trials; thus, it was included in trials for assessing the Value for Cultivation and Use (VCU), conducted for two seasons (2008/09 and 2009/10) in Itajaí, Turvo and Pouso Redondo. Statistical analysis was performed using Scott-Knott 1% (Cruz 2006). SC 471 line showed uniformity, good yield performance and milling yield, it is suitable for white rice and parboiled system, lodging resistance, and it presents blast moderate resistance. Based on the performance in the regional and VCU trials, SC 471 line was released in 2013, named as SCS118 Marques.

Table 1. Agronomic characteristics of SCS118 Marques cultivar, observed in VCU trials (Itajaí, Turvo and Pouso Redondo), in 2008/2009 and 2009/2010

Plant trait	Description
Leaf color	Green
Leaf pubescence	Medium pubescence
Flag leaf angle	Upright
Tillering	High
Cycle to maturity	144 days
Plant height	80cm
Lodging	Resistant
Resistance to blast	Moderate
Iron toxicity tolerance	Moderate
Glumella color	Golden
Apex color at maturity	White
Awns	Absent
Shattering	Intermediate

PERFORMANCE

The agronomic characteristics of SCS118 Marques cultivar are listed in Table 1. These assessments were based on the Handbook of Research Methods in Rice (Embrapa 1977). SCS118 Marques has modern plant type, with a late maturity life cycle (144 days), high tillering capacity and erect and hairy leaves. The cultivar is resistant to lodging, a trait that is considered essential to the pre-germinated system, that is most commonly used in Santa Catarina and Rio Grande do Sul. The cultivar also presents intermediate abscission and moderate susceptibility to iron toxicity and blast disease. SCS118 Marques presented in VCU trials (in Itajaí, Turvo and Pouso Redondo) an average yield of 8,944 kg ha^{-1}, which was similar to local control (Table 2). Although SCS118 Marques does not exceed the control varieties (Epagri 109 and Epagri 108) in yield, it adds excellent features as the industrial performance. Furthermore, its characteristics are suitable for cultivar as it releases and meet the criterion "new to market" required by the production chain.

OTHER CHARACTERISTICS

SCS118 Marques has long and translucent grains with high milling quality and good cooking characteristics. Milling yield was 70.02% (Table 3). The evaluations for the industrial grain traits showed that this cultivar is suitable for the parboiling process, and that both the polished and the parboiled grains presented a glassy appearance. Cooking tests confirmed the excellent quality, since grains were loose and had soft texture, good aroma and normal taste. Sensory evaluation resulted in good consumer acceptance, both as parboiled and as milled rice. Industrial test performed with SCS118 Marques showed that this cultivar is suitable for parboiling and it can substitute other varieties.

Table 2. Average grain yield (kg ha^{-1}) of SCS118 Marques, Epagri 108, and Epagri 109, in VCU trials (Itajaí, Turvo and Pouso Redondo), in 2008/2009 and 2009/2010

Cultivars	Itajaí		Turvo		Pouso Redondo		Means
	2008/09	2009/10	2008/09	2009/10	2008/09	2009/10	
	kg ha^{-1}						
SCS118 Marques	8,700 b	6,800 b	7,267 a	8,267 b	11,700 a	10,933 a	8,944 a
Epagri 108	8,100 c	8,267 a	7,900 a	9,267 a	11,533 a	9,467 b	9,450 a
Epagri 109	9,500 a	8,467 a	8,200 a	9,133 a	10,233 b	10,567 a	9,600 a

Means followed by the same letter are not significantly different by Scott-Knott's test at 5% probability.

Table 3. Physical and chemical grain characteristics of SCS118 Marques rice cultivar compared to Epagri 109 and Epagri 108

	Characteristics				Grain size (mm)^3				
Cultivars	Total	AC	GT	WB	L	W	T	L/W	Class
SCS118 Marques	70.2	28	I	2	7.09	2.25	1.77	3.15	Long-thin
Epagri 108	72.0	29	I	1	7.30	2.30	1.80	3.17	Long-thin
Epagri 109	71.0	28	H	1	7.6	2.2	1.80	3.44	Long-thin

Total: Percentage of total grain milled; AC: Percentage of amylose content; GT: Gelatinization temperature (I: intermediate, H: high); WB: White belly; L: Grain length; W: Grain width; T: Thickness; and L/W: Length width ratio.

PEDIGREE, SEED MAINTENANCE AND DISTRIBUTION

SCS118 Marques is registered at the Ministério da Agricultura, Pecuária e Abastecimento (Ministry of Agriculture, Livestock and Supply), under the number 21806.000175/2012-63. Genetic seed stock is kept by Epagri, at Itajaí Experiment Station, located at Rodovia Antônio Heil, n. 6800, Itaipava, P.O. Box 277, 88.301-970, Itajaí, SC, Brazil. This cultivar is licensed to Acapsa, Association of Brazilian seed producers, responsible for producing, marketing and selling certified seeds to rice farmers.

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