Introduction

Banana is one of the most commercially important fruits in the world. In 2016, production of edible bananas and plantains (bananas generally consumed fried or cooked) totaled approximately 148 million tons, making it the most highly produced fruit worldwide. About 4.5% of global banana production was from Brazil, with production of 6.7 million tons on 470,000 ha, the sixth largest producer in the world (FAOSTAT, 2018). Also in 2016, banana was the fifth most important agricultural crop in Brazil, with a gross value of production of 3.6 billion dollars, corresponding to 4.3% of the revenue generated by Brazilian agricultural production (IBGE, 2018).

The banana plant (*Musa* spp.) originated in Southeast Asia and started to be domesticated over 11,000 years ago (PERRIER et al., 2011). Since the beginning of its domestication, the selection of new genotypes with characteristics of interest has played a significant role in generating new varieties (D’HONT et al., 2000). The main commercial varieties used in the world are derived from the species *M. acuminata* (genome A) and its hybrids with *M. balbisiana* (genome B), especially the triploid genotypes of the AAA, AAB and ABB genomic groups (PERRIER et al., 2011). Among these genomic groups, the subgroups Cavendish (AAA) and Prata (AAB) are notable in Brazil and, consequently, dominate the commercial banana supply in the country (NASCIMENTO JUNIOR et al., 2008).

In 2016, the Empresa Brasileira de Pesquisa Agropecuária (Embrapa) and Empresa de Pesquisa Agropecuária Agropecuária Catarinense, Florianópolis, v.33, n.1, p.32-37, jan./abr. 2020
Extensão Rural de Santa Catarina (Epagri) released the cultivar BRS SCS Belluna (AAA) with the objectives of diversifying the genetic base of banana in Brazilian agriculture, and of providing producers with a productive cultivar resistant to the main diseases in banana, and to offer a different product to the consumer. The objective of this article is to present this cultivar and its main characteristics.

**Origin and breeding method**

In the 1980s, researchers at Embrapa conducted expeditions to Southeast Asia with the objectives of collecting and introducing new genotypes of interest to Brazilian banana farmers. The genotype that gave rise to the cultivar BRS SCS Belluna was one of them. Experiments to evaluate the agronomic performance of this genotype were conducted in the Brazilian state of Santa Catarina. Experiments were implemented by Epagri at experimental stations in Itajaí and Urussanga. After more than two decades of evaluation and mass selection for a phenotype with high yield and resistance to the main pests of the crop, the two institutions obtained a genotype with characteristics of interest to banana farmers throughout Brazil. It is clearly distinct from other cultivars and homogeneous and stable over successive generations in relation to descriptors, allowing Brazilian agribusiness firms to use the genotype; it is in conformity with Brazilian Seed and Seedling Regulations (BRASIL, 2004).

The performance of “BRS SCS Belluna” was compared with cultivars of the two main subgroups cultivated in Brazil - the cultivars SCS451 Catarina (widely known as Prata Catarina) and Prata Anã, of the Prata subgroup, and the cultivars Nanicão and Grande Naine, of the Cavendish subgroup. The plantations of the cultivars from the Cavendish subgroup had a density of about 1,600 plants per hectare (2.5 x 2.5m spacing), while the cultivars of the Prata subgroup and “BRS SCS Belluna” had a density of around 1,320 plants per hectare (2.5 x 3.0m spacing).

**Genetics**

The cultivar BRS SCS Belluna is a triploid genotype of the species *M. acuminata* (genomic group AAA). In order to avoid misidentifications related to its genetic characteristics, since it belongs to the same genomic group as the Cavendish subgroup and was popularly known as “Nam” and “Baby Prata”, names similar to other varieties, ‘BRS SCS Belluna’ was genetically characterized and compared with the cultivars Prata Catarina, Prata Anã, Nanicão, Grande Naine and Maçã (Silk-type). Nineteen microsatellite markers (SSRs) selected by Christelová et al. (2011) to distinguish species, subgroups and individuals of *Musa* spp. were used. Amplifications were performed by PCR (Polymerase Chain Reaction) combined in multiplex, and genotyping was via capillary electrophoresis using an ABI3130 genetic analyzer (Applied Biosystems) (Table 1). According to the parsimony-informative loci obtained, the cultivar ‘BRS SCS Belluna’ differs 39.2% from the cultivars Grande Naine and Nanicão, 65.22%, from the cultivars Prata Anã and Prata Catarina and 100% from the cultivar Maçã (Figure 1).

| SSR markers | Accession numbers in NCBI | Alleles detected (bp)* | Tm °C |
|-------------|--------------------------|------------------------|-------|
| mMaCIR01    | X87262                   | 254|273                    | 54    |
| mMaCIR164   | AM950454                 | 256|397                    | 55    |
| Ma-3-90     |                          | 154                    | 54    |
| mMaCIR307   | AM950533                 | 165                    | 55    |
| mMaCIR264   | AM950519                 | 238|268|270                  | 61    |
| mMaCIR196   | AM950462                 | 167|171|180                  | 60    |
| mMaCIR24    | Z85972                   | 232|237|239                  | 48    |
| mMaCIR152   | AM950442                 | 161|165                   | 50    |
| mMaCIR231   | AM950497                 | 248|280                   | 55    |
| mMaCIR150   | AM950440                 | 259|262                   | 55    |
| mMaCIR40    | Z85977                   | 158|160|162                  | 53    |
| mMaCIR214   | AM950480                 | 118|122                   | 54    |
| mMaCIR13    | X90745                   | 272|285|287                  | 53    |
| mMaCIR03    | X87263                   | 121|125                   | 55    |
| mMaCIR07    | X87258                   | 161|169                   | 55    |
| mMaCIR08    | X87264                   | 261|263|271                  | 55    |
| mMaCIR45    | Z85968                   | 268|276                   | 63    |
| mMaCIR260   | AM950515                 | 213|215                   | 55    |
| mMaCIR39    | Z85970                   | 309|319|327                  | 52    |

* Contains 18 bp relative to M13
The botanical characteristics of the cultivar BRS SCS Belluna (Figure 2 - Table 2) were evaluated in October 2009 in the EEI (26°57'08.9"S, 48°45'38.9"W) under spring conditions in a Cfa climate, according to the international descriptors for banana (IPGRI-INIBAP/CIRAD, 1996).

In relation to agronomic performance, the yield reached by ‘BRS SCS Belluna’ was similar to the cultivars of the Prata subgroup, both in Itajaí and Urussanga (Table 3). According to the evaluations conducted in these sites, the average yield from the second cycle was 20 and 17 t ha⁻¹, respectively, with yield sometimes reaching close to 40 t ha⁻¹. The average time to harvest for the first crop of ‘BRS SCS Belluna’ was 534 days, the average plant height was 2.27m in the first cycle and 2.98m in the second cycle, and the average number of hands formed was 7 in the first cycle and 10 in the second cycle. These values are also similar to the main cultivars of the Prata subgroup. However, the fruit of ‘BRS SCS Belluna” was small in all cycles (approximately 13cm), since it is an intrinsic characteristic of the cultivar. The fruit of the Prata subgroup is medium-sized and that of the Cavendish subgroup is large.

The resistance of ‘BRS SCS Belluna’ under field conditions to Panama disease (Fusarium oxysporum f. sp. cubense - Foc race 1), to yellow Sigatoka (Mycosphaerella musicola) and to black Sigatoka (Mycosphaerella fijiensis), the main pests of the crop, are notable traits (LICHTEMBERG et al., 2001). It should be noted that ‘Nanicão’ and ‘Grande Naine’ (Cavendish) and ‘Prata Anã’ and derived cultivars (Prata Catarina, Prata Gorutuba, among others) are susceptible to the Sigatoka complex. In relation to Panama disease (Foc race 1), cultivars of the Prata subgroup exhibit various levels of susceptibility and those of the Cavendish subgroup are resistant. ‘BRS SCS Belluna’ is also moderately resistant to weevil borer (Cosmopolitus...
| Morphological characteristic | Description |
|-----------------------------|-------------|
| **Leaf habit**              | Erect, with normal leaf distribution. |
| **Pseudostem**              | Average size (~3.0m), slender, dull (waxy) yellowish green. |
| **Leaf sheaths**            | Very little wax; external cream color with pink areas and dark spots; internal color uniformly cream. |
| **Suckers**                 | Deep and far from parent plant and only with lanceolate leaves until harvest of mother plant, produces an average number (~7.0) in the first cycle. |
| **Leaf blotches on suckers**| Without blotches. |
| **Cigar Leaf**              | Upper surface green. |
| **Leaf blade**              | Moderately waxy; corrugation of few stripes; opaque green color on upper surface and opaque medium-green on lower surface. Average length/width ratio of leaf blade 3.6 (2,580/715mm, respectively). Lobes of leaf base asymmetric, one side rounded, one pointed |
| **Midrib**                  | Green on upper surface (adaxial), light green on lower surface (abaxial) |
| **Petiole**                 | Margins erect, straight, turgid; pink-mauve on the edges, with a dark red longitudinal line. Straight canal. Average length of 62cm and large dark brown blotches at the base |
| **Inflorescence peduncle**  | Green with two scars, very hairy, short hairs. Average length and diameter of 55cm and 6cm, respectively |
| **Bunch**                   | Hanging at 45° angle; cylindrical to a truncated cone shape; few compact; fruit only developing from female flowers |
| **Male rachis**             | Present until harvest, inclined, scars prominent |
| **Male bud shape**          | Like a top, small; average length/width ratio 2 (16/8cm, respectively). |
| **Male bud bracts**         | Ovate, strongly grooved, very little wax; red-violet externally, red internally, uniform; external lines without discoloration; base with small and large shoulders, color discontinuing in bract base; apex slightly pointed |
| **Tepals of male flowers in the bud, in the axil of the first external bract** | Compound tepals with a basic cream color, pigmentation variable and lobes yellow. Free tepals with a translucent white color, oval, with developed apex, triangular and more or less smooth. Dominant color of male flower white |
| **Anther and pistil of flowers in the male bud, in the axil of the first external bract** | Anther external in relation to the lobe, with yellow color and filament and pollen sacs white; straight style with a white color without pigmentation, exerted above the tepal lobes; yellow stigma; arched ovary, with a basic cream color without pigmentation, two rowed ovules. Around 90% of the flowers have five stamens and 10% have six |
| **Fruit**                   | Fruit position curved upward; average of 14 bananas per hand; fruit straight to curved in distal part, rounded in transverse section, pointed apex, persistent base of style, average length of 13cm, unripe fruit peel dark green, ripe fruit peel yellow; pulp with soft texture, sweet taste and cream color; distinct pedicel, 9mm long, 14mm diameter, hairless; persistent fruit |
Table 3. Average yield (Kg ha⁻¹) of bunch of the cultivars BRS SCS Belluna, SCS451 Catarina (Prata Catarina), Prata Anã, Grande Naine and Nanicão in Itajaí and Urussanga in the first cycle and average of the other cycles

| Cultivar         | Average yield in Itajaí (Kg ha⁻¹)* | Average yield in Urussanga (Kg ha⁻¹)** |
|------------------|------------------------------------|---------------------------------------|
|                  | 1st cycle | Other cycles | 1st cycle | Other cycles |
| BRS SCS Belluna  | 11,390    | 20,259       | 9,000     | 16,720       |
| SCS451 Catarina  | 17,110    | 23,525       | 12,330    | 17,554       |
| Prata Anã        | 13,625    | 21,485       | 10,459    | 15,818       |
| Grande Naine     | 31,651    | 37,992       | 20,983    | 24,902       |
| Nanicão          | 30,456    | 35,613       | 20,091    | 23,931       |

* - Averages corresponding to evaluations between 1997 and 2010. ** - Averages corresponding to evaluations between 2010 and 2012.

sordidus) and burrowing nematode (Radopholus similis) (LICHTEMBERG et al., 2001). These characteristics can allow reduction in the use of pesticides during conventional cultivation of ‘BRS SCS Belluna’, reducing production costs; and it can allow this cultivar to be grown in organic and/or agroecological crop systems. Lichtemberg et al. (2006) noted the easy adaptability of ‘BRS SCS Belluna’ (cited as ‘Baby Prata’ and ‘Nam’) to the organic cultivation system in southern Brazil; and Peruch & Sonego (2007) noted that the cultivar (cited as ‘Nam’) exhibited an adequate level of resistance to yellow Sigatoka under organic cultivation.

The harvesting time for the bunches of the new cultivar (3/4 normal) is similar to the cultivars of the subgroups Prata and Cavendish, while the ripening temperature of the fruit (18°C) is conform to recommended for fruit of the Cavendish subgroup (LICHTEMBERG et al., 2001). The ‘BRS SCS Belluna’ fruits may be consumed in maturity stage 5 (yellow with green tips), according to the Von Loesecke (1950) maturation scale (Figure 2 G-H).

In relation to adverse abiotic effects, the plants and fruit of ‘BRS SCS Belluna’ are susceptible to cold damage, which is similar to cultivars of the Cavendish subgroup. The cultivar is moderately susceptible to damage from breaking or falling (LICHTEMBERG et al., 2001).

However, a major advantage of ‘BRS SCS Belluna’, in addition to the relevant agronomic characteristics, is the postharvest quality. When characterizing its green banana flour, the resistant starch level (40.25% of the total starch) was four times higher than that of ‘Grande Naine’ and double that of ‘Prata Anã’. The term “resistant starch” has gained relevance due to many clinical studies that have shown the physiological effects of this substance on the human body, especially benefits attributed to dietary fiber. Since resistant starch cannot be digested in the small intestine, this type of starch is available as a fermentation substrate and provides an ideal environment as a prebiotic source for growth of anaerobic bacteria in the colon (JENKINS et al., 1998).

Cerqueira et al. (2002) also found that the cultivar (cited as ‘Nam’) has lower acid in the pulp compared with twenty other genotypes, with values of around one third of those found for ‘Prata Anã’. This is a characteristic of interest to people who suffer from gastrointestinal problems related to acidity.

Thus, the nutritional composition of ‘BRS SCS Belluna’ fruit allows it to be classified as a functional food. In accordance with resolution no. 18/99 of the Brazilian Health Regulatory Agency (ANVISA, 1999), when consumed as part of a diet, a functional food produces metabolic and/or physiological effects and/or provides health benefits in addition to basic nutritional functions.

Perspectives and problems of the cultivar

Studies have demonstrated that changes in family structure, with a lower average number of individuals per family, tends to increase the demand for smaller portions of food, such as smaller fruits. It should be noted that the tendency to buy smaller fruits or portions is also linked to conscious
consumption without waste, which has been a subject of growing concern in many segments of society. A search for healthy foods is also a notable trend, which is related to the intrinsic nutritional characteristics of a food and the absence of pesticide residues used during cultivation and/or postharvest treatment. Thus, the cultivar BRS SCS Belluna can meet all these demands and has considerable and growing potential for consumption, even as a food for school snack programs. However, Brazilian consumers’ strong fidelity to bananas of Prata and Cavendish subgroups is still the main barrier to increasing demand for BRS SCS Belluna fruits, and for any other new cultivar different from the two main subgroups.

The ‘BRS SCS Belluna’ fruit is also suitable for processing, which minimizes loss in the production chain since it increases the postharvest life of the fruit and adds value to the industrialized product. Furthermore, Cerqueira et al. (2002) found that ‘BRS SCS Belluna’ had the highest fruit/pulp ratio among twenty genotypes (cited as ‘Nam’) had the highest fruit/product. Furthermore, Cerqueira et al. (2002) found that ‘BRS SCS Belluna’ fruit and adds value to the industrialized product. Furthermore, Cerqueira et al. (2002) found that ‘BRS SCS Belluna’ fruit and adds value to the industrialized product. Furthermore, Cerqueira et al. (2002) found that ‘BRS SCS Belluna’ fruit and adds value to the industrialized product.

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