UENF Rio Dourado: a new passion fruit cultivar with high yield potential

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Abstract: *This work aimed at introducing the characteristics of the passion fruit cultivar UENF Rio Dourado, developed from three cycles of recurrent selection, to the scientific community. The cultivar presents yield of 25 tons ha^{-1}, mean values of 250 for number of fruits and 175g for fruit weight, providing a percentage increase in yield, number of fruits and fruit weight of 36%, 25% and 3%, respectively, when compared to the standard cultivar tested.*

Key words: Passiflora edulis *Sims., plant breeding, fruits crops, VCU.*

INTRODUCTION

Passion fruit belongs to the Passifloraceae family, and the main cultivated species is *Passiflora edulis* Sims, also known as sour passion fruit. This species represents about 90% of the Brazilian orchards, mainly due to its quality, yield, and consumer preference.

Brazil is the largest world producer of passion fruit. In 2013, yield was of about 780 million tons (IBGE 2014). However, the low national mean yield in 2013 (15 tons ha^{-1}) in Brazil (IBGE 2014) was due to many factors, such as the low number of cultivars and hybrids available for the producers in the market, besides viral and fungal diseases (Santos et al. 2015). Thus, these problems are key barrier to continued expansion for this important Brazilian fruit crop.

There are currently no more than 25 sour passion fruit cultivars available in the seed market in Brazil (MAPA 2015). This number of cultivars is low, considering the importance of Brazil in the global scenario as the biggest passion fruit producer. Thus, due to the economic and social importance of this crop, it is very important to improve breeding programs, which will enable faster development of new cultivars.

Passion fruit breeding is directly related to the fruit, which focuses on three main points: meet the market demands (quality), increase yield, and develop cultivars which are resistant to diseases (Gonçalves et al. 2009).

With this objective, the Universidade Estadual do Norte Fluminense Darcy Ribeiro (UENF) tested a population with potential to develop a commercial cultivar for the north and northwest regions of the state of Rio de Janeiro. In

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this context, the purpose of this study is to inform the scientific community on the characteristics of this new cultivar.

CULTIVAR ORIGIN AND DEVELOPMENT

Passion fruit breeding program developed by the Universidade Estadual do Norte Fluminense Darcy Ribeiro started in 1998 with the early collection of various genotypes in three different producing regions of the state of Rio de Janeiro (Viana et al. 2003). Based on these first studies, a wider sampling was carried out in commercial areas of the Northern Rio de Janeiro region.

Figure 1 shows a schema of the passion fruit breeding program of UENF. In 2002, a larger number of progenies was obtained with the use of appropriate genetic designs, such as the Design I proposed, by Comstock and Robinson (1948). Thus, based on the results of these previous analyses, an intrapopulation recurrent selection program was prepared. Currently, passion fruit breeding program carried out by UENF is in the fourth cycle of recurrent selection.

Data from 81 full-sib progenies from the third cycle were evaluated between 2011-2013 in Campos dos Goytacazes (lat 21º 45' S, long 41°20' W, alt 11m asl), in the northern state of Rio de Janeiro, and in Itaocara (lat 21º 40' S, long 42° 04' W, alt 76m asl), in the northwestern state of Rio de Janeiro.

The experiments were arranged in randomized complete block design with two replications and five plants per plot. Weed, pest, fertilization and disease management were carried out according to standard recommendations. Daily drip irrigation was used during the dry season.
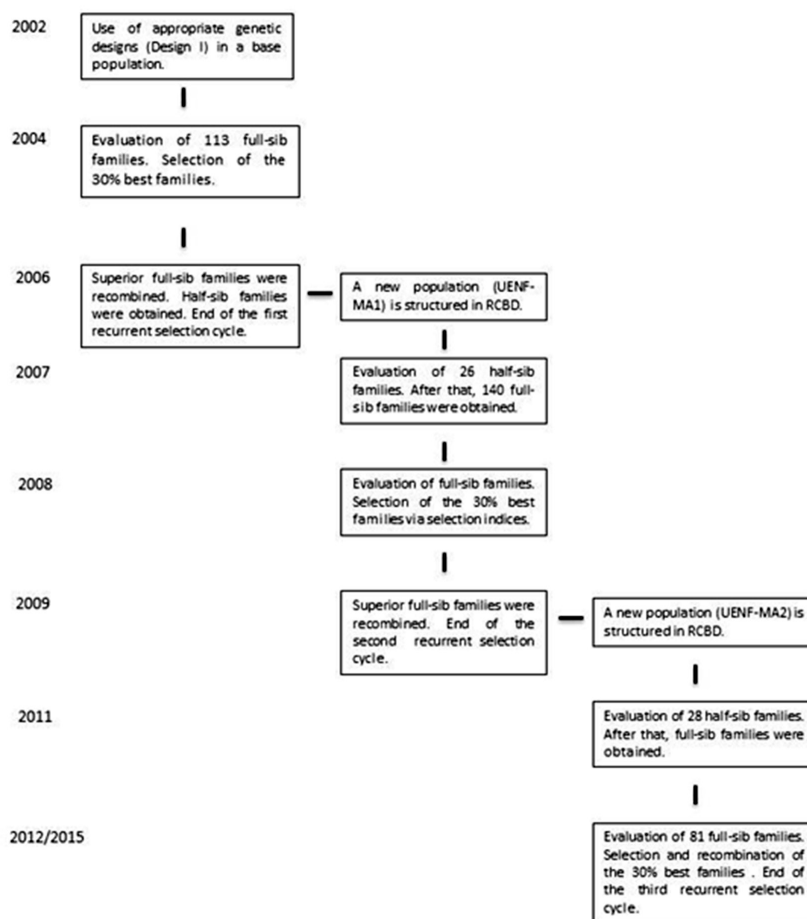

Figure 1. Schema of passion fruit breeding program of UENF.

The 22 best progenies were selected regarding fruit characteristics via BLUP (best linear unbiased prediction). The selected progenies were planted in separate field in the municipalities (previously specified) of Campos dos Goytacazes and Itaocara.

Fruits seeds resulting from the open-pollination crossing between the best selected progenies composed the released cultivar UENF Rio Dourado. For comparison, it was used the open-pollinated cultivar 'FB 200' in the VCU tests.

CULTIVAR CHARACTERISTICS

UENF Rio Dourado cultivar was evaluated based on agronomic and morphological characteristics (leaves, flowers and fruits) proposed by the National Cultivar Protection Service (SNPC) of the Ministry of Agriculture, Livestock and Supply (MAPA).

For the cultivar characterization, the used characteristics were: branch color; sinus depth; nectary position; skin color; blade length (mm): blade width (mm); petiole length (mm); flower diameter (mm); corona diameter (mm); sepal length (mm); sepal width (mm); sepal length (mm); petal width, (mm); bracts length (mm); peduncle length (mm); androgynophore length (mm). For the above characteristics, it was used the mean value of a random sample of five observations per plot.

For the characterization and selection of 22 best progenies, the used characteristics were: a) number of fruit (NF) – measured by counting all the fruits in each plot; b) total yield (Yield, tons ha^{-1}) from the first harvest in August 2012 until the end of April 2013; c) mean fruit weight (FW, g fruit^{-1}); d) fruit length (FL, mm) – obtained by longitudinal measurements of the fruits with a digital caliper; e) fruit width (FD, mm) – obtained by transversal measurements of the fruits with a digital caliper; f) pulp percentage (PP) – obtained by the ratio between the pulp weight and the total fruit weight (seeds, aril and juice); f) skin thickness (ST, mm) – the mean value after measuring the skin thickness in a transversal cut; g) soluble solids content of the juice (SSC, °Brix) – measured by a hand-held digital refractometer (Atago USA, Inc., Belleview, WA). For the characteristics FW, FL, FD, PP, ST and SSC, the mean value was obtained from a random sample of 15 fruits per plot.

PERFORMANCE

UENF Rio Dourado cultivar presented better performance than FB 200 cultivar for the three main evaluated characteristics (Table 1).

It is important to emphasize that UENF Rio Dourado cultivar originates from open-pollination. If crossing system via manual pollination had been used, yield would have been better than a when using the open-pollination system (Krause et al. 2012). Thus, these results show the genetic potential of UENF Rio Dourado cultivar as alternative to retake passion fruit cultivation in the regions in question. Due to its high yield potential and favorable fruit characteristics, UENF Rio Dourado cultivar is a new option for passion fruit growers in the north and northwestern region of the state of Rio de Janeiro. Moreover, after more performance tests,

Table 1. Mean values for number of fruits, yield (tons ha^{-1}) and fruit weight (grams) of UENF Rio Dourado cultivar and one control, in two locations (Campos dos Goytacazes and Itaocara), in the state of Rio de Janeiro

Traits	UENF Rio Dourado	FB 200
Number of fruits	250	186
Yield	25	16
Fruit weight	175	171

Table 2. Qualitative and quantitative characteristics of UENF Rio Dourado cultivar measured in leaves, flowers and fruits

Traits	UENF Rio Dourado
Branch color	Green-Purple
Sinus depth	Deep
Nectary position	Adjacent to the limbus
Skin color	Yellow
Blade length	166.65 mm
Blade width	214.70 mm
Petiole length	61.98 mm
Flower diameter	79.87 mm
Corona diameter	68.06 mm
Sepal length	33.79 mm
Sepal width	12.69 mm
Petal length	33.81 mm
Petal width	10.35 mm
Bracts length	26.91 mm
Peduncle length	51.93 mm
Androgynophore length	11.68 mm
Fruit length	84.50 mm
Fruit width	76.00 mm
Percent pulp	41.00 %
Skin thickness	7.10 mm
Soluble solids content	13.50 °Brix
pH	3.20

there is the possibility of recommending this cultivar for other Brazilian regions.

OTHER CHARACTERISTICS

The cultivar has the following characteristics (Table 2).

There is no specified form to register passion fruit cultivars at MAPA. *Passiflora* breeders need to fill the "other species" form (annex IX). Thus, besides the descriptors used by MAPA, the authors aimed to contribute by describing UENF Rio Dourado cultivar and by proposing descriptors for the register of *Passiflora edulis Sims* species.

BASIC SEED PRODUCTION

UENF Rio Dourado was registered (nº 34328) by MAPA. The genetic seed stock is maintained by UENF.

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