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PERFORMANCE OF COMMERCIAL CULTIVARS OF *PASSIFLORA EDULIS* SIMS IN CÁCERES, MATO GROSSO, BRAZIL

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ABSTRACT

Brazil is the largest producer of passion fruit in the world. However, production in the state of Mato Grosso is one of the lowest in the country and this is due mainly to the lack of genetically enhanced cultivars suitable for growing in the region. This study aimed to compare the performance of five commercial cultivars of *Passiflora edulis* Sims grown under the specific environmental conditions of Cáceres, a leading fruit production hub in Mato Grosso. The experiment was of a randomized block design with a 3 x 3 m configuration and comprised five *P. edulis* cultivars, namely FB 200, FB 300, BRS Gigante Amarelo, BRS Sol do Cerrado and BRS Rubi do Cerrado, with 4 repetitions and 10 plants per repetition. The production system employed was a simple espalier system involving supporting wire held 2 m above the ground by posts spaced at 6 m intervals. The variables analyzed during one production cycle from June 2013 to July 2014 were number of fruits per plant, fruit production per plant, average fruit mass and productivity. The best performances were recorded for FB200, FB 300, BRS Rubi do Cerrado and BRS Gigante Amarelo with 128 to 188 fruits plant^{-1}, fruit production of 31.60 to 37.40 kg plant^{-1}, average fruit mass of 195 to 249.5 g fruit^{-1} and productivity of 25.1 to 41.4 t ha^{-1}. Our results demonstrate that these four cultivars are appropriate for cultivation under the climatic and edaphic conditions of the Cáceres region in Mato Grosso.

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INTRODUCTION

Brazil is the largest producer of passion fruit (*Passiflora* spp.) in the world with a planted area of 41,216 ha yielding 554,598 t of fruit according to data for the year 2017 (INSTITUTO BRASILEIRO DE GEOGRAFIA E ESTATÍSTICA, 2019). At this time, the states of Bahia, Ceará, Santa Catarina, São Paulo, Rio Grande do Norte, Espírito Santo, Amazonas, Paraná and Minas Gerais were responsible for 83% of the national production, of which Bahia alone contributed 170,910 t of fruit from a cultivated area of 16,299 ha. The central-west state of Mato Grosso is also a producer of passion fruit but, with a planted area of 346 ha and a fruit yield of just 5,460 t in 2017, accounted for just 1% of the national productivity and was, as a consequence, dependent on other regions for supply of this commodity. The average national productivity of passion fruit in Brazil is around 13.5 t.ha^{-1}, a value that is low considering that the 50 t.ha^{-1}. Poor productivity and the inferior quality of fruit may be caused by a combination of factors including phytosanitary issues, the use of inappropriate cultivars and the application of unsuitable cultivation and/or management techniques. In particular, the failure to use genetically enhanced cultivars that are adapted to the region can result in heterogeneous plantations producing low-yields of small fruit that are highly susceptible to pests and diseases (AMBROSIO et al., 2018). In order to exploit fully the potential of passion fruit culture, new varieties that are highly productive and tolerant/resistant to drought, insect pests, nematodes and phytopathogenic bacteria/fungi must be made available to farmers. In this context, resistance to *Fusarium oxysporum* f. sp. *passiflorae*, the causal agent of fusarium wilt, is of particular relevance because of the devastating economic consequences of this disease. Currently, the main barriers to the improvement of passion fruit plantations in Mato Grosso are the limited availability of commercial varieties and hybrids and the high cost of superior quality propagules (KRAUSE *et al*., 2012).

Among the cultivars of *Passiflora edulis* Sims (maracujá-azedo) registered with the Ministério da Agricultura, Pecuária e Abastecimento, five warrant attention because they have been recommended for cultivation in various states, including Mato Grosso. Two of these cultivars, FB 200 and FB 300, were developed from a mixture of genotypes by the Flora Brasil nursery (Araguari, Minas Gerais) to serve primarily as feedstock for the local fruit industry but also for consumption *in natura*. These cultivars offer a potential productivity of 50 $t.ha^{-1}$ of fruits that are uniform in size, shape and color, with an average weight of approximately 240 g, good mechanical resistance during transport, a pulp yield of around 36% and total soluble solids of 14.0° Brix. The other three cultivars, namely BRS Gigante Amarelo, BRS Sol do Cerrado (yellow variety) and BRS Rubi do Cerrado (purple variety), have comparable characteristics and were developed by Embrapa Cerrados (Planaltina, Federal District). These cultivars produce oblong shape fruits with slightly flattened base and apex, an average weight between 120 and 350 g and a pulp yield of around 40%. Under conditions of artificial irrigation, the productivities of these cultivars are reportedly in the region of 42 $t.ha^{-1}$ in the first year and 20 to 25 $t.ha^{-1}$ in the second year even when affected by disease. Despite registration of genotypes at the Federal level and the recommendation for cultivation in the state of Mato Grosso, further research on the performance of these passion fruit cultivars is necessary in order that they can be recommended for cultivation in specific areas. However, little is known about the output of these cultivars under the climatic conditions and soil characteristics extant in Mato Grosso, while the limited information that is available is contradictory and mainly shows that the cultivar used influences the passion fruit production system, inducing behavioral variations on fruit production (TEIXEIRA et al., 2017). In light of the above, we aimed to compare fruit production of the five registered cultivars of *P. edulis* when grown under the specific environmental conditions encountered in the municipality of Cáceres, which is a leading fruit production hub in Mato Grosso.

MATERIALS AND METHODS

The experiment was performed between July 2012 and August 2014 and involved cultivars FB 200, FB 300, BRS Gigante Amarelo, BRS Sol do Cerrado and BRS Rubi do Cerrado. The experimental area was located in Cáceres, Mato Grosso, within the grounds of Empresa Matogrossense de Pesquisa, Assistência e Extensão Rural (16º4'28" S; 57º39'35" W: altitude 126 m). According to the Köppen classification, the climate of the region is tropical sub-humid (Aw) with an average annual temperature of 25.2°C (40°C maximum; 20°C minimum), an annual rainfall of 1,348.3 mm and a mean relative humidity of 80.4%. Table 1 shows the average monthly temperature and rainfall in the experimental area throughout the year established from data collected over a 30-year period, and reveals a climatic profile comprising a dry/mild Autumn/Winter (April to September) and a wet/hot Spring/Summer (November to March).

Table 1. Average monthly temperatures and rainfall throughout the year in the experimental area based on 30-year data set (https://en.climate-data.org/).

Month	Minimum temperature (°C)	Maximum temperature (°C)	Rainfall (mm)
January	23	32	245
February	23	33	177
March	22	33	145
April	21	33	97
May	19	32	46
June	17	31	23
July	16	32	20
August	17	34	18
September	20	34	46
October	22	35	89
November	23	34	130
December	23	33	216

Passion fruit seedlings were produced at a commercial nursery belonging to Cooperativa Agrícola Mista Terra Nova Ltda (Coopernova) located in Terra Nova do Norte, Mato Grosso. Seeds (100 per cultivar) were sown on 13 June 2012 in polyethylene tubes (288 cm^3) containing a 3:1:1 (by weight) mixture of topsoil, mature cattle manure and Plantmax® commercial substrate. Trays containing the tubes were suspended 0.5 m above the ground, with support provided by brick benches, in a screen-shaded (50%) greenhouse equipped with a micro sprinkler system to provide daily overhead watering. In this manner, roots that extended below the bottom of the tubes were air-pruned to prevent them from touching the ground and impairing development. Seedlings were transplanted to the field 30 days after sowing, at which time they had attained approximately 15 cm in height and had eight fully developed leaves. The field experiment followed a randomized block design with a 3 x 3 m configuration and comprised five cultivars with four repetitions and 10 plants per repetition with one extra plant bordering the plot. Soil preparation involved mechanical weeding followed by fertilization as described by Lima (2005) to provide a base saturation of over 60% and a magnesium concentration of 9 $mmol_c\ dm^{-3}$. Liming was not required. Lines (3 m apart) were marked out for the location of plants (3 m spacing) and for line support posts (6 m spacing). Holes (roughly 0.4 x 0.4 m) were opened up with the aid of a tractor-operated pit digger to depths of 0.4 m for plants and 1.2 m for posts. After drilling, the walls of the plant pits were scarified with the drill itself, the support posts were installed and smooth training wires were fixed at a distance of 2 m from the ground. The plant pits received localized fertilization with 30 L of mature cattle dung, 40 g of FTE BR-12 and 350 g of simple superphosphate to improve the nutrient foundation taking into account previous soil analysis.

The seedlings were transplanted to the prepared pits on 13 July 2012 and the vines were trained, with the help of small wooden stakes and string lines linking the pit crowns and the support wires, to grow as single stems towards the wires. Irrigation was performed using an AquaSmart 2002 (NaanDanJain Brazil, Leme, SP, Brazil) micro sprinkler system with insect-proof pop-up swivel that remained closed when the system was off. Plants were watered at a flow rate of 35 $L.h^{-1}$ over a 1 h period on two mornings every week until the start of the rainy season (around October). During the vegetative stage, cover fertilization was provided individually to each plant by applying 22 g of urea at 30 days after planting (DAP), 33 g of urea at 60 DAP and 112 g of urea together with 83 g of potassium chloride at 90 DAP. During the fruit production stage, each plant received cover fertilization with 150 g simple superphosphate and 40 g FTE BR-12 (September 2012) in addition to 100 g ammonium sulfate together with 150 g potassium chloride supplied in six equal parts (September 2012 to February 2013). This fertilization scheme was repeated from September 2013 to February 2014. Standard culture management was performed as recommended by Lima (2005). Plants were sprayed every 15 days with a solution of copper oxychloride in water (3 $g\ L^{-1}$) to prevent fungal and bacterial diseases such as anthracnose (*Colletotrichum gloeosporioides*), scab (*Cladosporium herbarum*) and bacterial blight (*Xanthomonas campestris* pv. *passiflorae*). In addition, dimethoate (2 $mL\ L^{-1}$) was applied for the control of insects and mites in general, while leafhoppers such as *Diactor bilineatus* Fabricius, *Holhymenia clavigera* Herbst and *Leptoglossus gonagra* Fabricius were controlled by application of imidacloprid (500 $mL\ ha^{-1}$) as recommended by Lima (2005). Fipronil baits were used against stingless bees *Trigona spinipes* Fabricius (*irapuã* bees). Weeds were controlled by mowing between the lines with a brush cutter while manual weeding was performed along the plant lines. Plants were allowed to overgrow the support wires by 10 cm, after which the single stems were pruned to induce the emission of secondary branches, two of which were selected and primed to grow in opposite directions. These branches were pruned again when they were 1.5 m from the neighboring plant to force the emission of tertiary branches. The tendrils were removed to allow the branches to develop in the form of a combed curtain. Manual pollination was performed daily. Production performances of the five cultivars were evaluated during one cultivation cycle (June 2013 to July 2014) by collecting the fallen ripe fruits each week.

Table 2. Performance of five *Passiflora edulis* (maracujá–azedo) cultivars grown in Cáceres, Mato Grosso, and assessed over one production cycle (June 2013 to July 2014).

Cultivar	Number of fruits (fruits plant^{-1})	Fruit production (kg plant^{-1})	Average fruit mass (g fruit^{-1})	Productivity (t ha^{-1})
FB 200	175 [a]	37.40 [a]	214.25 [bc]	41.4
FB 300	182 [a]	31.60 [a]	174.50 [d]	35.1
BRS Sol do Cerrado	48 [c]	10.60 [b]	227.50 [ab]	11.7
BRS Gigante Amarelo	128 [b]	31.80 [a]	249.50 [a]	35.2
BRS Rubi do Cerrado	188 [a]	36.70 [a]	195.50 [cd]	40.7
Minimum significant difference (MSD)	42.572	7.659	23.21	-
Coefficient of variance (%)	13.12	11.48	4.85	-

Mean values followed by dissimilar lowercase letters are significantly different according to the Tukey test with the significance level α set at 0.05.

The number of fruits per plant, fruit production (kg plant^{-1}), average fruit mass (fruit production/number of fruits per plant; g fruit^{-1}) and productivity (t ha^{-1}) were determined. Data were submitted to analysis of variance and mean values compared using the Tukey test with the significance level α set at 0.05. Statistical analyses were performed with the aid of Sisvar software (FERREIRA, 2011).

RESULTS AND DISCUSSION

As shown in Table 2, the number of fruits produced per plant by each of the studied cultivars decreased in the order BRS Rubi do Cerrado > FB300 > FB 200 > BRS Gigante Amarelo > BRS Sol do Cerrado. The differences in performance between the first three cultivars were not statistically significant while the number of fruits per plant produced by BRS Sol do Cerrado was, in comparison, at least 3.6-times lower. The average mass of the fruits produced by the cultivars decreased in the order BRS Gigante Amarelo > BRS Sol do Cerrado > FB200 > BRS Rubi do Cerrado > FB300, although the differences between the first three cultivars were not statistically significant. In terms of weight of fruit per plant, cultivars FB 200 and BRS Rubi do Cerrado were the highest yielders, followed closely by BRS Gigante Amarelo and FB 300 such that the differences between the four cultivars were not statistically significant. However, fruit production by BRS Sol do Cerrado was significantly lower ($P < 0.05$) in comparison with the other four cultivars. It is noteworthy that the overall productivities of the studied cultivars were, with the exception of BRS Sol do Cerrado, between 2.6- and 3.1-times higher than the national average (13.5 t ha^{-1}) and between 2.2- and 2.6-times greater than the average in Mato Grosso (15.8 t ha^{-1}). The average fruit mass values recorded in this study ranged from 174.5 to 249.5 g and were comparable with those (155.3 to 237.7 g) described by Meletti et al. (2000) for eight hybrids of *P. edulis* f. *flavicarpa* cultivated in the southeastern state of São Paulo, and with those (172.3 to 227.8 g) reported by Aguiar et al. (2015) for 13 hybrids of *P. edulis* cultivated in the southern state of Paraná.

On the other hand, the fruit masses obtained in the present study were, with the single exception of FB200, appreciably higher than those (130.6 to 202.3 g) described by Zaccheo et al. (2012) for 36 hybrids cultivated in Paraná. Indeed, the average fruit mass of BRS Gigante Amarelo registered in this study was outstanding and even superior to that (235.28 g) documented for *P. edulis* grafted onto *P. alata* rootstock (CAVICHIOLI et al, 2011). Although, these authors explained that oversized fruit was a trait transmitted from the rootstock to the graft, the superior fruit masses of the cultivars presently investigated can be better appraised by comparison with values reported previously for grafted *P. edulis*, most of which were in the range 102 to 192 g (NASCIMENTO et al., 1999; VIANNA-SILVA et al., 2008; CAVICHIOLI et al., 2008; NOGUEIRA-FILHO et al., 2010, 2011). The fruit production values registered in this study were, with the exception of BRS Sol do Cerrado, much higher than those reported previously for cultivars/chimeras of *P. edulis*. For example, BRS Gigante Amarelo grown in the state of São Paulo produced 20 kg.plant^{-1} (CAVICHIOLI et al., 2009), while Junqueira et al. (2006) reported yields varying between 13.22 and 26.80 kg plant^{-1} for a clone of *P. edulis* f. *flavicarpa* propagated by seed, rooted-cutting or graft onto *P. nitida* root stock and grown in the Federal District. Moreover, Aguiar et al. (2015) described yields in the range 21.3 to 28.3 kg plant^{-1} for 13 *P. edulis* hybrids cultivated in Paraná. The overall productivities of the cultivars studied herein, with the exception of BRS Sol do Cerrado, were more than 35 t ha^{-1}, such values being very much higher than those established in previous studies. Thus, Maia et al. (2009) obtained productivities ranging from 4.89 to 14.00 t ha^{-1} in the first year of harvest of 14 genotypes of *P. edulis* f. *flavicarpa* cultivated in the Federal District. Furthermore, Aguiar et al. (2015) reported that the productivities, accumulated over two cultivation cycles, of 13 *P. edulis* hybrids varied between 34.5 and 43.6 t.ha^{-1}.

Interestingly, although Krause et al. (2012) described relatively low productivities (18.43 and 22.75 t ha^{-1}, respectively) for FB 200 and BRS Gigante Amarelo cultivated in Mato Grosso, the overall productivity of BRS Sol do Cerrado was recorded as 18.48 t ha^{-1}, a value substantially higher than that reported herein.The excellent performances of FB200, FB 300, BRS Rubi do Cerrado and BRS Gigante Amarelo may be explained by the climatic conditions in Cáceres during the June 2013 to July 2014 cultivation cycle, with mean maximum/minimum temperatures of 35 ºC /20ºC all year round and well-defined dry (April to September) and rainy (October to March) seasons. In addition, soil characteristics, pre-and post-planting preparation and the sowing density employed likely exerted a positive influence on the yields of fruit obtained. Nevertheless, the performance of BRS Sol do Cerrado was poor, indicating that the cultivar was insufficiently adapted to the climatic and cultivation conditions extant in the experimental area.

CONCLUSIONS

The commercial cultivar FB 200 from the Flora Brasil nursery was significantly superior to its counterpart FB 300 with respect to fruit mass but similar regarding both the number of fruit and fruit production per plant, such that the two cultivars did not differ greatly in their overall productivity. However, while the fruits of FB 200 were large and suitable for fresh consumption and industrial purposes, those of FB 300 were small and appropriate exclusively for food processing. The number of fruits per plant produced by the commercial cultivar BRS Rubi do Cerrado from Embrapa was significantly greater than that of its counterpart BRS Gigante Amarelo, although the latter was significantly superior with respect to average fruit mass, such that the overall productivities of the two cultivars were similar. Our results show that all four of the cultivars mentioned above are suitable choices for growing in Cáceres, and underline the potential for the cultivation of these passion fruit cultivars under the climatic conditions and soil characteristics of this region of Mato Grosso. In contrast, BRS Sol do Cerrado produced a low number of fruits and, although it was the second only to BRS Gigante Amarelo in terms of fruit mass, this trait was not sufficient to raise fruit production and productivity to acceptable levels.

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REFERENCES

AGUIAR, R.S. de; ZACCHEO, P.V.C.; STENZEL, N.M.C.; SERA, T.; NEVES, C.S.V.J. Produção e qualidade de frutos híbridos de maracujazeiro-amarelo no Norte do Paraná. Revista Brasileira de Fruticultura, Jaboticabal, v.37, n.1, p.130-137, 2015.

AMBROSIO, M.; KRAUSE, W.; SILVA, C. A., LAGE, L. A.; CAVALCANTE, N. R.; SILVA, I. V. da Histological analysis and performance of sour passion fruit populations under different rootstocks resistant to *Fusarium* spp. Revista Brasileira de Fruticultura, Jaboticabal, v.40, n.1, p.274-283, 2018.

CAVICHIOLI, J.C.; CORRÊA, L. de S.; BOLIANI, A.C.; OLIVEIRA, J.C. de Uso de câmara úmida em enxertia hipocotiledonar de maracujazeiro-azedo sobre três porta-enxertos. Revista Brasileira de Fruticultura, Jaboticabal, v.31, n.2, p.532-538, 2009.

CAVICHIOLI, J.C.; RUGGIERO, C.; VOLPE, C.A. Caracterização físico-química de frutos de maracujazeiro-amarelo submetidos à iluminação artificial, irrigação e sombreamento. Revista Brasileira de Fruticultura, Jaboticabal, v.30, n.3, p.649-656, 2008.

CAVICHIOLI, J.C.; CORREA, L. de S.; BOLIANI, A.C.; SANTOS, P.C. dos Características físicas e químicas de frutos de maracujazeiro-amarelo enxertado em três porta-enxertos. Revista Brasileira de Fruticultura, Jaboticabal, v.33, n.3, p.905-914, 2011.

FERREIRA, D. F. SISVAR: a computer statistical analysis system. Ciencia e Agrotecnologia, Lavras, v. 35, n. 6, p. 1039-1042, 2011.

INSTITUTO BRASILEIRO DE GEOGRAFIA E ESTATÍSTICA (IBGE). Produção Agrícola Municipal. Maracujá. Brasília: Ministério do Planejamento, Orçamento e Gestão, 2015. https://sidra.ibge.gov.br/tabela/1613#resultado Acesso em 20/08/2019.

JUNQUEIRA, N.T.V.; LAGE, D.A. da C.; BRAGA, M.F.; PEIXOTO, J.R.; BORGES, T.A.; ANDRADE, S.R.M. de Reação a doenças e produtividade de um clone de maracujazeiro-azedo propagado por estaquia e enxertia em estacas herbáceas de Passiflora silvestre. Revista Brasileira de Fruticultura, Jaboticabal, v.31, n.3, 2006.

KRAUSE, W.; SOUZA, R.S.; NEVES, L.G.; CARVALHO, M.L.S.; VIANA, A.P.; FALEIRO, F.G. Ganho de seleção no melhoramento genético intrapopulacional do maracujazeiro-amarelo. Pesquisa Agropecuária Brasileira, Brasília, v.47, n.1, p.51-57, 2012.

LIMA, A.A. Aspectos fitotécnicos: desafios da pesquisa. In: Maracujá Germoplasma e Melhoramento Genético. Eds. FALEIRO, F.G.; JUNQUEIRA, N.T.V.; BRAGA, M.F. 2005. p.643- 677.

MAIA, T.E de G.; PEIXOTO, J.R.; JUNQUEIRA, N.T.V.; SOUSA, M.A. de F. Desempenho agronômico de genótipos de maracujazeiro-azedo cultivados no Distrito Federal. Revista Brasileira de Fruticultura, Jaboticabal, v.31, n.2, p.500-506, 2009.

MELETTI, L.M.M.; SANTOS, R.R. dos; MINAMI, K. Melhoramento do maracujazeiro-amarelo: obtenção do cultivar 'composto IAC-27'. Scientia Agricola, Piracicaba, v.57, n.3, p.491-498, 2000.

NASCIMENTO, T.B.; RAMOS, J.D. de; MENEZES, J.B. Características físicas do maracujá-amarelo produzido em diferentes épocas. Pesquisa Agropecuária Brasileira, Brasília, v.34, n.12, p.2353-2358, 1999.

NOGUEIRA FILHO, G.C.; RONCATTO, G.; RUGGIERO, C.; OLIVEIRA, J.C. de; MALHEIROS, E.B. Desenvolvimento e produção de maracujazeiro-amarelo produzidos por enxertia hipocotiledonar sobre seis porta-enxertos. Revista Brasileira de Fruticultura, Jaboticabal, v.32, n.2, p.535-543, 2010.

NOGUEIRA FILHO, G.C.; RONCATTO, G.; RUGGIERO, C.; OLIVEIRA, J.C. de; MALHEIROS, E.B. Florescimento e produção de maracujazeiro-amarelo obtido por enxertia hipocotiledonar em Jaboticabal-SP e Araguari-MG. Revista Brasileira de Fruticultura, Jaboticabal, v.33, n.1, p.227-236, 2011.

TEIXEIRA, L.M.; COELHO, L.; TEBALDI, N.D. Characterization of *Fusarium oxysporum* isolates and resistance of passion fruit genotypes to fusariosis. Revista Brasileira de Fruticultura, Jaboticabal, v.39, n.3, p.415-425, 2017.

VIANNA-SILVA, T.; RESENDE, E.D. de; PEREIRA, S.M.; VIANNA, A.P.; ROSA, R.C.C.; CARLOS, L. de A.; VITORAZI, L. Influência dos estádios de maturação sobre as características físicas dos frutos de maracujá-amarelo. Bragantia, Campinas, v.67, n.2, p.521-525, 2008.

ZACCHEO, P.V.C.; AGUIAR, R.S. de; STENZEL, N.M.C.; SERA, T.; NEVES, C.S.V.J. Produção e características qualitativas dos frutos de híbridos de maracujazeiro-amarelo Revista Brasileira de Fruticultura, Jaboticabal, v.34, n.4, p.1113-1120, 2012.

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