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Physicochemical characteristics in passion fruit as affected by harvest times

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ABSTRACT: Physicochemical fruit characteristics are of great importance for passion fruit genetic breeding since they allow the evaluation of fruit organoleptic properties in order to ensure quality for both fresh fruit market and industry. The objective of this study was to evaluate fruit physicochemical characteristics of 26 yellow passion fruit (*Passiflora edulis* Sims) genotypes cultivated in the Federal District, Brazil, and harvesting at two harvest months. Fruits harvested in April presented greater values for fruit weight, longitudinal length, and equatorial diameter; longitudinal length to equatorial diameter ratio; peel thickness and weight; number of seeds per fruit; and pulp weight, yield, pH, protein, moisture, and ash contents. Fruits harvested in March showed greater titratable acidity (TA), total soluble solids (TSS) and reducing sugar contents. The oval-shaped fruits with low pH (2.40 to 2.98) and high TA (3.70 to 4.50) values indicate suitability for the juice industry. MAR20#15 presented the best characteristics for industrial purposes in the first harvest: pH of 2.48; pulp yield of 40.72%; and along with MAR20#40 and MAR20#2005, TSS content of 13.25° Brix. Rubi Gigante (54.26%) showed the greatest pulp yield in the second harvest. The highest fruit longitudinal length was observed in genotype MAR20#19 (98.44 mm) whereas the greatest fruit equatorial diameter was verified in MAR20#24 (79.84 mm). YM FB100 (344.00) had the highest number of seeds per fruit. The peel thickness observed indicate greater resistance of the genotypes to transport over long distances.
Keywords: *Passiflora edulis* Sims, fruit quality, genetic breeding.

RESUMO: Características físico-químicas em maracujazeiro afetadas por épocas de colheita. As características físico-químicas dos frutos possuem grande importância para o melhoramento genético do maracujazeiro, pois permitem avaliar as propriedades organolépticas dos frutos a fim de se garantir a qualidade para o mercado da fruta fresca e para a indústria. O objetivo deste trabalho foi avaliar as características físico-químicas dos frutos de 26 genótipos de maracujazeiro azedo (*Passiflora edulis* Sims) cultivados no Distrito Federal, Brasil, em duas épocas de colheita. Frutos colhidos em Abril apresentaram maior peso, comprimento longitudinal e diâmetro equatorial de fruto; razão entre comprimento longitudinal e diâmetro equatorial; espessura e peso da casca; número de sementes por fruto; peso, rendimento, pH, proteína, açúcar redutor, umidade e cinzas da polpa. Frutos colhidos em Março mostraram maiores teores de sólidos solúveis totais (SST), acidez titulável (AT) e açúcar redutor. Frutos com formato ovalado, baixos valores de pH (2,40 a 2,98) e altos valores de TA (3,70 a 4,50) indicam adequação para o uso na indústria de sucos. MAR20#15 apresentou as melhores características para o uso industrial na primeira época de colheita: pH de 2,48; rendimento de polpa igual a 40,72%; e, juntamente com MAR20#40 e MAR20#2005, teor de SST de 13,25° Brix. Rubi Gigante (54.26%) mostrou o maior rendimento de polpa na segunda época de colheita. O maior comprimento de fruto foi observado para MAR20#19 (98.44 mm) enquanto o maior diâmetro de fruto foi apresentado por MAR20#24 (79.84 mm). YM FB100 (344.00) teve o maior número de sementes por fruto. As espessuras de casca observadas indicam maior resistência dos genótipos ao transporte a longas distâncias.
Palavras-chave: *Passiflora edulis* Sims, qualidade de frutos, melhoramento genético.

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INTRODUCTION

Passion fruit is native in Tropical America and belongs to the Passifloraceae family (Cunha et al., 2004). The genus *Passiflora* is comprised of over 400 species and has a significant commercial interest (Bernacci et al., 2003) due to its ornamental potential and use in the pharmaceutical, food, and cosmetics industries (Peixoto, 2005; Zeraik et al., 2010; Casierra-Posada & Jarma-Orozco, 2016). As a result of its therapeutic properties, passion fruit has excellent medicinal value. Its leaves, flowers, roots, and fruits are used to treat different infirmities, such as neural excitations, anxiety, insomnia, headaches, and depression (Taïwe & Kuete, 2017).

Brazil is a large fruit producer, and passion fruit crop stands out for its production of 593,429 tons within a harvest area of 41,584 hectares during the 2018/2019 season (IBGE, 2019). However, the current estimated yield of 14.27 tons ha^{-1} $year^{-1}$ is still considered low given the crop's productive potential to reach 50 tons ha^{-1} $year^{-1}$ with the use of genetically improved cultivars and crop management practices (Faleiro et al., 2011).

Passiflora edulis Sims (yellow passion fruit) is the predominant species cultivated in Brazil. Its fruits are oval or subglobose and present great variation in size and pulp color. Fruit longitudinal length varies from 60 to 80 mm, equatorial diameter ranges from 50 to 70 mm, and fruit weight varies between 44 and 160 g. Fruit pulp contains 13 to 18% of total soluble solids, presenting sugars and citric acid as the main components (Abreu, 2011).

Physicochemical fruit characteristics are of great importance for passion fruit genetic breeding since they allow for the evaluation of fruit organoleptic properties in order to ensure quality for both fresh fruit market and industry (Junqueira et al., 2010). The fresh fruit market requires larger and oval fruits, internal cavity completely filled with pulp, and resistance to transportation and post-harvest losses. For industry purposes, it is desirable that fruits present thin peels, internal cavity filled with pulp, high juice yield, stable yellowish golden pulp coloration, and total soluble solids (TSS) superior to 13º Brix (Oliveira et al., 1994; Bruckner et al., 2002).

Several physicochemical changes are observed during fruit maturation, and they are intrinsically related to passion fruit point of harvest. Besides the maturation stage, physicochemical characteristics can be affected by storage conditions, genetic variability, cultural practices, fertilization, and harvest times (Viana-Silva et al., 2008). Therefore, the objective of this study was to evaluate fruit physicochemical characteristics of 26 yellow passion fruit genotypes cultivated in the Federal District, Brazil, and harvesting at two harvest months. Based on these evaluations, the study aimed at identifying genotypes with desirable physicochemical characteristics and with high pulp yield, TSS content, number of seeds per fruit, and thin peel thickness.

MATERIAL AND METHODS

The experiment was conducted at University of Brasilia's Água Limpa Farm (16°S and 48°W, 1,100 m above sea level), located in Brasilia, DF, Brazil. The genotypes evaluated in this study were obtained from research studies developed by Embrapa (Empresa Brasileira de Pesquisa Agropecuária – Brazilian Agricultural Research Corporation) and University of Brasília which used yield, fruit quality, and disease resistance as selection criteria. Plants were arranged in the field, spaced 3 m (within-row) by 3 m (between-rows), a total of 1,111 plants ha^{-1}. The crop was managed using a trellis fence system comprised of wooden stakes (6 m apart from each other) and two pieces of flat wire at 2 and 1.5 m from the ground. All cultivation practices recommended for passion fruit crop were performed. No artificial pollination was performed to increase fruiting.

The experiment consisted of a complete randomized block design (RBD) with subdivided parcels comprised of 26 genotypes, four repetitions, eight plants per plot, and two harvest months (March and April). Samples of 10 fruits per genotype were selected from each of the four repetitions and at each evaluation date, totaling in 2080 fruits at full physiological maturation stage.

The following physicochemical analyses were performed: fruit weight (g), fruit longitudinal length (mm), fruit equatorial diameter (mm), fruit longitudinal length to equatorial diameter ratio (L/D), peel thickness (mm), peel weight (g), number of seeds per fruit, pulp weight with seeds (g), pulp yield (%), pulp TSS (°Brix), pulp titratable acidity (TA; % citric acid), pulp TSS/TA ratio, pulp pH, pulp protein (%), pulp reducing sugar (%), pulp moisture (%), and pulp ash content (%).

Fruits were measured using a digital caliper and weighed on an analytical scale. Pulp yield was determined by the pulp weight to fruit weight ratio. Fruit transverse direction was used as a standard to measure the peel thickness. Seeds were separated from the pulp, washed, dried in a forced-air-circulation oven, and weighed. The number of seeds per fruit was determined by the ratio between the number of seeds present in two grams and the total seed weight. All physicochemical analyses were performed according to the Analytical Rules from Adolfo Lutz Institute (IAL, 2008).

Data were subject to analysis of variance, and means were compared by the Duncan's test, at 5% probability. Regression analyses were performed to evaluate linear and quadratic responses of genotypes to harvest times. Statistical analyses were performed using the SISVAR statistical program.

RESULTS AND DISCUSSION

Fruits harvested in March exhibited greater TA whereas greater pulp protein and moisture contents were observed in fruits harvested in April (Table 1). Fruits harvested in March did not differ significantly from those harvested in April for TSS/TA.

TABLE 1. Pulp total titratable acidity (TA; % citric acid), pulp total soluble solids to titratable acidity ratio (TSS/TA), pulp protein (PP; %), and pulp moisture (PM; %) in fruits of yellow passion fruit (*Passiflora edulis*), cultivated in the Federal District, Brazil, and harvesting at two harvest times.

Harvest time	TA	TSS/TA	PP	PM
1	4.50 a	2.85 a	0.93 b	88.56 b
2	3.60 b	2.86 a	1.13 a	89.66 a

Genotypes presented differences for TA, TSS/TA, pulp protein content, and pulp moisture (Table 2). TA values varied from 3.70 (MAR20#29 and Roxo Australiano) to 4.50% (MAR20#39), which is within the expected range of 3.00 to 5.00% reported for yellow passion fruit (Folegatti & Matsuura, 2002). Fruit acidity results from organic acids which may influence fruit color, flavor, and quality. By determining TA in relation to sugar content, fruit maturation stage may be obtained (Lima et al., 2013). According to Campos et al. (2013), high TA is an important characteristic for the industry since it reduces the addition of acidifiers, providing nutritional improvement, food safety, and organoleptic quality.

Genotype MAR20#44 (3.31) presented fruits with the greatest TSS/TA while Rubi Gigante (2.45) showed the lowest ratio (Table 2). Abreu et al. (2009) reported a ratio of only 2.14 for Rubi Gigante whereas, in a recent study, Greco et al. (2014) found TSS/TA of 2.47 for the same genotype. TSS/TA determines the sweet or acidic nature of the pulp. Usually, the higher the value of this ratio, the more pleasant is the juice or pulp taste (Machado et al., 2003). This ratio is useful in determining fruit maturation stages since it tends to increase with fruit ripening, due to the inverse behavior of TSS and TA (Coelho et al., 2010). TSS/TA may be influenced by cultivar, location, and harvest time (Gomes et al., 2006). In this study, no statistical difference between harvest times was found for this trait. However, these factors may explain greater TSS/TA values observed in our study as compared to those reported by Abreu et al. (2009) and Greco et al. (2014).

Fruits from YM FB200 (1.23%) presented the greatest pulp protein content while fruits from MAR20#49 (0.78%) showed the lowest content. The expected protein contents in fresh fruits and frozen pulp are 2.00% and 0.80%, respectively (TACO, 2011). Pulp moisture ranged between 86.85 (MAR20#24) and 91.27% (PES9). The mean pulp moisture content was 89.11%, higher than that observed for frozen pulp (88.90%) and higher than that reported for fresh fruits (82.90%) (TACO, 2011).

Genotype x harvest time interaction was detected for fruit weight, fruit longitudinal length, fruit equatorial diameter, L/D, peel thickness, peel weight, number of seeds per fruit, pulp weight, pulp yield, TSS, pulp reducing sugar, pulp pH, and pulp ash content. An increasing linear response was observed for fruit weight, longitudinal length, and equatorial diameter; L/D; peel thickness and weight; mean number of seeds per fruit; and pulp weight, yield, pH, and ash content. These traits presented an increase with harvest times. Hence, fruits harvested in April revealed higher values for these traits than those harvested in March.

Fruit weight varied from 87.20 (MAR20#24) to 217.22 g (MAR20#19), showing greater mean values in April (156.90 g) as compared to March (129.58 g) (Table 3). These values were higher than the Brazilian mean of 120 g (Farias et al., 2007). Our results are corroborated by Abreu et al. (2009), who also recorded greater fruit weight for fruits harvested in April, for distinct passion fruit genotypes cultivated in the Federal District. The selection of genotypes showing greater fruit weight is essential since genetic plant materials presenting this characteristic could represent significant gains to the producer, as fruit weight is directly and positively correlated to fruit size. Therefore, those fruits could be better priced in the fresh fruit market (Meletti et al., 2000).

Fruit longitudinal length and equatorial diameter, along with peel color, are important physical indices for classifying fruits intended for the fresh fruit market. These traits determine fruit acceptance and, ultimately, influence on fruit price. In general, larger, attractive-looking fruits are preferred by consumers (Campos et al., 2013). Fruit longitudinal length ranged from 73.53 (MAR20#24) to 86.89 (MAR20#41) in March and from 68.74 (MSCA) to 98.44 mm (MAR20#19) in April. For fruit equatorial diameter, a variation from 67.97 (MAR20#12) to 78.29 (MAR20#34) and from 64.12 (MSCA) to 79.83 mm (MAR20#24) was observed in the first and second harvest times, respectively. In March,

TABLE 2. Pulp titratable acidity (TA; % citric acid), pulp total soluble solids to titratable acidity ratio (TSS/TA), pulp protein (PP; %), and pulp moisture (PM; %) in fruits of yellow passion fruit (*Passiflora edulis*) cultivated in the Federal District, Brazil.

Genotype	TA	TSS/TA	PP	PM
MAR20#12	4.30 abc	2.81 abc	0.95 bcde	88.71 bcde
MAR20#10	4.00 abc	3.06 ab	1.12 abc	88.67 cde
MAR20#41	4.40 ab	2.59 bc	1.05 abcd	88.55 bcde
MAR20#40	4.30 abc	2.88 abc	1.02 abcde	88.09 bcde
MAR20#24	4.30 abc	2.99 abc	1.00 abcde	86.85 e
MAR20#2005	4.10 abc	2.99 abc	1.14 abc	90.39 ab
MAR20#01	3.90 abc	2.95 abc	0.87 cde	88.68 bcde
MAR20#15	3.80 bc	3.05 ab	1.01 abcde	88.23 bcde
MAR20#44	3.80 bc	3.31 a	1.11 abc	89.00 abcde
MAR20#19	3.90 abc	2.87 abc	1.06 abcd	88.81 bcde
MAR20#06	3.80 bc	2.99 abc	1.07 abcd	88.40 abcd
MAR20#29	3.70 c	3.08 ab	1.13 abc	89.34 abcd
MAR20#34	4.20 abc	3.00 abc	0.97 abcde	87.59 de
MAR20#39	4.50 a	2.63 bc	1.11 abc	89.09 abcde
MAR20#21	4.40 ab	2.79 abc	0.97 abcde	89.48 abcd
MAR20#49	3.90 abc	2.94 abc	0.78 e	90.33 ab
MSCA	4.10 abc	2.58 bc	0.97 abcde	90.07 abc
Rubi Gigante	4.10 abc	2.45 c	0.95 bcde	89.62 abcd
Redondão	4.20 abc	2.66 bc	1.13 abc	89.10 abcde
Roxo Australiano	3.70 c	2.66 bc	1.10 abc	89.27 abcd
PES9	3.80 bc	2.82 abc	0.81 de	91.27 a
YM FB200	3.80 bc	3.05 ab	1.23 a	89.46 abcd
YM FB100	3.90 abc	2.80 abc	1.05 abcd	89.65 abcd
ECL-7	3.80 bc	2.95 abc	1.21 ab	89.27 abcd
EC-3-0	4.30 abc	2.73 bc	1.12 abc	89.57 abcd
BRS-GA1	4.00 abc	2.82 abc	0.93 cde	89.35 abcd

the highest L/D ratio was verified in MAR20#41 (1.19) whereas, in April, the highest L/D values were observed in genotypes MAR20#39 (1.28), Roxo Australiano (1.28), and EC-3-0 (1.27). As stated by Medeiros et al. (2009), round-shaped fruits has L/D ratio close to 1.00. Oval-shaped (oblong) fruits were observed in this study, which is the result of a ratio greater than 1.00. Oval-shaped fruits were found for all genotypes and in both harvest times. Such fruits present juice yield of up to 10% greater than round-shaped fruits and, for this reason, are preferred for industrial purposes (Greco et al., 2014).

Genotype MAR20#29 (6.30 cm) had the lowest peel thickness whereas EC-3-0 (10.34 cm) showed the highest value. An increase in the mean peel thickness was observed between the first (7.38 cm) and the second harvest time (8.54 cm) (Table 3). These results indicate a need for selection towards peel thickness reduction. Peel thickness is determinant for the juice industry and the fresh fruit market. Different studies have indicated a negative correlation between peel thickness and pulp and juice yield in yellow passion fruit (Cavichioli et al., 2008; Santos et al., 2009; Ferreira et al., 2010; Greco et al., 2014). However, in our study, this relation could only be verified for genotypes MAR20#12, MAR20#41, MAR20#15, and MAR20#44 (Table 3). Even though MAR20#24 (6.90 cm) revealed the lowest peel thickness in April, it also showed the lowest pulp yield (26.50%) and pulp weight (22.95 g) in the same harvest time. Although peel thickness may result in lower pulp and juice yields, fruits with thicker peel have greater resistance to long-distance transportation, due to a reduction in post-harvest losses caused by physical injuries (Silva et al., 2015).

The peel weight represented from 59.4 (MAR20#49) to 77.9% (MAR20#01) of the fruit in March. The variation increased throughout the harvest time, ranging between 54.46 (MAR20#49) to 73.69% (Rubi Gigante) in April. Mean peel weight identified in the first and in the second harvest times were 86.50 and 98.05 g, respectively.

The number of seeds per fruit ranged from 83.00 (MAR20#10) to 344.00 (YM FB100) (Table 3). Differences among genotypes for this trait were detected only in the second harvest time. Means of 119.86 and 256.14 seeds per fruit were found in March and April, respectively. Likewise, a higher number of seeds per fruit was recorded in April by Abreu et al. (2009). It is possible that a reduced number of pollinators from *Xylocopa* genera or that the typical rains from February and March could have restricted *Xylocopa* spp. visitation, reducing pollination, fruiting, and the number of seeds per fruit.

For pulp weight, values varied from 29.63 (EC-3-0) to 55.45 g (MAR20#15) in March, and from 22.95 (MAR20#24) to 83.90 g (MAR20#21) in April. The mean pulp weight was 41.88 g (March) and 59.26 g (April). The greatest pulp yields were detected in MAR20#15 (40.72%), in the first harvest time, and in Rubi Gigante (54.26%), in the second harvest time (Table 3). Therefore, such genotypes could be improved for the industry since it prefers fruits with an average yield of 45% (Farias et al., 2007). Mean pulp yield ranged between 31.58% (March) and 37.02% (April).

Pulp pH values varied between 2.40 (March) and 2.98 (April) (Table 3), both presented by PES9. The highest mean pH value was identified in April (2.68), as also recorded by Abreu et al. (2009). These results indicate a possibility of using these genotypes for industrial purposes since the observed values are suitable for storage (Folegatti & Matsuura, 2002). According to Tocchini et al. (1994), fruits with pH ranging from 2.50 to 3.50 are more appropriate for the concentrated juice production than for natural juice consumption.

Pulp ash content expresses the mineral amount found in the pulp. In this study, ash content ranged from 0.07 (YM FB200) to 1.06% (MAR20#40). Mean ash contents of 0.49 and 0.82% were observed in March and April, respectively. Most genotypes did not differ for ash content in the second harvest. Only fruits harvested in April had values within the expected range for frozen pulp (0.5%) and fresh fruit (0.8%) (TACO, 2011). There is no specification for passion fruit ash content in the Brazilian law.

TSS and reducing sugar contents presented a decreasing linear response. In general, pulps from fruits harvested in March showed greater TSS and reducing sugar contents than those harvested in April. TSS is highly and positively correlated to sugar and organic acids contents. Consequently, it is used as a fruit quality indicator, especially in the fresh fruit market, since consumers prefer sweeter fruits (Silva et al., 2002). The lowest TSS content was identified for Rubi Gigante (7.75° Brix) whereas MAR20#40, MAR20#2005, and MAR20#15 presented the highest content (13.25° Brix) (Table 3). The genotypes presented mean TSS content of 12.50° Brix (March) and 10.26° Brix (April). Since fruits with TSS content greater than 13º Brix are preferred by consumers (Bruckner et al., 2002), our results indicate that, in general, the genotypes tested are suitable for undemanding markets.

Sugars are the main components of the TSS from passion fruit juice. In this study, reducing sugar content varied from 6.29% (PES9), in April, to 17.80% (MAR20#34), in March. Fruits harvested in March presented mean reducing sugar content of 14.61% while those harvested in April showed mean value of 12.37%.

CONCLUSIONS

TSS, AT, and pH values were compatible to undemanding passion fruit markets. Since no artificial pollination was performed, fruits presented pulp yield values lower than the standards demanded by the most important consuming centers. However, the genotypes presented favorable characteristics for industrial purposes, such as oval-shaped fruits, low pH (2.40 to 2.98), high TA (3.70 to 4.50%), and TSS equal to or greater than 13° Brix for selected genotypes during the first harvest time. Peel thickness values were high, demonstrating greater resistance to transport over long distances.

TABLE 3. Fruit weight (FW; g), peel thickness (PT; mm), pulp yield (PY; %), mean number of seeds per fruit (NSF), pulp pH, and pulp total soluble solids (TSS; ◦ Brix) in yellow passion fruit (*Passiflora edulis*), cultivated in the Federal District, Brazil, and harvested at two harvest months (H1 and H2).

Genotypes	FW		PT		PY	
	H1	H2	H1	H2	H1	H2
MAR20#12	125.08 bA	169.79 aBCDEF	7.00 bABC	8.99 aABCD	33.12 aABC	30.27 aDEF
MAR20#10	147.70 aA	107.34 bHIJ	7.98 aAB	8.34 aBCDEFG	33.34 aABC	42.45 aBC
MAR20#41	147.50 aA	117.50 aGHIJ	7.32 aABC	8.20 aBCDEFG	36.77 aAB	29.67 aEF
MAR20#40	116.75 aA	151.08 aCDEFG	7.80 bABC	9.19 aABC	33.68 aABC	35.96 aBCDEF
MAR20#24	118.44 aA	87.20 aJ	7.35 aABC	6.90 aG	33.68 aABC	26.50 aF
MAR20#2005	132.88 bA	173.19 aBCDE	7.15 bABC	9.55 aAB	29.74 aABC	34.92 aBCDEF
MAR20#01	109.75 bA	154.56 aBCDEFG	7.30 aABC	8.29 aBCDEFG	27.61 bBC	39.70 aBCDE
MAR20#15	130.67 bA	191.43 aABC	7.15 bABC	9.57 aAB	40.72 aA	34.70 aBCDEF
MAR20#44	132.75 aA	131.00 aFGHI	7.65 aABC	7.25 aFG	31.90 aABC	35.07 aBCDEF
MAR20#19	126.74 bA	217.22 aA	6.58 bBC	8.46 aBCDEF	30.61 aABC	37.91 aBCDEF
MAR20#06	119.57 aA	118.84 aGHIJ	7.30 aABC	7.33 aEFG	28.19 aBC	30.42 aDEF
MAR20#29	123.00 aA	136.67 aEFGH	6.30 bC	7.92 aCDEFG	30.35 aABC	31.43 aCDEF
MAR20#34	143.50 aA	156.10 aBCDEFG	7.40 aABC	8.35 aBCDEFG	33.68 aABC	36.91 aBCDEF
MAR20#39	139.88 bA	195.00 aAB	7.80 aABC	8.81 aBCDE	35.16 aABC	39.88 aBCDE
MAR20#21	124.00 bA	195.67 aAB	7.10 bABC	8.65 aBCDEF	30.99 bABC	42.50 aBC
MAR20#49	145.76 aA	177.50 aABCDE	7.23 bABC	8.67 aBCDEF	30.69 bABC	44.59 aB
MSCA	150.67 aA	95.50 bIJ	8.14 aA	7.65 aDEFG	35.19 aABC	32.13 aCDEF
Rubi Gigante	127.00 aA	148.25 aDEFG	7.40 bABC	9.58 aAB	32.63 bABC	54.26 aA
Redondão	121.59 aA	116.58 aGHIJ	7.21 aABC	7.73 aCDEFG	31.53 aABC	31.90 aCDEF
Roxo Australiano	147.19 bA	191.67 aABC	7.68 aABC	8.15 aBCDEFG	32.27 bABC	42.60 aBC
PES9	129.13 aA	150.33 aCDEFG	7.19 bABC	8.96 aABCD	29.19 aABC	29.88 aEF
YM FB200	116.30 bA	180.23 aABCD	7.29 aABC	8.45 aBCDEF	27.39 bBC	40.39 aBCDE
YM FB100	120.25 bA	189.00 aABCD	6.75 bABC	8.73 aBCDEF	34.28 aABC	41.68 aBCD
ECL-7	136.99 bA	177.50 aABCDE	8.00 bAB	8.73 aBCDEF	26.29 bBC	38.84 aBCDE
EC-3-0	120.75 bA	176.67 aABCDE	8.00 bAB	10.34 aA	24.11 bC	36.09 aBCDEF
BRS-GA1	115.31 bA	173.67 aBCDE	7.80 aABC	10.34 aA	30.86 bABC	41.76 aBCD
MAR20#12	129.00 bA	300.25 aABCDEF	2.48 aA	2.63 aCDEFG	12.75 aA	11.00 bBCD
MAR20#10	145.50 aA	83.00 aI	2.50 aA	2.50 aG	12.25 aA	12.00 aAB
MAR20#41	133.25 aA	148.45 aHI	2.43 bA	2.68 aBCDEFG	11.75 aA	10.75 aBCDE
MAR20#40	99.50 bA	237.00 aCDEFG	2.53 aA	2.63 aCDEFG	13.25 aA	11.00 bBCD
MAR20#24	119.00 bA	199.00 aGH	2.43 bA	2.80 aABCD	12.50 aA	13.00 aA
MAR20#2005	124.25 bA	233.00 aEFG	2.48 aA	2.60 aDEFG	13.25 aA	11.00 bBCD
MAR20#01	89.75 bA	250.75 aBCDEFG	2.43 bA	2.70 aBCDEFG	12.50 aA	10.25 bBCDE
MAR20#15	115.75 bA	313.00 aABCD	2.48 aA	2.60 aDEFG	13.25 aA	10.00 bCDE
MAR20#44	84.75 bA	258.00 aBCDEFG	2.50 aA	2.65 aCDEFG	13.00 aA	11.75 aABC

...continua

TABLE 3. Continuação

MAR20#19	126.25 bA	242.75 aCDEFG	2.58 aA	2.60 aDEFG	13.00 aA	9.75 bDEF
MAR20#06	93.75 bA	199.00 aGH	2.50 aA	2.80 aABCD	12.75 aA	10.00 bCDE
MAR20#29	107.50 bA	307.00 aABCDE	2.50 aA	2.88 aAB	12.25 aA	10.00 bCDE
MAR20#34	128.25 bA	235.00 aDEFG	2.48 aA	2.53 aFG	13.00 aA	11.75 aABC
MAR20#39	137.00 bA	325.00 aAB	2.50 aA	2.68 aBCDEFG	12.75 aA	10.00 bCDE
MAR20#21	129.00 bA	303.25 aABCDE	2.45 aA	2.58 aEFG	12.75 aA	11.75 aABC
MAR20#49	138.50 bA	304.75 aABCDE	2.55 aA	2.60 aDEFG	12.50 aA	10.00 bCDE
MSCA	139.50 aA	205.25 aGH	2.48 aA	2.60 aDEFG	11.75 aA	9.00 bEFG
Rubi Gigante	120.50 bA	306.00 aABCDE	2.43 bA	2.50 aG	12.75 aA	7.75 bG
Redondão	106.00 bA	191.25 aGH	2.45 aA	2.73 aBCDEF	13.00 aA	9.25 bDEFG
Roxo Australiano	132.25 bA	315.75 aABC	2.58 aA	2.70 aBCDEFG	11.75 aA	8.00 bFG
PES9	118.50 bA	211.25 aGH	2.40 bA	2.98 aA	12.25 aA	9.00 bEFG
YM FB200	123.75 bA	259.00 aBCDEFG	2.43 bA	2.83 aABC	11.25 aA	10.67 bBCDE
YM FB100	104.50 bA	344.00 aA	2.45 aA	2.87 aAB	12.25 aA	9.00 bEFG
ECL-7	115.50 bA	341.75 aA	2.45 aA	2.78 aABCDE	12.00 aA	10.00 bCDE
EC-3-0	120.25 bA	223.75 aFGH	2.48 aA	2.60 aDEFG	12.75 aA	10.00 bCDE
BRS-GA1	134.50 bA	322.50 aAB	2.43 bA	2.73 aBCDEF	12.00 aA	10.25 bBCDE

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