




# Agronomic performance and fruit sensory and quality analyses of pineapple cultivars

Angélica Padilha de Freitas<sup>1</sup> , Willian Krause<sup>1</sup> , Débora Sarana Ortolan Arantes<sup>1</sup> , Dayane Castro Silva<sup>1</sup> ,  
Eileen Azevedo Santos<sup>1</sup> , Renê Arnoux da Silva Campos<sup>2</sup> 

<sup>1</sup>Universidade do Estado de Mato Grosso, Tangará da Serra-MT, Brasil

<sup>2</sup>Universidade do Estado de Mato Grosso, Cáceres-MT, Brasil

\*Corresponding author, e-mail: daykastro@gmail.com

## Abstract

The objective of this study was to assess the agronomic performance and fruit sensory and quality characteristics in traditional and modern pineapple cultivars grown in Tangara da Serra, MT, Brazil. The experiment was conducted in a randomized block design, with five replications and 20 plants per plot. Planting was carried out in double rows with spacing of 1.2×0.4×0.4 m, in May 2018. The evaluated cultivars were BRS-Ajuba, BRS-Imperial, BRS-Vitoria, Gigante-de-Tarauaca, IAC-Fantastico, Jupi, Perola, and Smooth-Cayenne. Gigante-de-Tarauaca exhibited the highest fruit weight, but presented low soluble solids content and soluble solids to titratable acidity ratio (SS/TA); thus, it is not recommended for fresh fruit market. Jupi exhibited fruit weights (>1500 g) suitable for the market and soluble solids above 12°Brix, but SS/TA below 20. Considering the modern cultivars, BRS-Ajuba presented the highest fruit weight, but BRS-Imperial and IAC-Fantastico were the most attractive to consumers, as well as the traditional cultivar Perola. However, BRS-Imperial and IAC-Fantastico yield small fruits, which reduces their per-unit value in the market, as pineapples are typically valued based on their sizes.

**Keywords:** *Ananas comosus*, physical and chemical characteristics, modern cultivars, fusariosis

## Introduction

Pineapple (*Ananas comosus* L. Merrill var. *comosus*) is commercially grown in subtropical and tropical regions worldwide. The main producing countries are Costa Rica (2.9 million Mg), Indonesia and The Philippines (2.8 million Mg), Brazil (2.3 million Mg), and Indonesia (2.4 million Mg) (FAO, 2021).

Smooth-Cayenne is the most grown pineapple cultivar in the world and the most utilized for processing due to its high yield (Sanewski et al., 2018). In Brazil, 88.0% of the pineapple crop area is grown with the cultivar Perola, which is favored by Brazilian consumers. Plants of the cultivar Perola are highly vigorous, exhibit medium size, upright growth habit, and spiny leaves; the fruits weigh between 0.9 and 1.6 kg, with a white pulp, soluble solids content between 13 and 16°Brix, low acidity, and pleasant taste. However, as Smooth-Cayenne, Perola is susceptible to fusariosis (*Fusarium guttiforme*), which is

the main disease affecting pineapple crops (Souza et al., 2016). The growth of resistant varieties is currently the most economic and efficient method for controlling this disease.

Thus, the primary objectives of pineapple breeding conducted in research institutions worldwide are to develop cultivars with higher yields, improved fruit quality, and resistance to fusariosis. The largest pineapple breeding program in Brazil is conducted by the Brazilian Agricultural Research Corporation (Embrapa Cassava and Fruit Production), in Cruz das Almas, Bahia. Embrapa has already developed and released the cultivars BRS-Imperial, BRS-Ajuba, and BRS-Vitoria, which are resistant to fusariosis. The Agronomic Institute of Campinas (IAC) also conduct a pineapple breeding program in Brazil and has released the cultivar IAC-Fantastico, which is resistant to fusariosis and exhibits few spines.

In addition to these expected quality attributes

in pineapple cultivars, sensory properties are responsible for the fruit's market acceptance (Saradhulhat & Paull, 2007). Sensory evaluations can be used as a tool for ensuring the quality of final products in the market by detecting characteristics that might not be perceptible using other instruments. Some studies have compared the performance of qualitative, physical, chemical, and sensory attributes among different cultivars, with many of them confirming that the cultivar Perola exhibits superior performance in the Brazilian market (Brito et al., 2008). However, other studies have recommended modern cultivars, such as BRS-Vitoria (Berilli et al., 2014).

Considering the continental dimensions of Brazil and the genotype  $\times$  environment interaction, comparing and evaluating the performance of cultivars in different environments is essential. Thus, the objective of this study was to evaluate the agronomic performance and fruit sensory and quality characteristics of traditional and modern pineapple cultivars grown in Tangara da Serra, MT, Brazil.

## Material and Methods

The experiment was conducted at the experimental area of the Mato Grosso State University (Unemat), in Tangara da Serra, MT, Brazil (14°37'55"S, 57°28'05"W, and altitude of 488 m). The climate of the region is Aw, tropical with a dry winter, and presents two well-defined seasons (a rainy summer and a dry winter); the mean annual rainfall depth is 1,800 mm and the mean temperature is approximately 25 °C (Martins et al., 2010).

The soil of the area was classified according to the Brazilian Soil Classification System as a Typic Hapludox of clay texture (Latossolo Vermelho distroferico; Santos et al., 2018). The analysis of the 0-20 cm soil layer showed the following results: pH (water) = 5.2; P = 1.48 mg dm<sup>-3</sup>; K = 80 mg dm<sup>-3</sup>; Al = 0.12 cmolc dm<sup>-3</sup>; Ca = 0.85 cmolc dm<sup>-3</sup>; Mg = 0.29 cmolc dm<sup>-3</sup>; H+Al = 3.75 cmolc dm<sup>-3</sup>; sum of bases = 1.3 cmolc dm<sup>-3</sup>; cation exchange capacity (pH 7.0) = 5.05; base saturation = 25.75%; and organic matter = 12 g dm<sup>-3</sup>. Lime and fertilizers were applied at planting and as topdressing, following recommendations for pineapple crops (EMBRAPA, 2021).

A randomized block experimental design was used, with five replications and 20 plants per plot; 16 plants per plot were evaluated, considering a border between the plots and around the experimental area. The traditional cultivars evaluated were Perola, Jupi, Smooth-Cayenne, and Gigante-de-Tarauaca (grown in Tarauaca, AC, Brazil); and the modern and/or improved cultivars evaluated were BRS-Vitoria, BRS-Ajuba, BRS-Imperial, and IAC-Fantastico. The seedlings used were

suckers of 35 cm length obtained from the active germplasm bank of Unemat. The seedlings were planted in in May 2018 in double rows with spacing of 1.2×0.4×0.4 m.

Weed control was carried out through manual weeding and application of herbicides approved for the crop. The irrigation was carried out three times a week. Artificial floral induction was carried out in May 2019, 12 months after planting, as recommended for pineapple crops (Andrade Neto et al., 2018), using a solution composed of 20 L of water, 20 mL of Etefon 720, 400 g of urea, and 7 g of hydrated calcium oxide. The solution was applied to the center of the shoot apex at the rate of 50 mL plant<sup>-1</sup>. The floral inductions were carried out in the morning. The fruits were harvested within five to six months after the artificial floral induction, as recommended for pineapple crops (Andrade Neto et al., 2018).

The vegetative characteristics evaluated were: plant height, number of active leaves, and D-leaf length and width. The evaluations were carried out at the same time as artificial floral induction. Plant height (cm) was measured from the ground to the tip of the tallest leaf in the plant's natural position, using a tape measure. Number of active leaves was determined by counting the number of green or active leaves at flowering stage. D-leaf length (cm) was measured from its insertion on the stem to the leaf tip, using a tape measure; and D-leaf width (cm) was measured in the widest leaf region, using a tape measure.

The fruit physical characteristics evaluated were: fruit weight with crown, crown weight and length, core (inflorescence axis) diameter, pulp firmness and color, and fruit shape. Fruit weight with crown and crown weight were determined using a digital balance. Crown length was measured using a ruler. Core diameter was measured by transversally cutting the fruit at its middle part and measuring it using a digital caliper with fine tips (200 mm; Digimes). Pulp firmness was evaluated using an analog penetrometer (depth: 10 mm, model PTR-100) in three points between the core and the locule of a fruit slice from the middle part of the fruit; the data were expressed in Newtons (N). Fruit shape and pulp color were also evaluated.

The fruit chemical characteristics evaluated were: soluble solids content (SS), titratable acidity (TA), SS to TA ratio (SS/TA), and pH. The evaluations were carried out in 10 fruits per plot. Titratable acidity was determined by titration with 0.1 N NaOH (sodium hydroxide); 50 mL of distilled water was added to 10 mL of fruit juice, followed by the addition of 2 to 3 drops of the indicator (1%

phenolphthalein); the solution was subjected to agitation and titration with 0.1 N NaOH until the color turned slightly pink. The quantity of NaOH spent was calculated as percentage of citric acid in the juice. Soluble solids content was determined using a digital refractometer (scale of 0% to 95% Brix; model RTD-95), and the results were expressed as °Brix. Pulp pH was determined using a pH-meter (TECNAL TM Tec-3 MP). SS/TA was calculated by the ratio between soluble solids and titratable acidity.

The data of plant vegetative characteristics and fruit physical and chemical characteristics were subjected to analysis of variance and the significant means were subjected to the Scott-Knott test ( $p < 0.05$ ). The analyses were carried out using the software R (R Core Team, 2017).

Sensory analysis was carried out for the cultivars Perola, BRS-Imperial, BRS-Ajuba, IAC-Fantastico, and Smooth-Cayenne. Five fruits of each cultivar were randomly harvested at the harvest stage, with green skin and open mesh, i.e., suitable for fresh consumption. All evaluations were conducted two days after harvest. The preparation of the samples consisted of peeling the fruits and removing floral residues completely, discarding 3 cm of pulp from the top and bottom, slicing the middle section into 1.5-cm thick slices (approximately 65 g), which were radially divided into 8 portions; two pieces were served to each taster.

The samples were served in coded containers with random numbers to the tasters; a glass of water and a salted cracker were provided between samples for cleaning the tastebuds. Fifty people among students, staff, and professors from Unemat were invited to participate in the test and complete a questionnaire. The samples were evaluated regarding appearance, flavor, sweetness, color, overall impression, aroma, and texture.

A non-structured 9-point hedonic scale was applied, using a range of terms from 'disliked extremely' to 'liked extremely' for the attributes: appearance, aroma, flavor, color, texture, and overall impression.

A non-structured 9-point hedonic scale was used to evaluate sweetness, using a range of terms from 'extremely less sweet than the ideal' to 'extremely sweeter than the ideal'. The potential of tasters to purchase the product was evaluated through a 5-point scale of purchase intention, ranging from 'certainly would not buy' to 'certainly would buy'.

A completely randomized design with 50 replications was used for the statistical analysis, i.e., each taster was analyzed as one replication. The data of sensory analysis were subjected to analysis of variance

( $p < 0.05$ ) and Tukey's test ( $p \leq 0.05$ ), using the software R (R Core Team, 2017). The data of sensory analysis were evaluated through a frequency distribution of responses from the tasters.

## Results and Discussion

### *Plant vegetative characteristics and fruit physical and chemical characteristics*

The cultivars Gigante-de-Tarauaca, Perola, Jupi, and BRS-Ajuba presented higher plant heights (**Table 1**), and were in the same group. Smooth-Cayenne, BRS-Imperial, BRS-Vitoria, and IAC-Fantastico presented lower plant heights and consequently lower D-leaf lengths. The difference in vegetative growth among cultivars grown in a same environmental condition are intrinsic to the genotype. BRS-Imperial has slow growth rate and requires a longer period for plant development in the field until floral induction. However, long crop cycles in the field increase production costs and make the plant more prone to attack of pests. In the present work, the period from planting to artificial floral induction was one year.

Gigante-de-Tarauaca, Perola, Jupi, and BRS-Ajuba were in the same group, with the highest plant heights, which varied from 98.90 to 106.34 cm; Smooth-Cayenne had the largest number of leaves and was isolated from the other cultivars (Table 1). Number of leaves is an important characteristic from the agronomic point of view for pineapple plants, as a high number of leaves tend to increase leaf area, which allows for a better use of solar radiation, contributing to plant development and fruit quality (Loamy et al., 2014).

The cultivars Gigante-de-Tarauaca, Perola, and Jupi exhibited the greatest D-leaf lengths, followed by BRS-Ajuba, which was classified in another group. Jupi alone formed a group, exhibiting the largest D-leaf width, followed by Perola and a group composing of Gigante-

**Table 1.** Means of vegetative characteristics: plant height (PH), number of active leaves (NL), D-leaf length (DLL), and D-leaf width (DLW) of eight pineapple cultivars. Tangara da Serra, MT, Brazil, 2020

Cultivars	PH (cm)	NL	DLL (cm)	DLW (cm)
Gigante-de-Tarauaca	100.08 a	26.88 c	97.26 a	6.22 c
Perola	106.34 a	27.18 c	97.00 a	6.92 b
Jupi	105.78 a	28.42 c	99.34 a	7.62 a
BRS-Imperial	70.80 b	26.98 c	67.40 c	5.22 d
BRS-Ajuba	98.90 a	36.70 b	78.48 b	5.92 c
BRS-Vitoria	65.70 b	34.18 b	64.86 c	4.48 f
IAC-Fantastico	64.78 b	35.68 b	65.68 c	4.82 e
Smooth Cayenne	67.68 b	52.58 a	60.96 c	4.90 e
QMR <sub>trat</sub>	1850.55**	379.67**	1363.31**	6.13**
Mean	85.01	33.57	78.87	5.76
CV (%)	10.60	13.78	7.10	4.31

Means followed by the same letter in the columns belong to the same group by the Scott-Knott test ( $p < 0.05$ ).

de-Tarauaca and BRS-Ajuba. The small plants (BRS-Vitoria and IAC-Fantastico) produced a higher number of active leaves, but these leaves were smaller in size (Table 1). D-leaf width of the genotypes also varies; the D-leaf width of the cultivars presented higher differences than length. These are important variables for evaluating plant growth (Loamy et al., 2014). These characteristics related to pineapple plant's leaves are used as references for estimating and defining the optimal timing to proceed with floral induction, as they usually present a positive correlation with infructescence weight and length at harvest (Caetano et al., 2013).

Pineapple is a non-climacteric fruit, ripening only when attached to the plant, not progressing in sensory and nutritional qualities, although changes in texture and loss of green color may occur. Therefore, the harvest stage has a pronounced effect on the fruit's flavor, mainly in cultivars with more pronounced acidity. Thus, determining the optimal harvest point is essential for obtaining quality fruits and avoiding losses. The fruits were harvested as recommended for pineapple crops, between five to six months after artificial floral induction (Andrade Neto et al., 2018), thus the fruits were in the proper state of maturation for harvest.

Gigante-de-Tarauaca had the highest fruit weight, followed by Jupi and a group composed of BRS-Ajuba and Perola (Table 2). Fruit weight is a determinant factor for commercialization, as consumers seek large fruits. These cultivars also exhibited greater plant heights and D-leaf lengths, indicating that fruit weight is positively correlated with plant height and D-leaf length, emphasizing the importance of pineapple vegetative growth for obtaining larger fruits.

A small core diameter is another desirable characteristic in pineapple cultivars. BRS-Ajuba and BRS-

Vitoria were grouped with the smallest diameters (Table 2). Consumers and industries commonly prefer fruits with small core diameters (Berilli et al., 2014), as smaller core diameters correspond to a higher amount of edible pulp. Fruits with large core diameters and low pulp weight may have a higher fiber content; thus, fruits with smaller core diameters tend to yield higher pulp gains and better results (Barker et al., 2018).

Perola, Jupi, BRS-Imperial, and BRS-Vitoria were in the same group, presenting the lowest crown weights; they also had the greatest crown lengths, together with BRS-Ajuba, thus forming only one group (Table 2). IAC-Fantastico and Smooth-Cayenne presented the highest crown weights and the smallest crown lengths due to the multiple crowns that emerged after artificial floral induction. Small and consequently lighter crowns facilitate the handling, processing, transportation, and commercialization of fruits, visually attract more consumers and are preferably by markets, which demand fruits with small and more visually appealing crowns to offer consumers.

Cylindrical shape of fruits is a prioritized characteristics in pineapple cultivars that should be considered to meet the demands of the international market and position Brazil as a large exporter (Viana et al., 2013). Gigante-de-Tarauaca, BRS-Imperial, BRS-Ajuba, BRS-Vitoria, and Smooth-Cayenne exhibit a cylindrical fruit shape (Figure 1). Pulp color is among the most essential attributes determining consumer acceptance of fresh pineapples; yellow pulp is preferred by consumers (Lobo & Yahia, 2017). BRS-Imperial, BRS-Ajuba, IAC-Fantastico, and Smooth-Cayenne exhibited a yellow pulp (Figure 1).

All cultivars fell into the same group regarding fruit firmness (Table 3). Fruit firmness is an essential parameter assisting in determining the fruit shelf life and quality. The

**Table 2.** Means of fruit characteristics: fruit weight with crown (FW), fruit length (FL), core diameter (CD), crown weight (CW), and crown length (CL) of eight pineapple cultivars. Tangara da Serra, MT, Brazil, 2020

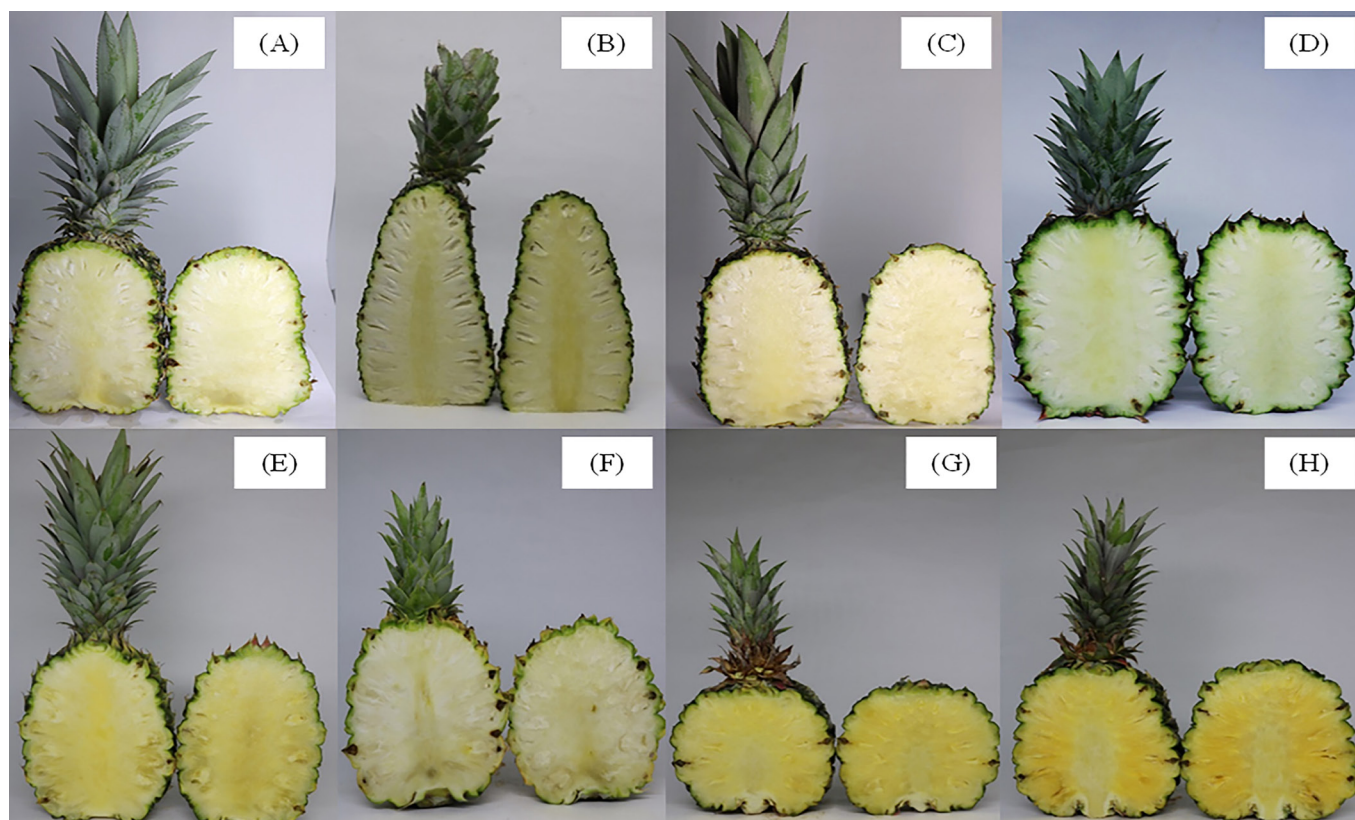
Cultivars	FW (g)	FL (cm)	CD (cm)	CW (g)	CL (cm)
Gigante-de-Tarauaca	2481.4a	19.51a	2.64a	201.70c	15.11b
Perola	1207.0c	18.26b	1.92c	108.20d	17.67a
Jupi	1536.8b	17.35b	1.88c	144.66d	19.37a
BRS-Imperial	909.2 d	11.79c	1.78c	161.80d	18.57a
BRS-Ajuba	1295.0 c	13.10c	1.59d	247.08c	19.74a
BRS-Vitoria	731.1 e	10.55d	1.42d	135.71d	19.94a
IAC-Fantastico	1050.4 d	9.69d	1.74c	402.36a	16.82b
Smooth-Cayenne	1033.2 d	10.42d	2.13b	352.13b	15.60b
QMR	1476575.52**	77.52**	0.69**	57460.57**	17.48**
Mean	1280.5	13.83	1.90	219.20	17.86
CV (%)	13.84	8.99	11.53	15.86	9.14

Means followed by the same letter in the columns belong to the same group by the Scott-Knott test ( $p < 0.05$ ).

**Table 3.** Means of pulp firmness (FIR), soluble solids content (SS), titratable acidity (AT), SS to TA ratio (SS/TA), and potential hydrogen (pH) of eight pineapple cultivars. Tangara da Serra, MT, Brazil, 2020

Cultivars	FIR(N)	SS (°Brix)	AT (%AC)	SS/TA	pH
Gigante-de-Tarauaca	1.95a	10.47d	0.83a	12.58c	3.39c
Perola	2.31a	12.30c	0.72a	17.37c	3.49b
Jupi	1.81a	14.03c	0.84a	16.65c	3.54b
BRS-Imperial	2.32a	17.85a	0.74a	24.13b	3.73a
BRS-Ajuba	2.26a	12.54c	0.74a	16.85c	3.46c
BRS-Vitoria	2.06a	16.30b	0.58a	30.26a	3.53b
IAC-Fantastico	2.12a	13.43c	0.74a	18.18c	3.52b
Smooth-Cayenne	1.86a	14.89b	0.51b	29.96a	3.58b
QMR	0.20**	27.63**	0.06**	216.77**	0.05**
Mean	2.09	13.98	0.71	20.74	3.53
CV (%)	14.86	8.53	14.24	19.96	1.68

Means followed by the same letter in the columns belong to the same group by the Scott-Knott test ( $p < 0.05$ ).



**Figure 1.** Fruit pulp color of the pineapple cultivars Gigante-de-Tarauaca (A), Perola (B), Jupí (C), BRS-Imperial (D), BRS-Ajuba (E), BRS-Vitoria (F), IAC-Fantastico (G), and Smooth-Cayenne (H), Tangara da Serra, MT, Brazil, 2020

post-harvest storage period decreases as the pineapple firmness decreases. This is attributed to physiological changes associated with senescence. The breakdown of cell wall structure reduces mechanical resistance, resulting in decreases in fruit firmness. Fruits with a high firmness are well-accepted by consumers and can be marketed to industries and international markets without risks of damage during the process (Viana et al., 2015).

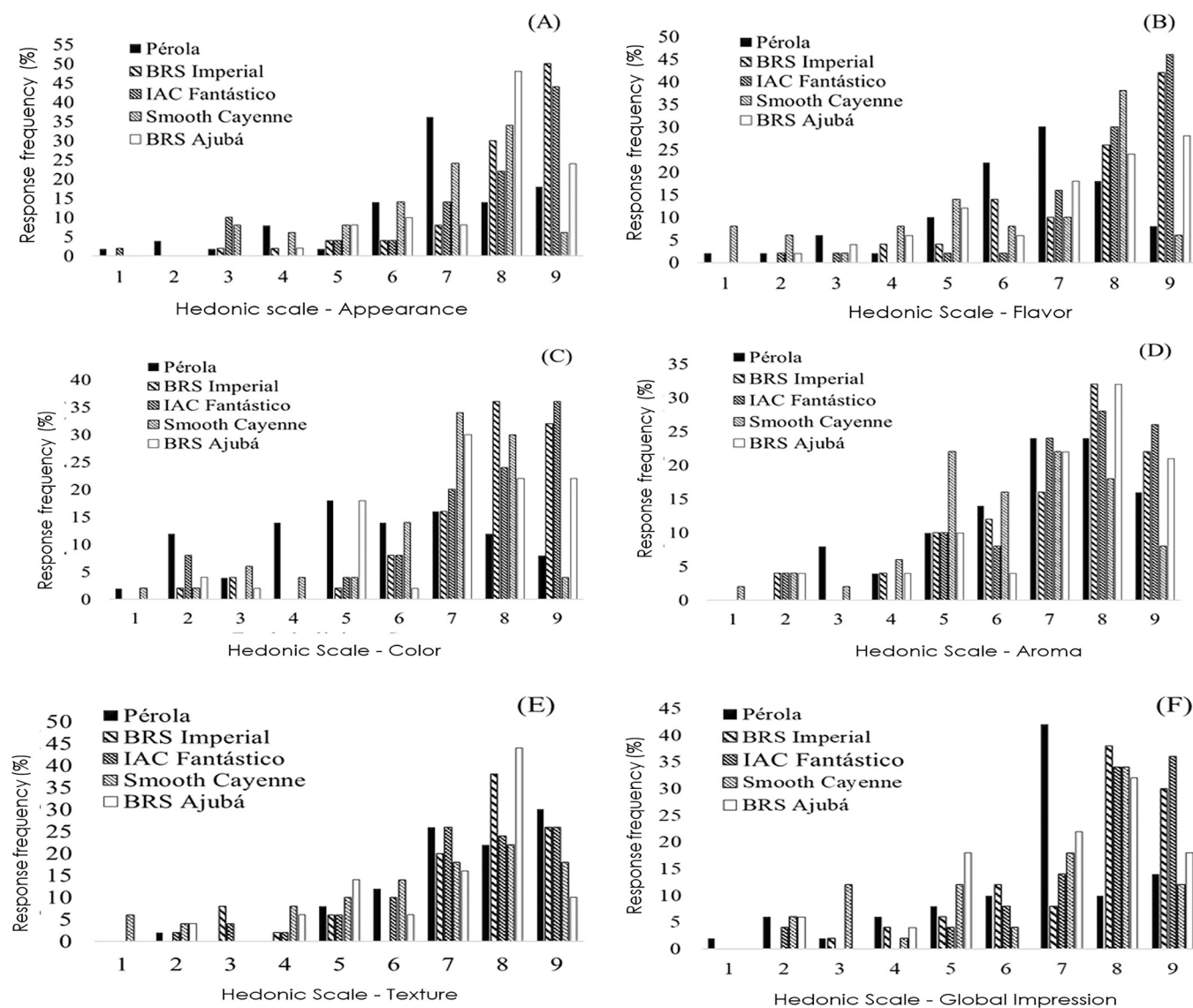
Considering the consumption of fresh pineapple, consumers prefer fruits with sweetness exceeding 12 °Brix and low acid (Wijeratnam, 2016). Additionally, the Normative Instruction no. 43 by the Brazilian Ministry of Agriculture, Livestock, and Food Supply (MAPA, 2002) recommends that fruits should be harvested with a minimum of 12 °Brix. All cultivars, except Gigante-de-Tarauaca, presented °Brix levels within this recommendation (Table 3). The low soluble solids content of Gigante-de-Tarauaca is intrinsic to its genotype, which is a landrace variety mainly cultivated in the municipality of Tarauaca, Acre, Brazil. Fruit samples obtained from crops in this municipality presented 9.5 °Brix (Marques et al., 2020). Generally, soluble solids content affects fruit palatability and acceptability and is an important quality factor (Wei et al., 2017). Fruits with sugar contents above 12 °Brix are recommended for fresh consumption, while fruits with sugar contents below 12 °Brix are suitable for

industrial processing (Peng Tan et al., 2019).

Titrateable acidity (AT) is usually expressed in pineapple fruits as a percentage of citric acid, varying from 0.32% to 1.22% (Bleinroth, 1987) depending on the cultivar, fruit maturation stage, climatic factors, and mineral nutrition. Thus, all evaluated cultivars were within this range of TA, remaining in the same group (Table 3).

Soluble solids to titrateable acidity ratio (SS/TA) is one of the most used methods to evaluate fruit quality and flavor, which is more representative than the measures of sugars and acidity, denoting the balance between these components (Ogawa et al., 2018). A TA between 20 and 40 is recommended for pineapple fruits (Soler, 1992). BRS-Vitoria, Smooth-Cayenne, and BRS-Imperial reached TA within these range. In general, TA presents wide variations, depending on the pineapple variety and crop environment (Lu et al., 2014).

Fruit pH is used to determine ripeness and the harvest point, with an ideal range of 3.0 to 4.0. All cultivars exhibit pH levels within this range, with variations between the cultivar groups. The highest mean pH was found for BRS-Imperial and the lowest for Gigante-de-Tarauaca and BRS-Ajuba (Table 3). Determining pH is important for providing information on fruit deterioration, enzyme activity, flavor, and odor and for assessing fruit maturation (Cecchi, 2003).



**Figure 2.** Frequency distribution of consumer responses (%) for acceptance of appearance (A), flavor (B), color (C), aroma (D), texture (E), and overall impression (F). 1 = disliked extremely; 5 = neither liked nor disliked; 9 = liked extremely).

*Sensory evaluation of fruits*

The evaluated sensory parameters showed significant variation among the pineapple cultivars (Table 4). Overall, BRS-Imperial and IAC-Fantastico had a greater acceptance. BRS-Ajuba also stood out alongside these two cultivars in terms of purchase intention.

The aroma evaluation showed that the cultivars were not significantly different from each other in the analysis of means, except for Smooth-Cayenne (Table

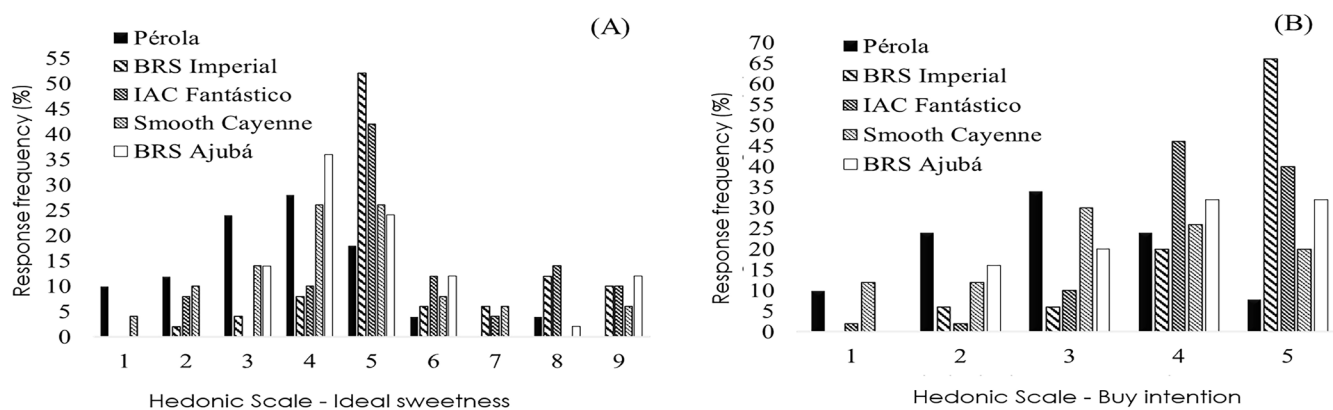
4). It is possible that other chemical characteristics of the pineapple cultivars, such as volatile compounds responsible for aroma or other sensory attributes, may have effect aroma acceptance. Therefore, additional studies focusing on investigating this attribute are necessary.

The analyze of hedonic scale frequencies for appearance, flavor, color, aroma, texture, and overall impression (Figure 2) revealed that consumers more

**Table 4.** Means for acceptance of fruits: appearance, flavor, pulp color, aroma, texture, overall impression, sweetness, and purchase intention for five pineapple cultivars. Tangara da Serra, MT, Brazil, 2020

Cultivars	Appearance	Flavor	Color	Aroma	Texture	Overall impression	Sweetness	Purchase intention
BRS-Imperial	8.04a	7.76a	7.62a	7.12a	7.40a	7.54a	5.72a	4.42a
IAC-Fantastico	7.46a	7.98a	7.40a	7.32a	7.22a	7.70a	5.68a	4.20a
BRS-Ajuba	7.64a	7.12b	7.00b	7.24a	6.92b	6.90b	5.02a	3.80a
Perola	6.68b	6.40c	5.48c	6.78a	7.44a	6.44b	3.64c	2.96b
Smooth-Cayenne	6.66b	6.04c	6.58b	6.16b	6.44b	6.46b	4.44b	3.30b

Means followed by the same letter are not significantly different from each other by the Tukey's test (p ≤ 0.05).



**Figure 3.** Frequency distribution of consumer responses (%) for sweetness (A; 1 = extremely less sweet than the ideal; 5 = ideal sweetness; 9 = extremely sweeter than the ideal) and purchase intention (B; 1 = certainly would not buy; 3 = maybe yes, maybe no; 5 = certainly would buy)

frequently rated the fruits between 7 and 9 ('liked moderately', 'liked quite a lot', and 'liked extremely'), reflecting the good quality of the evaluated cultivars. BRS-Imperial and IAC-Fantástico presented the highest frequency of rating 9 ('liked extremely') for appearance, flavor, color, aroma, and overall impression. Appearance and flavor are the most important fruit characteristics for consumers during purchase, although food price also significantly affects consumption.

Pulp color is a characteristic to be highlighted in the present study. All evaluated have yellow pulp, except Perola (white pulp), which was the least accepted by the tasters in the color acceptance evaluation. These findings confirm consumers' preference for pineapple fruits with yellow pulp (Lobo & Yahia, 2017). The results found in the present study reinforce the findings of Conceição et al. (2016), who reported greater consumer interest in fruits that are not fully white, as a characteristic color indicating ripeness is expected.

Fruit texture is another highlighted characteristic (Figure 3E). Interestingly, most tasters answered 'liked moderately', 'liked quite a lot', or 'liked extremely' for all cultivars. However, this variable is nearly imperceptible in pineapple (Oliveira et al., 2012), denoting the challenge in evaluating it, which may have affected the results obtained. Therefore, although texture is an important fruit physical attribute, it cannot be assessed through tactile perception of tasters and, consequently, through their evaluations.

More than 50% of consumers considered the sweetness of BRS-Imperial as ideal and 42% for IAC-Fantástico (Figure 3A). Probably, the high SS/TA of BRS-Imperial (Table 3) contributed to the high sensory acceptance means for sweetness. SS/TA is a quality index related to fruit sweetness (Branches & Pinho, 2014); therefore, fruits with higher SS/TA present more

pronounced sweetness and consequently greater consumer acceptance.

The purchase intention results showed a predominance of positive responses for BRS-Imperial and IAC-Fantástico, with 66% and 40%, respectively, with the tasters choosing the option 'certainly would buy' for these cultivars (Figure 3B). This result was consistent with the findings for these two cultivars, which presented the highest means for almost all evaluated parameters (Table 4), indicating that they were preferred fruits considering the analyzed variables.

## Conclusions

The pineapple cultivar Gigante-de-Tarauaca exhibited the highest fruit weight, however, low soluble solids content and soluble solids to titratable acidity ratio (SS/TA), making it not suitable for the fresh market. The cultivar Jupi had fruit weight (>1500g) suitable for the market, soluble solids above 12 °Brix, but SS/TA below 20.

Among the modern cultivars, BRS-Ajuba presented higher fruit weight, but BRS-Imperial and IAC-Fantástico were the most attractive to consumers, along with the traditional cultivar Perola. However, BRS-Imperial and IAC-Fantástico yield small fruits, which reduces their per-unit value in the market, as pineapples are typically valued based on their sizes.

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