Conservation and postharvest quality of prata-anã banana cultivated in organic and conventional management system

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ABSTRACT

On the ecological problems and health that result by the heavy use of agrochemicals in farming, new alternatives have been demanded. This demand for organic products is growing around the world, due to the demand for healthier foods, eco-friendly and greater profitability. Thus, the work aimed to evaluate by physical, chemical and sensory methods to conservation and postharvest quality of banana ' Prata-Midget "produced in the North of Minas Gerais under conventional and organic management. The work was conducted in the laboratory of Physiology and post-harvest of the State University of Montes Claros-UNIMONTES, in exact sciences and Technology Centre on the Campus of Janaúba-MG. The fruits used were of the variety-Silver Dwarf The fruits used were of the variety-Silver and framed in the market as of Monday, being from two farms, one adopts the organic system of production and the other the traditional system the experimental design was completely randomized design (DIC) in factorial scheme 2 x 6, being the organic and conventional management and six evaluation periods (1, 3, 5, 7, 9 and 11dias after harvesting). Four replicates were used and the experimental unit was formed of four fruits. The fruits were evaluated as the coloration of the shell diameter, length, firmness, fresh pasta with and without bark, pulp/Peel, soluble solids,

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pH, titratable acidity and sensory analysis. The organic production system introduced for most physical and chemical characteristics evaluated superior results compared to the conventional system, not differing in firmness and pulp/Peel. The values of the notes for all attributes analyzed were at most 1 Note (I like extremely) and 2 (liked moderately), demonstrating that there was no satisfactory sensory acceptance on the part of assessors for both managements.

Keywords: *Musa spp.*, Storage, North of mines.

INTRODUCTION

Brazil stands out in the international market as one of the largest producers of fruits, among the fruits of greatest economic and social relevance is bananas. Due to its nutritional characteristics, it is considered a nutritious fruit, with high digestibility, wide acceptance and easy acquisition, it implies a high consumption in the various layers of society (RODRIGUES, 2009). In 2009, the world production of this fruit was over 96 million tons, with India, the Philippines and China as the largest producers. Brazilian production was more than 6.7 million tons and is the fifth largest producer in the world (AGRIANUAL, 2012). In Brazil, the crop is exploited by small, medium and large producers in an area of approximately 527 thousand hectares (IBGE, 2013), mostly managed in a conventional way, and almost all of them include the use of fertilizers, herbicides, pesticides to control the main pests and diseases and the intensive turning of the soil using agricultural machinery and implements (BORGES et al., 2004). A growing demand for food without the use of chemical inputs is mainly due to consumers' concern with food safety, due to the high levels of pesticides present in some crops, which are easily absorbed by the body, which can cause damage ranging from mild poisoning to serious health problems (RIBEIRO et al., 2013).

The adoption of alternative production systems comes as a tool to improve the quality of the fruits, introducing to the market a differentiated product, with the potential to reach new markets, especially the foreign market (LOPES, 2011). Organic agriculture is based on a holistic system, making food production compatible without the use of chemical inputs in the crop, combined with low production costs (AZADI and HO, 2010). Due to this new appeal, associated with the better remuneration achieved by organic products, many producers have migrated from the conventional to the organic production system. As the banana is a climacteric fruit, it undergoes profound biochemical transformations after harvest, having a relatively short post-harvest life and presenting marked changes during ripening. Because it is a fruit that is very sensitive to transport when ripe and does not keep for long periods, bananas should be harvested while still green. During ripening, there is an increase in the content of simple sugars, an increase in simple and organic acids, a decrease in phenolic compounds, resulting in a reduction in astringency and an increase in acidity, in addition to the release of volatile compounds, factors responsible for aroma and flavor, which are fundamental characteristics for the acceptance of the fruit (SOTO-BALLASTERO, 1992). Seen as one of the most critical phases within the production-marketing process, but the least considered, the post-harvest phase of the fruits is of paramount importance, since it defines, from the moment it is harvested to consumption, the quality and conservation capacity of the fruit (LOPES, 2011).

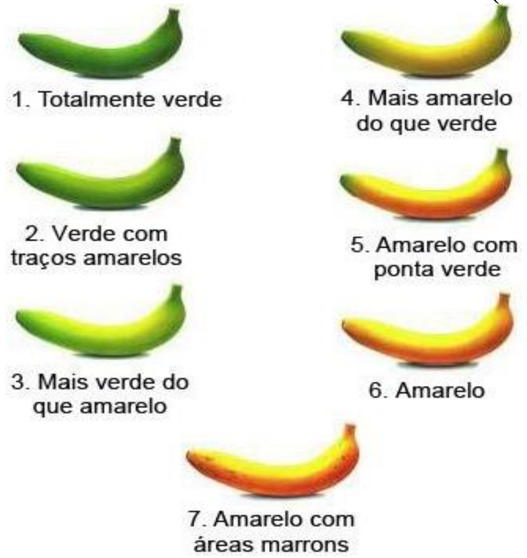
OBJECTIVE

To evaluate by physical, chemical and sensory methods the conservation and postharvest quality of the "Prata-Anã" banana produced in the North of Minas Gerais under conventional and organic management.

MATERIAL AND METHODS

The present work was carried out at the Laboratory of Postharvest Physiology, State University of Montes Claros (UNIMONTES), Department of Agricultural Sciences, Janaúba Campus, MG. The fruits used were of the Prata-Anã variety and included in the market classification as second, coming from two farms, one of organic cultivation and the other of conventional cultivation, both located in the municipality of Janaúba/MG. The characterization of the climate is semi-arid, with flat relief and silty alluvial soil. The average annual rainfall is 750 mm, concentrated from November to March. It has annual average temperature of 28 °C, insolation of 9.5h/day and relative humidity of 48%. The bunches were harvested at stage 2 of maturation (Figure 1) according to the CEAGESP Classification Standards (2006), and taken to the laboratory, where the selection of the fruits was carried out, discarding the damaged ones and those with symptoms of mechanical injuries. Subsequently, the bunches were divided into bouquets of four fruits, which were washed in running water and stored at 26°C ±1ºC and analyzed at two-day intervals

FIGURE 1 CEAGESP Classification Standards (2006)



CONVENTIONAL HANDLING

The property has its fruit production structured with a high technological level, with a production of first, second and export bananas. Management, fertilization is carried out through soil and leaf analysis, providing the plants with the necessary nutrients for their development according to their needs. These nutrients are provided in the form of chemical fertilizers, such as urea, simple superphosphate, potassium chloride, among others. When there is the occurrence of diseases and pests, alternatives are sought that are integrated in obtaining the best control, such as the use of chemical products combined with cultural control. Herbicides are used to combat weeds, since this presence of weeds delays the development of the banana plantation, decreases plant vigor, reduces the size of the bunch, hinders phytosanitary treatments, fertilization and the displacement of workers within the crop. On the property, modern techniques are used in its post-harvest infrastructure, the bunches are transported by overhead cables, taking them to the packin house, where the entire process of hygiene, classification and packaging of the products is carried out, undergoing inspections by technicians in order to ensure the quality of the product.

ORGANIC MANAGEMENT

The production of organic bananas is in an area of 9.5 hectares that was acquired in 2010, where previously there was already the planting of Prata-Anã banana conducted in a conventional way, however it was in conditions of abandonment. The irrigation system was replaced by a new one, and the area was managed, with cultural treatments and application of organic fertilizers. In management, fertilization is carried out according to the needs of the plants, through soil analysis carried out periodically. There is no involvement by any type of pest that will reduce production. Disease control is done with monthly application of mineral oil and lime application on the foot of plants that show symptoms of Panama disease (*Fusarium oxisporum* f. sp. *Together* with the organic matter that increases the amount of beneficial microorganisms and the competition between them, there will be a smaller amount of this fungus. In 2013, the producer adapted to the certification standards for pesticide-free plant products (SAT), a certification issued by the Minas Gerais Institute of Agriculture (IMA). The certification of products of plant origin Without Pesticides - SAT is offered by the IMA for the pesticide-free system at any stage. The property produces second-class bananas, since the production of first-class bananas is not satisfactory. This is due to the fact that the area was for a long time under conventional cultivation, which caused an imbalance in the soil and microfauna. This process can take a long time to reverse and, despite the organic management adopted by the producer, he has not yet been able to achieve an ecological balance in his area capable of causing an increase in the production of prime bananas.

EXPERIMENTAL DESIGN

The experiment was conducted in a completely randomized design (DIC), in a 2 x 6 factorial scheme, with organic and conventional management and six evaluation periods (1, 3, 5, 7, 9 and 11 days after harvest). Four replications were used and the experimental unit consisted of four fruits. The data of the evaluated characteristics were submitted to analysis of variance and the significance of the interactions between the tested factors was verified by means of the F test, with subsequent unfolding for the significant results. For the data of the storage periods, polynomial regression models were adjusted and submitted to analysis of variance, and the significant models with the highest coefficient of determination and that best explained the biological phenomenon were selected. The SISVAR program was used to process the data analysis (FERREIRA, 2008).

EVALUATED PARAMETERS

The physical, chemical and sensory quality of the fruits was evaluated by analyzing length, diameter, fresh fruit mass, soluble solids, titratable acidity, pH, color and firmness.

On the last day of storage, a more careful characterization of the fruits was carried out, evaluating the peel mass, pulp mass, pulp/peel ratio and sensory analysis.

Fruit length

The external curvature from the base of the peduncle insertion to the end of the fruit was measured with the aid of a caliper, and the results were expressed in centimeters.

Fruit diameter

The median region was measured with the aid of a caliper, and the results were expressed in centimeters.

Fresh fruit mass, pulp and peel

The result was performed with the aid of a semi-analytical balance and the result was expressed in grams.

PULP/PEEL RATIO

To obtain the relationship, the value of the mass of the fruit without the peel was divided by the mass of the peel and the result was expressed in pure number, with two decimal places.

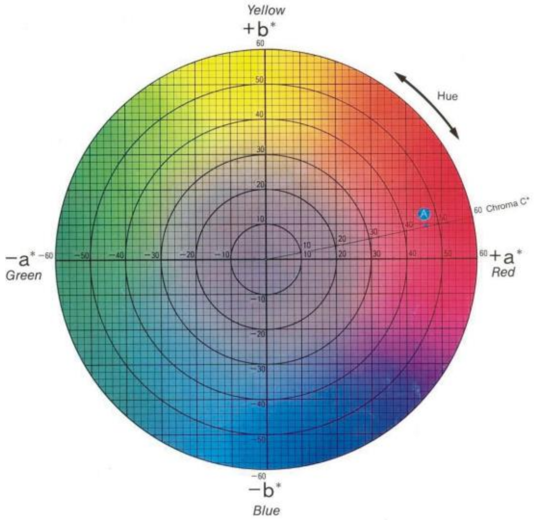
Bark staining

Color analysis was performed using a Color Flex 45/0(2200), stdzMode:45/0 colorimeter, with direct reflectance reading of the coordinates L* (luminosity), a* (red or green) and b* (yellow or blue hue), from the Hunterlab Universal Software system (Figure 2). From the values of L*, a* and b*, the hue angle (°h*) and the chroma saturation index (C*) were calculated. For each replication, an average of four measurements per fruit was used.

°H*= ActG (A*/B*) (–1) +90 □ for negative A* **(A1)**

°H*= 90− (ActG (A*/B*)) □ for A* positive **(A2)**

$C^* = \sqrt{}\ (a^*)^{2+(b^*)2}$ **(B)**



L, a, b Color Solid representation of the Hunterlab Universal Software system and description of hue angle (°h*) and chroma saturation index (C*).

FIRMNESS

Firmness was measured with a tabletop penetrometer (FACCHINI, model FT 011), with the results expressed in Newton (N), with a penetration depth of 2.0 mm and a tip TA 9/1000. The reading was performed on whole fruits with peel, in the median region, using four fruits for each analysis.

SOLUBLE SOLIDS

Soluble solids were determined by refractometry, using an ATAGO benchtop refractometer, model N1, with readings in the range of 0 to 95 □Brix, after extracting a sample of the pulp from the central region of each fruit. The result expressed in $^{oBrix.}$

TITRATABLE ACIDITY

The titratable acidity was determined by titrating the juice of the fruit set of each tray under agitation after extracting, crushing and homogenizing 10g of the pulp of the central region of each fruit in 90 mL of distilled water, with 0.1N NaOH, using 1% phenolphthalein as an indicator. The result was expressed in grams of malic acid per 100 g of sample.

ph

The pH determination was performed directly in the juice using a DIGIMED pH meter, model DM20, after the preparation of the samples as in the previous analyses.

SENSORY ANALYSIS

To verify the acceptance of the fruits from the different managements, sensory studies were carried out with 20 volunteer tasters. The test followed a structured 5-point scale (1- I liked it extremely, 2- I liked it moderately, 3- I didn't like it, I didn't like it or dislike it, 4- I disliked it moderately, and 5- I disliked it extremely) (Figure 3). The sensory evaluation was carried out by 20 untrained tasters, including employees, visitors and interns. The samples were presented to consumers at room temperature, in disposable plastic plates coded with repeat numbers and evaluated for pulp color, appearance, flavor, texture and overall evaluation. Sensory analyses were performed on the last day of storage, when the fruits were already ripe. The results of the sensory characteristics were evaluated and then frequency histograms were constructed with the values received by each sample.

FIGURE 3 Sensory analysis sheet to verify the acceptance of the fruits.

Nome:____________________

Sexo: ☐ Feminino ☐ Masculino Data: ___/___/___ Idade:______

Produto: **Banana Prata-anã**

- Você costuma consumir banana?

☐ Sempre ☐ Frequentemente ☐ Raramente ☐ Nunca

- Por favor, avalie a amostra do fruto servido e indique o quanto você gostou ou desgostou de acordo com essa escala.
    1. Gostei extremamente
    2. Gostei moderadamente
    3. Não gostei, nem desgostei
    4. Desgostei moderadamente
    5. Desgostei extremamente

	R1	R2	R3	R4
Cor				
Aparência				
Sabor				
Textura				
Avaliação global				

Comentários:____________________

Muito Obrigada!

RESULTS AND DISCUSSION

Table 1 shows the mean length, diameter and weight of the fruits in the different managements. It was observed that there were significant differences between the managements, in the organic the fruits presented higher values, with average values found for the length were 14.68 and 13.39 cm and for the diameter were 3.47cm and 3.23cm for organic and conventional, respectively. These results are similar to those found by Lopes (2011), who found that under a temperature of ±26° the values of length and diameter were higher for the alternative culture.

However, Ribeiro *et al*. (2013), in disagreement with the results, reports that no statistical differences were detected in the characteristics of length and diameter of the Prata-Anã cultivar under organic and conventional management system and found values lower than those of the present study. According to Ribeiro (2011), the benefits found in the organic cultivation system result from the importance of organic matter, which, when applied to the soil, provides the necessary nutrients for production in a gradual manner. The improvement of the physical and biological structure of the soil is due to these nutrients, retained in the humus, as they provide greater efficiency in the ability of plants to assimilate nutrients. Donato (2003) reports that the length of the fruit is an important characteristic from the perspective of quality for classification, however, this varies with the demand of the consumer market. Research conducted by Matsuura *et al*. (2004) indicate that 87.4% of consumers prefer medium (12 to 15 cm) and large (16 to 19 cm) bananas. The advantage of the Prata-Anã banana lies in its dimensions, since they are smaller than those of the Cavendish subgroup, thus making them more practical for consumption (DAMATTO Jr., 2005).

Regarding the average mass of bananas (bouquets of four fruits), there was a significant difference, with the fruits of organic cultivation having a weight of 554.63g, a value higher than that of conventional cultivation, which was 402.45g (Table 1). The mean values observed in this study for fruit mass in organic cultivation were higher than those found by Santos *et al*. (2012) in the cultivar Prata-Anã where it found a value of 115.33g, which is higher when compared to conventional cultivation with an average value of 100.61g per fruit analyzed. Fruit mass is an important parameter for breeding work, since it cannot be considered in isolation, as it is associated with other characteristics that define fruit size, such as length and diameter, and reflect fruit quality and consequently in consumer preference (DONATO *et al*., 2006).

TABLE 1 Mean values of length (CF), diameter (DF) and fruit mass (PF) of Prata-Anã bananas cultivated under conventional and organic management (average of the evaluations of the entire storage period).

Handling	**CF (cm)**	**DF (cm)**	**MF (g)**
Conventional	13.39 b	3.23 b	402,45 b
Organic	14.68 to	3.47 to	554,63 to
CV(%)	5,35	6,12	14,55

Values followed by different letters in the columns differ statistically according to the F test(0.05).

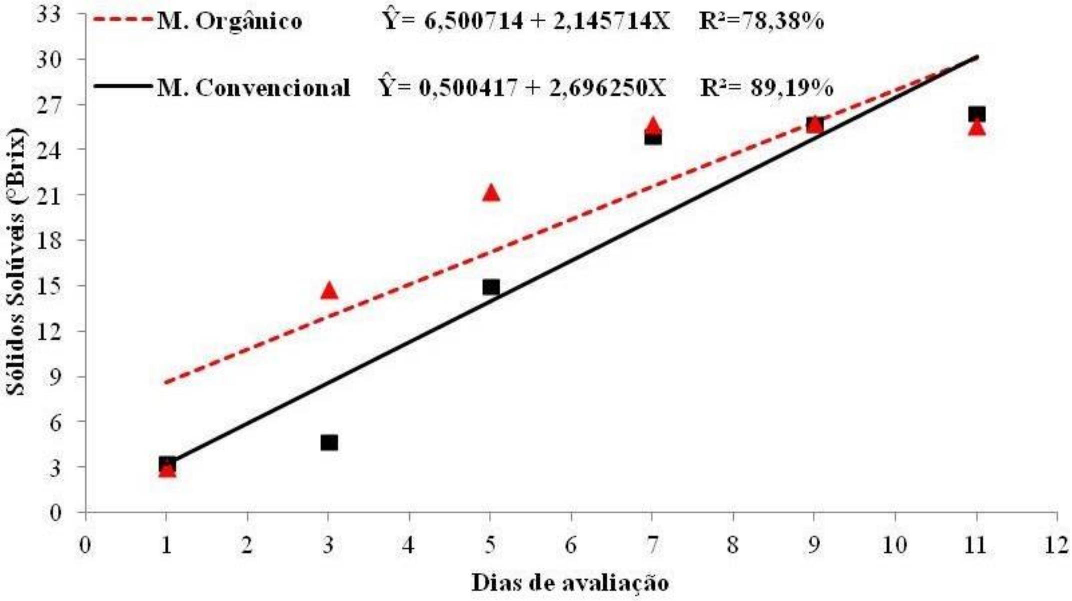
In the evaluation of the soluble solids content, a linear increase was observed throughout storage, with values ranging from 3.0 to 30 °brix, since there was a statistical difference between the two managements. At the end of storage, the organic system presented a value of 30.10 °brix and in the conventional system, 30.16 °brix (Figure 4). Soluble solids determine the amount of solids that are dissolved in the juice or pulp of fruits, being mainly made up of sugars, they are variable with the species, the cultivar, the stage of maturation and the climate.

The lower content of soluble solids may be an indication of slower ripening of the fruits, since the tendency is to increase during ripening (CASTRICINI *et al*., 2012).

In a test with several banana cultivars managed in organic and conventional systems, Ribeiro (2011) found that organic management allowed the highest average soluble solids content in relation to the conventional cultivation system in the Prata Anã cultivar, with a content of 25.20%. Pimentel *et al*. (2010) with the same cultivar obtained values of 2.13% to 20.48% in bananas planted in conventional cultivation system.

According to Ribeiro (2011), the proportion of soluble solids are of great relevance to determine the quality of the fruit, so it is an indicator of the sugar content along with acids, vitamins, amino acids and some pectins. Thus, it is an important variable both for *fresh* consumption and for the food industry.

FIGURE 4 Soluble solids of banana fruits as a function of the evaluation time in different production managements.

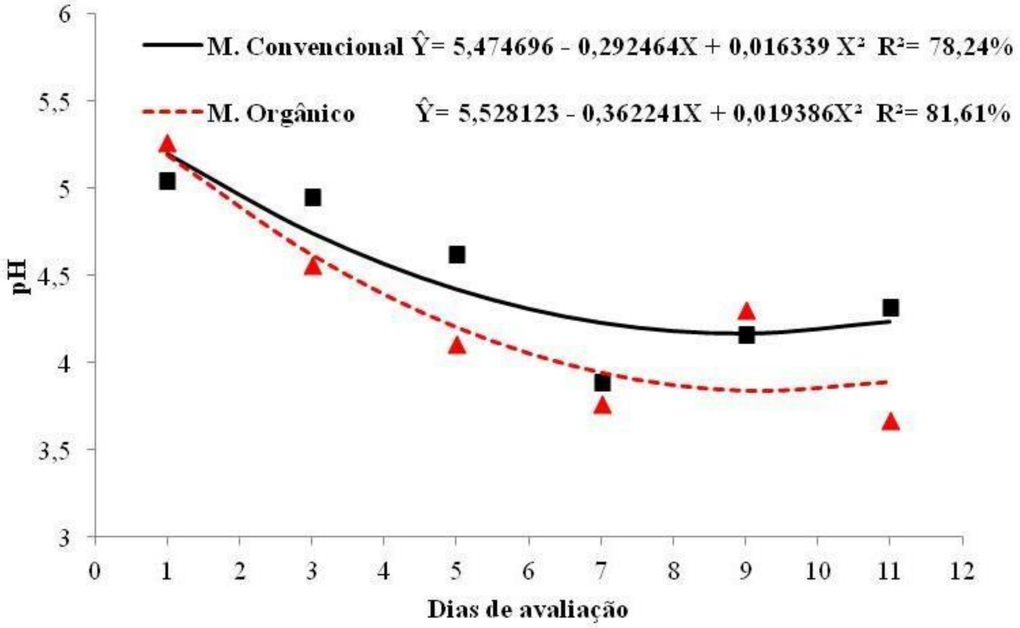


When the pH of the fruits was evaluated, a significant difference was observed between the managements, with a decline in the values, and in the conventional cultivation there were higher pH values. Figure 5 shows that there was a quadratic reduction for the pH of the fruits in both systems in the time interval evaluated. Oliveira (2010), also observed the same behavior in storage at 25° C, noting a decline in values until the 6th day of storage, with a slight increase after this period.

Nascimento Jr. *et al*. (2008) also observed a decline in pH during storage for Prata banana, where from the 10th day after harvest no changes were observed, remaining the values of 4.06.

The pH of the pulp of unripe bananas tends to fluctuate between 5.0 and 5.6, while for ripe fruit this value drops to 4.2 to 4.7 (MATSUURA and FOLEGATTI, 2001). This decrease during ripening is expected because it is associated with the accumulation of sugar and acidic constituents during fruit ripening. The fact that bananas have a predominance of malic acid, the reducing sugars, which are the precursors of organic acids, causes a decrease in pH during ripening due to their accumulation (NASCIMENTO Jr. *et al*., 2008). The small increase observed at the end of ripening can be explained by the consumption of organic acids as a respiratory substrate, causing an increase in pH (OLIVEIRA, 2010).

FIGURE 5 Variation of the pH of banana fruits as a function of the evaluation time in different managements of production.

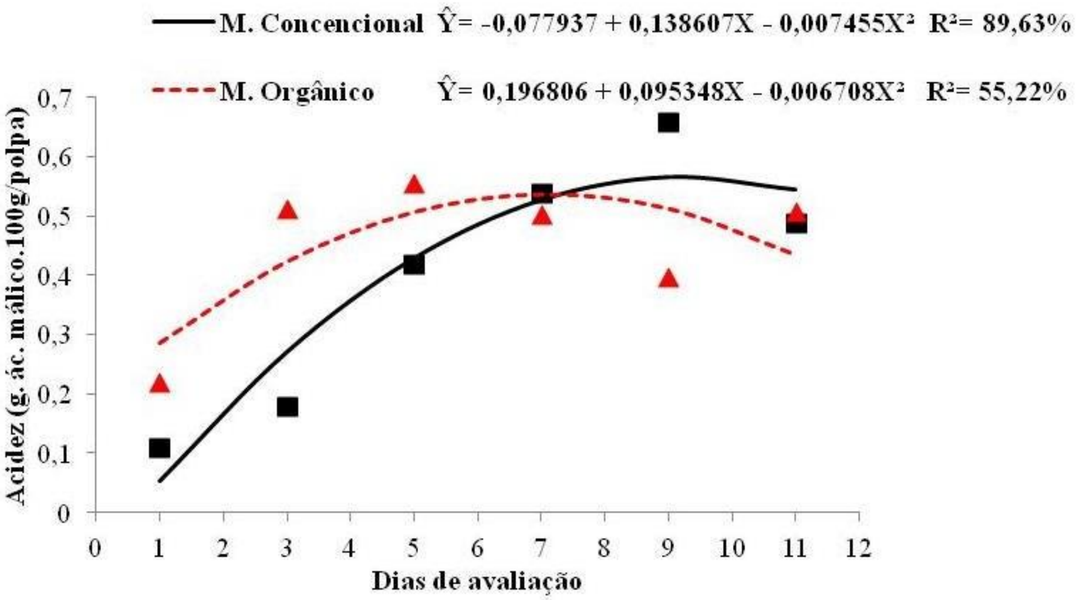


For titratable acidity, significant differences and variable behaviors were also observed within the storage period. Acidity was initially presented with 0.05 and 0.29g of malic acid/100g of pulp and at the end of the storage period it reached 0.54 and 0.43g of malic acid/100g of pulp, for conventional and organic management, respectively (Figure 6). Ribeiro (2011), working with both management systems (organic and conventional), found no statistical difference in the total titratable acidity content, and the average value of 0.21% was verified for both managements. These results differ from those found in this study, since the average levels of titratable acidity were 0.40 and 0.45g of malic acid/100g of pulp, for conventional and organic management, respectively.

On the other hand, the results of Nascimento Jr. *et al*. (2008), with Prata bananas were similar, the acidity content in the green fruit was 0.17% of malic acid per 100 g of pulp, and in the ripe fruit the value found was 0.72% of malic acid per 100 g of pulp.

According to Campos *et al*. (2003), the taste when related to sugars is favored by the increase in acidity content. Thus, with the ripening of the banana, there is an increase in the acidity content, reaching its maximum when the skin is completely yellow.

FIGURE 6 Total titratable acidity of bananas as a function of the evaluation time under different production managements.

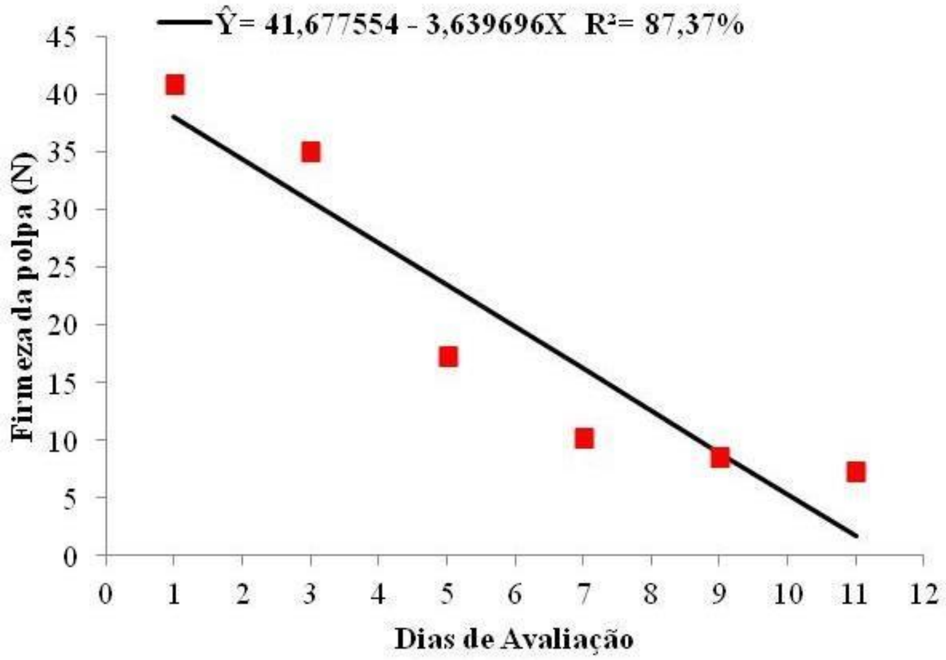


Analyzing the firmness of the fruit, no significant differences were found between the two crops, the difference that can be noticed is between the days of evaluation. During storage, the variation in firmness was very pronounced, with a decrease, where, on the day of harvest, the firmness was approximately 40.9 N and at the end of storage, 7.2 N (Figure 7). These results are consistent with those of Sarmento *et al*. (2012), when he worked with bananas from the Cavendish group in organic and conventional management systems, since he did not observe a difference in firmness for the two cultivation systems. Damatto Jr. (2008), evaluating the postharvest quality of Prata-Anã bananas fertilized with different doses of organic compost, also found no significant difference for the variable fruit firmness for the different concentrations of the compound when compared to the control.

Differently from the results obtained in this study, Ferreira (2013), on the last day of storage of Prata Anã at 25°C, found firmness values of 3.27N, which is much lower than that presented in this study. This difference is due to the ripening of the fruits, since the fruits with a firmness of 3.27N are more ripe.

According to Pereira *et al*. (2004), fruits that express low firmness are more likely to be susceptible to falling. The reduction in the firmness of the banana pulp usually occurs due to the action of the enzymes pectinmethylesterase and polygalacturonase that act on the cell wall. Differences in firmness may be related to different amounts of polysaccharides, starch and pectic substances found in banana pulps (CANO *et al*., 1997). Loss of firmness during ripening leads to lower quality and a higher incidence of mechanical damage during handling and transport (DADZIE and ORCHARD, 1997).

FIGURE 7 Variation of the firmness (N) of the banana peel Prata-Anã as a function of the time of evaluation in the different production systems.



The determination of the color of the fruits by colorimeter ascertains the differences in the color of the skin, which is spectrally close to the pattern observed by the eyes, with the advantage of being three-dimensional, eliminating evaluations of each observer (when it is done only visually) (ÁLVARES *et al*., 2003).

The characteristic L* (luminosity or brightness) of the shell ranges from 0 to 100, and that low values indicate opaque/dull bark and high values are equivalent to maximum brightness (CASTRICINI *et al*, 2012).

The value of the L* coordinate fluctuated well over the days of storage, it can be seen in Figure 8 that there is an increase in the values initially and in the last days of storage there is a decline in these values. The fruits of conventional management reached the end of 59.2, and in organic management an average value of 64.8 of fruit luminosity.

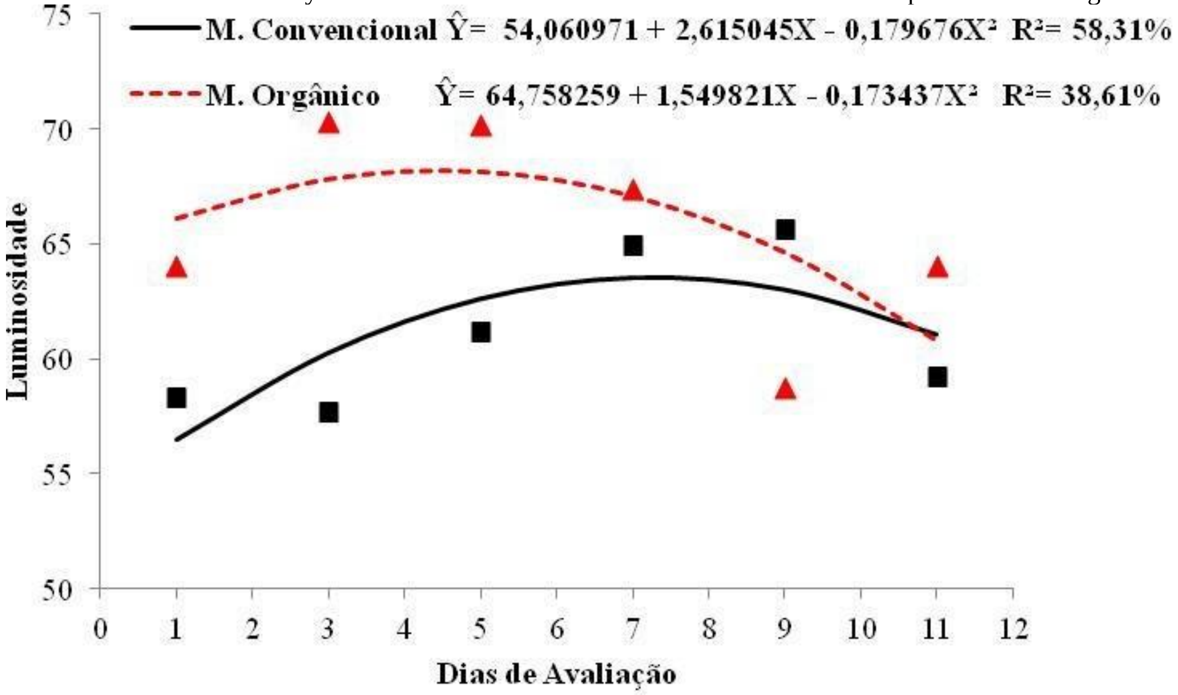
The maximum luminosity value was 63 and 68 in conventional and organic crops, respectively. Results similar to those of Pinheiro (2009), who, working with bananas cultivar Tropical, found that the values of L* at the temperature of 25ºC ranged from 61.5 to 68.1. Castricini *et al.* (2012), testing different irrigation depths with bananas cultivar BRS Platina (PA42-44) observed values ranging from 60.75 to 73.12 for peel luminosity.

The characteristic color of the banana (ripe) begins to emerge a little before the climacteric peak, due to the unmasking of pre-existing carotenoids due to the degradation of chlorophyll from the enzymatic activity of chlorophyllase. This activity evolves with increased breathing (AWAD, 1993).

Figure 9 shows the chroma (c) or chromaticity values, a parameter that expresses the intensity of the color, i.e., the saturation in terms of pigments of this color. Chroma values close to zero represent neutral colors (grays) and values close to 60 express vivid colors (MENDONÇA *et al.*, 2003). It can be seen that the behavior of color intensity was very variable in the two cultivation systems, since on the last day the values were 41.4 for the conventional system and 45.6 for the organic system.

Similar results were found by Pinheiro (2009), in which at 25ºC the chroma values for the banana cultivar Tropical increased from 41 to 46.56 at 11 days of storage.

FIGURE 8 Banana luminosity values as a function of the evaluation time in different production managements.



The color angle (hº) is a measure that has been used to express the variation of color in vegetable products, allowing the visualization of the change in the color of the fruits, from green to yellow.

The hº value in freshly harvested conventionally grown fruits was 105.87 and in organically grown fruits it was 96.86, and over the days they were stored this value only decreased linearly to 74.01 and 71.72, respectively (Figure 10).

The mean shade angle (°Hue) for the banana cultivar BRS Platina verified by Castricini *et al.* (2012) oscillated between 90.25 and 95.50, where all fruits were within the angular range of yellow color (90°).

According to the preference of consumers interviewed by Matsuura *et al.* (2004), the preferred colors for banana peels were medium yellow and dark yellow, totaling 74.6% of the preference.

FIGURE 9 Banana chroma values as a function of the evaluation time in different production managements.

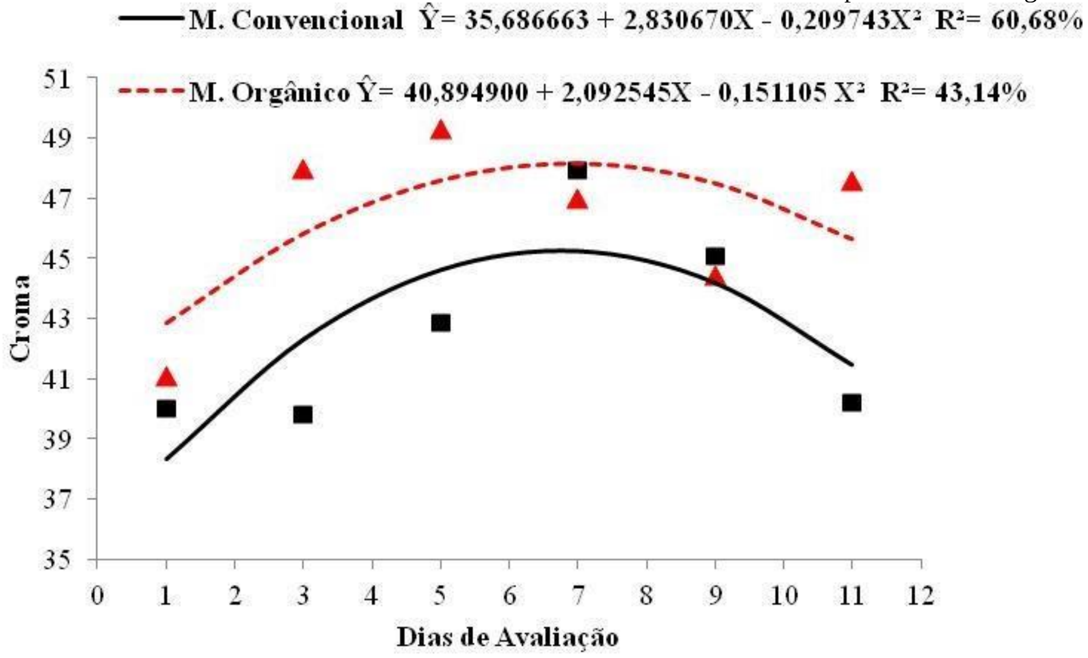
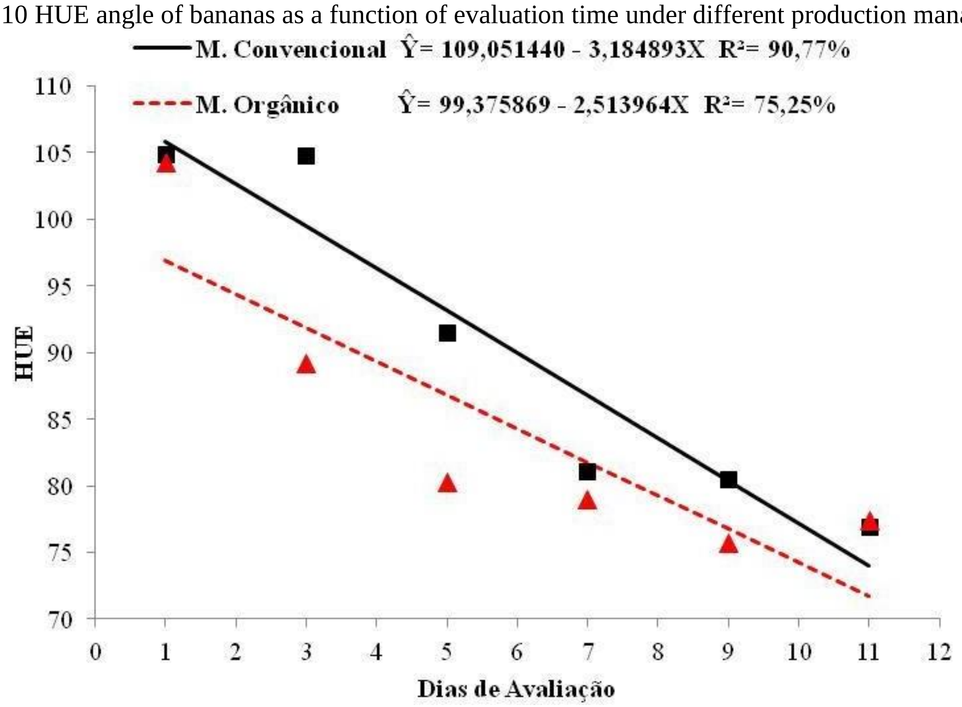


FIGURE 10 HUE angle of bananas as a function of evaluation time under different production managements.



A significant effect of the management systems was observed for the characteristics fruit weight, pulp mass, peel mass and diameter, highlighting the superiority of organic management in relation to conventional management on the last day of evaluations, except for the characteristics pulp/peel ratio and length, for which there was no significant difference between the treatments.

For the fruit mass, the difference found was quite relevant, with a difference of 38.41 grams between the crops, with emphasis on the organic management with heavier fruits (123.82g) (Table 2). Ribeiro (2011), testing some banana genotypes cultivated in conventional and organic cultivation systems in Bahia, reported distinct and superior results, of 135.08g and 90.55g, for conventional and organic, respectively. Contrary to Borges *et al.* (2011), who, evaluating the performance of banana genotypes, found a value of 86.2g for the average fruit mass of the cultivar Prata-Anã, a value much lower when compared to organic cultivation and higher when compared to conventional cultivation in the present study.

Organic cultivation also provided bananas with a higher pulp mass (88.71g) and peel mass (35.34g). Leite *et al.* (2010) evaluating the quality of Pacovan bananas sold in three different types of establishments in Rio Grande do Norte, obtained pulp mass values of 106.54, 74.98 and 94.18 grams, which are similar to those found.

Although the organic crop had the highest average fruit mass with and without peel, on the other hand, the results of the pulp/peel ratio did not give significant differences. The explanation may be based on the fact that the characterization was carried out on the last day of storage and with most of the fruits already ripe.

With ripening, the fruits start to have a higher percentage of pulp, since the peel loses more water than the pulp in this period. In addition to losing water to the pulp, the banana peel loses water to the environment through transpiration, resulting in an increase in the pulp/peel ratio during ripening (DAMATTO Jr. *et al.*, 2005). According to Matsuura and Folegatti (2001), this relationship is also known as the "ripening coefficient", which is considered a maturity index.

Similar results were reported by Calasans *et al*. (2012), who studied the characteristics of several banana genotypes and found a pulp/peel ratio of 2.44 for Prata Anã.

Damatto Jr. *et al*. (2005) found that the pulp/bark ratio was higher for the cultivar Prata-Zulu (3.43), differing from 'Prata-Anã', which presented this ratio lower (1.81). These values were found by the same author to be lower than those presented in this work.

According to Ahmad *et al*. (2001), smaller fruits have a higher pulp/peel ratio than larger fruits, as is the case of the banana cultivar Prata-Anã, which has smaller dimensions.

In the characterization of the length and average diameter of the fruits, a significant difference was found only for the diameter. For the diameter, the highest averages were obtained for organic cultivation (3.13 cm). In contradiction to Ribeiro (2011), with the cultivar Prata-Anã produced in different managements, there was no statistically significant difference for the diameter values, with the organic management resulting in 3.40 cm and the conventional 3.78 cm.

The length found for conventional cultivation was 13.03 cm and for organic cultivation was 13.88 cm, with no significant difference between managements. Ribeiro (2011), on the other hand, found totally unequal results, and there was a difference in the crops, the conventional management (16.62cm) registered a higher result than the organic one (13.96cm) and these values were much higher than those found in this study, obtaining a difference of 3.6cm larger than conventionally produced bananas.

TABLE 2 Mean values of fruit mass (MF), pulp mass (MP), peel mass (MC), pulp/peel ratio (RPC), length (CF) and diameter (DF) of Prata-Anã bananas cultivated in different managements (average of the evaluations of the last day of the storage period).

Handling	MF (g)	MP (g)	MC (g)	RPC	CF	DF
Conventional	85,41 b	61.73 b	23.49 b	2.53 to	13.03 to	2.55 b
Organic	123.82 to	88.71 to	35.34 A	2.63 to	13.88 to	3.13 to
CV (%)	15,77	14,57	17,97	6,11	5,26	6,02

Values followed by different letters in the columns differ statistically according to the F test(0.05).

The results of the sensory analyses showed a satisfactory acceptance rate for the two managements that obtained the majority of grades 1 (I liked it extremely) and 2 (I liked it moderately), which are the most convenient to receive.

In the color parameter, bananas from conventional cultivation obtained the highest amount of maximum score (1), with an acceptance percentage of (60%) compared to organic bananas, which obtained 25% of grade 1, and 60% of grade 2 (Figure 10(a)). However, there was a conventional rejection with grades 3 and 4 (15%), which are not so satisfactory to receive.

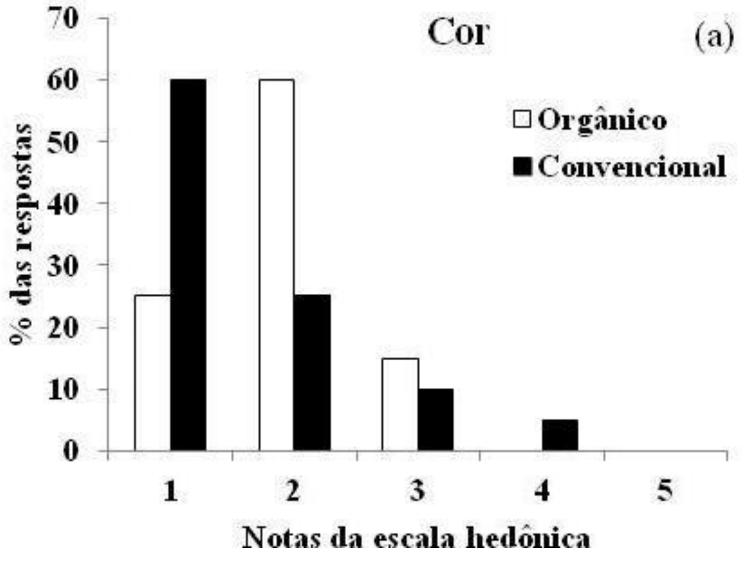
In terms of fruit flavor, the highest amount of maximum score was obtained by organic fruits with 60% of preference, with conventional fruits with 40% of grade 1 and 20% of grade 3 (neither liked nor disliked) (Figure 10 (b)). In sensory analysis, taste is one of the main attributes, as it reflects the consumer's preference for the product.

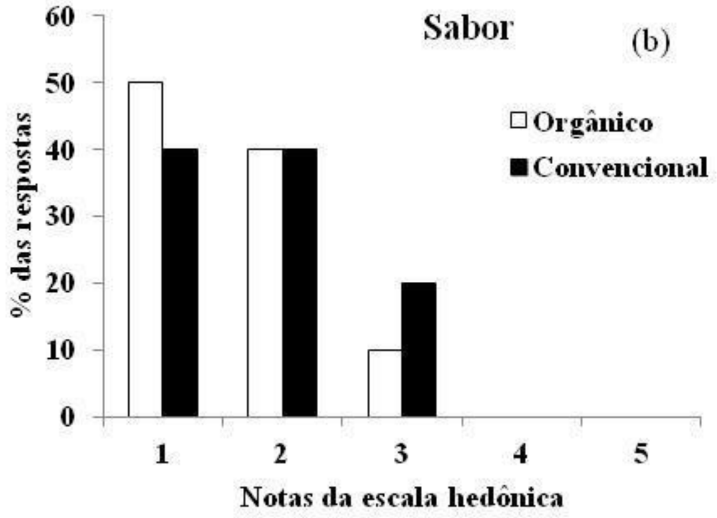
For the appearance of the fruits, 50% of the grade 1 was for the conventional management, although it still obtained 10% of the lowest scores (3 and 4), even so the organic management reached 25% of grade 3 and a small percentage of maximum grade 1 (Figure 10 (c)). These results show that the organic fruits were not apparently beautiful, but with a better flavor.

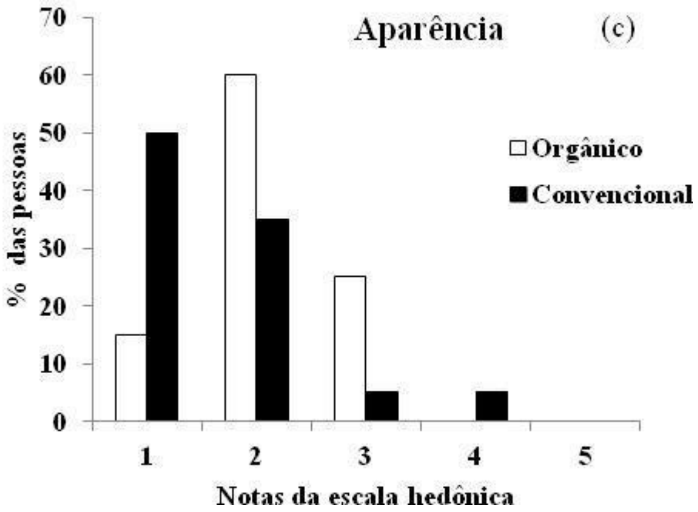
Regarding texture, organic and conventional fruits were equal, the mean scores given by the tasters were the same, obtaining 45% of grades 1 and 2 and 10% of grade 3 (Figure 10 (d)). So, in this characteristic, there was no difference between the bananas.

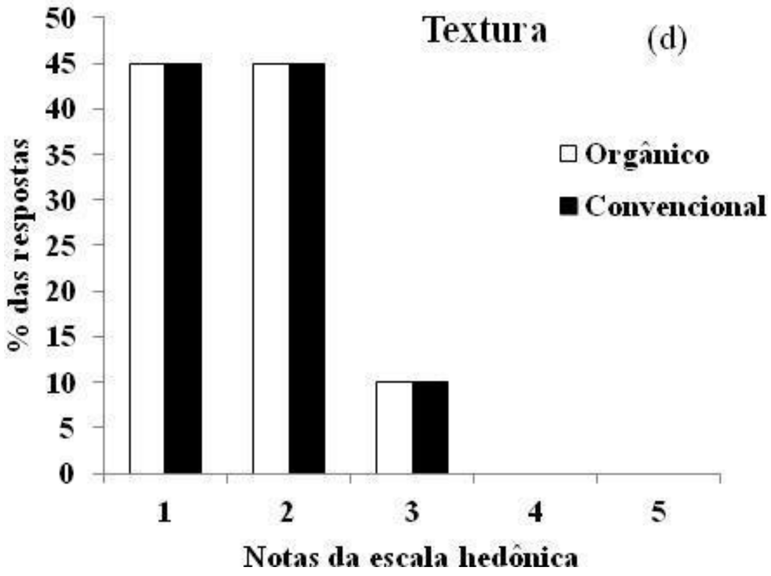
Finally, in the global evaluation, 40% of the maximum score 1 was verified in the fruits produced in a conventional way, leaving the organic fruits with 25% of maximum acceptance (figure 10 (e)). However, the organic ones obtained a lower percentage of low acceptance scores (grades 3 and 4) (15%), while the conventional ones obtained 20% of these grades.

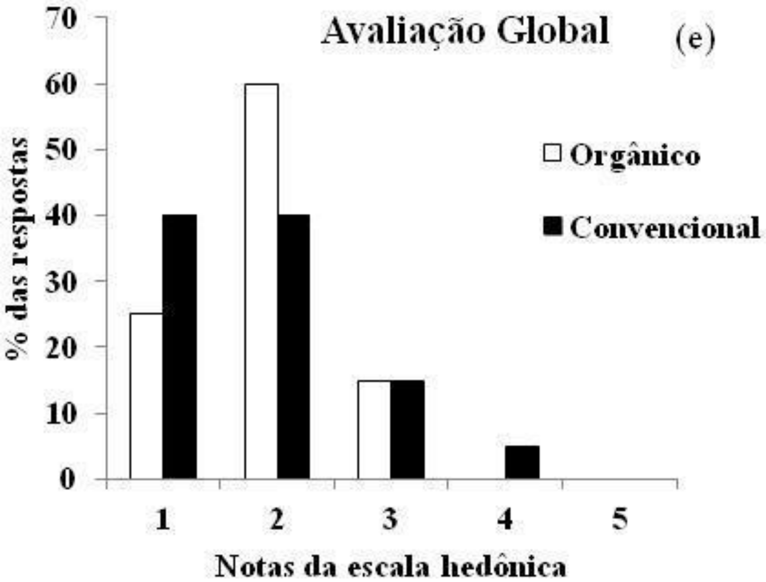
Figure 10 Frequency histogram of hedonic values for color (a), taste (b), appearance (c), texture (d) and overall impression (e) of samples of Prata-Anã banana grown under organic and conventional management (1- I liked it extremely, 2- I liked it moderately, 3- I didn't like it, nor I disliked it, 4- I disliked it moderately and 5- I disliked it extremely).






Aparência
(c)
% das pessoas
Orgânico
Convencional
Notas da escala hedônica


Textura
(d)
% das respostas
Orgânico
Convencional
Notas da escala hedônica


Avaliação Global
(e)
% das respostas
Orgânico
Convencional
Notas da escala hedônica

CONCLUSION

For most of the physical and chemical characteristics evaluated, the organic production system presents superior results compared to the conventional system, with no difference in firmness and pulp/peel ratio.

The values of the scores for all the attributes analyzed were mostly scores 1 (I liked it extremely) and 2 (I liked it moderately), demonstrating that there was satisfactory sensory acceptance by the tasters for both management.

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