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# Staggered and continuous fructification pruning in guava trees in the Southwest of Mato Grosso do Sul

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**Abstract:** Guava is one of the fruit trees with good economic returns. The aim with this study was to evaluate the production and fruit quality of five guava cultivars (Tailandesa, Cortibel SLG, Cortibel RM, Cortibel RG, and Paluma) submitted to staggered and continuous production pruning, in the bioclimatic conditions of Southwest Mato Grosso do Sul. The experiment was conducted during the year 2019/2020/2021, performing two production pruning (PP1 and PP2). In each production pruning, eight fructification pruning were carried out, with an interval of 30 days, namely: in PP1 (October/2019, November/2019, December/2019, January/2020, February/2020, March/2020, April/2020 and May/2020); and in PP2 (June/2020, July/2020, August/2020, September/2020, October/2020, November/2020, December/2020 and January/2021). Statistical analyzes were performed within each production period, not comparing the effects of these. The means were compared using the Tukey test for cultivars and the Scott-Knott test for staggered pruning. Higher yield values were observed in PP1 of the Tailandesa and Cortibel RM cultivar, in the pruning of October/2019 and January/2020. In PP2, the productivity of all cultivars was higher than in PP1, especially Cortibel RM and Tailandesa, with higher yields and lower amounts of non-marketable fruits in the pruning of November and December/2020 and January/2021. The fruits were classified as oblong and with quality for commercialization. Continuous staggered pruning, and Tailandesa and Cortibel RM cultivars are promising for cultivation in Southwest MS.

**Index terms:** *Psidium guajava* L., fruit crops, cortibel RM, tailandesa, soluble solids.

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# Podas de frutificação escalonadas e contínuas em goiabeiras no Sudoeste do Mato Grosso do Sul

**Resumo:** A goiabeira é uma das fruteiras com bom retorno econômico. Objetivou-se com o presente estudo avaliar a produção e a qualidade dos frutos de cinco cultivares de goiabeiras (Tailandesa, Cortibel SLG, Cortibel RM, Cortibel RG e Paluma) submetidas a podas de frutificação escalonadas e contínuas, nas condições bioclimáticas do Sudoeste do Mato Grosso do Sul. O experimento foi conduzido no ano de 2019/2020/2021, realizando duas podas de produção (PP1 e PP2). Em cada poda de produção, foram realizadas oito podas de frutificação, com intervalo de 30 dias: na PP1 (outubro/2019, novembro/2019, dezembro/2019, janeiro/2020, fevereiro/2020, março/2020, abril/2020 e maio/2020); e na PP2 (junho/2020, julho/2020, agosto/2020, setembro/2020, outubro/2020, novembro/2020, dezembro/2020 e janeiro/2021). As análises estatísticas foram feitas por poda de produção, não comparando os efeitos dessas. As médias foram comparadas pelo teste de Tukey para cultivares e pelo teste de Scott-Knott para podas escalonadas. Observaram-se maiores valores de produtividades na PP1 da cultivar Tailandesa e Cortibel RM, nas podas de outubro/2019 e janeiro/2020. Na PP2, a produtividade de todas as cultivares foi superior à PP1, especialmente a Cortibel RM e Tailandesa, com maiores produtividades e menores quantidades de frutos não comercializáveis nas podas de novembro e dezembro/2020 e janeiro/2021. Os frutos foram classificados em oblongos e com qualidade para comercialização. As podas escalonadas contínuas e as cultivares Tailandesa e Cortibel RM são promissoras para o cultivo no Sudoeste do MS.

**Termos para indexação:** *Psidium guajava* L., fruticultura, cortibel RM, tailandesa, sólidos solúveis.

## Introduction

In the global context, the largest guava producers are: India, China, Thailand, Pakistan, Mexico and Indonesia, and Brazil, which occupies seventh position (RIBEIRO, 2018), highlighting the need to enhance production. The culture presents socioeconomic viability in Brazilian agribusiness, contributing to the establishment of men in the countryside and improving income distribution. In view of this, it has been gaining more and more space at the national level (BONIFÁCIO et al., 2018). In 2020, Brazil produced 566,293 tons of guava, in a harvested area of 21,914 hectares, with an average yield of 25,842 kg $ha^{-1}$ (IBGE, 2020). Therefore, studies are needed to improve management techniques to optimize guava production, highlighting the growing demand for tropical fruits in domestic and international markets.

The Brazilian fruit production exceeded 41 million tons in 2021, occupying an average of 2.6 million hectares, that is, only 0.3% of the national territory is occupied by the fruit growing activity, compared to 7.8% occupied by other crops. There are more than 940,000 agricultural establishments distributed in all regions of the country, of which 81% are classified as family farming (CNA, 2022). However, in the state of Mato Grosso do Sul, there is still insufficient information and advanced phytotechnical management for the crop in order to increase the scale of production.

The guava (*Psidium guajava* L., Myrtaceae) stands out, being also found in regions with tropical and subtropical climates, being rus-

tic and easily adaptable to different edaphoclimatic conditions (MALTA et al., 2018). In Brazil, it is naturally distributed throughout the entire territory (OLIVEIRA et al., 2015), with excellent conditions for exploration on a commercial scale, as fruits reach good prices in the market and are highly appreciated for their characteristics both for fresh consumption and for the manufacture of processed products (POMMER et al., 2013).

The main cultivars grown in Brazil are Pedro Sato, Paluma, Kumagai, which are the oldest, and the most recent ones are Cascuda de Pariquera-Açu, with rounded to oblong fruit and red pulp, Chinesa, with oblong fruits and red and white pulp, Sassaoka, with flat to globose fruits and white pulp, and Tailandesa, with oblong fruits and red pulp (CEAGESP, 2021), in addition to Cortibel variations (grown in the state of Espírito Santo), which differ from each other in terms of productivity, start of production, size, shape and number of fruits, pulp color and crown shape (FLORI, 2016).

Guava production is responsive to fruit pruning, and the association of adequate management and the appropriate season allow for satisfactory production throughout the year (MARTINS et al., 2020). Carrying out fruit pruning on the guava tree can effectively assist in its production, however, research is needed in the scope of staggered pruning. In Brazil, the largest marketed guava volume occurs between January and April, due to the normal crop harvest period, resulting in low prices in this period (IBGE, 2020).

Thus, fruiting pruning has been adopted, associated with irrigation, in order to change production peak to months when there is shortage of fruits in the market (RAMNIWAS et al., 2012; MARTINS et al., 2020), which occurs between the months of June and October, period in which the best prices are reached. However, the inappropriate choice of pruning time and intensity can cause decrease in fruit production. In addition, it should be noted that there are practically few studies on staggered and continuous pruning for guava trees.

The pruning time can change the duration of the crop cycle. The edaphoclimatic conditions directly interfere with the performance of cultivars, affecting the productive potential of each genetic material. Therefore, the regionalization of pruning times and intensity becomes necessary for the adoption of genotypes by guava producers.

In the Southwestern region of the State of Mato Grosso do Sul, the cultivation of guava trees is the main activity within fruit growing. However, the region has focused on just three cultivars, “Pedro Sato”, “Tailandesa”, and “Paluma”, with moderate adoption of new pruning concepts. Fruit growers have established partnerships with the state of Espírito Santo with the aim of modifying the production system and adopting new cultivars, which still need to be studied under the bioclimatic conditions of the region.

Based on the above, it has been hypothesized that new materials may have good potential for insertion in the region and that staggered pruning may be a promising alternative to regularize the annual fruit production. Considering the importance of pruning management in determining the time of harvest and production, the aim of this study was to evaluate production and fruit quality of five guava cultivars submitted to staggered and continuous production pruning under the bioclimatic conditions of the southwestern state of Mato Grosso do Sul.

## Material and Methods

The experiment was carried out during the 2019/2020 years in the ‘Fazendinha’ Project area, at the ‘João Humberto de Andrade’ Exhibition Park, space intended for agricultural exhibitions with the aim of transferring technologies to farmers in the region, located

at the Rural Union of Dourados (22° 226992' S and 54° 734726' W, and approximately 595 m a.s.l.), in the municipality of Dourados-MS. According to the Köppen classification, the local climate is of Am type (Tropical Monsoon), with hot summers and dry winters, maximum temperatures observed in December and January and minimum temperatures between May and August, coinciding with excessive rainfall in spring - summer and water deficit in autumn-winter (FIETZ et al., 2017), as shown in Figure 1.

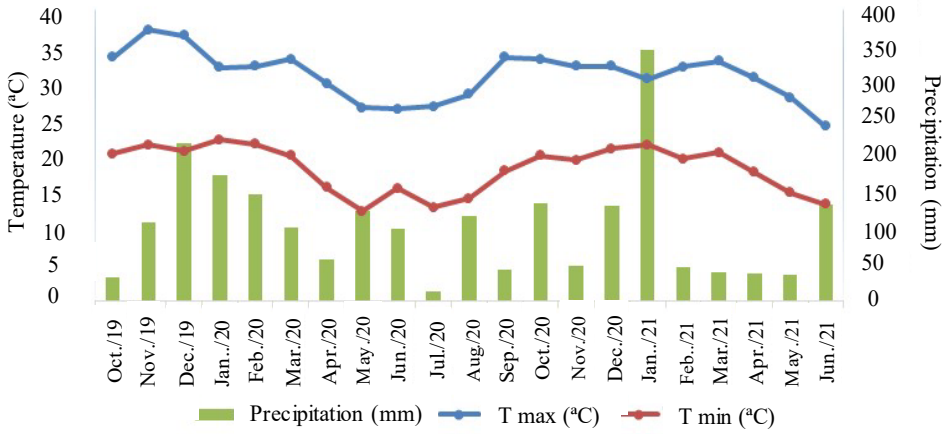


**Figure 1.** Maximum and minimum temperatures (monthly averages) and total precipitation (monthly) at the time of the experiment, from October 2019 to June 2021. Source: Embrapa Agropecuária Oeste – CPAO (Dourados – MS).

The soil in the experimental area is classified as Distrophic Red Latosol (SANTOS et al., 2018) with very clayey texture and the following chemical attributes at the first depth in the 0 - 20 cm layer: pH ($CaCl_2$ mg/$dm^{-3}$) = 5.60; V = 81.79%; O.M (g/$dm^{-3}$) = 57.84; P (mg/$dm^{-3}$) = 447.23; K ($cmol_c/dm^{-3}$) = 4.61; Ca (cmolc/$dm^{-3}$) = 13.04; Mg ($cmol_c/dm^{-3}$) = 4.04 and Al ($cmol_c/dm^{-3}$) = 0.00, and at the second depth in the 20-40 cm layer: pH ($CaCl_2$ mg/$dm^{-3}$) = 5.40; V = 71.84%; O.M (g/$dm^{-3}$) = 26.88; P (mg/$dm^{-3}$) = 173.25; K ($cmol_c/dm^{-3}$) = 6.21; Ca ($cmol_c/dm^{-3}$) = 8.03 and Mg ($cmol_c/dm^{-3}$) = 3.60.

In 12/07/2018, the guava tree cultivation area was implemented. Before opening pits, the soil was harrowed and plowed with a plow/leveler harrow in order to uncompact, break up clods and standardize the soil. Pits of dimensions of 40 cm x 40 cm x 40 cm were prepared, which were opened with the aid of a soil drill. Two sources of nutrients were applied to planting pits, 260 g/natural thermophosphate + 150 g/pit of NPK 4-30-10 chemical formulation, the former releases slower into the soil and the latter faster.

The cultivars used in the experiment were Tailandesa, Cortibel SLG, Cortibel RM, Cortibel RG and Paluma, acquired from the Frucafé seedling nursery, located at Linhares-ES. The spacing adopted was 6.0 x 3.5 m, totaling 417 plants $ha^{-1}$. Microsprinkler irrigation system was used, with flow rate of 47 liters per emitter. Two months after planting (February/2019), the first formation pruning was carried out, and the second formation pruning was carried out six months after planting (June/2019). Two production pruning were carried out, namely: production pruning 01 and production pruning 02 (PP1 and PP2, respectively), staggered into eight fruiting pruning.

PP1 was carried out when plants were 10 months old, taking as management criterion the choice of mature and uniform branches, leaving 6 to 8 pairs of leaves on the most vigorous branches, that is, with a greater number of leaves and branches with great-

er diameters and lengths, and 2 to 3 pairs of leaves on branches with lower vigor (for example: lower branch diameter and length). In PP2, plants were pruned when they were more than 1.5 years old, with more productive and better formed branches, adopting the same procedures as in PP1, with greater amount of mulch on the soil in function to fall of some leaves.

The experimental design used was in randomized blocks, with subdivided plots, with three replications, and the production pruning's were not statistically compared due to different ages. Therefore, we chose to analyze the effects of pruning and cultivars in each PP. The main plots were composed of the five guava cultivars (Tailandesa, Cortibel SLG, Cortibel RM, Cortibel RG, and Paluma) and continuous and staggered pruning in each production pruning period in subplots (PP1 and PP2), using two useful plants per experimental unit.

One week before PP1 and PP2, irrigation was suspended, leading to water stress, and subsequent fertilization with reactive phosphate (PP1 150 g/plant) (PP2 250 g/plant) + bovine manure (5 L/ plant) + boric acid (4 g/ dissolved in 0.5 L of water/plant).

In each production pruning (PP1 and PP2), eight fruiting prunings were carried out, with interval of 30 days, namely, in PP1: pruning carried out in October/2019, November/2019, December/2019, January/2020, February/2020, March/2020, April/2020 and May/2020; in PP2: pruning carried out in June/2020, July/2020, August/2020, September/2020, October/2020, November/2020, December/2020 and January/2021.

During the experiment, routine cultural treatments such as application of fungicides/insecticides and the control of invasive plants were carried out. The control of invasive plants was carried out in two ways: between rows, mechanized brushcutter coupled to a tractor was used, while for control between plants, manual brushcutter was used. he defensives applications were carried out according to the incidence of pests and diseases installed in the crop according to products recommended in Agrofit of the Ministry of Agriculture, Livestock and Supply (MAPA).

The period of greatest attack by guava weevil (*Conotrachelus psidii*) was from December 2019 to March 2020. Pisyllid (*Triozoida limbata*) attack occurred on a larger scale in two stages of 2020, one in the dry and cold period (May to July) and the other in the hot and rainy period (September to November). Rust (*Puccinia psidii*) was higher in the rainy season (November to February) in both years. For the control of pests and diseases in the experiment, the chemical method was used through the application of insecticides and fungicides registered for the crop. Application was carried out using a high-pressure knapsack sprayer. In the most severe seasons, applications were carried out at intervals of 07 to 15 days, interspersing the use of products for 30 to 60 days.

After 180 days from each continuous pruning, fruits of the five cultivars were harvested, during an average period of 25 days, using as harvest index fruits that presented skin color at maturation stage 3 (yellow-green) (AZZOLINI et al., 2004), manually harvested. Subsequently, fruits were weighed and the number of fruits was counted, classifying them as marketable or unmarketable. Unmarketable fruits were classified as fruits with some type of severe damage caused by pests or diseases that would compromise their visual appearance.

The total production per plant was calculated by estimating the productivity per hectare, considering a stand of 417 plants $ha^{-1}$ (BETIN et al., 2018). After weighing fruits on a digital scale, five fruits per treatment were used to evaluate the characterization of fruit length (FL) and fruit diameter (FD) with a digital caliper, and fruit shape by the FL/FD

ratio. The total soluble solids content (ºBrix) of fruits was determined by refractometry.

The data obtained in each period of production pruning (PP1 and PP2) were analyzed individually and subjected to analysis of variance, that is, no comparative statistical analysis was carried out between PP1 and PP2. When significance was detected by the F test ($p < 0.05$), means were compared by the Tukey test for cultivars, and by the Scott-Knott test for staggered and continuous pruning, at 5% probability. Statistical analyses were performed using the SISVAR software version 5.6. (FERREIRA, 2019).

## Results and Discussion

The productivity of commercial guava fruits was influenced by factors under study separately in the two production years (PP1 and PP2) (Figure 2). In PP1, the highest productivity values were observed in plants from Tailandesa cultivar (6,432.42 kg ha$^{-1}$) followed by Cortibel RM cultivar (4,942.57 kg ha$^{-1}$) (Figure 2A), surpassing by 4,689.34 kg ha$^{-1}$ (+ 72.90 %) and 3,199.49 kg ha$^{-1}$ (+ 64.73 %), respectively, Cortibel SLG and Paluma cultivars, which had the lowest average productivity (1,743.08 kg ha$^{-1}$). It was observed in PP2 that cultivars with the highest productivity were Cortibel RM (14,471.00 kg ha$^{-1}$) and Tailandesa (12,140.00 kg ha$^{-1}$), surpassing by 8,197.00 kg ha$^{-1}$ and 5,866 kg ha$^{-1}$, respectively, Cortibel SLG cultivar (6,274 kg ha$^{-1}$), which had the lowest productivity (Figure 2C).

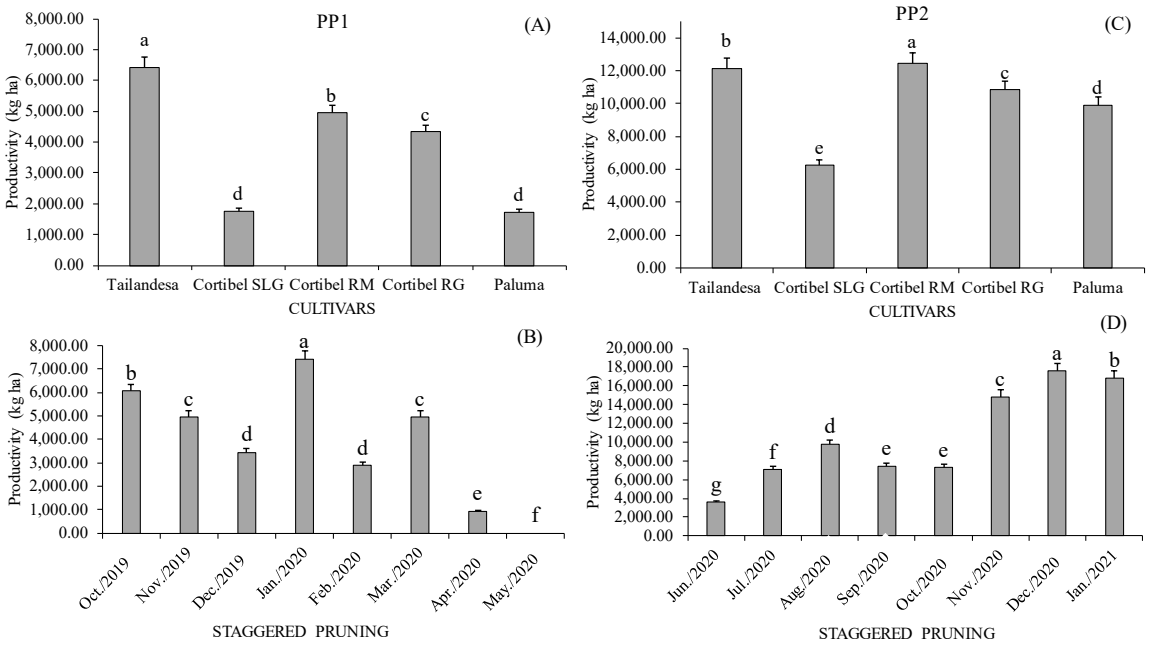


**Figure 2.** Productivity of commercial guava fruits from different cultivars (A, C) and subjected to staggered pruning (B, D) within PP1 (A, B) and PP2 (C, D). The same letters do not differ from each other using the Tukey test ($p$>0.05) for cultivars, and the Scott-Knott test ($p$>0.05) for staggered pruning.

It was observed that productivity in PP2 doubled in comparison to PP1 due to the fact that in the second productive year, plants were more physiologically adapted to edaphoclimatic conditions, especially Cortibel RM and Cortibel RG cultivars, which are new to the Southwestern region of Mato Grosso do Sul, indicating potential insertion in the fruit production chain in the state due to its adaptability. In addition, although Tailandesa and Paluma cultivars have been established in the market for a longer period of time, they still maintain their productive expression potential, especially Tailandesa cultivar, which

showed the best agronomic performance in PP1, and a value close to that of Cortibel RM cultivar in PP2, indicating good stability.

With regard to staggered pruning for PP1, the highest yields were 7,424.90 and 6,055.66 kg $ha^{-1}$ when pruning was performed in the months of January/2020 and October/2019, respectively (Figure 3B), periods in which maximum temperatures were 32.1 and 33.5º C and minimum were 22.1 and 20.2 ºC (Figure 1). The ideal temperature range for guava culture is from 25 to 30 ºC (TEIXEIRA et al., 2001), which may vary with the genetic material and other factors. Therefore, fruiting pruning management, which aims to contribute to the ecophysiology of guava production, should be carried out at appropriate times, associated with the choice of cultivars with good adaptability and stability.

However, responses vary among cultivars and growing locations. For example, Ramos et al. (2010) evaluated production and fruit quality of 'Paluma' guava trees under subtropical climate conditions and observed that pruning in this region increased the harvest period and decreased the fruiting cycle, as pruning was carried out later (August-October). In addition, the best production results were obtained when pruning was carried out in August.

The lower productivity from pruning carried out in April/2020 is due to the fact that in that month, there was less rainfall, associated with reduction in temperature until the end of July/2020, with minimum average value of 14.1 ºC (Figure 1). With the reduction in temperature, even if not accentuated, there is a decrease in the plant metabolism, causing a delay in the emergence and opening of floral buds (TEIXEIRA et al., 2001; BARBOSA and LIMA, 2010), compromising the plant phenological cycle and reducing production performance.

In addition, in PP1, plants pruned in May/2020 did not produce commercial fruits (Figure 3), probably due to the temperature and the severe attack of *Conotrachelus psidii* and *Triozoida limbata*, which compromised the visual appearance of fruits and classified them as unmarketable.

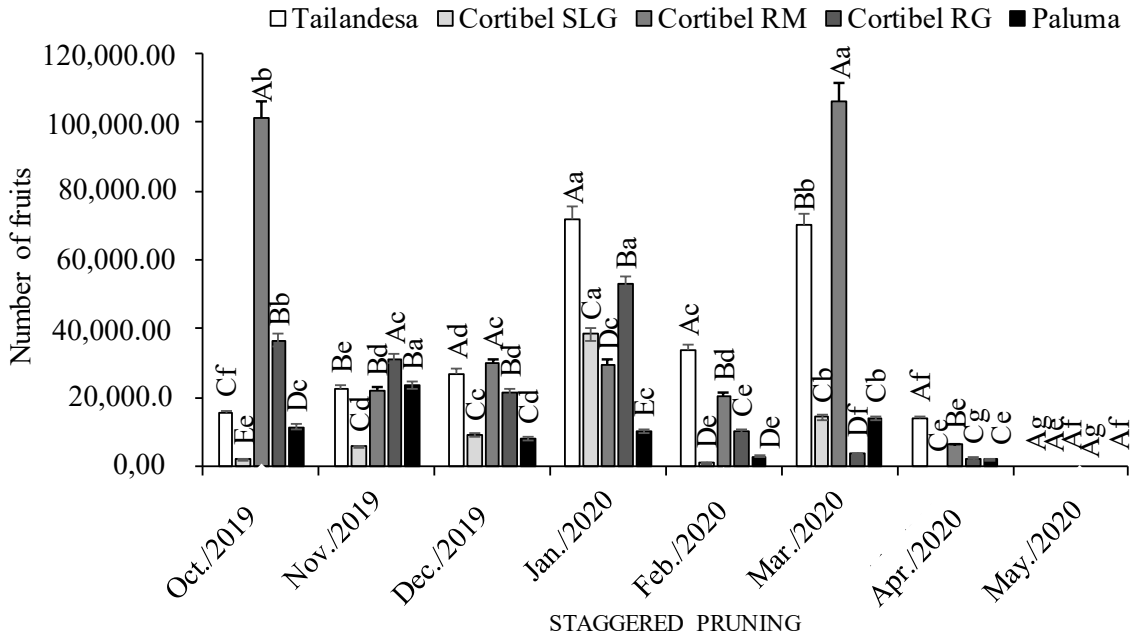


**Figure 3.** Number of guava fruits from different cultivars subjected to staggered pruning within PP1. Capital letters compare the cultivars within each staggered pruning using the Tukey test ($p$>0.05). Lowercase letters compare staggered pruning within each cultivar using the Scott-Knott test ($p$<0.05).

In PP2, pruning carried out in November and December 2020, and in January/2021 promoted the highest productivity (Figure 2D), periods in which there was increase in temperature (Figure 1). On the other hand, plants pruned between June and August/2020 produced less fruit compared to other pruning months in PP2. Physiologically, pruning contributes to the hormonal regulation of plants, especially in fruit trees, since it decreases auxin synthesis and apical dominance, and favors cytokinin and gibberellin, which act on the lateral branching of productive branches (TAIZ et al., 2017), increasing the number of fruits.

In addition to contributing to maintaining productivity, fruiting pruning acts to promote the maintenance of large fruits, with high biomass and distributed throughout the plant (SCARPARE FILHO, 2013), regulating the source-sink relationship, that is, the relationship between vegetative and reproductive development, in addition to facilitating harvesting.

When evaluating different types of fruit pruning (short-term, medium-term, and long-term) at different times, Farias et al. (2017) concluded that long pruning was the most effective, especially in the months of November and July. Sánchez-Mora et al. (2020), evaluating the effect of fruit pruning on commercial "Alcântara" and "Nonante" mountain guava cultivars, observed that pruning influenced plant height and increased parameters related to fruit yield.

As for the number of fruits, in PP1, there was interaction among factors under study (Figure 3), and in PP2, there was an isolated effect (Figure 4) for cultivars. In PP1, the Cortibel RM cultivar produced the most commercial fruits (101,333.00 and 106,250.00 fruits ha$^{-1}$), especially when pruned in October/2019 and March/2020, respectively. The 'Tailandesa' cultivar pruned in January and February 2020 showed higher values (72,000.00 and 33,500.00 fruits ha$^{-1}$, respectively) compared to the other cultivars at the same pruning times.

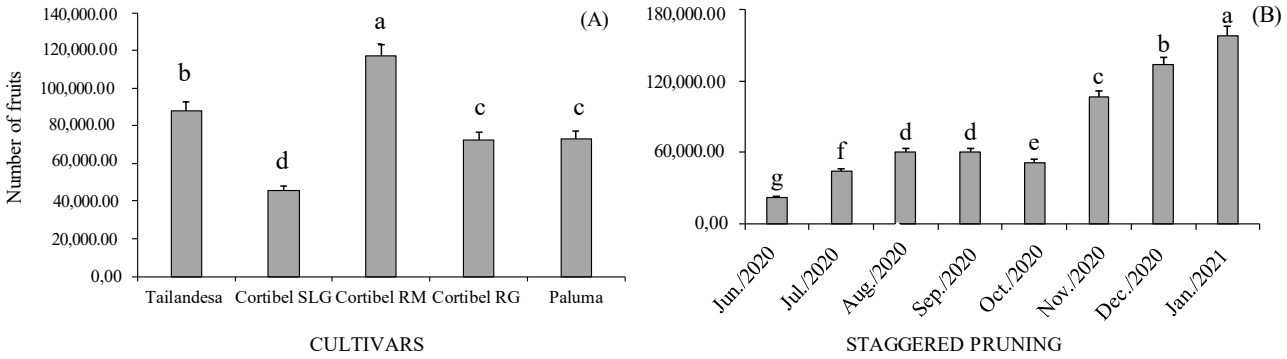


**Figure 4**. Number of guava fruits from different cultivars (A) and subjected to staggered pruning (B) within PP2. The same letters do not differ from each other using the Tukey test ($p$>0.05) for cultivars, and the Scott-Knott test ($p$>0.05) for staggered pruning.

In general, pruning carried out in April and May/2020, periods of reduced temperature, resulted in a lower number of fruits for all cultivars, compared to other pruning times. In addition, based on these results, it was suggested that the 'Cortibel SLG' cultivar shows lower adaptability potential compared to other new cultivars in the Southwestern region of MS (Cortibel RM and RG).

In PP2, the highest number of fruits was obtained in 'Cortibel RM' cultivar (117,197 fruits ha$^{-1}$), followed by 'Tailandesa' cultivar (88,093.00 fruits ha$^{-1}$), surpassing by 71,593 (+61.09 %) and 42,489 fruits ha$^{-1}$ (+48.23%), respectively, 'Cortibel SLG' cultivar, which presented the lowest value (45,604.00 fruits ha$^{-1}$) (Figure 5A). With regard to staggered and continuous pruning, results were

similar to those of productivity, that is, the highest values were 158,116.00, 133,500.00 and 106,450.00 fruits ha$^{-1}$ in plants pruned in November and December /2020 and January/2021, respectively (Figure 5B).

The productivity of unmarketable fruits in PP1 was higher for 'Paluma' cultivar (3,276.27 kg ha$^{-1}$) and lower for the 'Tailandesa' cultivar (1,098.14 kg ha$^{-1}$) (Figure 6A). Pruning carried out in May/2020 resulted in higher value (10,222.00 kg ha$^{-1}$) (Figure 6B), a period with decrease in temperature (Figure 1). On the other hand, pruning carried out in the period from October, November and December/2020 to January/2021 resulted in lower productivity of unmarketable fruits, with average value of 73.25 kg ha$^{-1}$.

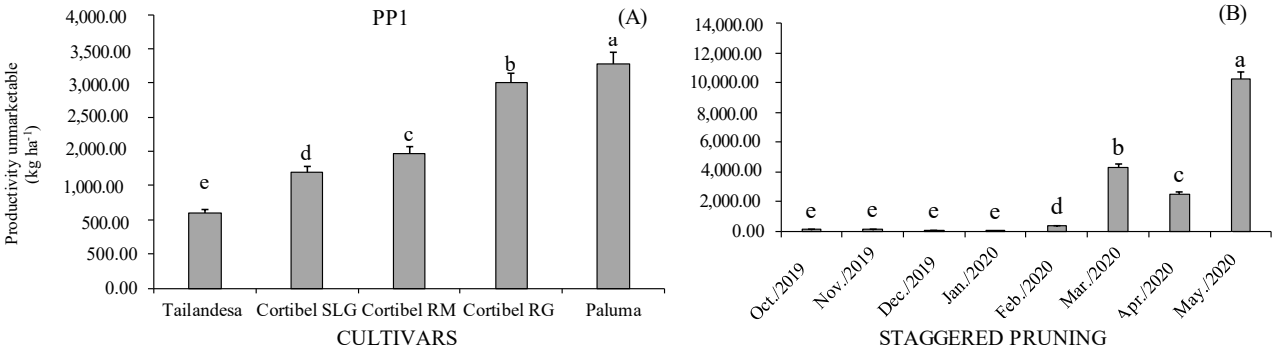


**Figure 5**. Productivity unmarketable guava from different cultivars subjected to staggered pruning within PP1. The same letters do not differ from each other using the Tukey test ($p$>0.05) for cultivars, and the Scott-Knott test ($p$>0.05) for staggered pruning.

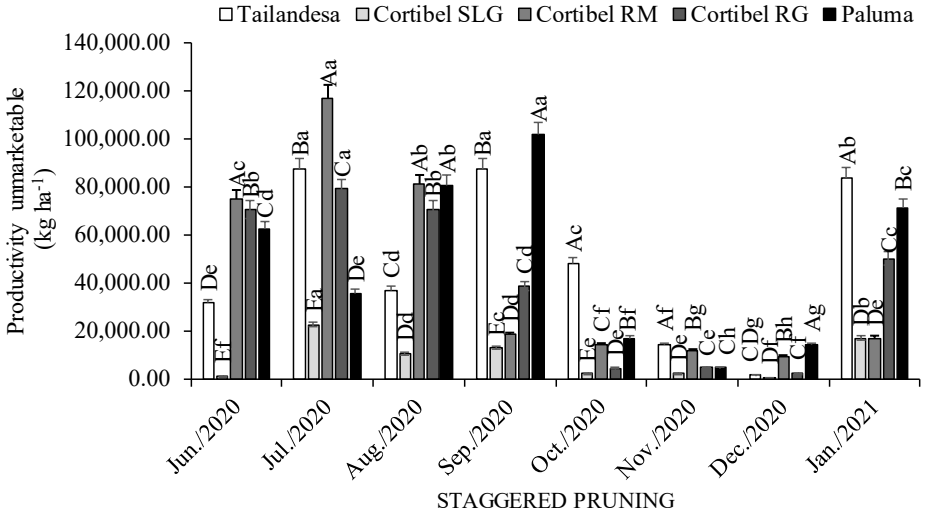


**Figure 6**. Productivity unmarketable guava from different cultivars subjected to staggered pruning within PP2. Capital letters compare the cultivars within each staggered pruning using the Tukey test ($p$>0.05). Lowercase letters compare staggered pruning within each cultivar using the Scott-Knott test (p<0.05).

In PP2, the highest productivity values of unmarketable fruits were obtained for 'Cortibel RM' cultivar in pruning carried out in June, July and August/2020 (74,833.00, 116,833.00 and 81,000.00 kg ha$^{-1}$) and for 'Paluma' cultivar pruned in September/2020 (102,000.00 kg ha$^{-1}$). The lowest values in all cultivars were observed for plants pruned in October, November and December 2020, with the exception of 'Tailandesa' cultivar pruned in October/2020 (48,000.00 kg ha$^{-1}$), which showed higher production compared to the other cultivars (Figure 7). Although 'Tailandesa' and 'Cortibel RM' cultivars

showed higher productivity of unmarketable fruits, these were those with the highest number of fruits and marketable productive performance in PP1 and PP2, indicating high productivity potential.

Fruits from the five cultivars varied little in terms of length, diameter and shape (Table 1 and Figure 7), with greater average lengths for 'Tailandesa' and 'Cortibel SLG' cultivars (Table 1). As for fruit diameter, the lowest values were observed for fruits from 'Cortibel RM' and' Paluma' cultivars. Fruit shape (FS) values ranged from 1.35 to 1.40. According to Fachi et al. (2018), FS is an important characteristic in the evaluation and marketing of fruits, since the closer to 1, the more rounded the fruits. The five cultivars in this study produce fruits with oblong shape. Generally, fruits with rounded shape are directed to industry for facilitating handling and procedures, while oblong fruits are directed to fresh consumption, depending on their characteristics (SANTOS et al., 2014; FACHI et al., 2018).


**Figure 7.** Visual appearance of whole (A) and cut (B) fruits of guava cultivars (Tailandesa, Cortibel SLG, Cortibel RM, Cortibel RG, and Paluma, from left to right). Source: Flauzino (2021).

**Table 1.** Characterization of length (FL), diameter (FD), fruit shape (FF) and total soluble solids (TSS) of fruits of guava cultivars.

| Characteristic | Cultivars | | | | |
|---|---|---|---|---|---|
| | Tailandesa | Cortibel LSG | Cortibel RM | Cortibel RG | Paluma |
| FL (mm) | 107.91 | 103.75 | 93.37 | 100.44 | 96.72 |
| FD (mm) | 79.36 | 73.79 | 67.67 | 72.34 | 69.37 |
| FF | 1.35 | 1.40 | 1.37 | 1.38 | 1.39 |
| TSS (º Brix) | 12.8 | 11.5 | 11.9 | 11.5 | 13.1 |

The morphometric characterization information of fruits is important in decision-making regarding the public targeting and form of consumption. For example, smaller fruits, such as 'Cortibel RM' and 'Paluma' fruits, may be of greater interest to both adults and children in meals, as they satisfy both publics and there is no waste. Larger fruits ('Tailandesa', 'Cortibel SLG' and 'Cortibel RM') can be used to prepare sweets, jellies, juices and/or processing, which generally require larger volumes.

With regard to the total soluble solids content, higher ºBrix value was found in fruits from 'Paluma' cultivar, followed by 'Tailandesa' cultivar. The values observed for the five cultivars in this study were higher than those described by Azzolini et al. (2004), Cerqueira et al. (2009) and Fachi et al. (2018), whose values ranged from 5.4 to 9.8 º Brix, indicating that fruits have quality for fresh consumption, processing and marketing at the ripening stage.

Based on results found in this study, it was possible to understand the importance of adopting new management techniques, represented here by staggered and continuous fruiting pruning with the aim of improving the guava production chain, since the fruit grower is able to produce fruits at different amounts during the year. Thus, instead of producing large amount of fruits at once, with flow difficulties depending on the location, there is the possibility of fractioning production to meet different publics and markets, with good production flow. Another aspect to be highlighted are new cultivar options such as 'Cortibel RM' and 'Cortibel RG', which can be inserted in the Southwestern region of MS.

In addition, by maintaining stable prices throughout the year, the producer guarantees a more consistent and uniform income. In 2020, the average price of a 10 kg box of guava varied from R$33.00 to R$43.00, with a variation of up to R$10.00 throughout the year (Figure 8). This contrasts with other fruit species that often experience price fluctuations between harvest and off-season, making this approach a significant advantage.

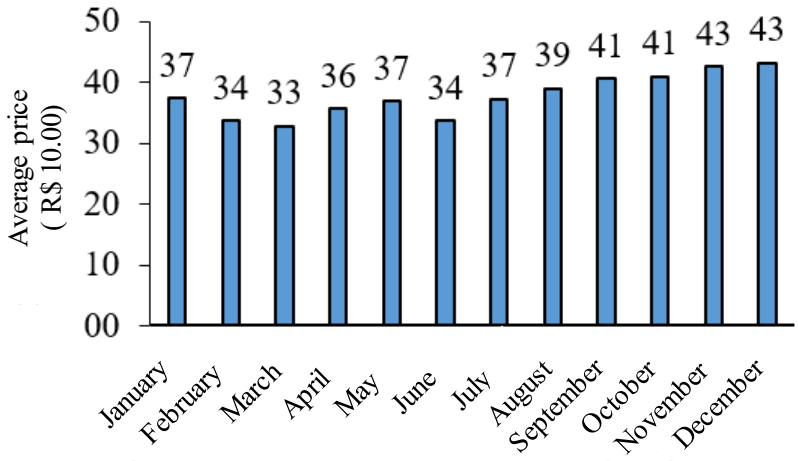


**Figure 8.** Average price of guavas (10 kg box) between the months of January to December 2020 in Mato Grosso do Sul. Source: Ceasa MS, 2020.

We emphasize that the average prices paid to the red guava producer vary according to the place of delivery. For example: at CEASA/MS (2020) and local markets according to a survey carried out in the City Halls of Dourados, Caarapó and Itaporã, all in MS, the price ranges from R$ 4,00 to R$ 5,00, while public notices such as the food acquisition program (P.A.A.) and the national school feeding program (P.N.A.E) the value rang-

es from R$ 8,36 to R$ 10,18, respectively. Thus, the producer should be aware of the cultivar that provides the best income, that is, those with better prices. In addition, the fruit grower can plan the production scale, that is, in months of lower productivity, other species of economic interest can be cultivated, according to the climatic conditions, in order to diversify income.

## Conclusions

Under the conditions in which this study was carried out, it could be concluded that:

Staggered and continuous fruiting pruning is a promising practice for year-round guava cultivation in the southwestern region of Mato Grosso do Sul.

Prunings carried out in January in the two production years were those that most contributed to higher productivity.

'Cortibel RM' and 'Tailandesa' cultivars were those with the best productive performance.

Fruits from guava cultivars have morphometric and soluble solids characteristics that ensure adequate quality for marketing.

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