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QUALIDADE DO ABACAXI (CV. BRS RBO) EM DIFERENTES ÉPOCAS DE PLANTIO COM IRRIGAÇÃO SUPLEMENTAR E EM SEQUEIRO*

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1 RESUMO

Épocas de plantio e irrigação suplementar são práticas agronômicas que podem contribuir com a produção de frutos de abacaxizeiro ao longo do ano, o que permite escaloná-la para períodos com preços favoráveis. O objetivo foi avaliar a qualidade do abacaxi, cv. BRS RBO, em diferentes épocas de plantio, com irrigação suplementar e em sequeiro na região de Senador Guiomard, Acre. Adotou-se o delineamento blocos casualizados em parcelas subdivididas. Nas parcelas, foram alocados os sistemas de cultivo com irrigação suplementar por aspersão e em sequeiro, e nas subparcelas, as épocas de plantio correspondentes aos meses de junho, julho, agosto, setembro, novembro e dezembro de 2012, e janeiro e fevereiro de 2013. Avaliou-se produtividade, massa da coroa, comprimento e diâmetro central e massa do fruto com e sem casca, teor de sólidos solúveis, acidez titulável, pH, relação sólidos solúveis e acidez titulável, bem como a correlação entre a produção e as características físicas e químicas do abacaxi. Foi possível observar que a irrigação suplementar por aspersão promoveu aumento da produtividade e proporcionou frutos de abacaxizeiro de melhor qualidade física. As melhores épocas para o plantio foram os meses de dezembro e janeiro, sendo as mais produtivas em ambos os sistemas de cultivo analisados.

Palavras-chave: *Ananas comosus* L., Amazônia ocidental, escalonamento da produção.

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QUALITY OF PINEAPPLE (cv. BRS RBO) IN DIFFERENT PLANTING TIMES WITH SUPPLEMENTAL IRRIGATION AND RAINFED

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2 ABSTRACT

Planting times and supplemental irrigation are agronomic practices that can contribute to the production of pineapple fruits throughout the year, allowing production to be scheduled with favorable prices. This work aimed to evaluate the quality of the BRS RBO pineapple at different-planting times with supplemental irrigation and rainfed in the region of Senador Guiomard, Acre. A randomized split-plot block design was adopted. In the plots, the cultivation systems were allocated with supplemental irrigation by sprinkler and rainfed, and in the subplots, the planting times corresponding to the months of June, July, August, September, November, and December 2012, and January and February 2013. The productivity, crown mass, length and central diameter of the fruit, fruit mass with and without peel, the content of total soluble solids, titratable acidity, pH, ratio of total soluble solids with titratable acidity, as well as, the correlation between production and the physicochemical characteristics of the pineapple was evaluated. It was possible to notice that the supplemental sprinkler irrigation promoted increases in productivity and provided pineapple fruits of better physical quality. The best planting times were the months of December and January, being the most productive in both cultivation systems analyzed.

Keywords: *Ananas comosus*, western Amazon, production scheduling.

3 INTRODUCTION

The pineapple tree *Ananas comosus* (L.) Merrill, which belongs to the Bromeliaceae family, is a monocotyledonous, herbaceous and perennial plant that originated in South America (REFLORA, 2020). The great success of this species as a cultivated plant is due to its adaptability to tropical and subtropical areas, its high hardness and efficiency of vegetative propagation and, mainly, its good acceptance by consumers (CRESTANI *et al*., 2010). It is one of the most exploited tropical fruit trees in the world (ESPINOSA *et al*., 2017) and is considered the most economically important bromeliad species (LOPES NETO *et al*., 2015).

Brazil, with an annual production of approximately 2.46 million tons in 2020, is the world's fourth-largest pineapple producer, behind the Philippines, China, and Costa Rica (FAO, 2022). Pará, Paraíba, Minas Gerais, Rio de Janeiro, and Tocantins are the largest national producers, accounting for almost 64% of the total production in 2020 (IBGE, 2022). Pineapple is one of the main fruits produced in Brazil, both in quantitative terms and in production value, which places it ninth in the national ranking in terms of harvested area, and in the state of Acre, it occupies the second position in the ranking of most produced fruit (IBGE, 2022). Thus, this crop is widely important in the national socioeconomic scenario, as it contributes ~~to~~ the generation of employment and income (FRANCO *et al*., 2014) and is an economically viable crop (GALEANO; VENTURA, 2018).

Despite the importance of this crop in Acre, problems arise from the low use of inputs or the use of inappropriate agronomic practices by pineapple growers, resulting in low productivity and poor fruit quality, especially in concentrated harvests. As a result, pineapple growers receive low prices for their produce, making the activity less profitable. However, these problems can be minimized with the use of better planned agronomic practices and processes adapted to the state's reality, such as the use of irrigation, planting times, floral induction treatment, and standardization of seedlings per plot (ALMEIDA *et al*., 2002; GONDIN; AZEVEDO, 2002; LEDO *et al*., 2004; FRANCO *et al*., 2014; HOTEGNI *et al*., 2015; KUSTER *et al.*, 2017; ESPINOSA *et al*., 2017; BARKER *et al*., 2018). Thus, plantings can be staggered or planned so that harvesting occurs at a time when market prices are favorable.

Although pineapple plants can adapt to water deficit conditions, irrigation is necessary for commercial crops in regions experiencing prolonged droughts. Water deficit affects plant growth, fruit development, and quality (ALMEIDA *et al*., 2002; FENG *et al*., 2017). Therefore, irrigation is important for crops, and when combined with different planting seasons, production can be staggered throughout the year without compromising fruit quality. Therefore, the objective of this study was to evaluate the quality of pineapple, cv. BRS RBO, during different planting seasons with supplemental irrigation and under dryland conditions.

4 MATERIALS AND METHODS

The study was carried out on the Bom Jesus farm in the municipality of Senador Guiomard, Acre, located at coordinates 11°54'36"S latitude, 68°28'21"W longitude, and at an approximate altitude of 160 m. The climate of the region, according to the Köppen criterion, is Am (ALVARES *et al*., 2013). The annual precipitation is 1,997.6, the average relative humidity is 84.2%, and the average temperature ranges from 30.6 to 31.5 (NATIONAL INSTITUTE OF METEOROLOGY, 2022). The soil of the experimental area was classified as eutrophic Red Argisol, flat and well-drained, and its chemical and physical characteristics in the 0–20 cm layer are shown in Table 1.

Table 1. Chemical and physical attributes of the soil in the area used for pineapple cultivation, cv. BRS RBO, at different planting times under supplemental irrigation and dryland conditions. Senador Guiomard, Acre, 2014.

Layer (cm)	pH	He re	Mg	K	Al+H	P	Base Saturation	Sand	Silt	Clay
		-------- cmol $_c$ dm $^{-3}$ --------				mg L $^{-1}$		---- ------g kg $^{-1}$ ----------		
0-20	5.20	1.43	0.73	0.13	1.35	34.22	63.19	631.74	227.27	141.00

Source: Cades (2015)

Randomized blocks with three replications and treatments were distributed in a split-plot scheme. The plots were the adopted cropping systems (supplementary irrigation and rainfed), and the subplots were the planting seasons, corresponding to the months of June, July, August, September, November, and December 2012 and January and February 2013. Each experimental unit consisted of 150 seedlings, 84 for useful areas and 66 for borders.

Soil preparation was carried out mechanically via two harrowing operations, followed by levelling. The plants were planted manually, burying one-third of the seedlings in a single row at a spacing of 0.9 × 0.3 m (37,037 plants ha $^{-1}$). Seedlings with an average height of 30 cm and a mass between 250 and 350 g were used.

Floral induction treatment of the plants was carried out 300 days (ten months) after planting via the commercial product ethrel, which is based on ethephon (2-chloroethylphosphonic acid). A solution of 2 mL of pc/liter of water and 2% urea (mv $^{-1)}$ was prepared, and 50 mL was applied to the leaf rosette of the plant (CUNHA; CABRAL; SOUZA, 1999).

A conventional fixed-portable sprinkler irrigation system was used, and irrigation management was carried out on the basis of calculations obtained from Equations 1 and 2. Meteorological data (Figure 1) were obtained from the Rio Branco station, Acre, which is the closest to the experiment and belongs to the National Institute of Meteorology (2014).

$$ET_0=0,0023*Ra*(T_{máx}-T_{mín})^{0,5}*(T_{méd}+17,8) \quad (1)$$

where ET_o = reference evapotranspiration (mm day $^{-1}$) and Ra = extraterrestrial solar radiation (MJ m $^{-2}$ day $^{-1}$), according to Allen *et al*. (1998); T_{max}, = average maximum temperature (^{0} C); T_{min}, = average minimum temperature (^{0} C); and $T_{med.}$ (^{0} C) = average temperature (^{0} C).

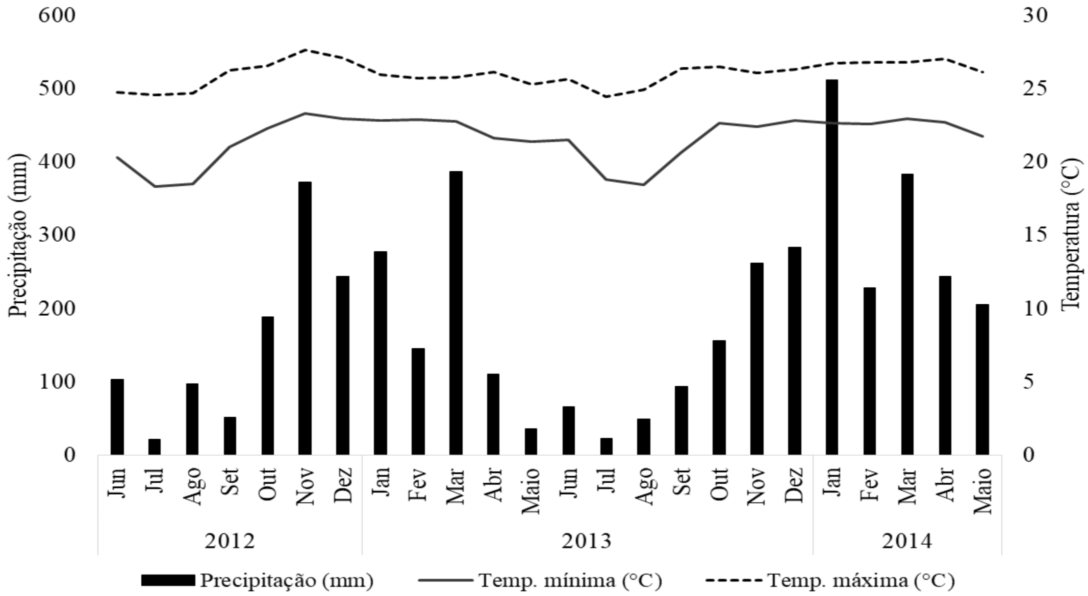
Crop evapotranspiration (ET_c) was estimated via Equation 2 (BERNARDO; SOARES; MANTOVANI, 2006).

$$ET_c=ET_o*K_c \quad (2)$$

where ET_c = crop evapotranspiration (mm day $^{-1}$); ET_o = reference evapotranspiration (mm day $^{-1}$); and Kc = crop or crop coefficient.

P-5 rotary sprinklers were used, with a working pressure of 15 mca and a flow rate of 285 L h $^{-1}$, spaced every 8 m at a height of 1.50 m from the ground, with an irrigated diameter equal to 8 m. Crop evapotranspiration (ETC) was calculated daily, according to Equation 2, and from the sum of this value with that calculated on the previous day, the ETC was obtained. accumulated until reaching an accumulated level of 10 mm, at which point the water depth to be applied and, consequently, the degree of irrigation were calculated.

Figure 1. Monthly rainfall and minimum and maximum temperatures during the experiment, between July 2012 and May 2014.



Source: INMET (2014).

The cultivation coefficients (Kc) considered for pineapple in the present study, adopted by Souza *et al.* (2009), according to Bernardo, Soares and Mantovani (2006), were as follows: Kc = 0.4 for the initial stage of the crop; Kc = 0.8 for the secondary stage; Kc = 1.0 for the production stage; and 0.45 for the maturation stage. The reference evapotranspiration was estimated via Equation 1 (HARGREAVES;

SAMANI, 1985).

Topdressing and planting fertilization were carried out according to soil analysis and technical recommendations for the crop (CUNHA; CABRAL; SOUZA, 1999). Weeds were controlled by applying a diuron-based herbicide at a dose of 3 L ha $^{-1}$ and by hand weeding. During cultivation, eye rot (*Phytophthora nicotiana* var. *parasitica*), which is caused by the spraying of a fosetyl-based fungicide at a dose of 2.5 g/L of commercial product dissolved in water, and soft rot (*Chalara paradoxa*), which occurs during harvesting, are carried out in periods with high relative humidity and mild temperatures, in addition to solar burn.

The harvest was carried out when the fruits reached the “painted” ripeness point, with up to 25% of the peel yellow–orange (MINISTRY OF AGRICULTURE, LIVESTOCK AND SUPPLY, 2002). The production characteristics and physicochemical qualities of the fruits evaluated were as follows: productivity (kg ha $^{-1}$), obtained by multiplying the average mass of six fruits by the planting density; crown mass; length and central diameter of the fruit (mm); pineapple mass with and without crown and without peel (g); total soluble solids content (°Brix); pH; titratable acidity (%); and total soluble solids to titratable acidity ratio (RATIO). For this purpose, six pineapple fruits were randomly harvested within each subplot and sent to the Food Technology Laboratory of Embrapa Acre for appropriate physicochemical analyses.

The fixed effects of planting time and supplementary irrigation and their interaction on the morphological variables, i.e., number of offspring, fruit mass without shell, fruit mass without crown, fruit mass with crown, crown mass, fruit length and fruit diameter, and on the physicochemical variables, i.e., total soluble solids, pH, titratable acidity, the SST/AT ratio (RATIO) and productivity (kg ha $^{-1}$), were estimated via general linear models (PROC GLM, SAS 9.4).

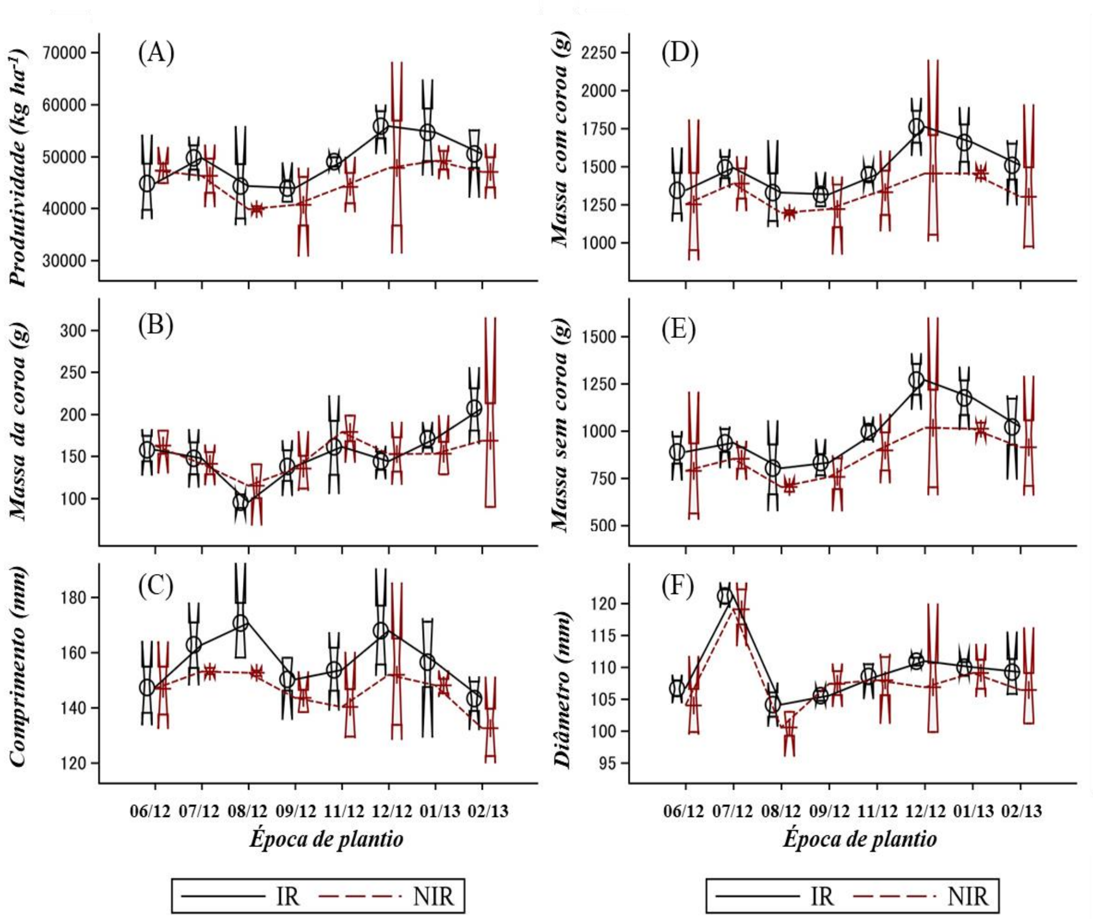
The normality of the variables was tested via the Shapiro–Wilk test via the PROC UNIVARIATE command in SAS version 9.4. The pH variable was logarithmically transformed. The titratable acidity and RATIO variables were *rank* transformed. (intervals). The correlation of residues was also performed via the F test at 1% and 5% significance ($p<0.01$ and 0.05) between the production and physical-chemical quality variables evaluated.

5 RESULTS AND DISCUSSION

Among the production and physicochemical quality variables of pineapple fruits evaluated, only soluble solids (SSTs), titratable acidity (TA), and the soluble solids/titratable acidity ratio significantly differed between cultivation systems and planting seasons. The cultivation system significantly influenced productivity, fruit mass with a crown, fruit mass without a peel, and fruit length. For the planting seasons, all the production and physicochemical quality characteristics of the pineapple fruits analyzed significantly differed.

The highest productivity was obtained with the use of supplemental irrigation (Figure 2A). With respect to the planting seasons, the highest productivities were observed in the months of December and January in both cultivation systems, with averages of 55,793 and 54,608 kg ha $^{-1}$, respectively. with the use of supplemental irrigation and 49,125 and 47,773 kg ha $^{-1}$, respectively, under rainfed conditions. The average yield was higher than the national average (37.9 kg ha $^{-1}$) and that recorded for the state of Acre (18.3 kg ha $^{-1}$) (IBGE, 2022) in all the planting seasons, regardless of the cultivation system, mainly because of the use of agronomic practices necessary for the crop, which are rarely used by pineapple growers in the state, which can result in low productivity.

Figure 2. Productivity (A), crown mass (B), fruit length (C), fruit mass with crown (D), fruit mass without shell (E) and fruit diameter (F) of pineapple, cv. BRS RBO, in different planting seasons with supplementary irrigation (IR) and dryland (NIR). Senador Guiomard, Acre, 2014.



The average crown mass was similar between the cultivation systems and the oscil or between 95.5 g (August) and 207.2 g (February) with supplemental irrigation and between 115 g (August) and 178.7 g (November) under rainfed conditions (Figure 2B). Ledo *et al*. (2004), when evaluating the effects of inducers and the age of floral induction in three pineapple cultivars in Rio Branco, AC, which was planted in January, obtained an average crown mass of 169.9 g for the cultivar BRS RBO, which is similar to that determined in the present study for the same planting season (January) and under rainfed conditions. The crown mass of the fruits produced in the planting seasons of June, November and February presented a relatively high percentage of the total fruit mass, which was more representative of the total fruit mass without the use of supplemental irrigation. Therefore, during these planting seasons, the crown experiences high growth, which is not ideal for marketing, as consumers prefer large fruits with small crowns (BENGOZI *et al*., 2009). Therefore, December was one of the best planting seasons, as it promoted greater fruit mass and smaller crowns, which can result in higher juice yield. Greater crown growth in some seasons may be related to environmental conditions, such as high rainfall and inadequate light, which results in small, poor-quality fruits (CUNHA; CABRAL; SOUZA, 1999). Seed mass and type are also factors that can influence crown mass, increasing the degree of crown mass when seedlings with lower masses or pups are used (HOTEGNI *et al*., 2015; BARKER *et al*., 2018), as well as the age of floral induction (KÜSTER *et al*., 2017).

Fruit length was influenced independently by planting time and cropping system. Compared with those under dryland irrigation, those under supplemental irrigation produced longer fruits (Figure 2C). In the months of July, August, December, and January, under supplemental irrigation, the fruit length was greater than that in the other months. In drylands, July, August, and December produced longer fruits, the only ones with average values above 150 mm, and these values were statistically similar. Fruit diameter was not influenced by cropping system, but fruits tended to have higher averages with supplemental irrigation (Figure 2F). In terms of planting time, July stands out over the other months, both with supplemental irrigation (121 mm) and under dryland (119 mm). The smallest fruit diameter was obtained in August in both cropping systems. Küster *et al*. (2017), when studying the behavior of pineapple cv. "Vitória" in July and September with different induction times, demonstrated that the physical characteristics of the fruit were influenced by the planting time; the highest values were obtained for pineapple harvested in July because of the better vigor of the plants. Pereira *et al*. (2009) also demonstrated that the physical characteristics of pineapple fruits harvested at different times significantly differ, which may be related to climatic conditions, cultural treatments, cultivar, and planting time, among other factors.

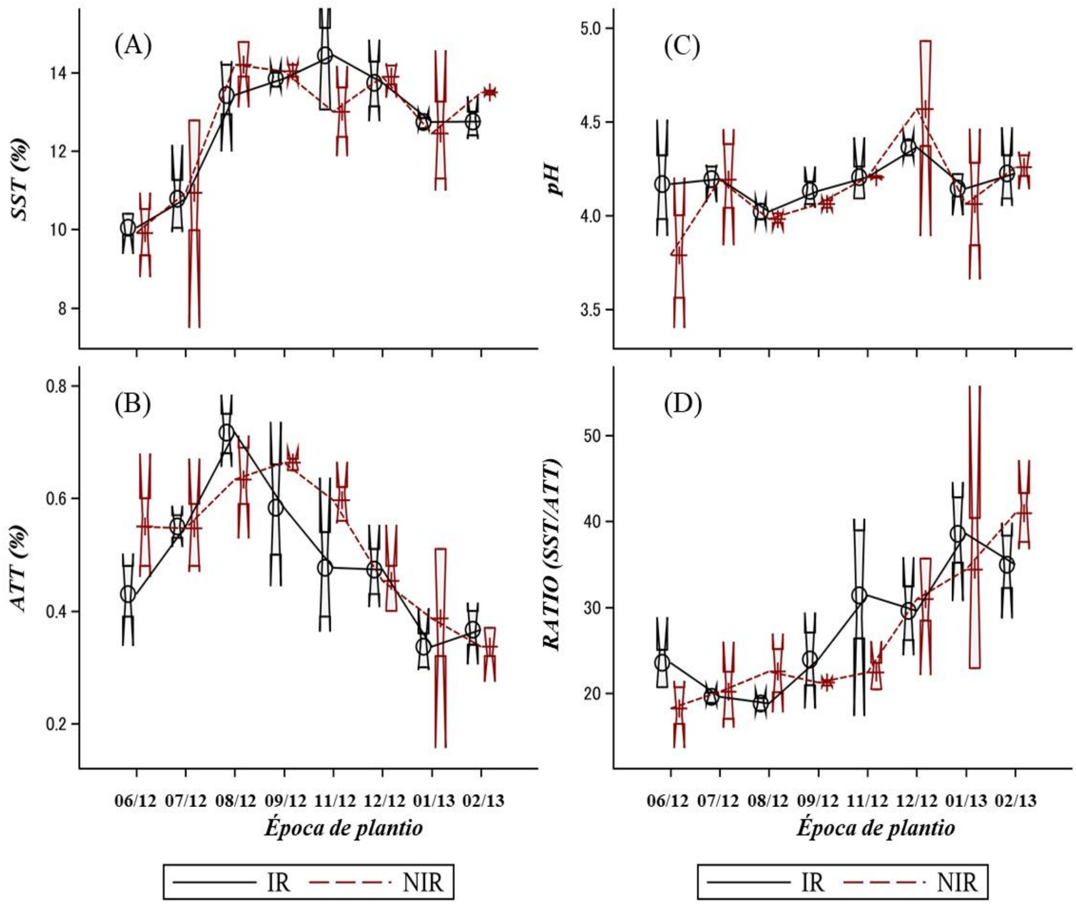
Compared with the rainfed system, the cultivation system with supplemental irrigation promoted greater fruit mass with crowns (Figure 2D). The December and January planting seasons with supplemental irrigation provided greater fruit mass with crown, whose average values were above 1,600 g, with the fruits classified as class 3 (1,500–1,800 g), and for the other planting seasons as class 2 (1,200–1,500 g) (MINISTRY OF AGRICULTURE, LIVESTOCK AND SUPPLY, 2002) , both with water supplementation and in rainfed conditions. These results, referring to December and January, are superior to those reported by Ledo *et al*. (2004) for the same cultivar and climatic conditions, who obtained fruit with a crown with an average mass equal to 1,426 g. Additionally, all planting times were superior, in both cultivation systems, to the results obtained by Gondin and Azevedo (2002) for the cultivar SGN-3 (1,064 g), which was produced in a hot and humid environment in Rio Branco, AC.

Peeled fruit mass was greater in the planting system with supplemental irrigation, and the December and January planting seasons produced heavier fruits than did the other planting seasons in both cultivation systems (Figure 2E). Planting during the rainy season (November, December, January, and February) favored the production of fruit with greater peeled masses, unlike plantings during the dry season (June, July, August, and September). This behavior may be related to environmental conditions, since fruits that begin to develop during the rainy season (Figure 1) tend to be larger than those that begin to form during the dry season (PEREIRA *et al*., 2009). Similar behavior was also observed with the use of supplemental irrigation, demonstrating the efficiency of this agronomic practice even in plantings during the rainy season, as droughts also occur during this period. The pineapple plant requires a minimum water availability of 60 mm well distributed throughout the month (CUNHA; CABRAL; SOUZA, 1999); however, there was a deficit in some months of the year (Figure 1), which may have contributed to the lower mass, fruit length and productivity when the pineapple plant was cultivated without supplementary irrigation, since a marked water deficiency in the initial phase of cultivation harms the vigor of the plant, causing a reduction in the size of the fruit and its quality (PEREIRA *et al*., 2009; KÜSTER *et al*., 2017).

Almeida *et al* . (2002) reported the positive influence of irrigation on pineapple mass. Furthermore, this practice allowed for uniform fruit production and earlier harvesting. This earlier cycle reduces the time required to occupy the cultivation area. However, the staggered distribution of pineapple plants in the area can facilitate the marketing process of production throughout the year, which can provide significant economic gains with the adoption of irrigated pineapple farming.

There was a significant interaction for total soluble solids; however, there was no influence of the cropping system when it was treated as an isolated factor. The lack of significance between the cropping systems for TSS is in line with the results of Franco *et al*. (2014), and opposes Souza *et al*. (2013), who reported a significant increase in the TSS with increasing irrigation depth in the cv. Smooth cayenne. With the exception of the plantings carried out in June and July, in both cultivation systems, the other planting periods produced fruits with a TSS above 12°Brix (Figure 3A), which is the minimum level required for *fresh consumption* (MINISTRY OF AGRICULTURE, LIVESTOCK AND SUPPLY, 2002). These results corroborate Gondim and Azevedo (2002) and Ledo *et al*. (2004), who obtained fruits with a TSS above 12°Brix when fruiting was induced at ten months.

Figure 3. Total soluble solids-SST (A), titratable acidity-ATT (B), pH (C) and ratio (D) of pineapple, cv. BRS RBO, at different planting times with supplementary irrigation (IR) and in drylands (NIR). Senador Guiomard, Acre, 2014.



According to Feng *et al*. (2017), stress caused by water deficit can significantly reduce the sucrose content of fruits, which is more pronounced under severe deficiency conditions. According to these same authors, this reduction occurs due to changes in the activity of enzymes related to sucrose metabolism under water deficit. Thus, low rainfall in some months during fruit formation did not affect the TSS content. For Barker *et al*. (2018), high temperatures and light during fruit formation and ripening result in increased TSS contents. Low temperatures reduce the TSS, starch, and titratable acidity levels, in addition to impairing fruit development, causing malformation, especially within 22 days after floral induction, which is the most sensitive period. However, the occurrence of low temperatures at 33 and 50 days after floral induction does not interfere with the physical-chemical quality of the fruits (JULIUS; TSENG; LIN, 2017). Pereira *et al*. (2009) emphasized that it is important to determine the ideal harvest point for pineapple, taking into account the various factors that influence the chemical and physical characteristics of the fruit, as these characteristics constitute the first factor influencing whether the fruits are acceptable to consumers. These factors may be the type of cultivar, the planting season, the climate and soil conditions, and the management practices employed.

Notably, the SST content is an important indicator of sweetness and is normally used as a ripeness index for some fruits, indicating the quantity of substances dissolved in the juice, which increases as ripening progresses (SOUZA *et al*., 2013); therefore, its determination helps define the harvest season as long as it is associated with other characteristics of the fruit, such as diameter and length, thus allowing consumers to receive fruits with better quality *in natura*.

The pH of the fruits was not influenced by the cultivation system or the interaction with the planting period. The highest average pH was obtained in December under both supplementary irrigation (4.36) and dryland (4.56) cultivation (Figure 3C). When evaluating the quality of the commercialized “Pérola” pineapple at the Cooperfruto Cooperative in Miranorte, TO, from different harvest seasons, between November 2006 and May 2007, Pereira *et al.* (2009) reported little variation in the average pH values (4.07–4.38), which are similar to the results obtained in the present study via supplemental irrigation (4.02–4.36). Under rainfed conditions, there was greater variation in the average values, which ranged from 3.79 to 4.56. Souza *et al*. (2013), after studying cv. Smooth Cayenne under different irrigation depths and frequencies, reported that the fruits had a pH of approximately 3.57, which led them to report that the harvest was performed at the correct time and that this variable was associated with the ripening of the fruits.

Titratable acidity (TTA) was statistically similar between the cropping systems, although it significantly interacted with the planting period. In the supplementary irrigation cropping system, the highest average acidity was obtained in the planting season corresponding to August, followed by September, whereas the lowest acidity was found in January and February, a similar pattern observed for dryland cultivation (Figure 3B). These results are consistent with those of Pereira *et al.* (2009), who reported TTA values between 0.35% and 0.65% for cv. "Pérola" at different harvest times. The highest ATT values found in the August and September planting seasons are probably due to the occurrence of low temperatures (9 °C in July 2013 and 12.5 °C in August 2013) during fruit formation (Figure 1), according to results obtained by Julius, Tseng and Lin (2017), who detected ATTs above 0.8 when the plant was exposed to low temperatures (12 °C/8 h and 3 °C/16 h) from 17--50 days after floral induction. Ledo *et al* . (2004), when the effects of flowering inducers in two induction periods in the cultivars RBR-1, SNG-2, and SNG-3 were analyzed, reported average ATTs of 0.55%, 0.53%, and 0.64%, respectively. For cv. SGN-3, Gondin and Azevedo (2002) obtained average ATTs of 0.64%, 0.35%, and 0.40% with inductions performed at 8, 10, and 12 months after planting, respectively, indicating that fruits from young plants tend to have greater acidity. This behavior was also demonstrated by Barker *et al*. (2018), who reported that plants induced at 8 and 10 months provided pineapples with higher ATT than those induced at 12 months or those without induction. Thus, ATT may vary depending on the planting and induction periods and other agronomic practices employed in cultivation (PEREIRA *et al*., 2009).

With respect to the RATIO, one of the best forms of analysis used to indicate quality, higher average values were observed in January (38.54) and February (34.95) with the use of supplementary irrigation, which was statistically equal, whereas in July (19.59) and August (19.82), the values recorded were the lowest (Figure 3D). The higher the RATIO is, the better the fruit quality, which is an indicator that favors fruit acceptance (PEREIRA *et al*., 2009) because it is more flavorful (MARTINS *et al*., 2012). For fruits produced under dryland conditions, February provided fruits with the highest RATIO (40.93), followed by January (34.38). Furthermore, plantings carried out from November onward promoted fruits with a relatively high RATIO in both cultivation systems, probably due to low acidity and acceptable TSS levels, with the exception of November under dryland conditions. This behavior was consistent with that reported by Pereira *et al*. (2009), who observed sweeter fruits when fruits were harvested in periods with greater water availability in Miranorte, TO. Franco *et al*. (2014) did not find a significant difference when irrigation depths corresponding to 30, 50, 70, 100, and 150% of the evaporation of the class A tank were used, which is partially consistent with the low influence of cultivation systems in most of the planting periods studied. With respect to the planting period and floral induction age, Küster *et al*. (2017) did not find a significant influence on this characteristic.

The correlation of the residuals related to the comparison between the production characteristics and the physical and chemical qualities of pineapple showed significant positive and negative coefficients (Table 2). Fruit mass with a crown was positively and significantly correlated with all production characteristics (fruit mass without peel, crown mass, fruit length and diameter, and yield), except for the physical and chemical variables. This indicates that the greater the fruit mass of cv. BRS RBO is, the greater these production variables will also be. Fruit mass without peel was significantly positively correlated with fruit length and diameter and yield and significantly negatively correlated with pH, which, in turn, was also negatively and significantly correlated with yield. Thus, the greater the fruit mass without peel or the yield is, the lower the pH index. The crown mass correlated only with the fruit mass of the crown and with a low magnitude (0.33). Küster *et al*. (2018) also did not observe a significant correlation between crown mass and fruit mass with crown mass for cv. “Vitória”, with inductions performed at 8, 10, and 12 months after planting, in two periods (July and September). Oliveira *et al*. (2015) reported that the mass of fruits with crowns of cv. “Imperial”, produced under the soil and climate conditions of Porto Seguro, BA, presented a significant and negative correlation with crown mass; that is, crown weight decreased with increasing fruit mass.

Table 2. Correlation coefficients of the residues from the comparison between the production and physicochemical characteristics of pineapple, cv. BRS RBO, in different planting seasons and cultivation systems. Senador Guiomard, Acre, 2014 **.**

	MFSCA	**MCO**	**CFR**	**DFR**	**PROD**	**SST**	**pH**	**ATT**	**RATIO**
MFCCO	0.95 **	0.33 *	0.80 **	0.79 **	0.51 **	-0.02 ns	-0.31 ns	0.18 ns	-0.24 ns
MFSCA	1.00	0.21 ns	0.77 **	0.77 **	0.74 **	0.04 ns	-0.35 *	0.11 ns	-0.14 ns
MCO		1.00	0.18 ns	0.24 ns	0.16 ns	-0.28 ns	-0.11 ns	0.22 ns	-0.38 ns
CFR			1.00	0.54 **	0.42 **	-0.09 ns	-0.30 ns	0.14 ns	-0.18 ns
DFR				1.00	0.37 *	0.08 ns	-0.25 ns	0.25 ns	-0.21 ns
PROD					1.00	-0.04 ns	-0.38 *	0.09 ns	-0.05 ns
SST						1.00	0.02 ns	-0.35 *	0.66 **
pH							1.00	-0.55 **	0.42 **
ATT								1,00	-0.79 **
RATIO									1.00

* Significant according to the F test at 5% probability; ** significant according to the F test at 1% probability; ns not significant at 5% probability;
MFCCO = fruit mass with crown; MFSCA = fruit mass without peel; MCO = crown mass; CFR = fruit length; DFR = fruit diameter; PROD = productivity; SST = total soluble solids; pH = hydrogen potential; ATT = titratable acidity; RATIO = SST/AT ratio.

Fruit length and diameter were highly significantly positively correlated with fruit mass (with and without peel). Therefore, the increase in these characteristics directly reflects pineapple mass and, consequently, productivity, since there was also a significant correlation with this variable, albeit with a medium magnitude. Vilela, Pegoraro, and Maia (2015) reported a strong and significant positive correlation between fruit diameter and mass (0.93) and reported that for each millimeter increase in diameter, there was a 19 g increase in the fruit mass of the "Vitória" cv. Oliveira *et al*. (2015) also confirmed that fruit mass is directly related to fruit diameter and length.

The TSS content was significantly negatively and positively correlated with only the titratable acidity and RATIO, respectively. Therefore, sweet pineapple fruits have lower acidity and a higher RATIO. In terms of acidity, a highly negative (-0.79) and significant correlation with RATIO was observed, indicating that sweeter fruits tend to be less acidic. Küster *et al*. (2018) reported significant positive and negative results between soluble solids and titratable acidity, with a greater magnitude observed in July, with fruiting induction at 8 and 10 months after planting, under the climatic conditions of the municipality of Sooretama, ES. These authors also reported that larger fruits tend to have low soluble solids contents because there is a negative correlation between soluble solids and fruit mass within the crown.

6 CONCLUSIONS

The use of supplemental irrigation promotes increased productivity and provides better quality pineapple fruit.

The productivity obtained from dryland cultivation and supplementary irrigation during all the evaluated planting seasons was higher than the national average and that recorded for the state of Acre.

They are higher than the national

average, as well as the state of Acre, in all the evaluated planting seasons.

Pineapple planting can be carried out in December and January in both cultivation systems.

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