Yield and agronomic performance response to irrigation on banana cultivars 'Prata Anã' and 'Prata Graúda'

Produção e desempenho agronômico de bananeiras 'Prata Anã' e 'Prata Graúda' submetidas à irrigação

Elisangela Clarete Camili[1*], José Adriano Lima Soares[2], Antonio Renan Berchol da Silva[1], Erval Rafael Damatto Júnior[3] e Davi José Bungenstab[4]

Recebido em 29/05/2014 / Aceito para publicação em 06/02/2015.

ABSTRACT

An adequate irrigation system with high efficiency application can improve vegetative growth, yields, plant height, pseudostem diameter, leaf area index and number of standing leaves on banana plants. This paper compares responses to the foot-dripping irrigation of two banana cultivars: 'Prata Anã' and 'Prata Graúda'. Yields and agronomic traits related to growth parameters are analyzed. The trial was carried out at Universidade Católica Dom Bosco Experimental Station in Campo Grande, MS, Brazil, between December 2005 and April 2007. Traits related to production cycle were: number of days from planting to flowering and to harvesting as well as from flowering to harvest. The following production traits were evaluated: yields; bunch weight; number of hands per bunch; number of fruits per bunch; average fruit weight, diameter and length. The experimental design was random blocks in factorial scheme 2 x 2 (cultivars x irrigation) with five repetitions and three useful plants per plot. Results showed statistically significant differences between cultivars. There were also significant differences on superior development performance, yield and agronomic traits when cultivars were irrigated. It indicates that the use of strategic technologies, such as irrigation, can enhance banana production in the central part of Mato Grosso do Sul, Brazil.

KEYWORDS: *Musa* spp., drip-irrigation, dry season.

RESUMO

O uso adequado de sistemas de irrigação com elevada eficiência de aplicação de água pode melhorar o crescimento vegetativo, rendimento, altura de planta, diâmetro do pseudocaule, índice de área foliar e número de folhas em plantas de bananeira. Assim sendo, o presente trabalho comparou a resposta à irrigação por gotejamento de duas cultivares de banana: 'Prata Anã' e 'Prata Graúda' em suas características vegetativas e produtivas. O ensaio foi conduzido na Estação Experimental da Universidade Católica Dom Bosco em Campo Grande, MS, Brasil, no período de Dezembro de 2005 a Abril de 2007. As características de crescimento avaliadas foram: número de dias do plantio à colheita, do plantio ao florescimento e do florescimento à colheita. As seguintes características de produção foram avaliadas: produtividade; massa dos cachos; número de pencas e de frutos por cacho; massa, comprimento e diâmetro dos frutos da segunda penca. O delineamento experimental foi em blocos casualisados em esquema fatorial 2 x 2 (cultivares x irrigação), com cinco repetições e três plantas úteis por parcela. Os resultados mostraram diferenças significativas entre as cultivares, bem como superioridade no desenvolvimento, produtividade e características vegetativas quando as cultivares foram irrigadas, indicando que o uso de tecnologias estratégicas, como a irrigação, pode potencializar a produção de banana na região central do Mato Grosso do Sul, Brasil.

PALAVRAS-CHAVE: *Musa* spp., gotejamento, sequeiro.

[1] Universidade Federal de Mato Grosso, Cuiabá, MT, Brasil.
[2] Engenheiro Agrônomo, Autônomo, Cuiabá, MT, Brasil.
[3] Agência Paulista de Tecnologia dos Agronegócios, Registro, SP, Brasil.
[4] Embrapa Gado de Corte, Cuiabá, MS, Brasil.
[*]Autor para correspondência <eccamili@hotmail.com>.

INTRODUCTION

Banana (*Musa* spp.) is the most popular tropical fruit around the world. It is produced and consumed in most of tropical and subtropical countries. Globally, Brazil plays a major role, being ranked as the fourth largest banana producer. Bananas are grown in all Brazilian States, covering over than 500 thousand hectares, annually harvesting a total of approximately seven million metric tons, yielding on average 13.8 t ha^{-1} (FAO 2011). Mato Grosso do Sul State has a cultivated area of 1,284 ha with bananas representing no substantial contribution (0.25%) to the Brazilian banana production (AGRIANUAL 2009). On the other hand, this production mostly comes from small holders, being of major importance as a source of income for subsistence farmers and traditional communities. Besides food production, banana has an underestimated potential to sequester carbon, contributing to reduce global warming.

Being a typical tropical plant with constant growth through the year, in order to have satisfactory growth, reasonable yields and fruit quality, banana demands high temperatures and air moisture as well as evenly distributed rainfall. Most Brazilian bananas are produced in Vale do Ribeira, located in the São Paulo State coastal area, where rainfall usually satisfies plant needs. But according to MANICA (1998), as a whole, traditional banana crops in Brazil do not get adequate water supply to satisfy plant growth and produce high quality bunches. In many areas irrigation is needed throughout the year or at least seasonally, when rainfall does not satisfy plant requirements (ALVES 1999). In the Brazilian Central plains, where Mato Grosso do Sul is located, covered by the savanna type biome called Cerrados, average rainfall is above 1200 mm. This precipitation is distributed in a six to eight month period though, restricting plant development and production (FIGUEIREDO et al., 2006). Therefore, it would be expected that irrigation could greatly improve banana farming in the area. Little regional research has been carried out in this field. Therefore, it is necessary to define the best irrigation methods, as well as suitable banana varieties for the area, which, allied to proper framing practices and crop management, would greatly improve local farmers' livelihoods.

Regarding possible irrigation methods for banana in Brazil, ALVES (1999) and OLIVEIRA et al. (2005) do not point to any restrictions for the majority of available irrigation techniques. For the authors, choice must be based on local characteristics like climate, landscape, soils, implementation and maintenance costs. According to them, factors like management, labor, water quality and availability must not be disregarded.

In other regions, banana yields under irrigation greatly vary with Brazilian cultivars, being around 30 t ha^{-1} for 'Prata', 'Prata Anã' and 'Pacovan' and 70 t ha^{-1} for 'Nanica', 'Nanicão' and 'Grand Naine'. Yet, according to ALVES (1999), these figures represent yields twice larger than traditional non irrigated production. SILVA et al. (2004) and FIGUEIREDO et al. (2006) found that adequate banana irrigation improves vegetative growth, yields, plant height, pseudostem diameter, leaf area index and number of standing leaves.

In this context, considering the importance of banana farming for the country and its potential for Central Brazil, this work aimed to evaluate the effects of irrigation on vegetative development, yield and fruit quality of banana cultivars 'Prata Anã' and 'Prata Graúda'.

MATERIALS AND METHODS

The trial was carried out between December 2005 and April 2007 at the Universidade Católica Dom Bosco (UCDB) Experimental Station, in Campo Grande-MS, located 20°27' South and 54°37' West at 530 meters above sea level. Climate is mesothermal with dry winters. Figure 1 shows average data for temperature and rainfall during the experiment.

Experimental plot had soil identified by the Brazilian classification as "Neossolo Quartzarenico" (EMBRAPA 2006) with sandy phase and medium texture with presented chemical characteristics at 0 to 20 cm: pH (CaCl2) = 4,6; Organic matter = 14 g kg^{-1}; P = 1,5 mg dm^{-3}; K = 1,9 mmolc dm^{-3}; Ca = 10 mmolc dm^{-3}; Mg = 8 mmolc dm^{-3}; Al = 2 mmolc dm^{-3}; H + Al = 41 mmolc dm^{-3}; Cationic change capacity = 61 mmolc dm^{-3} and base saturation = 33%. And at 20 to 40 cm deep presented: pH (CaCl2) = 4.7; Organic matter = 12 g kg^{-1}; P = 1,0 mg dm^{-3}; K = 1,0 mmolc dm^{-3}; Ca = 14 mmolc dm^{-3}; Mg = 6 mmolc dm^{-3}; Al = 1 mmolc dm^{-3}; H + Al = 31 mmolc dm^{-3}; Cationic change capacity = 52 mmolc dm^{-3} and base saturation = 40%.

Seedlings were produced by micropropagation, raised in a shaded nursery and transplanted to the

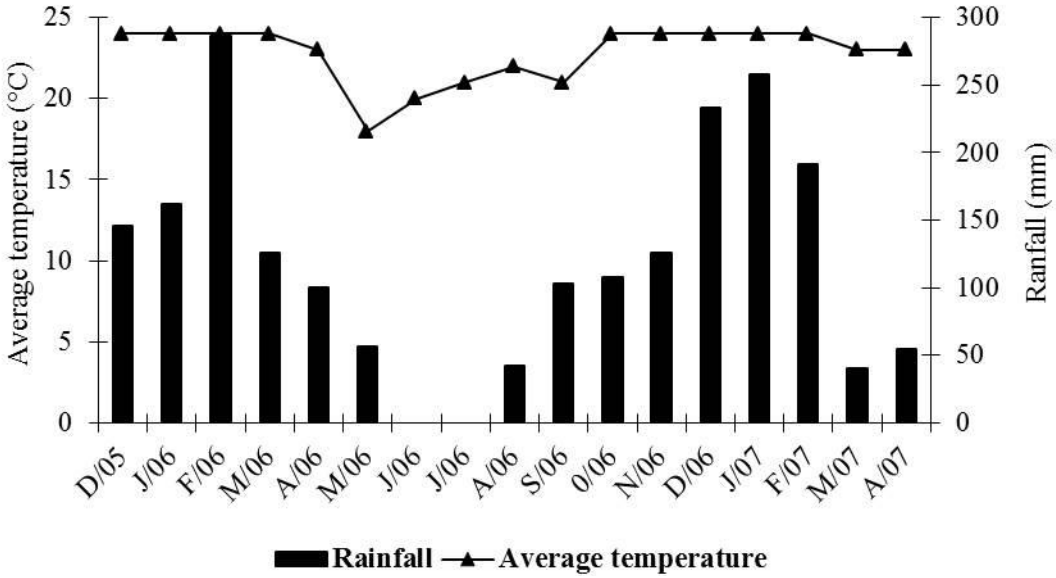

Figure 1. Average temperature (° C) and rainfall (mm) for the trial period when banana (*Musa* spp.) cultivars 'Prata Anã' and 'Prata Graúda', were under irrigation or not. (December 2005 to April 2007). Source: Meteorologic Station from Instituto São Vicente in Campo Grande, MS.

field. The irrigation system used at nursery was a fully automated spot dripping with rain sensor. Two dripping devices per plant were used with a 4 L^{-1} h^{-1} flow per device (pressure 50 mwc). Irrigation supplied plant needs according to soil moisture monitored by tensiometers installed in the experimental field.

Spot fertilization at transplantation and supplemental fertilization followed soil analysis and technical recommendations for the crop. At the moment of seedling plantation, fertilization was done with 45 g of urea (45% of N), 270 g of superphosphate (60 % of P_2O_5), 130 g potassium chloride (18% of K_2O) and 150 g of thermo phosphate per hole. Fertilization with N and K was performed each fifteen days with 100 g of urea (45 g N) and 50 g of KCl (30 g K_2O) per hole. During the first production cycle, plants were cleared of dead leaves, bunch heart cut off, also sprout dressing and weed control were carried out when necessary. Pseudostem was also cut off after bunch harvest.

The experimental design was random blocks in factorial scheme 2 x 2 (cultivars x irrigation) with five repetitions and three useful plants per plot. Each plot constituted 15 banana plants. Treatments were the two banana varieties: Prata Anã (genomic group AAB) and Prata Graúda (genomic group AAAB) receiving or not irrigation as follows: T1 = 'Prata Anã' irrigated, T2 = 'Prata Anã' without irrigation, T3 = 'Prata Graúda' irrigated e T4 = 'Prata Graúda' without irrigation, spaced 3 x 2 m, with an area of 6 m² per plant.

Quantitative descriptors analyzed for the plant crop cycle were: days to flowering, days from flowering to harvest, days from planting to harvest, bunch weight, number of hands per bunch, number of fruits per bunch, weight, length and average diameter of the 10 central fruits from the second hand of each bunch for calculating yields. Statistic evaluation was performed using variance analysis and averages were compared by the Tukey test at 5% significance level.

RESULTS AND DISCUSSION

The 'Prata Anã' banana irrigated showed shorter cycle than the non irrigated 'Prata Graúda', with 363 and 437 days respectively (Figure 2). Analysis of isolated cultivar behavior did not show significant effects of irrigation. However, an absence of irrigation extended the first cycle to 47 and 27 days for 'Prata Graúda' and 'Prata Anã' respectively. This confirms the effectiveness of irrigation for reducing plant cycle. Similar figures were found by GOMES (2004) when evaluating potash fertilization dosages for Prata Anã cultivar. The author reports first harvest at 386 days. FIGUEIREDO et al. (2006) compared water laminas of 40, 60, 80, 100 and 120% of reference evapotranspiration (ETo) for 'Prata Anã' in the Northern part of Minas Gerais State. The authors concluded that 100 and 120% of ETo favored earlier flowering and consequently, earlier harvest.

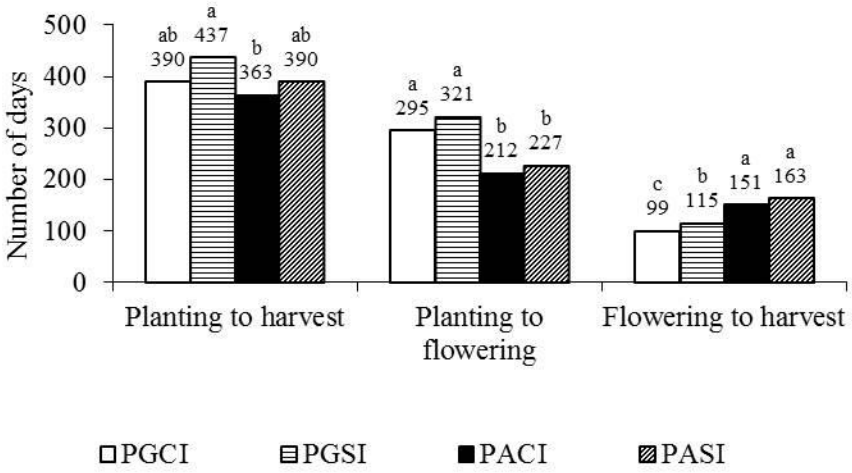

Figure 2. Plant crop cycle of banana (*Musa* spp.) cultivars 'Prata Anã' and 'Prata Graúda' under irrigation or not in Campo Grande, MS from December 2005 to April 2007). PGCI = Irrigated 'Prata Graúda', PGSI = Non-Irrigated Prata Graúda', PACI = Irrigated 'Prata Anã', PASI = Non-Irrigated 'Prata Anã'.

It is known that cycle length is influenced by genetic and environmental factors LEONEL et al. (2004) and DAMATTO JUNIOR et al. (2005a) evaluated Prata Anã cultivar from micropropagation in the Botucatu-SP area and found under irrigation average cycles of 434 and 493 days respectively. For the same banana cultivar also irrigated, in different areas of Minas Gerais State, PEREIRA et al. (2003) (Central) as well as RODRIGUES et al. (2006) and FIGUEIREDO et al. (2005) (North), reported cycles of 510, 320 and 387 days respectively. RAMOS et al. (2009) in Botucatu-SP found that irrigated 'Prata Anã' and 'Prata Graúda' took 476 and 531 days respectively to complete a cycle. PEREIRA et al. (2000) in Jaíba (Northern Minas Gerais) and FEHLAUER et al. (2010) in Bonito-MS, studying behavior of 'Prata Anã' without irrigation, reported cycle of 411 and 470 days, respectively. In Western São Paulo State FOLTRAN et al. (1998) reported a cycle of 633 days with and 646 without irrigation for the Prata Anã cultivar.

According to LEITE et al. (2003) cycle length is a relevant characteristic for genetic improvement since it has direct effect on annual yields. Compared to Brazilian results, the use of irrigation for 'Prata Anã' in Campo Grande-MS allowed for an even shorter plant cycle. This is a very important crop characteristic for farmers since it represents earlier returns on investments and larger production volumes in the same area in shorter periods.

Regarding the period between planting and flowering, there was a remarkable difference between cultivars. The period between planting and flowering of 'Prata Graúda' irrigated was 83 days more than 'Prata anã' irrigated, while in plots without irrigation 'Prata Graúda was 94 days longer than in 'Prata Ana' (Figure 2). Even though there was no statistically significant difference on cycle length, irrigation reduced by 26 and 15 days the period between planting and flowering for 'Prata Graúda' and 'Prata Anã' respectively. In Botucatu, these two banana cultivars when irrigated needed respectively 420 and 350 to flowering (RAMOS et al. 2009). In Northern Minas Gerais, 'Prata Anã' under irrigation needed 245 from planting to flowering (FIGUEIREDO et al. 2005) and in Bonito-MS without irrigation, 326 days (FEHLAUER et al. 2010). SILVA et al. (2000) stated that a shorter period for flowering is related to genotype, being an important characteristic since it results in successive shorter production cycles, increasing total production and consequently final yields.

Comparing flowering to harvest period with planting to harvest and planting to flowering periods, a reverse effect could be noticed between the two cultivars. 'Prata Graúda' had a shorter vegetative phase. This period lasted 99, 115, 151, and 163 days for irrigated and traditional system for 'Prata Graúda' and 'Prata Anã', respectively. This meant a difference between cultivars and irrigation presence for the 'Prata Graúda' cultivar. With irrigation, the cycle was reduced by 16 days for this cultivar.

CASTRO & KLUGE (1998) observed that in tropical areas with a well defined dry season the interval

between flowering and harvest without irrigation is extended. This information was corroborated by this study. RAMOS et al. (2009) reported a 126 and 111 days period between flowering and harvest for irrigated 'Prata Anã' and 'Prata Graúda' respectively. FIGUEIREDO et al. (2005) and RODRIGUES et al. (2006), mentioned periods of 147 and 181 days for the same phase in irrigated 'Prata Anã' in Northern Minas Gerais State, respectively. FEHLAUER et al. (2010) in Bonito-MS observed in 'Prata Anã' without irrigation, 144 days between flowering and harvest.

In the present work, even though 'Prata Anã' had a shorter plant crop cycle, it was the cultivar that had the largest interval between flowering and harvest, indicating that these factors are not associated, agreeing with RAMOS et al. (2009) who compared crop cycle duration for these two cultivars in Botucatu-SP. LIMA et al. (2005) studied several banana genotypes in the Bahia State Plains (Recôncavo Baiano). They concluded that the cultivars with the largest crop cycles were not the same as those that needed more time for flowering. This indicates remarkable differences among genotypes. According to DAMATTO JUNIOR (2005b) and RODRIGUES et al. (2006), a shorter interval between flowering and harvest is important because it reduces chances of fruit injury while in the field, as to the direct effect of water on cell expansion, water is the transport vehicle for fruit filling nutrients.

Fruits length and diameter are commercial classification criteria for banana. Therefore, measuring post-harvest characteristics is important for banana improvement as well as for farmers' decision making. Banana responds to irrigation not only with better yields, but also with more uniform and better developed fruits, with consequent higher commercial value. Independent from cultivar, bunch mass was positively influenced by irrigation. PEREIRA et al. (2003) in Lavras-MG and MOURA et al. (2002) in Itambé-PE working with irrigated 'Prata Graúda' obtained bunch weights of 14.7 and 16.0 kg, respectively. CARVALHO et al. (2002) compared several irrigated banana genotypes in the semiarid area of Piaui State. Their results showed 8.78 kg average bunch weight for 'Prata Anã'. In this work bunches weighed 10.18 kg, which were superior to the ones obtained by these cited authors, and can be explained by different climatic conditions and management characteristics.

RAMOS et al. (2009) obtained from 'Prata Anã' and 'Prata Graúda' under irrigation at the Botucatu-SP area, bunches weighing 9.5 and 26.9 kg respectively. These values are close to the ones from this work for 'Prata Anã' and higher for 'Prata Graúda'. Also in Botucatu-SP, DAMATTO JUNIOR et al. (2005a) working with irrigated 'Prata Anã', had 17.7 kg average bunch mass, being heavier than the ones from this work, probably because of the better soil characteristics, irrigation system and longer plant cycle, since according to the authors, their plants demanded 130 days more to complete plant harvest cycle. Under such circumstances, plants have more time to accumulate reserves, producing larger bunches. FEHLAUER et al. (2010) obtained from 'Prata Anã' in Bonito, MS without irrigation bunches weighing 7.01 kg.

Results for average hands per bunch and fruits per bunch showed no difference between cultivars. However, differences for irrigation presence within the 'Prata Graúda' cultivar were significant. This cultivar produced 8.0 hands and 103 fruits per bunch under irrigation, against 6.6 and 71.6 without irrigation.

Variation on the number of hands and fruits per bunch is attributed to genetic factors and regional soil and climatic conditions (SILVA et al. 2000) and should not be conclusively evaluated in the plant cycle, since it can increase in ratoon cycles (RODRIGUES et al. 2006). FIGUEIREDO et al. (2005) and RODRIGUES et al. (2006) in Norhtern Minas Gerais, as well as LEONEL et al. (2004) in Botucatu-SP, harvested irrigated 'Prata Anã' bunches with an average number of hands of 8.5, 8.7 e 9.0, respectively. RAMOS et al. (2009) in Botucatu-SP, compared several irrigated banana genotypes harvested bunches of 'Prata Anã' and 'Prata Graúda' with 85 and 137 fruits in 7 and 9 hands respectively. In Bonito-MS 'Prata Anã' without irrigation, bunches with 5.97 hands and 69.31 fruits were produced (FEHLAUER et al. 2010).

Compared to results for fruits and hands per bunch from the same varieties reported by the authors above, in the present trial, 'Prata Anã' produced more and 'Prata Graúda' produced less (Table 1). LEONEL et al. (2004) and DAMATTO JUNIOR et al. (2005a) in Botucatu-SP observed a larger number of hands and fingers per bunch of irrigated 'Prata Anã' than observed in this experiment. This difference in results can be due to differences in cycle length, soil characteristics and irrigation system. This assumption can be confirmed by the results obtained by FIGUEIREDO et al. (2005), where the number of

Table 1. Bunch weight (kg), number of hands per bunch and number of fruits per bunch in banana (*Musa* spp.) cultivars 'Prata Anã' e 'Prata Graúda', under irrigation or not in Campo Grande, MS (December 2005 to April 2007).

Treatments	Cultivars		
	'Prata Anã'	'Prata Graúda'	Average
	Bunch weight		
Irrigated	10.18 Ab	19.27 Aa	14.73 A
Non-irrigated	4.65 Bb	11.47 Ba	8.06 B
Average	7.41 b	15.37 a	
	VC (%) = 24.59		
	Number of hands per bunch		
Irrigated	7.6 Aa	8.0 Aa	7.8 A
Non-irrigated	7.0 Aa	6.6 Ba	6.8 B
Average	7.3 a	7.3 a	
	VC (%) = 11.99		
	Number of fruits per bunch		
Irrigated	95.4 Aa	103.8 Aa	99.6 A
Non-irrigated	82.4 Aa	71.6 Ba	77.0 B
Average	88.9 a	87.7 a	
	VC (%) = 13.31		

Average of five repetitions followed by the same low case characters in the row and same high case characters in the column do not differ statistically (Tukey p≤0,05).
VC (%) = Variation coefficient.

days to complete de cycle and consequently, bunch quality and yield, were similar. The number of hands and fingers per bunch were related to bunch weight; however, this relation could not be perfect, since it depends also on fruit size.

For BELALCÁZAR CARVAJAL (1991) bunch size and shape are genetically conditioned factors, peculiar for each cultivar. However, the number of hands and fingers, consequently yields, can be reduced by adverse environmental conditions as well as droughts during the differentiation phase. The highest yield obtained in this work was from 'Prata Graúda' (32 and 19 t ha^{-1} for irrigated and conventional respectively), followed by 'Prata Anã' irrigated and conventional (17 and 8 t ha^{-1}, respectively). The three first yields can be considered satisfactory, since they were high above average for Mato Grosso do Sul State (6.7 t ha^{-1}), where bananas are grown without irrigation. These yields are close to São Paulo State average yields (21.6 t ha^{-1}) (AGRIANUAL 2009) and in this State bananas are also produced without irrigation. Yield improvemente when using irrigation was 68.4% and 112.5%, respectively for 'Prata Graúda' and 'Prata Anã'. It could be observed that the higher yield genotype (Prata Graúda) showed longer cycle (Figure 2), and this explains heavier bunches that take longer to form and fill fruits (RAMOS et al. 2009). These confirmed FEHLAUER et al. (2010) with 'Prata Anã' without irrigation, reported yield 12.27 t ha^{-1} in Bonito-MS with longer cycles. According to CARVALHO et al. (2002) in Teresina-PI, irrigated 'Prata Graúda' reached an average yield of 28.5 t ha^{-1}. In Botucatu-SP, RAMOS et al. (2009) using irrigation, verified yields of 13.4 and 39.1 t ha^{-1} respectively for 'Prata Anã' e 'Prata Graúda' cultivars were observed, which corroborates the present results of higher yields for 'Prata Graúda' compared to 'Prata Anã'. Also in Botucatu-SP, LEONEL et al. (2004) and DAMATTO JUNIOR et al. (2005a) respectively obtained yields of 19.5 and 28.3 t ha^{-1} for irrigated 'Prata Anã'. The shorter crop cycle, soil characteristics (sand soil) and the small amount of fertilizer application could explain lower yields obtained in this work, since LEONEL et al. (2004) and DAMATTO JUNIOR et al. (2005a) had their harvests respectively at 434 and 493 days after planting, while in this work harvest was performed at 363 and 390 days on irrigated and traditional systems respectively. The present results are also in accordance with the results from FIGUEIREDO et al. (2005), where irrigated 'Prata Anã' produced 14.3 t ha^{-1} within a 387 days cycle. Importantly, cycles may result in longer higher yields, this is due to water and nutrients supplied, especially in the phase of the filling of fruits, between flowering and harvest .

Table 2. Second hand mass (kg), length (cm) and fruit diameter (mm) of banana (*Musa* spp.) cultivars 'Prata Anã' and 'Prata Graúda', under irrigation or not in Campo Grande, MS from December 2005 to April 2007).

Treatments	Cultivars		
	'Prata Anã'	'Prata Graúda'	Average
	Bunch weight		
Irrigated	10.18 Ab	19.27 Aa	14.73 A
Non-irrigated	4.65 Bb	11.47 Ba	8.06 B
Average	7.41 b	15.37 a	
	VC (%) = 24.59		
	Number of hands per bunch		
Irrigated	7.6 Aa	8.0 Aa	7.8 A
Non-irrigated	7.0 Aa	6.6 Ba	6.8 B
Average	7.3 a	7.3 a	
	VC (%) = 11.99		
	Number of fruits per bunch		
Irrigated	95.4 Aa	103.8 Aa	99.6 A
Non-irrigated	82.4 Aa	71.6 Ba	77.0 B
Average	88.9 a	87.7 a	
	VC (%) = 13.31		

Average of five repetitions followed by the same low case characters in the row and same high case characters in the column do not differ statistically (Tukey p≤0,05).
VC (%) = Variation coefficient.

The Table 2 shows mass of 10 fingers, average fruits diameter and length. The 'Prata Graúda' showed better results than 'Prata Anã' for all fruit parameters. As a whole, irrigation led to better results. However, analyzing the 'Prata Graúda' cultivar individually regarding 10 fingers mass, it showed no significant response to irrigation (Table 2). PEREIRA et al. (2003) in Lavras-MG found that 'Prata Graúda' produced fruits weighing 157.1 g, 43 g lighter when compared to the present work. In Northern Minas Gerais, RODRIGUES et al. (2006) and in Botucatu-SP, LEONEL et al. (2004) obtained from irrigated 'Prata Anã', fruits weighing 127 and 160.38 g respectively in the plant crop. Their figures were higher than the ones from this work, where irrigated 'Prata Anã' was harvested with fingers 100 g average weight.

Regarding average fingers length, results varied from 12.28 to 16.03 for 'Prata Anã' and from 20.21 to 23.01 for 'Prata Graúda' under traditional and irrigated systems respectively, being classified as Class 12, 15, 18, and 22 respectively (Table 2) under the Brazilian Ceagesp Banana Classification Norms (2010). RODRIGUES et al. (2006) in Northern Minas Gerais, GOMES (2004), LEONEL et al. (2004), DAMATTO JUNIOR (2005a) and RAMOS et al. (2009) all of them in Botucatu-SP, as well as LEITE et al. (2003) in Belmonte-BA found finger lengths for 'Prata Anã' of 14.2, 12.0, 13.4, 12.6, 16.0, and 14.0 cm respectively. RAMOS et al. (2009) in Botucatu-SP harvested from 'Prata Graúda' fruits 22.7 cm long, close to the ones obtained in this trial.

Results regarding average finger diameter showed no difference between irrigated and traditional systems for 'Prata Graúda', as well as between both cultivars under irrigation (Table 2). 'Prata Anã irrigated showed larger diameter than a non-irrigated system. According to the Brazilian Classification Norms for Bananas from Genomic Group AAB (Prata) from CEAGESP (2010) these figures put the fruits as Type II (28 mm) and Extra (34 mm), respectively. Fruit length and diameter are related to bunch weight (RODRIGUES et al. 2006). According to DANTAS et al. (2000), variations in size, number and fruit shape depends on cultivars and plant development conditions. In Northern Minas Gerais and Botucatu-SP, irrigated 'Prata Anã' produced fruits with an average diameter of 32.8 and 35 mm respectively (LEONEL et al. 2004, RODRIGUES et al. 2006). RAMOS et al. (2009) obtained average finger diameter for 'Prata Anã' and 'Prata Graúda' of 35.1 and 37.3 mm, respectively. Those authors concluded that for the trial conditions in Botucatu-SP, 'Prata Anã' showed reduced plant size and reduced cycle, however, it did not show satisfactory yield

performance. Otherwise, 'Prata Graúda' showed good growth and production characteristics, corroborated by the results of the present work.

CONCLUSION

Irrigation improved banana yields under the environmental conditions for the central area of Mato Grosso do Sul State for both cultivars.

'Prata Anã' had a shorter plant crop cycle and the use of irrigation reduced the production cycle for both cultivars.

The 'Prata Graúda' banana showed greater production compared to Prata anã.

REFERENCES

AGRIANUAL. 2009. Anuário Estatístico da Agricultura Brasileira. São Paulo: FNP Consultoria & Comércio. 497p.

ALVES EJ (Org.). 1999. A cultura da banana: aspectos técnicos, socioeconômicos e agroindustriais. 2.ed. Brasília: Embrapa. 585p.

BELALCÁZAR CARVAJAL SL. 1991. El cultivo del plátano en el trópico. Cali: Feriva. 376p.

CARVALHO JRP et al. 2002. Avaliação de genótipos de bananeira no estado do Piauí. 2 - Comportamento produtivo. In: 17 Congresso Brasileiro de Fruticultura. Anais... Belém: SBF. CD-Rom.

CASTRO PRC & KLUGE RA. 1998. Ecofisiologia de Fruteiras Tropicais. São Paulo: Nobel. p.69-88.

CEAGESP. 2010. Classificação da banana. Disponível em: <http://www.ceagesp.gov.br/produtor/classific/>. Acesso em 31 ago. 2010.

DAMATTO JUNIOR ER. 2005. Efeitos da adubação com composto orgânico na fertilidade do solo, desenvolvimento, produção e qualidade de frutos de bananeira 'Prata-anã' (Musa AAA). Dissertação (Mestrado em Agronomia). Botucatu: UNESP. 70f. 2005a.

DAMATTO JUNIOR ER et al. 2005. Produção e caracterização de frutos de bananeira 'Prata-Anã' e 'Prata-Zulu'. Rev Bras Frutic 27: 440-443. 2005b.

DANTAS ACVL et al. 2000. Cultivo da banana. Brasília: SENAR. 100p.

EMPRESA BRASILEIRA DE PESQUISA AGROPECUÁRIA - EMBRAPA. 2006. Sistema brasileiro de classificação de solos. 2 ed. Rio de Janeiro: Embrapa Solos. 306 p.

FAO - Food and Agriculture Organization. 2011. Disponível em: <http://faostat.fao.org/faostat>. Acesso em: 10 mai. 2013.

FEHLAUER TJ et al. 2010. Caracterização da produção de genótipos de banana introduzidos na região de Bonito-MS. Rev Bras Frutic 32: 938-943.

FIGUEIREDO FP et al. 2005. Efeitos de diferentes lâminas de irrigação na produtividade da bananeira 'Prata Anã' cultivada no Norte de Minas Gerais. Rev Ceres 52: 429-433.

FIGUEIREDO FP et al. 2006. Produtividade e qualidade da banana prata anã, influenciada por lâminas de água, cultivada no Norte de Minas Gerais. Rev Bras Eng Agríc Ambient 10: 798-803.

FOLTRAN DE et al. 1998. Comportamento de sete cultivares de bananeira no Oeste Paulista. In: 15 Congresso Brasileiro de Fruticultura. Resumos... Lavras: UFLA/SBF. p.127.

GOMES EM. 2004. Crescimento e produção de bananeiras 'Prata-anã' e 'Maçã' fertirrigadas com potássio. Tese (Doutorado em Agronomia). Botucatu: UNESP. 76p.

LEITE JBV et al. 2003. Caracteres da planta e do cacho de genótipos de bananeira, em quatro ciclos de produção em Belmonte, Bahia. Rev Bras Frutic 25: 443-447.

LEONEL S et al. 2004. Desempenho agronômico de bananeiras micropropagadas em Botucatu-SP. Rev Bras Frutic 26: 245-248.

LIMA MB et al. 2005. Avaliação de cultivares e híbridos de bananeira no recôncavo baiano. Ciên Agrotec 29: 515-520.

MANICA I. 1998. Adubação e irrigação. In: MANICA I. Bananas: do plantio ao amadurecimento. Porto Alegre: Cinco Continentes. p.45-52.

MOURA RJM et al. 2002. Avaliação de cultivares e híbridos de bananeira na zona da mata norte de Pernambuco (1º ciclo). In: 17 Congresso Brasileiro de Fruticultura. Anais... Belém: SBF. CD-Rom.

OLIVEIRA SL et al. 2005. Uso da irrigação e da fertirrigação na produção integrada de banana no norte de Minas Gerais. Cruz das Almas: Embrapa Mandioca e Fruticultura. 7p. Circular Técnica, 77

PEREIRA MCT et al. 2000. Crescimento e produção do primeiro ciclo da bananeira 'Prata Anã' (AAB) em sete espaçamentos. Pesq Agropec Bras 35: 1377-1387.

PEREIRA LV et al. 2003. Avaliação de cultivares e híbridos de bananeira em Lavras-MG. Ciênc Agrotec 27: 17-25.

RAMOS DP et al. 2009. Avaliação de genótipos de bananeira em Botucatu-SP. Rev Bras Frutic 31: 1092-1101.

RODRIGUES MGV et al. 2006. Avaliação de genótipos de bananeira sob irrigação. Rev Bras Frutic 28: 444-448.

SILVA SO et al. 2000. Caracterização morfológica e avaliação de cultivares e híbridos de bananeira. Rev Bras Frutic 22: 161-169.

SILVA LB et al. 2004. Comportamento vegetativo de cultivares de banana sob diferentes lâminas de irrigação. Pesq Agropec Trop 34: 93-98.