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Original Paper

Fruit biometry and pitombeira seed [*Talisia esculenta* (St. Hil) Radlk (Sapindaceae)]

Alan M. Zuffo[1], Jorge G. Aguilera[1], Augusto M. de Oliveira[2], Aécio Busch[3] and Fábio Steiner[3]

1 Federal University of Mato Grosso do Sul (UFMS), Campus Chapadão do Sul – MS, Brazil

2 State University of Mato Grosso do Sul (UEMS), Unidade de Cassilândia – MS, Brazil

3 Federal University of Piaui (UFPI), Campus Cinobelina Elvas, Bom Jesus – PI, Brazil

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Abstract

Research on the biometry of fruits and seeds is relevant in the conservation and exploitation of economic value resources and in the evaluation of genetic variability within the species. However, there are few studies on biometry analysis of fruit and seed of *Talisia esculenta* (St. Hil) Radlk, popularly known as pitombeira. The objective of this study was to characterize the fruits and seeds of pitombeira. The study was developed at the Crop Science Laboratory of the State University of Mato Grosso do Sul, using 100 fruits and seeds randomly selected from 120 fruits. The fruit traits evaluated were: longitudinal length, width, thickness, fresh mass, dry mass, peel fresh mass and volume; and the seed traits assessed were: longitudinal length, width, fresh mass, dry mass and water content. There was a morphological difference between fruits and seeds. Fruit traits that presented lower and higher variability were the peel fresh mass and length, respectively, and for the seed traits were dry mass and length. The results indicate that there may be genetic variability among the harvested pitombeira fruits.

Key-words: Biometric Analysis, Pitomba, Genetic Variability

Introduction

Talisia esculenta Radlk, known popularly as pitombeira and/or pitomba, belonging to the family Sapindaceae, it is a tree plant native of the Amazon region found in temperate and tropical regions. In Brazil, it presents cosmopolitan distribution (Rodrigues et al., 2018). Its fruits measure about 32.59 x 26.33 cm in length and diameter, and they are coated with a brownish-yellow bark of coriaceous consistency, and its pulp yield is approximately 3.35 g (Vieira and Gusmão, 2008).

The commercialization of pitomba fruits usually occurs in local markets and are collected from wild trees and / or domestic orchards. However, there is no official data on its annual production (Alves et al., 2013; Rodrigues et al., 2018). Due to its high occurrence, adapted to the different environments, with fast growth and great seed production, it can also be used in the recovery of ciliary forests (Vieira; Gusmão, 2008).

Despite its socioeconomic importance, *Talisia esculenta* is not the focus of many studies, with few references on the biometry of fruits and seeds (Vieira; Gusmão, 2008). Biometric data is useful for conserving and exploiting economic value resources, allowing the rational use of the fruits and the evaluation of genetic variability within and between populations, besides allowing to evaluate if the variability has or not relation with the edaphoclimatic factors (Gonçalves et al., 2013; Barroso et al., 2016; Zuffo et al., 2016a, b).

Given the above, this study aimed to evaluate the biometry of fruits and seeds of pitombeira [*Talisia esculenta* (St. Hil) Radlk (Sapindaceae)].

✉ Alan M. Zuffo
E-mail: alan_zuffo@hotmail.com

Material and Methods

The he fruits were harvested at a natural vegetation area, whose species are constituents of the nature reserve, distant 10 km from the municipality of São Pedro do Piauí (05º 55’ 46’’ S; 42º 43’ 07’’ W) and altitude of 264 m, in the State of Piauí, Brazil. The vegetation of the study area is Caatinga type, it is little anthropized, still with several fruit species native to this biome, among them the pitombeira, that has been exploited in an extractive way and serves to feed the residents.

According to the Köppen classification, region climate is Aw, with two well-defined climatic seasons, a drought that usually extends from May to September, and a rainy one, from October to April. Figure 1 shows the rainfall data for 2017 collected at the meteorological station of the National Institute of Meteorology – INMET.

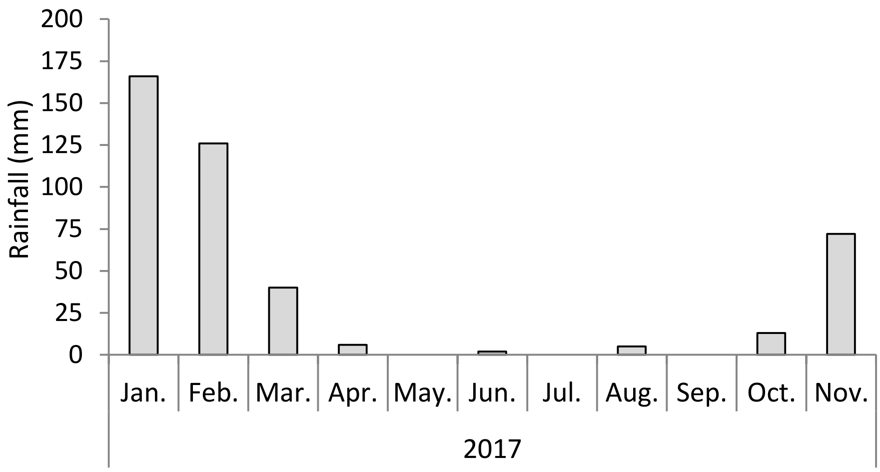

Fig. 1. Monthly rainfall (mm) occurred during the formation of fruits in 2017. Source: INMET Experimental Station in São Pedro do Piauí, PI.

The ripe fruits were harvested in the tree canopy during the second week of November 2017, beginning of the rainy season in the region. After harvesting, faulty, predated and wilted fruits were removed and quickly washed. Afterwards, the fruits were transported to the Crop Science Laboratory of the State University of Mato Grosso do Sul for measuring the biometric traits.

In a random sample containing 100 fruits and seeds, we extracted 120 visually healthy, completely and without deformation fruits, and proceeded to the determination of several biometric traits. The following traits were evaluated: longitudinal length (FLL), width (FW) and thickness (FT) with a digital caliper (Clarke-150 mm) and ± 0.01 mm precision; fruit fresh mass (FFM), fruit dry mass (FDM), peel fresh mass (PFM) and fruit volume (FV). In the seeds were evaluated: longitudinal length (SLL), width (SW) and thickness (ST), also by a digital caliper (Clarke-150 mm), and fresh mass (SFM), dry mass (SDM), and water content (SWC). A precision analytical balance (0.001 g) was used to determine fresh and dry mass.

The biometric traits of fruits and seeds were analyzed by frequency distribution. Spearman's non-parametric correlation coefficient (rS) between the traits and its respective significance level (P) were calculated by t-test (Zar, 1996). All statistical analyses were performed using the BIOESTAT 5.0 software (Ayres et al., 2007).

Results and discussion

The length, width, thickness, fresh mass, volume and peel fresh mass for the fruits were 25.76 mm, 24.15 mm, 20.63 mm, 8.22 g, 6.99 cm3 and 2.83 g, respectively. Already length, width, thickness, fresh mass, dry mass and water content for the seeds were 21.57 mm, 14.24 mm, 11.52 mm, 3.03 g, 1.49 g and 48.55% respectively (Table 1).

The higher standard deviation values indicate that there is greater sample variance for the fruit volume, fruit fresh mass and seed fresh mass regarding the other traits evaluated (Table 1). At last, the coefficients of variation reveal a lower variation in thickness of the fruits and seeds regarding the mean value, which corroborate the results found by Vieira and Gusmão (2008).

Table 1. Morphometric characterization of pitombeira (*Talisia esculenta* (St. Hil) Radlk) fruits and seeds. N = 100 fruits and N= 100 seeds.

Trait Fruit	Mean	Asymmetry	Kurtosis	SD	CV(%)
Length	25.76(0.26)	0.05	0.02	2.60	10.13
Width	24.15(0.13)	0.11	-0.39	2.35	9.76
Thickness	20.63(0.17)	1.96	5.79	1.76	8.56
Fresh mass	8.22(0.14)	-0.04	-1.20	1.44	17.61
Volume	6.99(0.18)	0.95	1.09	1.81	25.98
Peel fresh mass	2.83(0.06)	0.35	-0.37	0.67	23.92
Trait Seed	**Mean**	**Asymmetry**	**Kurtosis**	**SD**	**CV(%)**
Length	21.57(0.17)	-0.44	-0.08	1.72	7.99
Width	14.24(0.15)	1.96	6.32	0.15	11.18
Thickness	11.52(0.08)	0.06	-0.20	0.08	7.43
Fresh mass	3.03(0.08)	1.59	1.68	0.86	28.42
Dry mass	1.49(0.01)	0.39	0.22	0.01	12.92
Water content	48.55(0.88)	1.23	0.22	0.88	18.24

In brackets, standard error of the mean; SD: standard deviation; CV: coefficient of variation.
Length, Width, Thickness - mm; Fresh mass, Peel fresh mass, Dry mass - g; Volume - cm^3; Water content - %.

Biometric data of fruits and seeds of *Talisia esculenta* indicate that the sampling was taken from the population accurately, since the standard error values for all traits were small. Therefore, the analyzed sample mean is close to the population mean, whose value is unknown.

For the fruit traits, peel fresh mass (0.67 g) and length (2.60 mm) showed the lowest and highest standard deviation, respectively, and the lowest and highest standard deviation for the seed traits were dry mass (0.01) and length (1.72), respectively (Table 1). These traits are probably the ones with the lowest and highest variability (SILVA et al., 2017).

Regarding the frequency distribution for each fruit trait, the longitudinal length (FLL) ranged from 18.7 to 32.0 mm, with about 32% of the fruits showing FLL ranging from 23.1 to 25.3 mm (Figure 2a), and the width (FW) ranged from 18.7 to 30.2 mm, with 31% of the fruits ranging from 22.5 to 24.4 mm (Figure 2b). Fruit thickness (FT) ranged from 17.2 to 28 mm, 56% of these with a thickness from 19.0 to 20.8 mm (Figure 2c), while the fruit fresh mass (FFM) ranged from 5.3 to 10.7 g, wherein from the 100 fruits, 24% weighed from 6.2 to 7.1 g (Figure 2d). Already the fruit volume (FV) ranged from 4.0 to 13.1 cm3, wherein of the total number of fruits (100), 50% showed a volume ranging from 5.5 to 7.0 cm3 (Figure 2e). Lastly, peel fresh mass of the fruits (PFM) had a variation from 1.4 to 4.1 g, and from the 100 fruits, 34% showed variation for PFM from 2.3 to 2.8 g (Figure 2f).

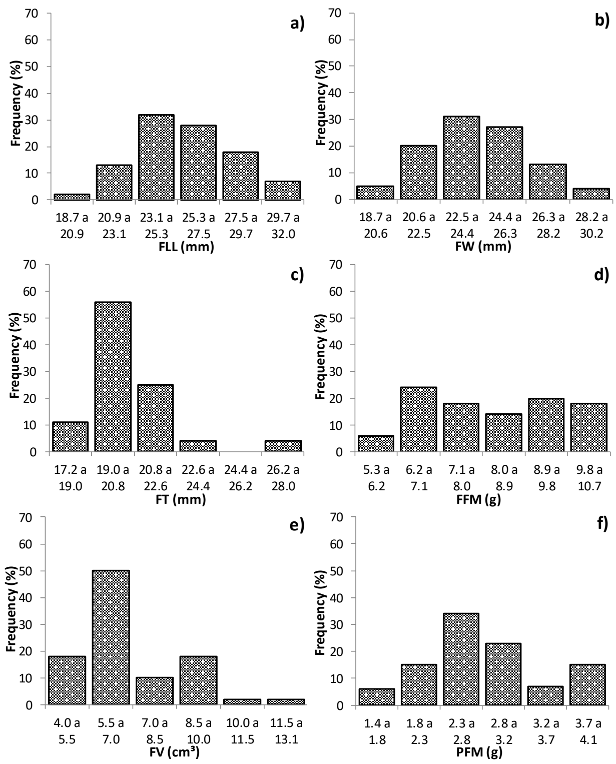

Fig. 2. Frequency of the longitudinal length – FLL (a), width – FW (b), thickness – FT (c), fresh mass – FFM (d), volume – FV (e), and peel fresh mass of the fruit – PFM (f) of pitombeira (*Talisia esculenta* (St. Hil) Radlk), in the municipality of São Pedro do Piauí, PI, in 2017. N = 100 fruits.

Regarding the seed traits, the frequency for the longitudinal length (SLL) ranged from 17.6 to 24.4 mm, in which from the total number of seeds (100), 31% showed SLL ranging from 19.8 to 21.0 mm (Figure 3a), while the width (SL) had variation from 12.0 to 20.3 mm, in which 39% of the seeds ranged from 13.3 to 14.7 mm (Figure 2b). The thickness (ST) ranged from 9.8 to 13.4 mm, in which from the total seeds, 30% oscillated between 11.0 and 11.6 mm (Figure 2c), while the fresh mass (SFM) ranged from 2.1 to 5.4 g, with most seeds (59%) ranging from 2.1 to 2.7 g (Figure 3d). Its dry mass (SDM) ranged from 1.1 to 2.0 g, and from the total number of seeds, 39% ranged from 1.4 to 1.5 g (Figure 3e). Lastly, seed water content (SWC) ranged from 38.2 to 68.0%, with 47% of the seeds having a water content ranging from 43.1 to 48.1% (Figure 3f). These differences show that there is variability among the studied genotypes.

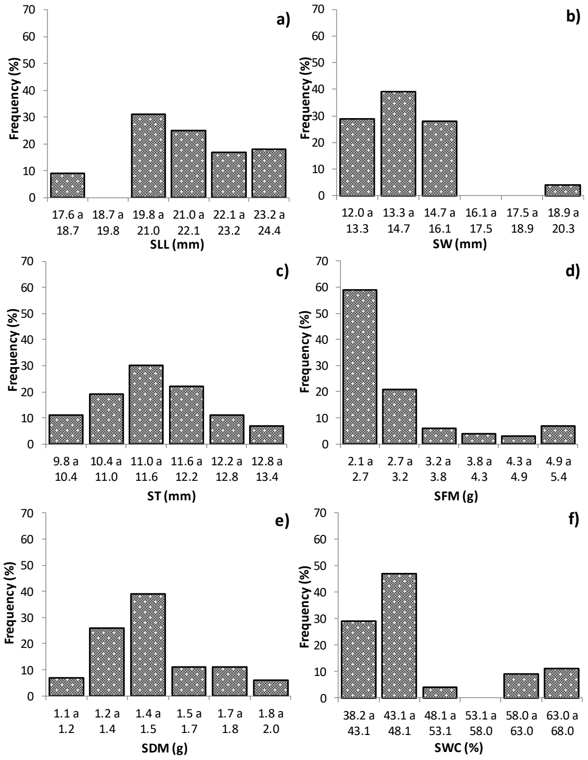

Fig. 3. Frequency of the longitudinal length – SLL (a), width – SW (b), thickness – ST (c), fresh mass – SFM (d), dry mass – SDM (e), and seed water content – SWC (f) of pitombeira (*Talisia esculenta* (St. Hil) Radlk), in the municipality of São Pedro do Piauí, PI, in 2017. N= 100 seeds.

The difference in seed size within the same species may be associated with the environment where the mother-plant is inserted. If the resources necessary for the seed formation (water, solar radiation and nutrient) are scarce during its development stage, the mother-plant will probably give rise to seeds with the most varied morphological patterns, not having uniformity in their sizes (Silva et al., 2017). Therefore, the biometry of fruits and seeds is relevant in the taxonomy for identifying varieties and checking the occurrence of phenotypic variations (Cardoso; Lomônaco, 2003).

Fruit width (FW) had a strong positive correlation with longitudinal length (FLL) (0.641). There was also a weak and positive Pearson correlation for fruit thickness (FT), longitudinal length (0.349) and fruit width (0.312). There was a strong and positive correlation between the volume (FV) and fruit fresh mass (FFM) (0.654), weak and positive for peel fresh mass (PFM) with fruit fresh mass (FFM) (0.329) and fruit volume (0.271) (Table 2).

There was also a weak and positive correlation for seed width (SW) with fruit fresh mass (FFM) (0.261), fruit volume (FV) (0.250) and peel fresh mass of the fruit (PFM) (0.252), just as the seed fresh mass (SFM) correlated with PFM (0.232). Seed dry mass (SDM) showed a weak and positive correlation with PFM, and strong and positive with seed dry mass (0.680). At last, the seed water content presented a moderate and positive correlation with the SFM (0.502) (Table 2).

Table 2. Pearman correlation (r_S) for the biometric traits of the fruits and seeds of pitombeira (*Talisia esculenta* (St. Hil) Radlk).

	FLL	FW	FT	FFM	FV	PFM	SLL	SW	ST	SFM	SDM
FW	0.641**										
FT	0.349**	0.312**									
FFM	0.106ns	-0.006ns	0.124ns								
FV	0.029ns	-0.042ns	0.068ns	0.654**							
PFM	0.132ns	0.006ns	-0.049ns	0.329**	0.271**						
SLL	0.142ns	0.000ns	0.063ns	0.064ns	0.057ns	0.095ns					
SW	0.059ns	0.093ns	0.178ns	0.261**	0.250**	0.252**	-0.017ns				
ST	0.022ns	0.045ns	-0.029ns	0.005ns	-0.077ns	-0.063ns	-0.159ns	0.128ns			
SFM	0.079ns	0.044ns	-0.076ns	0.104ns	-0.018ns	0.232*	0.182ns	-0.155ns	-0.168ns		
SDM	0.121ns	0.001ns	-0.058ns	0.176ns	0.069ns	0.297**	0.134ns	0.009ns	-0.015ns	0.680**	
SWC	0.111ns	0.114ns	0.012ns	0.008ns	-0.120ns	0.139ns	0.173ns	-0.156ns	-0.185ns	0.502**	-0.138ns

** and * significant at 1% and 5% probability level, respectively, by t-test; ns: not significant.
FLL – fruit longitudinal length, FW – fruit width, FT – fruit thickness, FFM – fruit fresh mass, FV – fruit volume, PFM – peel fresh mass of the fruit, SLL – seed longitudinal length, SW – seed width, ST – seed thickness, SFM – seed fresh mass, SDM – seed dry mass, SWC – seed water content.

All these results obtained when assessing variables related to fruits and seeds of pitombeira evidences that there is genetic variability for most of the characteristics and that their knowledge is important in the scarce knowledge that they have of the culture in the present time. The selection of characteristics of the fruit and correlated seeds can help in the selection of characteristics that can be used in an indirect or direct selection process facilitating the work with this species.

Conclusion

There was variation in the biometry of fruits and seeds, indicating that there may be genetic variability among the harvested pitombeira fruits. Fruit traits which presented lower and higher variation were the peel fresh mass and length, respectively, and for the seed traits were dry mass and length, indicating that these are possibly the traits of smaller and greater variability.

Conflict of interest: All authors declare no conflict of interest.

References

Alves, E.U.; Monte, D.M.O.; Cardoso, E.D.A.; Santos-Moura, S.D.S.; Moura, M.F. 2013. Emergence and initial growth of *Talisia esculenta* (A. St. Hil) radlk seedlings in fuction of depths and positions of sowing. Bioscience Journal 29(2):328-339

Ayres, M.; Ayres Júnior, M.; Santos, A.A.S. 2007. *BioEstat 5.0: Aplicações estatísticas nas áreas das ciências biológicas e médicas*. Belém, Sociedade Civil Mamirauá

Barroso, R.F.; Silva, F.A.; Nobrega, J.S.; Silva, L.J.; Novaes, D.B.; Ferreira, V.S. 2016. Biométria de frutos e sementes de *Luetzelburgia auriculata* (Allemão) Ducke. Revista Verde de Agroecologia e Desenvolvimento Sustentável 11(5):156-160

Cardoso, G.L.; Lomônaco, C. 2003. Variações fenotípicas e potencial plástico de *Eugenia calycina* Cambess. (Myrtaceae) em uma área de transição cerrado-vereda. Revista Brasileira de Botânica 26(1):131-140

Gonçalves, L.G.V.; Andrade, F.R.; Junior, M.; Hur, B.; Schossler, T.R.; Lenza, E.; Marimon, B.S. 2013. Biometria de frutos e sementes de mangaba (*Hancornia speciosa* Gomes) em vegetação natural na região leste de Mato Grosso, Brasil. Revista de Ciências Agrárias 36(1):31-40

Rodrigues, S.; Brito, E.S.; Silva, E.O. 2018. Pitomba *Talisia esculenta*. In: Rodrigues, S.; Silva, E.O.; Brito, E.S. (Org.) Exotic Fruits. 1ed.: Elsevier, p. 351-354

Silva, R.M.; Cardoso, A.D.; Dutra, F.V.; Morais, O.M. 2017. Aspectos biométricos de frutos e sementes de *Caesalpinia ferrea* Mart. ex Tul. provenientes do semiárido baiano. Revista de Agricultura Neotropical 4(3):85-91

Vieira, F.A.; Gusmão, E. 2008. Biometria, armazenamento de sementes e emergência de plântulas de *Talisia esculenta* Radlk. (Sapindaceae). Ciência agrotécnica 32(4):1073-1079

Zar, J.H. 1996. Biostatistical analysis**.** 4. ed. New Jersey, River, Prentice-Hall/Upper Saddle

Zuffo, A.M.; Gesteira, G.S.; Zuffo Júnior, J.M.; Andrade, F.R.; Soares, I.O.; Zambiazzi, E.V.; Guilherme, S.R.; Santos, A.S. 2016a. Caracterização biométrica de frutos e sementes de mirindiba (*Buchenavia tomentosa* Eichler) e de inajá (*Attalea maripa* [Aubl.] Mart.) na região sul do Piauí, Brasil. Revista de Ciências Agrárias, 39(1): 455-472

Zuffo, A.M.; Steiner, F.; Busch, A.; Zuffo Júnior, J.M. 2016b. Physical characterization of fruits and seeds of *Delonix regia* (Bojer ex Hook.) raf. (Fabaceae – Caesalpinoideae). International Journal of Current Research, 8(11):42072-42076contem referências.

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