



## Fruit and seed biometry of cambuí (*Myrciaria tenella* O. Berg)<sup>1</sup>

*Biometria de fruto e semente de cambuí (Myrciaria tenella O. Berg)*

Ana Veruska Cruz da Silva<sup>2\*</sup>, Allívia Rouse Carregosa Rabbani<sup>3</sup>,  
Tatiana Santos Costa<sup>2</sup>, Débora Clivati<sup>4</sup>

**Abstract** - The cambuí tree (*Myrciaria tenella* O. Berg) is native to Brazil and its fruits are harvested by extraction for fresh consumption in the state of Sergipe (Brazil). Because of the regional importance of the species, this work aims to characterize the cambuí fruits and seeds. The fruits were harvested mature from native trees in the Reserva do Caju Experimental Field, on Itaporanga d'Ajuda (Sergipe, Brazil), belonging to Embrapa Tabuleiros Costeiros. Two hundred fruits and seeds were biometrically analyzed. In addition, we evaluated the fruit, pulp, and seed color based on RHS Color Chart. Two different skin colors were found: 1. yellow [orange - red (group 32A)] with yellow pulp [yellow - orange (group 17A)]; and 2. purple [violet - blue (group 93A)] with red pulp [red - purple (group 60A)]. The seeds have only one color, green [yellow-green (group 152A)] with dark stripes [Brown (group 200C)]. The fruits mean diameter was 9.23 mm.fruit<sup>-1</sup>, and average width 8.50 mm.fruit<sup>-1</sup>. The seeds mean diameter was 5.34 mm.seed<sup>-1</sup>, mean width 6.52 mm.seed<sup>-1</sup> and thickness 5.08 mm.seed<sup>-1</sup>. The cambuí is a little red fruit. The biometry had a high variability as expected, because it is a native species without any type of management.

**Key words** - Color. Myrtaceae. Sergipe.

**Resumo** - O cambuí (*Myrciaria tenella* O. Berg) é nativo do Brasil e os frutos são colhidos por extrativismo para consumo *in natura* no estado de Sergipe (Brasil). Por causa da importância regional da espécie, objetivou-se com este trabalho caracterizar os frutos e sementes de cambuí. Os frutos foram colhidos maduros provenientes de plantas nativas do Campo Experimental Reserva do Caju, no município de Itaporanga d'Ajuda (Sergipe, Brasil) pertencente a Embrapa Tabuleiros Costeiros. Foram analisados 200 frutos e sementes biometricamente. Além disso, caracterizou-se a cor da fruta, da polpa, e da semente com base na cartela de cores RHS. Foram identificados duas cores diferentes para a fruta: 1. de cor amarela [laranja - vermelho (grupo 32A)], com polpa amarela [amarelo - laranja (grupo 17A)], e 2. com cor roxa [violeta - azul (grupo 93A)], com polpa vermelha [vermelho - roxo (grupo 60A)]. As sementes foram de uma só cor, verde [verde-amarelo (grupo 152A)], com listras escuras [Marrom (grupo 200C)]. O diâmetro médio dos frutos foi de 9,23 mm.fruto<sup>-1</sup>, e a média da largura 8,50 mm.fruto<sup>-1</sup>. O diâmetro médio das sementes foi de 5,34 mm.semente<sup>-1</sup>, 6,52 mm.semente<sup>-1</sup> para a largura, e a espessura média de 5,08 mm.semente<sup>-1</sup>. O cambuí é um pequeno fruto vermelho. A biometria de sementes de cambuí são altamente variáveis, sendo justificado por ser uma espécie nativa.

**Palavras-chave** - Cor. Myrtaceae. Sergipe.

\*Autor para correspondência

<sup>1</sup>Enviado para publicação em 15/06/2012 e aprovado em 02/12/2012

<sup>2</sup>Embrapa Tabuleiros Costeiros, Aracaju, Sergipe, Brasil, [ana.veruska@embrapa.br](mailto:ana.veruska@embrapa.br), [tatiana\\_itase@hotmail.com](mailto:tatiana_itase@hotmail.com)

<sup>3</sup>Bolsista DCR do CNPq/FAPITEC, Universidade Federal de Sergipe (UFS), São Cristóvão, Sergipe, Brasil, [alliviarouse@hotmail.com](mailto:alliviarouse@hotmail.com)

<sup>4</sup>Universidade de Mogi das Cruzes, Centro de Ciências Biomédicas, Mogi das Cruzes, São Paulo, Brasil, [deboraclivati@hotmail.com](mailto:deboraclivati@hotmail.com)

## Introduction

Myrtaceae is known for its high species richness and its important role in phytosociology, mainly in the Brazilian forests (ROMAGNOLO; SOUZA, 2004), being one of the predominant groups of the Atlantic arboreal component. Several native species of fruit trees have high forthcoming uses in Sergipe (Brazil), and some studies are being carried out on them (COSTA *et al.*, 2011; SANTOS *et al.*, 2011).

Cambuí (*Myrciaria tenella* O. Berg) is a Brazilian native species of Myrtaceae, occurring from northern to southern Brazil and extending to Argentina (SOBRAL *et al.*, 2010). It is an important species to the Sergipe population, who sell fruits for fresh consumption in the regional market. The species has a great potential, mainly due to the attributes regarding the C vitamin content (PINHEIRO *et al.*, 2011), color, size, sweet taste and unique flavor. Preliminary studies showed that fruits can be consumed as juice, jelly (RYBKA *et al.*, 2011) or wine with higher antioxidant properties compared to grape wine (BIASOTO *et al.*, 2011); also, the residue formed after fruit processing is a potential substitute for grass in ruminants feeding (VOLTOLINI *et al.*, 2011). Moreover, fruits of Cambuí are rich in polysaccharides, which can be potentially used by its gelling properties (pectins) (ROLIN, 1993; VRIESMANN *et al.*, 2004) or to reduce LDL and total cholesterol blood levels (BAKER, 1994).

Although some studies reveal economic and medicinal importance of Cambuí, the morphology of seeds and fruits are poorly known (BERG, 1857; LORENZI, 2000; SOUZA; MORIM, 2008). Furthermore, there is another gap in the literature regarding the attributes of this fruit. For instance, the production losses are not even perceived, due mainly to ignorance of their characteristics. Therefore, research is necessary on this species to improve the fresh fruit market and the use of raw materials for agro-industry (LIRA JUNIOR *et al.*, 2005; TORRES *et al.*, 2009). Moreover, it is necessary to characterize and conserve natural resources to prevent the species extinction. The characterization of genotypes is an essential step in breeding programs and conservation of germplasm (ZUBRZYCKI, 1997; SMIDERLE; SOUZA, 2008; ADEWALE *et al.*, 2012). The characterization provides important insights regarding the handling and packaging, commercial exploitation, and agriculture industry, contributing to the proper use and application of technological methods (OLIVEIRA *et al.*, 2009). The biometry of fruits and seeds is important to obtain information about color, shape and size of seeds, which will help to create marketing methods (FENNER, 1993; GUSMÃO *et al.*, 2006; OLIVEIRA *et al.*, 2009).

These studies, involving morphological analysis of seeds, may also help understanding the process of

germination and characterization of vigor and viability of the culture on study (MATHEUS; LOPES, 2007; CHRISTRO *et al.*, 2012). Thus, the aim of this study was to characterize the cambuí fruits to complement the information available about the species.

## Material and methods

A natural population of cambuí trees is located in the Reserva do Caju (11°06'S, 37°11'W), in municipality of Itaporanga d'Ajuda (Sergipe, Brazil), belonging to Embrapa Tabuleiros Costeiros (Embrapa – CPATC).

The cambuí fruits were harvested at the stage of physiological maturity from randomly selected trees.

In total, 200 fruits and 200 seeds from eight trees were analyzed, measuring the weight (g) with analytical balance (GEHAKA - model B64400, 0.1 g sensitive), and dimensions (mm) with digital caliper (0.01 mm sensitive).

Fruit skin and pulp, and seed-coat color were determined following RHS Color Chart (RHS, 1995). The biometric data of fruits and seeds were analyzed using frequency distribution and univariate statistics, which comprised the position measurements (average, minimum and maximum values) and dispersion (coefficient of variation, skewness and kurtosis) with SPSS v.18 ([www.ibm.com/software/analytics/spss/products/statistics/](http://www.ibm.com/software/analytics/spss/products/statistics/)).

## Results and discussion

The majority of the fruits presented one seed per fruit, and in some cases up to two seeds per fruit, as described by Berg (1857) and Lorenzi (2000) (Figure 1).

The biometric data of 200 cambuí fruits and seeds indicated that the population sample was taken precisely because the standard error values for all traits were small, indicating that the sample mean is close to the average population, which value is unknown (Table 1).

The average weight of 100 fruits was 54.9 g and of a single fruit was 0.77 g. The average diameter was 9.23 mm.fruit<sup>-1</sup>, and width 8.50 mm.fruit<sup>-1</sup>. The most common class for dimensions was 9.01-10.00 (51%, 103), and 8.01 to 9.00 (54%, 108) for the width (Figure 2).

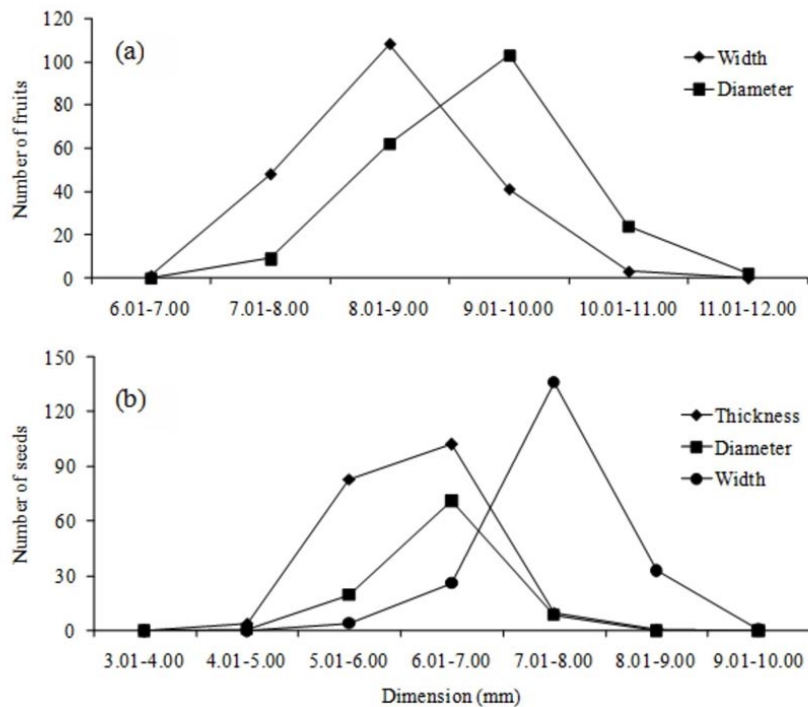
According to Lorenzi (2000), cambuí fruits are globose berries, glabrous, bright red or dark purple color. Also, orange fruits were recorded by Souza & Morim (2008). In this investigation, two different skin colors were detected (Figure 3). A light color, yellow [orange - red (group 32A)], with yellow pulp [yellow - orange (group 17A)]; and a dark color, purple [violet - blue (group



**Figure 1** - Fruits (a) and seeds (b) of cambuí (*Myrciaria tenella* O. Berg) from Reserva Ecológica do Caju, Itaporanga d’Ajuda (Sergipe, Brazil), belonging to Embrapa Tabuleiros Costeiros (Embrapa – CPATC). Source: Embrapa - CPATC.

**Table 1** - Biometric values to fruits and seeds of cambuí (*Myrciaria tenella* O. Berg) from Reserva Ecológica do Caju, Itaporanga d’Ajuda (Sergipe, Brazil), belonging to Embrapa Tabuleiros Costeiros (Embrapa – CPATC)

	Fruits		Seeds		
	Diameter	Width	Diameter	Width	Thickness
	mm		mm		
Range	7.51-11.90	6.60-10.70	3.81-6.83	4.54-8.16	3.83-7.39
Mean	9.23	8.50	5.40	6.52	5.08
Std. Error	0.05	0.05	0.03	0.04	0.04
Std. Deviation	0.73	0.66	0.49	0.56	0.52
Variance	0.54	0.44	0.24	0.32	0.27
Skewness (S)	0.17	0.19	-0.05	-0.39	0.67
Kurtosis (K)	0.49	0.11	0.84	1.70	2.31



**Figure 2** - Class frequency of fruits (a) and seeds (b) of cambuí (*Myrciaria tenella* O. Berg) from Reserva Ecológica do Caju, Itaporanga d’Ajuda (Sergipe, Brazil), belonging to Embrapa Tabuleiros Costeiros (Embrapa – CPATC).

93A)], with red pulp [red - purple (group 60A)]. During fieldwork, it was common to find both colors of ripe fruits in the same tree.



**Figure 3-** Fruits of cambuí (*Myrciaria tenella* O. Berg) from Reserva Ecológica do Caju, Itaporanga d'Ajuda (Sergipe, Brazil), belonging to Embrapa Tabuleiros Costeiros (Embrapa – CPATC): (a) yellow and (b) purple. Source: Embrapa - CPATC.

All variables of fruits and seeds had a coefficient of kurtosis  $K < 3$ , indicating that the data has a wider range of data distribution. Native plants greatly differ in their characteristics (OLIVEIRA *et al.*, 2009), and various authors show that there is a natural variability (SILVA; MEDEIROS FILHO, 2006; VERA *et al.*, 2007).

The average weight of 100 seeds was 16.34 g, and one seed was 0.2 g. The seeds average diameter was 5.34 mm.seed<sup>-1</sup>, width was 6.52 mm.seed<sup>-1</sup> and thickness was 5.08 mm.seed<sup>-1</sup> (Table 1). The most common dimension class was 6.01-7.00 (71%, 142) for diameter, 7.01 - 8.00 (68%, 136) for width, and 6.01 - 7.00 (51%, 102) to thickness (Figure 2).

Seeds diameter and width show negative asymmetric (S) values. According to Silva *et al.* (2007), the negative asymmetric coefficient indicates seed diameter and width less prevalent in the sample.

The seed-coat color showed no differences between yellow or purple fruit. The seeds were green [yellow-green (group 152A)] with with dark color stripes [Brown (group 200C)] (Figure 1).

The cambui is a little red fruit. This is the first study to characterize biometrically fruits and seeds, which present a large variation in all dimensions measured.

## Scientific literature cited

- ADEWALE, B. D.; DUMET, D. J.; VROH-BI, I.; KEHINDE, O. B.; OJO, D. K.; ADEGBITE, A. E.; FRANCO, J. Morphological diversity analysis of African yam bean (*Sphenostylis stenocarpa* Hochst. ex A. Rich.) Harms and prospects for utilization in germplasm conservation and breeding. **Genetic Resources and Crop Evolution**, v. 59, n. 5, p. 927-936, 2012.
- BAKER, R. A. Potential dietary benefits of citrus pectin and fiber. **Food Technology**, v.11, p.133-138, 1994.
- BERG, O. Myrtaceae. In: MARTIUS, C.F.P.; EICHLER, A.; URBAN, I. Flora brasiliensis. 1857. v. 14, part. I, p. 367 - 368,
- BIASOTO, A. C. T; OLIVEIRA, E. A.; VOLTOLINI, T. V. RYBKA, A. C. P. Potencial do cambuí (*Myrciaria tenella*) para elaboração de fermentado. In: SIMPÓSIO LATINO AMERICANO DE CIÊNCIA DE ALIMENTOS, 9., Campinas. **Anais...** Campinas: UNICAMP/ FEA/ SLACA, 2011.
- CHRISTRO, L. F.; AMARAL, J. F. T.; LAVIOLA, B. G.; MARTINS, L. D.; AMARAL, C. F. Biometric analysis of seeds of genotypes of physic nut (*Jatropha curcas* L.). **Agropecuária Científica no Semiárido**, v.8, n.1, p. 01-03, 2012.
- COSTA, T. S.; SILVA, A. V. C.; LÉDO, A. S.; SANTOS, A. R. F.; SILVA JUNIOR, J. F. Diversidade genética de acessos do banco de germoplasma de mangaba em Sergipe. **Pesquisa Agropecuária Brasileira**, v. 46, n. 5, p. 499-508, 2011.
- FENNER, M. **Seed ecology**. London: Chapman Hall, 1993. 151p.
- GUSMÃO, E.; VIEIRA, F. A.; JÚNIOR, E. M. F. Biometria de frutos e endocarpos de murici (*Byrsonima verbascifolia* Rich. Ex. A. Juss.). **Revista Cerne**, v.12, n.1, p.84-91, 2006.
- LIRA JUNIOR, J. S.; MUSSER, R. S.; MELO, E. A., MACIEL, M. I. S.; LEDERMAN, I. E.; SANTOS, V. F. Caracterização física e físico-química de frutos de cajá-umbu (*Spodias* spp.). **Ciência e Tecnologia de Alimentos**, v.25, n. 4, p.753-761, 2005.
- LORENZI, H. **Árvores Brasileiras**. 3. ed. São Paulo: Plantarum, 2000. 352p.
- MATHEUS, M. T.; LOPES, J. C. Morfologia de frutos, sementes e plântulas e germinação de sementes de *Erythrina variegata* L. **Revista Brasileira de Sementes**, v.29, n. 3, p 8-17, 2007.
- MELO, M. G. G.; MENDONÇA, M. S.; MENDES, A. M. S. Análise morfológica de sementes, germinação e plântulas de jatobá (*Hymenaea intermedia* Ducke var. *adenotricha* (Ducke) Lu & Lang.) (Leguminosae-Caesalpinioideae). **Acta Amazônica**, v.34, n.1, p.9-14, 2004.
- OLIVEIRA, M. E. B.; GUERRA, N. B.; MAIA, A. H. N; ALVES, R. B.; XAVIER, D. S.; MATOS, N. M. S. Caracterização física de frutos do pequi nativos da chapada do Araripe-CE. **Revista Brasileira de Fruticultura**, v.31, n.4, p. 1196-1201, 2009.
- PINHEIRO, L. R.; ALMEIDA, C. S.; SILVA, A. V. C. Diversidade genética de uma população natural de cambuizeiro e avaliação pós-colheita de seus frutos. **Scientia Plena**, v.7, n.6, p. 1-5, 2011.

- RHS - Royal Horticultural Society. RHS Colour Chart. London: Royal Horticultural Society, 1995.
- ROLIN, C. Pectin's In: Whistler, RL; Bemiller, JN. Industrial Gums: Polyssacharides and their derivatives. 3. ed. San Diego, EUA: Academic Press, 1993. p. 257-293.
- ROMAGNOLO, M. B.; SOUZA, M. C. Os gêneros *Calycorectes* O. Berg, *Myrcianthes* O. Berg, *Myrciaria* O. Berg e *Plinia* L. (Myrtaceae) na planície alagável do alto rio Paraná, Brasil. **Acta Botanica Brasilica**, v.18, n. 18, p. 613-627, 2004.
- RYBKA A. C. P.; OLIVEIRA, E. A.; BIASOTO A. C. T. Elaboração de suco e geléia de cambuí (*Myrciaria tenella*). In: SIMPÓSIO LATINO AMERICANO DE CIÊNCIA DE ALIMENTOS, 9., Campinas. Anais... Campinas: UNICAMP/FEA/SLACA, 2011.
- SANTOS, A. R. F.; SILVA-MANN, R.; FERREIRA, R. A. Restrição hídrica em sementes de Jenipapo (*Genipa americana* L.). **Revista Árvore**, v. 35, n.2, p. 213-220, 2011.
- SMIDERLE, O. J.; SOUZA, R. C. P. Teor de vitamina C e características físicas do camu-camu em dois estádios de maturação. **Revista agro@ambiente online**, v.2, n.2, p. 61-63, 2008.
- SILVA, M. A. P.; MEDEIROS FILHO, S. Morfologia de fruto, semente e plântula de piqui (*Caryocar coriaceum* Wittm.). **Ciência Agronômica**, v. 37, p. 320-325, 2006.
- SILVA, M. S.; VIEIRA, F. A.; CARVALHO, C. Biometria dos frutos e divergência genética em uma população de *Geonoma schottiana* Mart. **Revista Brasileira de Biociências**, v.5, n.1, p. 582-584, 2007.
- SOBRAL, M.; PROENÇA, C.; SOUZA, M.; MAZINE, F.; LUCAS, E. Myrtaceae. In: FORZZA, R. C.; BAUMGRATZ, J. F. A.; BICUDO, C. E. M.; CARVALHO JR., A. A.; COSTA, A.; COSTA, D. P.; HOPKINS, M.; LEITMAN, P. M.; LOHMANN, L. G.; MAIA, L. C.; MARTINELLI, G.; MENEZES, M.; MORIM, M. P.; COELHO, M. A. N.; PEIXOTO, A. L.; PIRANI, J. R.; PRADO, J.; QUEIROZ, L. P.; SOUZA V. C.; STEHMANN, J. R.; SYLVESTRE, L. S.; WALTER, B. M. T.; ZAPPI, D. Catálogo de plantas e fungos do Brasil. Rio de Janeiro, RJ: Andrea Jakobsson Estúdio/ Instituto de Pesquisas Jardim Botânico do Rio de Janeiro, 2010, p. 1326.
- SOUZA, M. C.; MORIM, M. P. Subtribos Eugeniinae O. Berg e Myrtinae O. Berg (Myrtaceae) na Restinga da Marambaia, RJ, Brasil. **Acta Botanica Brasilica**, v. 22, n.3, p. 652-683, 2008.
- TORRES, L. B. V.; SILVA, S. M., FELIX, L. P. Fruit characterization of a *Selenicereus* c.f. *setaceus* native from Brejo micro region, Paraíba State, Brazil. **Acta Horticulturae**, v.811, p. 149-154, 2009.
- VERA, R.; SOUZA, E. R. B.; FERNANDES, E. P.; NAVES, R. V.; SOARES JÚNIOR, M. S.; Caliari, M.; Ximenes, P. A. Caracterização física e química de frutos do pequizeiro (*Caryocar brasiliense* Camb.) oriundos de duas regiões no estado de Goiás, Brasil. **Pesquisa Agropecuária Tropical**, v. 37 p.93-99, 2007.
- VOLTOLINI, T. V.; BIASOTO, A. C. T.; OLIVEIRA, E. A.; RYBKA, A. C. P. Composição químico-bromatológica do farelo obtido do resíduo do processamento de cambuí (*Myrciaria tenella*). In: SIMPÓSIO LATINO AMERICANO DE CIÊNCIA DE ALIMENTOS, 9., Campinas. Anais... Campinas: UNICAMP/FEA/SLACA, 2011.
- VRIESMANN, L. C.; PETKOWSKI, C. L. O.; CARNEIRO, P. I. B.; CARNEIRO, E. B. B. Polissacarídeos de frutos do Cambuí (*Myrciaria tenella*, Berg.). **Publicatio UEPG: Ciências Exatas e da Terra, Ciências Agrárias e Engenharias**, v.10, n.3, p. 41-45, 2004.
- ZUBRZYCKI, H. M. Descriptores básicos de diferentes órgãos de plantas cítricas para identificar mutantes, cultivares e híbridos. Corrientes: Instituto Nacional de Tecnología Agropecuaria, 1997. 14p.