

Scientific Electronic Archives

Issue ID: Sci. Elec. Arch. Vol. 12 (5)

October 2019

DOI: <http://dx.doi.org/10.36560/1252019799>

Article link

<http://www.seasinop.com.br/revista/index.php?journal=SEA&page=articulo&op=view&path%5B%5D=799&path%5B%5D=pdf>

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Biometric parameters of fruits and seeds of *Sesbania virgata* (cav.) Pers

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Abstract: Studies on fruit and seed biometrics constitute an important tool for characterizing seeds as to vigor and viability. Moreover, it also contributes to the knowledge of the reproductive process, provides information for seedling production, and aids in understanding the process of natural regeneration. Thus, this work was carried out with the objective of evaluating the biometry of fruits and seeds of *Sesbania virgata* collected in the city of Vitória da Conquista – Bahia, Brazil. The study was conducted at the State University of Southwestern Bahia. One hundred mature fruits were randomly collected from ten *Sesbania virgata* mother trees. The evaluated characteristics were: length, width, and thickness measured in the midline of fruits and seeds with the aid of a digital caliper. The data were subjected to descriptive analysis, from which we obtained the respective means, median, mode, and standard deviation. There were changes in the morphological characteristics of *Sesbania virgata* fruits and seeds collected in the city of Vitória da Conquista, Bahia; thus being important carrying out new studies with the species.

Keywords: Feijãozinho, Tree species, Forest seeds, Morphology

Introduction

Sesbania virgata (Fabaceae- Faboideae), popularly known in Brazil as saranzinho, mãe-jose, and feijãozinho, is a tree species that naturally occurs in Brazil, Argentina, Paraguay and Uruguay (Ignaci & Miotto, 2010). In the Northeast region of Brazil, the species has been virtually unknown for about two decades; then, it began occupying river banks and reservoirs. *S. virgata* has recently emerged as a weed capable of causing serious impacts on invaded ecosystems (Andrade, 2006).

This species has indehiscent fruits that remain for several months attached to the tree canopy after seed maturation. *S. virgata* can be used in restoring degraded land (Pott & Pott 1994; Schiavo et al. 2010) and in intercropping with annual crops such as irrigated rice due to its ability to tolerate high moisture environments and to fix large amounts of atmospheric N₂ (Cummings et al., 2009).

Considering the ecological importance of this species, studies on fruit and seed size are important for understanding the variability within the species. According to Macedo et al. (2009), fruit biometrics is a widely used technique to evaluate genetic variability within populations of the same species as well as the relationship of this variability with environmental factors. It provides great insight into ecological aspects, thereby contributing to the knowledge of the reproductive process, providing knowledge for seedling production, and assisting in the understanding of the natural regeneration

process (Nunes et al., 2009; Cunha-Silva et al., 2012).

Fruit and seed biometric studies also provide information about conservation and exploitation of a given species, allowing an effective and sustainable use of it (Araújo, 2009). Moreover, seed classification as to size serves as a way to determine physiological quality of seeds and is widely used for the classification of lots of different species belonging to the Fabaceae family (Pereira et al., 2011). Distinguishing seeds as to weight and number per plant can improve seed lots in respect to emergence uniformity and seedling vigor (Fontenele et al., 2007).

Thus, we aimed to evaluate the biometry of fruits and seeds of *Sesbania virgata* collected in the municipality of Vitória da Conquista, Bahia state, Brazil.

Methods

The study was carried out at the State University of Southwestern Bahia, Vitória da Conquista, Bahia state, Brazil (14°50'19"S and 40°50'19"W, 928 m in altitude). The climate in this municipality is tropical highland (Cwa in Köppen classification). Mean temperature is 20.2 °C, with the maximum and minimum means ranging between 26.4 °C and 16.1 °C, respectively; mean annual rainfall is 733.9 mm, which occurs mostly between November to March (Sei, 2013).

Ripe fruits of *Sesbania virgata* were manually collected from ten randomly selected mother trees in the urban area of Vitória da Conquista, Bahia. The trees were approximately 2 km apart from one another. After collecting, the fruits were placed in paper bags and sent to a laboratory for evaluation.

Visually healthy, whole, undamaged fruits and seeds were selected to form a sample composed of one hundred fruits and one hundred seeds; then, samples were subjected to biometric analysis. Healthy, disease/pest-free, non-deformed seeds were used.

The following biometric characteristics of fruits and seeds were evaluated: a) longitudinal length, determined from the base to the tip, with the aid of a ruler; b) width and thickness, measured at the midline of the fruits and seeds, using a digital caliper at an accuracy of 0.05 mm.

The data obtained were tabulated and subjected to descriptive analysis to obtain the mean, median, mode, variance, and standard deviation; also, data were classified by frequency distribution and plotted on frequency histograms; the number and class ranges were determined according to the Sturges formula using a spreadsheet, Microsoft Office - Excel 2010.

Results and discussion

As can be seen in Figure 1, there were variations in *Sesbania virgata* fruit length (36.95 to 75.37 mm), width (6.07 to 11.26 mm) and thickness (4.11 to 8.65 mm). Costa et al. (2017) evaluating the fruit biometrics of *Sesbania virgata* (Cav.) Pers in Arapiraca, Alagoas, Brazil, found length ranging from 41 to 77 mm; values close to those obtained in this study.

Fruits with length of 56.17 to 65.77 mm, width of 7.38 to 8.66 mm and thickness of 5.82 to 6.95 mm were predominant (Figure 1). These results are lower than those found by Barreto (2014), who studied the effect of light, flooding and salinity on *Sesbania punicea* seed germination and growth, and reported fruits with length of 80.9 ± 1.19 mm (mean \pm standard deviation).

Barroso et al. (1999) state that the genus *Sesbania* was characterized by having fruits measuring more than three centimeters in length, which is consistent with the fruits of *Sesbania virgata* used in this study.

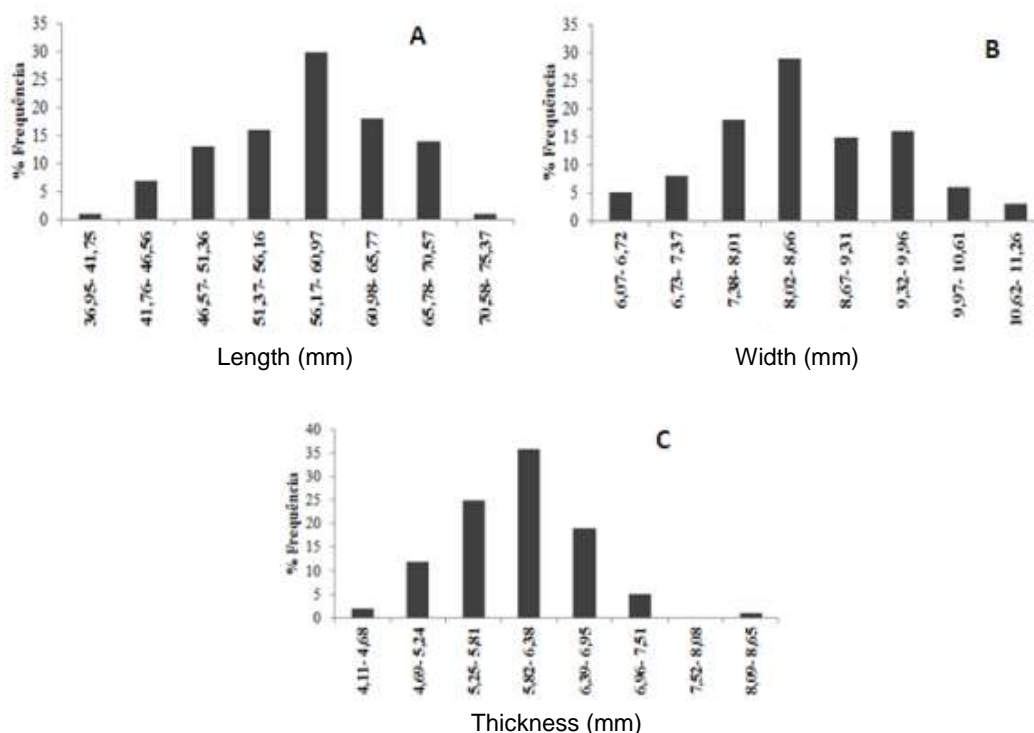


Figure 1. Length (A), width (B), thickness (C) of fruits of *Sesbania virgata*. Vitória da Conquista, Bahia, 2016.

Biometric evaluation can be considered an important tool for indicating morphological and genetic variability within populations of a certain

species, thus providing information for ecological characterization (Acchile et al., 2017; Carvalho et al., 2003).

Fruits of *Sesbania virgata* were, on average, 57.7, 8.52, and 5.98 mm in length, width, and thickness, respectively (Table 1). Araújo et al. (2004), studying the morphology of fruits, seeds, and seedlings of *Sesbania virgata* (cav.) Pers, found a mean length of 5.81 mm, width of 7.82 mm and thickness of 5.81 mm. Menegatti et al. (2014) reported 40.6 mm, 6.6 mm and 5.00 mm for fruit length, width and thickness, respectively. Teixeira (2016) evaluating the seed development of *Sesbania virgata* (cav.) Pers, reported mean values of 55.00, 10.00 and 9.00 cm for length, width, and thickness, respectively; these results are lower than those obtained in this study. According to Santos (2007), this difference is attributable to individual variations that are, among other factors, associated with the genetic variability of the species. As for other species of the Fabaceae family, Bezerra et al. (2012), evaluating fruit and seed biometrics and pre-germination treatments in *Cassia grandis* L. f. reported mean values of 34.75 ± 12.29 cm, 39.96 ± 3.38 mm for length and width, respectively. Abud et al. (2009), studying morphological traits of fruits, seeds, and seedlings as well as the germination of *Mucuna aterrima* Piper & Tracy, reported mean values of 11.9, 0.7 and 0.5 cm for length, width and thickness respectively. Within the same species there may be variability between trees due to environmental influence during seed development (Santos et al., 2009).

Tropical tree species show high variability as to fruit size, number of seeds per fruit, and seed weight (Gusmão et al., 2006); such fruit size variability may be observed in species belonging to the Fabaceae family.

Plants are often subjected to fluctuations in temperature, daytime length, and rainfall. These variations can eventually up-regulate certain aspects of the plant's genetic composition; the surrounding environment may be more suitable for the plant to exhibit certain characteristics that, in another site,

would not manifest (Botezelli et al., 2000). This might justify the values obtained in this work.

Coefficients of variation for length, width, and thickness were 12.64, 12.49 and 10.98%, respectively (Table 1). Araújo et al. (2004) obtained coefficients of variation of 14.96, 10.81 and 13.66% for length, width, and thickness, respectively, indicating a higher homogeneity of evaluated *Sesbania virgata* fruits.

Sesbania virgata seeds exhibited length, width and thickness ranging from 5.68 to 7.55 mm, 3.08 to 5.04 mm, and 2.48 to 3.94 mm, respectively. Most seeds were longest, widest and thickest within the range of 6.62 to 6.85 mm, 4.07 to 4.31 and 3.04 to 3.21 mm, respectively (Figure 2). Teixeira (2013) verified mean length, width, and thickness of *Sesbania virgata* seeds ranging from 0.9 to 0.6, 0.4 to 0.5 and 0.4 to 0.6 cm, respectively; findings were consistent with this work in respect to width.

Studying the biometrics of *Sesbania virgata* seeds is of great importance for determining seed size, which indicates the genetic variability of the studied species since there is no organized seed production system for the genus *Sesbania*; therefore, seeds used in cultivation are still of low quality (Masetto et al., 2013).

Mean *Sesbania virgata* seed size were 6.60, 4.18, and 3.21 mm for length, width, and thickness, respectively (Table 2). Araújo et al. (2004) reported that *S. virgata* seeds are kidney shaped, brownish, with a smooth, hard testa, 6.87 mm long, 4.4 mm wide, and 3.32 mm thick. Barreto (2014) observed that average seed size of *Sesbania punicea* was 0.6 ± 0.01 cm (mean ± standard deviation), similar to that found in this study. Although the seeds are basically formed by embryo, reserve tissues, and seed coat; in nature, several factors contribute to the differentiated development of these seed components, varying between species and within a species, as to color, shape and size (Abud et al., 2010).

Table 1. Length, width, and thickness of *Sesbania virgata*. Fruits. Vitoria da Conquista, BA, 2016

Characteristic	Length (mm)	Width (mm)	Thickness (mm)
Mean	57.7	8.52	5.98
Median	58.41	8.53	5.94
Mode	63.57	8.58	5.68
Standard deviation	7.29	1.06	0.66
Variance	53.19	1.13	0.43
CV (%)	12.64	12.49	10.98

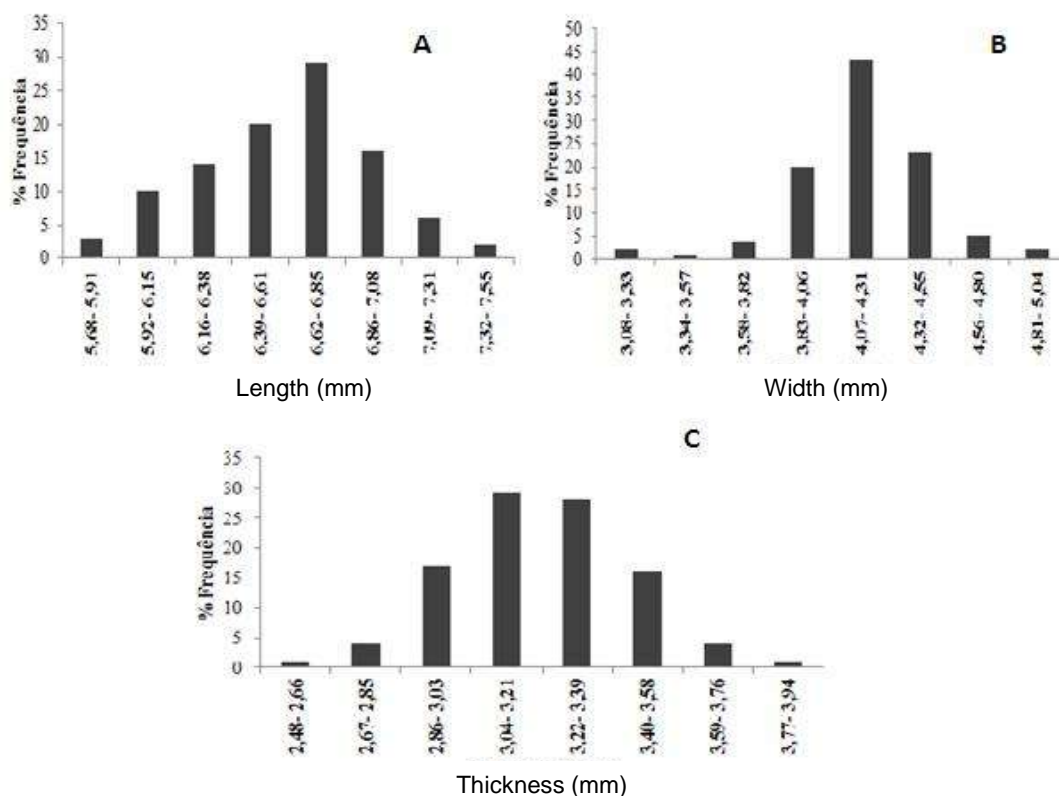


Figure 2. Length (A), width (B), thickness (C) of *Sesbania virgata* seeds. Vitoria da Conquista, BA, 2016.

Table 2. Length, width, thickness of *Sesbania virgata* seeds. Vitoria da Conquista, BA, 2016

Characteristic	Length (mm)	Width (mm)	Thickness(mm)
Mean	6.60	4.18	3.21
Median	6.64	4.17	3.21
Mode	7.07	4.11	3.11
Standard deviation	0.38	0.28	0.22
Variance	0.14	0.08	0.05
CV (%)	5.72	6.74	6.95

Coefficients of variation were 5.72, 6.74 and 6.95% for seed length, width and thickness, respectively; these low coefficients suggest high uniformity and homogeneity of the species in regard to seed size (Table 2). Araújo et al. (2004) reported lower coefficients of variation than those of this study for width and thickness (4.97 and 4.43% respectively). This variation is likely related to genetic variability and/or uncontrolled environmental factors such as anthropization, soil, climate, and plant age (Silva et al., 2001).

Conclusion

There were variations in morphological characteristics of *Sesbania virgata* fruits and seeds collected in the city of Vitória da Conquista, Bahia state; thus, it is important to carry out new studies with the species.

Acknowledgements

Coordination of Improvement of Higher Education Personnel – (CAPES).

References

ABUD, H. F.; GONÇALVES, N. R.; REIS, R. G. E.; GALLÃO, M. I.; INNECCO, R. Morfologia de sementes e plântulas de cártamos. *Revista Ciência Agronômica* 41:259-265, 2010.

ABUD, H. F.; REISE, G. E. de; TEÓFILO, E. M. Caracterização morfológica de frutos, sementes, plântulas e germinação de *Mucuna aterrima* Piper & Tracy. *Revista Ciência Agronômica* 40: 563-569, 2009.

ACCHILE, S.; COSTA, R. N.; SILVA, L. K. S.; SANTOS, J. C. C.; SILVA, D. M. R.; SILVA, J. V. Biometria de frutos e sementes e determinação da curva de absorção de água de sementes de *Sesbania virgata* (Cav.) Pers. *Scientific Electronic Archives* 10:26 – 34, 2017.

ARAÚJO R.R. Fenologia e morfologia de plantas e biometria de frutos e sementes de muricizeiro (*Byrsonima verbascifolia* L. Dc.) do Tabuleiro

- Costeiro de Alagoas. 89f. (Dissertação de Mestrado) -Universidade Federal Rural do Semi-Árido, Mossoró, Brasil, 2009.
- ANDRADE, L. A. Espécies exóticas invasoras no nordeste do Brasil: impactos nos ecossistemas locais. In: MARIATH, J. E. A.; Santos, R.P. (Orgs.). Os avanços da botânica no início do século XXI: Morfologia, Fisiologia, Taxonomia, Ecologia e Genética. Porto Alegre: Sociedade Botânica do Brasil, p. 524-528, 2006.
- ARAÚJO, E. C.; MENDONÇA, A. V. R.; BARROSO, D. G.; LAMÔNICA, K. R.; SILVA, R. F. Caracterização morfológica de frutos, sementes e plântulas de *Sesbania virgata* (Cav.) Pers. Revista Brasileira de Sementes 26:104-109, 2004.
- BARRETO, B. B. de. Efeito da luz, alagamento e salinidade na germinação e crescimento de *Sesbania punicea* (Cav.) Benth. (Fabaceae, Papilionoideae). 56f. (Dissertação de Mestrado) - Universidade Federal do Rio Grande, Rio Grande, Brasil, 2014.
- BARROSO, G. M.; MORIM, M. P.; PEIXOTO, A. L.; ICHASO, C. L. F. **Frutos e sementes**: morfologia aplicada à sistemática de dicotiledôneas. Viçosa: UFV, 443p. 1999
- BEZERRA, F. T. C.; ANDRADE, L. A. DE; BEZERRA, M. A. F.; PEREIRA, W. F.; FABRICANTE, J. R.; OLIVEIRA, L. S. B. DE; FEITOSA, R. C. Biometria de frutos e sementes e tratamentos pré-germinativos em *Cassia grandis* L. f. (Fabaceae). Semina: Ciências Agrárias 33:2863-2876, 2012.
- BOTEZELLI, L.; DAVIDE, A. C.; MALAVASI, M. M. Características dos frutos e sementes de quatro procedências de *Dipteryx alata* Vogel (Baru). Cerne 6:9-18, 2000.
- CARVALHO, J.E.U.; NAZARÉ, R.F.R.; OLIVEIRA, W.M. Características físicas e físico-químicas de um tipo de bacuri (*Platonia insignis* Mart.) com rendimento industrial superior. Revista Brasileira de Fruticultura 25:326- 32, 2003.
- COUTINHO, M. P. Crescimento de *Sesbania virgata* (Cav.) Pers em cavas de extração de argila. Floresta, v. 35:231-239, 2005.
- CUMMINGS, S. P.; GYANESHWAR, P.; VINUESA, P.; FARRUGGIA, F. T.; ANDREWS, M.; HUMPHRY, D.; ELLIOTTI, G. N.; NELSON, A.; ORR, C.; PETTITT, D.; SHAH, G. R.; SANTOS, S. R.; KRISHNAN, H. B.; ODEE, D.; MOREIRA, F. M.; SPRENT, J. L.; YOUNG, J. P.; JAMES, E. K. Nodulation of *Sesbania* species by *Rhizobium* (Agrobacterium) strain IRBG74 and other rhizobia. Environmental Microbiology, Washington, p. 2510-2525, 2009.
- CUNHA-SILVA, G.R.; RODRIGUES, C.M, MIRANDA, S.C. Dados biométricos de frutos e sementes de *Hymenaea courbaril* var. *stilbocarpa* (Hayne) Y. T. Lee e *H. martiana* Hayne. Revista Biotemas 25:121-127, 2012.
- FONTENELE, A.C.F.; ARAGÃO, W.M.; RANGEL, J.H.A. Biometria de Frutos e Sementes de *Desmanthus virgatus* (L) Willd Nativas de Sergipe. Revista Brasileira de Biociências 5: 252-254, 2007.
- GUSMÃO, E.; VIEIRA, F. A.; FONSECA-JUNIOR, E. M. Biometria de frutos e endocarpos de murici (*Byrsonima verbascifolia* Rich. ex A. Juss.). Cerne 12:84-91, 2006.
- IGNACI, J. R. V.; MIOTTO, S. T. S. *Sesbania* in Lista de espécies da flora do Brasil. Rio de Janeiro: Jardim Botânico, 2010. <http://floradobrasil.jbrj.gov.br/2010/FB019125/>
- MACEDO, M. C.; SCALON, S. P. Q. de; SARI, A. P.; FILHOS, H. S.; ROSA, Y. B. C. J.; ROBAINA, A. D. Biometria de frutos e sementes e germinação de *Magonia pubescens* ST. Hil (SAPINDACEAE) Revista Brasileira de Sementes 31:202-211, 2009.
- MASETTO, T. E.; FARIA, J. M. R.; FRAIZ, A. C. R.; REZENDE, R. K. S. Condicionamento osmótico de sementes de *Sesbania virgata* (CAV.) PERS (Fabaceae). Cerne 19:629-636, 2013.
- MATHEUS, M. T.; LOPES, J. C. Morfologia de frutos, sementes e plântulas e germinação de sementes de *Erythrina variegata* L. Revista Brasileira de Sementes 29:08-17, 2007.
- MENEGATTI, R. D.; GUOLLO, K.; MANTOVANI, A.; NAVROSKI, M. C.; POSSENTI, J. C. Biometria de frutos de *Sesbania virgata* (Cav.) Pers. In: X SIMPÓSIO FLORESTAL CATARINENSE, 2014, Curitiba- SC. Anais... Curitiba: Universidade Federal de Santa Catarina, 2014. p. 20.
- NUNES, C. F.; SANTOS, D. N. dos; PASQUAL, M.; VALENTE, T. C. T. Morfologia externa de frutos, sementes e plântulas de pinhão-manso. Pesquisa Agropecuária Brasileira 44:207-210, 2009.
- PEREIRA, S. R.; GIRALDELLI, G.R.; LAURA, V. A.; SOUZA, A. L. T. S. Tamanho de frutos e de sementes e sua influência na germinação de jatobá-do-cerrado (*Hymenaea stigonocarpa* var. *stigonocarpa* Mart. ex Hayne, Leguminosae - Caesalpinoideae). Revista Brasileira de Sementes 33:141-148, 2011.

POTT, A.; POTT, V. J. Plantas do Pantanal. Corumbá: Embrapa; CPAP; SPI, 320 p. 1994

SCHIAVO, J. A.; MARTINS, M. A.; RODRIGUES, L. A. Crescimento de mudas de *Acacia mangium*, *Sesbania virgata* e *Eucalyptus camaldulensis*, inoculadas com fungos micorrízicos, em casade-vegetação e em cava de extração de argila. Acta Scientiarum: Agronomy 32:171-178, 2010.

SAHI, S. V.; ISRAR, A. K.; SRIVASTAVA, J. L.; GARDEA-TORRESDEY, J. L.; PARSONS, J. G. Accumulation speciation and cellular localization of copper in *Sesbania drummondii*. Chemosphere 67:2257-2266, 2007.

SANTOS, F. S. dos; PAULA, R. C. de; SABONARO, D. Z.; VALADARES, J. Biometria e qualidade fisiológica de sementes de diferentes matrizes de *Tabebuia chrysotricha* (Mart. Ex. A. DC.) Standl. Scientia Forestalis 37:163-177, 2009.

SANTOS, F. S. dos; Biometria, germinação e qualidade fisiológica de sementes de *Tabebuia chrysotricha* (Mart. Ex. A. DC.) Standl. provenientes de diferentes matrizes. 57 f. (Dissertação de Mestrado) – Universidade Estadual Paulista, Jaboticabal, Brasil, 2007.

SUPERINTENDÊNCIA DE ESTUDOS ECONÔMICOS E SOCIAIS DA BAHIA- SEI. Estatística dos municípios Baianos 4: 127-144, 2013.

SILVA, R. S. M.; CHAVES, L. J. NAVES, R. V. Caracterização de frutos e árvores de cagaita (*Eugenia dysenterica* DC.) no sudeste do estado de Goiás, Brasil. Revista Brasileira Fruticultura 23: 330-334, 2001.

TEIXEIRA, F. P. Desenvolvimento de sementes de *Sesbania virgata* (Cav.) Pres. 59f. (Dissertação de Mestrado) - Universidade Federal De Lavras, Lavras, Brasil, 2016.