Morphometry of Seeds of the Species *Serjania comata* Radlk in a Remnant of Atlantic Forest, Alagoinhas, Bahia

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The Atlantic Forest is a biodiversity-rich area, but it is highly threatened due to the numerous human actions that have affected ecosystems since the colonial era. Considering that morphological studies of forest seeds will serve as subsidies for reforestation programs and research on seed technology and physiology in the conservation of native forests, the study on the morphometry of seeds of the species *Serjania comata* Radlk will contribute positively to knowledge despite the diversity of species present in the ecosystems, to characterize the morphometry of *S. comata* seeds in remnants of the Atlantic Forest, to represent biodiversity conservation strategies, serving as subsidies for the implementation of management projects for the recovery of degraded areas. The study area is a remnant of the Atlantic Forest in Alagoinhas-Ba, with collections from October 2023 to January 2024. After the seed processing process, they were characterized following descriptive parameters suggested by the literature. The species has fruits characterized as echizocarpic with three wing expansions and oblong-oval seeds, with a sharp end, rigid, shiny, brown integument and a visible hilum. The research analyzed morphometric data from 304 species of seeds, and it was possible to observe a slight variation in the variable's size and weight.
Keywords: Morphometry. Atlantic Forest. Seeds.

The Atlantic Forest is a region rich in biodiversity, but it is highly threatened due to the numerous human actions that have affected ecosystems since the colonial era. It was considered one of the world's hotspots due to its incredible biodiversity and the size of its degraded area, making it a priority for biodiversity preservation [1]. According to Cardoso (2016), "*The biome is responsible for regulating the flow of water sources, ensuring soil fertility, controlling climate balance, and protecting escarpments and mountain slopes*" [2].

In the Northeast of Brazil, the Atlantic Forest extends across eight Brazilian states, including Bahia, which has a high degree of diversity and endemism [3]. More than 46% of the remaining areas in the Northeast are located in Bahia [4]. However, these remnants are highly fragmented, making biodiversity conservation strategies extremely important.

Although studies on seed morphology are scarce, authors such as Barroso and colleagues (1999) [5] conducted a study on fruits and seeds with a descriptive book and an identification key for fruits, and Sena and Gariglio (2008) [6] are commonly cited for their guide, which provides instructions on the collection, processing, and storage of forest seeds. However, the Atlantic Forest on the Northern Coast of Bahia has few studies on the morphometry of its forest diaspores.

According to Araujo-Neto and colleagues (2002) [7], "*Morphological studies of seeds are important to facilitate research on soil seed banks, as well as to assist in identifying species in studies on the natural regeneration of degraded areas*". Since morphological studies of forest seeds will serve as subsidies for reforestation programs and research on technology and seed physiology in the conservation of native forests.

Defined by Judd and colleagues (2009) [8] as monophyletic, the Sapindaceae family is present mainly in tropical regions, with 141 genera and 1900 species [9]. Pereira (2014) [10] characterizes it as a family with important representatives in

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tropical vegetation, as the Atlantic Forest is one of its main centers of diversity and endemism. Maçaneiro (2016) [11], Meyer (2013) [12], Dullis and colleagues (2011) [13], and de Oliveira and colleagues (2013) [14] reaffirm that species of the family are commonly present in stages of natural regeneration of Atlantic Forest remnants.

The species *Serjania comata* Radlk is a climbing plant belonging to the Sapindaceae family, native to South America. It is a species found mainly in tropical and subtropical forests, including Brazil. The species is present in eight Brazilian states, including Bahia (Flora and Funga do Brasil, 2024) [15]. The species has a raceme inflorescence with white and yellow flowers; its fruits are schizocarps, with 3 winged samaroid mericarps, trispermic, and they have brown seeds with a visible hilum [16].

The study on the morphometry of seeds of the species *S. comata* will contribute positively to knowledge, despite the diversity of species present in ecosystems, for the restoration of degraded areas, as well as the preservation of endemic species, serving as a basis for management and forest restoration plans, since the species is important in the ecological dynamics of tropical forests, actively participating in seed dispersal and the structuring of the environment.

Therefore, the study's objective seeks to characterize the morphometry of *S. comata* seeds in remnants of the Atlantic Forest to represent biodiversity conservation strategies, serving as subsidies for implementing management projects to recover degraded areas and consequently highlighting the importance of knowledge about the biota.

Materials and Methods

Study Area

The study area is a remnant of the Atlantic Forest located in the municipality of Alagoinhas-Ba, belonging to Campus II of the State University of Bahia. It has approximately 50 ha under the coordinates 12°10'42" S; 38°24'43" W and an altitude of 150 meters. Its vegetation cover is characterized as a fragment of dense ombrophilous forest.

Collection

A total of 9 field trips were carried out on pre-established trails, starting in October 2023 and ending in January 2024. The fruits of the species found in the Atlantic Forest fragment were collected, preferably from a fertile branch of the plant, to collaborate in the identification process and integrate the reference collection, which was incorporated into the Herbarium of the State University of Bahia (HUNEB), Alagoinhas collection.

Collections were carried out during the period in which the seeds were at full physiological maturity since, according to Galvão and Medeiros (2002) [17], it is at this stage that they demonstrate more significant activity and germination percentage. Incorporating the previous methodology with that of Sena and Gariglio (2008) [6], aspects related to the fruits were observed to determine whether the seeds were viable for collection, such as change in color, dehiscence, size, shape, and texture or a combination of the aforementioned characteristics.

Based on Way's method (2003) [18], harvests were carried out directly from the fruits by shaking the branches, pruning, or collecting directly from the ground. Seeds that did not have visible damage due to the actions of pathogenic microorganisms were observed through their phytosanitary aspects. The samples were collected with pruning shears and stored in paper bags, on which field data (date, location, species habits) were recorded to be transported to the laboratory.

Herbalization and Identification

The collected material was herborized according to the usual botanical criteria [19], and taxonomic identification was performed by analyzing the material with consultation of a

specialized bibliography. The classification used for the family was according to Angiosperm Phylogeny Group version IV (APG IV) [20]. The nomenclature of the species was based on the Flora and Funga of Brazil [15].

Process

According to Sena and Gariglio (2008) [6], forest seed processing is the term used to describe all the stages that the seeds undergo after harvesting. These include peeling, threshing, pulping, cleaning, and drying.

Following the methods used by Sena and Gariglio (2008) [6], the seed extraction process was based on the type of fruit, using the best method to avoid damaging the seeds. As an indehiscent dry fruit, the seed was extracted using sharp instruments. This method was used with great caution to avoid damaging the seeds.

Drying is essential to reduce the water content of the seeds to low levels of metabolic activity, preventing degeneration and proliferation of fungi. The methods used by Draper (2004) and Galvão and Medeiros (2002) [17] were used to perform this procedure. This drying can be done using natural or artificial methods. The artificial method was used, which consisted of using an oven with a temperature adjusted to 50°C, and the heated air was forced through the seed mass to dry it [22]. After drying, the seeds were stored in adequately labeled glass jars with the collection information in a room with little light and air conditioning at a temperature not exceeding 17°C. When related to water vapor exchange with the environment, the type of packaging is classified as impermeable (airtight) and is recommended for seed storage.

Morphometric Characterization

Immediately after the seed processing process, morphometric characterization was performed, which included descriptive parameters suggested by González-Andrés (2001) [23], such as shape, color, and accessory structures. For the metric acquisition stage, observations were made using a stereoscope, where the length and width of each seed were also measured using the capture 2.3 program of the HD LITE 1080P camera, coupled to the stereoscope.

The portion between the basal and apical regions was considered as length, while the equatorial diameter of the fruit was considered as width. The number of seeds collected and the number per fruit was also determined. A WebLabor M254-Ai precision analytical balance was used to determine the weight of each seed. The mean, mode, median, standard deviation, and variance were calculated for each variable, according to Gomes (1987) [24] and Banzatto (1992) [25].

Results and Discussion

During the research, 9 collections were carried out over 4 months, in which 953 fruits of *Serjania comata* Radlk were produced. They were collected at 7 points on pre-established trails. Although cited by Coulleri (2014) [16] as having fruiting from June to August, the species under study presented fruiting during the collections from October to January.

Even with the high species incidence in the study area, not all specimens were in the fruiting period during the collection period. This demonstrates that the same species can vary its production cycle due to various factors, such as plant age, genetic variety, soil quality, water, and nutrient availability. According to Infosanbas (2020) [26], Alagoinhas has a territory composed of 14% Caatinga and 86% Atlantic Forest. The remaining area under study presents a transition area between both domains. Since the species is characteristic of tropical forests, being found in an area of high fragmentation and transition of ecosystems, the interpolation of fruiting of individuals is understandable.

The species *S. comata* exhibits schizocarpous fruits with three light brown winged expansions, trispermic. Among the 953 fruits collected, 41 did not have seeds, which may indicate some

imbalance or environmental change. The seeds are oblong-oval, with a sharp end, rigid, shiny, brown integument, and have a visible hilum (Figure 1).

The hilum is a morphologically distinct structure present on the surface of the seed. It is characterized by a scar of insertion or separation of the funiculus and a different coloration in relation to the rest of the integument. These characteristics are relevant for the identification of species and are widely used in morphological analyses [27].

In the metric measurements, the study presents 304 visibly healthy seeds, with slight variations, presenting lengths of 1.28 to 3.88 mm, width of 0.75 to 2.49 mm and weight of 03 to 21.5 mg (Figure 2). In Table 1, it is possible to visualize the variation existing in the size and weight of seeds, validating that the fruits that have wing expansions play an important role in the dispersal syndrome of the species since the wing-like structures that aid in the dispersal by the wind (anemochory) and the efficiency of this dispersal is directly related to the size, weight and shape of the seed, influencing its ability to be transported over greater distances [28].

Conclusion

Serjania comata Radlk presents a slight variation in its seed length and width, as well as in its weight, indicating a dimensional pattern appropriate for the species. The 304 seeds collected and analyzed indicate the species' great genetic variety, which is fundamental for its adaptation to different environmental conditions and selective pressures.

The variation and low production of fruits and seeds may be related to the edge effect and the

Figure 1. *S. comata* seed with visible hilum.

Figure 2. *S. comata* seed measurements.

Table 1. Length, width, and weight (mg) of seeds of *Serjania comata* Radlk.

Parameter	Length (mm)	Width (mm)	Weight (mg)
Mean	3.05	1.59	5.53
Mode	3.48	1.82	2,4
Median	3.42	1.63	3.6
Standard Deviation	0.60	0.35	4.79
Variance	0.36	0.12	22.83

impacts resulting from the fragmentation of the remnant under study since the area presents several anthropic interventions. These factors directly interfere with the ecological and reproductive dynamics of the species.

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