EVALUATION OF THE VITAL SPACE OF TWO NATIVE CERRADO SPECIES CONSIDERING THE MORPHOLOGY OF THEIR CROWNS

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ABSTRACT

This study aimed to define the procedures for the management of two native Cerrado species: Caryocar villosum Pers. and Caryocar brasiliense Cambess, located in rural areas of the state of Goiás. Analyses were conducted on the relationships between the main morphometric indices of the crown and growth in diameter and height. For this, the diameter at breast height, total height, insertion height, and crown diameter of 206 trees were measured. In the analysis of crown parameters, Caryocar brasiliense demonstrated superiority in diameter and area; indicating that this species requires a larger vital space and greater initial spacing for the development of its ecological characteristics.

Keywords: Floristics, tree planting, morphometry, Caryocar

INTRODUCTION

Studies on the shapes, dimensions, and morphometric relationships of tree canopies are fundamental for assessing the vital space and its relationship with the ecological niche of species, with pioneering studies in Brazil developed by Burger (1939) and Assmann (1961). In Brazil, research that seeks to relate morphometric variables with easily obtainable variables, such as diameter at breast height (DBH) and height (h), is still scarce. Among the notable works are those of Durlo & Denardi (1998), Spathelf et al. (2000), Durlo (2001), Nutto (2001), and Nutto et al. (2001).

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Durlo & Denardi (1998) developed definitions regarding the main morphometric variables. The measurement of these variables, especially the crown area, is very time-consuming; it is necessary to use diameter at breast height (DBH) and height (h) as independent variables in regression equations, as they are of lower complexity. Several studies show that there is a high correlation between the diameter at breast height (DBH) and the crown diameter (CD). The quality of the site influences this correlation; the better the site quality, the lower the correlation (Schneider, 1993).

According to Wadsworth (2000), the shape and size of an individual's crown influence its productivity. The trees in the upper canopy have horizontal and sparse crowns, while those in the lower stratum have vertical and deep crowns. Citing Dawkins (1959), Wadsworth (2000) emphasizes that for shade-intolerant species, the DC/DAP ratio does not decrease as the species reaches maturity, but it does decrease for the tolerant ones. He concluded that the high DC/DAP ratio, necessary for the rapid growth of tropical species, requires good initial crown growth and, therefore, the absence of suppression. The ratio between DC/DAP indicates how many times DC is greater than DAP.

The management of a stand is not determined by its age, but by the diameter reached by its components and the maximum number of trees per unit area. So, as the trees grow, it can be calculated using the DC/DAP index. This ratio can then be used as an indicator for thinning and can determine, at any time, the space to be cleared around a selected tree so that it can grow without competition. The relationship between the DC and the DAP, squared, corresponds to the vital space index. The smaller this index is, on average in the population, the larger its basal area will be, and probably also its volume per hectare (Durlo & Denardi, 1998).

The aim of this work was to define guidelines for thinning management of two native Cerrado species, in the case of cultivating Caryocar villosum and Caryocar brasiliense, due to the fact that their wood is of good quality (Gribel & Hay, 1993) and the oil from their fruits has desirable characteristics for cosmetic production (Pianovski et al., 2008).

METHODOLOGY

Six populations of Caryocar sp. were georeferenced, that is, located and measured using topographic survey methods, making the geographical coordinates of the referred areas known in a given reference system, and then three populations of C. brasiliense and three populations of C. villosum were measured. The location was taken with a GPS 12 GARMIM, and the measurements of trunk circumference and crown diameter were taken with a tape measure. For the plant height, a graduated pole was used, measuring from the collar to the highest leaf. Also, the height of the trunk from the collar to the beginning of the crown was measured. The collections of C. villosum took place in the municipalities of Nova Crixás, where two collections of 36 and 35 individuals were made, and in Aruanã, 34 individuals were collected. For C. brasiliense, the municipalities collected were: Iporá, Israelândia, and Bonfinópolis with 35, 35, and 31 individuals collected, totaling 206 trees. In each population, the following were measured: the diameter at breast height (DBH), total height (h), crown insertion height (CI), and crown diameter (CD) of all the trees. The crown diameter was obtained by measuring eight rays, in fixed directions, with the aid of a ruler, stakes, and tape measure. The following morphometric variables were used: crown insertion height (CI), crown diameter (CD), crown proportion (CP), slenderness ratio (SR), prominence index (PI), coverage index (CI), and crown shape (CS), according to Burger (1939).

RESULTS

The superiority of Caryocar villosum Pers. was observed in the parameters of stocking, diameter at breast height, dominant height, and average height, which indicates greater growth and, consequently, greater productivity. The higher values for the diameter and crown area of C. villosum indicate that this species develops larger and more vigorous crowns. Therefore, it requires more vital space and demands larger initial spacings than C. brasiliense Cambess. In comparison with other species, the higher values of crown proportion (CP) indicate that Caryocar villosum Pers. has deeper crowns. The positive correlations of DC with DAP and h indicate that they grow as DAP and tree height increase, in all species (Table 1).

Table 1 – Correlation between the morphometric variables and the diameter and height of the studied species

Endometrial variables	Morphometric variables					
	DC	PC	IS	GE	IA	FC
			Cariocar villosum			
DAP	0.585***	0.040	-0.401***	-0.399***	-0.040	-0.048
h	0.706***	0.220*	-0.072	0.296**	-0.366 **	-0.386***
			Cariocar brasiliense			
DAP	0.350***	-0.047	-0.398***	-0.531***	0.081	0.084
h	0.717 ***	-0.279**	0.063	0.102	-0.085	-0.051

Nota. * p < .05, ** p < .01, *** p < .001

CONCLUSION

It can be stated that there are significant relationships between various morphometric indices and the diameter and height of the trees of the studied species; the diameter and crown length increase as the DBH and height increase; the crown form, slenderness index, and protrusion index tend to decrease. The analysis of the morphometric parameters shows superiority for the diameter and crown area of C. villosum, indicating that this species requires less vital space compared to C. brasiliense. The crown of C. brasiliense proves to be less efficient in maintaining an average annual diameter increment of 2 cm, as it requires a crown area 5% larger than that of C. villosum.

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