

Fruits and Seeds Biometric Analysis of four selected species belonging to Papilionoideae-Leguminosae distributed in Chandrapur District (MS), India.

Pramod Khirade^{1,2*} and Sanjay Dudhe²

1. Department of Botany, Janata College, Chandrapur (MS).

2. Department of Botany, Guru Nanak College of Science, Ballarpur (MS).

* Corresponding author, Email: pramodkhirade@gmail.com

Abstract

The present investigation aims to evaluate the biometry of fruits and seeds of four selected species *Dalbergia lanceolaria* L.f., *Dalbergia sissoo* Roxb., *Sesbania bispinosa* (Jacq.) W.Wight and *Psoralea corylifolia* L. of Papilionoideae-Leguminosae distributed in Chandrapur District (MS). Biometric characteristics evaluated in this work were length, width, thickness and mass measured in the midline of fruits and seeds with the help of a digital caliper. The data were subjected to descriptive analysis, from which we obtained the respective range, mean, mode, median, standard deviation and coefficient of variation. The results obtained showed that the fruits and seeds of examined taxa exhibit considerable differences in quantitative characters even belonging to the same family. This study suggests that differences in quantitative characters may have systematic importance and can be used in species discrimination.

Introduction

The family Leguminosae is the third-largest plant family, with approximately 19,400 species (Lewis *et al.*, 2005), and they are found throughout the world in all biomes (Schrire *et al.*, 2005). This family is traditionally divided into three sub-families namely Mimosoideae, Caesalpinioideae and Papilionoideae. Sanjappa (1990) reported that there are about 1152 species under 179 genera in India. The family Papilionoideae has great economic importance and finds a wide range of uses. Many workers including Lewis *et al.*, 2005; Gepts *et al.*, 2005 and Singh *et al.*, 2005 suggest the utilization of this family as **food, oil, medicine, fiber, timber, dye, ornamental, etc.** Generally, the plants of Papilionoideae are herbs, shrubs, climbers and rarely trees (Devappa and Lingaraju, 2011; Siddique and Kumara, 2016).

Investigation of quantitative characteristics such as the size and mass of fruit and seed are important for understanding the variability and distinctness among the species. Macedo *et al.* (2009), suggests that fruit biometry is a widely employed technique to check genetic variability within populations of the same species and to establish the relationship. The biometric analysis provides the ability to understand ecological aspects, reproductive processes, knowledge of seedling

production and the natural regeneration process of the species (Cunha-Silva *et al.* 2012). Araújo, (2009) proposes the biometric analysis of fruits and seeds gives information about the conservation and exploitation of a given species. It allows effective and sustainable use of the species. Fruit and seed biometric studies also provide information about the conservation and exploitation of a given species, allowing effective and sustainable use of it (Araújo, 2009). According to Pereira *et al.*, (2011), seed classification based on size is used to determine the physiological quality of seeds. It is widely used for the classification of lots of different species belonging to the Fabaceae family. The biometric analysis helps for a better understanding of how morphology relates to ecology, physiology, genotype, and evolutionary and phylogenetic history. Detailed biometry studies on the fruits and seeds of the investigated taxa here have not been reported in the literature.

The present investigation aimed to evaluate the biometry of fruits and seeds of *Dalbergia lanceolaria* L.f., *Dalbergia sissoo* Roxb., *Sesbania bispinosa* (Jacq.) W.Wight and *Psoralea corylifolia* L. of Papilionoideae-Leguminosae found growing luxuriantly in Chandrapur District (MS), India.

Materials And Methods

The present study was carried out in the Chandrapur (North Latitude-18-4 to 20-5 (19.57'),

East Longitude-78-5 to 80-6 (79.18') and Altitude-189) district of Maharashtra, India. The climate in Chandrapur is tropical (Aw in the Köppen-Geiger climate classification). The average temperature in Chandrapur is 27.7 °C. The annual rainfall is 1245 mm which occurs mostly between June-September

Ripened fruits of *Dalbergia lanceolaria* L.f., *Dalbergia sissoo* Roxb., *Sesbania bispinosa* (Jacq.) W.Wight and *Psoralea corylifolia* L. were collected manually from randomly selected mother trees distributed in the Chandrapur district (Table-1). Collected fruits were kept in zipper bags and brought to the laboratory for evaluation.

Table 1: Collection sites of examined taxa.

Sr. No.	Plant Species	Collection Site	Coordinates
1	<i>Dalbergia lanceolaria</i>	Chandrapur-Ballarshah Road	Lat 19.9906812° Long 79.3279°
2	<i>Dalbergia sissoo</i>	Chandrapur-Ballarshah Road	Lat 19.913073° Long 79.326229°
3	<i>Sesbania bispinosa</i>	Mathara-Gadchandur Road	Lat 19.767825° Long 79.336171°
4	<i>Psoralea corylifolia</i>	Arvi-Gadchandur Road	Lat 19.767369° Long 79.336389°

Visually healthy, whole, undamaged, disease/pest-free, non-deformed fruits and seeds were selected to form a sample composed of fifty fruits and fifty seeds. Following quantitative characteristics were used for biometric analysis 1) Longitudinal length was determined from the base to the tip, with the help of a ruler. 2) Width and thickness were measured at the midline of the fruits and seeds, using a digital caliper at an accuracy of 0.05 mm and 3) Mass was recorded with the help of an electronic digital balance. The data obtained were tabulated and subjected to descriptive analysis to obtain the respective range, mean, mode, median, standard deviation and coefficient of variation. Charts were prepared considering the mean of the data for each parameter using Microsoft Office-Excel 2010.

Results And Discussion

As can be seen in Figures 1-4 and Tables 2-5, variations were noted in fruit length, width and

thickness. Fruits of *Sesbania bispinosa* were recorded with the highest length of 22.27 cm, followed by fruits of *Dalbergia sissoo* (6.89 cm). Fruit length of *Dalbergia lanceolaria* and *Psoralea corylifolia* were measured 4.2 cm and 0.41 cm respectively. Fruit widths among the studied taxa were recorded as 1.75 cm, 1.45 cm, 0.25 cm and 0.20 cm for *Dalbergia lanceolaria*, *Dalbergia sissoo*, *Sesbania bispinosa* and *Psoralea corylifolia* respectively. The thickness of the fruits among studied taxa ranges from 0.11-0.22 cm. *Sesbania bispinosa* were found to have the thickest fruit with 0.22 cm followed by *Psoralea corylifolia* (0.20 cm). Fruit thickness of 0.12 cm and 0.11 cm were recorded for *Dalbergia lanceolaria* and *Dalbergia sissoo* respectively. The largest mass of fruit was recorded in *Sesbania bispinosa* (0.47 gm) among the studied fruits. Fruits of *Dalbergia lanceolaria*, *Dalbergia sissoo* and *Psoralea corylifolia* were observed to have 0.22 gm, 0.06 gm and 0.01 gm mass respectively.

Table 2: Quantitative characters of *Dalbergia lanceolaria* L.f.

Parameter	Fruit				Seed			
	Length (cm)	Width (cm)	Thickness (cm)	Mass (g)	Length (mm)	Width (mm)	Thickness (mm)	Mass (mg)
Range	3.9 - 4.6	1.7 - 1.8	0.10-0.15	0.15-0.28	8.5 - 9.2	5.0 - 5.5	2.0-2.5	68 - 72
Mean	4.2	1.75	0.12	0.22	8.81	5.2	2.2	69.98
Mode	4.2	1.76	0.13	0.23	8.9	5.3	2.3	71
Median	4.2	1.76	0.13	0.23	8.8	5.3	2.3	70
Standard deviation	±0.206	±0.024	±0.012	±0.039	±0.19	±0.13	±0.13	±1.27
Coefficient of variation	4.90%	1.37%	10.00%	17.72%	2.15%	2.50%	5.90%	1.81%

Table 3: Quantitative characters of *Dalbergia sissoo* Roxb.

Parameter	Fruit				Seed			
	Length (cm)	Width (cm)	Thickness (cm)	Mass (g)	Length (mm)	Width (mm)	Thickness (mm)	Mass (mg)
Range	6.5-7.3	1-1.8	0.10-0.13	0.04-0.08	8.8-9.2	5.0-5.5	0.5-0.55	17-19
Mean	6.89	1.45	0.11	0.06	8.94	5.2	0.51	18
Mode	6.9	1.5	0.11	0.06	8.90	5.3	0.52	18
Median	6.9	1.5	0.11	0.06	8.90	5.3	0.52	18
Standard deviation	±0.230	±0.200	±0.008	±0.010	±0.130	±0.130	±0.038	±0.73
Coefficient of variation	3.33%	13.79%	7.27%	16.66%	1.45%	2.50%	7.45%	4.05%

	7	5	2	7	5	7	6	1
Mode	23	0.27	0.22	0.47	3.9	2.3	2.30	1.02
Median	23	0.27	0.22	0.48	3.9	2.3	2.30	1.02
Standard deviation	±1.650	±0.031	±0.011	±0.024	±0.242	±0.121	±0.106	±0.068
Coefficient of variation	7.40%	12.40%	5.00%	5.10%	6.28%	5.33%	4.69%	5.61%

Table 5 : Quantitative characters of *Psoralea corylifolia*

Parameter	Fruit				Seed			
	Length (cm)	Width (cm)	Thickness (cm)	Mass (g)	Length (mm)	Width (mm)	Thickness (mm)	Mass (mg)
Range	0.40-0.43	0.20-0.22	0.20-0.22	0.00-0.18	3.50-3.53	1.80-1.83	1.80-1.83	12-15
Mean	0.41	0.20	0.20	0.017	3.51	1.81	1.81	13.81
Mode	0.41	0.21	0.21	0.017	3.52	1.80	1.80	14.00
Median	0.41	0.21	0.21	0.016	3.52	1.81	1.81	14.00
Standard deviation	±0.008	±0.006	±0.006	±0.007	±0.009	±0.011	±0.011	±0.930
Coefficient of variation	1.95%	3.00%	3.00%	4.64%	0.25%	0.60%	0.60%	6.73%

Table 4: Quantitative characters of *Sesbania bispinosa* (Jacq.)W.Wight

Parameter	Fruit				Seed			
	Length (cm)	Width (cm)	Thickness (cm)	Mass (g)	Length (mm)	Width (mm)	Thickness (mm)	Mass (mg)
Range	19-25	0.20-0.30	0.20-0.24	0.43-0.52	3.6-4.2	2.0-2.5	2.0-2.4	1.1-1.3
Mean	22.2	0.2	0.2	0.4	3.8	2.2	2.2	1.1

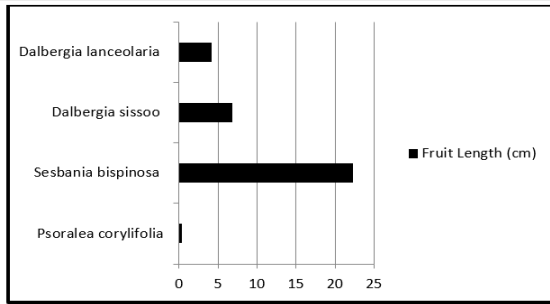


Fig. 1- Comparative fruit length of studied taxa.

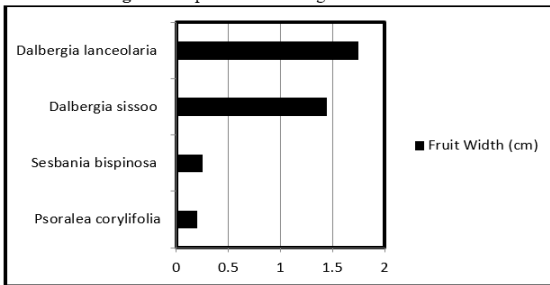


Fig. 2- Comparative fruit width of studied taxa.

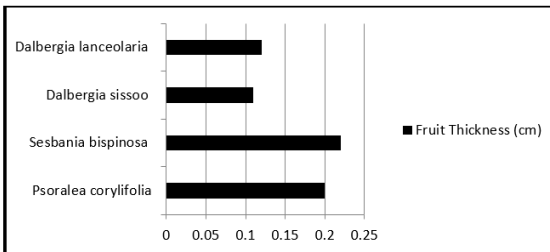


Fig. 3- Comparative fruit Thickness of studied taxa.

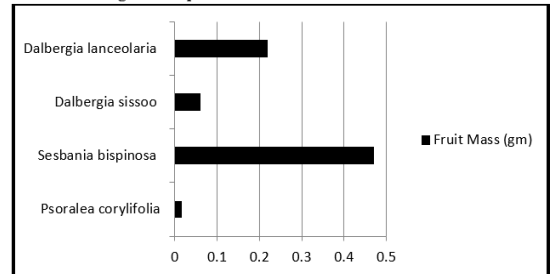


Fig. 4- Comparative fruit mass of studied taxa.

sissoo, *Sesbania bispinosa* and *Psoralea corylifolia* respectively.

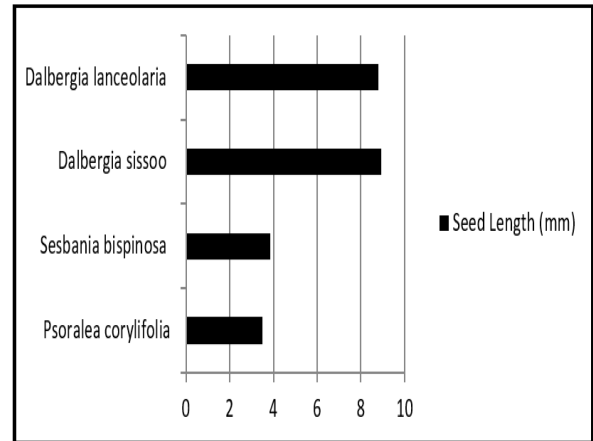


Fig. 5- Comparative seed length of studied taxa.

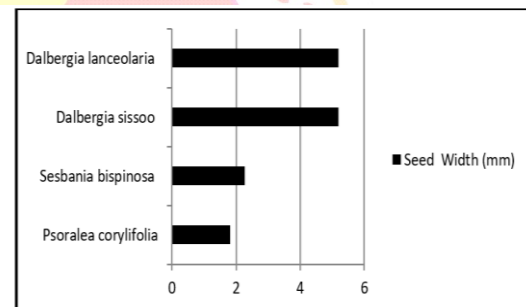


Fig. 6- Comparative seed width of studied taxa.

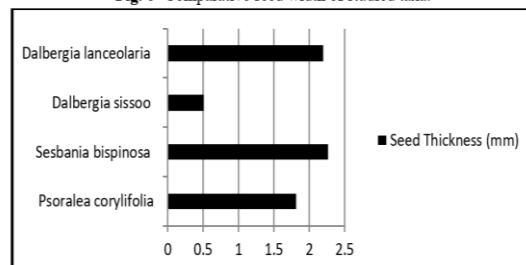


Fig. 7- Comparative seed thickness of studied taxa.

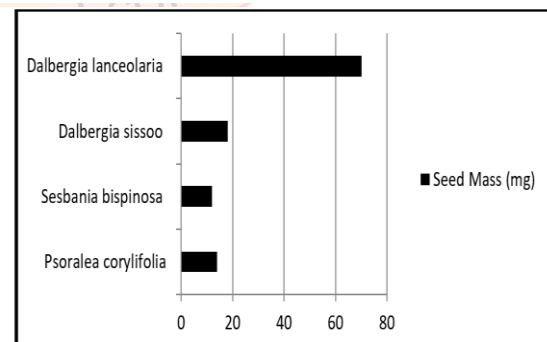


Fig. 8- Comparative seed mass of studied taxa.

Seeds of studied taxa showed variation in the parameters studied (Figure 5-8; Tables 2-5). Seeds of *Dalbergia lanceolaria*, *Dalbergia sissoo*, *Sesbania bispinosa* and *Psoralea corylifolia* were, on average 8.81mm, 8.94 mm, 3.85 mm and 3.51 mm in length respectively. Seed mean values of *Dalbergia lanceolaria*, *Dalbergia sissoo*, *Sesbania bispinosa* and *Psoralea corylifolia* for width were noted 5.2 mm, 5.2 mm, 2.27 mm and 1.81 mm respectively. *Dalbergia lanceolaria*, *Dalbergia sissoo*, *Sesbania bispinosa* and *Psoralea corylifolia* seeds exhibited the thickness of 2.2mm, 0.51mm, 2.26mm and 1.81mm respectively. Seed mass mean values of 69.98 mg, 18 mg, 11.9 mg and 13.81 mg were recorded for *Dalbergia lanceolaria*, *Dalbergia*

The standard deviation for *Dalbergia lanceolaria* fruit length, width, thickness and mass were recorded as ± 0.206 , ± 0.024 , ± 0.012 and ± 0.039 and the coefficient of variation 4.90 %, 1.37

%, 10.00 % and 17.72 % respectively. While, standard deviations of seeds recorded for length, width, thickness and mass were ± 0.19 , ± 0.13 , ± 0.13 and ± 1.2 and the coefficient of variation 2.15 %, 2.50 %, 5.90 % and 1.81% respectively.

For *Dalbergia sissoo* fruit, standard deviation calculated for length, width, thickness and mass were recorded as ± 0.230 , ± 0.200 , ± 0.008 and ± 0.010 with the coefficient of variation of 3.33 %, 13.79 %, 7.27 % and 16.66 % respectively. The standard deviation for length, width, thickness and mass of seeds was obtained as ± 0.130 , ± 0.130 , ± 0.038 and ± 0.73 with the coefficient of variation of 1.45 %, 2.50 %, 7.45 % and 4.05 % respectively.

In the biometric analysis of fruits of *Sesbania bispinosa* following data were recorded: The standard deviation for length, width, thickness and mass ± 1.650 , ± 0.031 , ± 0.011 and ± 0.024 respectively. While the coefficient of variation for length, width, thickness and mass of 7.40 %, 12.40 %, 5.00 % and 5.10 % respectively. The standard deviation for seed length, width, thickness and mass were obtained as ± 0.242 , ± 0.121 , ± 0.106 and ± 0.668 respectively while the coefficient of variation 6.28 %, 5.33 %, 4.69 % and 5.61 % respectively.

Biometric analysis of *Psoralea corylifolia* for fruits and seeds exhibits the following data. The standard deviations for fruit length, width, thickness and mass were noted as ± 0.008 , ± 0.006 , ± 0.006 and ± 0.0007 respectively while the coefficient of variations for fruit length, width, thickness and mass were noted as 1.95 %, 3.00 %, 3.00 % and 4.64 %. The data obtained from seed biometric analysis were recorded as- the standard deviations for length, width, thickness and mass were noted as ± 0.009 , ± 0.011 , ± 0.011 and ± 0.930 while the coefficient of variations was noted as 0.25 %, 0.60 %, 0.60 % and 6.73 % respectively.

Dutra *et al.* (2019) studied biometric parameters of fruits and seeds of *Sesbania virgata* and concluded that there were variations in morphological characteristics of fruits and seeds. Barros, H. S. D. *et al.* (2020) observed *Parkia gigantocarpa* seeds from different parent plants have high variability in biometry characteristics of fruits and seeds.

Studying the biometrics of fruit and seeds of studied taxa is of great importance for

determining fruit and seed size. There were variations in morphological characteristics of fruit and seeds among the studied taxa; thus it is important to carry out new studies with respect to the species studied.

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