RESEARCH ARTICLE

MORPHOLOGICAL VARIATION OF TENDU *(DIOSPYROS MELANOXYLON)* LEAVES IN DHAMTRI DISTRICT OF CHHATTISGARH, INDIA

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Received-06.01.2020, Revised-27.01.2020

Abstract: In the present study, morphological variation of tendu (*Diospyros melanoxylon*) leaves Dhamtari district were analyzed. The highest length of petiole was observed in year 2016 in site-2 (Nagri) (1.82 cm), followed by Site-1(Dugli) (1.8 cm) in year 2015. Minimum length of petiole was recorded in Site -1 (Dugli) (1.5 cm) in year 2016. The highest diameter of petiole was observed in year 2016 in site-1 (Dugli) (1.33 cm), followed by Site-2 (Nagri) (1.3 cm) in year 2015. Minimum diameter of petiole was recorded in Site -2 (Nagri) (1.2 cm) in year 2016. The highest length of leaf was observed in year 2016 in site-2 (Nagri) (14.27 cm), followed by Site-2 (Nagri) (13.57 cm) in year 2015. Minimum length of leaf was recorded in Site -1 (Dugli) (13.34 cm) in year 2016. The highest Width of leaf was observed in year 2016 in site-2 (Nagri) (7.97 cm) ,followed by Site-2 (Nagri) (7.02 cm) in year 2015. Minimum Width of leaf was recorded in Site -1 (Dugli) (6.62 cm) in year 2016. The highest leaf area was observed in year 2016 in site-1 (Dugli) (72.92 cm), followed by Site-2 (Nagri) (72.7 cm) in year 2015. Minimum leaf area was recorded in Site -1 (Dugli) (86.18 cm) in year 2015.

Keywords: *Diospyros melanoxylon*, Forest, Petiole, Tribes, Heterogeneity

INTRODUCTION

Diospyros melanoxylon Roxb. (Common name Tendu or Kendu) an endemic plant of India and Ceylon is used in various ways. Besides being the source of Indian ebony, its wood is also utilized for making boxes, combs, ploughs and beams. The fruits are eaten and sold commercially. The bark is burnt by tribals to "cure" small-pox. The seeds are prescribed as cure for mental disorders, palpitation of heart and nervous breakdown. Above all, the leaves of this plant constitute one of the most important raw materials of the "*Bidi*" (Indian cheap smoke) industry. It is not only an extremely important non-timber forest product that serves as a big revenue earner for the state government but is also an important economic resource to the indigenous tribes and local population during the summer months when they have no other form of employment. *Tendu* leaves are used to make *bidis*, an indigenous leaf-rolled cigarette made from coarse uncured tobacco, tied with a coloured string at one end. It is widely smoked in the Indian subcontinent and is gaining popularity globally, especially in USA, Germany, Middle East, Eastern Europe and Japan (Tobacco Board of India, 2010). Although T*endu* leaves and *Bidi* rolling are perceived as an important source of employment for the rural poor (Planning Commission, 2001). *Tendu* plucking generates only part-time employment for about 7.5 million people (Arnold, 1995) while rolling *bidis* engages nearly 4.4 million women and children. *Tendu* plucking provides 106 million person-days of employment in collecting activities and 675 million person-days in secondary processing (World Bank 2006).

The trade has tremendous socioeconomic value to the local population and is a source of income to them in the economically stretched summer months. Due to extreme exploitation of the collectors, who are mostly local indigenous people, the state governments have established state control over its collection and trade to earn revenue. The state and the central governments have continuously sought to empower the local populations, and several steps have been taken to establish ownership rights of the collectors over non-timber forest products. This has culminated in the 73rd constitutional amendment in 1996 that has given the ownership right over non-timber forest products to the *Gram Sabhas* (local groups or entities). There is an established network of selling agents composed of wholesalers and retailers. Some big companies also export some beedis (local cigarettes) to neighboring countries like Pakistan, Sri Lanka, Bangladesh, and Nepal and to distant countries such as the United States, France, African and West Asian countries.

MATERIALS AND METHODS

Dhamtari is abbreviated from "Dhamma" and "Tarai". District is situated in the fertile plains of Chhattisgarh Region. Jabarra village is located in Nagri Tehsil of Dhamtari district in Chhattisgarh, India. It is situated 18 km away from sub-district headquarter Nagari, 58 km away from district headquarter Dhamtari and 110 km from State capital Raipur. Jabarra village is also a gram panchayat and

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has a total population of 458 peoples. There are about 117 houses in Jabarra village. Jabarra comes under medicinal plants conservation areas (MPCA) of 200 hectares and comprises protected forest. This was established by the assistance of Ministry of Environment Forest and Climate Change in 2009. The study was conducted in Dugli and Nagari forest range in Dhamtari forest division situated in Dhamtari district (Chhattisgarh) during the year 2015-2016.

The study sites are located in the Dhamtari district (20^{o} 29' 49" to 20^{o} 33'12" N lat. and 81^{o} 52' 29" to 81^{o} 53' 40" E long. with an altitude of 399 m above the mean sea level within the Dhamtari Forest Division in Chhattisgarh. The study area falls under dry deciduous forest, agriculture lands and human settlements surround the study area is common . Most of the villages in study area are categorized as forest villages and majorities of them are accessible through Kaccha roads, which is motorable only in dry season.

The climate of the study area is wet sub-tropical and dry tropical. The year is divisible into three seasons viz. rainy (mid June to September), winter season (November to February) and summer (April to mid June). October and March comprise transition periods, respectively between rainy and winter, and between winter and summer seasons. Mean monthly value for temperature and rainfall based on five year data (2013-2018) are plotted in figure 1.

The mean monthly temperature ranges between 18.4 ^{o}C in December and 34.8 ^{o}C in May and the mean annual temperature averages 26.6 ^{o}C. The average annual rainfall of the study area is 1104.3 mm. About 80% of the annual rainfall in the study area is received during June to August. Relative humidity of study area increases with the onset of South-West monsoon and it becomes 86% during July and August. Relative humidity is lowest during summer and drops below 26.5% in the afternoon in April and May. Water table varies between 15-20m.

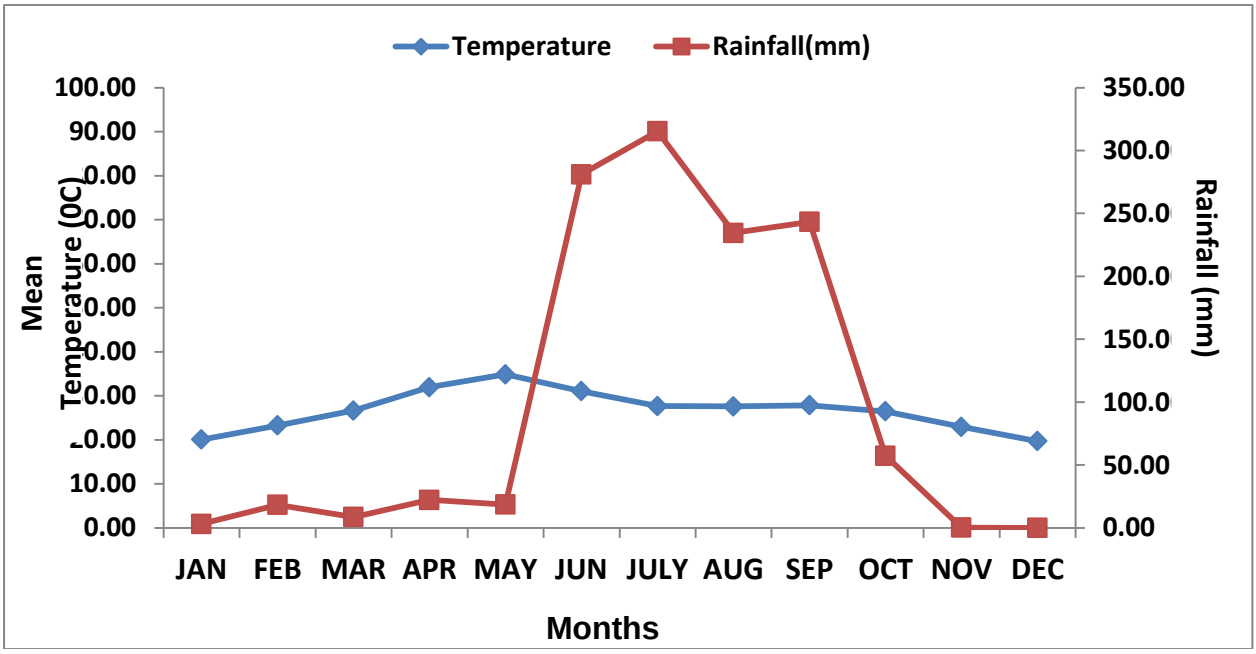

Figure 1: Ombrothermic diagram of tropical dry deciduous forest based on five year data (2013-2018)

Experimental details

Site selection:

Assessment of morphological variations in Tendu leaves from Dhamtari forest. Two site-1(Dugli) and site-2(Nagri) forest area were selected in Dhamtari forest to study the morphological variations in leaves. The data was collected two years for the experiment 2015 & 2016. Each forest sites twenty trees were selected for the study of morphological variation in leaves from each tree three leaves were collected smallest, medium sized and largest leaves respectively. The sample trees were selected random covering heterogeneity of forest to collect the leaves. *Diospyros melanoxylon* Roxb. (Common name Tendu) an endemic plant of India and Ceylon is used in various ways. The leaves were collected from 15 April to 15 June this is plucking period.

RESULTS AND DISCUSSION

Morphological characteristics of tendu leaf (*Diospyrous melanoxylon*) of Dhamtari forest area

The morphological variation of leaf is shown in Figure 2. The data relevant to length of petiole (cm), diameter of petiole (cm), length of leaf (cm), width of leaf (cm) and leaf area (cm^2) from each year and sites were presented in Table 1 and figure 3. The highest length of petiole was observed in year 2016 in site-2 (Nagri) (1.82 cm) ,followed by Site-1(Dugli) (1.8 cm) in year 2015. Minimum length of petiole

was recorded in Site -1 (Dugli) (1.5 cm) in year 2016. Whereas mean value of length of petiole was higher (1.75 cm) in year 2015 as compared to year 2016. Ram et al. (2012) Reported similar observation in litchi accessions assessed for morphological characters of leaf Petiole differential In Purbi (0.83 mm) which was equivalent to Hong Kong (0.82 mm), Seedless-1 (0.75 mm), Shahi (0.72 mm) and Serguja Se1.1 were observed higher in the petiole range. Differences (0.46 mm) could be due to the genetic composition of the cultivars and their reaction to environmental conditions among the various accessions the maximum leaflet blade width was recorded in Kasba (4.81 cm).

Table 1. Morphological characteristics of Tendu leaf (*Diospyros melanoxylon*) of Dhamtari forest area 2015-2016

Characteristics	2015 Site 1	2015 Site 2	Mean	2016 Site 1	2016 Site 2	Mean
	Dugli	Nagri		Dugli	Nagri	
length of petiole (cm)	1.8	1.7	1.75	1.5	1.82	1.66
diameter of petiole (cm)	1.21	1.3	1.26	1.33	1.2	1.27
Length of leaf (cm)	13.38	13.57	13.48	13.34	14.27	13.81
Width of leaf (cm)	6.86	7.02	6.94	6.62	7.97	7.30
leaf area sq1 (cm)	68.18	72.7	70.44	72.92	69.77	71.35

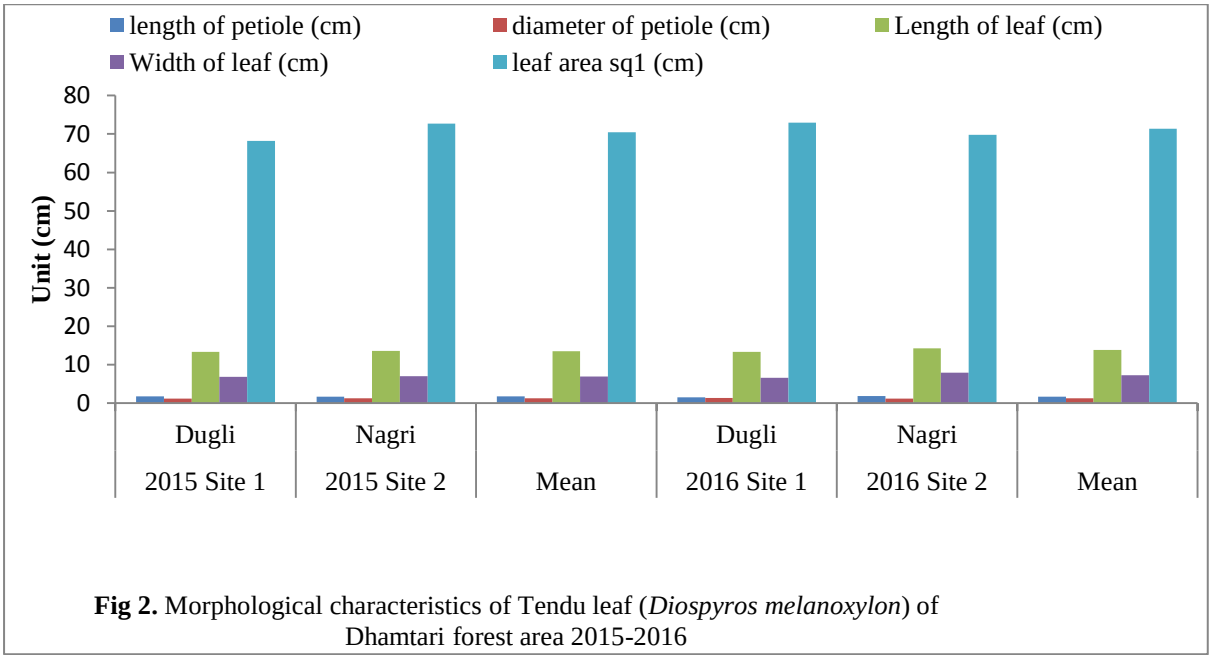

Fig 2. Morphological characteristics of Tendu leaf (*Diospyros melanoxylon*) of Dhamtari forest area 2015-2016

Figure 3: Tendu leaf (*Diospyros melanoxylon*) of Dhamtari forest area

CONCLUSION

This study gives the information regarding morphological variation among the two sites in Dhamtari districts of Chhattisgarh state. The highest length of petiole was observed in year 2016 in site-2 (Nagri) (1.82 cm), followed by Site-1(Dugli) (1.8 cm) in year 2015. Minimum length of petiole was recorded in Site -1 (Dugli) (1.5 cm) in year 2016. The highest diameter of petiole was observed in year 2016 in site-1 (Dugli) (1.33 cm), followed by Site-2 (Nagri) (1.3 cm) in year 2015. Minimum diameter of petiole was recorded in Site -2 (Nagri) (1.2 cm) in year 2016. The highest length of leaf was observed in year 2016 in site-2 (Nagri) (14.27 cm), followed by Site-2 (Nagri) (13.57 cm) in year 2015. Minimum length of leaf was recorded in Site -1 (Dugli) (13.34 cm) in year 2016. The highest Width of leaf was observed in year 2016 in site-2 (Nagri) (7.97 cm) ,followed by Site-2 (Nagri) (7.02 cm) in year 2015. Minimum Width of leaf was recorded in Site -1 (Dugli) (6.62 cm) in year 2016. The highest leaf area was observed in year 2016 in site-1 (Dugli) (72.92 cm), followed by Site-2 (Nagri) (72.7 cm) in year 2015. Minimum leaf area was recorded in Site -1 (Dugli) (86.18 cm) in year 2015.

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