

Growth and Harvesting of Common Rattans in Bangladesh

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Abstract

This paper presents information about growth, harvesting ages and yields for jalibet (*Calamus tenuis*), kerakbet (*C. viminialis*) and gollabet (*Daemonorops jenkinsiana*) raised in semi-evergreen/deciduous forests of Bangladesh. Clump expansion with increasing age was highest for *C. tenuis* and *C. viminialis* in Chittagong, and for *D. jenkinsiana* in Sylhet. Mean annual height increments of main shoot of a clump of *C. tenuis*, *C. viminialis* and *D. jenkinsiana* were 0.94 ± 0.08 , 1.11 ± 0.09 and 1.45 ± 0.11 m respectively. Highest number of shoots per clump was noticed for *C. tenuis* in Sylhet followed by *C. viminialis* and *D. jenkinsiana* in Chittagong. Mean diameters of the main shoot of these species were 1.6 ± 0.1 , 2.14 ± 0.1 and 3.01 ± 0.13 cm respectively. Wildings were found under the clumps with varying numbers. The exploitable ages for *C. tenuis*, *C. viminialis* and *D. jenkinsiana* appeared to be 6-8, 9-11 and 10-12 years respectively. Further information and studies are needed to determine the harvesting cycle and suggest a management plan for rattans.

সারসংক্ষেপ

এ প্রবন্ধে বাংলাদেশের অর্ধ চিরসবুজ ও পত্রঝরা বনে রোপিত জালি বেত (*Calamus tenuis*), কেরাক বেত (*C. viminialis*) ও গোলা বেত (*Daemonorops jenkinsiana*)-এর বৃদ্ধি, আহরণের বয়স ও উৎপাদনের উপর তথ্য উপস্থাপন করা হয়েছে। বয়স বৃদ্ধির সাথে সাথে *C. tenuis* ও *C. viminialis*-এর ঝাড়ের সর্বোচ্চ প্রসারণ চতুর্থাংশ এলাকায় এবং *D. jenkinsiana*-এর সিলেট এলাকায় ঘটে। *C. tenuis*, *C. viminialis* এবং *D. jenkinsiana*-এর প্রধান কাণ্ডের বাৎসরিক উচ্চতা বৃদ্ধির গড় হার যথাক্রমে 0.94 ± 0.08 , 1.11 ± 0.09 এবং 1.45 ± 0.11 মিঃ। ঝাড়প্রতি কাণ্ডের সংখ্যা *C. tenuis* এর জন্য সর্বোচ্চ ছিল সিলেটে এবং *C. viminialis* ও *D. jenkinsiana*-এর জন্য ছিল চতুর্থাংশে। এ সকল প্রজাতির কাণ্ডের গড় বেড় ছিল যথাক্রমে 1.6 ± 0.1 , 2.14 ± 0.1 এবং 3.01 ± 0.13 সেঃ মিঃ। ঝাড়ের নিচে প্রাণ্ড প্রাকৃতিক চারার পরিমাণ বিভিন্ন রকম পাওয়া যায়। *C. tenuis*, *C. viminialis* এবং *D. jenkinsiana* আহরণের বয়স যথাক্রমে ৬-৮, ৯-১১ এবং ১০-১২ বছর পরিলক্ষিত হয়। তিন প্রজাতির বেত আহরণের চক্র এবং ব্যবস্থাপনা পরিকল্পনা তৈরির জন্য আরও তথ্যের ও গবেষণার প্রয়োজন রয়েছে।

Key words : *Calamus tenuis*, *C. viminialis*, clump expansion, *Daemonorops jenkinsiana*, exploitable age, rattan plantation, yield, wilding

Introduction

Bangladesh is represented by eight species of rattans occurring in different environmental conditions. However, out of these jalibet (*Calamus tenuis*), kerakbet (*Calamus viminalis* var. *fasciculatus*) and gollabet (*Daemonorops jenkinsiana*) are still common. In recent years, there has been a great depletion of rattan resource all over the country. Owing to the lack of management and over-exploitation, rattan based cottage industries are facing problems for shortage of raw material. To overcome the problem and improve the status of this valuable resource, plantations of rattans have been tried in different forest areas by the Forest Department and on experimental basis by the Bangladesh Forest Research Institute (BFRI). Thus, nursery and planting techniques have been developed for different rattan species by BFRI, which however, need further improvement (Alim and Kamaluddin 1985, Ara *et al.* 1994, Banik and Nabi 1979, Mohiuddin *et al.* 1986, Mohiuddin and Ara 1997, Siddiqi *et al.* 1996).

As rattans grow naturally in the forests and homesteads, information on their growth, harvesting age and yield from the clumps are lacking. Such information are required for proper and sustainable management of rattan resource. This paper highlights information on clump expansion, growth, harvesting age and yearly exploitable stems, status of wildings, and supporting trees for three common and widely used rattan species.

Material and methods

Forest Department initiated rattan plantations in 1982, but has been raising with greater emphasis since 1990. Most of the successful plantations are found in Sylhet, Chittagong, Dhaka and Tangail Forest Divisions. Besides, BFRI also raised experimental plantations in Chittagong. Data on width of clump, shoot number, height and diameter of main shoot for each clump were collected during the period from 1997 to 2000. The diameter of main shoot was

measured by slide caliper, its height with bamboo gauze and the area occupying the clump by measuring tape. The clumps for measurement were selected randomly. Usually 10% of the clumps were measured in a locality. However, in an area with poor survival and less number of clumps, 100% enumeration was made. Collected data from different localities were summarized to assess the increment rate, harvesting age and yield for *C. tenuis*, *C. viminalis* and *D. jenkinsiana*. Probable yearly exploitable stems from a clump have been determined from visual observations, experience and discussion with the local people. The maturity of stems was ascertained from brownish colour of leaves and separation of leaf sheath from the stem (Basu 1992, Noor 1992).

Results and discussion

Distribution of plantation

The present studies show that successful plantations of rattans have been established since 1990. Most of the plantations are found in greater Sylhet, Chittagong, Tangail and Dhaka Districts. *Calamus tenuis* was observed in the deciduous and semi-evergreen forests. In the semi-evergreen forests, it has been raised at the base of hills. Successful plantation of this species was not noticed on the sandy hill top or along the slope. In the deciduous forest, plantation of *C. tenuis* exists in the depression of the forest floor or in the low lying areas of the forest. This indicates that the species has high requirement of moisture for higher survival and growth. Alam (1990) mentioned of its natural distribution in areas with higher moisture content.

Plantations of *C. viminalis* were found in all the locations except Sylhet District. The species was observed to grow on the hill top, along the slope or in the depression. It grows gregariously in soil having low moisture content. However, better performance of the species was noticed with adequate soil moisture. With regard to plantations of *D. jenkinsiana*, it was found in Sylhet, Tangail and Chittagong Districts. However, the

species survived with lower vigour in the deciduous forest of Tangail District. It may be noted that the species does not occur naturally in the deciduous forest of Bangladesh (Alam 1990).

Supporting trees

Existence of convenient supporting tree is a prerequisite for successful establishment of rattan plantations. These trees also provide shade to planted seedlings. Besides, for optimal growth, canopy closure, which usually depends on the density of supporting trees, determines the horizontal and vertical expansion of rattan clumps. For *C. tenuis*, the supporting trees included *Tectona grandis*, *Shorea robusta*, *Xylia kerrii*, *Cassia siamea*, *Bixa orellana*, *Bombax ceiba*, *Lannea coromandelica*, *Acacia auriculiformis*, *Terminalia arjuna* and *Anthocephalus chinensis*. For *C. viminalis*, *B. orellana*, *L. coromandelica*, *B. ceiba*, *S. robusta*, *C. siamea*, *T. arjuna*, *A. chinensis* and *A. auriculiformis* and for *D. jenkinsiana*, *T. grandis*, *S. robusta*, *X. kerrii*, *C. siamea*, *L. coromandelica*, *B. ceiba*, *A. auriculiformis*, *A. chinensis* and *B. orellana* were the supporting trees. The growth of rattan species is quite fast after their initial establishment. So, the age of the supporting tree should at least between 5-8 years depending on the growth of the species when rattan planting can be initiated. Slow growing long-rotation trees are preferable to fast growing short-rotation trees for sustainable and higher yield of rattans. On experimental basis, it was possible to raise *C. viminalis* plantation under the canopy of teak plantation (Siddiqi *et al.* 1998). However, some additional tending operations including periodical removal of dry leaves of teak from the forest floor were necessary. This allowed the newly planted seedlings from suppression by the dry leaves and also help avoid occurrence of fire.

Clump expansion and shoot emergence

In ten years, there was steady horizontal expansion of clump by approximately 1.5 m for *C. tenuis*, 1.2 m for *C. viminalis* and 2.0 m for *D. jenkinsiana* (Table 1). Clump expansion took

place with higher number of shoots as the age of the rattan plantations increased. A significant relationship was obtained between the size of the clump and the number of shoots for *C. tenuis* ($r = 0.74, P < 0.01$), *C. viminalis* ($r = 0.69, P < 0.01$) and *D. jenkinsiana* ($r = 0.74, P < 0.01$). Maximum clump expansion occurred for *C. tenuis* and *C. viminalis* in Chittagong and *D. jenkinsiana* in Sylhet (Fig. 1). Number of shoots significantly increased with age for *C. tenuis* ($r = 0.70, P < 0.01$), *C. viminalis* ($r = 0.74, P < 0.01$) and *D. jenkinsiana* ($r = 0.83, P < 0.001$). However, there was a variation in number of shoots per clump in four different locations -- Sylhet, Chittagong, Tangail and Dhaka. For plantation age of eight years, highest number of shoots was noticed in Sylhet for *C. tenuis* and in Chittagong for *C. viminalis* and *D. jenkinsiana* (Fig. 2). Average yearly emergence of new shoots for *C. tenuis*, *C. viminalis* and *D. jenkinsiana* was 3.03 ± 0.2 , 1.15 ± 0.2 and 2.5 ± 0.2 in number respectively (Table 2).

Height increment of main shoots was highest for *D. jenkinsiana* followed by *C. viminalis* and *C. tenuis*. Mean annual height increments for these species were 1.45 ± 0.11 , 1.11 ± 0.09 and 0.94 ± 0.08 m respectively for 6-10 year old clumps (Table 2). Their height increments over time are shown in Fig. 3. Mean diameters at breast height of main shoot for *C. tenuis*, *C. viminalis* and *D. jenkinsiana* were 1.6 ± 0.1 , 2.14 ± 0.1 and 3.01 ± 0.13 cm respectively (Table 2). However, diameters of *C. tenuis* in Sylhet, Chittagong, Tangail and Dhaka were 1.7 ± 0.1 , 1.8 ± 0.2 , 1.5 ± 0.4 and 1.4 ± 0.2 cm respectively. The diameters of *C. viminalis* in Chittagong, Tangail and Dhaka were 2.2 ± 0.1 , 2.0 ± 0.1 and 2.2 ± 0.1 cm respectively and of *D. jenkinsiana* in Sylhet, Chittagong and Tangail were 3.1 ± 0.3 , 3.3 ± 0.1 and 2.8 ± 0.2 cm respectively. In general diameter and height increments of the planted rattan species were higher in semi-evergreen forest compared to deciduous forest.

Status of wildings

Wildings are important for natural propagation and increase of rattan resource

Table 1. Growth performance of *C. tenuis*, *C. viminalis* and *D. jenkinsiana* in plantation established during the period for 1990-1994.

Species	Age of plantation (year)	Location	Supporting tree	Width (cm) per clump	Shoot (No.) per clump	Height (m) of main shoot	Diameter (cm) at breast height of main shoot
<i>Calamus tenuis</i>	6	Sylhet	<i>Tectona grandis</i> <i>Shorea robusta</i> <i>Xylia kerrii</i> <i>Cassia siamea</i>	143.7±11.4	25.9±4.9	4.9±0.2	1.4±0.1
	7			126.0±2.9	29.4±4.2	6.4±1.0	1.5±0.1
	8			127.4±2.6	33.0±3.7	6.5±1.1	1.1±0.1
	9			162.0±37.8	44.9±4.5	10.8±1.8	2.2±0.2
	10			194.0±11.4	43.2±5.4	11.3±1.2	2.4±0.2
	6	Chittagong	<i>Bombax ceiba</i> <i>Lamnea coromandelica</i>	130.0±9.5	15.2±3.9	5.4±8.0	1.3±0.1
	7			137.5±6.7	20.7±5.7	7.9±1.4	1.5±0.2
	8			149.1±3.9	23.5±5.9	7.7±1.7	1.7±0.1
	9			161.3±7.8	22.6±7.4	13.7±1.3	2.0±0.2
	10			185.7±6.9	31.3±3.9	14.6±1.5	2.4±0.2
	6	Dhaka	<i>S. robusta</i> <i>C. siamea</i> <i>Terninalia arjuna</i> <i>Anthocephalus chinensis</i>	85.3±10.2	10.0±1.6	2.9±0.1	1.5±0.1
	7			70.0±2.1	20.4±2.2	3.0±0.9	1.4±0.1
	8			72.1±5.5	19.0±2.4	5.0±1.2	1.3±0.2
	9			91.8±22.5	25.3±8.1	8.1±0.2	1.5±0.1
	10			148.0±21.4	69.0±9.0	9.0±0.9	2.1±0.1
	6	Tangail	<i>S. robusta, Acacia auriculiformis, Bixa orellana C. siamea A. chinensis</i>	55.3±10.2	5.1±1.0	6.0±0.2	1.4±0.1
	7			91.4±3.1	16.5±2.2	6.9±1.2	1.2±0.3
	8			66.0±4.1	18.4±1.9	7.9±1.1	1.1±0.1
	9			89.1±13.6	17.1±2.3	8.5±0.7	1.9±0.1
	10			102.0±9.0	79.0±6.9	9.4±1.9	1.3±0.2
<i>C. viminalis</i>	6	Dhaka	<i>S. robusta, C. siamea T. arjuna, A. chinensis A. auriculiformis</i>	71.9±5.2	3.8±0.4	4.0±0.9	2.2±0.2
	7			66.6±3.0	4.2±0.15	6.1±0.7	1.9±0.5
	8			65.8±0.4	5.4±1.4	6.2±1.6	2.5±0.2
	9			91.4±6.2	7.9±0.7	7.8±0.7	2.4±0.5
	10			110.2±10.0	8.9±1.1	17.0±3.3	2.2±0.1
	6	Chittagong	<i>B. ceiba L. coromandelica</i>	68.5±6.9	7.6±2.5	5.6±0.8	2.1±0.1
	7			80.9±8.5	8.9±2.6	6.1±0.9	1.8±0.3
	8			101.0±12.4	7.9±2.6	9.2±2.6	2.5±0.6
	9			118.6±19.7	9.5±3.1	12.8±4.7	2.4±0.3
	10			156.7±16.9	12.3±5.3	17.0±3.9	2.1±0.3

Table 1. (Contd.)

Species	Age of plantation (year)	Location	Supporting tree	Width (cm) per clump	Shoot (No.) per clump	Height (m) of main shoot	Diameter (cm) at breast height of main shoot
	6	Tangail	<i>S. robusta</i> , <i>C. siamea</i>	55.8±4.9	5.5±0.1	5.9±0.5	1.7±0.2
	7		<i>B. orellana</i>	35.0±2.2	6.9±0.4	7.7±1.2	1.8±0.2
	8		<i>A. chinensis</i>	61.0±0.4	5.4±1.4	6.2±1.6	2.5±0.2
	9			71.1±8.8	10.8±1.2	8.8±0.1	2.0±0.3
	10			99.2±18.9	10.9±0.9	9.5±1.5	2.0±0.1
<i>Daemonorops jenkinsiana</i>	6	Sylhet	<i>T. grandis</i> , <i>S. robusta</i>	23.7±1.5	12.3±1.8	6.5±1.6	3.9±0.0
	7		<i>X. kerrii</i>	140.0±11.4	22.4±2.1	9.0±2.1	3.2±0.9
	8		<i>C. siamea</i>	259.6±23.1	29.2±3.3	16.8±3.8	3.7±0.2
	9			276.3±35.6	31.0±8.1	19.0±2.8	2.3±0.1
	10			282.0±32.5	33.1±7.8	14.3±2.4	2.5±0.3
	6	Chittagong	<i>B. ceiba</i>	31.1±1.6	10.3±1.3	7.3±1.2	3.2±0.4
	7		<i>L. coromandelica</i>	110.0±10.2	14.0±0.9	9.5±2.1	3.6±0.8
	8			249.2±28.2	19.2±4.2	16.9±3.0	3.1±0.2
	9			286.8±25.9	18.0±6.1	19.0±2.4	3.3±0.3
	10			292.0±22.5	26.1±6.2	24.9±5.4	3.5±0.4
	6	Tangail	<i>S. robusta</i> ,	5.2±0.2	7.2±1.8	6.3±1.5	2.5±0.0
	7		<i>A. auriculiformis</i>	23.9±3.1	9.8±1.2	6.9±0.2	2.7±0.8
	8		<i>B. orellana</i>	91.4±3.2	21.8±3.8	6.6±0.8	3.4±0.8
	9		<i>A. chinensis</i>	92.0±9.9	24.5±4.5	6.7±2.03	2.3±0.2
	10			127.2±19	27.0±4.2	9.2±1.1	2.8±0.3

(Basu 1992, Lakshmana 1993), once the plantation is established. All the three species had wildings under the clumps on varying degrees. However, wildings were not always available under all the rattan clumps. The number of wildings varied from 100 to 300 depending on the location, age or size of the clumps for *C. tenuis*. Similarly, number of wilding varied from 200 to 400 for *C. viminalis* and from 150 to 300 for *D. jenkinsiana*.

Exploitable stem

Stems from the clumps of *C. tenuis* can be harvested from the age of 6-8 years. When 10 years

old, as many as 8-10 stems of varying length from 10 to 12 m can be harvested depending upon site conditions and locations. *C. viminalis* and *D. jenkinsiana* could be harvested at the age from 9-11 and 10-12 years respectively. At this age, 8-10 stems of 7-10 m length could be harvested from *C. viminalis* and 7-10 stems of 8-10 m length from *D. jenkinsiana* clumps. However, annual intensity of harvesting or harvesting cycle could not be determined as harvesting had not been undertaken by the Forest Department. Shaharia and Sen (1990) mentioned that maximum number and length of stems of *C. tenuis* could be obtained

Table 2. Number of shoots per clump, annual emergence of shoot, mean annual height of main shoot and diameter at breast height for *Calamus tenuis*, *C. viminalis* and *D. jenkinsiana*.

Species	Average age (yrs) of plantation	Average No. of shoots/ clump	Mean annual No. of emerging shoots.	Average height (m) of main shoot	Mean annual height (m) of main shoot	Mean diameter (cm) of main shoot
<i>Calamus tenuis</i>	6	13.7±5.12	3.03±0.2	4.62±0.73	0.94±0.08	1.6±0.1
	7	22.09±3.12		5.43±0.99		
	8	23.44±3.89		6.47±0.62		
	9	29.10±6.74		9.15±0.83		
	10	63.73±8.71		9.9 ±0.58		
<i>C. viminalis</i>	6	4.61±0.6	1.15±0.17	4.98±0.68	1.11±0.09	2.14±0.1
	7	5.56±0.96		6.89±0.57		
	8	7.0±1.16		8.28±1.44		
	9	9.36±1.02		8.32±0.35		
	10	9.9±0.71		13.25±2.65		
<i>Daemonorops jenkinsiana</i>	6	9.75±1.8	2.47±0.22	6.92±0.08	1.45±0.11	3.01±0.13
	7	16.1±4.45		7.94±0.72		
	8	25.48±2.63		11.72±3.59		
	9	29.55±6.3		12.85±4.34		
	10	30.05±2.16		13.15±1.8		

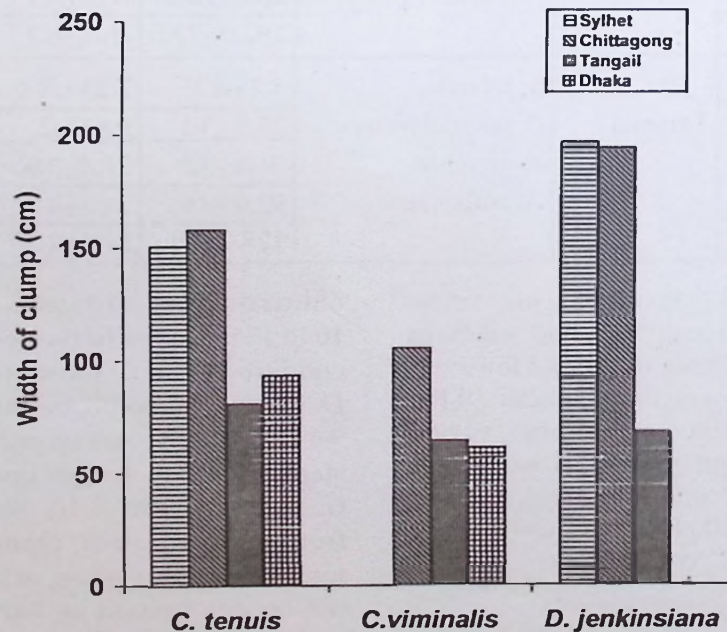


Figure 1. Average clump expansion in width for eight year old plantations of *C. tenuis*, *C. viminalis* and *D. jenkinsiana* in Sylhet, Chittagong, Tangail and Dhaka.

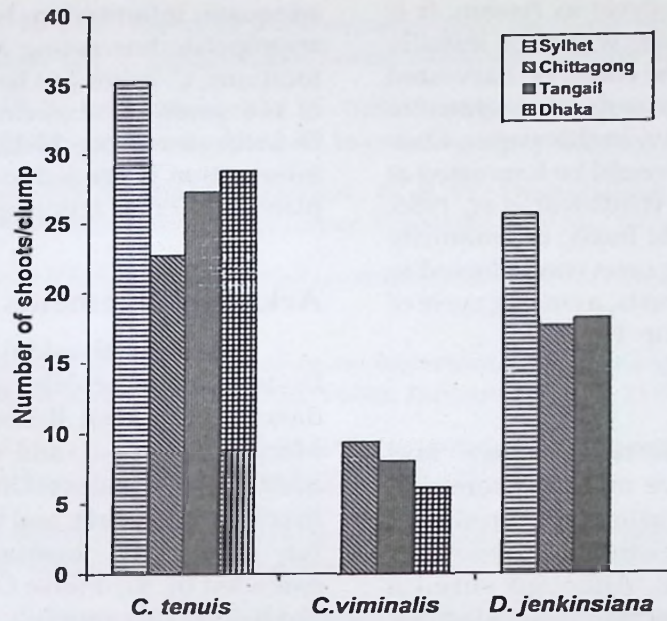


Figure 2. Average number of shoots per clump in eight year old plantations of *C. tenuis*, *C. viminialis* and *D. jenkinsiana* in Sylhet, Chittagong, Tangail and Dhaka.

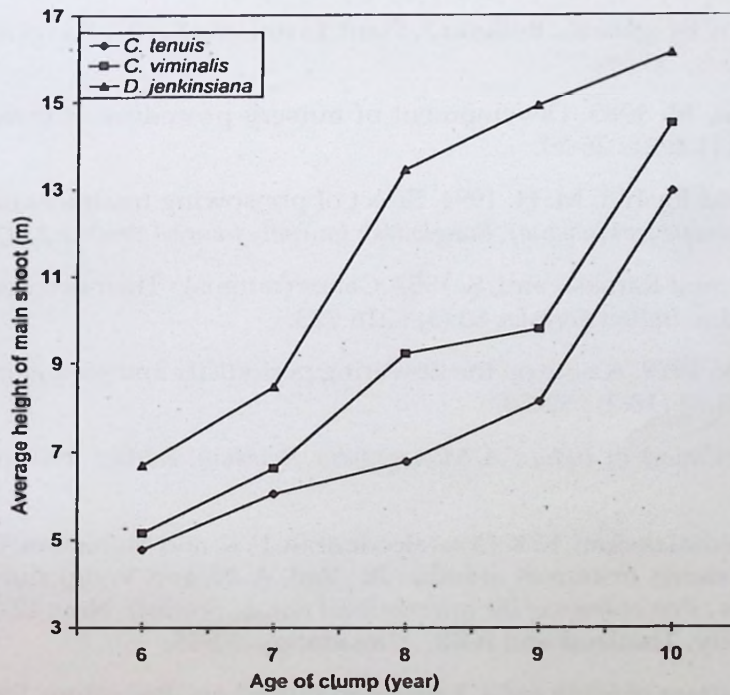


Figure 3. Average height of main shoots of the clumps for *C. tenuis*, *C. viminialis* and *D. jenkinsiana* over time.

from two years harvesting cycle in Assam. It is reported that growth for cane was slow initially but a certain amount of cane could be harvested from six years. However, growth was related to species and locality as shown in this paper. One-tenth of the standing stems could be harvested at every 2 or 3 years interval (Badhwar *et al.* 1956, Bhat *et al.* 1989). In Coorg of India, the maturity period of naturally growing cane was believed to be five years. In the Ghat forests, a cutting cycle of six years was adopted (Troup 1921).

Conclusion

Calamus tenuis, *Calamus viminalis* and *Daemonorops jenkinsiana* have marked promising performance for their inclusion as non-timber plantation species under the canopy of deciduous and semi-evergreen forests. Although survival and growth of these species are satisfactory,

adequate information is not yet available on appropriate harvesting age and cycle. On good locations, *C. tenuis* can be harvested from the age of 6-8 years. *C. viminalis* from 9-11 years and *D. jenkinsiana* from 10-12 years. However, more information is needed to suggest a management plan of different rattan species.

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