



## Growth and Development of Rare Tree Species *Sterculia villosa* Linn. in Districts, Meerut and Bulandshahr, U.P., India

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### Authors' contributions

This work was carried out in collaboration among all authors. Author YR designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors PK and SR managed the analyses of the study. Author PP managed the literature searches. All authors read and approved the final manuscript.

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### ABSTRACT

The present study was carried out in Districts Meerut and Bulandshahr from May 2014 to September 2019. The mature, dried and healthy seeds of *Sterculia villosa* were collected from Katarniaghat wildlife sanctuary, District Bahraich, Uttar Pradesh. A total of 100 seeds were sown in 10 pots containing mixture of soil: manure 3:1 ratio. The germination started seven days after sowing in the month of May. The total germination percentages were observed 80% within 21 days. 12 Months, old saplings were transplanting into the areas of Meerut and Bulandshahr. The results indicate that the status of germination, saplings growth and development of all stages of *Sterculia villosa* is fairly rapid. I had recorded 6 years old growth of *Sterculia villosa* 249 cm. in botanical garden of C.C.S. university Meerut. It is concluded that the aim of the present study is to spread awareness towards the conservation and established of the rare beautiful tree species *Sterculia villosa* in Meerut and Bulandshahr districts. The study benefited to biodiversity and silviculture in those areas, where the species is now not found.

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## 1. INTRODUCTION

The widespread loss and degradation of native forests is now recognised as a global environmental crisis. From 2000-2005, global forest area declined by around 20 million ha/yr [1], with undisturbed primary forest declining by an estimated 4.2 million hectares (or 0.4%) annually [2]. The loss and degradation of forest ecosystems resulting from human activity are major causes of global biodiversity loss [3]. Clearance of forest for agriculture, mining, urban and industrial development all contribute to the loss of forests and tree species in the wild. Management activities within forests, including burning, logging and overgrazing also impact on forest structure, functions and processes and can additionally contribute to the loss of tree species. The trees play a fundamental role in maintaining the basic ecosystem functions and the quality of life on earth. *Sterculia villosa* Roxb., common name known as Udal is a moderate sized deciduous tree belongs to family Sterculiaceae. It is distributed in the state of West Bengal, Assam, Odisha, Gujarat, North Eastern states and hills of South India including Andaman and Nicobar Islands. The tree generally attains up to a height of 15-20 m with a girth of 1.2- 1.5 m. Wood is very soft and light possessing pale yellowish or greyish white to light greyish or brown [4]. *S. villosa* is native to India and it is one of the indigenous fast growing tree species. The plant is generally used for making tea boxes and light weight packing cases, apart from use as fire wood in the rural areas *S. villosa* strong fiber obtained from the inner bark, is used for ropes, bags, cordage, elephant harness and dragging. Wood is used to preparing toys, guitars, cheap match boxes, splints and also for manufacturing of commercial plywood. It is served as good raw material for pulp and paper industries [5]. The seeds are eaten like a pulse after roasting or cooking. The whitish transparent gum exudes from the bark, locally known as karaya gum, the gum is also used as an ingredient in lozenges to relieve sore throat due to the demulcent properties. These seeds are endospermic and contain 35% oil. The bark and the petiole are used as a medication in seminal weakness and leaves is used in impotency [6]. One-fourth of the plant species listed by the U.S. Endangered Species Act include reintroduction as a component of their

recovery plan [7]. *Sterculia villosa* tree species not found in Meerut district. However, Meerut's soil is more fertile and has a warm subtropical climate and becomes very cold and dries in winters from December to mid February while it is dry and hot in summers from April to June. During extreme winters, the maximum temperature is around 12° and minimum 3° to 4° Celsius. Summers can be quite hot with temperatures rising 40° to 44° Celsius range. *Sterculia villosa* is perceived as very important tree species for local populations and environment management. *Sterculia villosa* can play an important role in the biodiversity conservation of the forests. *Sterculia villosa* is easily raised from seed, the rate of growth is fairly rapid in early stages and forming long tap roots. Hence, there is an urgent need for conserve rare tree species which is required in Meerut and many other adjacent Districts. The present research work consisted in defining conservation and growth development the availability of the tree species *Sterculia villosa*.

## 2. MATERIALS AND METHODS

The present study was carried out at B – 16, Jwala Nagar, Ambedkar Chowk in District Meerut for the period 15 May 2014 to June 2015 in pots and July 2015 to September 2019 in field areas of Districts Meerut and Bulandshahr. The mature and healthy seeds were collected from Katernia Ghat wild life sanctuary, District Bahrich, Uttar Pradesh in the month of 20 May 2014. The total 100 seeds were sown in 10 cemented pots containing 3:1 soil: manure ratio. Germination commenced seven days after sown and total 80% germination was observed within 21 days in the month of May-June 2014. Saplings growth parameters were recorded at 12 months intervals. After 12 months of old saplings were transplanted into various areas of Meerut and Bulandshahr District. Final reading on plant height and girth size was recorded at the age of 6 years old from date of sowing.

## 3. RESULTS AND DISCUSSION

Observation on daily seed germination was counted upto 15 days from the date of sowing. 12 months, saplings were transplanted from to the areas of Meerut and Bulandshahr. The result shows that the total seeds germinated 80% in the month of May-June within 21 days. Saplings

height was recorded at September 2014 in pots shoot height Mean 14.50 cm., After transplanted growth status 89.84 cm, in September 2015; 140.92 cm in September 2016; 165.0 cm in September 2017; 197.06 cm in September 2018; 249.26 cm in September 2019. The final reading growth status of plant, height and girth size was recorded at 23 September 2019 in botanical garden C.C.S. university Meerut plant shoot height Mean 249.26 cm, and girth size Mean 25.54 cm. respectively growth of all stages of *Sterculia villosa* is fairly rapid in Meerut and Bulandshahr district. These observations are clearly made through the Tables 1 and 2. And these stages are shown in images 1-20. Germination and seedling establishment are two very critical phase in the life history of tree species [8]. Composition of Trees Grown Surrounding Water Springs at Two Areas in

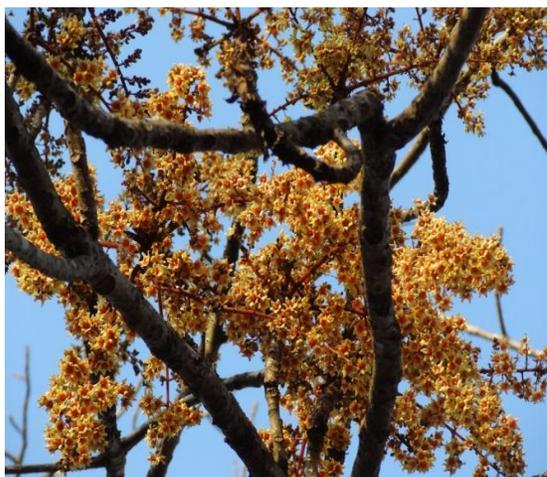
Purwosari Pasuruan, East Java [9]. Status and Cultivation of Sandalwood in India USDA Forest service [10]. For those of us associated with arboreta and botanical gardens, we are in a position to address the challenge of saving the world's threatened tree species. We need to do more than just include them in the plant collections of our gardens. Effective tree conservation may require a finessed combination of different kinds of ex situ and in situ actions, ecological restoration and plant reintroduction, and socio-economic and regulatory considerations to truly secure them from threat, Sara Oldfield and Adrian C. Newton (2013) [11]. As a consequence, many tree species are threatened and disappear more and more from their natural ecosystems. The present study focuses on the rare tree species *S. villosa* established in Meerut and Bulandshahr district.

**Table 1. Seed germination percentage of *sterculia villosa***

May							
Days	3	6	9	12	15	18	21
Germination (%)	-	-	20	30	45	60	80

**Table 2. Plant height and girth size at 2014-19 years**

Years	Plant height (cm)	Girth size (cm)
September 2014	14.50±0.94	
September 2015	89.84±0.50	7.22 ± 0.19
September 2016	140.92±0.91	10.64 ± 0.20
September 2017	165.0±0.31	15.52 ± 0.34
September 2018	197.06±0.92	20.08 ± 0.38
September 2019	249.26±0.49	25.54± 0.33



**Fig. 1. Flowers of *Sterculia villosa***



**Fig. 2. Rupture pod of *Sterculia villosa***



**Fig. 3.** View of seeds of *Sterculia villosa* collected by Dr. Yashwant Rai



**Fig. 4.** Germination stage of *Sterculia villosa*



**Fig. 5.** View of seed germination of *Sterculia villosa*



**Fig. 6.** Close up seedling of *Sterculia villosa*



**Fig. 7.** Seedlings of *Sterculia villosa* grown in dated of 17 June 2014



**Fig. 8.** Seedlings of *Sterculia villosa* Period 27 June 2014



**Fig. 9. Seedlings growth status Period 4 September 2014**



**Fig. 10. Growth status of *Sterculia villosa* in pot period 11 July 2016**



**Fig. 11. 2 years old sapling transplanted in C.C.S. University Meerut dated 12 July 16**



**Fig. 12. View of *Sterculia villosa* in C.C.S. University Meerut period, August 2016**



**Fig. 13. Ex – situ conservation of *Sterculia villosa* in Botanical garden I. P. College Bulandshahr**



**Fig. 14. Awareness activity for conservation of *Sterculia villosa* species in I. P. College Bulandshahr**



**Fig. 15. Growth status of *Sterculia villosa* in C.C.S Uni. Meerut September 2017**



**Fig. 16. Growth status of *Sterculia villosa* in CCS Uni. Meerut 21 December 2017  
Seeds of *Adenanthera pavonina* collected by Yashwant Rai**



Fig. 17. Growth status of *Sterculia villosa* in C.C.S Uni. Meerut dated 29 May 2018

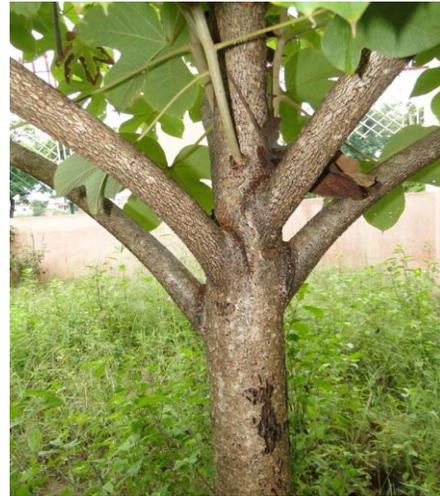


Fig. 18. Growth status of *Sterculia villosa* in C.C.S Uni. Meerut 27 August 2018



Fig. 19. Girth of *Sterculia villosa* 17 September 2019



Fig. 20. Growth status of *Sterculia villosa* in C.C.S Uni. Meerut 17 September 2019

#### 4. CONCLUSION

It is concluded that the aim of the present study is to spread awareness towards conservation of rare tree *S. villosa* and environmental management in those areas where the plant is now rarely found. This research work will also prove to be of immense usefulness for the conservation of rare tree species in the forest. Since this plant is beneficial for humans in many ways, therefore it is required that wide propagation and conservation of this plant should be carried out, in order to ensure that future generations can benefit from it.

#### DISCLAIMER

All the photographs are taken by Dr. Yashwant Rai.

#### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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