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## POLLINATION MECHANISMS IN GENUS *TERMINALIA* LINN.

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### Introduction

*Terminalia* Linn is a big genus of about 100 species widely distributed in the tropical and sub-tropical regions the world. Various species of *Terminalia* viz. *T. arjuna*, *T. tomentosa*, *T. chebula*, *T. belerica* and *T. paniculata* etc. have been extensively utilized in pharmaceutical, timber, tannin, leather and tasar industries (Chopra *et al.*, 1974; Singh *et al.*, 1983). Extensive plantations of *T. arjuna* and *T. tomentosa* have been already raised in Bihar, M.P., Orissa, West Bengal, U.P. and A.P. States of the country for tasar culture.

Present study was undertaken to collect informations on pollination mechanisms existing in four species of genus *Terminalia*.

### Materials and Methods

Observations were recorded on 2-3 selected trees at Piska Nagri, Farm of Central Tasar Research & Training Institute, Ranchi during May-June, June July, Sept.-Nov. and May-June months in *T. arjuna*, *T. tomentosa*, *T. paniculata* and *T. chebula* respectively in the year 1987-89. In order to check the nature of pollination for fruit setting the paniced spikes were covered with polythene bags before anthesis. Equal open sets of inflorescences served as control. The bagged inflorescence were shaken twice

during 9.00 to 10.00 hours to disburse the pollens over stigma. Observations were also recorded by resting on a ladder adjusted below the inflorescence from 8 hrs to 17 hrs initially. However, as the insect activity was more during morning, the subsequent observations were made from 8-10 hrs only. Hadegart (1976) and Mathew *et al.* (1987) also reported similar observations on teak pollinators in Thailand and India respectively. Collections were made using a hand net and the collected insects were later examined under the microscope to assess their comparative efficiency in pollen carriage. All the pollinators were identified by comparison with named species available in the collections of Entomology Section at CTR & TI, Ranchi.

### Results and Discussions

**Pollination :** In *Terminalia* around 300-500 bisexual flowers are produced per inflorescence. However, only a small percentage (5-10%) develops to fruits. The cross pollinated nature was supported by recording no fruit formation in 50, 80 and 20 bagged inflorescences in *T. arjuna*, *T. tomentosa* and *T. chebula* respectively. Only 250 seeds were produced in 20 nos of inflorescences bagged in *T. paniculata*, which too, were not viable. It suggests existence of self incompatibility in genus

*Terminalia*. This is supported by a large scale occurrence of morphological variations in each species of *Terminalia*.

Altogether 22 species of insects belonging to the orders Hymenoptera (6), Lepidoptera (6), Diptera (16), Hemiptera (2) and Coleoptera (2) were collected over *Terminalia* flowers listed in Table 1. Of the various insects collected, the *Achoea janata*, *Eristalinus arvorum*, *Apis florea*, *A. cercena indica*, *A. indica*, *Lespeyresia pseudonectis*, *Phalanta*

*phalantha*, *Polistes hebraeus*, *Eucelis*, *Lymantria semicineta* were the most frequent visitors on *T. tomentosa* whereas *Apis indica*, *A. cerena indica*, *Dysdercus cingulatus*, *Pyrophorus noctilucus*, *marginata* and few unidentified insects were observed at *T. tomentosa* and *T. chebula*. On the other hand *T. paniculata* was found to be visited by *Psiloptera fastuosa*, *Eristalinus arvorum*, *Syrripta orientalis*, *Bombylis*, *Tabanus striatus* and *Garphium nomius*.

**Table 1**  
*Insects involved in pollination of Terminalia species*

Order	Family	Insects	Feeding habit	Collection
1	2	3	4	5
Lepidoptera	Nymphalidae	1. <i>Phalanta phalantha</i> Drury	Nectar and pollen feeder	July-Sep
	Noctuidae	2. <i>Achoea janata</i> Meyr.	-Do-	-Do-
	Tortricidae	3. <i>Lespeyresia pseudonectis</i> Meyr.	-Do-	-Do-
		4. <i>Eucelis critica</i> Fabr.	-Do-	-Do-
		5. <i>Lymantria semicineta</i> Walker	Leaf and nectar feeder	-Do-
	Papilionidae	6. <i>Graphium nomius</i> Espar.	Nectar and pollen feeder	-Do-
Hymenoptera	Apidae	7. <i>Apis florea</i> Fabr.	-Do-	April-Sep
		8. <i>Apis indica</i> Fabr.	-Do-	-Do-
		9. <i>Apis cerena indica</i> Fabr.	-Do-	-Do-
		10. <i>Allodape marginata</i> Sm.	-Do-	-Do-

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	2	3	4	5
Hemiptera	Vespidae	11. <i>Polistes hebraeus</i> Fabr.	Predator, nectar and pollen feeder.	Sept.-Oct.
	Sphecidae	12. <i>Tachytes sinensis</i> Sm.	Pollen and nectar feeder	July-Aug.
	Pyrrhocoridae	13. <i>Dysdercus cingulatus</i> Fabr.	Leaf sap, nectar and pollen feeder.	May-Sept.
Coleoptera		14. <i>Canthecona furcellata</i> Fabr.	Predator, nectar and pollen feeder	July-Sept.
	Elateridae	15. <i>Pyrophorus noctilucus</i> .	Scraping, chewing, pollen and nectar feeder	July-Sept.
Diptera	Euprestidae	16. <i>Psiloptera fastuosa</i> Fabr.	Pollen and nectar feeder	Sept-Oct.
	Syrphidae	17. <i>Eristalinus arvorum</i> Fabr.	-Do-	July-Sept.
		18. <i>Syritta orientalis</i> Macq.	-Do-	Sept.-Oct.
	Muscidae	19. Not identified	-Do-	-Do-
	Bombyliidae	20. <i>Bombylis comastes</i> Brunn.	-Do-	July-Sept.
	Tabanidae	21. <i>Tabanus striatus</i> Fabr.	-Do-	-Do-
	Tachinidae	22. <i>Blepharipa zabina</i> Walker	Parasite, pollen and nectar feeder.	-Do-

**Pollen foraging :** Pollen foraging insects operated between 07.30 to 12.00 hrs in the morning and 15 00 to 17 00 hrs towards evening. Thus two frequency peaks appeared for pollen collection *Apis florea*, *Apis indica*, *A. cerena indica*, *Achoea janata*, *Eristalinus arvorum*, *Lespeyresia pseudonectis*, *Eucelis critica*, *Lymantria semicineta*, *Allodope marginata*, *Psiloptera fastuosa*, *Phalanta phalantha* etc. alight on the inflorescence and move along the flower rows covering 5-10 flowers at a time.

*Eristalinus arvorum*, *Apis florea*, *A. indica*, *A. cerena indica*, *Achoea janata*, *Lespeyresia pseudonectis*, *Eucelis critica*, *Allodope marginata*, *Psiloptera fastuosa* and *Tabanus striatus* were found to be active collectors of pollen and worked consistently for about 2-4 minutes on the same spike.

**Nectar foraging :** Nectar loving insects and bees alight on the spikes and thrust their head into the base of the ovary in between the calyx and androecium to seek

nectar. In this process, they dust the pollen grains deposited over their body to stigmatic surface.

Amongst the two, pollen foragers are generally more efficient pollinators than nectar foragers. The movement of the bees

were clockwise and was not observed at noon possibly due to high temperatures.

This study reveals that insects, particularly Hymenopterans, particularly the collected bees like *A. indica* and *A. florea* can be successfully utilized for enhancing pollination and improve seed set.

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#### SUMMARY

Studies on the pollination mechanisms of four species of genus *Terminalia* Linn. conducted at Central Tassar Research & Training Institute, Ranchi revealed that pollination is entomophilous. Out of 22 insect pollinators collected a maximum number belonged to Lepidoptera (6) and Hymenoptera (6) and bees play very important role in pollination.

टर्मिनेलिया लि० वर्ग में सेवन क्रियाविधि

पी०के० श्रीवास्तव

सारास

टर्मिनेलिया लि० की चार जातियों के परागण संबंधी अभिक्रियाओं का अध्ययन केन्द्रीय तसर अनुसंधान एवं प्रशिक्षण संस्थान, राँची में किया गया जिससे यह ज्ञात हुआ कि परागण की क्रिया द्वारा निष्पादित होता है। कुल एकत्रित 22 कोट परागणकारियों में सबसे अधिक लेपिडोप्टेरा (6) डिप्टेरा (6) एवं हाइमेनोप्टेरा (6) तथा मधुसूयाँ परागण में बहुत ही महत्वपूर्ण भूमिका निभाती हैं।

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