Journal of Tropical Forest Science 13(2): 394–396 (2001)

POLLEN PRODUCTION IN RELATION TO POLLINATION BEHAVIOUR IN SOME MULTIPURPOSE HIMALAYAN TREES

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Most angiosperms have been given particular attention due to their known significance as a major factor in human allergy. The researches carried out in this area yield data on the amount of pollen produced per anther or flower of the investigated species. Janaki & Subba (1980) and Subba & Reddi (1986) determined the pollen production per anther of several angiosperms. However, it is most important to estimate pollen production, not only aerobiologically but also from its breeding standpoint, as the production of seed often depends on the production of pollen (Faegri & Iversen 1964, Cour & van Campo 1980).

Although aeropalynological surveys have been conducted at various places in India, their data did not include pollen production studies. The density of dispersion of the various pollen types in the air at any locality is dependent on several factors, including pollen production. In the present study therefore, an attempt was made to study the pollen production per flower in relation to their pollination behaviour of 15 tree species.

For the present study, pollen grains from five anthers comprising different flowers for each tree species were counted. The anthers were obtained from closed flowers, kept in 70% ethanol, washed in distilled water, and placed in test tubes. They were taken apart with the aid of a glass rod and the pollen grains were suspended in 1 ml distilled water. From this concentrate, a drop of 10 µl was transferred to a microscopic slide and the number of pollen grains was counted under a microscope. Counting was replicated five times and the number of pollen grains per anther was calculated. The production of pollen grains per flower was estimated by multiplying the number of anthers per flower with the average number of pollen grains per anther (Cruden 1977). The mode of pollination (anemophilous, entomophilous, etc.) of the studied taxa was verified during field investigation, which was recorded for 10 randomly chosen flowers.

From the data obtained for 15 multipurpose angiospermous tree species (Table 1), it was evident that pollen production in terms of numbers per anther varied widely from species to species. The largest amount of pollen production per flower was observed in *Morus alba* (100 884) and the lowest in *Grevillea robusta* (1880). Some of the tree species like *Toona ciliata, M. alba* and *Holoptelea integrifolia* have previously been reported in allergic responses to human beings by Nair & Rastogi (1963) from India while *Celtis australis* and *Juglans regia* were reported in North America (Lewis *et al.* 1983).

Variations in pollen production could be attributed to the mode of reproduction of the particular species (Smart *et al.* 1979). Fryxell (1957) found that high pollen production per anther occurred principally in cross-pollinated and self-incompatible species, whereas the low pollen producers were either self-pollinated or apomictic. Moreover, wind-pollinated taxa are known to produce copious amount of pollen compared to insect-pollinated ones. The variations observed in the present study could be similarly interpreted, and all the species having a figure higher than 2000 pollen grains per anther are wind-pollinated, except for *Bauhinia variegata.*

Received June 1999
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Table 1. Pollen production in relation to pollination behaviour in some multipurpose Himalayan trees

Name of the species	Family	Anthers/flower	Pollen grains/anther	Pollen grains/flower	Mode of pollination
Celtis australis	Ulmaceae	4	1892 ± 61.26	7568	Anemophilous
Holoptelea integrifolia	Ulmaceae	7	9322 ± 104.18	65 254	Anemophilous
Morus alba	Moraceae	4	25 221 ± 215.00	100 884	Anemophilous
Juglans regia	Juglandaceae	32 ± 3.75*	2786 ± 54.19	89 152	Anemophilous
Grewia optiva	Tiliaceae	182 ± 7.23*	285 ± 13.12	51 870	Entomophilous
Lyonia ovalifolia	Ericaceae	10	1534 ± 76.00	15 340	Entomophilous
Leucaena leucocephala	Mimosaceae	10	862 ± 31.52	8620	Entomophilous
Bauhinia variegata	Caesalpinaceae	3	8745 ± 105.00	26 235	Entomophilous
Dalbergia sissoo	Papilionaceae	9	789 ± 34.17	7101	Entomophilous
Grevillea robusta	Proteaceae	4	470 ± 4.38	1880	Entomophilous
Aesculus indica	Hippocastanaceae	7	3621 ± 81.12	25 347	Anemophilous
Acer caesium	Aceraceae	8	1915 ± 31.54	15 320	Anemophilous
Toona ciliata	Meliaceae	5	1289 ± 81.00	6445	Entomophilous
Vitex negundo	Verbenaceae	4	921 ± 15.13	3684	Entomophilous
Jacaranda mimosaefolia	Bignoniaceae	4	627 ± 8.57	2508	Entomophilous

* Mean ± S.E. given due to variations in number of anthers per flower

Comparison of the pollen production of some of the species in this study with those reported earlier by other workers (Nair & Rastogi 1963, Singh & Choudhury 1981, Subba & Reddi 1986, Tormo *et al.* 1996) have shown variations in pollen count, which in certain cases, are very pronounced. These disparities could partly be due to lack of uniformity in the methodology used by the different workers. In any case the pollen production data (Table 1) of these 15 multipurpose angiospermous tree species could be helpful for assessment of the relative capacity of each species to charge the ambient air with their pollen. Also proper utilisation of the data is possible for studies on atmospheric pollen collected from any locality, where these taxa are distributed.

Acknowledgements

The authors are thankful to all the anonymous reviewers of the earlier draft of this manuscript for their valuable suggestions and criticism and also to the Indian Council of Forestry Research and Education (ICFRE), Dehra Dun for providing the financial assistance.

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