

ANTHESIS AND POLLEN STUDIES IN NUTMEG *MYRISTICA FRAGRANS* HOUTT

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ABSTRACT

A study of anthesis and pollen viability in nutmeg showed that anthesis started at 3 a. m. and continued upto 5 a. m. The anther dehiscence was observed to take place about 36 hr. in advance of the anthesis between 9 a. m. and 2 p. m. The pollen grains so held inside the flower were released as a cloud at the time of anthesis. The male flowers were shed in about 36 hr. after anthesis. The pollen had a mean diameter of 48.8μ , non-sticky, pilated in sculpture, spherical in shape and without any aperture. No insects were observed to visit the flowers at the time of anthesis.

Of the different concentrations of sucrose tested, maximum pollen germination of 74.3% was recorded in 5% sucrose solution. Pollen tube growth was also maximum in this concentration. Pollen germination was observed to start 2 hr. after the dusting of the pollen into the medium and was complete in about 5 hr. The mean stainability of pollen was 96.9%.

INTRODUCTION

Barring the report that pollination in nutmeg is effected by moth (Deinum, 1949), no information is available on the floral biology and pollen viability in this crop. Results of a study undertaken on anthesis, anther dehiscence, pollen morphology and pollen germination are presented in this paper.

MATERIALS AND METHODS

For the study of anthesis and pollen viability, four trees (one typical male tree and three bisexual trees of varying yield levels) were selected at three locations of the nutmeg growing areas of Kandy, Sri Lanka. The study of anthesis and anther dehiscence was limited to the typical male tree, while flowers from all the trees were used for other studies.

Five branches of the male tree were marked and all the open flowers removed. Anthesis was studied at hourly intervals using a hand lens. The time taken for complete opening of the flowers from the commencement of the anthesis to shedding was also recorded.

Flowers of the same tree were also used to study anther dehiscence. Twelve flower buds which required two to three days for their opening were selected. Half of the perianth was removed from all the selected flowers and covered with polythene. The anthers were examined at hourly intervals from 8 a. m. to 3 p. m.

One hundred and twenty immature flowers were selected and tagged. Ten flowers were randomly collected

and anthesis and anther dehiscence noted at 9 a. m. and 4 p. m. for six consecutive days to study the relationship between anthesis and anther dehiscence.

Pollen grains were dusted on to a drop of glycerine-acetocarmine on a clear microscope slide and their shape and surface characters recorded. Fifty pollen grains were measured from each tree to record the size. Pollen colour was observed using fresh pollen and the degree of stickiness assessed from the amount of pollen that was shed when the flowers were tapped using the fingers. Flowers collected from all the trees were dusted on to a drop of glycerine-acetocarmine stain on slide and about 500 pollen scored for pollen stainability and diameter of stained and unstained pollen grains were measured separately.

Sucrose solutions of different concentrations (1%, 5%, 10%, 15%, 20% and 25%) were used as media for pollen germination. Fresh pollen grains from flowers collected from all the trees were dusted on to a drop of the respective medium on clean microscope slides. The slides were kept in a petri dish lined with moist filter paper and examined at hourly intervals to determine the time of commencement of pollen germination and completion. Size of the germinated and ungerminated pollen grains and pollen tube length were measured. Observations were made in triplicate and about 300 pollen scored. The presence of insects in the flowers or in their vicinity was also noted.

RESULTS

Anthesis

Fifty five per cent of the flowers opened between 3 a. m. and 4 a. m. and

the rest between 4 a. m. and 5 a. m. Observations on the time taken by the male flowers to complete the opening and the period over which they are retained on the tree, are given in Fig. 1. It could be observed from Fig. 1 that the flowers required about two hours to open completely and were retained on the tree for about 36 hr. before they were shed.

Anther dehiscence commences at 9 a.m. and continues upto 2 p.m. About 62.5% of the anthers open between 9 and 11 a.m.

Data on the relationship of anther dehiscence and anthesis showed that anthesis takes place 36-48 hr. after anther dehiscence.

Pollen stainability and size

The stainability of pollen grains in acetocarmine-glycerine solution was 96.87%. The diameter of stained pollen grains was slightly more ($51.58 \pm 0.93 \mu$) than unstained pollen grains ($49.08 \pm 2.5 \mu$).

Pollen germination and tube growth

Observation on pollen germination and maximum length of pollen tube in distilled water and different concentrations of sucrose solutions are given in Table I.

The highest germination of 74.3% was obtained in 5% sucrose followed by 24.4% in 10% sucrose solution. Maximum pollen tube length was also observed in 5% sucrose solution (Table I).

Further it was observed that in 5% sucrose solution the germination starts two hours after dusting the pollen and is complete in about five hours.

Fig 1: Opening and shedding of flowers in male nutmeg tree

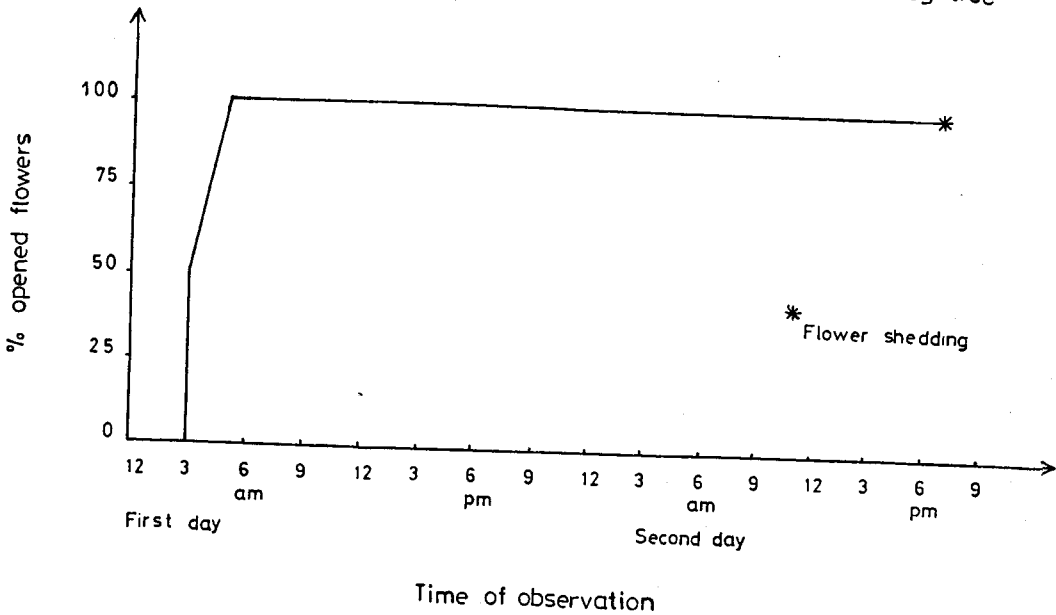


Table I. Pollen germination and tube growth in different concentrations of sucrose (after 20 hr.)

Media	Germination %	Pollen tube length (μ)
	Mean	Mean
Distilled water	10.50 \pm 1.96	25.1 \pm 2.9
Sucrose 1%	19.0 \pm 5.36	15.89 \pm 15.7
" 5%	74.3 \pm 5.70	82.55 \pm 9.48
" 10%	24.3 \pm 1.87	35.33 \pm 3.51
" 20%	13.1 \pm 1.51	21.77 \pm 3.28
" 15%	6.3 \pm 1.59	13.22 \pm 5.01
" 25%	—	—

DISCUSSION

Information on floral biology and pollen viability is essential for taking up genetic improvement work in any crop. The results obtained in the present study showed that anther dehiscence in male flowers of nutmeg takes place about 36 hr. earlier to anthesis thus holding the pollen inside the perianth. Such unopened flowers can be collected and

used for pollination in crossing programme. It is, however, not known whether the anther dehiscence and anthesis in bisexual flowers also follow a similar pattern. If so, emasculation of bisexual flowers earlier to 36 hr. is essential to avoid self-pollination.

Deinum (1949) had suggested pollination in nutmeg through a moth.

However, in the present study none of the crawling or flying insects were found visiting nutmeg flowers and hence role of insects as a pollinating agent is ruled out. Absence of attractive floral parts like petals and sepals also support this view. Anthesis takes place in the early hours of the day and a cloud of pollen is released at the time which is dispersed by the morning breeze. Hence pollination in nutmeg is presumed to be assisted by wind. The pollen size of nutmeg which is between media and magna and its non-sticky nature also favour wind pollination.

It appears that during the period of about 36 hr. between anther dehiscence and anthesis, enough pressure is developed inside the flower which may help in the sudden release of large quantity of pollen when the flowers open.

The pollen grains which are spherical in shape and pilate in sculpture

did not show much variation in diameter, shape, stainability and pollen germination. Uniformly viable pollen, may be due to the very narrow genetic base with which nutmeg cultivation might have been started in Sri Lanka. This is not improbable since it is an exotic species.

Since the present study has covered only anther dehiscence and anthesis in male flowers, similar studies in bisexual flowers along with information on stigmatic receptivity are needed to standardise hybridization techniques in nutmeg.

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