

ANTHESIS AND ANTHER DEHISCENCE OF CASHEW FLOWER

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ABSTRACT

Round the clock observations on anthesis were made for five consecutive days in three periods of flowering viz., early December, mid-February, and late April. The peak period of anthesis of male flower was around 6 h and the same for bisexual flower was around 11 h. The time taken for anther to dehisce with respect to flowers opened at different hours starting from 6 h was recorded. The time required for dehiscence reduced linearly as the day advanced.

INTRODUCTION

Cashew (*Anacardium occidentale* L.) has been assuming considerable importance as a plantation crop in India. Increase in productivity by breeding was initiated about two decades ago. Basic information on anthesis and pollen build up would help to work out time schedules of collecting of pollen which will be utilised in the directed crosses or in assisted pollination. The present study aims to collect the above informations with the possible details and also to examine critically the role played by wind in the pollination of this species.

Floral biology of cashew had received early attention from several workers (Aiyadurai and Koyamu, 1957; Rao and Hassan, 1957; Damodaran *et al.*, 1966; Northwood, 1966 and Thimmaraju *et al.* 1980). There is a general conformity on the time of anthesis of male and bisexual flowers, in spite of the fact that the different set of observations were made at varying eco-climatic conditions.

The present study may be considered as a re-investigation, differing only in the details of methodology.

MATERIALS AND METHODS

This study was conducted at Central Plantation Crops Research Institute, Vittal, during the flowering season of 1979-80. The trees selected for this study are from the germplasm planted in 1972. Three sets of experiments were carried out to gather information on anthesis, anther dehiscence and wind pollination.

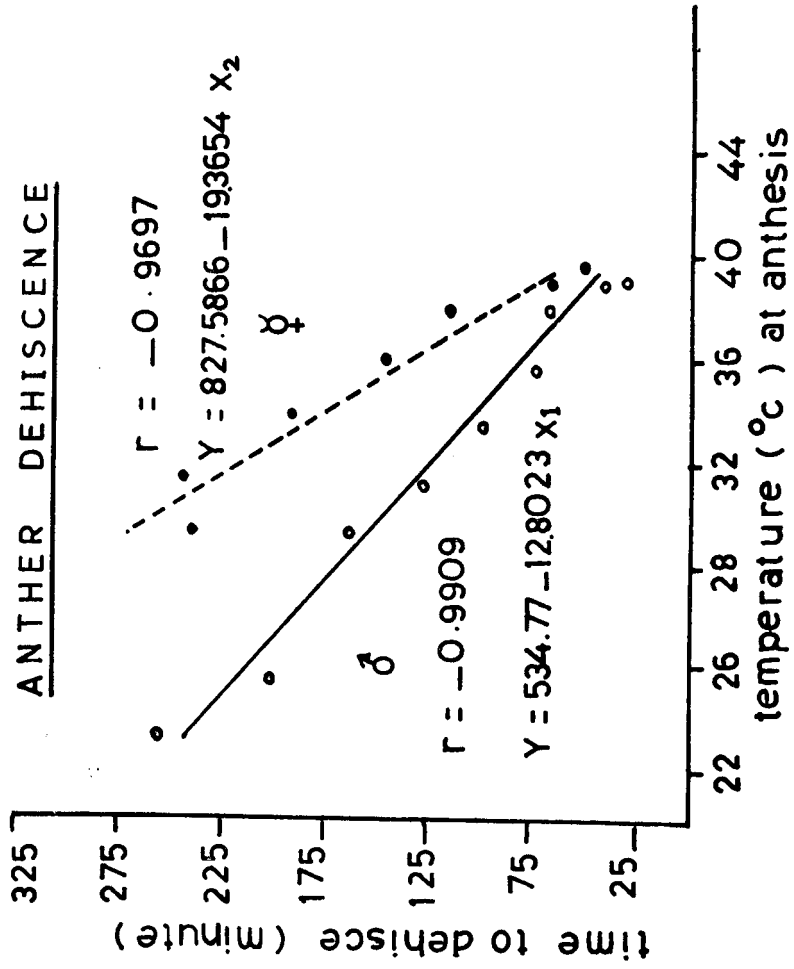
Anthesis : Twelve trees of easy access in night hours were selected. Twelve panicles per tree were tagged when the panicles were in about 50% flowering. Flowers already opened were pinched off. Freshly opened male and bisexual flowers were counted at hourly intervals, round the clock, for five consecutive days. After counting the flowers they were pinched off in order not to confuse with that of subsequent openings. The records were taken for three periods of one flowering season namely, the early (December 7-12), middle (February 13-18) and late (April 1-5).

Anther dehiscence : This study was conducted during the late season of flowering (April 6-10). A total number of 568 male and 162 bisexual flowers were tagged on two trees over five consecutive days. The tags were of light weight and coloured enough to differentiate between the ones opened at different hours. The anthers were examined at half-hourly intervals for incipient dehiscence, judged by viewing through an 'optical' head-gear. The observations started from 6 h and ended at 16 h. The ambient temperature and relative humidity were recorded by portable devices.

Test for wind pollination: Pollen count was made with the aid of a portable spore-cum-pollen trap of 'rotorod' model. The pollen trap was set up at different heights of the flowering branches at peak hours of pollen production.

RESULTS AND DISCUSSION

Anthesis : The observations made for the three periods of the season were found to follow more or less comparable trend and hence the data were pooled. A total of 15926 male and 1359 bisexual flowers were counted. (Table 1; Fig. 1). The anthesis activity in any appreciable quantity starts from 3 h (2.04%) and



increase gradually till 5 h (8.7%). At 6 h the increase was sharp rendering the distribution a highly peaked one. Between 12 h and 16 h the frequencies were found low, ranging between 1 and 2%. The frequency of flowers opened between 18 h and 2 h was found to range between 0.0 to 0.5% and may be considered of negligible consequence.

The bisexual flowers showed a different trend. The distribution is much more peaked and 35.9% of anthesis was found concentrated around 11h. The anthesis begins in some appreciable frequency at 9 h (5.2%) and steadily increased to 21.63% at 10 h to reach the peak at 11h, thereafter, it decline gradually up to 14 h.

Anther dehiscence : Flowers opened at 6 h had taken 252 minutes for anther dehiscence. As the day advanced the time taken for anther dehiscence declined. Thus, flowers opened at 14 h had their anther dehisced in just 30 minutes. The time taken for dehiscence has been plotted against temperature and was found to have negative correlation. When plotted against relative humidity the correlation was found positive and significant. The fit with respect to temperature and time for dehiscence was found more perfect and the fitted equation is presented (Table 2, Fig. 2). This finding is in agreement with the observation made by Northwood (1966). The observation of Damodaran *et al.* (1966) that flowers under shade, mature late can be explained as an influence of temperature rather than of light.

The dehiscence of anther in the bisexual flower showed similar relationship as in the above case. However, in bisexual flower, anther dehiscence took longer time though the anther was exposed to comparatively higher temperatures. This may be due to the difference in morphology, size and weight between male and bisexual flowers, and due to the accompanied changes in the water relations.

It may be inferred from the above findings that 70% of male flowers opened between 6 h and 10 h. Anther dehiscence in all this high proportion of flowers occurs during the short time span of 10.30 h to 12 h. Thus a high pollen build up can be found timing with the peak of bisexual flower anthesis. Considering the fact that stigma is immediately receptive at anthesis (Rao and Hassan,

Table 2. Anther dehiscence in cashew.

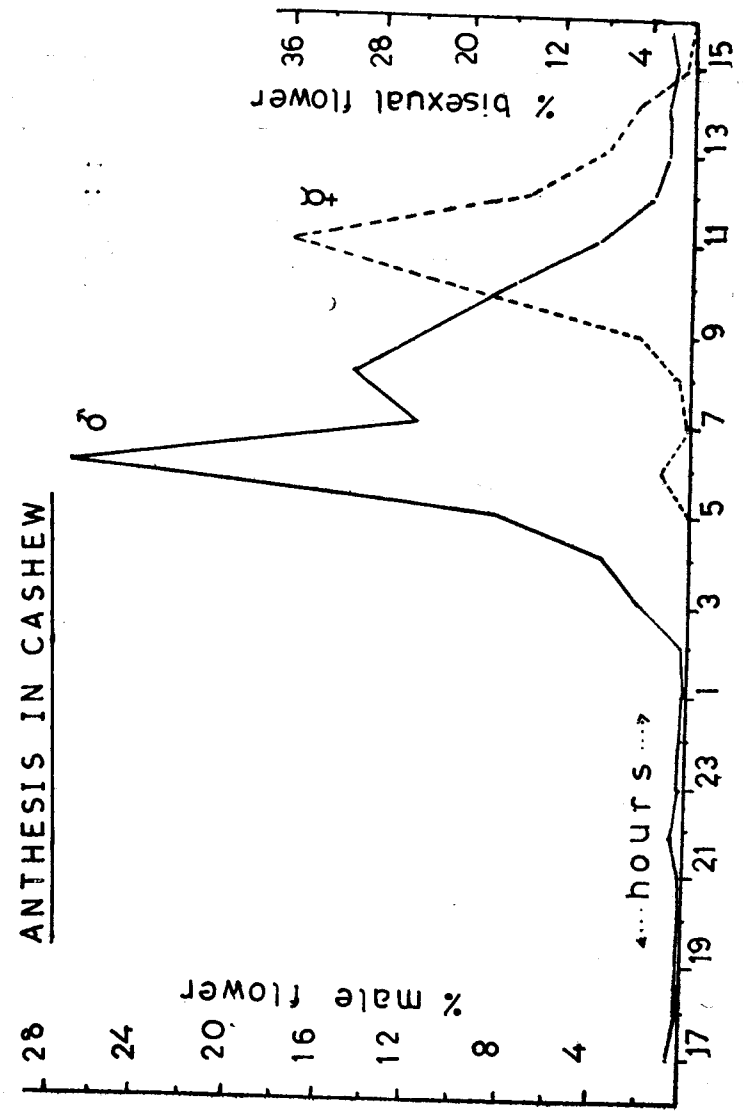
Hour	At anthesis :		Time to dehise (minutes)=Y	
	Temperature (x1)	R.H. (x2)	Male	Bisexual
6	23.0	92.5	252	..
7	25.5	92.5	200	..
8	29.0	84.3	168	240
9	31.0	79.3	129	246
10	33.2	70.5	100	193
11	35.5	61.8	75	150
12	37.6	59.1	72	120
13	38.8	50.1	41	67
14	39.0	49.0	30	50

$r = -0.9909$	$r = -0.9697$
$Y = 534.77 - 12.8023 x_1$	$Y = 327.58 - 19.3654 x_1$

$r = +0.9663$	$r = +0.9849$
$Y = -184.70 + 4.27 x_2$	$Y = -212.89 + 5.63 x_2$

1957, Agnolini and Giuliani, 1977), this synchronisation is of considerable adaptive significance. The information obtained through this study restricts the time of pollen collections between 10.30 and 12 h so that this could be utilised in the assisted pollination or directed crossing, as the case may be. Very few pollen could be found attached to anther lobes in the late afternoon.

The pollen of the bisexual flowers is not available to the already receptive stigma of the same flower, due to delay in anther dehiscence. This affords a temporal isolation between male and female organs of the same flower. This prevents the strictest form of selfing in nature (autogamy). However, this does not rule out selfing since the chance of pollination between different flowers of the same tree (geitonogamy) may be equal or greater than that of crossing between trees (xenogamy). Either of the cases are desirable to the maximum possible intensity so far as total nut production is concerned. The difference lies only in the genetical consequence of the seed wherein geitonogamy leads to the same make up as that of autogamy. Quantifying of the selfing versus crossing is beyond the scope of



this study. However, it may be viewed that xenogamy may be the desired mode of pollination as it leads to heterozygosity and heterosis (Damodaran, 1975).

Wind pollination : The test for pollen presence in the air has so far produced absolutely negative result. This is contra-suggestive of the assumptions made by Agnolini and Giuliani (1977) that wind is a possible pollinating agent in cashew. The present finding corroborates the conclusion of Northwood (1966) which was drawn from a study conducted by implanting sticky tapes on the tree.

Considering the anemophilous syndrome of flowers in general (Faegri and Van der Pijl, 1971), we find only negative traits in cashew flower. To the contrary, there are many traits in this species positive to the entomophilous syndrome. Detailed investigations in this direction are under way.

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