

FRUIT SET, FRUIT DEVELOPMENT AND FRUIT DROP IN NUTMEG (*MYRISTICA FRAGRANS* HOUTT.)

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Low fruit set and heavy fruit drop are the two most important factors which reduce nutmeg yield considerably. Low fruit set in nutmeg has already been reported by Sloff (1950) and Flach (1966). It is reported that the fruit drop in nutmeg is mainly due to physiological disorders which are influenced by a series of interacting factors (Sloff, 1950). Leslia (1963) and Cruickshank (1973) found that the time taken for fruit maturity in nutmeg varies from place to place. The details of fruit setting and fruit development and factors regulating fruit drop were studied in the present experiments.

Materials Methods

The studies were conducted on bearing nutmeg plants available in the District Agricultural Farm, Mannuthy. Four female plants of the same group (17 years) and receiving uniform cultural practices as per the Package of Practices (Anon. 1978) were selected for the studies.

The percentage of natural set was assessed by tagging 100 female flowers each in the four canopy segments corresponding to the East, West, South and North aspects of the selected female trees. Observations were made at weekly intervals and those flowers which were retained after three weeks were reckoned as 'set' ones. To ascertain whether there was any apomictic fruit set, 100 female flowers were bagged on each tree with muslin bags. The effect of hand pollination was studied by hand pollinating 100 flowers on each tree with pollen collected from mature dehisced buds.

To study the developmental stages of the fruits and the extent of post-set drop, young fruits of 15 to 20 days (marble stage) were tagged and observed at weekly intervals. Tagging was done by taking equal samples on all the four quadrants of the canopy. Fruit girth was measured by using a non elastic twine and meter scale. A total of 800 fruits were taken for the study.

The data obtained were statistically analysed following the methods suggested by Snedecor and Cochran (1967).

Results and Discussion

Fruit set

The data on fruit set are presented in Tables 1 and 2.

The percentage fruit set was nil for the flowers excluded from pollination and the set was maximum for hand pollinated ones (88.75%). Open pollination

recorded 33.70% per cent set. The tree-wise and the aspect-wise difference in natural set were found to be significant at one per cent level (Table 2). This may be due to the variations in the physiological conditions of the tree. The aspect-wise difference in fruit set could be explained on the basis of the relative position of flower. In nutmeg, since the peak flowering season coincides with the peak rainy season (July), the better set on eastern and western aspects might perhaps be due to better exposure to sunlight of these areas.

Fruit development and drop

The data on fruit development showed that the fruits take seven to eight months after set (206 to 237 days) to attain maturity (Plate I). This observation is almost in conformity with Cruickshank (1973). Fruits showed a sigmoid growth pattern with a peak between sixth and sixteenth week (Fig. 1).

There was fruit drop in all the months with the maximum between eighth and sixteenth week after set (Fig.1). Total drop after set accounted to 74.4 per cent (Table 3).

Table 1
Fruit set in Nutmeg under different conditions

Treatments	No. observed	No, set	Percentage set
No pollination	100	Nil	Nil
Open pollination	456	154	33.70
Hand pollination	80	71	88.75
		χ^2	= 86.83 **

** Significant at 1 per cent level

Table 2
Variation in fruit set in different trees and in different aspects of canopy spread

Tree No.	Percentage fruit set	Aspects	Percentage fruit set
1	39.00	East	36.63
2	41.60	South	30.50
3	29.50	West	37.60
4	250.0	North	30.38
Mean	33.70		33.70
F Value	38.52 * *		9.31 * *
CD	2.48		2.48

* Significant at one per cent level.

Table 3
Mean monthly increase in fruit girth and percentage drop of nutmeg fruits

Months after set	Increase in girth		
	Mean	Mean expressed as percentage of the total	Percentage drop
1	2.25	15.38	3.48
2	2.80	18.66	1.95
3	4.59	30.21	24.75
4	3.38	24.37	31.90
5	0.88	6.29	8.17
6	0.45	3.17	2.65
7	0.28	1.92	1.50
Total	14.63	100	74.40
F Value	74.40 * *		275.42 * *
CD	0.56		1.98

* * Significant at one per cent level

Table 4
Mean fruit girth and percentage drop in nutmeg

Tree No	Fruit girth		% drop		Aspects	Fruit girth		% drop	
	Total	Mean for the month	Total	Mean for the month		Total	Mean for the month	Total	Mean for the month
1	14.3	2.04	62.9	8.99	East	14.6	2.08	75.0	10.71
2	15.0	2.14	58.9	8.41	South	14.8	2.11	72.0	10.23
3	14.7	2.10	94.5	13.50	West	14.4	2.06	73.1	10.44
4	14.9	2.13	87.4	12.49	North	14.1	2.01	77.5	11.07
F		0.11 NS		25.78 * *			0.11 NS		0.31 NS
CD				1.4					

NS = Not significant

* * = Significant at one per cent level

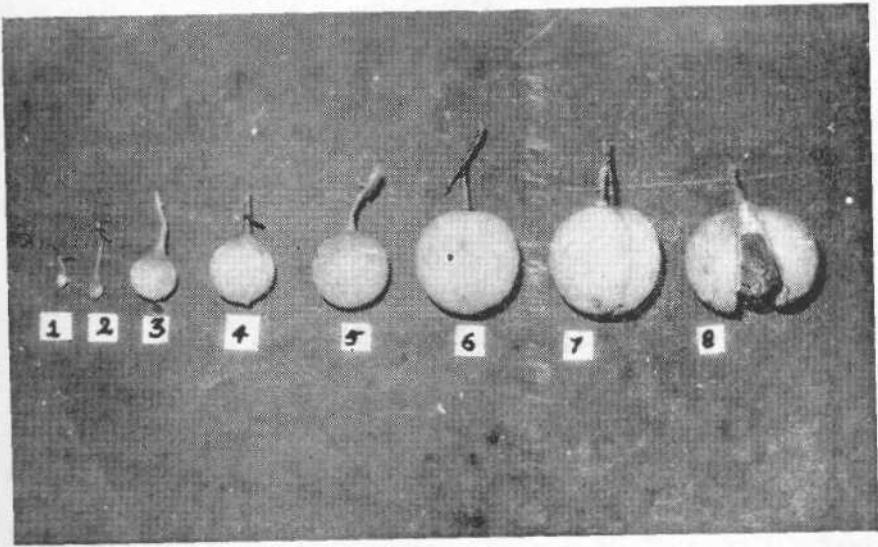


Plate 1 Stage of development of nutmeg fruit

- | | |
|--------------------------|---------------------------|
| 1. Open flower | 2. One month after set |
| 3. Two months after set | 4. Three months after set |
| 5. Four months after set | 6. Five months after set |
| 7. Six months after set | 8. Seven months after set |

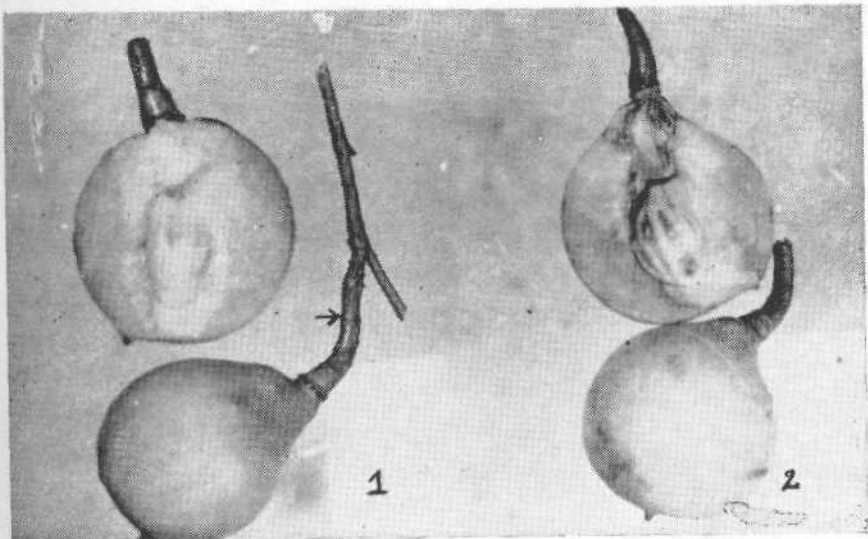


Plate 2 Immature nutmeg fruits

1. Healthy fruit retained on the tree indicating the region of abscission
2. Dropped fruit

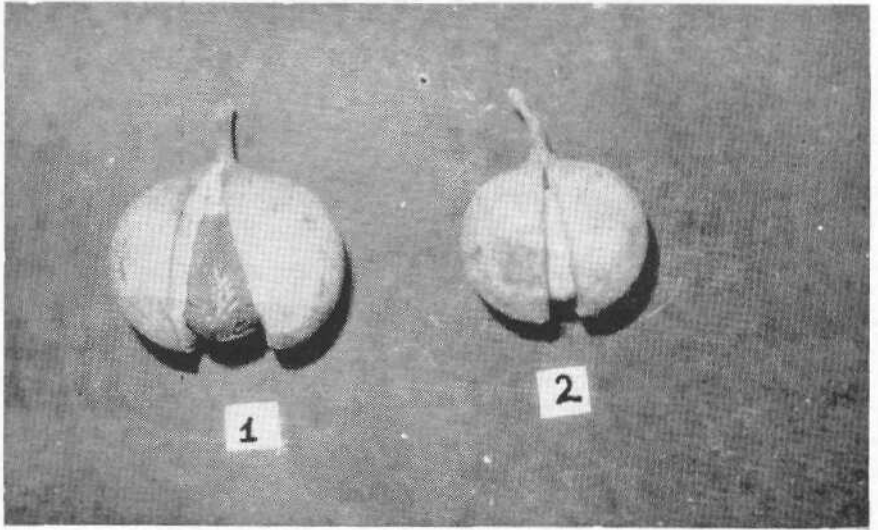
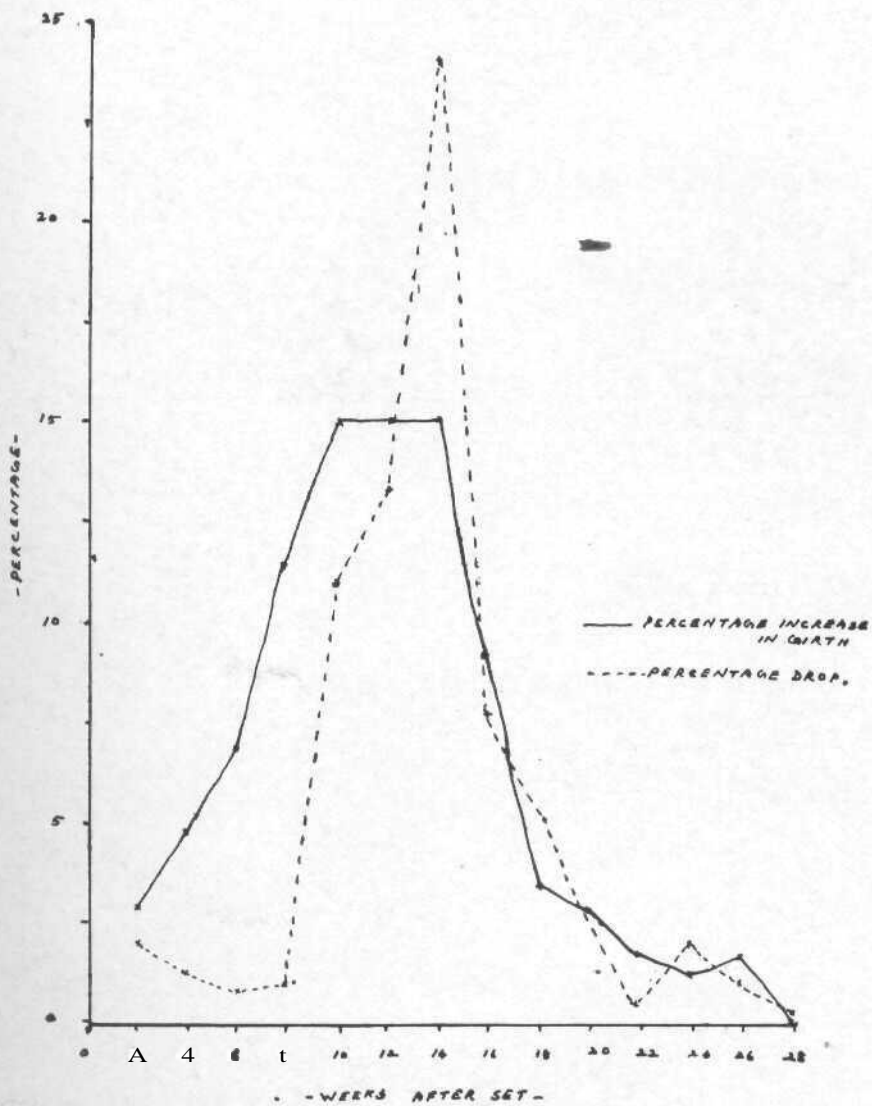


Plate 3 Splitted fruits of nutmeg

1 Mature split

2 Immature split



-Weeks after set-

Fig. 1 Percentage increase in fruit Girth and fruit drop

Pests and diseases were not found to be associated with the dropped fruits. Freshly dropped fruits showed a discolouration of the embryo (Plate 2) and were found to abscise at the base of the pedicel which becomes dry and light brown. Premature fruit split (Plate 3) was also observed.

Maximum drop coincided with the peak fruit development period indicating the possibility of nutrient competition as one of the major factors implicated in the fruit drop. The drop was found to vary significantly from tree to tree which might be due to inherent physiological variations among the trees. There was no significant canopy aspect-wise difference for the fruit development and fruit drop (Table 4).

Flach (1966) has reported 50 per cent initial set and Sloff (1950) reported 60 per cent fruit drop in nutmeg after fertilization. The variation of the present results may perhaps be attributed to the variation in the agro-climatic conditions in these regions.

Summary

Studies on fruit set, development and fruit drop in nutmeg (*Myristica fragrans* Houtt.) conducted in Kerala, India have indicated that the fruit set was only 33.7 per cent while the post-set fruit drop was 74.4 per cent. The ultimate harvested yield accounted to only about 8.2 per cent of the total flower production. Therefore, the best method to increase fruit production is to increase the set and to lower the fruit drop. Hand pollination increased the set by about 2.5 times as compared to the natural set. The fruits showed a sigmoid growth pattern and took seven to eight months to attain maturity. Maximum drop period synchronised with the peak development period of sixth to sixteenth week after set, indicating nutritional imbalance as one of the major factors influencing fruit drop

സംഗ്രഹം

ജാതി മരത്തിലെ കായ്പിടുത്തം, കായ്കൊഴിച്ചിൽ എന്നിവയെ സംബന്ധിച്ചുള്ള പഠനങ്ങളിൽ കായ്പിടുത്തത്തിന്റെ ശതമാനം 33.7% മാത്രമാണെന്നു കണ്ടു. ശരാശരി 74.4% കായ്കളും മുപ്പത്തുനൂറ്റാണ്ടിനുശേഷം കൊഴിഞ്ഞുപോകുന്നതുമൂലം ഗണ്യമായ വിളനഷ്ടം അനുഭവപ്പെടുന്നു. ഉല്പാദിപ്പിക്കുന്ന പുഷ്പങ്ങളുടെ 8.2% മാത്രമേ പൂർണ്ണവളർച്ചയെത്തിയ കായ്കളായി ലഭിക്കുന്നുള്ളൂ. ജാതിയിൽ അപരാഗണ ഫലനം കാണപ്പെട്ടില്ല. കൃത്രിമ പരാഗണം മൂലം കായ്പിടുത്തം രണ്ടരമടങ്ങു വർദ്ധിപ്പിക്കാമെന്നു കണ്ടു. കായ് മുപ്പത്തുനൂറ്റാണ്ടിനു ശേഷം മുതൽ എട്ടുമാസം വരെ സമയമെടുക്കുന്നു. ഏറ്റവും കൂടുതൽ കായ്പ്പെഴിച്ചിൽ കായിനം ഏറ്റവും കൂടുതൽ വളർച്ചയുള്ള സമയത്താണ് (കായ്പിടുത്ത് 6-16 ആഴ്ചകൾക്കുള്ളിൽ) കാണപ്പെട്ടത്.

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