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Vegetative and Reproductive Growth Pattern of Mango (*Mangifera indica* L.)

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ABSTRACT

Studies were undertaken to understand vegetative and reproductive physiology of mango cv. langra (*Mangifera indica* L.). Maximum flushes appeared from April to August. Several flushes resumed their growth after alternate months while others ceased after first extension. Occurrence of blooming was found affected from the time of flush emergence and ceasing of its growth. The malformation of inflorescence was more frequent on panicles emerged on late flushes. The blooming terminals if removed or remained unfruitful resumed vegetative growth in the same season while fruit bearing terminals could start vegetative flushes during the following season.

Key Words: Vegetative; Reproductive; Growth; Mango

INTRODUCTION

Mango is extensively grown in tropical and sub-tropical regions of the world. The commercial cultivars suffer from the intricate problems of alternate bearing and mango malformation which appear mainly because of enigmatic blooming and vegetative growth behaviour (Chacko, 1991). Growth in mango occurs as terminal flushes and thus a period of growth may follow a period of quiescence which appears essential to ensure flowering (Popenoe, 1939; Chacko, 1985). Mature flushes are high in starch and bloom more readily (Chacko *et al.*, 1982). Physiological maturity appears directly related with flower bud differentiation (Sen & Malik, 1946; Singh, 1978). Most of the vegetative growth is produced from non-flowering shoots. Furthermore, shoots which carry mature fruit have been reported to have markedly lower probability of vegetative growth compared with those which have not flowered (Issarakraisila *et al.*, 1991). This study was hence objected to further understand the complex growth pattern and to explore for yearly production of mango (*Mangifera indica* L.).

MATERIALS AND METHODS

Studies were carried out at experimental fruit garden of the University of Agriculture, Faisalabad during 1996-98. Ten years old healthy and uniform trees of mango cv. Langra were selected for the studies. Flushes emerging during April to September were tagged on each tree individually. Data on blooming were recorded in the following blooming season i.e. February-April. Different flushes were considered as treatments. Following data were recorded:

i. Intensity of emergence of monthly flushes
ii. Growth continuity pattern of flushes
iii. Reproductive pattern of flushes

The observations were further extended on the behaviour of vegetative and blooming of flushes during the subsequent year. The flushes tagged for this study were:

i. Vegetative flushes
ii. Blooming flushes
a. Panicles removed artificially (prior to fruit setting)
b. Fruits removed artificially (premature)
c. Fruits dropped naturally (premature)
d. Half fruits thinned artificially (premature)
e. Fruits harvested on maturity

All these flushes were considered as treatments.

RESULTS AND DISCUSSION

Vegetative growth pattern. The number of flushes emerged and those with ceased growth was 388 and 166; 344 and 129.40; 471 and 162; 392.8 and 284; 416.8 and 383.4; and 93.80 and 93.80 during April, May, June, July, August and September, respectively (Fig. 1). It is evident from the results that a tree produced more flushes in one month and less during the following month. April to August was the active growth period. Flushes ceased to grow from April to June attained physiological maturity needed for blooming in the next season. The growth ceasing increased from July onward. Similar results were observed by Popenoe

Fig. 1. Vegetative growth pattern of Langra mango mangó during active growth period

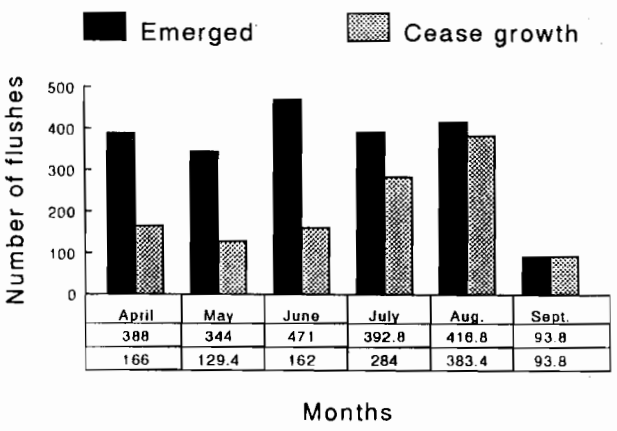

Fig. 2. Reproductive growth pattern of Langra

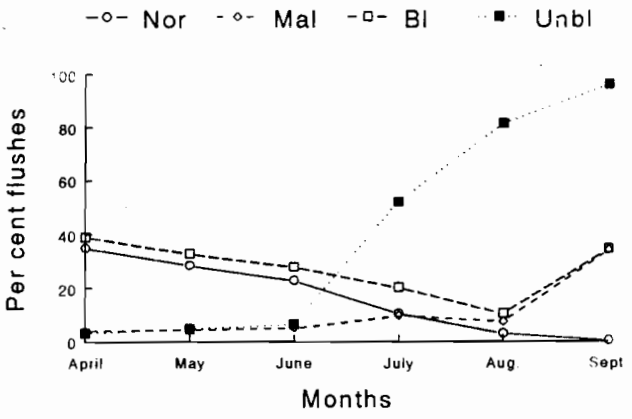

Table I. Different terminals (n=100) and their behaviour of vegetative and reproductive growth (1996–1998)

Nature of Terminals	Year	Monthwise vegetative extension during the same year						Flowering next year
		April	May	June	July	Aug.	Sep.	
Without panicles	1996	70	30	-	-	-	-	36
	1997	68	29	3	-	-	-	34
Panicles removed artificially	1996	-	24	50	14	6	-	24
	1997	-	20	57	12	10	1	23
Fruit dropped naturally	1996	-	-	-	56	36	2	14
	1997	-	-	-	35	61	3	12
Fruit dropped artificially	1996	-	-	-	46	4	6	12
	1997	-	-	-	34	55	6	11
Fruit thinned	1996	-	-	-	-	14	4	-
	1997	-	-	-	-	10	3	-
Fruit harvested	1996	-	-	-	-	2	4	-
	1997	-	-	-	-	3	5	-

(1939) and Chacko (1985). It was found that non-blooming terminals resumed their vegetative growth during April-May. In blooming terminals, resumption of vegetative growth depended upon the duration for which the terminals remained occupied with the panicles or fruits. Seventy and 30% of non-blooming terminals grew vegetatively in April and May, 1996 (Table I). Similarly during 1997, 68, 29 and 3% terminals grew vegetatively in April, May and June, respectively. When the panicles were removed artificially the terminals resumed growth from May to September in the intensity of 24, 50, 14, 6 and 0%, respectively during 1996 and same trend was observed during 1997 for such terminals. The resumption of growth of the terminals which set the fruit but dropped, took place not earlier than July in both the years. In case the fruit remained on terminals upto harvesting only 2 to 4% gave poor vegetative extension in 1996 which was 3 to 5% during 1997 in August and September, respectively (Table I). Occurrence of earlier vegetative growth on empty flushes appeared due to stored food in them due to their non-bearing in previous season. The effect is evident

from the presence of fruit on the terminal for longer time, it used more energy and thus resumption of growth delayed till quite late in the next season. These results are similar to the findings of Issanakraisila *et al.* (1991).

Reproductive behaviour. Out of 388 April flushes, 166.60 ceased their growth. These ceased flushes (April) produced 35.10% normal and 4.07% malformed panicles while 3.30% remained unbloomed. During May to September flushes, normal and malformed panicles, were 28.54, 22.84, 10.59, 3.07, and 0.43; and 4.30, 5.05, 9.67, 7.48, and 34.11%, respectively. Flushes which did not bloom in the same period were 4.71, 6.41, 52.03, 81.43 and 96.16%, respectively (Fig. 2). The blooming frequency of flushes appeared to decrease from April to September. Older flushes got maximum maturity thus maximum blooming was observed in them. The frequency of malformation was found low on April to June flushes whereas it tended to increase significantly on flushes emerged in July and afterwards. Number of unbloomed terminals was observed less in earlier flushes. In late season flushes i.e. August-September, most of the terminals were found unblooming, which could be attributed to the lack of proper time needed for fruit bud differentiation in these flushes as already reported by Sen and Malik (1946) and Singh (1978).

Blooming intensity for the previous year's blooming, non-blooming, and bearing terminals has been presented in Table I. It was observed that the blooming was highest (36%) on the non-blooming (empty) terminals of the previous season in 1997 which was found 34% in 1998. The blooming of previously blooming and bearing terminals decreased in the order that the terminals which dropped the panicles without setting fruit bloomed more (24% in 1997 and 23% in 1998) after empty flushes and decreased for bearing flushes in accordance with the time for which the fruit remained attached with the panicles. When fruit dropped naturally, 14% terminals bloomed in 1997 and 12% in 1998. If the fruit dropped artificially, 12% terminals bloomed in 1997 and 11% in 1998. None of the terminals could bloom in the following season if fruit matured on it during the previous season.

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