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Effect of Growth Retanrdants on Vegetative and Reproductive Growth Behaviour of Mango (*Mangifera indica* L.)

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Abstract: The study was initiated to observe the effect of three growth retardants i.e. paclobutrazol, alar and cycocel on vegetative growth pattern and its impact on reproductive behaviour towards normal or malformed panicles. As a result of growth retardants spray, vegetative growth was reduced and thus intensity of flushing was minimized on treated plants after application. Out of three growth retardants, paclobutrazal was found more effective in which least number of growth flushes were observed. As a result of decreased number of flushes, the production of malformed panicles was also minimized.

Key words: Mango, vegetative growth, growth retardants, malformation

Introduction

Mango (*Mangifera indica* L.) is the most popular fruit among millions of people of the world due to its excellent taste, flavour and nutritive values. It is grown in all the tropical and sub tropical countries of the world. In Pakistan mangoes are the second largest crop but fruit yield is quite low although, soil and climatic conditions of this country are much suitable for producing high yield of superior quality mango. Production is not increased due to several known and unknown causes. Out of which mango malformation is much serious which causes about 37% losses annually (Khan and Khan, 1960). Efforts have been made to probe into the causes of malformation and low yield but it is still unresolved. It has been found that flushes of late season i.e. from July and onward were found more vulnerable to mango malformation. It was intended to reduce the late vegetative growth and thus to reduce the frequency of malformation. Some previous studies indicated that application of cycocel, alar, ethephon, maleic hydrazide etc. to mango plants reduced vegetative shoot formation and enhanced flowering especially during off year (Checko *et al*., 1974; Sen *et al*., 1979; Pandey, 1989; Rath and Rajput, 1990; Gogney, 1993; Haw, 1986; Winston, 1992; Nunez-Elisea *et al*., 1992; Werner, 1993).

This project was initiated with the objective that flushes emerging late in the season should be discouraged and minimized. It would help to improve the mango production in two ways i.e. firstly it helped to lessen the problem of malformation as late vegetative growth had more incidence of malformation. Secondly, the tree would not become exhausted due to the use of food for the growth of these useless flushes in late season and thus the stored energy can be used to initiate more flowers and heavy fruit set on early season flushes.

Materials and Methods

The project was conducted in Experimental Fruit Garden, Department of Horticulture, University of Agriculture, Faisalabad during 1997-99. Twelve years old mango cv. langra plants were selected for these studies. Three growth retardants were sprayed during July @ 1000 ppm each. There were four treatments replicated twice as mentioned below:

T_1 = Control
T_2 = Paclobutrazol
T_3 = Alar
T_4 = Cycocel

The experiment was laid out according to randomized complete block design and treatment means were compared using DMR test (Steel and Torrie, 1980). Following data were collected: number of flushes after spray, number of blooming flushes and percentage of malformation on the flushes emerged after spray, number of blooming flushes and percentage of malformed on whole tree basis.

Results and Discussion

The growth retardant's sprays reduced the frequency of vegetative flushes as compared with control. As regards blooming frequency of these flushes during the following spring the data showed a significant difference among control and treated plants for the production of normal and malformed panicles (Table 1).

In response to the spray of growth retardants maximum inhibition took place due to paclobutrazol treatment and as a result flushes from July to September recorded were 40.89 however, statistically at par with 43.67 as a result of alar treatment. Cycocel spray's also inhibited growth as the number of flushes appeared were 47.50 as compared with 91.28 in control trees.

When different treatments were compared for production of normal and malformed panicles. Paclobutrazol was found better than all other treatments for production of normal panicles on July to September, flushes amounting to be 6.72 although, it was at par statistically with control in which 6.50 normal panicles were produced. Alar and cycocel treated plants also behaved similarly with 4.28 and 3.94 normal panicles, respectively. Maximum malformed panicles 10.28 (61.26%) were observed in control whereas this number was reduced to 6.06 (47.42%) in paclobutrazol treatment and again decreased too much in case of alar and cycocel with 2.22 (34.15%) and 2.33 (37.16%) malformed panicles and both of them were at par statistically (Table 1).

This study was further extended beyond the tagged flushes to observe a response on production of normal and malformed panicles on the flushes of April to September on whole tree basis. Number of normal panicles were found significantly different on April, May, June and July flushes in an order of 29.04, 19.63, 14.92 and 10.13, respectively. However, last two months i.e., August and September were found statistically at par for the production of normal panicles amounting to 3.63 and 2.25, respectively. Similarly the flushes produced variable number of malformed panicles (Table 2).

Table 1: Effect of growth retardants on vegetative and reproductive growth during experimental period

Treatments	No. of flushes	No. of normal panicles	No. of malformed panicles	% age of malformation
T_1	91.28a	6.50a	10.28a	61.26
T_2	40.89c	6.72a	6.06b	47.42
T_3	43.67bc	4.28b	2.22c	34.15
T_4	47.50b	3.94b	2.33c	37.16

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Table 2: Effect of growth retardants one the emergence of normal and malformed panicles during whole season

Months	No. of normal panicles	No. of malformed panicles
April	29.04a	2.79b
May	19.63b	4.71a
June	14.92c	5.38a
July	10.13d	6.13a
August	3.63e	3.08b
September	2.25e	2.33b

Table 3: Effect of growth retardants on the emergence of normal and malformed panicles on whole tree basis

Treatments	No. of normal panicles	No. of malformed panicles	% of malformation
T_1	11.64b	16.23a	58.21
T_2	16.33a	9.17b	35.96
T_3	12.92b	5.32c	29.16
T_4	12.17b	5.91c	34.04

Significant level = 0.05 %

While comparing various treatments for the production of normal and malformed panicles on the whole basis, it was observed that paclobutrazol treated plants produced maximum normal panicles amounting to 16.33 while the remaining treatments and control were at par statistically by producing 12.92, 12.17 and 11.64 normal panicles for alar, cycocel treated plants and control, respectively. Similarly different treatments affected the emergence of malformed panicles. Control plant produced maximum 16.23 (58.21%) malformed panicles whereas on the treated plants, emergence of malformed panicles was decreased. Paclobutrazol, alar and cycocel treated plants produced 9.17 (35.96%), 5.32 (29.16%) and 5.91 (34.04%) malformed panicles, respectively. (Table 3).

Similarly flushes of various months from April to September produced variable number of malformed panicles. July flushes produce maximum (6.13) malformed panicles although it was at par with flushes of May and June for the production of malformed panicles having 4.71 and 5.38 affected panicles in these months, respectively.

Flushes of April, August and September exhibited similar results and no statistical difference could be located among them. They produced 2.79, 3.08 and 2.33 malformed panicles, respectively.

Results of present experiment are in partial agreement with the previous findings (Pandey, 1989; Rath and Rajput, 1990) which reported that when growth retardants were sprayed on mango during active growth period, they reduced the vegetative growth in terms of decreased number of flushes. Trees showed earlier initiation of rest period, which helped to induce more flowers in the next blooming season.

Similarly Winston (1992); Nunez-Elisea *et al.* (1992) and Werner (1993) also supported these results and proved that actively growing mango trees immediately showed reduction in vegetative growth. Trees exhibited partial rest conditions and enhanced blooming was observed on them with the start of blooming season. However, present findings in respect of use of growth retardants to reduce malformation are proved convincing and useful with no such previous publication on this issue.

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