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EFFECT OF PLANT GROWTH REGULATORS ON INITIAL FRUIT SET, FRUIT SET RETENTION AND FRUIT DROP OF INDIAN BER *(Zizyphus mauritiana* Lamk.)

SURESH KUMAR[1], UPESH KUMAR [2] AND PREM NARESH[3]

F-1, KRISHI FARM, SAMNAPUR TIRAHA, AMARKANTAK ROAD, DINDORI (M.P.)[1].

SENIOR SCIENTIST & HEAD, KRISHI VIGYAN KENDRA, DISTRICT - PATAN (GUJRAT)[2].

***DEPARTMENT OF PLANT PATHOLOGY, C.S.A.U.A &T. KANPUR (U.P.)[3].**

Corresponding author's e-mail: upeshkvk@gmail.com

ABSTRACT:

An investigations were undertaken to find out the effect of plant growth regulators (NAA, GA_3 and 2,4,5-T) along with control and water spray replicated thrice in CR D different doses as (T-0 Control (No spray), T-1(water spray),T-2(NAA- 10 ppm),T-3(NAA- 20 ppm),T-4(NAA- 30 ppm),T-5(GA3 - 25 ppm),T-6(GA3 - 30 ppm),T-7(GA3 - 35 ppm),T-8(2,4,5-T-15 ppm),T-9(2,4,5-T- 20 ppm),T-10(2,4,5-T- 25 ppm) on initial fruit set ,fuit set retention and fruit drop of Indian ber . fruit set ranged from 157 to 162 during both the years of trial. There were no significant differences in the mean values in this regard, but the highest initial fruit set was recorded under 2,4,5-T 20 ppm (162 in both year) followed by 2,4,5-T 25 ppm (162 and 161) and GA_3 25 ppm (162 jn both year) while the lowest was registered under NAA 10 ppm (159 in both year) being significantly superior over control. The maximum fruit retention was recorded by the application of 2,4,5-T (11.21 and 11.09%) followed by NAA (10.02 and 9.54%) and GA_3 (9.24 and 9.13%) over the control (5.16 and 4.74%) but the highest fruit retention was recorded under 2,4,5-T 25 ppm (11.88 and 12.45%) followed by 2,4,5-T 20 ppm (11.24 and 10.85%) and NAA 30 ppm (11.00 and 10.75%) while the lowest was registered under GA_3 25 ppm (7.79 and 7.75%) being significantly superior over control. The probable reason for greater fruit retention might be due to the stimulation of natural

growth substances on the experimental plant and particularly the limb. The percentage of fruit fall under different treatments (growth regulators and their concentrations) during both the years revealed that all the growth regulators namely, NAA, GA_3 and 2,4,5-T reduced the fruit drop irrespective of their concentrations as compared to control. Most effective growth regulator was found to be 2,4,5-T (88.79 and 88.91%) followed by NAA (89.98 and 90.46%) and GA_3 (90.76 and 90.87%).

KEY WORDS: *Indian Ber (Zizyphus mauritiana Lamk.), Growth regulators, Initial fruit set, Fruit drop, Fruit retention.*

INTRODUCTION:

The Indian Ber *(Zizyphus mauritiana* Lamk.) belongs to family Rhamnaceae and is tetraploid (2n=48) in nature. The ber is utilized chiefly for its mature edible fruits, it is also one of the principal host plants for rearing lac insects *(Tachardia laccad).* Secondary, uses of the tree are for carpentry and building wood, fodder, hedges, fences, fuel and medicinal purposes. In Uttar Pradesh ber orchards are found around Varanasi, Aligarh. Saharanpur, Faizabad and Agra. The ber is subtropical fruit and prefers a hot climate. *Zizyphus jujube* and *Z. mauritiana* are two important spp. of ber, *Z. mauritiana* is more common in tropical and subtropical regions and *Z. jujube* is found in temperate parts of the world. In the North West plains of India various cultivars of *Z mauritiana* are found growing commercially. Ber is quite popular due to high economic returns, low cost of cultivation, wide adaptability and ability to stand draught. Area under ber cultivation has increased in arid and semi arid regions. It is popularly known as "king of the fruit of the arid region" has also known as "poor man's fruit. In Uttar Pradesh, flowering in cv. Banarasi Karaka starts in the second week of September and continues upto November (**Teotia and Chauhan, 1963**). Fruit setting starts in second week of October and continues upto first fortnight of November. The ber fruit reaches to ripe stage in about 180 days after fruit setting. The fruit growth in terms of length and diameter shows three distinct phases and follows a pattern of "Double sigmoid" curve. There is marked variation in fruit set among the different cultivars, which ranged from 5% in Ilaichi to 14.9% in Aliganj in arid conditions of Rajasthan. A maximum fruit drop of 95.63% and a minimum of 79.88% were observed in the cultivars Ilaichi and Tikdi, respectively.

The yield of ber depends upon soil, nutrition, irrigation and precautions against serious pests and diseases mainly fruit fly *(Carpomyia vesuviana)* and powdery mildew *(Oidium* sp.), respectively. Plant growth regulators play a significant role in many physiological phenomena. Various types of plant growth regulators like IAA, IBA, NAA, 2,4-D, 2,4,5-T; GA and TIBA are used for improving the flowering, fruit set, size and quality of fruit as well as yield. Fruit drop is a serious problem associated with ber (**Dhillon and Singh, 1968**). It fruits in the months of Sept.-Oct. and fruits ripe

during Feb-Mar under Kanpur conditions of north India During their long period of stay on tree, fruits face the vagaries of climatic conditions changing from humid rains to chilling winter and ultimately spring season. These changes may be attributed as a major cause of fruit drop, however attack of powdery mildew, forced scarcity of nutrients and plant hormones in developing fruits may further add to this quantum of premature fruit loss. The use of plant growth regulators in ber particularly for checking fruit drop and improving quality has not been properly harnessed in central U.P. conditions. Therefore, present investigation was conducted to study the different growth regulators to record the initial fruit set and fruit drop on ber *(Zizyphus mauritiana* Lamk) cv. Banarasi Karaka.

MATERIALS AND METHODS:

The experimentation, investigations were conducted on ber *(Zizyphus mauritiana* Lamk) cv. Banarasi Karaka" at Horticulture garden of C. S. Azad Uni. of Agriculture and Technology, Kanpur during 2001-02 and 2002-03. The plant material comprised of thirty years old, thirty three uniform ber trees of cv. **Banarasi Karaka** were selected. The orchard soil in which the trees under study were growing was clarified as sandy loam having pH 7.4 to 7.5. All the trees were maintained by uniform cultural practices throughout the period of experiment. In all, there were eleven **treatments** comprising of combination of three levels each of NAA, GA_3 and 2,4,5-T along with control and water spray replicated thrice in CR D as **(** T-0 Control (No spray), T-1(water spray),T-2(**NAA- 10** ppm),T-3(**NAA-** 20 ppm),T-4(**NAA-** 30 ppm),T-5(GA3 - 25 ppm),T-6(GA3 - 30 ppm),T-7(GA3 - 35 ppm),T-8(**2,4,5-T-**15 ppm),T-9(2,4,5-T- 20 ppm),**T-10(**2,4,5-T- 25 ppm).

For preparation of NAA solution, one stock solution was made. In first 10 mg NAA was weighed and dissolved in minute quantity of absolute alcohol. The volume was made up 1000 ml by adding distilled water (10 ppm) further solutions were prepared by this stock solution. The solution of GA_3 of 25 ppm concentration was prepared by dissolving 25 mg of GA3 in small quantity of alcohol and the volume was made up 1000 ml by adding distilled water. The solution of 30 ppm concentration was prepared by dissolving 30 mg of GA_3 in sufficient quantity of alcohol and the volume was made up 1000 ml by adding distilled water. Likewise, other solution of GA_3 was prepared. For preparation of 2,4,5-T solution of 15, 20 and 25 ppm concentrations, firstly 15 mg 2,4,5-T mixed with alcohol and finally volume was made up to 1000 ml by adding distilled water, like wise other concentration of 2,4,5-T.

Time and methods of treatment time application- Solutions of NAA, GA_3, and 2,4,5-T before spraying mixed with sticker such as teepol and then trees were sprayed at fruit set stage during after-noon of clean day with the help of hand automizer in month of September in the year of 2001-02 and 2002-03.

Techniques adopted for recording observations:

1-**Fruit set (initial):** The initial fruit set per panicle was recorded before spraying by counting the total number of fruits set under tagged panicles of each treatments and average number of fruits per panicle was derived.

2-**Fruit retention** (%): The number of fruits reached at maturity was harvested to work out the extent of fruit retention.

3-**Fruit drop** (%): Number of fruit dropped under each treatment was calculated from fruit set and retention. In order to compare one treatment from another as also to determine the effectiveness of different treatments with certainty, all the data were subjected to statistical analysis and significant response at 0.5 per cent level were computed where ever necessary critical difference (C.D.) were worked out for comparing the effect of various treatments.

RESULT AND DISCUTION:

The data derived on fruit drop in ber cv. Banarasi Karaka were analysed statistically and mean values arranged in Tables-5 that the three growth regulators differed significantly when compared with control**.**

Effect of NAA, GA_3 and 2,4,5-T on initial fruit set -Observations with regard to initial fruit set were taken during both the years of investigations. Initial fruit set per limb was counted prior to application of growth regulators. It is obvious from the mean values summarized in **Table-1** that the fruit set ranged from 157 to 162 during both the years of trial. There were no significant differences in the mean values in this regard , but the highest **initial fruit set** was recorded under 2,4,5-T 20 ppm (162 in both year) followed by 2,4,5-T 25 ppm (162 and 161) and GA_3 25 ppm (162 jn both year) while the lowest was registered under **NAA** 10 ppm (159 in both year) being significantly superior over control

Effect of NAA, GA_3 and 2,4,5-T on final fruit retention- Table -2 The maximum mean value of fruit retention was recorded by the application of 2,4,5-T (11.21 and 11.09%) followed by NAA (10.02 and 9.54%) and GA_3 (9.24 and 9.13%) over the control (5.16 and 4.74%) but the highest fruit retention was recorded under 2,4,5-T 25 ppm (11.88 and 12.45%) followed by 2,4,5-T 20 ppm (11.24 and 10.85%) and NAA 30 ppm (11.00 and 10.75%) while the lowest was registered under GA_3 25 ppm (7.79 and 7.75%) being significantly superior over control. The probable reason for greater fruit retention might be due to the stimulation of natural growth substances on the experimental plant and particularly the limb. **Pandey (1999)** also observed increased fruit retention (10.3% at 20 ppm), in ber. Similar findings on fruit retention have been reported by **Bhat *et al.* (1997)** in litchi, Maurya *et al.* (1973) in mango by the application of 2,4,5-T.

Effect of NAA, GA_3 and 2,4,5-T on fruit drop- Table-3. The percentage of fruit fall under different treatments (growth regulators and their concentrations) during both the years revealed that all the

growth regulators namely, NAA, GA_3 and 2,4,5-T reduced the fruit drop irrespective of their concentrations as compared to control. Most effective growth regulator was found to be 2,4,5-T (88.79 and 88.91%) followed by NAA (89.98 and 90.46%) and GA_3 (90.76 and 90.87%). GA_3 sprays at lower concentration i.e., 25 ppm caused relatively greater fruit drop, although the different concentrations did not vary significantly when compared among themselves during both the years. Similarly NAA and 2.4,5-T under varying concentrations varied significantly except NAA at 10 ppm under both the trials. The increasing concentrations irrespective of the growth regulators caused numerically lesser fruit drop in ber during 2001-02 and 2002-03. The higher drop was, however, recorded in control (94.84 and 95.26%) during both the years of study. A comparison of NAA, GA_3 and 2,4,5-T revealed 89.98, 90.46; 90.76, 90.86 and 88.79, 88.91% drop during first and second years of investigation, respectively.

The reduction in fruit drop may be attributed to the optimal level of auxin in the treatments, which might have prevented abscission **(Gardner, 1951**). Auxin inhibits abscission by preventing physiological breakdown of calcium pectate of the middle lamella (**Bonner, 1950 and Van Overbeek, 1959**). Auxin also inhibit fruit drop by strengthening the pedicel. Exogenous application of GA_3 inhibit the production of ethylene (**Cooper and Henry, 1973) a**nd higher endogenous levels of gibberellin probably counteract the effect of endogenous ABA which has been ascribed to cause drop in fruit crops (**Martin and Nishizima, 1972**).in ber, **Pandey (1999)** in ber cv. Banarasi Karaka.

REFERENCES:

Bhat, S.K., Raina, B.L., Chogtu, S.K. and **Muthoo, A.K. (1997).** Effect of exogenous auxin application on fruit drop and cracking in litchi *(Litchi chinensis* Sonn) cv. Dehradun. *Advances-in-Plant* Sciences, **10** (1): 83-86.

Bonner, J. (1950). Plant Biochemistry. *Academic Press*, New York.

Cooper, W.C. and Henry (1973). Chemical control of fruit abscission. In : Shedding of plant parts. T.T. Kozlowski (ed.) *Academic Press.* pp. 476-524

Dhillon, H.S. and Singh, K. (1968). Effect of some plant regulators on fruit set and fruit drop in *(Zizyphus jujuba* L.)1 *Res.* PAU. 5:392-394.

Gardener, F.E. (1951). Growth substance in relation to the production of fruit trees. Plant Growth Substances. *Skoog. F.*, 207-223, Univ. Wis. Press.

Pandey, V. (1999). Effect of NAA and GA_3 spray on fruit retention, growth, yield and quality of ber *(Zizyphus mauritiana* Lamk.) cv. Banarasi Karaka. *Orissa J. Hort.,* 27 (10: 69-73.

Teotia, S.S. and Chauhan, R.S. (1963). Flowering, pollination, fruit set and fruit drop studies in ber, *(Zizyphus mauritiana* Lamk). *Punjab Hort. .1,* **3** (1): 60-70.

Van Oberbeek, J. (1959). Auxins. *Bot. Rev.*, 25: 269 —350.

Table:- 1 Effect of NAA, GA_3 and 2,4,5-T on initial fruit set in ber

Treatments/	Initial fruit set in ber (2001-2002)	Initial fruit set in ber (2002-2003)
T-1 T-0 Control (No spray),	**157.00**	**160.00**
T-2, T-1(water spray),	**158.00**	**161.00**
T-3 T-2(NAA- 10 ppm),	**159.00**	**159.00**
T-4 T-3(NAA- 20 ppm),	**161.00**	**157.00**
T-5 T-4(NAA- 30 ppm),	**160.00**	**158.00**
T-6 T-5(GA3 - 25 ppm),	**162.00**	**162.00**
T-7 T-6(GA3 - 30 ppm),	**161.00**	**160.00**
T-8 T-7(GA3 - 35 ppm),	**162.00**	**160.00**
T-9 T-8(2,4,5-T-15 ppm),	**160.00**	**161.00**
T-10 T-9(2,4,5-T- 20 ppm),	**162.00**	**162.00**
T-11 T-10 (2,4,5-T- 25 ppm).	**161.00**	**162.00**
SE(d) **CD at 5%**	**2.29** **p.= NS**	**2.33** **p. = NS**

Table:- 2 Effect of NAA, GA_3 and 2,4,5-T on fruit retention in ber (%)

Treatments/	Fruit retention in ber (%) (2001-2002)	Fruit retention in ber (%) (2001-2002)
T-1 **T-0 Control (No spray),**	5.03	4.57
T-2**, T-1(water spray),**	5.28	4.90
T-3 **T-2**(NAA- 10 **ppm),**	8.41	8.00
T-4 **T-3**(NAA- **20 ppm),**	10.65	9.87
T-5 **T-4**(NAA- **30 ppm),**	11.00	10.75
T-6 **T-5(GA3 - 25 ppm),**	7.79	7.75
T-7 **T-6(GA3 - 30 ppm),**	9.30	9.15
T-8 **T-7(GA3 - 35 ppm),**	10.62	10.49
T-9 **T-8**(2,4,5-T-**15 ppm),**	10.50	9.97
T-10 **T-9(2,4,5-T- 20 ppm),**	11.24	10.85
T-11 T-10 (**2,4,5-T- 25 ppm).**	11.88	12.45
SE(d) CD at 5%	0.30 p=0.62	0.28 p=0.57

Table:- 3 Effect of NAA, GA_3 and 2,4,5-T on fruit drop in ber (%)

Treatments(Dose)	Fruit drop in ber (%) (2001-2002)	Fruit drop in ber (%) (2002-2003)
T-1 T-0 Control (No spray),	94.97	95.43
T-2, T-1(water spray),	94.72	95.10
T-3 T-2(NAA- 10 ppm),	91.59	92.00
T-4 T-3(NAA- 20 ppm),	89.35	90.13
T-5 T-4(NAA- 30 ppm),	89.00	89.25
T-6 T-5(GA3 - 25 ppm),	92.21	92.25
T-7 T-6(GA3 - 30 ppm),	90.70	90.85
T-8 T-7(GA3 - 35 ppm),	89.38	89.51
T-9 T-8(2,4,5-T-15 ppm),	89.50	89.50
T-10 T-9(2,4,5-T- 20 ppm),	88.76	88.76
T-11 T-10 (2,4,5-T- 25 ppm),	88.12	88.12
SE(d) CD at 5%	0.91 p=1.88	0.98 p=2.03