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Effect of Plant Growth Regulators on Yield of Indian Ber *(Zizyphus mauritiana* L.) Fruit

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ABSTRACT

The ber is subtropical fruit and prefers a hot climate. 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. The data derived on fruit drop in ber cv. Banarasi Karaka were analysed statistically that the three growth regulators differed significantly when compared with control. The maximum yield per tree was recorded under 2,4,5-T (43.58 and 45.06 kg) and minimum (28.51 and 29.60 kg) under GA_3. It is further clear from the table that increasing concentrations of all the growth regulators caused significant increment in the yield of fruits per tree. The highest concentrations of all the growth regulators i.e.,, 30, 35 and 25 ppm caused greater effect in boosting the yield over its lower and medium doses barring 2,4,5-T during both the years. The yield per tree is the ultimate object of almost all the experiments. The maximum fruit yield was recorded under 2,4,5-T (43.58 and 45.06 kg) succeeded by NAA (34.66 and 36.05 kg) and GA_3 (28.51 and 29.60 kg), but minimum was under control (19.30 and 20.36 kg). All the growth regulators gave higher yield with every increase in concentrations. Maximum fruit yield was estimated with 2,4,5-T at 25 and 20 ppm followed by NAA 30 and 20 ppm. However, minimum yield was recorded under GA_3 25 ppm.

Key words: *Indian Ber (Zizyphus mauritiana Lamk.), growth regulators, yield*

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).* 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.

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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[8]. 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[2]. 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 physical 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 physical attributes and yield of ber (*Zizyphus mauritiana* Lamk) fruit on 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. 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. Randomly selected fruits were brought to the laboratory immediately after harvesting and the yields were calculated by counting the no. of fruits/shoot retained at maturity and multiplied it by its weight and number of shoot from each treatment.

RESULT AND DISCUTION

The data derived on fruit drop in ber cv. Banarasi Karaka were analysed statistically and mean values arranged in Tables-1 that the three growth regulators differed significantly when compared with control**.** A perusal of table indicates that computed yield of fruits per tree were significantly affected by the spray of all the growth regulators. Even the spray of simple water also proved numerically effective in increasing the yield per plant. The maximum yield per tree was recorded under 2,4,5-T (43.58 and 45.06 kg) and minimum (28.51 and 29.60 kg) under GA_3. The growth regulators varied statistically in respect of yield per tree when compared among themselves.It is further clear from the table that increasing concentrations of all the growth regulators caused significant increment in the yield of fruits per tree. The highest concentrations of all the growth regulators i.e.,, 30, 35 and 25 ppm caused greater effect in boosting the yield over its lower and medium doses barring 2,4,5-T during both the years. The yield per tree is the ultimate object of almost all the experiments. The total yield of fresh fruits were significantly increased with the spray of NAA, GA_3 and 2,4,5-T at all the concentrations during both years of research. The maximum fruit yield was recorded under 2,4,5-T (43.58 and 45.06 kg) succeeded by NAA (34.66 and 36.05 kg) and GA_3 (28.51 and 29.60 kg), but minimum was under control (19.30 and 20.36 kg). All the growth regulators gave higher yield with every increase in concentrations. Maximum fruit yield was estimated with 2,4,5-T at 25 and 20 ppm followed by NAA 30 and 20 ppm. However, minimum yield was recorded under GA_3 25 ppm. Though it was also significantly superior in increasing yield of fruits as compared to control. It seems possible that spray of 2,4,5-T NAA and GA_3 at different concentrations had improved the internal physiology of developing fruits in terms of better supply of water, nutrients and other compound vital for their proper growth and development which resulted in more fruit retention, improved size and ultimately greater yield. Significant improvement in yield have also observed by Singh *et al*[5]., Pandey[7], Yadav *et al.*[6], with use of NAA. Singh *et al.*[4] also found increased yield with GA_3 in ber. Even the spray of simple water washing out the dust from the plant, enabled them better photosynthesis and produce more yield of quality fruits.

Table: 22 Effect of NAA, GA_3 and 2,4,5-T on fruit yield (kg/tree)

Treatments	NAA		GA_3		2,4,5-T		Mean	Control
	Doses ppm	Value	Doses ppm	Value	Doses ppm	Value		
2001-2002								
$Conc_1$	10	25.42	25	23.75	15	39.37	29.51	18.48
Conc2	20	36.32	30	28.68	20	44.17	36.39	20.12
$Conc_3$	30	42.25	35	33.10	25	47.21	40.85	-
Mean		34.66		28.51		43.58	35.58	19.30
SE (d) = 1.86 CD at 5% p. = 3.86								
2002-2003								
$Conc_i$	10	26.65	25	25.10	15	40.75	30.83	19.50
$Conc_2$	20	37.70	30	29.95	20	45.80	37.81	21.22
$Conc_3$	30	43.80	35	34.65	25	48.65	42.36	-
Mean		36.05		29.60		45.06	37.00	20.36
SE (d) = 1.87 CD at 5% p. = 3.88								

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