

Original Research Article

Influence of Foliar Application of GA₃ with and without NAA on Fruit Drop, Growth, Yield and Quality of Ber (*Zizyphus mauritiana* Lamk.) C.V. Banarasi Karaka

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ABSTRACT

An experiment was conducted at Horticulture Garden, Department of fruit science, Chandra Shekhar Azad University of Agriculture and Technology Kanpur (U.P.) during November 2017 to February 2018 to judge the Influence of foliar application of GA₃ with and without NAA on fruit drop, growth, yield and quality of ber (*Zizyphus mauritiana* Lamk.) c.v. Banarasi Karaka. The 10 treatments viz. T₀: Control, T₁: GA₃ 10 ppm, T₂: GA₃ 20 ppm, T₃: GA₃ 30 ppm, T₄: GA₃ 40 ppm, T₅: NAA 20 ppm, T₆: GA₃ 10 ppm+NAA 20 ppm, T₇: GA₃ 20 ppm+NAA 20 ppm, T₈: GA₃ 30 ppm+NAA 20 ppm, and T₉: GA₃ 40 ppm+NAA 20 ppm with 3 replications were used in CRD design. The result revealed that initial fruit set, fruit retention and yield was profoundly hastened due to spraying of GA₃ 40 ppm +NAA 20 ppm, these treatments also minimized fruit drop. Highest fruit yield promoted cost benefit ratio to the former for obtaining more return where as other treatments also improved quality and other fruit attribute character of the fruit, though positive advice to the fruit grower and research worker to spraying of GA₃ 40 ppm coupled with NAA 20 ppm for obtaining more yield of ber fruit.

Keywords

Ber, GA,
NAA,
Growth and yield

Introduction

The ber is an important indigenous fruit of India. It belongs to the family Rhamnaceae and includes about 50 species which about 18-20 are native of India. The botanical name of commercially grown Indian ber is (*Zizyphus mauritiana*) consisting chromosome number 2n=48. It associated with the Indian culture since ancient times. It produces good crop and

quality during January-February and it is one of the main constraints in the fruit production.

It is considered as religious fruit of India, grown at various religious places of Hindus, Muslims and Sikhs. The tree is associated with Lord Shiva, whose worship is considered incomplete without offering of jujube fruit especially during

Mahashivaratri. The ber fruit is also associated with Shabari, an old woman, who believed to have tasted the ber fruits first, and then offered only the sweet and ripe ones to Lord Rama. The use of ber is found in Puranas, Vedas and other literature like Kathaka Samhita, Charak Samhita, Kautilaya Arthasastra etc. In fact it was one of the prominent fruit on which the sage Ved Vyas, Author of Purana and Mahabharat made his abode amidst the ber tree and for the reason he was named “Badrayan” (a person living in a forest of ber tree). Some very old trees, about 450 years old (Dukh Bhanjan ber, Illaichi ber etc.) are still found growing in ‘Golden Temple’, Amritsar.

It originated in central Asia which includes North-West India, Afghanistan, Tazakistan, Uzbekistan, U.S.S.R and China. India ranks first among the ber growing countries of the world with an area of 49000 ha and annual

production of 530000 MT (NHB, 2017-18). The major ber growing states in India are Madhya Pradesh, Bihar, Uttar Pradesh, Punjab, Haryana, Rajasthan, Maharashtra, Assam, Gujarat, West Bengal, Andhra Pradesh and Tamil Nadu. But, it is an ideal fruit for cultivation in the arid and semi-arid zones of Northern India (Bal, 1982). Its cultivation has received a great impetus as a commercial crop in Punjab, Haryana, and Rajasthan because of its excellent yield and economic returns.

A comparison of nutritive value of ber and apple reveals that the ber is richer in the amount of protein, mineral matter, calcium, phosphorus, carotene and vitamins than that of apple. That’s why ber is referred to as ‘the apple of arid zone. The nutritive value of ber fruit is presented in following as:-

Composition of ber fruit

Constituents	Percentage (%)
1. Moisture	85.90
2. Protein	0.80
3. Fat	0.10
4. Carbohydrate	12.80
5. Calcium	0.03
6. Phosphorus	0.03
7. Iron	0.80
8. Calorific value per 100 gm	55.00
9. Carotene (I.U. Vitamin A per 100 gm)	70.00
10. Vitamin C (mg per 100 gm)	50-150

[Source: Fruits of India (Tropical and Sub-tropical) by T. K. Bose]

Ripe fruits are eaten fresh and utilized in the preparation of jam, jelly, preserve and candy and it can be dried to prepare a product similar to “chuhhara”. Ber juice can be prepared from the fresh fruit and can be used for making squash. The fruit is born in the axils of leaves on the young growing shoot of the current year. Hence, a regular annual

pruning is necessary to induce a good healthy growth which will provide maximum fruit bearing area on the tree. It is known as “King of Arid Fruits”.

The tree as a whole has multipurpose uses. The leaves are used as fodder for cattle and camels and to feed tassar silk-worms. The

ber tree can serve as a host to lac insects, bark is used in tanning industry, wood is used for making charcoal etc. The seeds are sedative and are taken, sometimes with buttermilk, to halt nausea, vomiting, and abdominal pains in pregnancy. Moreover, there is huge scope for ber fruit processing, as several products like chutney, dried ber, murabba, ber candy, squash, nectar, beverage and jam can be prepared.

Gibberellin has been mainly used for manipulating in many physiological events and is commercially used to improve the quality of fruit in crops like grapes, ber, citrus, cherries and apple. In grapes it has manipulated three physiological events i.e. rachis cell elongation, flower thinning and berry enlargement. The effect of delayed fruit senescence by GA₃ has also been exploited in the citrus and more recent result suggests that GA₃ may accelerate flowering in apple. In ber, fruit set increases and fruit drop decreases by GA₃ Singh *et al.*, (2001).

Nepthalene acitic acid (Auxin) increased fruit set, decreased fruit drop and brought beneficial change in quality of many fruits. Raising of auxin concentration in plant prevents abscission (Gardner 1951). Auxin inhibits abscission by preventing physiological breakdown of calcium pectate of middle lamella (Bonner, 1950). NAA (auxin) also inhibits fruit drop by strengthening the pedicle. Increased visualization in the fruit pedicle usually follows fruit set and promoting vascular development of pedicle. High auxin content in abscission zone prevents the fruit drop (Briggs and Leopoid). In this concept there are various work has been done by many scientists on different fruit crops from time to time. Yet, there were inadequate in this regards.

Although, there was a huge research being done in this field by different scientist in

world scenario but seeing the importance of hormones there are scanty results available in this regard. Thus, keeping above facts in view, the present investigation “Influence of foliar application of GA₃ with and without NAA on fruit drop, growth, yield and quality of ber (*Zizyphus mauritiana* Lamk.) cultivar Banarasi Karaka” was undertaken.

Materials and Methods

The experiment was conducted in Horticulture Garden, Department of fruit science, Chandra Shekhar Azad University of Agriculture and Technology Kanpur (U.P.) during November 2017 to February 2018. It is situated at latitude of 26.0° North and 80.15° East longitude. The soil of orchard was sandy loam in texture with good organic matter content, slightly saline (pH 7.2) in nature and well drained. The 30 trees having uniform growth were selected randomly before application of plant growth regulators. The standard cultural operations and basal application of manures and fertilizers were applied as per recommended schedule for ber plantation. The 10 treatments viz. T₀: Control, T₁: GA₃ 10 ppm, T₂: GA₃ 20 ppm, T₃: GA₃ 30 ppm, T₄: GA₃ 40 ppm, T₅: NAA 20 ppm, T₆: GA₃ 10 ppm+NAA 20 ppm, T₇: GA₃ 20 ppm+NAA 20 ppm, T₈: GA₃ 30 ppm+NAA 20 ppm, and T₉: GA₃ 40 ppm+NAA 20 ppm with 3 replications were used in CRD design. The plant growth regulator was sprayed on branches of each experimental tree. For preparation of GA₃ solution, four stock solution were made separately with 10, 20, 30 and 40 mg GA₃ and dissolved in minute quantity of absolute alcohol respectively and the volume was made upto 1000 ml by adding distilled water separately. For preparation of NAA solutions, a stock solution was made. In first 20 mg NAA was dissolved in minute quantity of absolute alcohol and then the volume was made upto 1000ml by adding distilled water. The

solutions with different concentration were sprayed by foot sprayer in the morning hours and the selected branches were fully drenched.

For control there was only water spray is allowed. Spraying was done on 2nd Nov, 2017 at fruit setting stage with fine nozzle sprayer. The following observation was recorded as:

Initial fruit set

The initial fruit set per panicle was recorded before spraying, by counting the total number of fruit set under tagged panicles of each treatment and average number of fruits per panicle was derived.

Fruit retention

The number of initial fruit set from each treatment per replication was recorded and after fruit shedding, remaining fruits were counted in each treatment.

Fruit drop (%)

The initial fruit set before spraying of plant growth regulators was recorded up to 21 November, 2017. After spraying, fruits were counted at 15 days interval and final observation was recorded on 28 February, 2018. The percent fruit drop was calculated on the basis of initial fruit set. The per cent fruit drop was calculated as follows:-

Per cent fruit drop (%) =

$$\frac{\text{Total fruit set} - \text{Number of fruits retained}}{\text{Total fruit set on selected cyme}} \times 100$$

Length of fruit (cm)

The length of fruit was recorded by measuring the longitudinal length of the

sampled fruits at their maximum point with the help of Vernier calipers. The average value was calculated and expressed in cm.

Width of Fruit (cm)

The width of the fruit was also recorded with Vernier calipers on horizontal expansion of the fruit at maximum point.

Fruit volume (cc)

The volume of fruit was taken using measuring cylinder by water displacement method.

The same set of 10 randomly selected fruits was dipped in distilled water and the volume of water displaced was recorded. The average volume per fruit was worked out in cubic centimeters.

Fruit weight (g)

The weight of 10 randomly selected fruits from each treatment per replication was recorded on electric balance and the mean value was expressed in grams per fruit.

Specific gravity of fruit (g cc⁻¹)

The specific gravity of five randomly selected fruits was determined by weighing the fruits in air and then in water. The displacement method was used for calculation by the following formula:

$$\text{Specific gravity} = \frac{\text{Weight of fruits in air}}{\text{Weight of fruits in water}}$$

Weight of fruit pulp (g)

The fresh mean weight of the pulp was calculated by separating the fruit pulp from the stone and then weighed on physical balance and expressed in grams.

Yield

The yield per treatment was recorded and expressed as fruit yield/tree in kg.

Total soluble solids (°Brix)

The pulp of five fruits were meshed in motor with pestel and juice squeezed by hand through muslin cloth and the juice of fruits was immediately used for determining the total soluble solid by hand refractometer at 20°C. The mean value was expressed as percentage of total soluble solid. The values of total soluble solids were then corrected to 20°C with the help of a temperature correction chart (A.O.A.C., 1984).

Ascorbic acid (mg /100g)

The ascorbic acid was determined by the procedure detailed in A.O.A.C. (1984).

Total sugars (%)

The total sugars were estimated by Lane and Etymon method (A.O.A.C., 1984).

Statistically analysis

Data were analysed according to the method described by Panse and Sukhantme (1985) and Chandel (1984).

Results and Discussions

Fruiting attributes

The physical characteristics of fruits are an expression of a plant's fruiting activity which was significantly influenced by GA₃, NAA and GA₃ coupled with NAA over control. It is obviously appeared to vision of data that fruit set of all treatment were found to be significant over control, barring only the treatment of T₁ showing (154) fruit set.

The range of fruit set was shown under the present investigation 151 to 162. The poorest fruit set 151 was observed under control (T₀). The maximum fruit set (162) was obtained under treatment of GA₃ 40 ppm +NAA 20 ppm (T₉). The second highest fruit set (161) was presented with the treatment of GA₃ 30 ppm coupled with NAA 20 ppm (T₈). Thus, plants sprayed with GA₃ 30 ppm +NAA 20 ppm (T₉) and GA₃ 30 ppm +NAA 20 ppm (T₈) caused significant improvement of fruit set i.e. 7.28% and 6.62% respectively as, compared to control.

Increasing concentration of GA₃ gradually enhanced fruit set and there were slightly stimulation was NAA in fruit setting comparison with control in presented investigation. Thus, the hastening of GA₃ concentration positively and significantly improved fruit set with GA₃ 40 ppm coupled with NAA 20 ppm. Scenario of investigation focused, that gradually promotion of GA₃ with constant dose of NAA 20 ppm observed ultimately improvement in fruit setting of ber. These findings of the experiment are in line with the reports of Ying-Yue *et al.*, (2010) in ber and Singh and Acharya (1999) in lithchi.

Fruit retention of ber cv. banarsi karaka as results of foliar treatments of GA₃, NAA and GA₃ coupled with NAA 20 ppm. Applications these growth hormones are aggressively and significantly influenced on fruit retention of ber. The maximum (23.75%) fruit retention was obtained under the treatments of GA₃ 40 ppm coupled with 20 ppm NAA (T₉). The improvement in fruit retention was observed (187.53%) due to foliar spraying of GA₃ 40 ppm +NAA 20 ppm over control. The minimum fruit retention was influenced (8.26%) under control. The second highest (23.12%) fruit retention was expressed with spraying of

NAA 20 ppm(T_5) which was thus (179.09%) more improvement in fruit retention over control. GA_3 and NAA both are influenced positively regarding fruit retention, there was maximum dose of concentration of GA_3 i.e. 40 ppm with coupled of 20 ppm NAA concentration showed greatest fruit retention in present investigation. These finding also in line with the reports of Ghosh *et al.*, (2013) in Ber.

It is obviously clear from the data given in finding that all the Gibberellic Acid treatments enhanced fruit drop in comparison of treatment of NAA 20ppm (76.88) which influenced as lesser to fruit drop in ber and express poor fruit drop over all the GA_3 treatments. The minimum fruit drop (76.25%) was obtained under the treatment of GA_3 40 ppm coupled with NAA 20 ppm (T_9). The data showed that in higher concentration of GA_3 reduce fruit drop than lower concentration gradually. The maximum (91.74%) was observed under the control (T_0). In other term 16.88% less fruit drop was obtained under the treatment of GA_3 40ppm coupled with NAA 20 ppm, It is might have due to dominancy of NAA on GA_3 which ultimately Reduced Fruit drop. These finding are also in line with the reports of Kaur *et al.*, (2004) in plum, Yadav *et al.*, (2010) and Gill and Ball (2013) in ber.

In present investigation GA_3 improved size up to 20 ppm GA_3 concentration after that there was slightly less improvement regarding fruit size was observed. The maximum (23.86%) improvement was maximum showed of fruit length under the treatment of GA_3 20ppm coupled with NAA 20 ppm (T_7). The poorest (3.52cm) fruit length of ber was showed under control (T_0). Similarly the minimum fruit width (2.08cm) was expressed under control (T_0). The maximum (35.10%) more width of fruit was

demonstrated with the treatments of 20ppm GA_3 coupled with 20ppm NAA over control in this regard. These finding are in agreement with the reports of Bhowick *et al.*, (2011) in Mango and Pandey (1999), Singh and Randhawa (2001) and Ram *et al.*, (2005) in ber.

The possible reasons for Enhancement in fruit size with GA_3 , NAA and GA_3 coupled with NAA, treatments might be due to higher synthesis of metabolite and enhancing food and mineral mobilization from the other parts of plant towards the developing fruit as it's a well established in Phases that fruit act as an extremely metabolic sink. It might have also been due to environment of these hormones in cell division expansion, increased volume of intercellular in the mesocarpic cells and in increased the water absorption and mobilization of sugar and mineral in the expended cell and intercellular space of mesocarp and the improvement of size with NAA and GA_3 .

Volume of fruit in ber was influenced by the spraying of GA_3 , NAA and GA_3 coupled with NAA over control, But the concentrations did not show equal influences significantly when examined among their respective treatments. The treatments of GA_3 20 ppm coupled with NAA 20 ppm noticed maximum 39.93% more improvement in respect of fruit volume was express with the treatment of GA_3 20ppm coupled with NAA 20 ppm. The minimum fruit volume (11.22cc) was expressed under the control (T_0). This improvement was appeared possibility might due to GA_3 regulates semi permeability of cell wall by which mobilization of water was extended in to fruit which ultimately helped to enhancement of fruit volume. These findings are in line with the reports of Masalkar and Wavhal (1991) and Pandey

(1999) in ber. The specific gravity in fruit ber was estimated by water displacement method. The minimum (1.020 g cc^{-1}) Specific gravity was obtained with control (T_0). GA_3 40ppm (T_4) influenced maximum (1.027 g cc^{-1}) specific gravity. These reflexion of value in specific gravity thus, regard within above treatments did not differ significantly whereas, data shows that enhancement of specific gravity observed due to growth regulators but data varies only numerically. These findings get support by Bal *et al.*, (1996) in ber and Kher *et al.*, (2005) in Guava (Table 1 and 2).

Yield attributes traits

The yield parameters of ber were significantly influenced by the GA_3 , NAA and GA_3 coupled with the NAA treatments. The maximum (15.54 g) fruit weight was recorded under foliar application of 20 ppm GA_3 (T_2) and the minimum weight (12.28g) was noticed with the control (T_0). In this regard improvement in fruit weight was enhanced (26.55%) under GA_3 20 ppm treatment (T_2) when compared with control (12.28 g fruit weight).

Increased in fruit weight may be attributed to the straightly with middle lamella and consequently cell wall which later may have the free passage of soluble to the fruit. This have leads to more length and diameter of fruit and also heavier weight of individual fruit. There was positive and significant correlation among the length, weight, and diameter of fruit with the weight of fruit. these finding in line with the reports of Pandey (1999), Masalkar and Wavhal (1991) in ber, Painkara *et al.*, (2012) in mango and Rokaya *et al.*, (2016) in Mandrin.

The pulp content in ber fruit influenced significantly with the spraying of GA_3 , NAA

and GA_3 coupled with NAA over control treatment. In present investigation the maximum (14.94g) weight of fruit pulp was examined under spraying of 20ppm GA_3 . The control gave the minimum (9.25g) weight of fruit pulp respectively. Application of 20ppm GA_3 improved 61.62% more weight of fruit pulp over control (9.25g). This increase may be ascribed to enhanced synthesis of metabolites responds to increased adsorption of water and mobilization of sugar and minerals. In the expanded cells and intercellular space of mesocorp, these aggressive enhancements of Physiological activities are accelerated positively due to growth promoter especially by GA_3 . These results were enclosed conformity with the finding of Maslkar and Wahval (1991) in ber and Painkara *et al.*, (2012) in Mango.

The yield per tree is the ultimate object of almost all the experimentation, the total yield of fresh fruit per plant was influenced significantly with the spraying of GA_3 , NAA and GA_3 coupled with NAA treatments over control. The maximum fruit yield (43.85kg/tree) was obtained under the treatments of GA_3 40ppm coupled with NAA 20ppm (T_9). As regard, the minimum (21.02 kg/tree) fruit yield per plant was obtained with control (T_0). Obviously, there was increasing attributes of fruit yield per plant was noticed when concentration of different growth hormone were promoted respectively, but maximum improvement (108.61%) was exiled by the treatment of GA_3 40ppm + NAA 20ppm treatment (T_9) over control. Both the growth regulators Promotes yield aggressively with every increase in the concentration of growth regulators. These results are in accordance with the findings of Bhowmik and Banik (2011), Painkara *et al.*, (2012) in mango, Ghosh *et al.*, (2013) in ber.

Table.1 Influence of foliar application of GA3 with and without NAA on initial fruit set, fruit retention (%), fruit drop (%), length and width of fruit, fruit volume, fruit weight and specific gravity in ber

Treatments and symbols used	Initial Fruit Set	Fruit Retention (%)	Fruit Drop(%)	Length Of Fruit(cm)	Width of Fruit (cm)	Fruit Volume (cc)	Fruit Weight (g)	Specific gravity(g cc⁻¹)
T ₀ : Control	151	8.26	91.74	3.52	2.08	11.22	12.28	1.020
T ₁ : GA3 10 ppm	154	10.35	89.65	4.13	2.64	15.48	15.33	1.022
T ₂ : GA3 20 ppm	157	15.19	84.81	4.21	2.76	15.62	15.54	1.024
T ₃ : GA3 30ppm	159	17.24	82.76	3.89	2.62	14.76	15.21	1.026
T ₄ : GA3 40 ppm	160	19.92	80.08	3.69	2.61	14.51	14.76	1.027
T ₅ : NAA 20 ppm	156	23.12	76.88	4.09	2.48	14.32	13.68	1.024
T ₆ : GA3 10 ppm+NAA 20 ppm	156	21.03	78.97	4.30	2.78	15.56	15.41	1.025
T ₇ : GA3 20 ppm+NAA 20 ppm	159	21.97	78.03	4.36	2.81	15.70	15.53	1.026
T ₈ : GA3 30 ppm+NAA 20 ppm	161	22.10	77.90	4.31	2.79	15.08	15.50	1.026
T ₉ : GA340 ppm+NAA 20 ppm	162	23.75	76.25	4.28	2.76	15.02	15.47	1.021
S.E. (d)±	2.236	0.842	1.740	0.134	0.730	0.444	0.382	0.0058
CD at 5%	4.665	1.756	3.631	0.280	0.151	0.927	0.797	NS

Table.2 Influence of foliar application of GA3 with and without NAA on weight of fruit pulp, fruit yield, TSS, ascorbic acid and total sugar in ber

Treatments and symbols used	Weight of fruit pulp(g)	Fruit yield (kg tree⁻¹)	Total Soluble Solid (°Brix)	Ascorbic Acid (mg/100g)	Total Sugar(%)
T ₀ : Control	9.25	21.02	13.18	76.17	8.98
T ₁ : GA3 10 ppm	14.71	29.52	14.03	98.85	10.12
T ₂ : GA3 20 ppm	14.94	31.12	14.12	99.08	9.93
T ₃ : GA3 30ppm	13.65	35.89	13.58	102.98	9.23
T ₄ : GA3 40 ppm	13.42	38.92	13.49	107.10	9.01
T ₅ : NAA 20 ppm	12.95	42.96	15.53	94.24	11.03
T ₆ : GA3 10 ppm+NAA 20 ppm	14.08	35.72	14.91	98.21	10.88
T ₇ : GA3 20 ppm+NAA 20 ppm	14.20	38.39	14.78	98.88	10.72
T ₈ : GA3 30 ppm+NAA 20 ppm	13.31	41.08	14.66	102.18	10.29
T ₉ : GA340 ppm+NAA 20 ppm	13.18	43.85	14.53	103.37	10.07
S.E. (d)±	0.496	1.005	0.304	2.284	0.151
CD at 5%	1.034	2.096	0.636	4.767	0.312

Quality attributory traits

Application of GA₃, NAA and GA₃ coupled with NAA significantly enhanced the yield but also improved the fruit quality i.e. total Soluble solid, Ascorbic Acid, total sugar. Application of above plant growth hormones significantly influenced above bio-chemicals constituents of fruit over the control. The treatment of NAA 20 ppm (T₅) significantly and profoundly maximized (15.53 °Brix) TSS content over control, whereas, the minimum (13.18°Brix) TSS was expressed with the control (T₀). In other wards the improvement of total soluble solids (17.28%) increased with application of treatment of NAA 20 ppm (T₇) over control (13.18 °Brix).

These enhancements in TSS of treated juice might be due to increase in mobilization of carbohydrates from the source to sink Fruit by above plant hormone NAA. Besides this these growth regulators also promotes enzymatic activities and enzymes metabolized the carbohydrates into simple sugar. These results are in agreement with the reports of Banker and Prasad (1990), Ram *et al.*, (2005) and Gill and Bal (2013) in ber.

The findings of the studied elaborated significant variation among the growth regulators in respect of Ascorbic Acid content in the fruits all and the treatment were found to be showing significant over control. The maximum (107.78 mg/100g) ascorbic acid content was influenced under the treatment of 40ppm GA₃ (T₄). The minimum (76.17mg/100g) Ascorbic acid was recorded under the control (T₀). As regard, further improvement 40.61% was observed with spraying of 40ppm GA₃ over control. The increase of ascorbic acid content may have resulted owing to enhance of ascorbic acid due to the metabolic

activities involving certain enzyme and metabolic ions under the influence of plant growth regulators and increasing ascorbic acid content might be due to per actual synthesis of glucose-6-phosphate throughout the growth and development of fruits which is thought to the precursor of vitamin C These findings are in line with the reports of Dhillon and Singh (1968) in ber.

The examination of finding showed that effect of GA₃, NAA and GA₃ coupled with NAA treatment significantly influenced total sugar in ber fruit over control (T₀). The maximum (11.03%) total sugar was obtained under the treatment of NAA 20ppm concentration. In this regard, the minimum 8.98% total sugar was influenced with control (T₀). Further improvement (22.83%) in total sugar was obtained due to treatment of NAA 20ppm spraying (T₅) over control (T₀). The increasing fruit sweetness might be due to photo synthetic activity and formation of more carbohydrates content and it's transportation are also maximized within the fruits. Under the influence of growth regulators, Sugars are quickly converted into their derivatives by Reactions involving several of Glycolytic Pathway. These results are in line with the reports of Kale *et al.*, (1999 and 2000), Bhati and Yadav (2002), Kassem *et al.*, (2011), Ghosh *et al.*, (2013) in ber and Haidary *et al.*, (1997) in Mango.

It is concluded, on the basis of summary of results treatment of GA₃ 40 ppm coupled with NAA 20 ppm (T₉) showed maximum initial fruit set, fruit retention, and yield but minimized fruit drop respectively. Treatment of GA₃ 20 ppm coupled with NAA 20 ppm (T₇) maximized length of fruit, width and volume of fruit. Treatment of GA₃ 20 ppm (T₂) maximized the weight of fruit as well as fruit pulp and treatment of GA₃ 40 ppm (T₄) maximized specific

gravity and ascorbic acid of the ber fruit. But treatment of NAA 20 ppm (T₅) reproduced maximum TSS and total sugar contents of ber fruit.

As regard, scenario of investigation clearly showed that initial fruit set, fruit retention and yield was profoundly hastened due to spraying of GA₃ 40 ppm +NAA 20 ppm, this treatments also minimized fruit drop. Highest fruit yield promoted cost benefit ratio to the former for obtaining more return where as other treatments also improved quality and other fruit attributory character of the fruit, though positive advice to the fruit grower and research worker to spraying of GA₃ 40 ppm coupled with NAA 20 ppm for obtaining more yield of ber fruit.

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