Response of micronutrients and GA3 foliar feeding on yield attributes of Ber (*Ziziphusmauritiana*Lamk.) fruit cv. Banarasi Karaka

ABSTRACT

The present investigation entitled "Response of micronutrients and GA_3 foliar feeding on Yield attributesof Ber (*Ziziphusmauritiana*Lamk.) fruit cv. Banarasi Karaka" was conducted on twenty-nine-year-old ber plants grown in sodic soil condition at Main Experimental Station, Department of Fruit Science, AcharyaNarendra Deva University of Agriculture & Technology KumarganjAyodhya (U.P) during the year 2022-23 and 2023-24 to investigate the response of foliar application of micronutrients and GA_3 on yield attributes of ber. The experiment comprised of two foliar applications during September and Novemberwith five treatmentson the cultivarBanarasi karakawith four replication. The data was recorded and analysed by usingRandomised block design. Under the investigation, ber plants were studied for the parameter of fruit weight, fruit length, fruit width, fruit specific gravity, yield. The maximum fruit weight (21.68 g), fruit length (4.48 cm), fruit width (3.48 cm), fruit specific gravity (0.982), yield (16.81 t/ha) was recorded in plants sprayed with $ZnSO_4$ 0.5% + Borax 0.5% + GA_3 10 ppm, which was significantly superior over all other treatments. It was followed by T_3 (Borax 0.5%), T_2 ($ZnSO_4$ 0.5%) and T_4 (GA_3 10 ppm) treatments. The maximum fruit weight (15.86 g), fruit length (3.63 cm), fruit width (2.40 cm), fruit specific gravity (0.973), yield (12.69 t/ha) was recorded in control.

Keywords: Ber, borax, $ZnSO_4$, Banarasi Karaka

Introduction

Ber (*Ziziphusmauritiana*Lamk.) belongs to family Rhamnaceae, is one of the ancient and common fruit of India and China, being cultivated over 4000 years (Mehra, 1967). It is also known as Chinese date, Indian plum, Indian jujube or Chinese fig. Its tree is one of the hardy fruit crops right for cultivation mainly in arid and semiarid condition where most of the trees fail to grow due to lack of irrigation. Commercial cultivation usually extends up to 1000m above sea level. It is known as for its ability to withstand adverse condition, such as salinity, drought and water logging. It originated in central Asia which includes North-West India, Afghanistan, Tazakistan, Uzbekistanand China. India ranks first among the ber growing countries of the world with an area of 53000 ha and annual production of 580000 MT (Anon, 2021). 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*et al.*, 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. 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 KathakaSamhita, CharakSamhita, KautilayaArthasastra etc. In fact it was one of the prominent fruit on which the sage VedVyas, 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 (DukhBhanjanber, Illaichiber etc.) are still found growing in “Golden Temple”, Amritsar. Its fruit is richer than apple in respect of protein, phosphorous, calcium, carotene and vitamin C.It is popularly called as poor man’s apple due to its high nutritional quality such as higher protein (0.8g), β-carotene (70 IU), vitamin C (50-100 mg) contents as well as medicinal value (Rai and Gupta, 1994). Fresh 100 g fruit contains Moisture (81.6-83.0 g), Fat (0.07 g), Fiber (0.60 g), Carbohydrates (17.0 g), Ascorbic acid (66-110 mg/100 g), Total sugars (5.4-10.5%), Non reducing sugar (3.2-8.0%), Reducing sugar (1.4-6.2 g), Calcium (25.6 mg), Phosphorus (26.8 mg), Iron (0.76-1.8 mg), Ash (0.3-0.59 g), Carotene (0.021 mg), Thiamine (0.02-0.024 mg), Riboflavin (0.02-0.038 mg), Niacin (0.7-0.873 mg), Citric Acid (0.2-1.1 mg), Fluoride (0.1-0.2 ppm), Pectin (dry basis) 2.2-3.4 per cent (Morton, 1987).Jujube fruits have a spongy, sweet tasting pulp, and are an excellent source of ascorbic acid and carotenoids. Usually the fruits are eaten fresh but can also be used for making jam, pickles, candy or dehydrated products. 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.Plants can tolerate PH more than 9 and soil as well as water salinity to a limited extent (Hooda et al., 1990). The flowering period lasts for about two and a half months from September to November. In north Indian condition ber flowers in the month of AugustSeptember while in West Bengal flowering occurs mainly in September-November in different varieties which produces heavy flowers in the axillary cymes on both mature and current season’s growths (Teaotia and Chauhan, 1963). The fruit setting starts in the second week of October and continues up to the first fortnight of November. The fruit growth in terms of length and diameter follows a 'double sigmoid' curve. The flowers are borne on the current season's growth in leaf axils; the inflorescence is cymose (Bal, 1984; Singh and Randhawa, 2001) and each cyme contains 15-28 flowers. The fruit is berry with a single stone and the shape of the fruit may vary from round to oblong, ovate, oval and oblate depending on the cultivars. It is a quick growing and early bearing fruit which yields a heavy crop every year. Moreover, the tree can tolerate hot and dry weather during May-June as the tree goes to dormant conditions which, in turn, reduce the total water requirements during the period of water scarcity especially in Rajasthan.Pruning is essential to maintain vigour, productivity, quality and size of fruits (Singh et al., 2004).High degree of immature fruits dropped during initial stage of fruit growth and development experiences all over India may be due to various factors like hormonal imbalance, abortion of embryo and inclement weather (Bal et al., 1988), nutrition (Chauhan and Gupta, 1985), moisture stress (Ghosh and Tarai, 2007) and pathogen infestation (Reddy et al., 1997) makes ber cultivation nonprofitable. Plant growth regulators and micro nutrients in minute quantities play an important role in enhancing growth and development of plants to influence yield and quality, affecting plant metabolism by bringing about a change in nutritional and hormonal status of the plant (Gadi and Bohra, 2005). Gibberellins are reported to increase fruit set, size, retention and yield as well as improve fruit physico-chemical characteristics and ripening (Rizk-Alla et al., 2011). Micronutrients (B, Fe and Zn) also have a positive effect on ber fruit set, yield, fruit quality and storage-life (Samant et al., 2008). Borax and zinc sulphate are known to play a crucial role in growth, development, quality and storage of fruits (Jayachandran et al., 2005; Singh et al., 2007 and Rajput et al., 2015).

Material and Methods

The present investigation was carried out at Main Experimental Station, Horticulture, Department of Fruit Science; AcharyaNarendra Deva University of Agriculture & Technology, Kumarganj, Ayodhya (U.P.) during 2022-23 and 2023-24 on 29 year old Ber plants which were planted at spacing 6x6 m. Geographically, It is situated at 26.47º North latitude, 82.12º East longitude and altitude of 113 meter from sea level. The site is located in typical saline alkaline belt of Gangetic plains of eastern Uttar Pradesh.Randomized Block Design with four replication was applied in experimental trial, with the allocation of five treatment combinations on varieties Banarasi Karaka.Treatments wereT_1-Control, T_2-$ZnSO_4$(0.5%),T_3-Borax (0.5%), T_4-GA_3 (10 ppm), T_5-$ZnSO_4$ (0.5%) + Borax (0.5%) + GA_3 (10 ppm). Foliar spray was done twice in the month of September and November. The observations were recorded for fruit weight, fruit length, fruit width, fruit specific gravity, yield. The methodology adopted are following:

Fruit weight

The weight of 5 fruits of each replication was taken by analytical balance and the average weight per fruit was calculated as under:

$$\text{Average weight of Fruit (g)} = \frac{\text{Total weightof fruits (g)}}{\text{Total Number of fruits}}$$

Fruit length

The length of each of 5 fruits from each replication was measured in centimeters with the help of Verniercalipersof 0.1 mm least count capacity and the average length of fruit was calculated.

$$\text{Average length of Fruit (cm)} = \frac{\text{Total lengthof fruits (cm)}}{\text{Total Number of fruits}}$$

Fruit width

The width of each of 5 fruits from each replication was measured in centimeters with the help of Verniercalipers and the average width of fruit was calculated using following formula:

$$\text{Average width of Fruit (cm)} = \frac{\text{Total widthof fruits (cm)}}{\text{Total Number of fruits}}$$

Fruit specific gravity

The specific gravity of the fruit was calculated based on the average weight and volume of fruit. The weight was divided by the volume and represented as specific gravity of fruit.The formula of specific gravity is given below:-

$$\text{Speci ic gravity} = \frac{[\text{weight of fruit (g)}]\ /\ [\text{volume of fruit (ml}^3)]}{1\text{g ml}^{-3}\,(\text{water})}$$

Yield

The yield per tree was recorded, calculated and expressed as fruit yield t/ha.

Results and Discussion

Fruit weight

The data in Table 1 shows the effect of micronutrients and GA_3 treatments on fruit weight during both the years (2022-23 and 2023-24) of investigation.During 2022-23, the maximum (21.55g)fruit weight was recorded with foliar application of T_5 ($ZnSO_4$ 0.5% + Borax 0.5% + GA_3 10 ppm), which was significantly superior over rest of the treatments. This was followed by T_3 (Borax 0.5%), T_2 ($ZnSO_4$ 0.5%) and T_4 (GA_3 10 ppm) treatments with 19.70, 18.64, 17.50g fruit weight, respectively. However, the minimum (15.75g) fruit weight was recorded under control.

Similar trend was also noted in 2023-24 and the maximum (21.80g)fruit weight was observed in T_5 ($ZnSO_4$ 0.5% + Borax 0.5% + GA_3 10 ppm) which was significantly superior over rest of the treatments. This was followed by T_3 (Borax 0.5%), T_2 ($ZnSO_4$ 0.5%) and T_4 (GA_3 10 ppm) treatments with 19.90, 18.85, 17.73g fruit weight, respectively. While the minimum (15.96g) fruit weight was observed in control.

Table 1: Effect of foliar feeding of micronutrients and GA_3 on fruit weight of Ber cv. Banarasi Karaka

Treatments	**Fruit weight (g)**		
	2022-23	**2023-24**	**Pooled**
T_1- Control	15.75	15.96	15.86
T_2- $ZnSO_4$ 0.5%	18.64	18.85	18.75
T_3- Borax 0.5%	19.70	19.90	19.81
T_4- GA_3 10 ppm	17.50	17.73	17.62
T_5- $ZnSO_4$ (0.5%) + Borax (0.5%) + GA_3 (10 ppm)	21.55	21.80	21.68
SEm±	**0.41**	**0.41**	**0.41**
CD at 5%	**1.27**	**1.27**	**1.27**

Pooled data reveals that all the treatments increased fruit weight significantly over the control. The maximum(21.68g) fruit weight was recorded in plants sprayed with $ZnSO_4$ 0.5% + Borax 0.5% + GA_3 10 ppm, which was significantly superior over all other treatments. It was followed by T_3 (Borax 0.5%), T_2 ($ZnSO_4$ 0.5%) and T_4 (GA_3 10 ppm) treatments with 19.81, 18.75, 17.62g fruit weight, respectively. The lowest (15.86g)fruit weight was recorded in control.

Increase in fruit weight with the spray of micronutrients and GA_3 might be due to faster loading and mobilization into fruits (Brahmachari*et al.*, 1997) and involvement in hormonal metabolism, increased cell division and expansion of cell. This may also be attributed to greater photosynthetic activity, resulting the increased production and accumulation of carbohydrates and favorable effect on vegetative growth and retention of fruits, which might have increased size and weight.

The present findings regarding the increase in fruit weight with the application of micronutrients and GA_3 may be due to cell division and cell elongation. Similar findings were also noted by Tripathi*et al.* (2009), Majumder*et al.* (2017), Devi *et al.* (2019), Gangadhar*et al.* (2019), Choudhary*et al.* (2020), Laishram and Baruah (2020), Pal *et al.* (2020), Chouhan*et al.* (2022), Patel *et al.* (2023) and Singh *et al.* (2023).

Fruit length

A perusal of Table 2 shows significant influence of micronutrients and GA_3 treatment on fruit lengthduring both the years of investigation. During 2022-23, the maximum (4.46cm)fruit length was noted with the foliar application of T_5 ($ZnSO_4$ 0.5% + Borax 0.5% + GA_3 10 ppm), which was significantly superior over rest of the treatments. This was followed by T_3 (Borax 0.5%), T_2 ($ZnSO_4$ 0.5%) and T_4 (GA_3 10 ppm) treatments with 4.35, 4.24, 4.01cm fruit length,respectively. However, the minimum (3.61cm) fruit lengthwas recorded under control.

During 2023-24, similar trend was observed and the maximum (4.50cm)fruit length was recorded in T_5 ($ZnSO_4$ 0.5% + Borax 0.5% + GA_3 10 ppm) which was significantly superior over rest of the treatments. This was followed by T_3 (Borax 0.5%), T_2 ($ZnSO_4$ 0.5%) and T_4 (GA_3 10 ppm) treatments with 4.40, 4.28, 4.04 cm fruit length,respectively. While the minimum (3.64cm) fruit lengthwas observed in control.

Pooled data in Table.2 shows that all the treatments increased fruit length significantly over the control. The maximum (4.48cm)fruit length was recorded in plants sprayed with $ZnSO_4$ 0.5% + Borax 0.5% + GA_3 10 ppm, which was significantly superior over all other treatments. It was followed by T_3 (Borax 0.5%), T_2 ($ZnSO_4$ 0.5%) and T_4 (GA_3 10 ppm) treatments with 4.38, 4.26, 4.03 cm fruit length,respectively. The lowest (3.63cm) fruit length was recorded in control.

Table 2: Effect of foliar feeding of micronutrients and GA_3 on fruit length of Ber cv. Banarasi Karaka

Treatments	Fruit length (cm)		
	2022-23	2023-24	Pooled
T_1- Control	3.61	3.64	3.63
T_2- $ZnSO_4$ 0.5%	4.24	4.28	4.26
T_3- Borax 0.5%	4.35	4.40	4.38
T_4- GA_3 10 ppm	4.01	4.04	4.03
T_5- $ZnSO_4$ (0.5%) + Borax (0.5%) + GA_3 (10 ppm)	4.46	4.50	4.48
SEm±	**0.01**	**0.01**	**0.01**
CD at 5%	**0.04**	**0.04**	**0.04**

The increase in fruit length can be attributed to the involvement of micronutrients and GA_3 in cell division, cell expansion and increased volume of inter-cellular spaces in the mesocarpic cells. In conformity to our finding, Tripathi*et al.* (2009), Majumder*et al.* (2017), Devi *et al.* (2019), Gangadhar*et al.* (2019), Laishram and Baruah (2020), Pal *et al.* (2020), Chouhan*et al.* (2022), Patel *et al.* (2023), Priya*et al.* (2023) andSingh *et al.* (2023) also observed that micronutrients and plant growth regulators played significant role in fruit growth of ber.

Fruit width

Effect of micronutrients and GA_3 treatments on fruit widthrevealed that all the treatments proved effective in increasing fruit width over control (Table 3). During 2022-23, the maximum (3.45cm)fruit width was recorded with foliar application of T_5 ($ZnSO_4$ 0.5% + Borax 0.5% + GA_3 10 ppm), which was significantly superior over rest of the treatments. This was followed by T_3 (Borax 0.5%), T_2 ($ZnSO_4$ 0.5%) and T_4 (GA_3 10 ppm) treatments with 3.17, 2.91, 2.86 cm fruit width,respectively. However, the minimum (2.38cm) fruit widthwas recorded under control.

Similar trend was also noted in 2023-24 and the maximum (3.50cm)fruit width was observed in T_5 ($ZnSO_4$ 0.5% + Borax 0.5% + GA_3 10 ppm) which was significantly superior over rest of the treatments. This was followed by T_3 (Borax 0.5%), T_2 ($ZnSO_4$ 0.5%) and T_4 (GA_3 10 ppm) treatments with 3.21, 2.97, 2.89 cm fruit width,respectively. While the minimum (2.41cm) fruit widthwas observed in control.

Pooled data reveals that all the treatments increased fruit widthsignificantly over the control. The maximum (3.48cm)fruit width was recorded in plants sprayed with $ZnSO_4$ 0.5% + Borax

0.5% + GA_3 10 ppm, which was significantly superior over all other treatments. It was followed by T_3 (Borax 0.5%), T_2 ($ZnSO_4$ 0.5%) and T_4 (GA_3 10 ppm) treatments with 3.19, 2.94, 2.88 cm fruit width,respectively. The lowest (2.40cm)fruit width was recorded in control.

Table 3: Effect of foliar feeding of micronutrients and GA_3 on fruit width of Ber cv. Banarasi Karaka

Treatments	Fruit width (cm)		
	2022-23	**2023-24**	**Pooled**
T_1- Control	2.38	2.41	2.40
T_2- $ZnSO_4$ 0.5%	2.91	2.97	2.94
T_3- Borax 0.5%	3.17	3.21	3.19
T_4- GA_3 10 ppm	2.86	2.89	2.88
T_5- $ZnSO_4$ (0.5%) + Borax (0.5%) + GA_3 (10 ppm)	3.45	3.50	3.48
SEm±	**0.06**	**0.06**	**0.06**
CD at 5%	**0.17**	**0.17**	**0.17**

The increase in size of fruit (length and width) over control as a result of foliar application of micronutrients and GA_3 in present investigation might be due to their involvement in cell division, cell elongation, increased volume of intercellular spaces in the mesocarpic cells (Brahmachari*et al*., 1997). These results are in line with the findings of Tripathi*et al.* (2009), Majumder*et al.* (2017), Devi *et al*. (2019), Gangadhar*et al.* (2019), Choudhary*et al.* (2020), Laishram and Baruah (2020), Pal *et al.* (2020), Chouhan*et al.* (2022), Patel *et al.* (2023), Priya*et al.* (2023),Singh *et al.* (2023).

Fruit specific gravity

The data has been presented in Table 4, which reveals the effect of micronutrients and GA_3 on fruit specific gravity during both the years (2022-23 and 2023-24) of study. During 1^{st} year (2022-23), the maximum (0.980)fruit specific gravity was noted with the foliar application of T_5 ($ZnSO_4$ 0.5% + Borax 0.5% + GA_3 10 ppm), which was significantly superior over rest of the treatments. This was followed by T_3 (Borax 0.5%), T_2 ($ZnSO_4$ 0.5%) and T_4 (GA_3 10 ppm) treatments with 0.978, 0.977, 0.975 fruit specific gravity, respectively. However, the minimum (0.971) fruit specific gravity was recorded under control.

Similarly, in 2^{nd} year (2023-24), the maximum (0.983)fruit specific gravity was recorded with T_5 ($ZnSO_4$ 0.5% + Borax 0.5% + GA_3 10 ppm), which was significantly superior over rest of the treatments. It was followed by T_3 (Borax 0.5%), T_2 ($ZnSO_4$ 0.5%) and T_4 (GA_3 10 ppm) treatments with 0.981, 0.980, 0.978 fruit specific gravity respectively. However, the lowest (0.974)fruit specific gravity was noted under control.

The pooled data presented in Table 4 reveals that the significantly higher(0.982) fruit specific gravity in comparison to all other treatments was observed in plants sprayed with T_5 ($ZnSO_4$ 0.5% + Borax 0.5% + GA_3 10 ppm) which was followed by T_3 (Borax 0.5%), T_2 ($ZnSO_4$ 0.5%) and T_4 (GA_3 10 ppm) treatments with 0.980, 0.979, 0.977 fruit specific gravity respectively. The minimum (0.973)fruit specific gravity was observed in control.

Table 4: Effect of foliar feeding of micronutrients and GA_3 on fruit specific gravity of Ber cv. Banarasi Karaka

Treatments	Fruit specific gravity		
	2022-23	**2023-24**	**Pooled**
T_1- Control	0.971	0.974	0.973
T_2- $ZnSO_4$ 0.5%	0.977	0.980	0.979
T_3- Borax 0.5%	0.978	0.981	0.980
T_4- GA_3 10 ppm	0.975	0.978	0.977
T_5- $ZnSO_4$ (0.5%) + Borax (0.5%) + GA_3 (10 ppm)	0.980	0.983	0.982
SEm±	**0.001**	**0.001**	**0.001**
CD at 5%	**0.002**	**0.002**	**0.002**

The variation in specific gravity in different treatments might have been due to the change in fruit weight and volume, which were the functions of specific gravity. The specific gravity is generally correlated with composition of tissue such as starch content, dry matter, juice content and total sugars. Similar findings were also reported by Majumder*et al.* (2017), Gangadhar*et al.* (2019), Pal*et al.* (2020) in ber and Kumar *et al.* (2019) in guava.

Yield

The data in Table 5 shows the significant effect of micronutrients and GA_3 treatments on yieldduring both the years (2022-23 and 2023-24) of investigation.During 2022-23, the maximum (16.64t/ha)yield was recorded with foliar application of T_5 ($ZnSO_4$ 0.5% + Borax 0.5% + GA_3 10 ppm), which was significantly superior over rest of the treatments. This was followed by T_3 (Borax 0.5%), T_2 ($ZnSO_4$ 0.5%) and T_4 (GA_3 10 ppm) treatments with 15.95, 15.28, 14.42 t/ha yield, respectively. However, the minimum (12.54) yield (t/ha) was recorded under control.

Similar trend was also noted in 2023-24 and the maximum(16.96t/ha) yield was observed in T_5 ($ZnSO_4$ 0.5% + Borax 0.5% + GA_3 10 ppm) which was significantly superior over rest of the treatments. This was followed by T_3 (Borax 0.5%), T_2 ($ZnSO_4$ 0.5%) and T_4 (GA_3 10 ppm) treatments with 16.26, 15.58, 14.72 t/ha yield, respectively. While the minimum (12.83t/ha) yield was observed in control.

Pooled data reveals that all the treatments increased yield significantly over the control. The maximum (16.81t/ha) yield was recorded in plants sprayed with $ZnSO_4$ 0.5% + Borax 0.5% + GA_3 10 ppm, which was significantly superior over all other treatments. It was followed by T_3 (Borax 0.5%), T_2 ($ZnSO_4$ 0.5%) and T_4 (GA_3 10 ppm) treatments with 16.11, 15.44, 14.58 t/ha yield, respectively. The lowest (12.69t/ha) yield was recorded in control.

The increase in the fruit yield with the foliar application of nutrients may be attributed to increase fruit size, fruit weight and minimum fruit drop. In addition, more cell division, cell elongation and translocation of photosynthates and metabolites from leaves to the developing fruit which resulted in higher fruit yield. The highest fruit yield recorded by foliar spray of micronutrients and GA_3, may be attributed to better uptake and mobilization of nutrients to sink leading to better fruit development. These findings are also supported by the results of Yadav*et al.* (2014), Kanpure*et al.* (2016), Sen*et al.* (2016), Majumder*et al.* (2017), Devi *et al.* (2019), Gangadhar*et al.* (2019), Choudhary*et al.* (2020), Laishram and Baruah (2020), Pal *et al.* (2020), Pal *et al.* (2021), Yadav*et al.* (2021), Bisen (2022) and Patel *et al.* (2023).

Table 5: Effect of foliar feeding of micronutrients and GA_3 on fruit yield of Ber cv. Banarasi Karaka

Treatments	**Yield (t/ha)**		
	2022-23	**2023-24**	**Pooled**
T_1- Control	12.54	12.83	12.69
T_2- $ZnSO_4$ 0.5%	15.28	15.58	15.44
T_3- Borax 0.5%	15.95	16.26	16.11
T_4- GA_3 10 ppm	14.42	14.72	14.58
T_5- $ZnSO_4$ (0.5%) + Borax (0.5%) + GA_3 (10 ppm)	16.64	16.96	16.81
SEm±	**0.13**	**0.13**	**0.13**
CD at 5%	**0.40**	**0.41**	**0.39**

Conclusion

Based on the results, It may be concluded from the results obtained in present investigation that the treatment of $ZnSO_4$ 0.5% + Borax 0.5% + GA_3 10 ppm was found to be most effective to improve fruit weight, fruit length, fruit width, fruit specific gravity, yield. Therefore, $ZnSO_4$ (0.5%) + Borax (0.5%) + GA_3 (10 ppm) can be recommended to maximisefruit weight, fruit length, fruit width, fruit specific gravity, yieldof ber fruit in the Indo-Gangetic plains of eastern Uttar Pradesh.

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