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Effect of $ZnSO_4$, Borax and GA_3 on quality and yield of ber (*Zizyphus mauritiana* Lamk.) Fruits Cv. Gola

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Abstract
The present experiment was carried out in the Main Experiment Station, Department of Horticulture, Faculty of Agriculture Sciences, Bhagwant University, Ajmer, during 2019-20 on 15 years old plant of cv. Gola which were pruned and maintained properly. The collected data were analysed using Randomized Block Design (RBD) design with four replications. Single plant was used as a Unit. Spraying was done at fruit setting stage. The present investigation it is found that the application of $ZnSO_4$, borax and GA_3 on the growth and yield of ber fruits was studied and it was found that highest T.S.S. (19.36), Ascorbic Acid (86.32), Reducing Sugars (6.10), non-reducing sugar (8.00), Total sugars (14.10), Organoleptic quality (8.6) and lowest Acidity (0.22) was recorded with foliar application of $ZnSO_4$ 0.5% + Borax 0.5% + $GA_3$100ppm and the minimum are found under the control during the present investigation.

Keywords: Ber, borax, GA_3, growth, yield and $ZnSO_4$

Introduction
The ber (*Zizyphus mauritiana* Lamk.) is an ancient and important acid fruit of India. It is also known as 'Chinese date' or 'Chinese fig' and commonly considered as poor man's fruit. Ber is quite popular due to high economic returns, low cost of cultivation and wide adaptability and ability to stand drought. It is popularly known as "King of arid fruits". In India the major ber growing states are Punjab, Uttar Pradesh, Haryana, Rajasthan, Madhya Pradesh, Bihar, Maharastra, Assam, Andhra Pradesh, Tamil Nadu and West Bengal. Seedling ber trees are found extensively growing wildly in arid and semi-arid areas.

Ber is an important minor fruit of India which is reported to be grown in other countries also like Iran, Syria, Australia, USA, France, certain parts of Italy, Spain and Africa. It is also reported that the Indian ber is an important fruit crop grown in tropical, sub-tropical and arid regions of the world. It can be grown even on the marginal soils and under various kinds of waste land situations such as sodic soil, saline soil, ravines, arid and semi-arid regions including plateau area of Bundelkhand and Southern India. Although *Zizyphus mauritiana* Lamk. is now widely distributed and has become naturalized in tropical Africa, Burma, Jamaica, Iran, Srilanka and Syria, yet it is commercially important in India and China only.

The ber is highly paying and rich in food value, particularly ascorbic acid and protein. It is nutritious and is a rich source of protein, phosphorus, calcium and Vitamin 'C'. Ber is more nutritive than apple because for its higher protein (0.8g), beta carotene (70 IU) and vitamin C (50-100mg) contents. Fresh ber fruit contains moisture (81.6-83.0 g), fat (0.07 g), fibre (0.60 g), carbohydrates (17.0 g), total sugars (5.4-10.5 g), reducing sugars (1.4-6.2 g), non-reducing sugars (3.2-8.0 g), ash (0.3-0.59 g), calcium (25.6 mg), phosphorus (26.8 mg), iron (0.76-1.8 mg), carotene (0.021 mg), thiamine (0.02-0.024 mg), riboflavin (0.02-0.038), 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%/100 g pulp. (Morton 1987). Ber pulp contain 12.8 to 13.6% carbohydrates of which, 5.6% are sucrose, 1.5% glucose, 2.1% fructose and 1.0% starch.

Gola is an early variety and popular in Delhi, Haryana, Uttar Pradesh and other adjoining areas. Among the different cultivars of ber, Gola is an extremely drought hardy, early and extensively grown variety. The fruit is ovate to round in shape and the size of fruit is medium. It develops greenish to golden yellow colour at ripening stage. The quality of fruit is excellent but cannot stand long transport. The average weight of fruit varies from 15-20 g.

Foliar application of nutrients has certain advantages over soil application. Foliar applications are highly effective with rapid pant response and also useful to maintain their optimum concentration in the plant during growth and fruit development.

But very scanty information is available on foliage nutritional aspects, which can be valuable in making judicious fertilizer recommendation for profitable production of ber. The foliar application of fruit trees has gained much importance in recent years, as fertilizers applied through soil are needed in higher quantities because some amounts leach down and some amounts become unavailable to the plants due to complex soil reaction. The beneficial effect of foliar application of nutrients is based on the fact that the nutrients reach directly to leaves which are the sites of metabolism. Besides this, nutrients are made available to the plants at the time when it is needed. However, response of plants to these nutrients may vary depending upon the soil and Agro-climatic conditions. The rate of movement of some nutrients such as nitrogen, phosphorus and potassium absorbed by leaves has been estimated 0.5 cm / min. Not only leaves, buds, petioles and flowers also absorbed nutrients.

Zinc promotes synthesis of indole acetic acid through tryptophan which serves as a precursor for auxin synthesis and directly affected the growth parameters as well as yield parameters. In view of the above fact, it become quite clear that foliar feeding of Zn is very important for not only increasing plant vigour, but also for enhance the yield.

Boron is one of the minor nutrients, and its deficiency results in the inhibition of plant growth. The most important activity of boron is to facilitate the movement and transfer of the products of photosynthesis from the leaves (source) to the active areas (sink) in the plant. This element has a role in regulating cell membrane activity and gene expression. It also stimulates the biosynthesis of proteins through its effect in the process of DNA synthesis as well as its role in increasing vitamin C and B. The purpose was improving the growth of trees and the increase in the production of fruits in quantity and quality.

Methods and Materials

The present experiment was carried out in the Main Experiment Station, Department of Horticulture, Faculty of Agriculture Sciences, Bhagwant University, Ajmer, during 2019-20 on 15 years old plant of cv. Gola which were pruned and maintained properly. The collected data were analysed using Randomized Block Design (RBD) design with four replications. There were five treatments are T_1: $ZnSO_4$ 0.5%, T_2: Borax0.5%, T_3: $GA_3$100PPM, T_4: $ZnSO_4$ 0.5%+ Borax 0.5% + $GA_3$100 PPM and T_5: Control. Single plant was used as a Unit. 2 sprayings, the first spraying was done in first week of September (just before flowering) and second spraying was done after fruit setting in the month of November.

Observations of T.S.S. of berries was recorded with the help of Erma hand refractometer, whereas, total sugars, titratable acidity and ascorbic acid contents were determined by the methods, suggested by A.O.A.C. (1980) [1]. The data were analysed using Randomized Block Design and in second set of experiment was conducted with four replications. The data were analysed to find out the significant treatments Panse and Sukhatme (1985) [2].

Results and Discussion

Total Soluble Solids

On the basis of the data presented in Table-1, it is clear that the foliar application of certain minerals and GA_3 proved significantly effective in improving the per cent fruit set. The maximum TSS (19.36 °Brix) was found with foliar application of $ZnSO_4$ 0.5%+ Borax 0.5% + $GA_3$100 PPM (T_4) followed by 19.19 °Brix with foliar application of 0.5 per cent borax (T_2) and 18.15 °Brix with 100ppm GA_3 (T_3). The minimum 15.8 °Brix TSS was recorded under the control. The maximum total soluble solids (19.36 "Brix) was recorded with foliar application of $ZnSO_4$ 0.5%+ Borax 0.5% + $GA_3$100 PPM followed by foliar spray of GA_3 100ppm (T_3). Increase in the total soluble solids might be that boron and GA_3 spray. Increase in total soluble solids might due to that gibberellic acid, boron and zinc sulphate help transmembrane sugars transport and a notable characteristic of borax that it directly effects the photosynthesis and helps in translocation of sugars. The present results are in close conformity with Gami *et al.* (2019) [3] and Rahul Pal *et al.* (2021) [4] in ber.

Table 1: Studies on foliar feeding effect of certain minerals and GA_3 on growth and yield of ber (*Zizyphus Mauritiana* Lamk.) fruits Cv. Gola

Treatment	T.S.S.	Ascorbic Acid	Reducing Sugars	Non-reducing sugar	Total sugars	Organoleptic quality	Acidity
T_1: $ZnSO_4$	18.03	80.66	5.09	6.13	11.23	7.4	0.32
T_2: Borax	19.19	81.12	5.41	7.00	12.42	7.7	0.29
T_3: $GA_3$100PPM	18.15	84.69	5.72	7.08	12.81	7.9	0.28
T_4: $ZnSO_4$ 0.5%+ Borax 0.5% + $GA_3$100 PPM	19.36	86.32	6.10	8.00	14.10	8.6	0.22
T_5: Control	17.15	78.53	4.84	6.07	10.92	7.6	0.35
S.Em±	0.25	0.36	0.07	0.09	0.12	0.10	0.00
CD at 5%	0.81	1.13	0.22	0.29	0.39	0.32	0.01

Acidity

The minimum (0.22 per cent) acidity was observed with foliar spray of $ZnSO_4$ 0.5%+ Borax 0.5% + $GA_3$100 PPM (T_4) followed by 0.28 per cent with foliar spray of 100ppm GA_3. The highest acidity 0.35 per cent was noticed in control (T_5). The minimum acidity (0.22%) was found in $ZnSO_4$ 0.5%+ Borax 0.5% + $GA_3$100 PPM followed by foliar spray of GA_3 100ppm (T_3). While maximum acidity was recorded in control. The acidity per cent reduced with borax, GA_3 and $ZnSO_4$ treated fruits which might be due to early ripening induced by this treatment during which degradation of acid might have occurred. It also appears that total soluble solids increased at the expense of acidity under these fruits. These results are in close conformity with Gami *et al.* (2019) [3] and Rahul Pal *et al.* (2021) [4] in ber.

Ascorbic acid

The maximum ascorbic acid (86.32 mg/100g pulp) was recorded with foliar spray of $ZnSO_4$ 0.5%+ Borax 0.5% + $GA_3$100 PPM (T_4) followed by (84.69 mg/100g pulp) with 100 ppm GA_3 (T_3), 81.12 mg/100g pulp with 0.5 per cent borax, respectively. The minimum ascorbic acid (78.53 mg/100g pulp) was recorded under control (T_5). Ascorbic acid content increased with the foliar application of micronutrients

and GA_3 in the ascorbic acid content of ber fruits. This was due to GA_3, borax and $ZnSO_4$. The present study has been found to play important role in improving the which activate synthesis of ascorbic acid and photosynthates. In the present result maximum ascorbic acid (86.32 mg/100g pulp) was recorded with foliar application of $ZnSO_4$ 0.5%+ Borax 0.5% + $GA_3$100 PPM followed by foliar spray of GA_3 100ppm (T_3) against the control in which minimum ascorbic acid (78.53 mg/100g pulp) was recorded. The efficiency of metabolic process of trees and stimulates the functioning of a number of enzymes in the physiological process which probably cause an increase in ascorbic acid. Zinc application also increased the ascorbic acid which seems to be due to increased growth and availability of more metabolites for ascorbic acid synthesis. Similar results have been reported by Majumder *et al.* (2017) [6], Maurya, N. K. *et al.* (2018) [7] and Rahul Pal *et al.* (2021) [4] in ber.

Sugars

The maximum reducing sugar content (6.10 per cent), non-reducing sugar (8.00 per cent) and (14.10 per cent) total sugar was obtained with foliar spray of $ZnSO_4$ 0.5%+ Borax 0.5% + $GA_3$100 PPM (T_4) followed by 5.72 per cent with 100 ppm GA_3 (T_3) and 5.41 per cent with foliar application of 0.5 per cent borax (T_2), respectively however, the minimum sugars was recorded in control (T_5). The maximum reducing sugar (6.10 per cent). Non-reducing sugar (8.00 per cent) and total sugar (14.10 per cent) was recorded with foliar application of $ZnSO_4$ 0.5%+ Borax 0.5% + $GA_3$100 PPM followed by foliar spray of 100ppm GA_3 (T_3). While, it was minimum under control (T_5). The sugars (total and reducing) were increased by foliar application of urea and zinc sulphate. It might be due to more assimilates as a result of nitrogen availability to the fruit trees. The increase in nitrogen conc. increased the growth in terms of leaf area and shoot length which are directly responsible for the production of carbohydrates. Nitrogen is the constituent of various energy sources like amino acid and amino sugars. Adequate amount of zinc improved the auxin content and it also acted as catalyst in oxidation process. Its presence is of great importance in the sugar metabolism. These results are in conformity with the findings of Maurya, N. K. *et al.* (2018) [7] and Rahul Pal *et al.* (2021) [4] in ber.

Organoleptic quality

The foliar application of $ZnSO_4$ 0.5% + Borax 0.5% + $GA_3$100 PPM (T_4) obtained highest organoleptic quality followed by foliar spray of 100 ppm GA_3 (T_3). The all treatments including control obtained 7.40 or above scores indicating the edible quality of fruits of all treatments. Results recorded with organoleptic quality was increased after the foliar application of various treatments except control. The maximum organoleptic quality (7.40) was recorded with foliar application of $ZnSO_4$ 0.5% + Borax 0.5% + $GA_3$100 PPM. The increasing in organoleptic quality of ber fruits after foliar application of $ZnSO_4$, borax and GA_3 that might be due to changes in physic-chemical composition of fruits i.e., Changes in colour, texture aroma and taste. These results are in conformity with the findings of Rachna and Singh (2013) [8] in ber.

Conclusion

Hence it can be concluded the effect of $ZnSO_4$, borax and GA_3 on the yield and quality of ber fruits that highest TSS, ascorbic acid, reducing sugars, non-reducing sugar, total sugars content and organoleptic score and minimum acidity content was recorded with foliar application of $ZnSO_4$ 0.5%+ Borax 0.5% + $GA_3$100 PPM (T_4). So that the foliar application of $ZnSO_4$ 0.5%+ Borax 0.5% + $GA_3$100 PPM (T_4) twice just before flowering and after fruit setting is beneficial for the Ajmer condition.

Reference

1. AOAC. Official methods of Analysis. Association of Analytical chemists, Washington, D.C., 1980.
2. Panse VC, Sukhatme PV. Statistical Methods for Agricultural Workers, ICAR, New Delhi, 1985.
3. Gami J, Sonkar P, Haldar A, Patidar DK. Effect of pre harvest spray of $ZnSO_4$, KNO_3 and NAA on growth, yield and quality of ber (*Zizyphus mauritiana* L.) cv. Seb under Malwa Plateau Conditions. International Journal Current Microbiology of Applied Science. 2019;8(3):1977-1984.
4. Rahul Pal, Ashok Kumar, Abhinav Kumar. Effect of foliar feeding on chemical attributes of Ber (*Ziziphus mauritiana* L.) under Sodic soil. Int. J Chem. Stud. 2021;9(1):1558-1560. DOI: https://doi.org/10.22271/chemi.2021.v9.i1v.11446
5. Rahul Pal, Ashok Kumar, Abhinav Kumar. Studies on Effect of Foliar Feeding on Fruiting and Yield of Ber (*Zizyphus mauritiana* L.) under Sodic Soil, Int. J Curr. Microbiol. App. Sci. 2020;9(12):2991-2994. DOI: https://doi.org/10.20546/ijcmas.2020.912.353
6. Majumder I, Sau S, Ghosh B, Kundu S, Roy D, Sarkar S. Response of growth regulators and micronutrients on yield and physico-chemical quality of Ber (*Zizyphus mauritiana* L.) cv. BAU Kul-1, Journal of Applied and Natural Science. 2017;9(4):2404-2409.
7. Maurya, Neeraj Kumar, Pratap Bhanu, Kumar Abhinav, Yadav Dheeraj, Shrivastav Shiv Praksh. Effect of zinc sulphate and gibberellic acid on physical characters and yield attributes of winter season guava (Psidium guajava L.) CV. Allahabad Safeda, Journal of Pharmacognosy and Phytochemistry. 2018;7(3):3093-3095
8. Rachna, Sukhdev Singh. Effect of gibberellic acid on periodical changes in bio-chemical composition of ber cv. Umran. Hort. Flora Research Spectrum. 2013;2(1):25-29.
9. Rachna Arora, Sukhdev Singh. Effect of Growth Regulators on Quality of Ber (*Zizyphus mauritiana* Lamk) Cv. Umran. Agricultural Science Digest. 2014;34(2):102-106.