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STUDIES ON FOLIAR FEEDING EFFECT OF CERTAIN MINERALS AND GA_3 ON GROWTH 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, India during 2019-20 on 15 years old plant of ber (*Zizyphus mauritiana* Lamk.) cv. Gola which were pruned and maintained properly. The collected data were analysed using randomized block design (RBD) with four replications. Single plant was used as a unit. Spraying was done at fruit setting stage. In 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 Fruit set (48.06%), fruit retention (39.24%), fruit yield (89.00), fruit weight (19.03 g), seed pulp ratio (12.79) and moisture per cent (83.18%) 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' (Bakshi and Singh, 1974). Ber is more nutritive than apple because for its higher protein (0.8g), beta carotene (70 IU) and vitamin C (50-100 mg) 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 becomes quite clear that foliar feeding of Zn is very important for not only increasing plant vigour, but also for enhances 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.

Materials And Methods

The present experiment was carried out in the main experiment station, department of horticulture, faculty of agriculture sciences, Bhagwant University, Ajmer, India 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 on fruit set percentage, fruit retention percentage, size and weight of fruit, weight of fruit pulp, Seed Pulp Ratio and yield components were recorded. Fruit drop and fruit retention percentage were calculated by counting initial fruit set before spraying and fruit retained after spraying. Fruit size was measured with vernier caliper. At harvesting, fruit were weighted on electronic balance and yield of fruit per plant were calculated. After removal of stone from the fruit, weight of pulp was taken out. 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).

Results and Discussion

Fruit set, fruit retention and yield

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 fruit set (48.06 per cent), fruit retention (39.23 per cent) and yield (89.00 kg/tree) were noted with foliar application of $ZnSO_4$ 0.5%+ Borax 0.5% + $GA_3$100 PPM (T_4) followed by foliar spray of GA_3 100 ppm (T_3) where minimum result are found under the control treatment (T_5). The GA_3 prove to be very effective in increasing cell division and cell size in fruits. The GA_3, borax and $ZnSO_4$, response was also more positive because GA_3, borax and $ZnSO_4$ play an important role in translocation of carbohydrate and auxin synthesis to the sink and increased in pollen variability and fertilization. The minimum fruit set, fruit retention and yield were recorded under control (water spray). The increase in fruit size of ber by foliar application of zinc sulphate might be due to synthesis of Indole-3 acetic acid (IAA) which serves as precursor for auxin synthesis. The zinc beings also a precursor of tryptophan amino acid which increases auxin synthesis, resulting in production of metabolites in high quantities. Similar results were also observed by Dalal *et al.* (2011) in ber as well as Sen *et al.* (2016) and Yadav *et al.* (2018) which are in support of present findings in mango.

Weight of fruits, Seed pulp ratio and Moisture

The maximum fruit weight (19.03 g), seed pulp ratio (1:12.79) and maximum moisture per cent (83.18 per cent) was found with foliar application of $ZnSO_4$ 0.5%+ Borax 0.5% + $GA_3$100 PPM (T_4) while the minimum fruit weight (16.06 g) seed pulp ratio (1:9.69) and minimum moisture (78.32 per cent) was recorded under control (T_5). Thus, data indicates that the mixture of certain minerals and GA_3 gave better performance than single minerals and GA_3. It has been observed that the foliar application of different treatment proved beneficial in increasing fruit weight seed pulp ratio and moisture of fruit in comparison to control. The maximum fruit weight (19.03g), seed pulp ratio (12.79) and moisture (83.18) were recorded with $ZnSO_4$ 0.5%+ Borax 0.5% + $GA_3$100 PPM. Which was closely followed by GA_3 100 ppm (T_3). The increase in weight, seed pulp ratio and moisture of fruit by T_4, application might be due to rapid cell division, cell elongation, translocation of sugar and higher pulp ratio. The increase in fruit weight by GA_3 spray might be due the accumulation of more food material in tree. However, borax spraying provide boron to the plant and role of boron in the formation of hormone is little under stood yet it was believed that boron brings about in activation of superfluous growth hormone by formation of complex compound. The importance of the elements in improving the physiological activities of plant had been released but is not clear whether in influenced directly or in directly. fruit yield. It might be due to the fact that nitrogen and zinc application increased the photosynthetic activity of the plant which is responsible for better fruit weight. Being a constituent of amino acid and chlorophyll, nitrogen and zinc increase the production of metabolites and consequently the fruit weight. The These activity micronutrients and GA_3 increased results are in close conformity with findings at Poornima Devi *et al.* (2019) and Sneha Singh *et al.* (2019) in ber.

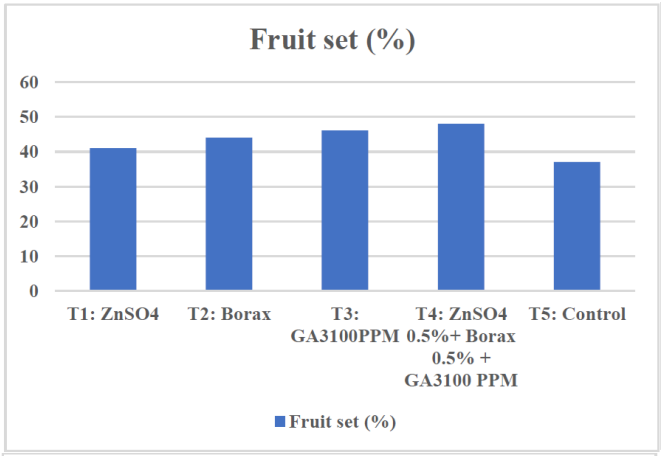
Conclusion

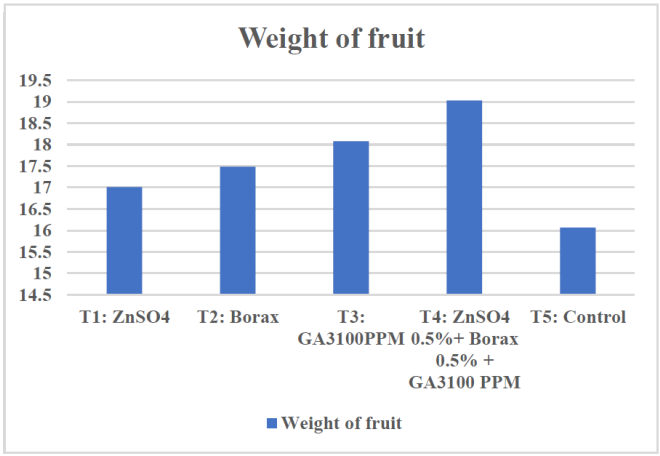
Hence it can be concluded the study the effect of $ZnSO_4$, borax and GA_3 on the yield and quality of ber fruits that highest fruit set, fruit retention, fruit yield, fruit weight, seed pulp ratio and moisture per cent was recorded with

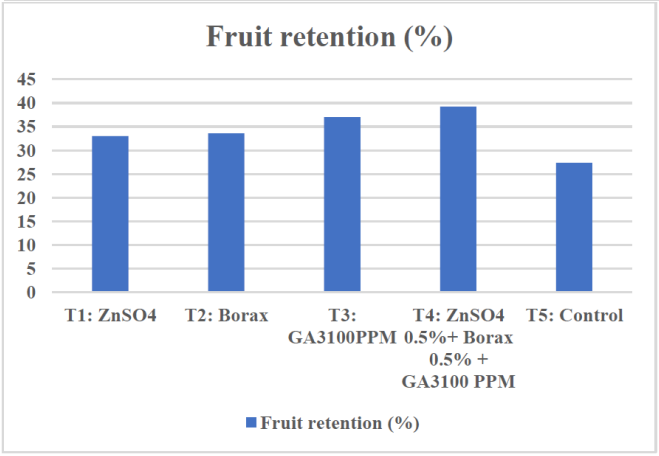
foliar application of $ZnSO_4$ 0.5%+ Borax 0.5% + $GA_3$100 PPM (T_4). So that the foliar application of $ZnSO_4$ 0.5%+ Borax 0.5% + $GA_3$100 PPM (T_4) twice just before flowering and after fruit setting is beneficial for the Ajmer condition.

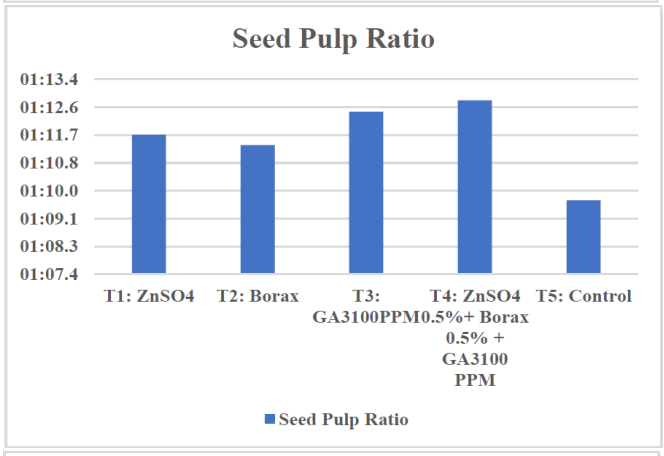
Table 1 : Effect of Certain Minerals and GA_3 on Growth and Yield of Ber (*Zizyphus Mauritiana* Lamk.) Fruits Cv. Gola

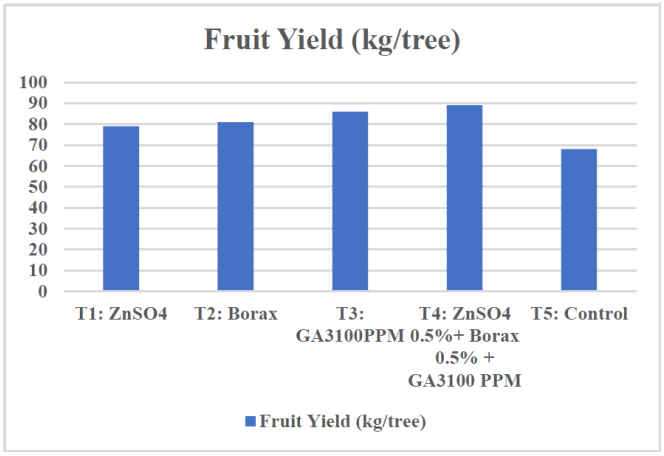
Treatment	Fruit set (%)	Fruit retention (%)	Fruit Yield (kg/tree)	Weight of fruit	Seed Pulp Ratio	Moisture
T_1: $ZnSO_4$	41.06	33.00	79.00	17.01	1:11.72	81.183
T_2: Borax	44.04	33.58	81.00	17.49	1:11.40	80.19
T_3: $GA_3$100PPM	46.09	37.03	86.00	18.08	1:12.43	82.107
T_4: $ZnSO_4$ 0.5%+ Borax 0.5% + $GA_3$100 PPM	48.06	39.24	89.00	19.03	1:12.79	83.183
T_5: Control	37.04	27.36	68.00	16.06	1:9.69	78.323
SEm±	0.35	0.21	0.47	0.27	0.03	0.28
CD at 5%	1.25	0.68	1.52	0.87	0.10	0.90











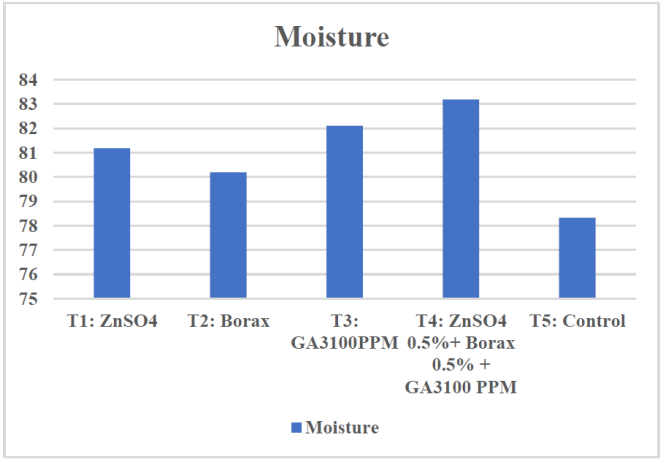


Fig. 1: Effect of Certain Minerals and GA_3 on Growth and Yield of Ber (*Zizyphus Mauritiana* Lamk.) Fruits Cv. Gol

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