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Effect of foliar spray of bio-regulators and npk on growth attributes of Ber (*Zizyphus mauritiana* L.)

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Abstract

A field experiment was entiled to study the Effect of Foliar Spray of Bio-regulators and NPK on Growth, Yield and Quality of Ber (*Zizyphus mauritiana* Lamk. under loamy sand soils was conducted at Horticulture Farm, SKNAU, Jobner (Jaipur) during September, 2017 to March, 2018. It consisted of 20 treatment combinations with five levels of bio-regulators (Control, Thiourea @ 250 ppm and 300 ppm Salicylic acid @ 75 ppm and 100 ppm) and four levels of NPK (control, 0.5% NPK, 1.0% NPK and 1.5% NPK) in Randomized Block Design with three replications. The study revealed that the application of thiourea @ 300 ppm among the different bio-regulators and 1.5 per cent NPK significantly increased the growth attributes (Gain in plant height, gain in plant spread, length of primary branch, number of secondary branches per primary branch, leaf area, relative leaf water content and total chlorophyll content in leaves) over control.

Keywords: Ber, bio-regulators, growth, NPK content, salicylic acid, and thiourea

Introduction

Indian jujube or ber (*Zizyphus mauritiana* Lamk.) is one of the most common fruits, indigenous to an area between India and China. It belongs to the family Rhamnaceae. Ber fruit is palatable and delicious with a good amount of vitamin A, C, B complex and minerals. It has significant levels of antioxidant activity, reducing power and scavenging effect on free radicals (Li *et al.*, 2005) [7]. Because of these properties, *Zizyphus strager* are used as folk medicines for the treatment of various diseases (Abdel-Zaher *et al.*, 2005) [1]. Its bark is also used to heal ulcer, wounds, scabies, throat problems and burning sensation of the body. Fruits are useful to purify and enrich blood, treat chronic bronchitis, fever and enlargement of the liver. Ber seeds are also used to treat dry cough and skin eruptions. The juice of ber root is used as a purgative and externally sin gout and rheumatism (Mukhtar *et al.*, 2004) [8]. However, its leaves are used for the treatment of *Diabetes mellitus* (Abdel – Zaher *et al.*, 2005) [1].

The cultivation of ber is mainly done in arid and semi-arid regions but, due to one or another reasons farmers are not harnessing the desired production potential of the crop. The potent reasons for lesser productivity could be attributed to poor management. Ber produces fruits continuously for a longer time, thus it needs proper and integrated nutrients to have regular feeding at vegetative as well as reproductive phase of the tree. Further, owing to very deep tap root system and xerophytic nature, ber plant is very hardy and once established, it needs little care and irrigation but it has been observed that it suffers from severe frost attack during peak winters which directly hampers the productivity. One possible alternative of overcoming this problem may be use of different bio-regulators like salicylic acid and thiourea along with foliar application of nutrients like NPK. Salicylic acid (SA) is known as a signal molecule in the induction of defense mechanisms in plants. SA is a well known phenol that can prevent ACO activity that is the direct precursor of ethylene and decreases reactive oxygen species (ROS) with increased enzyme antioxidant activity (Ansari and Misra., 2007) [2]. It has also been found that SA positively affects growth, development, ion uptake, transport and membrane permeability in plants. (Simaei *et al.*, 2012) [11]. Thiourea can be successfully used to develop an off season fruit production technology and to induce floral bud break in mature shoot for some mango varieties. (Peiris and Tongumpai 2003) [9]. Application of thiourea (2%) also induced flowering in twenty years old “Paternakh” Pear in India (Singh and Mann, 2002) [12].

Materials and Methods

The experiment was conducted at Horticulture Farm, S.K.N. College of Agriculture, Jobner (Jaipur) during September, 2017 to March, 2018. In Rajasthan, this region falls under agro-climatic zone-IIIA (Semi-Arid Eastern Plains).

The experiment was laid out in Randomized Block Design with five levels of bio-regulators (Control, Thiourea @ 250 ppm and 300 ppm Salicylic acid @ 75 ppm and 100 ppm) and four levels of NPK (control, 0.5% NPK, 1.0% NPK and 1.5% NPK) with three replications. Bio-regulators as Thiourea @ 250 and 300 ppm at first initiation of flowering and pea size fruit stage and Salicylic acid - @ 75 and 100 ppm at first initiation of flowering and pea size fruit stage in the present investigation alone were applied as foliar spray. First spray done at 6 September, 2017 and second spray was done at 8 October, 2017. The nitrogen, phosphorus and potassium were applied through complex fertilizer as NPK (19:19:19). First spray of NPK was done at September and second spray was done at pea size fruit stage as per treatment combinations. The plant geometry was kept at 6 m x 6 m. The observations like Gain in plant height, gain in plant spread, length of primary branch, number of secondary branches per primary branch, leaf area, relative leaf water content and total chlorophyll content in leaves of ber were taken manually. The data obtained from the trial were subjected to statistical analyses which are presented in tabular form.

Results and Discussion

Growth attributes

It is evident from data (Table 1) that foliar spray of bio-regulators significantly influenced the plant growth. The application of treatment B₂ (Thiourea @ 300 ppm) increased gain in plant height, gain in average length of primary branch, plant spread, number of secondary branches per primary branch, leaf area, relative leaf water content and total chlorophyll content in leaves as compared to rest of the treatments. This treatment had significant effect on these growth parameters over control as well as application of salicylic acid @ 75 ppm but remained at par to thiourea @ 250 ppm and salicylic acid @ 100 ppm. Exogenous application of bio-regulators at growth stages gave the plants a speedy growth rate with higher chlorophyll and relative leaf

water content which enabled the plants to use water more efficiently. Thiourea might mitigate the effects of low temperature stress by acting as an ROS scavenger and enhancing the water utilization efficiency. Thiourea and salicylic acid also contributed in alleviating the chilling stress affects upon the biological and physiological aspects.

Further, The beneficial effect of thiourea and salicylic acid were attributed to its role in significantly increasing the net photosynthetic rates and the concentration of total chlorophyll and starch in the leaves. Thiourea also reflect a positive role in enhancing nitrogen metabolism as it significantly increased nitrate reductase activity and concentration of soluble proteins in the treated plants. It has been proved that foliar spray could significantly improved growth and water use efficiency of ber under semi-arid conditions due to enhanced photosynthesis and more efficient nitrogen metabolism. Application of NPK @ 1.5% significantly increased the vegetative growth attributes over rest of the treatments except treatment N₂ (1.0% NPK), which was found statistically at par to it. The better growth and development of plant under this treatment might be due to better nutritional environment in root zone as well as in plant system. Nitrogen, phosphorus and potash are most indispensable among all mineral nutrients for growth and development of plant as it is basis of fundamental constituents of all living matter present.

The biological role of NPK as an essential constituent of chlorophyll and nucleic acid, in harvesting solarenergy, energy transformation from phosphorylated compounds, transfer of genetic information, regulation of cellular metabolism and structural unit compounds are well known. All these are found abundantly in the growing and storage organ, promote healthy root, shoot and full development (Devlin and Witham, 1986) ^[5]. The results are also close conformity with the findings of Lal and Dhaka (2003) ^[6] in ber, Bhubia *et al.* (2005) ^[3] in guava, Prasad (2005) ^[10] in ber and Devashi (2012) ^[4] in sapota.

Table 1: Effect of Bio-regulators and NPK on growth attributes of Ber.

Treatments	Gain in plant height (cm)	Gain in average length of primary branches (cm)	Gain in plant spread (cm)	
			N-S	E-W
Foliar spray of bio-regulators				
B ₀ (control)	70.20	68.33	95.50	98.00
B ₁ (Thiourea @ 250 ppm)	74.49	92.28	103.94	117.96
B ₂ (Thiourea @ 300 ppm)	78.19	97.78	109.06	121.04
B ₃ (Salicylic acid @ 75 ppm)	72.10	87.40	97.90	112.00
B ₄ (Salicylic acid @ 100 ppm)	73.45	91.81	101.10	114.42
SEm±	1.62	2.35	2.64	2.60
CD (P=0.05)	4.63	6.74	7.56	7.44
Foliar spray of NPK				
N ₀ (control)	70.53	83.40	95.95	100.88
N ₁ (NPK @ 0.5 %)	71.47	85.62	100.35	112.00
N ₂ (NPK @ 1 %)	74.57	89.57	102.35	117.86
N ₃ (NPK @ 1.5 %)	78.17	91.50	107.35	119.98
SEm±	1.45	2.10	2.36	2.32
CD (P=0.05)	4.14	6.03	6.76	6.65

Table 2: Effect of Bio- regulators and NPK on growth attributes of Ber.

Treatments	Gain in number Of secondary branches per primary branches	Leaf Area (cm ²)	Relative leaf water content (%)	Total chlorophyll content (mg/g)
Foliar spray of bio-regulators				
B ₀ (control)	7.40	802.50	56.29	0.809
B ₁ (Thiourea @ 250 ppm)	10.47	825.00	62.60	1.728
B ₂ (Thiourea @ 300 ppm)	10.78	878.00	65.23	1.818
B ₃ (Salicylic acid @ 75 ppm)	9.32	808.00	57.20	1.608
B ₄ (Salicylic acid @ 100 ppm)	10.08	818.00	60.80	1.698

SEm±	0.27	21.33	1.57	0.043
CD (P=0.05)	0.77	61.06	4.51	0.122
Foliar spray of NPK				
N ₀ (control)	7.37	772.40	57.32	1.500
N ₁ (NPK @ 0.5 %)	9.83	802.40	58.56	1.520
N ₂ (NPK @ 1 %)	10.50	855.40	62.04	1.550
N ₃ (NPK @ 1.5 %)	10.75	875.00	63.76	1.560
SEm±	0.24	19.08	1.41	0.038
CD (P=0.05)	0.68	54.61	4.03	NS

Conclusion

On the basis of the results emerged out from one year experiment, it can be concluded that growth parameters *viz.*, gain in plant height, gain in average length of primary brach gain in plant spread (E-W and N-S), length of primary branch, number of secondary branches per primary branch, leaf area, relative leaf water content and total chlorophyll content in leaves had significant effect with the application of bio-regulators. The treatment B₂ (Thiourea @ 300 ppm) recorded maximum values of these parameters which was statistically at par with B₁ (Thiourea @ 250 ppm). Further, application of B₄ (salicylic acid @ 100 ppm) also found stastically at par to this treatment B₂ in respect to number of secondary branches per primary branch, plant spread (E-W), leaf area, relative leaf water content and total chlorophyll content in leaves. The application of fertility levels in treatment N₃ (1.5% NPK) significantly increased the growth parameters over rest of the treatments except N₂ (1.0% NPK) which could not showed significant difference in these parameters.

Thus, application of B₁ (Thiourea @ 250 ppm) and foliar spray of N₂ (1.0% NPK) to ber is recommended for high fruit yield, economic returns in ber growing areas of semi arid Eastern Plains of Rajasthan.

The results are only indicative and require further experimentation to arrive at more consistent and final conclusion.

References

1. Abdel-Zaher AO, Salim SY, Assaf MH, Abdel-Hady RH. Antidiabetic activity and toxicity of *Zizyphusspina Christi* leaves. *Journal of Ethnopharmacology*. 2005; 101(1-3):129-138.
2. Ansari MS, Misra. Miraculous role of salicylic acid in plant and animal system. *Amrican Journal of Plant Physiology*, 2: 51-58. Arnon, D.I. 1949. Copper enzymes in isolated chloroplast I, polyphenol oxidase in *Beta vulgaris*. *Plant Physiology*. 2007; 24:1-15.
3. Bhojia SK, Godhara RK, Singh SK, Beniwal LS, Kumar S. Effect of organic and inorganic nitrogen on growth, yield and NPK content of guava cv. Hisar Surkha during winter season. *Haryana Journal of Horticultural Sciences*. 2005; 34(3-4):232-33.
4. Devashi V. Effects of organic and inorganic nitrogen on growth, yield and quality of Sapota 'Kalipatti'. *Journal of Fruit and Ornamental Plant Research*. 2012; 20(1):55-64.
5. Devlin RM, Witham FH. *Plant Physiology*. C.B.S. Publishing and Distributor, Delhi, 1986.
6. Lal G, Dhaka RS. Effect of phosphorus and potassium fertilization on growth and yield of ber (*Zizyphus mauritiana* L.) cv. Umran. *Hamdard Medicus*. 2003; 46(4):80-81.
7. Li JW, Ding SD, Ding XL. Comparison of antioxidant capacities of extracts from five cultivars of Chinese jujube. *Process Biochemistry*. 2005; 40(11):3607-613.
8. Mukhtar HM, Ansari SH, Ali M, Naved T. New compounds from *Zizyphus vulgaris*. *Pharmaceutical Biology*. 2004; 42(7):508-511.
9. Peiris, Tongumpai. Effect of nutrients and thiourea on economic of mango (*Mangifera indica* L.) cv. Kesar. *International Journal of Science, Enviornment and Technology*. 2003; 40:57.
10. Prasad RN. Effect of N and P on growth, yield and quality of ber grown under rainfed conditions of Indian arid zone. *Indian Journal of Horticulture*. 2005; 62(4):404-06.
11. Simaei M, Khavari-Nejad RA, Bernard F. Exogenous application of salicylic acid and nitric oxide on the ionic contents and enzymatic activities in NaCl- stressed soybean plants. *American Journal of Plant Sciences*. 2012; 3:1495-503.
12. Singh H, Mann SS. Effect of dormancy breaking chemicals on flowering, fruit set and quality in Asian pear (*Pyrus pyrifolia* L.). *Indian Journal of Horticulture*. 2002; 59(1):49-57.