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Short communication

Effect of growth regulator and nutrients spray on control of fruit drop, fruit size and quality of ber under sub-montane zone of Punjab

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ABSTRACT

The effect of foliar spray of plant growth regulators and nutrients on fruit drop, fruit size and quality was studied in ber cv Sanuar-2 at Krishi Vigyan Kendra, Hoshiarpur, Punjab Agricultural University, Ludhiana, during 2005-2006. Plants were sprayed with NAA (20, 30 or 40 ppm), KNO_3 (0.5, 1.0 or 1.5%) and $ZnSO_4$ (0.3, 0.4 or 0.5%) during the last week of October and again superimposed in the last week of November. All the treatments resulted in decreased fruit drop compared to control. Minimum fruit drop (69.6%) was recorded with application of NAA (30 ppm) while maximum was recorded in control. Plants sprayed with KNO_3 (1.5%) exhibited maximum fruit size, fruit weight while this was minimum in control trees. Palatability rating of fruits was maximum with KNO_3 (1.5%) which also exhibited maximum fruit size, fruit weight and minimum was observed in control trees besides producing fruits with on attractive colour. Total soluble solids were not affected by treatments. Maximum vitamin C (104.2 mg/100 g pulp) content was observed in NAA (30 ppm), followed by KNO_3 (1.5%) treatment. Results indicated that NAA (30 ppm) spray was better for fruit retention; however, fruit quality in terms of size, colour and palatability rating was better with KNO_3 (1.5%).

Key words: Ber, fruit drop, fruit quality, plant growth regulators, nutrients

Ber (*Zizyphus mauritiana* Lamk) is a hardy fruit tree which can be successfully grown in arid and semi-arid zones of Indian states particularly Haryana, Rajasthan, Madhya Pradesh and Gujarat, where most of other fruit plants fail to grow due to lack of irrigation facilities. Ber fruit is very popular among consumers due to its high nutritive value and comparatively lower market price. The fruit of ber is considered more nutritive than apple for its higher protein, beta-carotene and vitamin C contents (Rai and Gupta, 1994). In Punjab, the commercial cultivation of ber is largely focused on single cultivar 'Umran'. However, sub-montane region of state having higher relative humidity, Sanaur-2 cultivar is recommended due to its higher tolerance to powdery mildew disease as compared to Umran. But heavy fruit drop is a major obstacle for expansion of ber industry in this region. The bulk of fruit drop occurs at early stage of fruit development i.e, during second fortnight of December. Many reasons such as hormonal imbalance, abortion of embryo and inclement weather have been ascribed to drop immature fruits in ber (Singh *et al*, 1991). Application of NAA and $ZnSO_4$ alone or in combinations were effective in reducing fruit drop in ber cv Umran (Yadav *et al*, 2004). Similarly, foliar application of KNO_3 (1.5 %) alone or in combination with urea at pea size stage increased fruit size and quality in cv. Umran (Yadav, 2001). Keeping in view of above findings, the present study was undertaken to find out the efficacy of foliar sprays of NAA, KNO_3 and $ZnSO_4$ in checking the fruit drop and improving quality of ber cv. Sanaur.

The present investigation was carried out at ber orchard of Krishi Vigyan Kendra, Hoshiarpur, a centre of Punjab Agricultural University, Ludhiana, during 2005-2006, planted at 7.5 x 7.5 meters under square system. Four-years-old plants of uniform vigour of ber cv. Sanaur-2 maintained under uniform cultural practices and plant protection measures were selected. Aqueous solution of different chemicals viz; Naphthalene acetic acid (20, 30 and 40 ppm), KNO_3 (0.5, 1.0 and 1.5%) and $ZnSO_4$ (0.3, 0.4 and 0.5 %) were applied as foliar spray. The different nutrient solutions were prepared separately by dissolving the required quantity of salts in water. The trees were sprayed in last week of

October and November months. The control trees were sprayed with water. Ten treatments including control were laid out in completely randomized block design with three replications. In each replication, four branches were tagged and fruits from these were counted just before the first spray. The fruit drop was estimated at the time of harvesting by counting the number of fruits retained in labelled branches. Fruits were harvested at optimum maturity. Thirty fruits per replication were taken at random to determine physico-chemical characteristics. Fruit size (Length x breadth) was measured with the help of Vernier Calipers. Fruit weight was measured with electronic balance and expressed in gram. The colour of fruits was recorded with 'Royal Horticultural Society Colour Chart' (Wilson, 1938). Palatability rating in terms of general appearance, taste and flavour were recorded by panel of five judges. Total soluble solids were measured with hand refractometer and the values were corrected to 20°C with the help of temperature correction chart. Total acids were determined by titrating the known weight of finely blended pulp with 0.1N NaOH using phenolphthalein as an indicator. Vitamin C content was determined by titrating the juice against 2, 6-dichlorphenol indophenol dye solution to a light pink colour which persisted for 15 seconds. The results were expressed as mg/100 g of fruit flesh. The data were analysed statistically by randomized block design (RBD) method using CPCS-1 computer software package.

A. Fruit drop and physical characteristics of fruit

The data on fruit drop, fruit colour, fruit size and weight are presented in Table 1. All the sprayed treatments, except KNO_3 (1.0% and 1.5%) significantly decreased fruit drop over control. The decrease in fruit drop, however, seemed to vary with different chemicals and their concentrations employed. Minimum fruit drop (69.6%) was recorded in NAA 30 ppm treatment which was statistically on par with NAA 20 pppm, $ZnSO_4$ (0.4%) and $ZnSO_4$ (0.5%) treatments. However, the maximum fruit drop of 82.7 per cent was observed in control trees. Reduction in fruit drops of ber with NAA applications have also been reported by earlier workers (Bal *et al*, 1984 and Singh *et al*, 2001). The effect of $ZnSO_4$ in controlling the fruit drop might be due to the higher availability of photosynthates and promotes auxin synthesis necessary for fruit set and growth.

Application of KNO_3 (1.0 and 1.5%) and $ZnSO_4$ (0.5%) resulted attractive yellowish green colour (YG 154 B) fruit as compared to green coloured (YG 150 B) fruits in rest of the treatments including control.

Significantly higher fruit size was registered in NAA (30 ppm), KNO_3 (0.5 & 1.0%) and $ZnSO_4$ (0.5%) treatments as compared to control. The maximum fruit size was recorded in KNO_3 (1.5%) closely followed by $ZnSO_4$ (0.5%) treatment. The minimum fruit size was recorded in control. Similarly, the maximum fruit weight of 24.0 g was recorded in KNO_3 (1.5%) and minimum of 20.2 g was observed in control. Similar increase in fruit weight with foliar application of KNO_3 was noted by Ebraheim *et al* (1993) in 'Balady' mandarins. Increase in fruit size with $ZNSO_4$ was also reported by Samant *et al* (2008). Auxins are known to play fundamental role in determining fruit growth (Arteca, 1996). These results are in agreement with findings of Singh *et al* (2001), who observed higher fruit size and weight with $ZnSO_4$, K_2SO_4 and NAA treatments. Lal *et al* (2001) also observed increase in fruit weight of 'Umran' ber with application of potassium in combination with nitrogen.

Table 1. Effect of plant growth regulators and nutrients on fruit drop, fruit colour, fruit size and fruit weight of ber cv. Sanaur-2

Treatment	Fruit drop (%)	Fruit colour	Fruit length (cm)	Fruit breadth (cm)	Fruit weight (g)
NAA 20 ppm	70.5 (57.1)	*YG-150 B	4.45	2.96	21.2
NAA 30 ppm	69.6 (56.5)	YG-150 B	4.62	3.02	22.9
NAA 40 ppm	76.9 (61.3)	YG-150 B	4.50	2.98	21.8
KNO_3 0.5%	77.5 (61.7)	YG-150 B	4.57	3.00	22.4
KNO_3 1.0%	80.6 (63.8)	YG-154 B	4.60	3.05	22.1
KNO_3 1.5%	81.7 (64.7)	YG-154 B	4.71	3.09	24.0
$ZnSO_4$ 0.3%	74.0 (59.3)	YG-154 B	4.43	2.93	21.4
$ZnSO_4$ 0.4%	71.8 (57.9)	YG-150 B	4.43	2.94	21.8
$ZnSO_4$ 0.5%	72.6 (58.4)	YG-154 B	4.66	3.03	23.8
Control	82.7 (65.4)	YG-150 B	4.38	2.90	20.2
CD at *P=0.05*	(1.92)	--	0.13	0.10	2.06

Figures in parenthesis indicate arc sine transformed values
* YG = Yellow green

Table 2. Effect of plant growth regulators and nutrients on fruit quality characteristics ber cv. Sanaur-2

Treatment	Palatability rating (max. 20)	TSS (%)	Acidity (%)	TSS/acid ratio	Vitamin C (mg/100g)
NAA 20 ppm	14.6	15.4	0.40	38.9	93.3
NAA 30 ppm	14.7	16.2	0.38	43.2	104.2
NAA 40 ppm	15.9	17.2	0.34	50.5	101.6
KNO_3 0.5%	15.2	16.0	0.35	46.0	88.3
KNO_3 1.0%	15.4	15.8	0.32	49.5	93.3
KNO_3 1.5%	16.5	16.9	0.35	48.6	102.1
$ZnSO_4$ 0.3%	14.8	15.9	0.35	45.8	99.5
$ZnSO_4$ 0.4%	15.8	15.6	0.41	37.7	98.2
$ZnSO_4$ 0.5%	15.7	16.2	0.42	38.9	93.6
Control	14.6	15.4	0.45	34.0	84.7
CD at *P=0.05*	0.9	NS	0.06	NS	10.44

B. Quality of fruit

Data on quality parameters of fruit are presented in Table 2. The palatability rating of fruits was increased by various foliar sprays as compared to control. Significantly higher palatability rating was observed in NAA 40 ppm, KNO_3 (1.5%), $ZnSO_4$ (0.4%) and $ZnSO_4$ (0.5%) treatments as compared to control. The highest palatability rating (16.5) was recorded with KNO_3 (1.5%) treatment and the fruits were marked 'Excellent'. The minimum palatable rating was observed in control.

TSS content was not influenced by the spray treatments. All the treatments significantly decreased acid content of fruits as compared to control except, NAA (20 ppm) and $ZnSO_4$ (0.4 & 0.5%) treatments, where it was statistically at par. TSS / acid ratio was unaffected by different treatments.

Vitamin C content of fruit ranged from 84.7 mg/ 100g in control to 104.2 mg/100 g in NAA 30 ppm treatment. Significantly higher vitamin C content was recorded in NAA (30 & 40 ppm) and KNO_3 (1.5%) treatments as compared to control. Similar results were also reported by Singh *et al* (2002).

REFERENCES

Arteca, R. 1996. *Plant Growth Substances: Principles and Applications*. pp 57., Chapman & Hall, New York

Bal, J.S., Singh, S.N., Randhawa, J.S. and Jawandha, J.S. 1984. Effect of growth regulators on fruit drop, size and quality of ber (*Zizyphus mauritiana* Lamk). *Indian J. Hort.*, **41**:182-185

Ebrahiem, T.A., Ahmed, F.F. and Assy, K.G. 1993. Behavior of Balady mandarin tree (*C. reticulata*) grown in sandy loam soil to different forms and concentrations of potassium foliar sprays. *J. Agric. Sci.*, **24**:215-227

Lal, G., Dhaka, R.S. Agarwal, V.K. Goyal, S.K. and Pareek, C.S. 2001. A note physico- chemical attributes of Umran ber as affected by application of nitrogen and potassium. *Haryana J. Hort. Sci*., **30**:204-205

Rai, M. and Gupta, P.N. 1994. Genetic diversity in ber. *Indian J. Hort*., **39**:42-47

Samant D., Mishra, N.K. and Lal, R.L. 2008. Effect of micronutrient sprays on fruit yield and quality during storage in ber cv. Umran under ambient conditions. *Indian J. Hort.*, **65**:399-404

Singh, R., Godara, N.R., Singh, R. and Dahiya, S.S. 2001. Response of foliar applicatoin of growth regulators and nutrients in ber (*Zizyphus mauritiana* Lamk) *Haryana J. Hort. Sci*., **30**:161-164

Singh, R., Godara, N.R. and Ahlawat, V.P. 2002. Qualitative attributes as affected by foliar sprays of nutrients and growth regulators in ber (*Zizyphus mauritiana* Lamk.) cv. Umran. *Haryana J. Hort. Sci.*, **31**:23-25

Singh, Z., Dhillon, B.S. and Sandhu, A.S. 1991. Relationship of embryo degeneration with fruit drop and its pattern in different cultivars of ber. *Indian J. Hort.*, **48**:277-281

Wilson, R.R. 1938. Horticultural colour charts. Wilson Colours Ltd in collaboration with the Royal Horticultural Society and British Council.

Yadav, B., Rana, G.S. and Bhatia, S.K. 2004. Response of Naphthalene acetic acid, urea and Zinc sulphate on fruit drop in ber (*Zizyphus mauritiana* Lamk). *Haryana J. Hort. Sci.*, **33**:181-182

Yadav, P.K. 2001. Note on foliar application of urea and potassium sulphate on yield and quality of ber. *Curr. Agri.*, **25**:129-130

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