The Bioscan 11(1): 151-153, 2016
AN INTERNATIONAL QUARTERLY JOURNAL OF LIFE SCIENCES
www.thebioscan.in

RESPONSE OF POTASSIUM COMPOUNDS ON POST-HARVEST LIFE OF BER CV. BANARASI KARAKA

VIMAL SONKARIYA[1]*, S. P. SINGH[1] AND VISHAL NIRGUDE[2]
[1]Department of Horticulture,
Institute of Agricultural Sciences, Banaras Hindu University, Varanasi - 221 002, Uttar Pradesh, INDIA
[2]Department of Horticulture,
G. B. Pant University of Agriculture & Technology, Pantnagar - 263 145, Uttarakhand, INDIA
e-mail: sonkariya008@gmail.com

KEYWORDS
Ber
Potassium Compounds
Fruit quality
Postharvest life
Storage conditions

Received on :
13.12.2015

Accepted on :
02.03.2016

***Corresponding author**

ABSTRACT

An experiment was conducted during 2013-14 to study the effect of potassium compounds on post-harvest life of uniform and healthy fruits of ber cv. Banarasi Karaka at golden yellow stage of maturity. The fruits weretreated with two potassium compounds *viz.*, KNO_3 and K_2SO_4 at concentration levelsof 1%, 1.5% and 2%. The observations were recorded at 4 days interval (0th day, 4th day, 8th day and 12th day) during storage at ambient conditions. The treatment KNO_3 @ 2% was found significantly superior in reducing the weight loss (5.65%), decay loss (8.65%) and acidity (0.156%) as well as increased TSS (15.30%) and ascorbic acid (69.80 mg/100g) of fruitson 12th day of storage. Fruits treated with KNO_3 (2%) can be stored economically for 8 days in ambient conditions. Results indicated that foliar fertilization with KNO_3 (2.0%) was found superior in maintaining quality and shelf life of the ber fruits.

INTRODUCTION

Zizyphus mauritiana, also known as ber, Chinese apple, Jujube, Indian plum and Masau is a tropical fruit tree species belongs to the family Rhamnaceae is referred as the 'King of arid zone fruits'. In India, it is called as 'Poor man's apple' (Bal and Uppal, 1992). Zizyphus is a genus of about 40 species of spiny shrubs, distributed in the warm-temperate and subtropical regions throughout the world (Bhatt *et al.,* 2007). It is cultivated throughout India including states such as Punjab, Madhya Pradesh, Bihar, Uttar Pradesh, Haryana, Rajasthan, Gujarat, Maharashtra and Andhra Pradesh. Ber fruit contains 2.5% protein and 12.8% carbohydrates, 68.0% moisture, 3.92% acidity, 8.68% total sugars, 6.73% reducing sugars, 1.85% non-reducing sugars, 1.72% pectin, and 1.32% tannins. The vitamin C content of the fruit ranges from 70-165mg/100g (Bal and Mann, 1978). Ber is rich in protein, phosphorus, calcium, carotene and vitamin C than apple (Bakhshi and Singh, 1974). It is second only to guava and much higher than citrus or apples. It is also used for medicinal purposes. High temperature and low relative humidity during harvesting results in spoilage and rapid deterioration of fruit. The storage life of ber fruit is short, hardly 2-4 days at ambient conditions and thus early perishability is a major concern for its marketing (Baviskar *et al.*, 1995). Potassium is readily absorbed by leaves and is highly mobile and hence results in improving nutrient status of leaves. Humble *et al.* (1970) reported that potassium had a great role in opening of stomata. Carbohydrate metabolism and its storage are also regulated by potassium. Potassium spray has been found useful for several fruit crops like pineapple, citrus, guava and mango (Bose *et al.,* 1999). Fertilizers which are often used for supplying potassium through foliar feeding are KCl, KNO_3, K_2SO_4 and mono-potassium phosphate. However, response of plant to these nutrients may vary from plant to plant. Hence, the present study was carried out to enhance the postharvest life and subsequently increasing the quality attributes of ber with various potassium sprays.

MATERIALS AND METHODS

The investigation was carried out on thirty year old ber trees growing at the Horticultural Research Farm, Department of Horticulture, Institute of Agricultural Sciences, Banaras Hindu University (India) during 2013-2014. The experiment was laid out in Randomized Block Design (RBD) with four replications. A plant was treated as a unit for a treatment in each replication. The treatments used were; T_1- KNO_3 (1.0%), T_2- KNO_3 (1.5%), T_3- KNO_3 (2.0%), T_4- K_2SO_4 (1.0%), T_5- K_2SO_4 (1.5%), T_6- K_2SO_4(2.0%) andT_7- control (water spray). The first spray was done in the month of November after the fruit set followed by second spray in December at half grown stage of fruits and third spray in January at near to maturity stage. One kg healthy fruits were selected for the experiment from each treatment and were packed in corrugated fiber board (CFB) boxes. After packing, the fruits were storedin ambient condition at room temperature (27ºC). All the treatments were replicated two times for finding the weight loss, decay loss andfor sampling during experiment for chemical analysis. The observations were recorded at an interval of fourdays. A panel of 5 judges carried out the sensory evaluation for the quality attributes like colour, flavour, taste, and overall acceptability of fruits. The quality of the fruits was rated on the basis of score given to samples of each treatment at the day of observations. The method given by Amerine *et al*. (1965) was adopted with a 9 point hedonic scale. The chemical attributes of fruit *viz*., total soluble solid was determined with the help of Erma hand refractometer (0-32% range), acidity of fruit was recorded by method given by Ranganna, 1986 and the ascorbic acid content of ber fruit was analyzed employing the standard procedures (AOAC, 1990). The initial values of chemical attributes are presented in Table 2. The cumulative physiological loss in weight of the fruit in per cent was calculated using the following formula suggested by Koraddi and Devendrappa, 2011.

$$\text{Physiological loss in wt. (\%)} \quad \frac{\text{Initial weight - Final weight}}{\text{Intial weight}} \quad 100$$

$$\text{Decay loss (\%)} \quad \frac{\text{No. of decayed fruit}}{\text{No. of stored fruit}} \quad 100$$

All the data was subjected to analysis of variance (ANOVA) to determine significant differences and comparison of mean at a significant level of 5%.

RESULTS AND DISCUSSION

Data represented in Table 1 showed the physiological weight loss and decay loss under different treatments, days of storage and their interactions. The lowest physiological weight loss and decay loss 5.65% and 8.65% respectively was recorded in the fruits treated with KNO_3 (2%). The physiological weight loss and decay loss increased with the increase in days of storage. The highest physiological weight loss (6.59%) and decay loss (13.13%) was recorded under control. However, KNO_3 (1.0%) and KNO_3 (1.5%), K_2SO_4 (1.0 %) and K_2SO_4 (1.5%), were statistically found at par. These findings are in close conformity with the results obtained by Singh *et al*. (2013) in ber.

There was initial increase in TSS yet it showed a declining trend with the advancement in storage days. The highest TSS (17.03%) was found in fruits treated with KNO_3 (2%). Whereas, lowest (10.73%) was recorded in control. The trend of gradual increase in TSS throughout the period of ripening during storage has been reported by Bal *et al*.(1978) in ber. Also, the increase in TSS content might be because potassium has prominent role in translocation of photo-assimilates; sugars and other soluble solids. These results are in accordance with the earlier findings of Kumar *et al*. (2015), Mandal *et al*. (2012) in guava. The TSS increased during early days of storage, which was probably due to hydrolysis of polysaccharides which leads the non-soluble fraction converted into soluble fraction. The decrease in TSS after a particular peak period in storage may be due to increase in senescence process, which resulted in increased respiration rate. These results are in agreement with the findings of Singh *et al*. (1988).

The reduction in acidity was due to different treatments, days of storage and their interactions. The lowest acidity (0.156%) was found with treatment KNO_3 (2%) while it was highest (0.234%) in control on 12th day of storage. Acidity decreased with the increase in days of storage. The acidity continuously decreased in all the treatments with the increase in duration of storage of the fruits (Table 1). Decreasing trend of acidity upon prolonged storage of ber has been reported by Bal *et al*. (1978). Decrease in acidity may be due to utilization of acids in respiration (Ulrich, 1970).

There was a decrease in ascorbic acid due to allocation of different treatments, days of storage and their interactions. The highest ascorbic acid content (76.53 mg/100g) was found in KNO_3 (2%). Whereas, the lowest (59.05mg/100g) was recorded in control. Ascorbic acid continuously decreased with increase in duration of storage in all the treatments. The decrease (Table 1) may be due to the rapid conversion of l-ascorbic acid into dehydro-ascorbic acid (Mapson, 1970). Under ambient conditions, the maximum ascorbic acid was observed in those fruits which were treated with KNO_3 (2%). The rate of reduction in ascorbic acid was found lesser in treated fruits compared to controlled fruits. Irrespective of treatments, decrease in ascorbic acid was found to be significantly more with the advancement of storage. The interaction effect was also found to be significant. The highest reduction in ascorbic acid was recorded on 12th day of storage, while the lowest value for this parameter was noted on 4th day of storage. T_3 showed their superiority to rest of the treatments. The above findings are in close conformity with the results obtained by Rattan and Bal, 2008.

Table 1: Effect of potassium compounds on chemical attributes and organoleptic parameter of Ber fruit cv. Banarasi Karaka

Treatment	TSS (%)	Acidity (%)	Ascorbic acid (mg/100g FW)	Physiological loss (%)	Decay loss (%)	Overall acceptability (mean) 4th day	8th day	12th day
T_1	13.90	0.214	67.24	6.15	11.57	7.5	6.45	4.95
T_2	14.90	0.184	68.21	6.12	10.11	7.8	6.75	5.5
T_3	17.03	0.156	76.53	5.65	8.65	8.15	7.1	6.35
T_4	12.80	0.207	69.04	6.18	11.44	7.3	6.3	4.9
T_5	14.93	0.187	71.12	6.14	10.27	7.6	6.5	5.35
T_6	16.00	0.169	72.99	5.90	9.23	7.95	6.95	6.10
T_7	10.73	0.234	59.05	6.59	13.13	7	6	4.10
CD at 5%	T=0.23, D=0.15, TxD=0.41	T=0.005, D=0.003, TxD=0.009	T=0.14, D=0.09, TxD=0.25	T =0.06, D=0.04 TxD=0.11	T = 0.53 D = 0.35 TxD=0.92	-	-	-

Table 2: Initial value of chemical attributes of Ber fruit cv. Banarasi Karaka

Treatment	TSS (°Brix)	Acidity (%)	Ascorbic acid (mg/100g)
T_1	13.20	0.262	90.24
T_2	14.20	0.230	97.28
T_3	16.36	0.197	111.36
T_4	12.40	0.278	91.52
T_5	14.20	0.246	102.40
T_6	15.40	0.220	106.40
T_7	10.40	0.317	73.60
CD at 5%	0.32	0.018	3.36

The main criterion for fixing the market prices of any produce is the quality. This depends greatly on sensory evaluation by experienced judges. Some of the important characteristics considered were colour, texture, taste and flavour. The results revealed that the consumers rated maximum for the fruits treated with KNO_3 (2%) and the lowest rating was given for the fruits under control (Table 1). Sensory evaluation for any commodity decides its quality and the preference of the consumer towards that commodity. Experimental results indicate that there was variable impact of potassium compounds on organoleptic parameter of fruits. The consumer preference drastically decreased at 8^{th} day of storage, among treatments KNO_3 (2%) was judged to be the best.Thus potassium helps in improvement of physico chemical properties of be fruit. These findings are similar with the results of Dutta Ray *et al*. (2014)in Pomegranate Kilany *et al*. (1991) in ber.

ACKNOWLEDGEMENT

The author acknowledge the receipt of all kind of help and support rendered by Head and Chairman, Department of Horticulture, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi, India, forall the required infrastructure and facilities and time-to-time suggestion in making the assignment successful.

REFERENCES

Amerine, M. A., Pangborn, R. M. and Roessler, E. B. 1965. Principles of Sensory Evaluation of Food. Academic Press, New York, pp. 283-289.

AOAC. 1990. Official Methods of Analysis of the Association of Official Agricultural Chemists, 15th ed., Washington D C.

Bakhshi, J. C. and Singh, P. 1974. The ber - a good choice for semi-arid and marginal soils. *Indian Hort.* **19:** 27-30.

Bal, J. S. and Mann, S. S. 1978. Ascorbic acid content of ber (*Zizyphus mauritiana*) during growth and maturity. *Sci. and Cult.* **44(5):** 238-239.

Bal, J. S., Singh, P. and Mann, S. S. 1978. Changes in total yellow pigments, protein and total carbohydrates during ripening of ber fruit. *Prog. Hort.* **10:** 73.

Bal, J. S. and Uppal, D. K. 1992. *Ber varieties*. *Associated Publishing Company,* New Delhi. pp. 1-4.

Baviskar, M. R., Waskar, D. P. and Kaulgod, S. N. 1995. Effect of various post-harvest treatment on shelf-life and quality of ber fruits. *Indian J. Hort.* **52:** 37-45.

Bhatt, O. K., Raj, A. and Bhatt, K. 2007. Herbal and Medicinal Plants of India, Shri Publishers and Distributors, New Delhi, pp. 3307-3015.

Bose, T. K., Mitra, S. K., Farooqui, A. A. and Sadhu, M. K. 1999. *Tropical Hort.* **1:** 53-58.

Dutta Ray, S. K., Takawale, P. V., Chatterjee, R. and Hnamte, V. 2014. Yield and quality of pomegranate as influenced by organic and inorganic nutrients. *The Bioscan*. **9(2):** 617-620.

Humble, G. D., Fisher, R. R. and Hsiao, T. C. 1970. Potassium role found essential in stomatal function for plant life. *Calif. Agric*. **24(4):** 10.

Kilany, A. E. and Kilany, O. A. 1991. Effect of potassium and boron nutrients on growth, yield and fruit quality of Anna apple trees. *Bull. Facul. Agric., University of Cairo*. **42(2):** 415-428.

Koraddi, V. V. and Devendrappa, S. 2011. Analysis of physiological loss of weight of vegetables under refrigerated conditions. *J. Farm. Sci*. **1(1):** 61-68.

Kumar, J., Kumar, R., Rai, R. and Mishra, D. S. 2015. Response of 'Pant Prabhat' guava trees to foliar sprays of zinc, boron, calcium and potassium at different plant growth stages. *The Bioscan*. **10(2):** 495-498.

Mandal, G., Dhaliwal, H. S. and Mahajan, B. V. C. 2012. Effect of pre-harvest application of NAA and potassium nitrate on storage quality of winter guava (*Psidium guajava*). *Indian J. Agric. Sci.* **82(11):** 985-989.

Mapson, L. W. 1970. Vitamins in Fruits. Biochemistry of Fruits and their Products. *Academic Press,* London, pp. 369-383.

Ranganna, S. 1986. Handbook of analysis and quality control for fruit and vegetable products, Tata Mc Graw- Hill Publishing Company, New Delhi.

Rattan, C. S. and Bal, J. S. 2008. Effect of nutrients and growth regulators on fruit yield and quality of 'umran' ber. *Res. Punjab agric. Univ.* **45(3&4):** 144-47.

Singh, K., Mann, S. S. and Chander, M. 1988. Effect of fungicides and wax emulsion on storage of mandarin at ambient storage conditions. *Haryana J. Hort. Sci.* **17: 14-19.**

Singh, S. K., Singh, R. S. and Awasthi, O. P. 2013. Influence of pre- and post-harvest treatments on shelf-life and quality attributes of ber fruits. *Indian J. Hort.* **70(4):** 610-613.

Ulrich, R. 1970. Organic acid in the biochemistry of fruits and their products. *Academic press, London.* **1:** 89-115.