The Pharma Innovation Journal 2018; 7(7): 342-345

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277- 7695
ISSN (P): 2349-8242
NAAS Rating: 5.03
TPI 2018; 7(7): 342-345

www.thepharmajournal.com
Received: 12-05-2018
Accepted: 14-06-2018

Tariq A Bhat
Division of Vegetable Science, Faculty of Horticulture, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Srinagar, Jammu and Kashmir, India

MA Chattoo
Division of Vegetable Science, Faculty of Horticulture, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Srinagar, Jammu and Kashmir, India

EA Parray
Division of fruit Science, Faculty of Horticulture, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Srinagar, Jammu and Kashmir, India

F Mushtaq
Division of Vegetable Science, Faculty of Horticulture, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Srinagar, Jammu and Kashmir, India

Asif M Rather
Division of Vegetable Science, Faculty of Horticulture, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Srinagar, Jammu and Kashmir, India

SB Zehra
Division of Vegetable Science, Faculty of Horticulture, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Srinagar, Jammu and Kashmir, India

MA Hajam
Division of Vegetable Science, Faculty of Horticulture, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Srinagar, Jammu and Kashmir, India

MD Shah
Division of Vegetable Science, Faculty of Horticulture, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Srinagar, Jammu and Kashmir, India

RC Patra
Division of Vegetable Science, Faculty of Horticulture, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Srinagar, Jammu and Kashmir, India

Correspondence
Tariq A Bhat
Division of Vegetable Science, Faculty of Horticulture, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Srinagar, Jammu and Kashmir, India

Influence of varying levels of zinc on quality attributes and shelf life of onion in Kashmir

Tariq A Bhat, MA Chattoo, EA Parray, F Mushtaq, Asif M Rather, SB Zehra, MA Hajam and MD Shah

Abstract
An investigation was performed at the experimental field of Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir (SKUAST-K) during Rabi 2015-16 and 2016-17 to find out the effect of different levels of zinc on quality attributes and shelf life of onion. The experiment was tested in Randomized completely block design with three replications. Four levels of zinc viz., Zinc (Z), Z_0 (control or no zinc), Z_1 (2.500 kg ha^{-1}), Z_2 (5.00 kg ha^{-1}) and Z_3 (7.500 kg ha^{-1}). The observations were recorded on quality attributes from 10 randomly selected samples of each treatment while observations regarding shelf were carried out after storage of 10 kg bulbs in each treatment for three months. Pooled analysis revealed that maximum values for quality traits like protein content (12.83 percent), vitamin C content (13.78 mg 100^{-1}g), T.S.S (13.11 ^{o}Brix), pyruvic acid (8.11 µmol g^{-1}) and dry matter content (15.21 percent) were recorded with Z_3 (7.500 kg Zn ha^{-1}) treatment followed by Z_2 (5.000 kg Zn ha^{-1}). Significantly lower values of total weight loss (28.98 percent), physiological weight loss (13.62 percent), sprouting (7.75 percent) and rotting (7.61 percent) were observed with Z_3 (7.500 kg Zn ha^{-1}).

Keywords: Onion, TSS, Pyruvic acid, total weight loss and zinc

Introduction
Onion (*Allium cepa* L.) is one of the most important commercial vegetable crop cultivated extensively in India. It is the most widely cultivated species of the genus *Allium*, belongs to family Alliaceae. An umbel-like inflorescence composed of white or greenish-white small flowers, grows at the tip of the stem. The fruits are capsules, which contain black flat seeds. The edible bulb can grow up to 10 cm in diameter; it is composed of several overlapping layers on a central core. The edible portions of the bulb are the enlarged leaf bases and compact stem. The predominant flavor component results from activity of the enzyme alliance in broken or crushed tissue, yielding the volatiles allyl propyl disulfide and methyl propyl disulfide (Malik, 1994) [15]. It is one the most important character which increases the taste of food (Kumar *et al*., 2010) [13]. In India, it is treated as most important export oriented vegetable, exporting to the tune of 13, 58,193.00 mt of rupees 2, 87,713.00 lakhs during 2015 – 2016 (Anonymous, 2016) [6]. It is a cool season vegetable crop but is among the most widely adapted vegetable crops. Onion is cultivated under an area of 4121.51 ('000 ha) with a production of 79867.21 ('000 mt) in the world (Anonymous, 2015) [7]. In India, onion is being grown in an area of 1225.21 (000' ha) with production of 20991.34 (000't) and the productivity is 17.30 t ha^{-1} which is low (Anonymous, 2017) [4]. Poductivity of onion were higher in the case of Turkey (34.3 t ha^{-1}) followed by Brazil (26.1 t ha^{-1}) and China (25 t ha^{-1}). Due to lower yields, though India has the highest area under onion, it stands second in the production of onion in the world. Hence, there is a lot of potential for increasing the production of onion by improving the yields. In Kashmir it is grown under an area of 950 ha and produces 24250 (t) with a productivity of 25.4 (t ha^{-1}) (Anonymous, 2015) [5]. India is also the largest exporter of onion and hence, it is crucial to improve the yield and quality for enhancing the export level, so that it helps in earning foreign exchange for the exchequer of the country. In India onion is mostly cultivated during rabi (60 percent) followed by 20 percent each in kharif and late kharif seasons. Productivity could be increased by use of suitable varieties, balanced nutrition, optimum water management as well as need based plant protection measures. Among the many constraints for low productivity in onion, imbalanced nutrition is the main limiting factor.

Fertilizers offer the best means of increasing yield, quality and maintaining soil fertility. In addition to nitrogen, phosphorus, potassium and sulphur, zinc as a micronutrient have great

role in the fertilization program to achieve higher bulb quality (Rafie *et al*. 2016) [18]. Zinc deficiency has been reported in soils of India and Kashmir (Mandal *et al*., 2000 and Wani *et al.*, 2013) [16, 25]. A statistical analysis of zinc in the soil of Himalaya and a value with a mean of 0.29 mg of zinc kg^{-1} of soil was reported which is lower than the critical value (Rai *et al*., 2005) [19]. Under zinc deficient conditions photosynthesis is depressed as a consequence of sucrose accumulation in the leaves and its effect on gene expression. Dry weight of onion bulbs also gets significantly enhanced by applying zinc (Gamelli *et al*., 2000) [9]. Zinc application influenced the quality and storage of onion (Aske *et al*., 2017) [8]. Therefore, the objective of this work aims to investigate the effect of zinc on the quality attributes and shelf life of onion of onion.

Materials and methods

The present investigation entitled "Response of onion cv. Yellow Globe to different levels of zinc under temperate conditions" in Kashmir valley was carried out during Rabi 2015-16 and 2016-17 at Vegetable Experiment Farm, Division of Vegetable Science, SKUAST-K, Shalimar. Soil of the experiment area was sandy loam having pH of 7.61; available NPKS 288.83:15.71:155.95:26.23 kg ha^{-1} with low zinc content (0.58 ppm). The treatment consists of four levels of zinc (0, 2.500, 5.000 and 7.500 kg ha^{-1}) by adopting RCBD with three replications. The zinc sulphate (35 %) as source of zinc as per the treatments was applied at the time of transplanting. The recommended full dose of phosphorus, potassium and half dose of nitrogen were applied as basal dose while the remaining nitrogen was applied as top dressing at 30 days after transplanting. The seedlings of seven weeks old were transplanted at a spacing of 15×10 cm2. All the recommended package of practices was adapted uniformly to all the treatments to raise a good onion crop of cv. Yellow Globe. Data were recorded on five bulbs per replication and estimated for Vitamin C (mg/100g), protein content (%), total soluble solids (^{0}Brix), pyruvic acid content (µmoles of g^{-1}) and dry matter content (%). Ascorbic acid (vitamin C) was estimated by 2, 6-dichlorophenol-indophenol dye by visual titration method (A.O.A.C, 2000) [1]. The protein content was calculated by multiplying a factor 6.25 (protein factor) with total nitrogen content in bulbs. Total nitrogen content in bulbs was determined by Kjeldahls method as outlined by Tandon (1993) [22]. TSS were analysed by Hand Refractrometer, pyruvic acid (µmoles of g^{-1}) by Ketter and Randle (1998) [12] and dry matter content (%) composite samples of 100 g were taken from each treatment and subjected to sun drying followed by oven drying at 60ºC to a constant weight. The dried material was weighed and recorded as dry matter content in percent.

Storage quality of onion

After curing 10 kg bulbs from each treatment were kept in perforated plastic crates keeping lower crates empty and stored in a well ventilated conditions at room temperature for a period of 90 days (3 months). The physiological weight loss, sprouting percent and rotting percent during storage were recorded after each month and total weight loss was then calculated by following formulas:

$$\text{PWL (\%)} = \frac{\text{Initial weight} - \text{final weight}}{\text{Initial weight}} \times 100$$

$$\text{Sprouing (\%)} = \frac{\text{No. of sprouted bulbs}}{\text{Total No. of bulbs}} \times 100$$

$$\text{Rotting (\%)} = \frac{\text{No. of rotted bulbs}}{\text{Total No. of bulbs}} \times 100$$

Total weight loss % were recorded by sum of PWL (%), Sprouing (%) and Rotting (%).

The data recorded on various parameters were subjected to statistical analysis as per the procedure suggested by Gomez and Gomez (1984) [11].

Result and discussion

Effect of zinc on qualities attributes of onion

Pooled data presented in Table 1 revealed that protein percent, vitamin C (mg $100g^{-1}$), TSS (°Brix), pyruvic acid (umol g^{-1}) and dry matter percent responded significantly to varying levels of zinc. Application of zinc at the rate of 7.500 kg ha^{-1} (Z_3) recorded higher values for vitamin C (13.78 mg $100g^{-1}$), protein content (12.83 percent), TSS (13.11 °Brix), pyruvic acid (8.11 µ mol g^{-1}) and dry matter content (15.21 percent) as compared to lower levels of zinc including control. This could be attributed to increased synthesis of amino acids with zinc application and due to increased uptake of nitrogen, potassium, sulphur, zinc and boron by crop which are the main constituents of many amino acids and nucleic acids which in turn have enhanced the cell division and translation. In addition to this, application of zinc might have enhanced metabolic processes involved in biosynthesis of total soluble solid, such as carbohydrates, organic acid, volatile compounds, amino acids and other inorganic constituents. Increased sulphur uptake might have increased the synthesis of volatile compounds and thus increased pungency of onion. Similar results were reported by Thakare *et al.* (2007) [3], Thomay *et al.* (2009) [21], Alam *et al.* (2010) [3] and Rafie *et al*. (2016) [18] and Aske *et al*. (2017) [8] in onion; Acharya *et al.* (2015) [2] in multiplier onion and Samreen in Mung bean (2016) [20].

Table 1: Effect of different levels of zinc on quality parameters of onion

Zinc	vitamin C mg $100g^{-1}$	protein (percent)	TSS (^{0}Brix)	pyruvic acid (µmol g^{-1})	dry matter (percent)
Z_0	11.76	11.24	12.14	6.45	14.12
Z_1	12.38	11.67	12.32	7.13	14.41
Z_2	12.93	12.26	12.67	7.96	14.83
Z_3	13.78	12.83	13.11	8.11	15.21
C.D($p \leq 0.05$)	0.21	0.15	0.16	0.24	0.11
S.E (m)	0.07	0.05	0.05	0.08	0.038

Effect of zinc on storage qualities of bulb

Pooled data presented in Table 2 and fig. 1 depicted that treatment Z_3 (7.500 kg Zn ha^{-1}) recorded significantly lowest total weight loss (28.98 percent), physiological weight loss (13.62 percent), sprouting (7.75 percent) and rotting (7.61 percent) after 3 months of storage as compared to lower levels of zinc, while control (Z_0) recorded significantly maximum values for total weight loss (38.87 percent), physiological

weight loss (16.48 percent), sprouting (10.41 percent) and rotting (11.98 percent) of onion bulbs. This might be possible due to strong negative correlation between zinc uptake and total weight loss. High application of zinc increased the additional uptake of sulphur which in turn increased the firmness of the skin of onion bulbs which had significant effects on storability of onion bulbs. Due to increase in firmness microbial infection was reduced there by increasing the shelf life of onion. Similar findings have been reported by Gamelli *et al.* (2000) [10], Kumar *et al*. (2000) [14], Mohsen *et al.* (2007) [17], Srinivasan (2015) [21] and Aske *et al*. (2017) [8] in onion.

Zinc	physiological weight loss (percent)	sprouting (percent)	rotting (percent)	Total weight loss (percent)
Z_0	16.48	10.41	11.98	38.87
Z_1	14.37	9.71	10.29	34.37
Z_2	14.22	9.15	8.27	31.64
Z_3	13.62	7.75	7.61	28.98
C.D($p \leq 0.05$)	0.54	0.37	0.26	1.77
S.E (m)	0.18	0.12	0.09	0.59

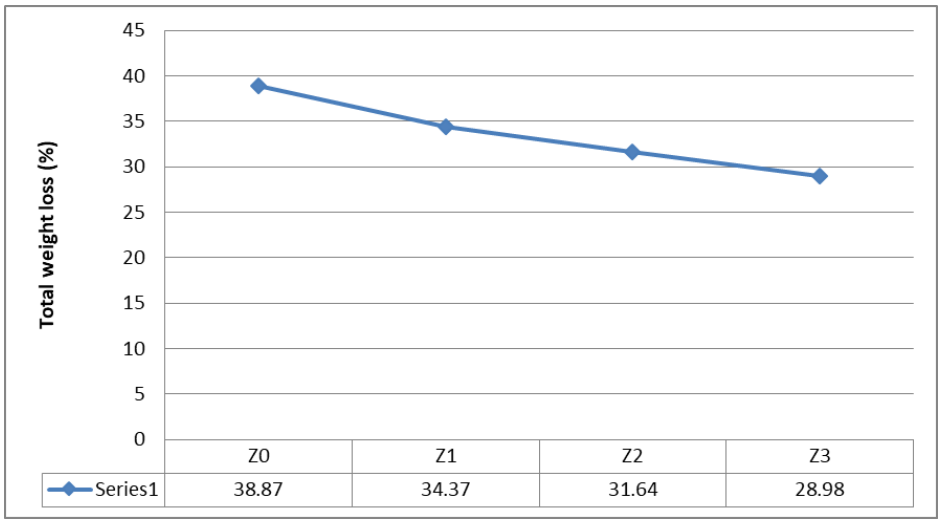

Fig 1: Effect of different levels of zinc on total weight loss (percent).

References

1. AOAC (Association of Official Analytical Chemist). Official Method of Analysis.12th Ed. Washington, DC, 2000, 144-149.
2. Acharyaya U, Narayan SR, Venkatesan K, Subramanian KS. Response on growth, yield and quality parameters of multiplier onion (*Allium cepa* L. var. *aggregatum*) var. $CO(On)_5$ With different doses and method of zinc and boron application. International Journal of Agronomy and Agricultural Research. 2015; 6:59-67.
3. Alam M, Abedin MJ, Azad M. Effect of micronutrients on growth and yield of onion under calcareous soil environment. International Research Journal of Plant Science. 2010; 1:56-61.
4. Anonymous. Horticulture statistics division, department of agriculture, cooperation and farmers welfare Govt. of India New Delhi. Monthly Report, 2017, 11-27.
5. Anonymous. Information status of vegetables, spices, and mushroom of Kashmir Division. Agriculture Department Jammu and Kashmir, 2015.
6. Anonymous. Indian Horticulture Data Base. Published by National Horticulture Board, Gurgaon, 2016, 47-51.
7. Anonymous. Directorate of economics and statistics, New Delhi- Horticultre Division, Ministry of Agricultre, Govt. of India. Market intelligence system, 2014-2015, 7-9.
8. Aske V, Jain PK, Govind S. Effect of Micronutrients on yield, quality and storability of onion cv. Bhima Super. Trends in Biosciences. 2017; 10:1354-1358.
9. Gamelli EL, Hanna N, Hadi EL. The effect of some foliar fertilizers application on growth, bulb yield, quality and storage ability of onion. Journal of Horticulture. 2000; 12:30-38.
10. Gamelli EL, Hanna N, Hadi EL. The effect of some foliar fertilizers application on growth, bulb yield, quality and storage ability of onion. Journal of Horticulture. 2000; 12:30-38.
11. Gomez KA, Gomez AA. Statistical procedures for agriculture research. Second ed. wiley interscience publication john willey and sons, New York, 1984.
12. Ketter CA, Randle WM. Pungency assessment in onion. Tested studies for laboratory teaching. Proceedings of the 19th workshop/ conference of the Association for Biology Laboratory Education. 1998; 19:177-196.
13. Kumar KS, Debjit B, Tiwari P. *Allium cepa*: A traditional medicinal herb, importance and its health benefits. Journal of Chemical and Pharmaceutical Research. 2010; 2:281-291.
14. Kumar M, Das DK, Chattopadhyay TK. Effect of zinc and sulfur application on the storage of Rabi onion (*Allium cepa* L.) under different methods of storage. Environment and Ecology. 2000; 18:311-316.
15. Malik MN. Onion. *Bulb crops.* National book foundation Islamabad, Pakistan. 1994, 500-501.
16. Mandal B, Hazra GC, Mandal LN. Soil management influences on zinc desorption for rice and maize nutrition. Soil Science Society of America Journal. 2000; 64: 1699-1705.
17. Mohsen KD, Rastegar J, Fatemeh DM. The effects of nitrogen and some micronutrients (zinc and copper)

application rates on onion (*Allium cepa* L.) storability in spring cultivation. Journal of Applied Horticulture Research. 2007; 12:32-36.
18. Rafie MR, Khoshgoftarmanesh AH, Darabi H. Influence of foliar applied zinc in the form of mineral and complexed with amino acids on yield and nutritional quality of onion under field conditions. Scientia Horticulturae. 2016; 216:160-168.
19. Rai SK, Pandey SP, Uprety R. Mapping and spatial zinc distribution in Himalayas. Mountain Research and Development. 2005; 27:49-56.
20. Samreen T, Humaria H, Ullah S. Zinc effect on growth rate, chlorophyll, protein and mineral contents of hydroponically grown mungbean plant. Arabian Jouranl of Chemistry. 2016; 10: 1802-1807.
21. Srinivasan R. Post harvest management of black mould rot of onion. Indian Phytopathology. 2015; 59:333-339.
22. Tandon HLS. Methods of analysis of soils, plants, waters and fertilizers. Fertilizer development and consultant organization, New Delhi, 1993.
23. Thakare RG, Jadhao BJ, Nandre DR, Ghawade SM, Khewale P. Effect of zinc and iron levels on growth and yield of potato. Indian Journal of Plant Archives. 2007; 7:275-276.
24. Tohamy WA, Khalid AK, El-Abagy HM, Abou-Hussein SD. Essential oil, growth and quality of onion (*Allium cepa* L.) in response to application of some micronutrients. Australia Journal of Basic Applied Science. 2009; 3:201-205.
25. Wani MA, Wani JA, Bhat MA, Kirmani NA, Wani ZM, Bhat MA *et al*. Mapping of soil micronutrients in Kashmir agricultural landscape using ordinary kriging and indicator approach. Journal of the Indian Society of Remote Sensing. 2013; 41:319-328.