Influence of Different Onion Cultivars on Storage Life under Hill Zone of Karnataka

Veena Goni* Devaraju, V. Srinivasa, D. Lakshmana and Y. Kantharaj

Department of Vegetable Science, College of Horticulture, Mudigere, University of Agricultural and Horticultural sciences, Shivamogga, Karnataka, India

*Corresponding author

ABSTRACT

An experiment was conducted to study the storage behavior among thirty onion genotypes under ambient condition for four months. The experiment results revealed that after four months of storage, the minimum per cent of sprouting was noticed in Bhima Shakti (7.68 %), while, the maximum per cent of sprouting was noticed in N-53 (15.10 %). The minimum per cent of rotting was observed in Bhima Shakti (7.34 %) and the maximum per cent of rotting was recorded in N-53 (14.78 %). With respect to total loss in weight, the cultivar Bhima Shakti (16.05 %) recorded minimum loss in weight after 4 months of storage, while, Poona Nasangi (28.63 %) recorded maximum loss in weight.

Keywords
Onion cultivars, Storage life, Sprouting

Article Info
Accepted: 24 September 2020
Available Online: 10 October 2020

Introduction

Onion is one of the most important vegetable crops commercially grown in the world. It is a diploid (2n=2x=16), herbaceous biennial in the Amaryllidaceae family and is one of the monocotyledonous crops. It belongs to the genus Allium which consists of about 750 species, among which, Japanese bunching onion, leeks, and garlic are the most important edible Allium crops (Rabinowitch and Currah, 2002). It is probably originated from Central Asia between Turkmenistan and Afghanistan where some of its relatives are still growing in the wild forms.

The Mediterranean regions are considered to be the secondary centre of origin (CSIR, 2003). Onion is a short duration horticultural crop (Brewster, 1990) grown at low latitudes. It is semi-perishable in nature and gets deteriorated during storage, transportation and marketing. Bulbs stored under ambient conditions are more prone to storage losses. These losses are comprised of physiological loss in weight i.e., moisture losses and shrinkage (30-40 %), rotting (10-12 %) and sprouting (8-10 %). Factors such as high respiration rate, biochemical changes, physiological injuries, water loss and physiological disorders are mainly responsible for post-harvest losses of onion.
bulbs (Kedar et al., 1989). Increase in temperature increases the sprouting per cent of onion bulbs, while, increase in humidity increases the rotting per cent of bulbs. Despite the achievements in production technology, post-harvest losses during storage still pose a great problem. Hence, it becomes necessary to study the performance of onion genotypes for storage characteristics.

**Materials and Methods**

The experiment was conducted at the experimental block of Department of Vegetable Science, College of Horticulture, Mudigere, which is situated in the hill zone of Karnataka during *Rabi* season. The study was conducted using Randomized Complete Block Design (RCBD) with two replications involving thirty genotypes which were procured from various research centres (Table 1). The bulbs were harvested and field cured for a week. Four kg of bulbs were selected randomly from each replication and the initial number of bulbs of all the cultivars per 4 kg was recorded replication wise. The bulbs were stored for 4 months under ambient conditions. Observations on storage characters *viz.*, per cent loss due to sprouting, per cent loss due to rotting and total loss in weight were recorded.

The per cent loss due to sprouting was calculated by weighing the bulbs that were sprouted in different treatments and the per cent loss due to rotting was calculated by weighing the bulbs that were rotten in different treatments. The weight of bulbs prior to storage and weight after storage were recorded at 15 days interval for 4 months and the difference was worked out to estimate the total loss in weight.

**Results and Discussion**

Results pertaining to per cent loss due to sprouting, per cent loss due to rotting and total loss in weight among thirty onion genotypes is depicted in Table 2 and 3.

In the present investigation, the per cent loss due to sprouting was not noticed in any of the genotypes during first and second months after storage. However, during third month of storage, per cent loss due to sprouting was maximum in PusaRed (4.37 %), whereas, minimum in Bhima Shubra (1.21 %). During fourth month of storage, it was maximum in N-53 (15.10 %) and minimum in Bhima Shakti (7.68 %). Similar findings were reported by Shanmugasundaram (1999), Trivedi and Dhumal (2010) and Utagi et al., (2015). Brewster (1994) reported that factors such as stage of bulb development during harvest, premature defoliation, skin integrity, harvesting, conditions during ripening and curing are responsible for sprouting.

The results regarding per cent loss due to rotten bulbs revealed that, during first month after storage, none of the genotypes exhibited rotting. However, during second, third and fourth month after storage, significant difference was observed for per cent loss due to rotten bulbs. Cultivar N-53 recorded highest per cent of rotten bulbs during second and fourth month after storage (4.87 % and 14.78 % respectively), while, W-125 (4.38 %) during third month after storage. The minimum per cent of rotten bulbs was observed in Arka Niketan (1.27 %), W-405 (1.06 %) and Bhima Shakti (7.34 %) during second, third and fourth month after storage respectively. Shanmugasundaram (1999), Shanmugasundaram (2000), Trivedi and Dhumal (2010), Dhotre (2009), also observed significant difference with respect to per cent loss due to rotting among different genotypes of onion. Kukanoor (2005) reported that due to high moisture content on outer scales, the onion bulbs are more prone to rotting loss after harvest.
The genotypes exhibited significant difference in respect of total loss in weight. The total loss in weight was maximum in N-53 (5.38 %), Bhima Red (12.27 %), Bhima Super (21.37 %) and Poona Nasangi (28.63 %) after first, second, third and fourth month after storage respectively, while it was minimum in Bhima Kiran (1.07 %) and Bhima Super (7.45 %) after first and second month after storage respectively. During third and fourth month after storage, it was minimum in Bhima Shakti (10.33 % and 16.05 % respectively). The results are in collaboration with findings of Shanmugasundaram (2000), Shanmugasundaram (2003), Trivedi and Dhumal (2010), Jamali et al., (2012).

**Table.1** List of onion genotypes used in the study and their sources of collection

| Sl.No | Genotypes      | Source of collection |
|-------|----------------|----------------------|
| 1.    | Arka Kalyan    | IIHR, Bengaluru      |
| 2.    | Arka Niketan   | IIHR, Bengaluru      |
| 3.    | Bhima Dark Red | DOGR, Pune            |
| 4.    | Bhima Kiran    | DOGR, Pune            |
| 5.    | Bhima Light Red| DOGR, Pune            |
| 6.    | Bhima Raj      | DOGR, Pune            |
| 7.    | Bhima Red      | DOGR, Pune            |
| 8.    | Bhima Safed    | DOGR, Pune            |
| 9.    | Bhima Shakti   | DOGR, Pune            |
| 10.   | Bhima Shubhra  | DOGR, Pune            |
| 11.   | Bhima Super    | DOGR, Pune            |
| 12.   | Bhima Swetha   | DOGR, Pune            |
| 13.   | N-53           | DOGR, Pune            |
| 14.   | Poona Nasangi  | Local collection      |
| 15.   | Pusa Red       | IARI, New Delhi       |
| 16.   | W - 045        | DOGR, Pune            |
| 17.   | W - 125        | DOGR, Pune            |
| 18.   | W - 143        | DOGR, Pune            |
| 19.   | W - 177        | DOGR, Pune            |
| 20.   | W - 182        | DOGR, Pune            |
| 21.   | W - 203        | DOGR, Pune            |
| 22.   | W - 210        | DOGR, Pune            |
| 23.   | W - 226        | DOGR, Pune            |
| 24.   | W - 253        | DOGR, Pune            |
| 25.   | W - 364        | DOGR, Pune            |
| 26.   | W - 405        | DOGR, Pune            |
| 27.   | W - 444        | DOGR, Pune            |
| 28.   | W - 464        | DOGR, Pune            |
| 29.   | W - 498        | DOGR, Pune            |
| 30.   | W - 500        | DOGR, Pune            |
Table 2: Storage behavior of onion bulbs among thirty genotypes of onion (After 1 and 2 months of storage)

| Sl. No | Genotypes          | Initial weight of bulbs (kg) | Total number of bulbs | Per cent loss one month after storage | Per cent loss two month after storage |
|--------|--------------------|------------------------------|-----------------------|----------------------------------------|----------------------------------------|
|        |                    |                              |                       | Per cent of sprouting bulbs | Per cent of rotten bulbs | Total loss in weight (%) | Per cent of sprouting bulbs | Per cent of rotten bulbs | Total loss in weight (%) |
| 1.     | Arka Kalyan        | 4.00                         | 44                    | 0                          | 0                        | 4.33                       | 0                          | 2.83                       | 10.08                     |
| 2.     | Arka Niketan       | 4.00                         | 42                    | 0                          | 0                        | 3.25                       | 0                          | 1.27                       | 9.23                      |
| 3.     | Bhima Dark Red     | 4.00                         | 40                    | 0                          | 0                        | 1.89                       | 0                          | 2.45                       | 10.33                     |
| 4.     | Bhima Kiran        | 4.00                         | 45                    | 0                          | 0                        | 1.07                       | 0                          | 2.57                       | 8.57                      |
| 5.     | Bhima Light Red    | 4.00                         | 51                    | 0                          | 0                        | 3.02                       | 0                          | 3.02                       | 11.25                     |
| 6.     | Bhima Raj          | 4.00                         | 48                    | 0                          | 0                        | 2.68                       | 0                          | 2.35                       | 7.55                      |
| 7.     | Bhima Red          | 4.00                         | 43                    | 0                          | 0                        | 1.08                       | 0                          | 1.75                       | 12.27                     |
| 8.     | Bhima Safed        | 4.00                         | 56                    | 0                          | 0                        | 4.13                       | 0                          | 2.71                       | 7.78                      |
| 9.     | Bhima Shakti       | 4.00                         | 42                    | 0                          | 0                        | 2.74                       | 0                          | 1.41                       | 11.56                     |
| 10.    | Bhima Shubhra      | 4.00                         | 49                    | 0                          | 0                        | 2.33                       | 0                          | 1.52                       | 10.16                     |
| 11.    | Bhima Super        | 4.00                         | 45                    | 0                          | 0                        | 3.63                       | 0                          | 3.09                       | 7.45                      |
| 12.    | Bhima Swetha       | 4.00                         | 46                    | 0                          | 0                        | 2.13                       | 0                          | 2.18                       | 8.41                      |
| 13.    | N-55               | 4.00                         | 50                    | 0                          | 0                        | 3.58                       | 0                          | 4.87                       | 10.25                     |
| 14.    | Poona Nasangi      | 4.00                         | 44                    | 0                          | 0                        | 2.98                       | 0                          | 1.34                       | 11.34                     |
| 15.    | Pusa Red           | 4.00                         | 52                    | 0                          | 0                        | 2.29                       | 0                          | 1.32                       | 8.12                      |
| 16.    | W - 045            | 4.00                         | 47                    | 0                          | 0                        | 2.31                       | 0                          | 3.08                       | 8.62                      |
| 17.    | W - 125            | 4.00                         | 45                    | 0                          | 0                        | 2.56                       | 0                          | 1.68                       | 12.13                     |
| 18.    | W - 143            | 4.00                         | 46                    | 0                          | 0                        | 2.34                       | 0                          | 3.34                       | 7.81                      |
| 19.    | W - 177            | 4.00                         | 54                    | 0                          | 0                        | 3.35                       | 0                          | 2.11                       | 10.62                     |
| 20.    | W - 182            | 4.00                         | 50                    | 0                          | 0                        | 3.89                       | 0                          | 1.79                       | 10.06                     |
| 21.    | W - 203            | 4.00                         | 49                    | 0                          | 0                        | 2.66                       | 0                          | 2.08                       | 7.67                      |
| 22.    | W - 210            | 4.00                         | 54                    | 0                          | 0                        | 2.31                       | 0                          | 3.14                       | 11.73                     |
| 23.    | W - 226            | 4.00                         | 51                    | 0                          | 0                        | 1.71                       | 0                          | 1.47                       | 11.14                     |
| 24.    | W - 253            | 4.00                         | 48                    | 0                          | 0                        | 1.41                       | 0                          | 3.98                       | 8.64                      |
| 25.    | W - 364            | 4.00                         | 52                    | 0                          | 0                        | 2.63                       | 0                          | 2.26                       | 7.76                      |
| 26.    | W - 405            | 4.00                         | 45                    | 0                          | 0                        | 2.61                       | 0                          | 2.87                       | 10.98                     |
| 27.    | W - 444            | 4.00                         | 49                    | 0                          | 0                        | 3.21                       | 0                          | 2.23                       | 12.07                     |
| 28.    | W - 464            | 4.00                         | 51                    | 0                          | 0                        | 2.50                       | 0                          | 2.72                       | 8.83                      |
| 29.    | W - 498            | 4.00                         | 51                    | 0                          | 0                        | 3.11                       | 0                          | 3.18                       | 8.43                      |
| 30.    | W - 500            | 4.00                         | 50                    | 0                          | 0                        | 2.93                       | 0                          | 1.58                       | 10.34                     |
| Mean   | -                 | -                            | 0                     | 0                          | 2.75                     | 0                          | 2.41                       | 9.71                      |
| S.Em+  | -                 | -                            | -                     | -                          | -                        | 0.05                       | -                          | 0.03                       | 0.02                      |
| C.D @ 5% | -              | -                            | -                     | -                          | -                        | 0.15                       | -                          | 0.09                       | 0.06                      |
Table 3 Storage behavior of onion bulbs among thirty genotypes of onion (After 3 and 4 months of storage)

| Sl. No | Genotypes         | Initial weight of bulbs (kg) | Total number of bulbs | Per cent loss three month after storage | Per cent loss four month after storage |
|--------|-------------------|------------------------------|-----------------------|----------------------------------------|----------------------------------------|
|        |                   |                              |                       | Per cent of sprouting bulbs | Per cent of rotten bulbs | Total loss in weight (%) | Per cent of sprouting bulbs | Per cent of rotten bulbs | Total loss in weight (%) |
| 1      | Arka Kalyan       | 4.00                         | 44                    | 1.41                                   | 2.62                                  | 10.70                          | 12.70                         | 13.05                         | 20.37                          |
| 2      | Arka Niketan      | 4.00                         | 42                    | 2.23                                   | 2.47                                  | 17.43                          | 10.00                         | 9.33                           | 24.22                          |
| 3      | Bhima Dark Red    | 4.00                         | 40                    | 2.24                                   | 3.08                                  | 15.44                          | 10.44                         | 8.87                           | 18.40                          |
| 4      | Bhima Kiran       | 4.00                         | 45                    | 3.13                                   | 4.37                                  | 12.73                          | 7.70                          | 9.35                           | 17.50                          |
| 5      | Bhima Light Red   | 4.00                         | 51                    | 4.05                                   | 2.10                                  | 18.45                          | 9.65                          | 11.19                          | 21.09                          |
| 6      | Bhima Raj         | 4.00                         | 48                    | 1.60                                   | 1.23                                  | 16.11                          | 12.35                         | 10.39                          | 18.97                          |
| 7      | Bhima Red         | 4.00                         | 52                    | 4.37                                   | 2.32                                  | 17.77                          | 12.21                         | 10.48                          | 22.69                          |
| 8      | Bhima Safed       | 4.00                         | 56                    | 1.33                                   | 4.21                                  | 16.09                          | 11.31                         | 12.54                          | 20.57                          |
| 9      | Bhima Shakti      | 4.00                         | 42                    | 2.95                                   | 1.23                                  | 10.33                          | 7.68                          | 7.34                           | 14.92                          |
| 10     | Bhima Shubhra     | 4.00                         | 49                    | 1.21                                   | 3.04                                  | 18.62                          | 11.52                         | 12.40                          | 22.52                          |
| 11     | Bhima Super       | 4.00                         | 45                    | 1.79                                   | 3.58                                  | 21.37                          | 11.06                         | 9.31                           | 20.37                          |
| 12     | Bhima Swetha      | 4.00                         | 46                    | 3.11                                   | 3.75                                  | 17.01                          | 10.78                         | 11.24                          | 24.01                          |
| 13     | N-53              | 4.00                         | 44                    | 2.48                                   | 2.33                                  | 12.84                          | 15.10                         | 14.78                          | 23.88                          |
| 14     | Poona Nasangi     | 4.00                         | 50                    | 1.36                                   | 4.03                                  | 18.31                          | 9.44                          | 11.66                          | 28.30                          |
| 15     | Pusa Red          | 4.00                         | 52                    | 4.37                                   | 2.32                                  | 17.77                          | 12.21                         | 10.48                          | 22.69                          |
| 16     | W-045             | 4.00                         | 47                    | 2.96                                   | 2.66                                  | 15.07                          | 12.33                         | 10.65                          | 26.66                          |
| 17     | W-125             | 4.00                         | 45                    | 1.70                                   | 4.38                                  | 12.63                          | 9.65                          | 10.77                          | 19.50                          |
| 18     | W-143             | 4.00                         | 46                    | 3.91                                   | 2.69                                  | 19.35                          | 9.87                          | 7.42                           | 17.30                          |
| 19     | W-177             | 4.00                         | 54                    | 2.53                                   | 1.57                                  | 18.44                          | 13.68                         | 12.41                          | 17.17                          |
| 20     | W-182             | 4.00                         | 50                    | 2.78                                   | 3.41                                  | 17.32                          | 10.76                         | 8.75                           | 24.81                          |
| 21     | W-203             | 4.00                         | 49                    | 3.09                                   | 3.30                                  | 15.39                          | 11.54                         | 13.15                          | 24.69                          |
| 22     | W-210             | 4.00                         | 54                    | 2.61                                   | 2.36                                  | 16.21                          | 10.25                         | 9.60                           | 25.64                          |
| 23     | W-226             | 4.00                         | 51                    | 1.57                                   | 3.57                                  | 10.48                          | 14.10                         | 12.64                          | 24.46                          |
| 24     | W-253             | 4.00                         | 48                    | 4.35                                   | 3.22                                  | 14.73                          | 14.03                         | 12.26                          | 20.86                          |
| 25     | W-364             | 4.00                         | 52                    | 2.51                                   | 2.97                                  | 18.69                          | 12.51                         | 10.24                          | 23.39                          |
| 26     | W-405             | 4.00                         | 45                    | 3.12                                   | 1.06                                  | 20.05                          | 10.98                         | 12.37                          | 21.09                          |
| 27     | W-444             | 4.00                         | 49                    | 2.68                                   | 1.77                                  | 11.46                          | 12.24                         | 10.86                          | 17.55                          |
| 28     | W-464             | 4.00                         | 51                    | 1.74                                   | 3.65                                  | 15.32                          | 11.63                         | 9.23                           | 22.69                          |
| 29     | W-498             | 4.00                         | 51                    | 1.58                                   | 2.86                                  | 15.21                          | 10.86                         | 13.63                          | 19.66                          |
| 30     | W-500             | 4.00                         | 50                    | 3.07                                   | 2.75                                  | 20.27                          | 13.34                         | 8.81                           | 11.03                          |
| Mean   |                   | -                            | -                     | 2.54                                   | 2.85                                  | 15.82                          | 11.43                         | 10.90                          | 21.62                          |
| S.Em±  |                   | -                            | -                     | 0.03                                   | 0.05                                  | 0.13                           | 0.08                          | 0.09                           | 1.92                           |
| C.D @ 5%|                  | -                            | -                     | 0.09                                   | 0.15                                  | 0.37                           | 0.24                          | 0.26                           | 5.56                           |
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How to cite this article:

Veena Goni, Devaraju, V. Srinivasa, D. Lakshmana and Kantharaj, Y. 2020. Influence of Different Onion Cultivars on Storage Life under Hill Zone of Karnataka. *Int.J.Curr.Microbiol.App.Sci.* 9(10): 3127-3133. doi: [https://doi.org/10.20546/ijemas.2020.910.375](https://doi.org/10.20546/ijemas.2020.910.375)