Effect of low cost storage structure on shelf life and quality of onion genotypes under arid conditions of Haryana, India

ABSTRACT

The effect of fully ventilated storage structure on shelf-life and quality of onion genotypes was studied at CCS, Haryana Agricultural University, Hisar. The experiment was conducted in a single factor with one level with three replications. The lowest physiological weight losses % was recorded (7.19%) at 30 days and (14.81%) at 120 days in Hisar onion-4 and there was no seen sprouting up to 60 days in all the genotypes after storage and then after start gradually sprouting in the bulbs in storage. lowest sprouting % was recorded from 90 days and 120 days (2.16% and 3.65%) in Hisar onion-4 respectively. Minimum rotting % was recorded in Hisar Onion-4 and Hisar Onion-7 and total minimum losses wererecorded in Hisar Onion-4 and Hisar Onion-7 among the genotypes in storage. Minimum total losses was recorded in best check Hisar Onion-4 closely followed by genotype Hisar Onion-7 during storage.

Key word: Genotypes, Physiological Weight Loss, sprouting and rotting

INTRODUCTION

Onion (*Allium cepa* L.) is an important underground bulb crop of tropical and subtropical part of the world (Kindeya, et al, 2020). It is an important vegetable crop which is used the daily Indian diet. Its bulbs are generally used as vegetablesand spices in various dishes. It is one of the most economically important vegetable products in the country (Abdissa, et al., 2011).It is a high value bulb crop produced by small farmers and commercial growers for both local and export markets in India.

Onion is known for valued crop for multipurpose uses and also consumed throughout the world for its flavour, taste and pungency in the part of whole plant (Dabhi, et al, 2008) because of its green leaves, immature and mature bulbs that used either raw or cooked as a vegetable. The bulb used in soups, sauces, condiments, spice, in medicine, seasoning of many foods and for the preparation of value added edible products like powder, flakes and salts.

Onion is a seasonal crop sometimes with excess production, bulbs are prone to long storage, or farmers will sell in low price due to the postharvest and storage loss. Even farmers who store for next use will not be beneficial because of short storage life. As Biswas, S.K., 2010 stated, after getting a good harvest of onion, farmers face storage problems in all conditions because bulbs are in semi-perishable; onion is subject to deterioration during storage like Rotting, sprouting, and physiological weight loss cause due to storage loss of onions. Significant postharvest or storage losses occur in quality and quantity of onion including sprouting, diseases incidence, rotting and physiological weight loss due to variation in

environmental condition, curing and drying method, storage condition etc. The shelf life of onion is influenced by various factors such as dry matter content, pungency, skin color, skin number and quality and length of natural dormancy period of the variety fertilizers and water regime during cultivation, treatment of sprouts suppressants and fungicides and postharvest factors (time and method of harvesting, curing).

Before storage, curing is the most important operation in the post-harvest technology of onion that helps in reducing the post-harvest decay and moisture loss due to the removal of excess moisture from the outer skin and neck of freshly harvested onion to a level where shrinkage from the interior will be less and reduction in microbial infection.

MATERIAL AND METHODS

The present investigations were carried out at the CCS, Haryana Agricultural University, Hisar. Mean maximum temperature of 38.3°C and maximum relative humidity of 72.9% were recorded at a medium elevation of the study location. Mean minimum temperature of 32 °C and minimum relative humidity of the atmosphere of 56.60% at medium elevation. Ten coloured (white, brown, red) genotypes were collected from Department of Vegetable Science, CCS, Haryana Agricultural University, Hisar. Healthy 500 gm seeds of each genotype were collected from department. Healthy seeds were treated with help of captan fungicide and the treated seed was sown in the nursery bed but after treatment of nursery bed in month of November-December. Harvesting, curing, sorting grading was done in month of April then store for five month under low cost storage structure in arid region of Haryana. Straight after harvest, bulbs have to be subjected to a drying process ("curing") in order to have their outer scales hardened and reduce skin cracks, and allow the necks to become narrower, thus inhibiting pathogen infections. Curing was done (one week) for reduction of moisture content of bulb for storage so that reduce the loss of stored bulbs. Before storage of bulbs, equal amounts of onion bulbs (200 bulbs) of each genotype were stored in storage structures. Quality parameters were analysed at 30 days under low-cost storage structure was made from locally available wood (eucalyptus and bamboo). Total soluble solidcontent of ten onion genotypes was measured at 0, 30, 60, 90 and 120 days of storage using Hand Refractometer at 20 ^{0}C temperature and the results were expressed in Brix (%).

RESULT AND DISCUSSION

Physiological weight loss (PWL) of ten onion genotypes wasrecoded at the 30 day's interval of storage (Table 1). Minimum Physiological Weight Loss (PWL) was recorded in best check Hisar Onion-4 during storage period of storage from 30 days (7.19%) to 120 days (14.81%) of storage. Maximum PWL was recorded in Hisar Onion-11 (11.27%) followed by Hisar Onion-9 (10.37%). The difference in PWL among genotypes might be due to genetically variation

among them. Physiological weight loss (PWL) increased as the storage period progressed. This might be due to fluctuation of temperature and humidity during storage (Baninasab and Rahemi, 2006, Sohany *et al*, .2016). Bulbs lost 20 to 30 % of their weight at the end of the storage (Sharma, *et al*, 2015).

Sprouting of ten onion genotypes was recoded at the 30 days interval of storage (Table 2), there were no sprouting recorded in bulbs up to 60 days of storage in our study. At 90 days of storage, sprouting in bulbs was recorded which ranged from 2.16 to 7.05 %. Minimum sprouting was observed in best check Hisar Onion-4 (2.16% and 3.65%) closely followed by Hisar Onion-2 (2.57 and 4.16%) and just half to other genotypes. Less percentage of sprouting might be due to thin neck of bulbs to protect the effect of high humidity (Pandey and Bhonde, 1992). Maximum sprouting in bulbs was recorded in Hisar Onion-8 (7.05% and 8.63%) closely followed by Hisar Onion-10 (6.83%). Vintila *et al.* (2014) and Kukanoor (2005) also reported that less sprouting was seen at ambient temperature compared to low temperature.

Rotting of ten onion genotypes was recoded at the 30 days interval of storage (Table 3), at 30 days storage, only four genotypes expressed rotting in their bulbs and maximum in Hisar Onion-11 (1.29%). This genotype had highest percentage of rotting was observed among four genotypes and expressed maximum throughout storage period among other genotypes. Hisar Onion-4 and Hisar Onion-7 had minimum rotting in their bulbs during storage. It might be due to high phenolic and antioxidant activity reported by (Lattanzio *et al*. 1994). In rest of genotypes rotting was observed almost in same trend as increasing with storage period. There was sharp increase in rotting of bulbs at 90 and 120 days compared to 30 and 60 days of storage because degrade the anthocyanin and antioxidant activity at 90 and 120 days of storage (Berno *et al.* 2014) and increases incidence of relative humidity and moisture content in bulbs in month of August and September (Mahmud and Monjil, 2015) minimum rots of bulbs was seen up to 60 days after storage due at this time, higher temperature was found so reduced rotting (Sharma *et al.* 2015).

A total loss of storage is sum of losses caused by PWL, sprouting and rotting in bulbs during storage period. Total losses were low at 30 and 60 days of storage as compared to 90 and 120 days of storage. Maximum total loss was found at the 120 days after storage. This might be due to high temperature coupled with high humidity (Nega, *et al.* 2015). Minimum total losses was recorded in best check Hisar Onion-4 closely followed by genotype Hisar Onion-7 (Table 4). Maximum total losses was recorded in genotype Hisar Onion-11 followed by Hisar Onion-10 and Hisar Onion-8. This might genotypic differences.

Table No. 1. Effect of storage on physiological weight losses (%) in onion genotypes

Genotypes	Day after storage (DAS)			
	30 Days	60 Days	90 Days	120 Days
	Mean	Mean	Mean	Mean
Hisar Onion-2	7.62	9.49	10.33	16.05
Hisar Onion-3	9.79	11.86	12.83	16.76
Hisar Onion-4	7.19	8.84	10.00	14.81
Hisar Onion-5	7.61	9.56	10.43	15.93
Hisar Onion-6	10.35	12.43	13.72	17.65
Hisar Onion-7	7.25	9.49	10.20	14.66
Hisar Onion-8	9.81	12.25	13.74	18.45
Hisar Onion-9	10.37	13.39	14.98	18.83
Hisar Onion-10	10.04	12.40	14.20	19.52
Hisar Onion-11	11.27	13.88	14.98	20.21
C.D. at 5%	0.44	0.78	0.81	0.95
SE(m)	0.15	0.26	0.29	0.32

Table No. 2. Effect of storage on sprouting (%) in onion genotypes

Genotypes	Day after storage (DAS)			
	30 Days	60 Days	90 Days	120 Days
	Mean	Mean	Mean	Mean
Hisar Onion-2	-	-	2.57	4.16
Hisar Onion-3	-	-	5.09	6.15
Hisar Onion-4	-	-	2.16	3.65
Hisar Onion-5	-	-	3.28	4.80
Hisar Onion-6	-	-	5.29	6.84
Hisar Onion-7	-	-	4.80	7.01
Hisar Onion-8	-	-	7.05	8.63
Hisar Onion-9	-	-	5.83	7.12
Hisar Onion-10	-	-	6.83	7.65
Hisar Onion-11	-	-	5.00	6.29
C.D. at 5%	-	-	0.70	0.87
SE(m)	-	-	0.27	0.28

Table No. 3. Effect of storage on rotting (%) in onion genotypes

Genotypes	Day after storage (DAS)			
	30 Days	60 Days	90 Days	120 Days
	Mean	Mean	Mean	Mean
Hisar Onion-2	0.00	0.74	2.94	7.29
Hisar Onion-3	0.31	1.00	3.32	8.40
Hisar Onion-4	0.00	0.49	2.68	6.03
Hisar Onion-5	0.00	1.10	3.94	9.09
Hisar Onion-6	1.06	1.66	4.90	9.83
Hisar Onion-7	0.00	0.49	2.52	6.38
Hisar Onion-8	1.08	1.97	4.70	9.75
Hisar Onion-9	0.18	1.10	4.71	10.61
Hisar Onion-10	0.00	1.43	4.02	9.73
Hisar Onion-11	1.29	2.22	5.72	12.02
C.D. at 5%	0.30	0.59	0.48	0.93
SE(m)	0.10	0.19	0.16	0.31

Table No. 4. Mean performance of onion genotypes for total losses (%) during storage

Genotypes	30 Days	60 Days	90 Days	120 Days
	PWL+ Sprouting+ Rotting	PWL+ Sprouting+ Rotting	PWL+ Sprouting+ Rotting	PWL+ Sprouting+ Rotting
	Mean	Mean	Mean	Mean
Hisar Onion-2	7.62	10.22	15.84	27.50
Hisar Onion-3	10.10	12.85	21.23	31.30
Hisar Onion-4	7.19	9.33	14.83	24.49
Hisar Onion-5	7.61	10.65	17.64	29.82
Hisar Onion-6	11.41	14.09	23.91	34.32
Hisar Onion-7	7.25	9.97	17.52	28.04
Hisar Onion-8	10.89	14.22	25.49	36.82
Hisar Onion-9	10.55	14.49	25.52	36.55

Hisar Onion-10	10.04	13.82	25.05	36.90
Hisar Onion-11	12.55	16.10	25.70	38.51
C.D. at 5%	0.75	1.20	2.03	2.76
SE(m)	0.25	0.41	0.68	0.92

CONCLUSION

In this study, it was recorded that Hisar onion-4 is best among the genotypes for storability during storage. Most of the grower or farmer facing various problems like rotting, sprouting and physiological loss and reduction of quality like total soluble solid due to respiration and physical causes. There was seen increase the shelf life and quality of those genotypes having good source of phytochemicals and TSS content. So coloured genotypes were suitable for retain the shelf life and quality of genotypes in the storage. White onion was low shelf life compared red and brown colour so red coloured genotypes was good for longer shelf life without any given treatment in the low cost storage structure in Haryana region of India.

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