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Effect of methods of harvesting and time of curing on storage life of onion (*Allium cepa* L.) cultivar agrifound light red

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Abstract
The investigation was carried out on effect of last irrigation and curing on yield and post-harvest losses of *Rabi* onion. After field and shade curing, the onion bulbs were kept three months upto September under ambient conditions to assess the post-harvest losses. Treatments were evaluated on the basis of storage life of onion. The results revealed that, the minimum neck thickness at the time of storage (0.892 cm) were recorded with m_3 (Harvesting without irrigation). The results indicated that crop harvesting without irrigation (m_3) recorded maximum weight of fresh onion after three month of storage life (14.541kg) and minimum per cent weight loss after three month of storage life (27.29%). As regards to field curing treatments, field curing of onion bulbs for four days curing in field condition produced significantly higher fresh onion after three month of storage life (14.541kg) and minimum per cent weight loss after three month of storage life (25.72%) during storage in 2012-13, respectively, over no curing.

Keywords: Irrigation, Field and Shade Curing, Onion

Introduction
Onion is an important part of our daily diet. The onion crop cannot be stored safely under ambient conditions because of its perishable nature. Out of the total onion production, about 20-25% is stored for daily requirement is lean season. Annual storage losses of onion are more than 40-60% (Bhagachandani *et al*., 1980) [1]. There are several factors or operations during crop raising in the field like with holding last irrigation and field and shade curing which influence the storability of onion. Curing in the field and shade for the purpose of removal of excess moisture from the outer skin is the prime technology to obtain under sized skin for avoiding moisture loss, disease infection and their spread. Very limited information on these aspects is available for agroclimatic conditions of Gujarat.

Materials and Methods
The trial was conducted at Horticulture Instructional Farm, C. P. College of Agriculture, Sardarkrushinagar, Dantiwada Agricultural University, Sardarkrushinagar, District-Banaskantha. The seeds of Agrifound light red variety were obtained from NHRDF. 20 kg of onion in each treatment of uniform shape and size were selected for storage life. Experiment consists of total fifteen treatment combinations with three methods of harvesting [Irrigate the crop before two days of harvesting (m_1), irrigate the crop before three days of harvesting (m_2) and harvesting without irrigation (m_3)] and five time of curing [Two days curing in field condition (c_1), four days curing in field condition (c_2), two days curing in shade condition (c_3), four days curing in shade condition (c_4) and no curing (c_5). The soil of experimental site was loamy sand in texture having pH of 7.8, low in available N (149kg/ha), medium in available P_2O_5 (26kg/ha) and K_2O (287kg/ha). The onion seedling of eight weeks of uniform size were transplanted with the spacing of 15 cm x 10 cm and harvested in second week of May during the same year of 2013. A uniform dose of 50 kg N, 50 kg P_2O_5 and 50 kg K_2O/ha was applied in soil before transplanting and 50 kg N/ha was applied at 30, 45 and 60 days after planting in three equal splits and last irrigation was applied as per the treatments and after the harvesting from the field and shade curing was done as per the treatments and produce was stored for three months in ambient condition. Necessary data were recorded and analyzed to draw the conclusion.

Results and Discussion

Effect of Methods of harvesting on storage behavior

The results depicted from the data pertaining to the yield and post-harvest losses of onion are presented in Table 1. Significantly minimum (0.892 cm) and maximum (1.165cm) neck thickness of bulb was recorded with the treatments m_3 and m_1 respectively. Maximum fresh weight of onion after three month of storage (14.541kg), minimum weight of dry scales after three month of storage life (0.023kg), minimum weight of rotted and sprouted after three months of storage life (1.095kg) was recorded with the treatment of harvesting without irrigation while minimum weight of fresh onion after three month of storage life (11.647kg), maximum weight of dry scales after three month of storage life (1.566kg), maximum weight of rotted and sprouted onion after three months of storage life (1.797kg) were recorded with treatment harvesting without irrigation. The lowest rotting and sprouted loss in the control treatment may be due to the fact that control plots did not receive irrigation before the harvesting that kept the bulbs less succulent and as a result less attacked by bacteria and fungi during storage. This result is in the conformity with the findings of Sharma *et al.* (2007) [13] in onion. Minimum per cent weight loss of onion after three month of storage life (27.29%) were recorded with treatment m_3, while maximum per cent weight loss (41.76%) were recorded with treatment m_1. The temperature and humidity were high during storage that might be attributed to the higher weight loss of stored onion. The results of the present study are close agreement with those of Rao *et al.* (1967) [12], Kale *et al.* (1992) [8], Pandey and Bhonde (1992) [10] and Sharma *et al*. (2007) [13].

Effect time of curing on storage behavior

Curing method significantly affected the storage behaviors of onion (table1). Significantly minimum neck thickness was (0.952 cm) observed under the treatment two days curing under field condition and maximum neck thickness of bulb was (1.104 cm) observed under the treatment no curing further indicated that different time of curing was observed significant influences at the end of three month of storage. Maximum recovery of fresh onion after three month of storage life (14.856kg) was recorded with treatment four days field curing and minimum weight of fresh onion after three month of storage life (10.946kg) was recorded with no curing,. Significantly minimum weight of dry scales (0.014kg), weight of rotted and sprouted onion (1.081kg) was obtained with the treatment four days field curing and maximum dry scales (0.044kg) and rotted and sprouted onion (1.789kg) were observed with the treatment no curing at the end of three month of storage life. Curing of onion after harvesting affects the neck thickness of bulb, due to thin neck of bulb protect from atmospheric high temperature and high humidity and ultimately promotes the higher recovery of onion bulb during storage. These findings are in close accordance with the findings of Pandey *et al.* (1992) [10] in onion, Bhonde and Bhadauria (1995) [2] in onion, Bhonde *et al.* (1996) [3] in onion and Chadha and Sindhu (1989) [4] in onion. Influence of different time of curing were recorded at the end three month of storage life with respect to per cent weight loss was observed significant variation. Minimum per cent weight loss (25.72%) was observed with treatment c_2 and maximum (45.27%) was recorded with treatment c_5 at the end of three month of storage life. A minimum loss occurs at the different stages of storage that is only due to proper cured bulb were put for storing. These findings are in close accordance with the findings of Chadha and Sindhu (1989) [4] in onion, Pandey *et al.* (1992) [10] in onion, Bhonde and Bhadauria (1995) [2] in onion and Chauhan *et al.* (1995) [5] in onion.

Effect of methods of harvesting and time of curing on storage behavior

Interaction effect of harvesting and time of curing was also found significant on storage attributen of onion. Significantly minimum neck thickness of bulb was recorded with m_3c_2 i.e. 0.823 cm and treatment m_3c_1 and m_3c_4 were found significantly at par with treatment m_3c_2. Maximum neck thickness of bulb was recorded with treatment combination m_1c_5 i.e. 1.286 cm Significantly minimum weight of dry scales (0.014 kg) was recorded with treatment combination m_2c_2 and m_3c_2 while maximum dry scales was recorded with treatment combination m_1c_5 (0.048 kg). The minimum weight of the rotted and sprouted onion was also obtained with treatment m_3c_2 (0.710 kg) and maximum weight of rotted and sprouted onion was observed (2.000 kg) under treatment m_2c_5. The present results are in close accordance with Bhonde and Bhaduria (1995) [2] in onion.

Table 1: Effect of methods of harvesting and time of curing on weight of fresh, weight of dry scales, weight of rotted and sprouted (Out of 20 kg onion) and per cent weight loss after three month of storage life.

Treatment	Neck thickness at the time of storage (cm)	Weight of fresh (kg)	Weight of dry scales (kg)	Weight of rotted and sprouted (kg)	Per cent weight loss (%)
Methods of harvesting (M)					
m_1	1.165	11.647	0.026	1.797	41.76
m_2	0.995	12.605	0.025	1.651	36.97
m_3	0.892	14.541	0.023	1.095	27.29
S.Em ±	0.014	0.168	0.001	0.034	0.84
C.D. at 5 %	0.040	0.487	0.002	0.097	2.43
Time of curing (C)					
c_1	1.013	12.970	0.021	1.533	35.15
c_2	0.952	14.856	0.014	1.081	25.72
c_3	1.000	12.436	0.024	1.647	37.82
c_4	1.013	13.450	0.020	1.523	32.75
c_5	1.104	10.946	0.044	1.789	45.27
S.Em ±	0.018	0.217	0.001	0.043	1.08
C.D. at 5 %	0.052	0.629	0.002	0.126	3.14
Interactions (M X C)					
m_1 c_1	1.11	11.373	0.027	1.967	43.13
m_1 c_2	1.05	13.763	0.015	1.250	31.18

m_1 c_3	1.17	11.160	0.024	1.983	44.20
m_1 c_4	1.22	12.237	0.024	1.937	38.81
m_1 c_5	1.29	9.703	0.016	1.850	51.48
m_2 c_1	1.07	12.740	0.048	1.783	36.30
m_2 c_2	0.98	14.333	0.016	1.283	28.33
m_2 c_3	0.92	12.247	0.014	1.673	38.76
m_2 c_4	0.95	13.000	0.024	1.517	35.00
m_2 c_5	1.06	10.707	0.020	2.000	46.46
m_3 c_1	0.87	14.797	0.049	0.850	26.01
m_3 c_2	0.82	16.470	0.020	0.710	17.65
m_3 c_3	0.93	13.900	0.014	1.283	30.50
m_3 c_4	0.87	15.113	0.023	1.117	24.43
m_3 c_5	0.97	12.427	0.025	1.517	37.86
S.Em ±	0.03	0.0376	0.001	0.075	1.87
C.D. at 5 %	0.091	NS	0.004	0.218	NS
C.V. %	5.320	5.034	10.359	8.589	9.20

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