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Short communication

Effect of storage environments and packing methods on storage losses in onion

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ABSTRACT

A Study was conducted using four storage environments and packing methods. After four months storage lossed were evaluated alongwith economics of storage. Top and bottam ventitated storage gave lowest physiological loss in weight (19.08%) and minimum bulb rotting (7.52%). Highest storage losses (54.77%) in traditional storage. Top and bottam ventilated storage was most economic (Rs. 2,459/t).

Key words: Onion, packing mathod, storage conditions.

Onion is an important crop of our country. It is grown in three seasons in different onion growing areas. But the main crop, which is harvested in April-May, is usually stored for consumption during June to October. The storability of onion is influenced by several factors such as variety, cultural practice, pre-harvest treatment and post harvest handling practices (Bruce *et al.*, 1; Shinde *et al.*, 5; Warade *et al*., 6). The bulk storage onion is done in stake/heap rather than the containers. In bulk storage, bulbs are loose and utilization of store is maximum but strong walls are required for the storage of large quantity of onion. Further bagging is required before marketing. The storage of onion in containers such as bags and crates does not require strong walls but aeration in bags is less and uneven. The plastic or wooden crates provide good aeration but space utilization is poor. The storage environment during the period of storage plays an important role in the storage life and losses during the storage (Bruce *et al.*, 1). Various types of storage structures are used for storage of onion in different onion growing areas of the country. Considering all these points in view, a trial on storage of onion in different storage structures and packing materials was taken up.

The experiment was conducted at National Research Centre for Onion and Garlic, Rajgurunagar, Pune for three years. Four storage environments, *i.e*. (i) traditional storage structure, (ii) modified bottom ventilated storage structure, (iii) top and bottom ventilated storage structure, and (iv) bottom ventilated storage structure with chain linked side walls and four packing methods, stake/heap storage, hessian cloth bags, lino bags and plastic crates were used for the trial. Well-cured bulbs of onion cv. N-2-4-1 were packed by different materials/methods. In first method, the bulbs were kept in heaps of 1.2 m x 1.2 m and 1.5 m high stake/ heap. While in case of bags, onion bulbs were packed in 40 kg capacity hessian cloth bags or lino bags. In case of crates, 25 kg well ventilated plastic crates were used. These packed onion bulbs were stored in four storage environments from May to September. The observations on weight loss, disease infection, sprouting, were recorded after 4 months of storage. The economics of storage was calculated on the basis of cost of storage structures, cost of packing material, loading and unloading, sorting, packing charges. The economic life of storage structure was considered as 20 year, while the economic life of crates was taken three years. The cost of onion was calculated on the basis of average prices of May and September in local onion wholesale market. The data were analyzed as described by Panse and Sukhatme (3).

Among various storage structures, the lowest physiological loss of weight (PLW) was observed in top and bottom ventilated storage structure (19.08%).The higher PLW were recorded in Modified bottom ventilated storage structure with chain-linked sidewalls (24.25 %) and traditional storage structure (24.09%; Fig. 1). Among the packing materials, lowest (20.05%) physiological loss of weight (PLW) was recorded in stakes, while it was highest (24.39%) in plastic crates. Among various combinations of storage environment and packing material, the highest physiological loss of weight (28.24%) was recorded in plastic crates stored under modified bottom ventilated storage structure with chain-linked sidewalls while it was lowest (15.92%) in heap/stake storage in top and bottom ventilated storage structure

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Table 1. Effect of storage environment and packing material on storage losses (%) of onion.

Storage structure	Packing material																	
	Stake				Hessian cloth bag				Lino bag				Plastic crate					
	PLW	Rot	Sprouting	Black mould	Total losses	PLW	Rot	Sprouting	Black mould	Total losses	PLW	Rot	Sprouting	Black mould	Total losses	PLW	Rot	Sprouting	Black mould	Total losses
Traditional storage structure	22.18	22.72	0.56	4.65	50.11	22.06	31.82	2.97	5.63	62.48	26.40	26.24	1.44	3.99	58.07	25.73	15.38	3.13	4.19	48.33
Modified bottom ventilated storage structure	19.36	17.94	2.96	8.22	48.48	20.96	15.65	2.56	6.02	45.19	22.74	16.73	3.61	5.14	48.22	22.89	9.27	2.83	4.07	39.86
Top and bottom ventilated storage structure	15.92	7.57	2.49	7.9	33.83	18.97	10.83	2.78	6.69	39.27	20.72	9.08	2.39	5.83	38.02	20.69	7.52	2.01	5.07	35.34
Bottom ventilated storage structure with chain linked side walls	22.73	14.19	3.29	5.78	45.99	22.27	15.15	2.13	3.85	43.4	23.76	13.99	2.70	4.15	44.60	28.24	8.62	3.60	4.11	44.57
Average	20.05	15.60	2.33	6.64	44.60	21.07	18.36	2.61	5.55	47.59	23.41	16.51	2.54	4.78	47.23	24.39	10.70	2.89	4.56	42.05
$CD_{0.05}$ S	1.94				1.23					NS					0.53					2.94
P	2.17				1.2					NS					0.93					2.23
S × P	3.55				1.91					1.09					1.13					5.59

(Table 1). The higher weight loss in crates stored in modified bottom ventilated structure with chain linked sidewalls may be attributed to exposure of onions to hot and dry wind in initial period of storage. While PLW in top and bottom ventilated storage structure was due to restricted movement of hot air (Brice *et al*., 1; Shinde *et al*.,5; Warade, *et al*., 6). The rotting was higher (24.04%) in the traditional storage structure than other structures, while it was lowest (8.75%) in top and bottom ventilated storage structure (Fig. 1). Among the packing materials, significantly lower rotting (10.71%) was recorded in plastic crates, while higher rotting was found in hessian cloth bags (18.36%) and lino bags (16.57%). Among the various combination of storage structures and packing materials, the lowest (7.52%) rotting losses were found in plastic crates stored in top and bottom ventilated storage structure while highest rotting losses were recorded in hessian cloth bags stored in Traditional storage structure (31.82%, Table 1). The higher rotting in bags may be due to poor air circulation in onions stored in bags. As it is well establish fact that proper aeration and optimum humidity level reduces storage losses in onion (Brice *et al*., 1; Naik *et al*., 2; Skultab and Thompson, 4).

The sprouting losses were highest in modified bottom ventilated storage structure (2.99%), while it was lowest in traditional storage structure (2.03%). Among the packing material highest sprouting losses were recorded in plastic crates (2.89%) but there was no significant different among the sprouting losses in storage structures and packing materials. Among various combination of storage structures and packing materials, lowest sprouting (0.56%) was recorded in stake stored in traditional storage structure, which was significantly lower than other treatments combinations (Table 1). The lower sprouting losses in stakes may be due to the less exposure of cooler winds in later part of storage. The increase in sprouting by low temperature is reported by Brice *et al*. (1).

Black mould infection was highest (6.37%) in top and bottom ventilated storage structure, while it was lowest (4.35%) in bottom ventilated storage structure with chain linked sidewalls. Among the packing material, lowest black mould infected bulbs were recorded in plastic crates (4.56%), while it was highest (6.64%) in stakes. Among the various combination of storage structures and packing materials, the highest (8.22%) black mould infected bulbs were found in stakes stored in modified bottom ventilated storage structure, while it was lowest in hessian cloth bags and plastic crates stored in modified bottom ventilated storage structure (Table 1). The lack of proper aeration in stakes resulted in increased the humidity level inside might be the reason for higher

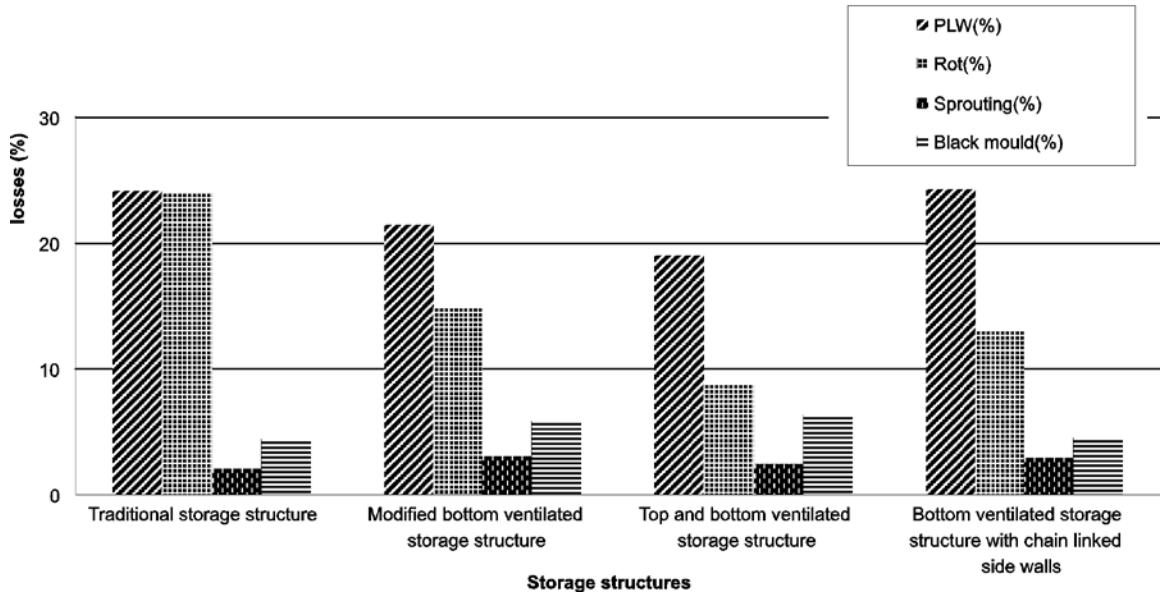

Fig. 1. Effect of storage environment on various storage losses in onion.

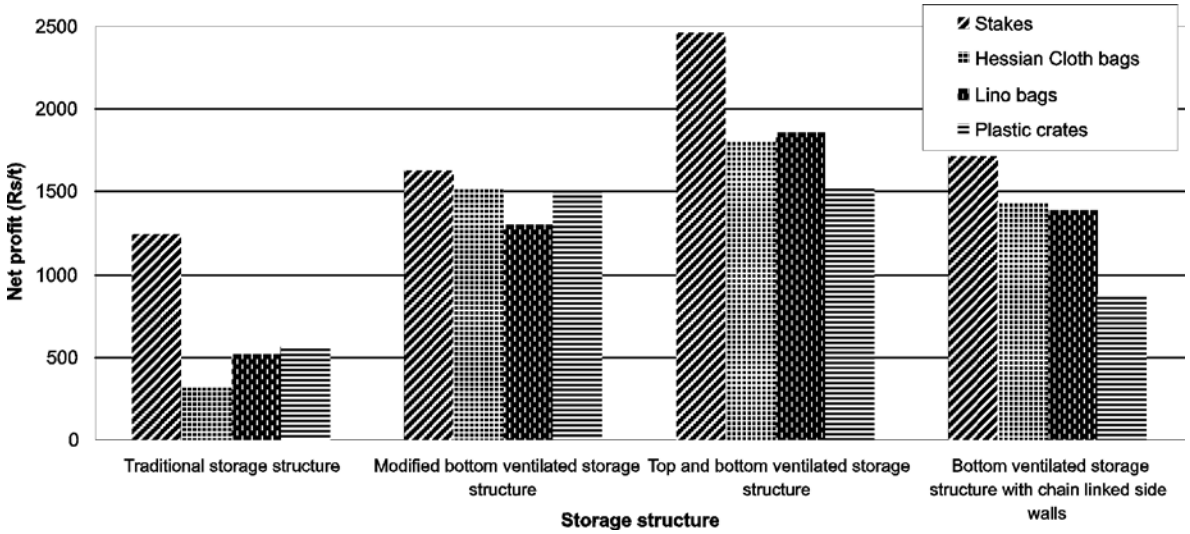

Fig. 2. Effect of storage environment and packing material on net profit in onion.

black mould infection as it is an established fact that infection of black mould and other storage diseases is higher when store moisture content is high. The total storage losses were lowest (36.62%) in top and bottom ventilated storage structure, which were significantly lower than other storage structures. The highest total storage losses (54.77%) were found in traditional storage structure. The storage of onion in plastic crates was found lower than other packing materials. The total storage loss was of 42.05% in plastic crates as compared to 44.60% in stakes, 47.59% in hessian cloth bags and 47.23% in lino bags. Among different combinations of the storage structures and packing materials, significantly lower total storage losses were observed in stakes (33.83%) and plastic crates (35.34%) stored in top and bottom ventilated storage structure. The highest losses (62.48%) were recorded in hessian cloth bags stored in traditional storage structure (Table 1). The economic of the storage of onion in different storage environment and packing revealed that highest net profit (Rs. 1,917/t) was found in top and bottom ventilated storage structure while it was lowest (Rs. 664/t) in traditional storage structures. Among

packing methods, higher net profit (Rs. 1,787/t) was found in stake and lowest net profit was found in plastic crates (Rs. 1,125/t). Among the various combinations of storage structure and packing method, stake storage in top and bottom ventilated storage structure was found most profitable (Rs. 2,459/t; Fig. 2). The net profit was low in plastic despite of lower storage losses because the cost of plastic crates was more 15 times higher than other packing materials.

The results suggest that the storage of onion in stakes and crates in top and bottom ventilated structures was most effective in reduction of storage losses as compared to other storage structures and packing materials. The net profit was highest in stake storage in top and bottom ventilated structures.

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