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Short communication

A comparative study on different types of structures for onion storage

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Onion is one of the one of the most important vegetable crop of the country and plays a significant role in the routine diet of the people. A sizeable quantity of onion is exported from India mainly to gulf countries, Sri Lanka and south Asian countries. It is estimated that onion accounts for 87.5 per cent of annual export of vegetables from India (Roy and Chkrabarti, 1988). The rabi season crop yields 50- 60 per cent production whereas the kharif and late kharif season crop covers rest of the production. Generally, the harvested onion bulbs are stored in locally designed traditional structures all over the country, where 50 to 60 per cent losses incurred due to improper aeration (Pandita, 1994). Sometimes the entire produce is damaged so severely that it makes difficult to inhale in surrounding areas. Resultantly, farmers have no option to sale out their produces immediately after harvest at marginal rate.

To overcome these problems, there is an urgent need to develop a storage structure which has minimum rotting, sprouting and weight losses. The improved storage structures for large scale commercial onion storage have been built by NAFED at its Pimpalgaon and Lasalgaon complex in Nasik, Maharastra. These are multi-tier structure provided with bottom aeration. They are constructed in raised platform avoiding direct contact with soil, sun or rain. The loss in such structures is reduced to 27.7 % from 55.66% in ordinary conventional stores (Pandia, 1994). Keeping this in consideration it was decided to do a comparative study of improved storage structure developed at Nasik and locally available onion storage structures in warmer condition and low humidity region of Rajasthan. So that an appropriate onion storage structure can be designed and developed and huge amount of post harvest losses during storage can be minimized.

A comparative study of losses incurred in different storage structures was undertaken. There were six model (Fig. 1 to 6) were designed and developed at the Rajasthan Agricultural University, campus Agricultural Research Station, Durgapura, Jaipur.

All the structures were designed and developed having ample dimension to accumulate about 25- 30 q freshly harvested onions. Side walls of first two types of storage structures i.e. type-1 and type-2 (Figs. 1 and 2) were consist of longitudinal bamboo strips of desired size were interwoven. The roof was covered bamboo mat along with polyethylene sheet. The walls of type-3 and type-4 storage structures (Fig. 3 and 4) were made of bricks and cement, while the roof was made up of thatch with locally available materials. Cylindrical shaped structures of bamboo strips supported with 12 mm mild bar rings were provided on floor of type -3 storage structure. One end of the prepared pipe was fixed with 25 cm diameter hole in the walls and other end of the pipe was fixed with the opposite wall. Sixty cm space was maintained between two pipes. It was done with the specific purpose of free circulation of atmospheric air from bottom. In type-4, a platform was made up of half round bamboo strips at a height of 45 cm from the ground level. A horizontal rectangular opening was maintained in a wall below the platform to facilitate the aeration (Fig. 4). Type-5 and type-6 (Fig. 5 and 6) storage

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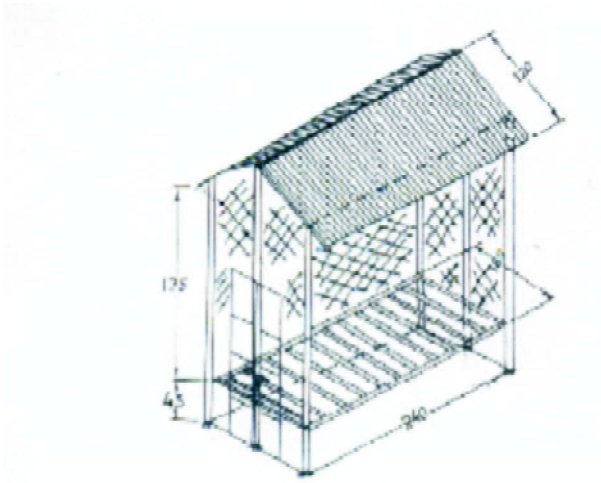

Fig.1 Single Tier Bamboo Made Onion Storage Structure (Type-1)

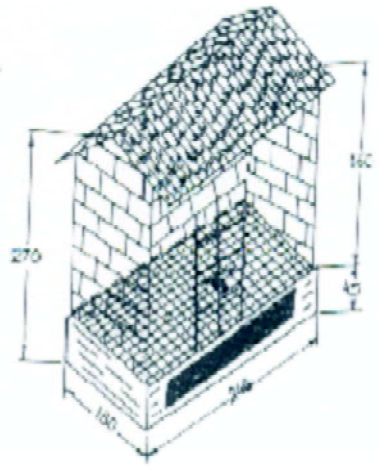

Fig.4 Onion Storage Structure Made of Bricks (Type-4)

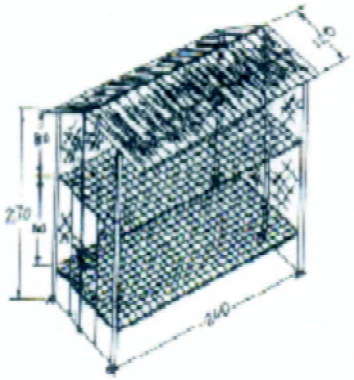

Fig.2 Two Tier Bamboo Made Onion Storage Structure (Type-2)

Fig.5 Onion Storage Structure Made of Thatch (Type-5)

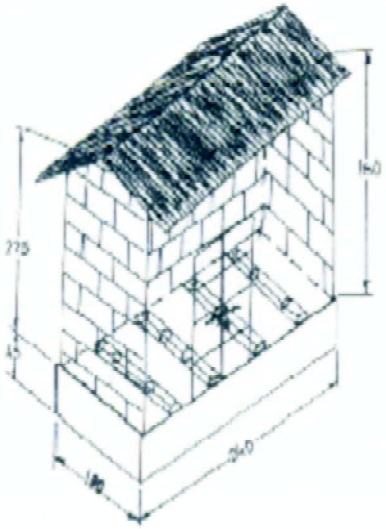

Fig.3 Onion Storage Structure Made of Bricks (Type-3)

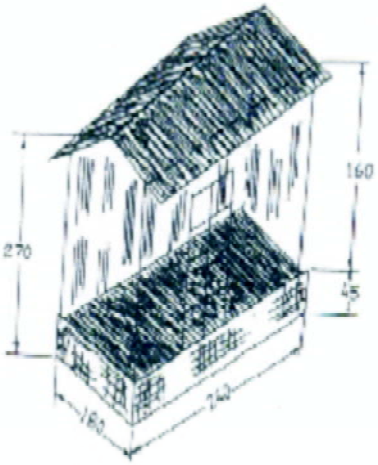

Fig.6 Onion Storage Structure Made of Thatch (Type-6)

structures were made of thatch in cylindrical and rectangular shape. After harvesting, RO-1 the most popular variety of onion of Rajasthan was given 10 days shade curing. The double splits, bolted and very small size onion bulbs were sorted out. The rest onion bulbs were stored in each prototype at the end of May in three consecutive years (2003 to 2005) of experimentation. The samples of 10 kg onion bulbs were taken out from each storage structure to observe three types of losses viz., sprouting, spoilage or decay and

Table 1: Cost of construction, storage losses and cost benefit ratio of different types of onion storage structures studied during year 2003-05

Type of storage structure	Storage capacity	Cost of construction	Storage loss (%)				BC ratio
			PLW	Sprouting	Decay	Total	
Type -1	30.62	6180	7.70	1.25	1.45	10.40	1.69
Type -2	24.95	6430	6.25	1.05	0.95	8.25	1.72
Type -3	29.30	7470	8.90	2.20	3.75	14.85	1.57
Type -4	30.62	7360	9.75	2.45	4.20	16.40	1.55
Type -5	30.95	3035	12.60	5.60	9.50	27.70	1.39
Type -6	30.62	2525	11.20	4.45	8.45	24.10	1.47
SEm±			0.7215	0.288	0.385	0.1575	
CD at 5%			2.174	0.870	1.161	0.4747	

physiological weight loss (PWL). The observations were recorded at 15 days intervals. Onion in each storage structure was stored for four months (from June to October). Minimum and maximum temperatures and relative humidity during storage period i.e. from June to October were recorded (Table 1). Based on the statistical analysis of three years polled data, the most suitable storage structure was determined.

The storage capacity cost of construction average storage loss and cost benefit ratio obtained in different type of storage structure is presented in (Table1). The storage capacity of different storage structures were varied between 24.9 -30.62 q. One cubic area of store accommodates about 750 kg onions (Bhonde, 1988). Thus, the storage structures were constructed as per norms of storage capacity. Accordingly, the onion storage prototypes were constructed.

Analysis of data physiological loss of weight (PLW), decay (spoilage) and sprouting revealed that two tier bamboos made onion storage structure (type-2) had minimum losses (8.25 %). This storage structure was also found cost effective (BC ratio 1.72). In this storage losses due PLW, sprouting and decay were recorded minimum as compared to other storage types studied. In single tier bamboo made onion storage structure (type-1) the average total storage loss was 10.40 % which was at par with 2-tier bamboo made onion storage structure. However, in type -3 and type-4, the walls of onion storage structures made of bricks with bottom ventilation have significantly higher storage losses as compared to type-1 and type-2 , which were estimated 14.85 and 16.40 per cent , respectively. The BC ratio was recorded 1.57 and 1.55 in type -3 and type-4 storage structure proto types. Result further exhibited that in type-3 and type-4 storage significant losses for PLW, sprouting and decay were recorded and maximum loss recorded from PLW flowed by decay and sprouting. The onion storage structures (type 5 and type-6) with roof and side wall made of thatch exhibited highest percentage of storage losses. The respective BC ratio in type-5 and type-6 was 1.39 and 1.47 which was comparatively lower than other model of storage structures. Conclusively, it was noted onion storage structures which have better ventilation facility have minimum storage losses because better aeration help in releasing the heat and moisture during respiration which reduce the sprouting and decay losses of onion during storage.

From present investigation it can be concluded that bamboo made onion storage structures (single tier or 2- tier) designed according to NHRDF on farm onion storage can help in reduction of losses to 8 -15 % over conventional storage structures. These types of storage structures have better aeration from sides and bottom which help in taking out accumulated heat and humidity and minimize the decay and sprouting losses during storage of onion.

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