RESEARCH ARTICLE

RESULT OF DIVERSE STORAGE STRUCTURES ON POTATO TUBER ROTS AND WEIGHT LOSS IN POTATO (*SOLANUM TUBEROSUM* L.) VAR. KUFRI BADSHAH

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Abstract: Four different storage structures were evaluated *viz.*, cold storage, country cold storage, heap method and rustic cum diffuse light storage. After 100 days of storage period, rottage incidence and weight loss were recorded. Minimum rottage incidence and weight loss was found in cold storage that is 16.31 % and 8.30 % followed by rustic cum diffuse light method 33.75 % and 12.35 %, country cold storage having 46.99 % and 20.70 % and maximum rottage incidence and weight loss was found in heap method 62.71 % and 27.45 % respectively.

Keywords: Cold storage, Country cold storage, Heap method, Rustic cum diffuse light storage

INTRODUCTION

Potato (*Solanum tuberosum* L.) is one of the most nutritious sources of food in the world. It has been recognized as a wholesome food and the richest source of energy in most of the countries of the world where, it forms an important part of the human diet. *Fusarium* dry rot is one of the most important diseases of potato, affecting tubers in storage and seed pieces after planting. *Fusarium* dry rot of seed tubers can reduce crop establishment by killing developing potato sprouts, and crop losses can be up to 25%, while more than 60% of tubers can be infected in storage. However, average annual crop losses attributed to dry rot have been estimated at 6 to 25 per cent (Chelkowski, 1989) and found that more than 60 per cent of tubers in storage can be affected (Carnegie *et al*., 1990). *Fusarium* sp. that causes dry rot and spread readily among tubers during handling and planting which results in seed tuber rots and poor plants stand (Hooker, 1981). However, other diseases as charcoal rot (*Macrophomina phaseolina*) may cause 10-70 per cent tuber rottage in eastern plains depending upon the period of harvest and presence of predisposing factors (Thirumalachar, 1955). The first symptoms of *Fusarium* dry rot are usually dark depressions on the surface of the tuber. In large lesions, the skin becomes wrinkled in concentric rings as the underlying dead tissue desiccates. Internal symptoms are characterized by necrotic areas shaded from light to dark brown or black in colour. This necrotic tissue is usually dry (hence the name given as dry rot) and may develop at an injury such as a cut or bruise. The pathogen enters the tuber, often rotting out in the center. *Fusarium* dry rot is caused by several fungal species in the genus *Fusarium*. *Fusarium sambucinum* (teleomorph *Giberella pulicaris*) is the most common pathogen causing dry rot of stored tubers, but other *Fusarium* species are also known to cause dry rot, particularly *F. solani* var. *coeruleum* and *F. avenaceum.* However, *F. sambucinum* is may be the probably the main causal agent of dry rot, but *F. solani* var. *coeruleum* may also be present and affect the potato crop. *Fusarium* dry rot is both seed and soil-borne and is present in most potato growing areas. Spread is associated with damage through seed cutting, grading or harvesting. Wounds created during these processes allow the *Fusarium* fungi to enter the tuber and spread. Temperatures of 15 to 20°C and high relative humidity aid the growth of *Fusarium* dry rot. Lower temperatures and humidity retard the fungus but dry rot development continues even at the lowest storage temperatures (As shown in photograph).

Many storage rots are incited by wound parasites. Therefore, avoidance of mechanical injuries at harvest and post-harvest stages, by improving the technology would go a long way in reducing tuber decay. Hence different storage structures have been evaluated in reducing the rottage incidence and weight loss in potato crop.

MATERIAL AND METHOD

In Gujarat, potato crop is sown in the month of November and harvested in March. The tubers are usually kept in heaps and country storages for one month to three months period. The experiment was conducted at Potato Research Station, Deesa, SDAU. The tubers are heaped covered with dry potato halms of one feet to two feet layers in the field itself under tree shade. Some of the farmers store the tubers in country cold store and rustic cum diffuse light store for a period of three months.

Healthy tubers of Kufri Badshah variety was selected and stored in cold storage, country cold storage, heap method and rustic cum diffuse light method to study

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the storage behaviour against different potato tuber rots. Twenty kg potato tubers of variety Kufri Badshah was kept in the beginning of March. Apparently unbruised and undamaged tubers of uniform sized (40-60 g) were kept under different storage structures. Stored potatoes were examined at 10 days interval for 100 days in respect to dry rot, charcoal rot and soft rot diseases. Here sprouts were not removed, but the tubers showing even the slightest sign of rottage were critically examined and rotted tubers were discarded from stocks in each observation.

Loss estimates

Four random samples were taken from every lot of potatoes. The diseased tubers were sorted out and counted on number and weight basis at 10 days interval. The weight of rotted tubers was done on pan balance. The per cent weight loss and per cent rottage incidence at each date were calculated.

Total percentage weight losses due to all diseases were calculated by formula given by Chester, K.S. (1950).

Percentage loss of individual diseases

$$= \frac{W_3}{W_2} \times 100$$

W_3 = Weight of diseased tubers of particular disease

W_2 = Total weight of the sample

RESULT AND DISCUSSION

A perusal of the data presented in Table-1 and 2 revealed that minimum dry rot incidence of 5.26 per cent was recorded in the cold storage method after 100 days of storage period followed by rustic cum diffuse light storage (10.82 %), country cold storage (14.20 %) and heap method storage (19.77 %). Charcoal rot infection was not observed in cold storage but maximum incidence of charcoal rot was observed in heap method (25.42 %) followed by country cold storage (20.95 %) and rustic cum diffuse light method (10.19 %). Soft rot incidence was minimum in cold storage method (11.05 %) followed by country cold storage (11.84 %), rustic cum diffuse light method (12.74 %) and heap method of storage (17.51 %).

Total rottage incidence ranged from 16.31 to 62.71 per cent (Fig.: 1) depending upon type of storage. The maximum rottage incidence was recorded in heap method of storage (62.71%) followed by country cold storage (46.99%), rustic cum diffuse light storage (33.75%) and cold storage method (16.31%).

Per cent weight loss due to dry rot was minimum in cold storage method (2.35 %) followed by rustic cum diffuse light method (2.92 %), country cold storage method (5.50 %) and heap method storage (7.05 %) while, weight loss due to charcoal rot was 3.82, 10.30 and 12.35 per cent in rustic cum diffuse light storage, country cold storage and heap method of storage, respectively. Weight loss due to soft rot was 4.90, 5.55, 5.95 and 8.05 per cent in country cold storage, rustic diffuse light storage, cold storage and heap method of storage, respectively (Fig.: 2).

Total weight losses due to storage diseases ranged from 8.30 to 27.45 % depending upon the type of storage. The minimum total weight loss was found to occur in cold storage (8.30 %) followed by rustic cum diffuse light storage (12.35 %), country cold storage (20.70 %) and heap method of storage (27.45 %) after 100 days of storage period.

Similarly, Khan *et al.* (1973) estimated weight losses of potato in cold storage at 22 locations amounted to about 2.2 – 9.5% due to dry rot, soft rot, common scab and physiological disorders such as hollow heart and freezing injury. Singh and Verma (1981) studied four storage environment at Patna (a) Kutcha farm store (b) Double walled Kutcha store (c) An under ground cellar (d) A cork insulated precooling room. Of which, rotting was lowest in pre-cooling room and highest in Kutcha store. Mehta and Kaul (1987) found 19.55 per cent weight loss of Kufri Badshah tuber stored at room temperature after 14 weeks (98 days) of storage. Shekhawat *et al.* (1992) reported that potato soft rot incidence ranged from 0.48 – 8.80% in cold storage and it was highest (8.8%) in the cultivar Kufri Badshah. Kang and Gopal (1993) studied ten advance stage hybrids and varieties of potato stored at ambient temperature and estimated per cent weight loss after 100 days in the year 1984 and 1985 was 20.6 and 18.8 per cent respectively in variety Kufri Badshah. The present findings were more or less similar in agreement with the above research workers.

Table 1. Effect of different storage structures on per cent rottage incidence and weight loss in var. Kufri Badshah

Storage period (days)	Cold Storage		Country Cold Storage		Heap Method		Rustic Cum Diffuse Light Method	
	% Rottage incidence	% Weight loss	% Rottage incidence	% Weight loss	% Rottage incidence	% Weight loss	% Rottage incidence	% Weight loss
10	0.000	0.000	2.180	0.900	2.82	0.870	3.821	1.450
20	0.526	0.220	2.190	0.950	9.955	1.700	3.821	0.975
30	1.052	0.550	2.730	1.150	5.084	2.200	3.184	1.075
40	2.105	1.150	1.640	0.650	5.084	2.230	1.910	0.875
50	1.578	0.770	4.920	2.100	5.649	2.600	1.273	0.450
60	2.105	1.140	6.010	2.600	6.215	2.800	3.821	1.375

70	2.105	1.100	6.010	2.700	7.344	3.300	3.184	1.275
80	2.105	1.100	7.650	3.350	8.474	3.700	3.821	1.475
90	1.578	0.700	7.650	3.550	9.040	4.000	3.184	1.180
100	3.157	1.570	6.010	2.750	9.040	4.050	5.732	2.225
Total	**16.31**	**8.30**	**46.99**	**20.70**	**62.71**	**27.45**	**33.75**	**12.35**

Table 2. Effect of different storage structures on per cent rottage incidence and weight loss in var. Kufri Badshah

Storage condition	Storage period (days)	% Rottage incidence			Total rottage incidence (%)	% Weight loss			Total weight loss (%)
		DR	CR	SR		DR	CR	SR	
Cold storage	100	5.26	-	11.05	16.31	2.35	-	5.95	8.30
Country cold storage	100	14.20	20.95	11.84	[illegible]99	5.50	10.30	4.90	20.70
Heap storage	100	19.77	25.42	17.51	62.71	7.05	12.35	8.05	27.45
Rustic cum diffuse light method	100	10.82	10.19	12.74	33.75	2.92	3.82	5.55	12.35

Where, DR = Dry rot, CR = Charcoal rot, SR = Soft rot.

Fig. 1. Indicates the Total Rottage Incidence (%) in different storage structures.

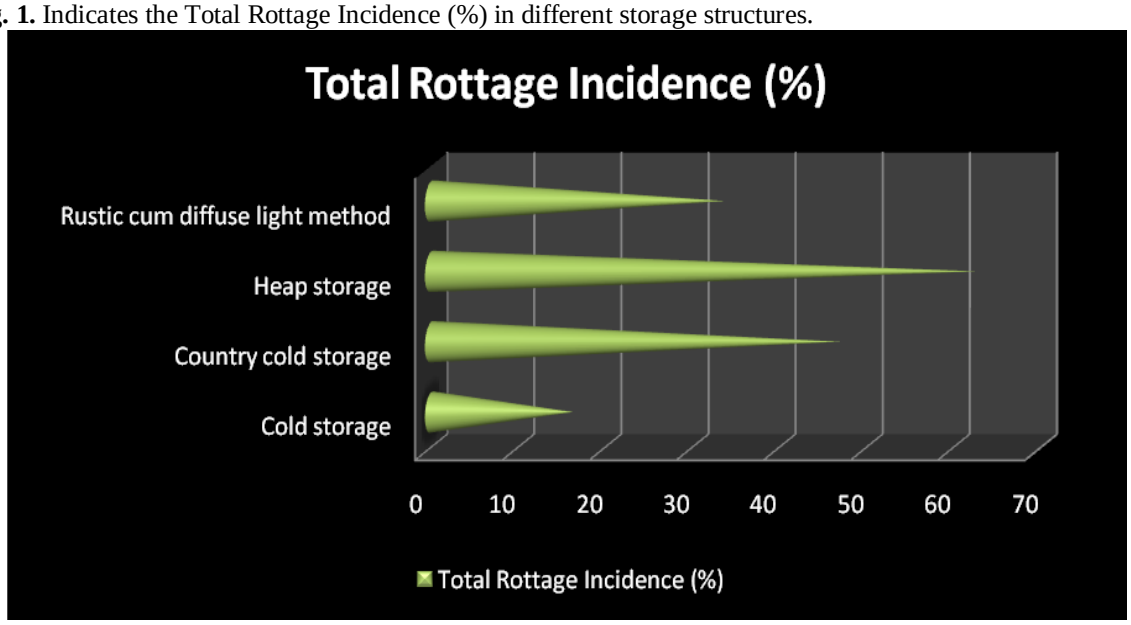
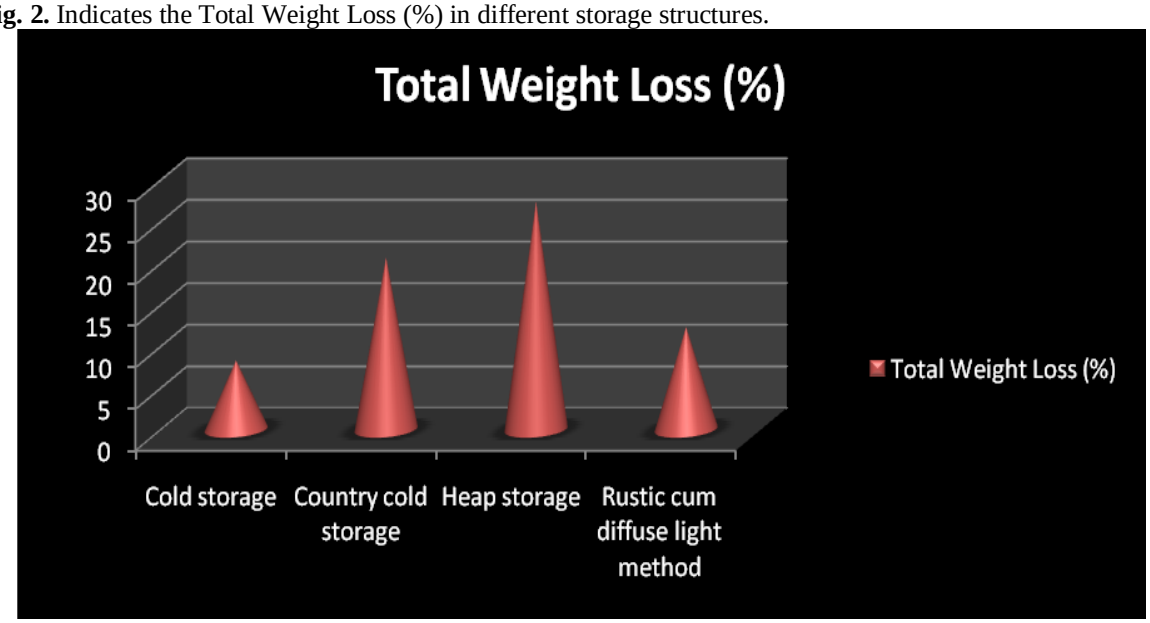


Fig. 2. Indicates the Total Weight Loss (%) in different storage structures.



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