KEEPPING QUALITY OF NEWLY RELEASED POTATO
CULTIVARS DURING ON-FARM STORAGE

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Potato production in India has increased from 1.5 million tons in 1949-50 to 24 million tons in 2002 (10). Due to inadequate infrastructure for storage, transport, marketing and utilization, the excess production frequently leads to glut situation making potato production uneconomical. To overcome this problem, short term non-refrigerated storage of potatoes for 3-4 months has been recommended in potato stores run on passive evaporative cooling (4) and by traditional on-farm storage methods like heaps and pits in northern plains of India (5, 11). Commercial potato cultivars developed by the Central Potato Research Institute have been investigated for their suitability for non-refrigerated storage from time to time (8, 9), but the information on storability of recently released potato cultivars, viz., Kufri Ashoka, Kufri Jawahar, Kufri Pukhraj and Kufri Sutlej under these storage conditions is lacking. These early and medium maturing cultivars with a yield potential of 40 q/ha were released during 1996-99 for large scale cultivation in north Indian plains (3). Further, with the creation of potato export promoting zones in Punjab, it becomes imperative to identify genotypes with good keeping quality. Poor infrastructure in terms of non-availability of refrigerated containers on the dry port, lack of preferential availability of pre-shipment transportation facilities and non-availability of warehousing facilities at the sea port are the main constraints faced by Indian exporters (1). Under the prevailing situations the export consignments are exposed to higher temperature conditions before reaching their destination. Hence the primary qualitative requisite for export of a potato variety is its good keeping quality. Therefore newly released commercial potato cultivars of the region were investigated to find their suitability for short term on-farm storage.

Healthy crops of the four potato cultivars (Kufri Ashoka, Kufri Jawahar, Kufri Pukhraj and Kufri Sutlej) were raised in sandy loam soils at the farm of the Central Potato Research Station, Jalandhar during October to January (2000-01 and 2001-02). N, P and K was applied at 180, 80 and 120 kg ha\(^{-1}\), respectively (12). Potatoes after harvest were kept in heaps covered with rice straw for 15 days for wound healing and proper curing of the skin (13). Undamaged and apparently healthy tubers with average weight of 50 g were stored in 4 replications of 5 kg each in hessian cloth bags in pit storage, heap storage, evaporatively cooled storage (ECS) and ambient room temperature storage (RT) in the first week of March. Kufri Chandramukhi, a good keeper was taken as control. A pit (10 ft deep, 5 ft diameter) with an inside lining of bricks in cement was dug under a thatched roof made of straw (Sarkanda) and bamboos. It was provided with a platform made of bamboos placed 2 inches apart and 2 ft above the base to improve aeration. Potatoes were stored in pit and heap under the thatched roof and covered with >1ft thick rice straw (5). ECS is a 20 tonne capacity double walled brick masonry structure with ventilators on one wall packed with wood wool which are

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continuously moistened by water dripping through a perforated pipe. Humidified and cool air enters the store through ventilators and hot air escapes through the exit. The temperatures inside the store are lowered and humidity is increased owing to adiabatic saturation (4). Daily record of maximum and minimum temperatures and relative humidity of the storage environment was maintained during the entire storage period. Temperatures were recorded twice (8.30 AM and 2.00 P.M) with maximum-minimum and dry-wet thermometers. Relative humidity was calculated by depression in wet bulb temperature as compared to dry bulb. The data on per cent sprouting, rottage, physiological weight loss (PLW) and total weight loss were recorded at fortnightly intervals. The PLW was recorded in 20 marked tubers and sprouting and rottage in 4 replications of 5 kg each. Tubers recorded as sprouted had at least one sprout 0.5 cm or more in length. Tubers were desprouted and sprout weight was recorded in undisturbed separate lots at each observation.

Three methods of storage, viz., ECS, pit and heap storage, allowed the daily range of variation in temperatures to be reduced while maintaining a high relative humidity (RH) compared to ambient. The mean minimum-maximum temperatures during March to June ranged between 10-31°C, 15-29°C and 14-31°C in ECS, pit and heap, respectively as compared to 16-38°C in the RT (Figure 1). Relative

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**Fig. 1. Temperature and relative humidity under different storage conditions during March-June**
humidity under the three storage conditions remained consistently high (71-95%, 76-95% and 67-93%, respectively) compared to wide variation and lower levels of 25-79% in the RT (Figure 1).

Sprouting of tubers started after 2 weeks of storage, which was recorded earliest in cv. Kufri Sutlej. Potatoes stored during 2001 storage season sprouted 15 days earlier under the same storage conditions than those stored in 2002 data not included). On average, 20 and 84% of tubers were found to sprout on 30 and 60 days of storage during 2002 as compared to 80 and 98% during 2001. The sprout weight of tubers was also comparatively less during 2002 on respective dates. Mean sprout weight of 0.46, 1.51 and 4.07% was recorded during 2002 as compared to 0.82, 2.29 and 4.67% during 2001 after 60, 90 and 120 days of storage, respectively (Figure 2). The differences in the extent of sprouting and sprout growth may be due to differences in environmental factors during the two growing seasons (6). Cv. Kufri Sutlej showed higher sprout weight during storage under all conditions as compared to the other cultivars (Figure 2).

Physiological weight loss increased progressively during storage under all storage conditions. Mean PLW increased from 1.8% at 30 days to 18.1% at 120 days of storage (Figure 3), a progression in accordance with earlier findings (14). Weight loss was minimum under pit storage throughout the storage period. The mean weight loss values in the pit storage (1.4% at 30 days to 15.0% at 120 days) were similar to ECS storage (Figure 3). The corresponding figures for samples stored for 120 days in heap and at RT were substantially higher at 20.5 and 20.8%, respectively. The higher losses under heap and RT storage may be attributed to relatively low levels of humidity during the storage period. The PLW in excess of 10% reduces the marketability of potatoes because of their shrivelled appearance (2). Loss in weight remained well below this level up to 90 days (May end) in potatoes stored in the pit and ECS of all the cultivars except Kufri Sutlej (Figure 3) and tubers appeared firm. Weight loss in the four cultivars stored in heaps and RT remained low (<10%).
up to 75 days only. However, in large scale trials where stored potatoes remained undisturbed under humid and cool environment throughout the storage period, the losses have been reported to remain low (below 10% at 90 days) in cv. Kufri Chandramukhi and Kufri Bahar under heap storage also (7, 11). Within the cultivars, Kufri Sutlej recorded maximum and Kufri Chandramukhi the minimum weight loss during storage under all the conditions.

No tuber rotting was detected until 90 days of storage in any of the cultivars except...
Kufri Sutlej which recorded 1.3-2.7% rottage under heap and pit storage. Mean rottage was high (1.7-3.8%) at RT and pit storage (1.2-3.3%) after 120 days with highest loss in Kufri Sutlej (1.3-6.7%). Mean total losses were minimum under pit storage (21.7%) and ECS (23.3%) up to 120 days (Figure 4). Total losses under the two conditions remained significantly low (<12%) up to 90 days in all the cultivars except Kufri Sutlej which recorded higher losses (>16%). Early sprouting, higher sprout weight, higher physiological weight loss and rottage in tubers contributed to higher total losses in Kufri Sutlej. Total losses during storage remained minimum in cv. Kufri Chandramukhi.

On the basis of the result obtained, it can be concluded that Kufri Sutlej, a high yielding medium maturing cultivar, is suitable only for quick disposal following harvest because it can not be stored well under ambient temperature conditions. Use of this cultivar for export purpose is risky. Cvs. Kufri Pukhraj, Kufri Ashoka and Kufri Jawahar can be successfully stored in pits and ECS for a period of 90 days i.e. by the end of May and in heaps and RT up to 75 days with acceptable losses and gradually released in the market to avoid distress sale at harvest. Kufri Chandramukhi can be stored for the maximum period up to 105 days (by mid June) in pits and ECS with minimum losses.

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