EFFECT OF EVAPORATIVE COOLING CHAMBER ON STORAGE OF POTATO

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ABSTRACT

Potatoes contain 80% water which results in low shelf life. The quality of potato and its storage life is reduced by the loss of moisture, decay and physiological breakdown. These deteriorations are directly related to storage temperature, relative humidity, air circulation, and gas composition. Bruise prevention, minimum weight loss, and disease prevention during storage are significant. In this study, attempts have been made to find out an affordable and effective storage system of potatoes in rural condition. For getting it, the effectiveness of storage of potatoes in zero energy cool chamber was tested. Minimum storage losses as weight loss, sprout loss, and rot losses have been recorded in case of its storage in zero energy cool chambers as compared to other tested methods.

Key words : Potato, Storage technology, Rottage, Sprouts, Zero energy, Cool chamber.

INTRODUCTION

Potato is the most important food crop in the world after wheat, rice, and maize. Potato ranks fourth in the world and third in India with respect to food production. In India, 73% of potatoes are consumed in different forms such as cooked, roasted, French fried, chipped etc. Potato contains 80% water. The high water content makes handling and storage of potatoes very difficult. It has been estimated that under tropical and sub-tropical countries, losses due to poor handling and storage amount to 40-50%. Therefore, it is of utmost importance to minimize storage losses. Unlike in temperate regions, in India the potato is harvested in the beginning of summer. Due to inadequate cold storage facilities to hold the produce for longer periods, prices plunge at harvest time and larger quantities are spoiled before they could be disposed of. Good storage can merely limit storage losses in good product over relatively long periods of storage. Storage losses are often specified as weight losses and losses in the quality of potatoes, although the two can not always be distinguished. Storage losses are mainly caused by the processes like respiration, sprouting, evaporation of water from the tubers, spread of diseases, changes in the chemical composition and physical properties of the tuber, and damage by extreme temperatures. These processes are influenced by storage conditions and therefore can be limited by maintaining favourable conditions in the store. Good storage should prevent excessive loss of moisture, development of rots, and excessive sprout growth. It should also prevent accumulation of high concentration of sugars in potatoes, which result in dark coloured processed products. Temperature, humidity, CO2, and air movement are the most important factors during storage (Harbenburg et al, 1986 and Maldegm, 1999).
Though refrigerated storage is the best option for long term storage needs, considering the rising cost of construction, equipment and energy required for additional refrigerated storage capacity, alternate storage methods should be considered for meeting short term storage requirements. Further, seasonal production pattern, limited alternate market outlets and high cost of cold storage often results in gluts and consequent reduction in the price of potato during harvesting period. Potato prices rise rapidly in April – May and are almost double in July – August. Therefore, holding the produce for 3-4 months and then selling in market is advantageous. So this study was done to test the efficiency of a non-refrigerated cooling system i.e. zero energy cool chamber in hot summer conditions.

**MATERIAL AND METHOD**

An on farm trial (OFT) with three treatments and ten replications was conducted in 2008 at Gesway village of Burmu Block under Divyayan Krishi Vigyan Kendra, Ram Krishna Mission Ashrama Ranchi, Jharkhand. The maximum and minimum temperature ranged from 37.2 °C to 20.6 °C and 22.9 °C to 10.3 °C and 654 m. above sea level. The treatments imposed were:

**T1** - Farmers Practice (Storage of Potatoes in heaps)

**T2** - Storage of Potatoes in Bamboo iceless refrigerator Bamboo iceless refrigerator is a bamboo basket stitched with a gunny bag which was always kept wet to decrease the temperature of the basket.

**T3** - Storage of Potatoes in Zero energy cool chambers

For this purpose (T3), a zero energy cool chamber 3.5 feet high, double walled made by bricks with a flooring of bricks was also constructed. The gap between two walls of cool chamber was 7.5 cm and this space was filled with river bed sand. The top of the storage space was covered by gunny clothes in a bamboo framed structure.

The study was done with 50 farmers who grew potato in large quantities in Burmu block of Ranchi district. They were previously facing problems in storing potatoes as cold storage is very far from their villages and so a proper storage system for potatoes was required immediately by them which do not require electricity or any other power system.

**RESULTS AND DISCUSSION**

The daily maximum temperature inside the cool chamber was 6-13 °C lower than the outside temperature. Relative humidity inside the cool chamber was high 72-98 % as noted during the study.

Potatoes were stored for 90 days as per three treatments stated above and different types of losses in potatoes stored were noted. There was weight loss, sprout loss and rottage seen in potatoes in every treatment. The mean data in percentage were calculated and were as following:

<table>
<thead>
<tr>
<th>Storage</th>
<th>Weight loss (%)</th>
<th>Sprout loss (%)</th>
<th>Rottage (%)</th>
<th>Total loss (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1- Heaps</td>
<td>8.30</td>
<td>1.85</td>
<td>5.30</td>
<td>15.45</td>
</tr>
<tr>
<td>T2- Bamboo bins</td>
<td>7.58</td>
<td>1.20</td>
<td>4.80</td>
<td>13.58</td>
</tr>
<tr>
<td></td>
<td>covered with wet gunny bags</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T3- Zero energy</td>
<td>5.50</td>
<td>1.00</td>
<td>3.50</td>
<td>10.00</td>
</tr>
<tr>
<td>cool chamber</td>
<td></td>
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</tr>
</tbody>
</table>

During the storage period, the total ambient temperature was 36.8 °C and the decrease in temperature in heaps, bamboo bins and zero energy cool chambers were 7, 9.6 And 10.7 °C respectively. The relative humidity was also recorded as 50.2%, 61%, 86% in heaps, bamboo bins and zero energy cool chambers, respectively.

The data reflects that the decrease in temperature and increase in relative humidity extends the shelf life of potatoes and decrease the percentage of losses.

Bamboo iceless refrigerator (bamboo bins covered with wet gunny bags) is also useful for farmers as it decreases the percentage loss of potatoes
during storage by 1.87% and also is less expensive and easy to build.

Zero energy cool chambers reduce the losses of potatoes during storage by 5.45% which can contribute much to the farmer’s income. It is easy to build up and no energy is required to run it.

CONCLUSION

Following recommendations may be followed for better management of potato storage:

- The ideal atmosphere for optimum storage conditions should be maintained for proper storage of potatoes and reduce the losses during storage.
- Since cool chambers are easy to build up and no energy is required to run it, it is most suitable for small and marginal farmers.
- Zero energy cool chambers are also best used for keeping tubers for few weeks before they are transferred to cold storage chambers to avoid quick loading and overloading of storage chambers.

REFERENCES
