

A study on shelf life of tomato, grape and milk under evaporative cool chamber and other storage conditions

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ABSTRACT

An evaporative cool chamber was designed and constructed by using soil and river bed sand and named as **Janta** cool chamber (J.C.C.). A comparative study was made to determine shelf-life of tomato, grapes and milk inside the cool chamber along with refrigerator, polyethylene bags, muslin cloth and in the ambient condition and their shelf-life was determined. The **Janta** cool chamber (J.C.C.) does not require any mechanical or electrical energy input and can be constructed with locally available materials and built by unskilled labourers. It is economical, eco-friendly and can store the tomato, grapes and milk for longer period with no significant loss.

INTRODUCTION

Preservation of food is a primitive invention of man during abundant availability of perishable eatable and lesser requirement, man's effort have been directed towards storage of foods. India is a second largest producer of fruits and vegetables after Brazil and China, respectively. It produces about 33 million tonnes of fruits and vegetables annually but it wastes about 30 per cent worth Rs. 28810 crore annually, which is more than what UK consumes in a year (India today, 1999), owing to lack of information on appropriate post harvest treatments and proper on-farm storage facilities, it is estimated that about 20-30 per cent of total fruits are lost after harvesting (Kadar, 1987).

Fruits and vegetables are living entities, respiring tissues separated from their parent plant to continue to respire after separation. Due to perishable nature, they deteriorate their freshness and taste after harvest. Keeping produces at their lowest safe temperature (0°C for temperature crops or 10-12°C for chilling sensitive crops) will increase storage life by

lowering respiration rate, decreasing sensitivity to ethylene gas and reducing water loss. Reducing the rate of water loss, slows the rate of shrivelling and wilting cause serious post-harvest losses. Maintenance of air conditioned structures/appliances in villages is not possible for farmers due to high energy consumption and irregular supply of electricity. Therefore, the cold storage facilities, mainly confined to rural areas only, are not so popular among the farmers.

Evaporative cooling has been found to be an efficient and economical means for reducing temperature and increasing humidity is comparatively low. Thompson and Kasmire (1981) developed an evaporative cooler for vegetable crops. Vakis (1981) has also developed a cheap cool store in Kenya, with the help of local grass for the storage of vegetables. He kept the roof and walls wet by dripping water from the top of the roof. Roy and Khurdia (1986) constructed an evaporative cooled structure for storage of the fruits and vegetables with a double wall made of baked bricks and the top of the storage space covered with khas-khas/gunny cloth in a bamboo framed structure. Mordi and Olorunda (2003) reported storage life of

unpacked fresh tomatoes in evaporative cooler environment as 11 days from the 4 days storage life under ambient conditions while in combination with sealed but perforated polyethylene bags, it was 18 days and 13 days, respectively.

In the present study a **Janta** cool chamber was made to store the horticultural produces for a short period. The principle of working of this cool chamber is based on the technique of evaporative cooling. This maintains low temperature and elevated humidity in the inner space compared to the outer surrounding. This evaporative cool chamber fulfils all these requirements and is helpful to small farmers and people at household level in rural areas.

METHODS

The present study was conducted at Department of Family Resource Management, Halina School of Home Science Sam Higginbottom Institute of Agriculture, Technology and Sciences (Deemed to be University), Allahabad, U.P., India, during April 2008 to Sept. 2008.

The following perishable items were studied:

- Tomato, variety – Pusa Ruby, procured from I.V.R.I., Varanasi under the supervision of horticultural specialist.
- Grapes, variety – Anab-e-sahi, procured by approaching, Department of Horticulture, N.D. Agricultural University, Kumarganj, Faizabad under the supervision of horticultural expert.
- Cow milk, procured from the milk man.

Selected storage materials :

- Open baskets (diameter-13cm)
- Refrigerator (capacity 15 l)
- Polyethylene bags (250gauge, length-28 cm, width-17cm)
- Muslin cloth bags (poplin material,length-51cm, width-35cm)
- Janta cool chamber (JCC) (length 94.5 cms, width 63 cms and height 26 cms)

Janta cool chamber (J.C.C.) : It was made of entirely from the sand, red and black soil in 3:2:1 and the designed model named as **Janta** cool chamber. It is an earthen structure in a shape of a box which has been divided into three parts: (i) One outer box (ii) Trays three in no. and (iii) Three lids for each tray. The size of **Janta** cool chamber is 94.5x63cm, height is 26cm and capacity to store 12 kg of fruit.

The amount of study items used:

- 500 g of tomatoes for each storage condition
- 500 g of grapes for each storage condition
- 500 ml of milk for each storage condition

Steps followed for the storage of tomato, grape and milk during the experiment:

- The trays were placed in JCC keeping 6 cms gap between the trays. The gap was filled with coarse sand followed by moistening it. Study items were kept in trays for storage study.
- After keeping the items (tomato, milk, grapes), the chamber was covered by lid. In the lid seven holes were maintained for exchange of gases.
- The JCC was placed on a steel frame which intern supported by flat rod placed 20 cms apart.
- Daily watering was done in the sand to maintain the humidity under the chambers.
- A set of study items were kept in refrigerator, open basket, polyethylene bag and muslin cloth bag and placed in verandah to study the shelf-life.
- Observations were recorded on every third day (1st day-3rd day-5th day). The study was continued up to 76 days (two months, 16 days).
- Turning of fruits was undertaken at every alternate day.

OBSERVATIONS AND ANALYSIS

A comparative study was made on the shelf life of tomato, grapes and milk. Remarkable increase in shelf-life of the produce kept in different storage conditions was observed in Janta cool Chamber as compared to other storage structures. This change is due to lower temperature inside the chamber.

Data regarding shelf-life of tomato and grapes are presented in Table 1 and illustrated with Fig. 1. The shelf-life of

Table 1 : Shelf life of tomatoes and grapes during storage period

Treatments details	Days	
	Tomato	Grape
Open basket (T ₁)	7.00	4.00
Muslin cloth bag (T ₂)	7.00	4.00
Refrigerator (T ₃)	14.00	19.00
Polyethylene bag (T ₄)	49.00	4.00
Janta cool chamber (T ₅)	76.00	10.00

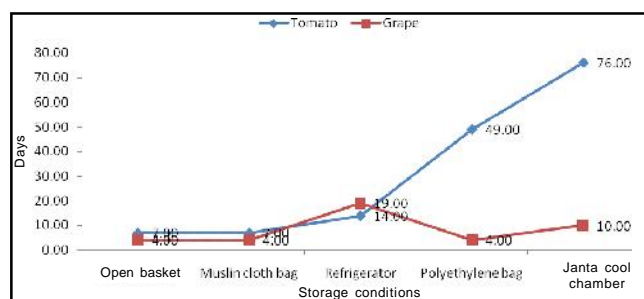


Fig. 1 : Shelf-life of tomatoes and grapes during the storage period

tomato and grapes was influenced by different storage structures, in which Janta cool chamber recorded significantly superior over other treatments, while shelf-life of grapes recorded significantly superior in refrigerator followed by Janta cool chamber (Table 1).

Data regarding shelf-life of milk are presented in Table 2 and illustrated in Fig. 2. The results indicated that shelf-life of milk was influenced by different storage structures used in the study.

Treatments details	Hours
	Shelf-life (Hours)
Open basket (T ₁)	5.00
Muslin cloth bag (T ₂)	5.00
Refrigerator (T ₃)	60.00
Polyethylene bag (T ₄)	4.00
Janta cool chamber (T ₅)	32.00

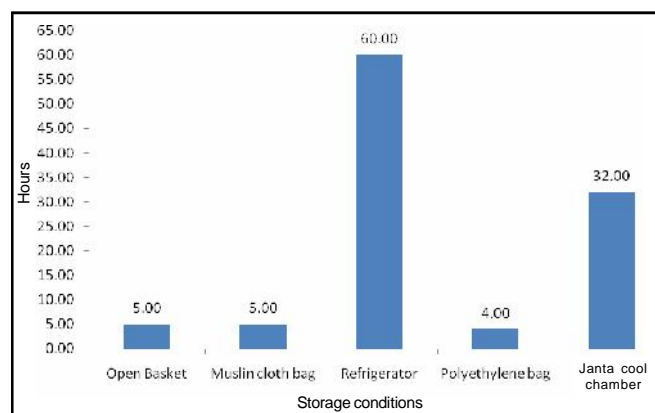


Fig. 2 : Shelf-life of milk during storage period

Shelf-life of tomato and grapes during storage period:

It is very clear from Table 1 that during the experimentation, the shelf-life of tomato was recorded seven days in open basket and muslin cloth bag, while, 14 days in refrigerator, 49 days in polyethylene bag and 76 days in Janta cool chamber. For the shelf-life of grapes, it is evident from Table 1 that refrigerator recorded 19 days which was followed by Janta cool chamber (10 days). Whereas, polyethylene bag, open basket and muslin cloth bag recorded 4 days each. Similar findings were recorded by Dadhich *et al.* (2008). A comparative study by storing tomato and grapes in evaporative cool chamber and at ambient temperature, the result was recorded that fruits and vegetable were fresh up to 3-5 days more inside the chamber than outside. Awasthi (2009) reported that tomato, brinjal, chillies and bottle gourd stored in zero energy cool chamber remained fresh up to 24 – 40 hours even if at high temperature (40 – 42°C).

Babitha (2006) reported that the shelf-life of tomato fruits was extended by 2 weeks in modified atmosphere packages. This is attributed to delay in the ripening of fruits due to the retardation of various physico-chemical changes accompanying ripening and maintenance of quality over the storage period. Extension of shelf-life by modified atmosphere packaging have also been observed by many workers *viz.*, Hong and Gross (2001) and Tasdelen and Bayindirli (1998) in tomato and Lizana and Ochagavia (1997) in mangoes.

Shelf-life of milk during storage period:

It is very clear from Table 2 that the shelf-life of milk was recorded same (- 5 h) in open basket and muslin cloth bag both, followed by four hours in polyethylene bag. Whereas in refrigerator, stored milk shelf-life was recorded 60 h followed by Janta cool chamber (32 h). Awasthi (2009) reported that milk stored in zero energy cool chamber remained fresh up to 24 – 36 hours even at high temperature (40 – 42°C). According to FAO (1997) report, the dairy fresh milk shelf-life in refrigerator (below 5°C) was recorded 2 weeks.

Summar and conclusion:

- The shelf-life of tomato was recorded best (76 days) in Janta cool chamber followed by (49 days) in polyethylene bag followed by refrigerator, muslin cloth bag and open basket during the experimentation.
- The shelf-life of grapes was recorded best (19 days) in refrigerator followed by Janta cool chamber (10 days), muslin cloth bag, open basket and polyethylene bag during the experimentation.
- The shelf-life of milk was recorded best (60 hours) in refrigerator followed by Janta cool chamber (32 hours), muslin cloth bag, open basket and polyethylene bag during the experimentation.

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