J. Indian Inst. Sci., May–Aug. 2004, **84**, 107–111
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Short Communication

Effect of water on the shelf-life of brinjal in zero-energy cool chamber

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Received on March 15, 2004; Revised on August 16, 2004.

Abstract

In the present study, brinjal or eggplant (cv. Pattabiram) was stored in cool chamber at room temperature. Three different levels of water (100, 75 and 50 litres per day) were drip-irrigated to moisten the sand in the cool chamber. The physiological loss in weight and rotting percentage increased at room temperature, but decreased with increasing water level up to 100 litres per day. The shelf-life at room temperature which was hardly three days enhanced to nine days with the addition of 100 litres of water per day.

Keywords: Cool chamber, vegetable storage, brinjal or egg plant, shelf-life.

1. Introduction

Brinjal or egg plant (*Solanum melongena*), one of the important vegetable crops belonging to the family Solanacea, is grown commercially under arid and semi-arid climatic conditions. The consumer preference greatly varies based on colour, size and shape. Tamil Nadu is a major brinjal-producing state in India. A large quantity of fresh brinjal gets wasted after harvest due to inadequate storage facilities. Zero-energy cool chamber developed at the Indian Agricultural Research Institute (IARI), New Delhi, India [1], could help store the harvested fruits and vegetables for a reasonable time [2–6]. Water plays a vital role in regulating relative humidity (RH) and temperature, which are important factors in the cool chamber. Too moist or too dry cool chamber will lead to unwanted growth of fungus and spoil the stored fruits. Since the moisture content in the cool chamber is regulated by the quantity of water added to the sand, it is necessary to find the optimum quantity of water to be added for effective performance of the cool chamber. Till now no such work has been reported in the literature. In order to standardize the quantity of water to be added per day, the present study was taken up with the objective of retaining the quality and extending the shelf-life of brinjal in the zero-energy cool chamber.

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Table I
Effect of water level on the shelf-life of brinjal stored in the cool chamber and at room temperature

Treatments	Shelf-life (days)	
	I Experiment	II Experiment
T1 (100 l/day)	8.80	9.40
T2 (75 l/day)	7.60	8.20
T3 (50 l/day)	7.00	7.20
T4 (Room temperature)	3.20	2.60
Critical Difference (CD) at 5%	1.10	0.82

2. Materials and methods

The experiment was carried out at the JRD Tata Ecotechnology Center of M.S. Swaminathan Research Foundation, Chennai. Freshly harvested brinjals (cv. Pattabiram) were obtained from farmer's field located in Thiruthaveli village near Kattupakkam in Kattangulathur block of Kancheepuram district in Tamil Nadu, India, which is 45 km away from the experimental site. They were brought to Chennai within two hours of harvest, and sorted out for elimination of bruised, punctured and damaged ones during transport. Soon after sorting, the vegetable was stored using perforated plastic crates in cool chamber and at room temperature conditions. The experiment was conducted in April 2003 and was repeated in May 2003. The trial was laid out in a complete randomized block design with five replications. The treatments consisted of three levels of water after saturating the bricks and sand with water. These were: T_1, 100 liters per day, T_2, 75 liters per day and T_3, 50 liters per day and T_4, was storage in the open at room temperature. A rectangle shape floor measuring 165×115 cm was made with bricks. Over this, a double wall was erected to a height of 67.5 cm leaving a gap of 7.5 cm between the double walls. The walls were drenched with water. Wet fine river sand was filled in the 7.5 cm gap between walls. A bamboo frame (165×115 cm) was made to cover the chamber. A thatched shed was constructed over the chamber in order to protect it from direct sun or rain. During the experimental period, the sand between the walls, bricks and top cover of the chamber was kept moist with varied quantities of water as per the treatments through drip system with plastic pipes and micro tubes connected to an overhead water source. The construction of zero-energy cool chamber was followed as per ICAR [7]. The stored vegetable was evaluated every two days till they rotted completely. Observations on physiological loss in weight (PLW) (%), rotting (%) and shelf-life were recorded. The PLW was determined by noting the difference between the initial and subsequent weights and was expressed in terms of percentage. The rotting percentage was determined after weighing the infected vegetable. The shelf-life of the vegetable was determined by judging the unmarketability parameters such as shriveling which was mainly due to physiological loss in weight. Ten per cent loss in weight was considered as an index of end of shelf-life of the vegetable. The data were analyzed statistically [8]. Temperature and relative humidity were also recorded at 2.00 pm every day using dry and wet bulb thermometer.

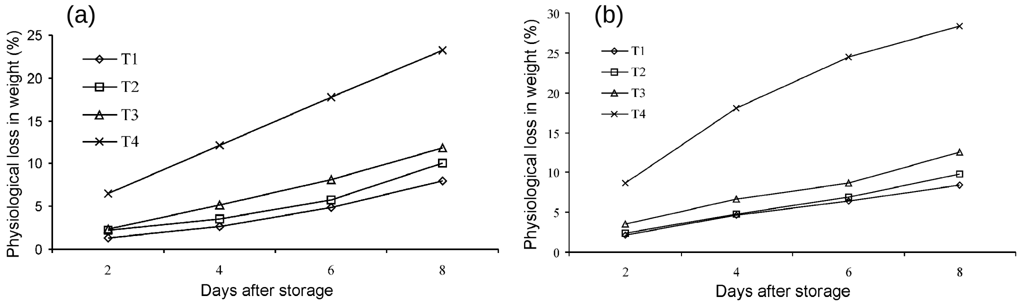

FIG. 1. Effect of water level on physiological loss in weight of brinjals stored in the cool chamber and at room temperature in the (a) first and (b) second experiments.

3. Results and discussion

The analysis of variance for the data on shelf-life (days) (Table I) showed highly significant differences among the treatments. The shelf-life of brinjal increased with increase in the addition of water up to 100 l/day. The vegetable was stored better in the cool chamber than at room temperature. At room temperature, the shelf-life was only up to three days, whereas in the cool chamber, it extended up to 9 days with the addition of 100 l/day. Brinjals stored in the cool chamber had good acceptance in the market at the end of storage. They were fresh, firm and attractive even at the end of 9 days compared to those stored at room temperature. Several workers [2–6, 9] reported that the cool chamber-stored fruits and vegetables look and taste better than the ones stored at room temperature.

Highly significant differences were recorded in the PLW in both the experiments. There was a sharp increase in the PLW of vegetable stored at room temperature (Fig. 1), whereas it was low in the vegetable stored in the cool chamber. The 100 l/day treatment followed by 75 and 50 l/day showed low increase in PLW. This might be due to optimum moisture content in the sand, which kept the fairly high RH and reduced the temperature prevailing inside the cool chamber as compared to room temperature.

The analysis of variance of data for rotting (%) showed highly significant variation among the treatments. The lowest rotting (%) was in the vegetable with the addition of 100 l/day

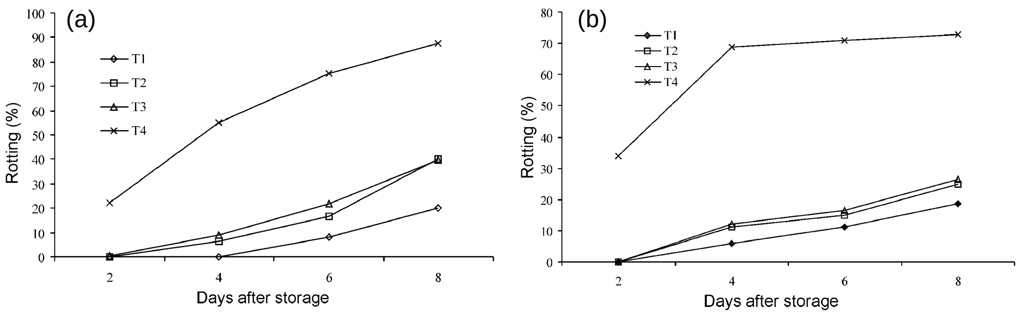

FIG. 2. Effect of water level on rotting (%) of brinjals stored in the cool chamber and at room temperature in the (a) first and (b) second experiments.

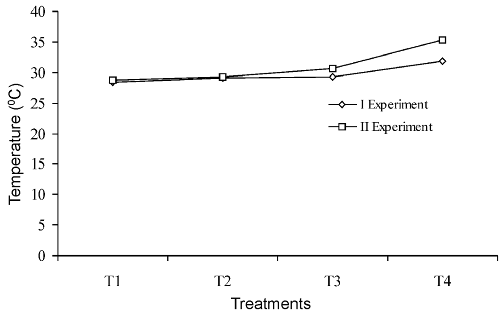

FIG. 3. Average temperature at 2.00 pm in the cool chamber and at room temperature.

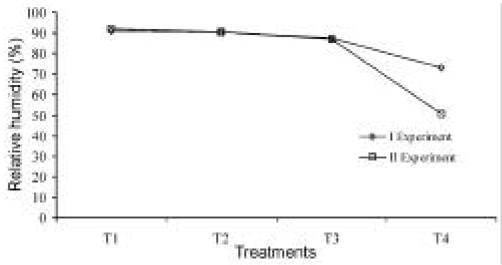

FIG. 4. Average relative humidity(%) in the cool chamber and at room temperature.

followed by 75 l and 50 l/day in that order (Fig. 2). No rotting was observed up to 4th day of storage with 100 l/day. At the end of the shelf-life, highest rotting was noticed among those stored at room temperature.

Data on the average temperature and relative humidity measured by dry and wet bulb at 2.00 pm daily in cool chamber are shown in Figs 3 and 4. The cool-chamber treatments recorded relatively lower temperature than the room temperature. A difference of 2–3°C between cool chamber and room temperature condition was observed during the first experiment, whereas it was 5–6°C in the second experiment. Lower temperature in the cool chamber is due to moisture in the sand caused by evaporative cooling method. Relative humidity was always higher in the cool chamber than in the open at room temperature. Lower temperature and higher relative humidity in cool chamber contributed to improved shelf-life. All the three water-level treatments recorded better results than storage at room temperature. Roy [10] constructed similar commercial-size cool chamber at the Indian Agricultural Research Institute, New Delhi, and found lower temperature and higher relative humidity (85–90%) inside the cool chamber.

A 100-kg-capacity cool chamber costs about Rs 2500.00 ($ 50–55) (Table II) and small farmers can easily construct it near their field and store the vegetable before dispatch to the market at an opportune time. The farmers thus can avoid distress sale. This will help the consumer to obtain the vegetable at a relatively stable price over a long period of time.

Table II
Cost of construction of cool chamber (100 kg capacity)

Items	Cost (in Indian rupees)
Bricks (400 Nos)	800.00
Sand	100.00
Bamboo, paddy straw for top cover	250.00
Thatched shed	500.00
Water tank, pipes, tubes, etc.	600.00
Labour	250.00
Total	2500.00 (about US$ 50–55)

4. Conclusion

This study shows that the shelf-life of brinjal could be extended up to 9 days in the cool chamber with the addition of 100 litres of water per day. The added advantage of the cool chamber is that it does not require any mechanical or electrical energy and is easily installable with cheap and locally available raw materials.

Acknowledgement

The authors gratefully acknowledge the assistance provided by Volkart, Stifftung, Switzerland, and JRD Tata Ecotechnology Centre in conducting the study and Dr S. P. Palaniappan for his valuable suggestions and for correcting the manuscript.

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