

Extension of Shelf-Life of Cucumber Fruit CV. '22414' using A Cold Storage

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Abstract: Uniform and healthy cucumber fruit of cv. '22414' were studied to extend their shelf life using a cold storage unit i.e. Ecofrost, during 8th to 27th February, 2017. The aim of the study was to determine the effectiveness of cold storage on the post-harvest management of cucumbers and their post-storage shelf-life at room temperature after being held inside cold storage at 10°C and 93% RH. The results showed that cucumbers kept in cold storage recorded better retention of fruit quality. Firmness was recorded to be very good from 9th to 15th February; good from 15th to 16th February; medium on 18th February; low from 19th to 21st February and very low from 22nd to 27th February, respectively, after the fruits were taken out of cold storage and kept at room conditions. Chilling injury symptoms were not observed inside cold storage. Shrivelling percentage was delayed in fruit taken out early from Ecofrost. Appearance was found to be better in fruit taken out early as compared to those taken out later. Average post-storage shelf-life was observed to be 4.1 days for the first five days, 3.3 days for the next five days and 1.67 days for the next 3 days at room temperature.

Keywords: Cucumber, Cold, storage, shelf and edible

1. Introduction

Cucumber (*Cucumis sativus* L.) is a widely cultivated plant in the gourd family Cucurbitaceae. It is a creeping vine that bears cucumiform fruits used as vegetable. There are three main varieties of cucumber: *slicing*, *pickling* and *seedless*. The cucumber is originally from South Asia, but now grows on most continents. Many different types of cucumber are traded on the global market. The cucumber originated in India, where a great many varieties have been observed from *Cucumis hystrix*[1].

Cucumbers are sensitive to temperatures below 50°F. Cucumbers in raw form are best, when they are crispy and fresh. When cucumber fruit stored below 50°F, they are prone to developing "chilling injuries," including water-soaked areas, pitting, and accelerated decay.

2. Materials and Methods

The study was carried out in the Agricultural Research Laboratory of Ecofrost Technologies Pvt. Ltd. Tathawade, Pune (MH), India, from 8th to 27th February, 2017. Cucumber fruit cv. '22414' were harvested at tender stage on the morning of 8th February, 2017. Fruits of cultivar were selected for their uniform size, colour and quality. Shelf-life (days) was recorded by the number of days held in normal room storage and also shelf-life was recorded by the number of days held inside cold storage conditions between the time of harvest and the end of edibility [2]. Also, post-storage shelf-life at room temperature was recorded every day when taking the fruit out from cold storage. Cucumbers were subjected to cold storage treatment at 10°C and 93% relative humidity and control treatment at room temperature with ambient relative humidity.

Treatment-wise data was collected, and average mean values are taken for further investigation. Every day five fruit were taken out of cold storage and kept at room temperature to measure the post-storage shelf-life and shrivelling

percentage. Data for post-storage shelf-life (days), chilling injury symptoms, appearance, firmness and shrivelling start on days at normal room conditions was observed and studied from 8th to 27th February, 2017.

3. Results and Discussion

The results showed that the cucumber fruit cv. '22414' kept inside cold storage at 10°C and 93% relative humidity recorded better quality. Firmness (Table 1) was recorded to be optimum up to 10 days when taken out of cold storage and kept at normal room conditions. The firmness was recorded by hand press basis, to be very good from 9th to 15th February; good from 15th to 16th February; medium from 16th to 18th February; low from 19th to 21st February and very low from 22nd to 27th February, respectively. Chilling injury symptoms were not observed during experimental periods. Shrivelling was delayed in fruit taken out early from cold room. The appearance of fruit (Table 1) was found to be better when taken out early as compared to those taken out later. Appearance on visual basis was recorded to be very good, good, slightly good, bad, very bad for fruit taken out of cold room and kept at room temperature from 9th to 16th February, 17th to 19th February, 20th to 21st February, 22nd to 24th February and 25th to 27th February 2017, respectively. Post-storage shelf-life at room temperature, when fruits were taken out of cold room at different times; recorded to be 4.5 days from 9th to 10th February; 4 days from 11th to 12th February; 3.5 days from 13th to 16th February; 3 days for 17th to 18th February; 2.5 days for 19th February, 1.5 days for 20th February; 1 day for 21st February and 0 day(s) for 22nd to 27th February 2017. Temperature was the major factor in determining the post-harvest performance of cucumber cv. '22414'. In this case, the Ecofrost helps to maintain relative humidity and reduce vapour pressure deficit and transpiration. This could be attributed to the slowdown of physiological processes such as respiration and transpiration that occur at low temperatures [3]. Wide fluctuations in temperature at ambient conditions increased rate of water loss from

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cucumber possibly by increasing vapour pressure deficit between the tissue and the surrounding air leading to enhancement of transpiration [4]. In addition, high temperatures at ambient conditions increased the rate of respiration and other metabolic processes that caused depletion of substrates like sugars and proteins resulting into further weight loss[5]. As water lost from the tissue, turgor pressure decreases, and the cell begins to shrink and collapse, thus leading to loss of freshness. Higher loss in green colour at ambient temperatures may be caused by increased breakdown of chlorophyll and synthesis of β -carotene and lycopene pigments, which occur during ripening process [6]. Lowering the temperature of cucumber lowers their rate of ripening and deterioration [3]. The low temperature induces a change in the physical properties of cell membrane due to changes in the physical state of membrane lipids. However too much lowering of temperature leads to chilling injury which causes the release of metabolites such as amino acids, sugars and mineral salts from cells that together with the degradation of the cell structure provide an excellent substrate for the growth of pathogenic organisms, especially fungi[7].

4. Conclusion

The shelf life of cucumber fruit cv. '22414' can be extended up to 13 days using cold storage at 10°C and high (93%) relative humidity. Post-storage shelf-life of cucumber, when kept in normal room conditions was recorded to decrease with increasing storage-life.

5. Future Scope

The shelf life and post storage life of cucumber fruit cv. '22414' can be extended by using cold storage.

6. Acknowledgements

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Table 1: Post-storage shelf-life (days), Firmness, Appearance and shrivelling at room temperature, after cucumber fruit cv. '22414' taken out of cold storage.

On days fruit were taken out of cold storage (n=5)	Post-storage shelf-life (Days)	Firmness	Appearance	Shrivelling starts on days
8 th Feb, 2017 (Fresh fruit)	3.0	VG	VG	4.0
9 th Feb, 2017	4.5	VG	VG	6.0
10 th Feb, 2017	4.5	VG	VG	6.0
11 th Feb, 2017	4.0	VG	VG	5.5
12 th Feb, 2017	4.0	VG	VG	5.0
13 th Feb, 2017	3.5	VG	VG	5.0
14 th Feb, 2017	3.5	VG	VG	4.5
15 th Feb, 2017	3.5	VG	VG	4.5
16 th Feb, 2017	3.5	G	VG	4.5
17 th Feb, 2017	3.0	G	G	4.0
18 th Feb, 2017	3.0	M	G	4.0
19 th Feb, 2017	2.5	L	G	3.5
20 th Feb, 2017	1.5	L	SG	2.5
21 st Feb, 2017	1.0	L	SG	1.5
22 nd Feb, 2017	0.0	VL	B	0.0
23 rd Feb, 2017	0.0	VL	B	0.0
24 th Feb, 2017	0.0	VL	B	0.0
25 th Feb, 2017	0.0	VL	VB	0.0
26 th Feb, 2017	0.0	VL	VB	0.0
27 th Feb, 2017	0.0	VL	VB	0.0

Note:
1. Firmness: VG- Very Good, G-Good, M- Medium, L-Low, VL- Very Low.
2. Appearance: VG- Very Good, G-Good, SG- Slight Good, B-Bad, VB-Very Bad