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Original Research Article

Extension of Storage and Post-Storage Shelf-Life of Fig Fruit

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ABSTRACT

Uniform and healthy Fig fruit were kept inside cold room conditions and at normal room conditions (RT) and subsequent weight loss, total soluble solids (TSS), cracking of fruit (percentage), fermentation of fruit (percentage), post-storage shelf life and shelf life were measured. The fruit were collected in the morning session from Fruit Market, Pune, Maharashtra, India and then transported to the 'Agricultural Research Laboratory' of Ecofrost Technologies Pvt. Ltd., within 2.0 hours in an air-conditioned cab. Selected fruit of Fig were kept inside cold storage at 4°C and 93% relative humidity (RH) conditions to maintain the TSS, weight loss reduction, increase the post-storage shelf-life and pre-cooled shelf-life. The results show that keeping the fruit at 4°C and 93% RH, recorded better retention of TSS, and weight-loss reduction than normal room conditions.

Keywords: Fig, Cold Room, Storage and Post-storage.

INTRODUCTION

'Anjeer' or Fig is a delicious fruit; Pune district of Maharashtra has 900 hectares of land under fig cultivation (http://www.walkthroughindia.com/offbeat/famous-fruit-capitals-india/). The fig tree (*Ficus carica*) is a member of the mulberry family, usually found in Asia. Fig in dried form is available almost everywhere, all year round. The health benefits of figs include its use in the treatment of sexual dysfunction, constipation, indigestion, piles, diabetes, cough, bronchitis, and asthma. It is also used as a quick and healthy way to gain weight after suffering from an illness. The health benefits of figs come from the presence of minerals, vitamins, and fibre contained in the fruit. They contain a wealth of beneficial nutrients, including vitamin A, vitamin B1, vitamin B2, calcium, iron, phosphorus, manganese, sodium, potassium, and chlorine. Fig is a moderately important crop with an annual estimated global production of one million tons of fruit of which about 30% is produced by Turkey. The other major producers are Egypt, Morocco, Greece, California, Italy, Algeria, Syria and Tunisia. In India, fig is a minor fruit crop and the commercial cultivation of common (edible) fig is mostly confined to Western Parts of Maharashtra, Gujarat, Uttar Pradesh (Lucknow & Saharanpur) Karnataka (Bellary, Chitradurga & Srirangapatna) and Tamilnadu (Coimbatore).

In India, 'Poona' is the most popular cultivar grown for consumption as fresh fruit. Most of fig cultivars grown in Mangalore, Bellary, Coimbatore, Daulatabad, Ganjam, Lucknow and Saharanpur resemble Poona Fig in plant and fruit morphology. Recently, a variety called 'Dinkar'- an improvement on 'Daulatabad' variety for yield and fruit quality - is gaining

commercial importance. Some hybrids from California have reportedly performed better than 'Poona' Fig in Mangalore.

Fresh figs are highly perishable. Slightly immature fruits are to be harvested for transporting to distant markets. Ripe fruits are picked either from the tree by twisting the neck at the stem end or cutting it, or are gathered after they drop. Yield ranges from 180 to 360 fruits per tree. The harvesting season starts in February - March and is over by May - June. The fruits are harvested in 2-3 days interval manually. The fruit should be picked when they are soft and wilt at the neck. If the fruits are picked before proper maturity, milky latex exudes.

MATERIALS AND METHODS

Harvested fig fruit were stored at ordinary room conditions and in the cold storage unit (Ecofrost). Fruit samples were taken out of Ecofrost on first, third, fifth, seventh and ninth days and placed at ordinary room conditions for 3 days. The total soluble solid (TSS) contents of fig fruit inside cold storage were investigated. Six fruit were taken out of Ecofrost on first, third, fifth, seventh and ninth days, of which two fruit were used to determine TSS at the end of first, second and third days of being kept at room conditions. Two fruit each were taken out from Ecofrost on first, third, fifth, seventh and ninth days and used to determine weight loss (%) at the end of first, second and third days at room conditions. Ten fruit were kept inside Ecofrost to check the fermentation and cracking percentage. Juices from the samples (5gm sample: 5ml water) were extracted and total soluble solid contents in the juice was analysed at room temperature by Handheld Refractometer method (AOAC 18th Edn. 37.1.15, 932.12).

RESULTS AND DISCUSSION

Table 1: Shelf-life of Fig (*Ficus carica* L.) fruit.

Shelf life (Days)
2.0

Table 2: After Pre-cooling, Post-storage shelf-life of Fig (*Ficus carica* L.) fruit at RT.

Pre-cooledconditions	Shelf life at Room conditions (Days)
4°C+ 93% RH	3.0

Table 3: Storage life of Fig (*Ficus carica* L.) fruit inside cold room conditions.

Stored inside cold room	Storage life (Days)
4°C+ 93% RH	9

Shelf life (Table 1; Figure 1), Pre-cooled shelf life (Table 2) and Storage life (Table 3; Figure 2) were recorded two days, three days and nine days, respectively.

Table 4: Total soluble solid contents changes in Fig (*Ficus carica* L.) fruit inside cold storage and at room conditions (n=2).

TSS (°B)of stored fig fruit inside cold room		TSS (°B)of fig fruit taken out of cold room and kept at RT.		
On day	TSS (°B)	Day- First	Day- Second	Day- Third
Day-1st	13	13	13	14
Day-2nd	13	13	14	14
Day-3rd	13	13	14	14
Day-4th	13	13	13	14
Day-5th	13	13	13	14
Day-6th	13	13	14	14
Day-7th	14	14	14	14
Day-8th	14	14	14	14
Day-9th	14	14	14	14

Total soluble solid contents (Table 4) of fig fruit slightly increased inside cold room as well as outside room conditions.

Table 5: Weight loss of Fig (*Ficus carica* L.) fruit inside cold room (n=10).

Weighing inside cold storage on day	Weight (g)	Weight loss (g)	% Weight balanced	% Weight loss	Weight loss per ton (g)
Day-1	586.78	0.00	100	0.00	0.00
Day-3	584.41	2.37	99.60	0.40	403.90
Day-5	582.28	4.5	99.23	0.77	766.90
Day-7	579.66	7.12	98.79	1.21	1213.40
Day-9	576.31	10.47	98.22	1.78	1784.31

Weight loss (Table 5) was recorded per ton on day 1, day 3, day 5, day 7 and day 9; 00 g, 403.90 g, 766.90 g, 1213.40 g and 1784.31 g, respectively. Likewise, percent weight loss was

recorded 0 %, 0.40 %, 0.77 %, 1.21 % and 1.78 %, respectively. Average weight loss was recorded 198.26 g per ton per day for 9 days storage.

Table 6: Weight loss of Fig (*Ficus carica* L.) fruit at RT, after being taken out from cold room (n=5).

Weighing at room conditions	Fresh weight (g)	Weight on day Second (g)	Weight on day third (g)	Weight loss on day-third (g)	Percentage Weight balanced for 3 days	Percentage Weight loss for 3 days	Weight loss per ton (g)
Day-1	156.56	146.91	139.72	16.84	89.24	10.76	10756.26
Day-3	126.6	116.24	108.32	18.28	85.56	14.44	14439.18
Day-5	107.55	100.89	92.13	15.42	85.66	14.34	14337.52
Day-7	99.87	93.48	81.92	17.95	82.03	17.97	17973.37
Day-9	97.99	91.26	80.15	17.84	81.79	18.21	18205.94

Weight loss (Table 6) was recorded for 3 days at RT when fig fruit were taken out of cold room on the end of first day (10756.26 g/ton), third day (14439.18 g/ton), fifth day (143337.52 g/ton), seventh day (17973.37 g/ton) & ninth day (18205.94 g/ton). In this study, the maximum weight loss was recorded at RT rather than cold storage. Weight loss increased with increasing storage period in both conditions. Minimum weight loss was recorded in fruit taken out of cold storage earlier compared to fruits taken out later. Percent weight loss of fruit was recorded to be 10.76 % for fruits taken out on first day, 14.44 % on third day, 14.34 % on fifth day, 17.97 % on seventh day and 18.21 % on ninth day when kept at room conditions for 3 days.

Table7: Fruit cracking percentage inside cold room (n=10).

Fruit Cracking percentage on Day	Fruit cracking percentage
Day-1st	0
Day-2nd	0
Day-3rd	20
Day-4th	30
Day-5th	30
Day-6th	50
Day-7th	50
Day-8th	50
Day-9th	50

Fruit cracking percentage (Table7) was recorded 0 percentages inside cold room on days first & second. 50 % fruit cracking was recorded on day sixth to ninth. Fruit cracking percentage increased with increasing storage period.

Table 8: Fermented Fig fruit percentage inside cold room (n=10).

Fermented Fig fruit (%) inside c old room on days	Fruit fermentation percentage
Day-1st	0
Day-2nd	0
Day-3rd	0
Day-4th	0
Day-5th	0
Day-6th	0
Day-7th	0
Day-8th	20
Day-9th	50

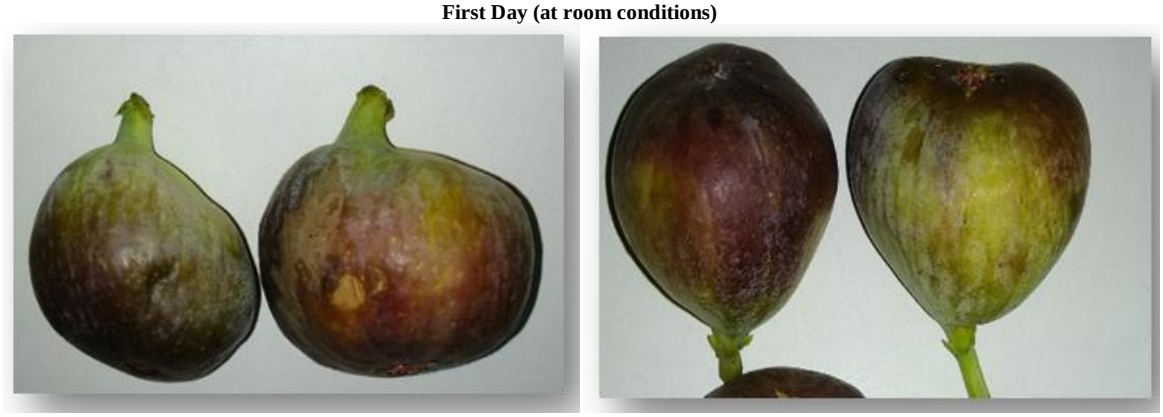
Fruit fermentation percentage (Table 8) was not seen on the first seven days inside cold storage. Fruit fermentation percentage started from day 8 and increased with increasing storage period.

Table 9. On days taken out from Cold Room and placed at room conditions:

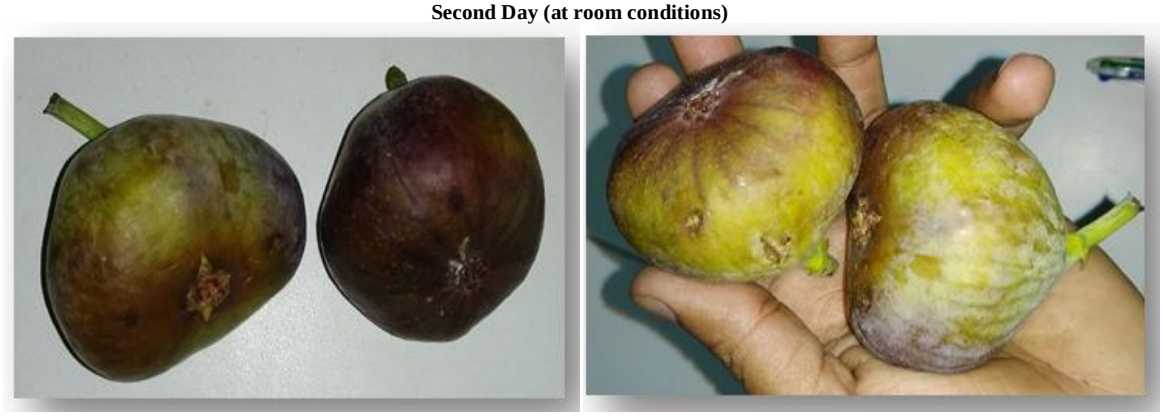
Fruits were taken out of cold room and kept in room conditions	Post-storage shelf-life at Room Conditions (Days)
Day-1st	3.0
Day-3rd	2.5
Day-5th	2.0
Day-7th	1.5
Day-9th	1.0

Post-storage shelf-life (Table 9, Figure 3 to 6) decreased with increasing storage period. Cold storage helped in suppressing enzymatic degradation and respiratory activity (softening), slowing or inhibiting water loss (wilting), slowing or inhibiting growth of decay producing microorganisms (mold and bacteria), reducing production of ethylene (a ripening agent) and/or minimizing the product's reaction to ethylene. In addition to protecting quality, post-harvest cooling provided marketing flexibility by making it possible to market the product at the optimum time.

First Day (at room conditions)



Second Day (at room conditions)



Third Day (at room conditions)

Figure 1. Fresh Fig fruit photos placed at room conditions.

First Day (Fresh fruit)

Second Day (Inside cold room)

Third Day (Inside cold room)

Fourth Day (Inside cold room)

Fifth Day (Inside cold room)

Sixth Day (Inside cold room)

Eighth Day (Inside cold room)

Ninth Day (Inside cold room)

Tenth Day (Inside cold room)

Figure 2. Photos taken inside cold room of Ecofrost:

First Day (at room conditions)

Second Day (at room conditions)

Third Day (at room conditions)

Figure 3. Photos of Fig fruit were taken out of cold room on the end of third day &kept at RT.

First Day (Fresh fruit)

Second Day (at room conditions)

Third Day (at room conditions)

Figure 4. Photos of Fig fruit were taken out of cold room on the end of fifth day and kept at RT.

First Day (at room conditions)

Second Day (at room conditions)

Third Day (at room conditions)

Figure 5. Photos of Fig fruit were taken out of cold room on the end of seventh day and kept at RT.

First Day (at room conditions)

Second Day (at room conditions)

Third Day (at room conditions)

Figure 6. Photos of Fig fruit were taken out of cold room on the end of ninth day and kept at RT.

CONCLUSION

In conclusion, it is observed that Fig-fruit stored at 4°C (50°F) and 93% RH conditions inside cold storage of Ecofrost retained maximum storage life of 6 to 9 days. Post-storage shelf-life was recorded to be 1to 3 days under room conditions. After pre-cooling, shelf life was recorded up to 3 days. The average weight loss was recorded on seventh day of storage as 1.2kg per tonne at 4°C and 93% RH.

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