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Quality Evaluation of Bittergourd Fruits under Cold Storage

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Abstract—*Bittergourd (Momordica charantia L.) is a cucurbitaceous vegetable grown for its immature fruits. It is well known for treating various diseases especially diabetes. Consumption of bittergourd in recent few years has been increased because of its medicinal properties. In our study, bittergourd fruits were harvested from greenhouse and stored for 16 days at 10°C. These fruits were evaluated for different quality parameters like antioxidants capacity, total chlorophyll content, physiological loss in weight and decay percentage. Antioxidant activity was found highest at 16th day of storage while total chlorophyll content was found at lowest level. Physiological loss in weight increases and found maximum at 16th day of storage. Decay percent was highest viz. 85 % on 16th day of storage. These results showed that bittergourd fruits can be stored safely up to 16 days under 10 °C without any quality deterioration.*

Keywords: *Bittergourd, Total Antioxidant content, Total chlorophyll content, Physiological loss in weight.*

Introduction

Bittergourd (Momordica charantia L.) is a cucurbitaceous vine native to tropical Asia, also popular as bitter melon, bitter squash, balsam pear, Karela, African cucumber and bitter cucumber in different parts of the world (Devi et al., 2019). Bitter gourd is well known vegetable for treating various diseases especially diabetes. Consumption of bittergourd has been increased in recent few years because of its medicinal properties. It is a rich source minerals like iron, zinc, phosphorus, sodium, and magnesium (Devi et al., 2019). High moisture content, large surface area to volume ratio, thin cuticle, and corrugated fruit surface limits its shelflife to four days at ambient tropical condition (Preetha et al., 2015). Bittergourd fruits being perishable in nature is highly susceptible to senescence which shows early signs of yellowing, softening and red pigmentation in the arils if stored under tropical ambient condition. Storage at low temperature could be the alternative treatment for shelflife extension of bittergourd (Mohammed and Wickham, 1993). The aim of this experiment was to study the quality aspects and extend the shelflife of bittergourd under cold storage.

Material and methods

Bittergourd (*Momordica charantia* L. var. 'Pusa Rasdar') fruits were harvested from Centre for Protected Cultivation and Technology, Indian Agricultural Research Institute, New Delhi in the year 2018.Harvested fruits were stored in 10 °C for 16 days. Quality evaluation of bittergourd was done during 16 days of storage at four days interval, for that Physiological loss in weight (PLW), decay percent, chlorophyll content, and antioxidant capacity were considered.

Physiological loss in weight (PLW)

The fruits were weighed during storage at regular intervals with the help of an electronic weighing balance. Physiological loss in weight was calculated by using the following formula and data were expressed in percentage.

$$\text{PLW (\%)} = \frac{\text{Initial weight} - \text{Weight after known storage period}}{\text{Initial weight (g)}} \times 100$$

Decay Percent

For measuring decay incidence fruits were kept separately in cold store. Decay incidence data was expressed as the percentage of fruits showing particular signs of some disease or disorders (Sivakumar *et al*., 2007).

Percent DPPH scavenging activity

DPPH inhibition percent was by dissolving 25 mg of 2, 2-diphenyl-1-picrylhydrazyl (DPPH) in 100 ml of methanol to obtain absorbance of 0.70 ± 0.01 limit at 517 nm wavelength using spectrophotometer (UV-VIS). 5 g of fruit sample was homogenised in 10 ml of methanol and centrifuged at 10,000 rpm for 20 min. 100 µl of supernatant was taken and added to 3.9 ml of DPPH stock. This solution was kept in dark place for 2 hr. and absorbance was recorded at 517 nm. The absorbance of solution was measured against reagent blank and % DPPH scavenging activity was determined (Wu and Ng, 2008)

Total chlorophyll

Chlorophyll content was determined by non-maceration method (Hiscox and Israelstam,1979). Fresh fruit were cut into small pieces and 50 mg were put in test tubes containing 10 ml of dimethyl sulphoxide (DMSO). The test tubes were kept in oven at 65 °C for four hours to facilitate the extraction of chlorophyll into the solution. The absorbance of solution was measured at 645 and 663 nm using double beam UV-Visible spectrophotometer.

Results and discussion

Bittergourd is very important vegetable crop known for its high nutritional value and rich medicinal properties. Due to high perishable nature its deterioration is high and can be stored for only 4-5 days if stored under ambient condition. To reduce this problem bittergourd fruits were stored in cold room maintained at 10 °C and 85% RH soon after harvesting. Various quality parameters were evaluated like physiological loss in weight, decay percentage, antioxidant activity and total chlorophyll content.

Physiological loss in weight was found to increase as storage days increases and maximum loss in weight was found on the 16th day of storage viz. 10.2 % (Fig.1). This result shows that bittergourd fruits can be stored up to 16 days without much loss in weight.Reason behind lower weight loss in cold stored fruit is reduced metabolic activity which results in lower respiration and hence reduced moisture loss from fruits(Preetha et al., 2015).

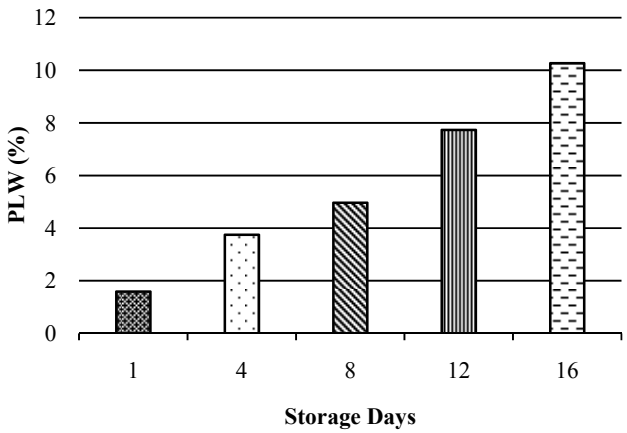

Fig. 1

Decay percent is another important quality parameter for fresh fruits and vegetables. In our study decay percent was found 51 % in fruits stored under cold condition (Fig. 2). Bittergourd fruit stored for 8 days have shown negligible decay percent which later increased drastically. The reason behind higher decay percent in fruits stored for 16 days could be due to higher metabolic activity of fruits and higher respiration losses. Fruit tissues losses its integrity, as storage days increase it approaches toward senescence(Maharaj et al., 1999). Fruits showed sign of yellowing, black streaks and fungal growth which limits its storage up to 16 days.

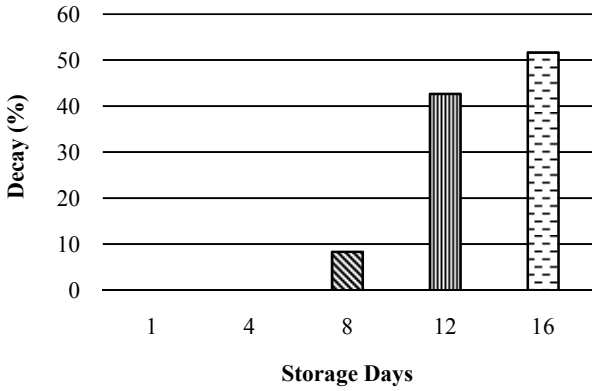

Fig. 2

Antioxidant activity was found higher during storage period. In our study DPPH scavenging activity was found maximum in 16th day storage period viz. 26.2 % (Fig.3). Increase in antioxidant activity could be due to higher accumulation of plant secondary metabolites. As the fruit approaches towards ripening and senescence it starts accumulating secondary metabolites due to which antioxidant capacity of fruit increases(Gogo et al., 2018).

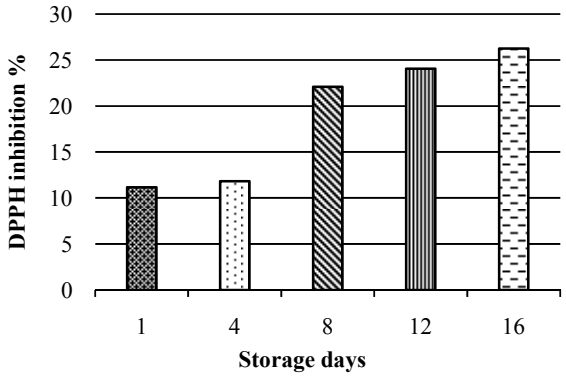

Fig. 3

Total chlorophyll content is responsible for green colour of bittergourd. In this study it was found to increase as storage duration increases viz. 0.188 mg/100 gm (Fig. 4). Slight increase in chlorophyll content could be due to increase in enzyme responsible for its synthesis. Furthermore no literature has been found behind the increase in chlorophyll level during storage.

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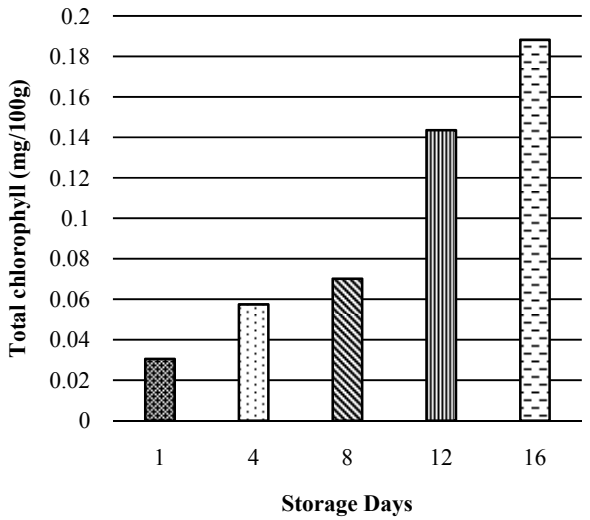

Fig. 4

Conclusion

Bittergourd is a nutritious vegetable but its limited storage life makes its availability a constraint. In this study storability of bittergourd was extended to 16 days in cold storage maintained at temperature 10°C and RH 85 %. During its storage period various quality parameters were evaluated and found maximum retention of antioxidant and total chlorophyll content in 16th day stored bittergourdfruits. PLW % and decay % increases along with its storage duration. This shows that bittergourd fruit can be safely stored up to 16 days.

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