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ASSESSMENT OF THE EFFECT OF COLD STORAGE ON SENSORY AND NUTRITIONAL QUALITY OF FOOD ITEMS

Seema Sonkar and Preeti Suman

Department of Food Science and Nutrition, C.S.A Univ. of Agricult. Sci. and Tech., Kanpur - 280 002 (U.P.), India.

Abstract

The some fruits and vegetables are generally seasonal crops, but whole fruits and vegetables are not consumed immediately after production. In order to ensure the uniform consumption around the year prompted the need for storage of produced grain. Fruits and vegetables generally stored in cold storage by the farmer for business purpose and seed for the next sowing season. The aim of this research was to assess the effect of cold storage on sensory and nutritional quality of food items. The present studies was carried out in the Department of Food Science and Nutrition, Chandra Shekar Azad University of Agriculture & Technology, Kanpur (U.P.), India. The nutritional evaluation indicates that the increasing storage duration decrease the moisture, ash and protein content of apple and carrot. Sensory quality test revealed that attributes such as colour, appearance, texture, taste and flavour decline with storage resulting decreased in overall acceptability score.

Key words : Cold storage, nutritional quality, sensory quality.

Introduction

Cold Storage is a specially designed and built of concrete, stone or brick in order to prevent the leakage. Its floor and ceilings, walls and doors are properly insulted with special insulating materials with special insulating materials with low thermal conductivity. The temperature of, which is kept very low with the help of machines and precision instruments.

Multi-commodity cold stores are provided with multiple chambers enabling them to store a wide range of fresh horticulture products together with respect to their storage capability requirements for temperature, relative humidity and atmosphere, protection from odour and sensitivity to other gases like ethylene. The refrigeration system is designed to adjust and operate to a range of temperature and humidity conditions, depending on the compatibility group for storage of fruits and vegetables.

The apple fruit technically known as Malus malus and belongs to the family Rosaceae. Apple fruit is the oldest and commercially the most important temperate fruit. It is fourth among the most widely produced fruit in the world after orange, banana and grape. In India it is mostly grown in Kashmir, hills of U.P. and Himachal Pradesh. Apple cultivation also extended to Nagaland, Sikkim, Arunachal Pradesh and Meghalaya. The apple is a good source of food and nutrition (Hussain, 2001) and is in high demand throughout the year and hence is generally stored. In relatively cooler climates, simple warehouses can be used for storing apples, but cold storage is required for long term storage and quality retention (Mitropoulos and Lambrinos, 2000). Apple storage resulted an increase in the rate of weight loss with increasing storage duration and thus the maximum weight loss (1.24%) was recorded with 120 days storage period and organolyptic quality test revealed that different quality attributes such as taste, colour and texture declined with storage resulting in decreased overall acceptability score from 7.23 in fresh fruits to 6.56 with 120 and 150 days storage, respectively (Farooq *et al*., 2012).

Carrot is a popular cool season crop grown throughout India. The carrots were stored at a temperature of 4^0C and relative humidity of 92% to 94% for controlled atmosphere storage and 79% to 94% for refrigerated storage. During storage, tissue firmness is lost due to cell wall breakdown and loss of turgidity. Postharvest treatments and storage conditions such as storage temperature usually have distinct effects on root vegetables quality attributes and texture properties.

Materials and Methods

Study sites

The present study was carried out in the Department of Food Science and Nutrition, Chandra Shekhar Azad University of Agriculture & Technology, Kanpur (U.P.), India.

Sensory evaluation

The 8 panel member was selected for the organoleptic test. The panel evaluated apple, carrot and wheat for various organoleptic qualities attributes such as fruit color, taste and texture by scoring 1 to, 9 where 1 was given for like extremely, 2 for like very much, 3 for like moderately, 4 for like slightly, 5 for neither like nor dislike, 8 for dislike slightly, 7 for dislike moderately, 8 for dislike very much and 9 for dislike extremely as suggested by hedonic scale (Ashaye *et al*., 2005).

Nutritional analysis

Moisture content (%)

The moisture content was determined by drying a 10g sample in an air forced draft oven at a temperature of 105± 5°C till to constant weight. The moisture content of the sample was determined on a weight basis using the following formula:

$$\text{Moisture content} = \left(\frac{\text{Weight of sample} - \text{Weight of dried sample}}{\text{Weight of sample}}\right) \times 100$$

Total ash (%)

Ten g of sample taken in a silica dish was ignited on a heater and later shifted to a muffle furnace until clean ash was obtained. The temperature of furnace was raised to 550°C±15°C. The weight of residue was noted and the per cent ash was calculated as under:

$$\text{Ash content} = \frac{\text{Weight of residue}}{\text{Weight of sample}} \times 100$$

Protein (%)

Place sample (0.5-1.0g) in digestion flask. Add 5g Kjedahl catalyst and 200 ml of conc. H_2SO_4. Prepare a tube containing the above chemical except sample as blank. Place flasks in inclined position and heat gently unit frothing ceases. Boil briskly until solution clears. Cool and add 60 ml distilled water cautiously. Immediately connect flask to digestion bulb on condenser and with tip of condenser immersed in standard acid and 5-7 indicator in receiver. Rotate flask to mix content thoroughly; then heat until all NH_3 is distilled. Remove receiver, wash tip of condenser and totrate excess standard acid distilled with standard NaOH solution. The per cent protein was calculated as under:

$$\text{Protein (\%)} = \frac{(A - B) \times N \times 1.4007 \times \text{Protein nitrogen conversion factor}}{W}$$

Where, A is the volume (ml) of 0.2 N HCl used sample titration, B is the volume (ml) of 0.2 N HCl used blank titration and N is the Normality of HCl.

Statistical analysis

The collected data was compiled and analyzed by using statistical method. Percent, arithmetic mean, chi square and analysis of variance technique (ANOVA) were used to analyze the data.

Results and Discussion

Table 1 shows that the mean sensory score of fresh apple and apple from cold storage, sensory score of colour and appearance were decreases from fresh apple to apple from cold storage (8.2-7.4). Score of body and texture were found to be maximum in fresh apple (8.4). The mean score of taste and flavour of fresh apple were found to be 8.1 where as apple from cold storage 7.2. The mean score of overall acceptability were decreases from fresh apple to apple from cold storage (8.2–7.2).

Table 2 shows that the mean sensory score of fresh carrot and carrot from cold storage, sensory score of colour and appearance were decreases from fresh carrot to carrot from cold storage (7.8–6.8). Score of body and texture were found to be maximum in fresh carrot (8.2). The mean score of taste and flavour of fresh carrot were found to be 8.1 whereas carrot from cold storage 7.1. The mean score of overall acceptability were decreases

Table 1 : Mean score of sensory evaluation of fresh apple and apple from Cold Storage (C.S).

Food items	Colour and appearance	Body and texture	Taste and flavour	Overall acceptability
Fresh apple	8.2	8.4	8.1	8.2
Apple from C.S	7.4	7.6	7.2	7.2
SE (diff)	0.25	0.26	0.21	0.23
CD (0.05)	0.53	0.56	0.44	0.50

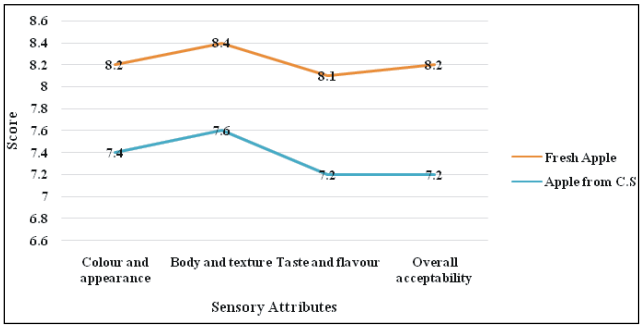
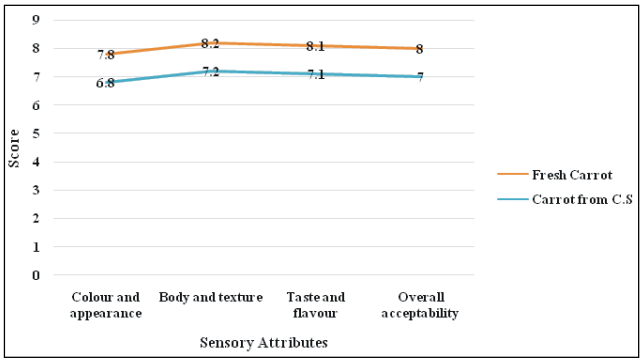


Table 2 : Mean score of sensory evaluation of fresh carrot and carrot from Cold Storage (C.S).

Food items	Colour and appearance	Body and texture	Taste and flavour	Overall acceptability
Fresh Carrot	7.8	8.2	8.1	8.0
Carrot from C.S	6.8	7.2	7.1	7.0
SE (diff)	0.25	0.26	0.21	0.23
CD (0.05)	0.53	0.56	0.44	0.50



from fresh carrot to carrot from cold storage (8.0–7.0).

Table 3 shows that the nutritional composition of fresh apple and apple from cold storage, moisture level were decreases from fresh apple to apple from cold storage (85.71%-84.02%). Ash content were found to be high in fresh apple (0.15%). The average protein content of fresh apple were found to be 0.27% whereas apple from cold storage 0.19%.

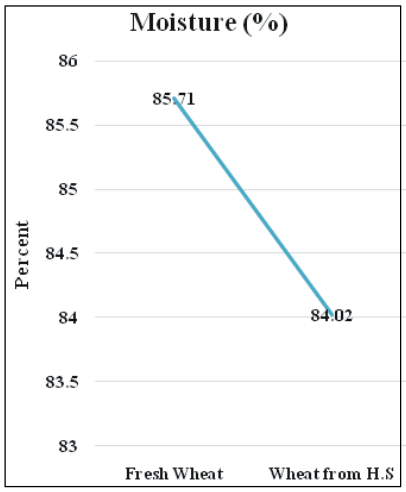
Table 4 shows that the nutritional composition of fresh carrot and carrot from cold storage, moisture level were decreases from fresh apple to apple from cold storage (88.30%-87.02%). Ash content were found to be high in fresh apple (0.95%). The average protein content of fresh apple were found to be 0.96% whereas apple from cold storage 0.79%.

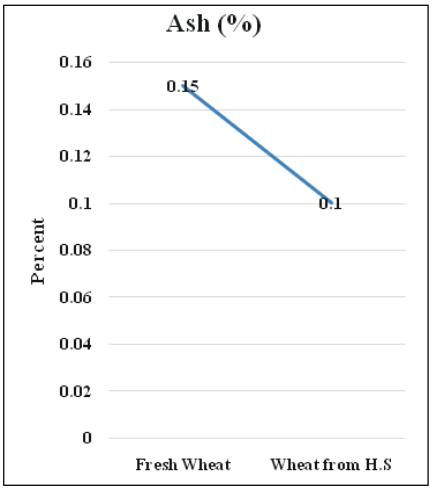
Conclusion

This study was carried out to analyze the effect of cold storage on sensory and nutritional quality of food items. The nutritional evaluation indicates that increasing storage duration decreased the moisture content from 85.71%-84.02% in apple from cold storage, 88.30%-87.02% in carrot from cold storage. Sensory quality test revealed that different attributes such as colour, appearance, texture, taste and flavour declined with storage resulting decreased in overall acceptability score from 8.2–7.2 in apple from cold storage, 8.0–7.0 in carrot from cold storage.

Table 3 : Mean table of nutritional composition of fresh apple and apple from Cold Storage (C.S).

Food items	Moisture (%)	Ash (%)	Protein (%)
Fresh apple	85.71	0.15	0.27
Apple from C.S	84.02	0.10	0.19
SE (diff)	0.007	0.007	0.007
CD (0.05)	0.015	0.015	0.015





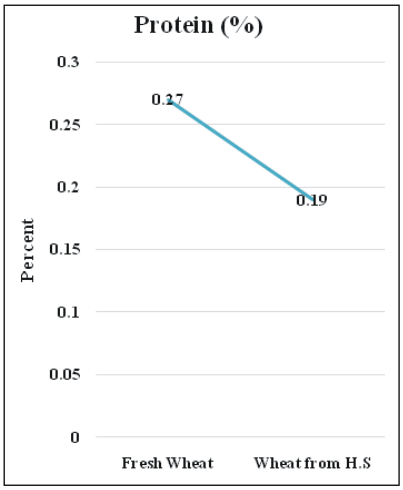
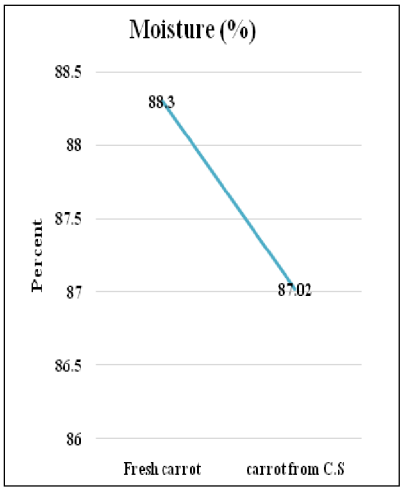
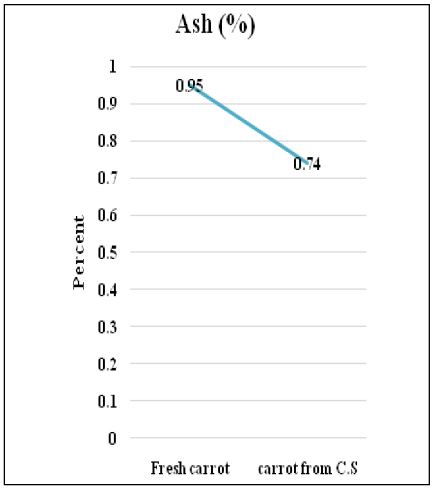
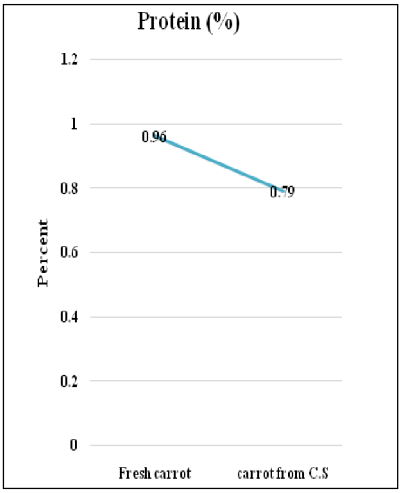


Table 4 : Mean table of nutritional composition of fresh carrot and carrot from Cold Storage (C.S).

Food items	Moisture (%)	Ash (%)	Protein (%)
Fresh carrot	88.30	0.95	0.96
Carrot from C.S	87.02	0.74	0.79
SE (diff)	0.011	0.012	0.011
CD (0.05)	0.024	0.026	0.024







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