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# Color values of whole walnuts effected by packagings and temperature

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**Abstract**
The effect of packaging material and storage period was investigated in medium shelled walnuts. The walnut kernels were mechanically dried (40°C) and packed in Gunny bags, Cardboard and HDPE packaging's and stored under ambient temperature for a period of nine months and were analysed for various color values. The experiment was carried out according to completely randomised design with three replications. During storage, decrease in L*, b*, hue angle and increase in a* value of walnuts was observed at ambient temperature. Storage of walnuts in HDPE packagings were more acceptable with respect to the color properties measured as compared to the other packaging types.

**Keywords:** walnut, color values, HDPE, cardboard and ambient temperature

## Introduction
Juglans regia, the Persian walnut is known to be indigenous to South-Eastern Europe, China and the Himalayan ranges, but its commercial cultivation and production is carried out in the United States of America. In commercial production of walnuts, the world's production of walnuts was around 2,123,814 metric tonnes in 2016 (Anonymous 2017) [4]. India ranks seventh after China, Iran, USA, Turkey, Romania and France (Anonymous, 2016); Martinez *et al*., 2010) [3]. The total walnut production of India was around 2362000 metric tonnes in 2016 from an area of 96000 hectares. Out of the India's total production, Jammu and Kashmir State covers an area of 88900 hectares with an annual production of 266133 metric tonnes (Anonymous, 2016) [3].
Walnut is known by different vernacular names in different parts of India. The most commonly used name is 'Akhroot' and is found growing in all parts of the Himalayan regions between the elevation of 1200 to 1250m above mean sea level (Rana and Ananda, 2002) [14]. On the basis of hardness of shells, walnuts are commonly categorized into three broad categories viz, thin shelled, medium shelled and hard shelled (katha).
Walnut is much prized as desert and dry fruit and has proven to be nutritionally valuable food (Dogan and Akgul, 2005; Tapsell, 2010) [7]. On an average walnuts contain around 60-70% of lipids comprising of mono and polyunsaturated fats, 15.2% proteins, 13.7 per cent carbohydrates, 6.7 per cent dietary fibre and 1.8 per cent ash (Cosmulescu *et al.*, 2009).
It is also good source of omega-3 oils with linoleic acid (44.2%), oleic acid (25.7%) and alfa linolenic acid (18.2%) as major components (Kuliev *et al.*, 1987). Ascorbic acid, thiamine, riboflavin, niacin, pantothenic acid, vitamin B-6, folate, vitamin A and vitamin E are the dominating vitamins and calcium, copper, iron, magnesium, manganese, phosphorous and potassium are the major minerals found in walnuts (Anonymous, 2004; Cosmulescu *et al*., 2009) [2].
The health benefits of walnuts kernel are usually attributed to their chemical composition. Walnuts are a good source of essential fatty acids and tocopherols (Amaral *et al*., 2003) [1]. Linoleic acid is the major fatty acid, followed by oleic, linolenic, palmitic, and stearic acids (Ruggeri *et al*., 1998; Savage *et al*., 1999; Amaral *et al*., 2003) [15, 1].

## Material and Methods
**T**he study was conducted in feb 2014 at the division of Food Science and Technology Skuast-K Shalimar, Srinagar. Medium shelled walnut were procured from the market and packed in three different packaging viz. Gunny bags,Cardboard and HDPE packagings for a period of 9 months under ambient and were analysed for various color values viz L*, a*, b* and hue angle after every three months.

**Colour values (L*, a*, b*, hue angle)**

The L*, a*, b* colour values were observed by Hunter colourimeter (Model CR-2000, Minolta, Osaka, Japan), equipped with a 8-mm measuring head and a c illumination (6774 K). The meter was calibrated using the manufacturer's standard white plate. Colour changes were quantified in the $L^*$, $a^*$, $b^*$ colour space. $L^*$, refers to lightness of the colour of the sample walnuts and ranges from black = 0 to white = 100. A negative value of $a^*$ indicates a green colour where the positive value indicates red-purple colour. A positive value of $b^*$ indicates a yellow colour and the negative value a blue colour (McGuire, 1992). Hue angle can (h*), effective parameter for describing visual colour appearance were calculated using following eq.

$$3h^* = (\tan^{-b/a})$$

**Results and Discussion**

Data on the effect of packaging materials and storage periods on the L* value of whole walnuts are given in Table 1. The data presented in the table reveal that packaging materials and storage periods significantly effected L value of whole walnuts. Among all the three packaging materials, significantly highest mean L value of 44.39 was recorded in HDPE [$P_3$] packed sample followed by value of 42.79 in samples from Cardboard [$P_2$] and lowest of 41.54 in samples packed in gunny bag [$P_1$]. With the advancement of storage periods there was significant decreases in L* value of whole walnuts as highest mean L value of 45.85 recorded at 0 days significantly decreased to value of 44.08 at 90 days which further dropped to 41.78 and 39.92 at 180 and 270 days of storage respectively.

The interaction effects between the packaging materials and storage periods were also found to be significant. Highest l value of 44.39 was observed in all the three types of packaging at 0 days and lowest of 37.33 in gunny bag [$P_1$] packed samples at 270 days of storage.

The gradual decrease in L*values of the whole walnut samples might be due to increase in the formation of brown pigment melanoidins formed due to non-enzymatic browning of whole walnuts at high temperature and high water activity. Higher concentration of reducing sugars which cause colour to change to brown. Wall and Gentry (2007). M.V christopolus *et al.* (2011) observed a decrease in colour values of walnut kernel during storage. The results are in conformity with the findings of Seyed *et al.* (2017) [16] who reported that lightness of walnut kernels decreased during storage of three months.

**Table 1:** Effect of packaging materials and storage periods on the *l * value of whole walnuts

| Packaging materials | Storage periods (days) | | | | Mean |
|---|---|---|---|---|---|
| | 0 | 90 | 180 | 270 | |
| Gunny bags ($P_1$) | 45.85 | 43.01 | 40.00 | 37.33 | 41.54 |
| Cardboard ($P_2$) | 45.85 | 44.09 | 41.60 | 39.62 | 42.79 |
| HDPE ($P_3$) | 45.85 | 45.15 | 43.75 | 42.81 | 44.39 |
| Mean | 45.85 | 44.08 | 41.78 | 39.92 | |

C.D($P_{=0.05}$)
Packagings (A) = 0.09
Storage (B) = 0.01
A × B = 0.02
Mechanical Drying (40˚C)

Data on the effect of packaging materials and storage periods on the a* value of whole walnuts are given in Table 2. The data presented in the table reveal that packaging materials and storage periods significantly effected a* value of whole walnuts. Among all the three packaging materials, significantly highest mean a value of 3.14 was recorded in gunny bag [$P_1$] packed sample followed by a value of 3.09 observed in samples from cardboard [$P_2$] and lowest of 3.02 in samples packed in HDPE [$P_3$]. The mean a value 3.02 recorded in HDPE [$P_3$] packed sample was statistically at par with the value of 3.09 in samples packed in cardboard [$P_2$].With the advancement of storage periods there was significant increases in a* value of whole walnuts as lowest mean a value of 2.46 recorded at o days significantly increased to 2.79 at 90 days which further increased to 3.37 and 3.72 at 180 and 270 days of storage respectively.

The interaction effects between the packaging materials and storage periods were also found to be significant. Lowest a value of 2.46 was observed in all the three types of packaging at 0 days and highest of 3.78 was recorded in gunny bag [$P_1$] packed sample at 270 days of storage.

With advancement of storage period there was a gradual increase in a*values of the whole walnut samples due to high temperature and Non enzymatic browning of whole walnuts. Similar results were observed by *Michele Renne warmund* (2008) [12] in who reported an increase in a value in black walnuts and Kahyoglu (2008) who reported the same trend during an investigation on the storage of pistachio nuts.

**Table 2:** Effect of packaging materials and storage periods on the *a * value of whole walnuts

| Packaging materials | Storage periods (days) | | | | Mean |
|---|---|---|---|---|---|
| | 0 | 90 | 180 | 270 | |
| Gunny bags ($P_1$) | 2.46 | 2.88 | 3.44 | 3.78 | 3.14 |
| Cardboard ($P_2$) | 2.46 | 2.79 | 3.38 | 3.75 | 3.09 |
| HDPE ($P_3$) | 2.46 | 2.70 | 3.30 | 3.62 | 3.02 |
| Mean | 2.46 | 2.79 | 3.37 | 3.72 | |

C.D($P_{=0.05}$)
Packagings (A) =0.08
Storage (B) = 0.08
A × B = NS
Mechanical Drying (40˚C)

Data on the effect of packaging materials and storage periods on the b* value of whole walnuts are given in Table 3. The data presented in the table reveal that packaging materials and storage periods significantly effected b* value of whole walnuts. Among all the three packaging materials, significantly highest mean b value of 32.21 was recorded in HDPE [$P_3$] packed sample followed by a value of 31.05 observed in samples from cardboard [$P_2$] and lowest of 30.37 in samples packed in gunny bag [$P_1$]. With the advancement of storage periods there was significant decreases in b value of whole walnuts as highest mean b value of 33.84 recorded at o days significantly decreased to 32.54 at 90 days which further dropped to 31.22 and 28.27 at 180 and 270 days of storage respectively.

The interaction effects between the packaging materials and storage periods were also found to be significant. Highest b value of 33.84 was observed in all the three types of packaging at 0 days and lowest of 26.77 in gunny bag packed sample at 270 days of storage.

With advancement of storage period there was a gradual decrease in b* values of the whole walnut samples which is mainly ascribed to enzymatic or chemical oxidation of phenolics (Monzoco *et al.,* 2001). Kahyoglu (2008) also observed a decresing trend in b* value in Pistachio nuts

during extended storage.

**Table 3:** Effect of packaging materials and storage periods on the *b* value of whole walnuts

| Packaging materials | Storage periods (days) | | | | Mean |
|---|---|---|---|---|---|
| | 0 | 90 | 180 | 270 | |
| Gunny bags ($P_1$) | 33.84 | 31.94 | 28.95 | 26.77 | 30.37 |
| Cardboard ($P_2$) | 33.84 | 32.41 | 29.93 | 28.02 | 31.05 |
| HDPE ($P_3$) | 33.84 | 33.26 | 31.78 | 29.95 | 32.21 |
| Mean | 33.84 | 32.54 | 31.22 | 28.27 | |

C.D($P_{=0.05}$)
Packagings (A) = NS
Storage (B) = 0.94
A × B = NS
Mechanical Drying (40˚C)

The data pertaining to the effect of packaging materials and storage periods on the hue angle of whole walnut kernels are presented in Table 4. Samples from HDPE [$P_3$] packaging recorded highest mean hue angle of 84.60, followed by value of 84.21 and 83.95 found in samples from cardboard [$P_2$] and gunny bag [$P_1$] packaging respectively. With the advancement of storage there was decrease in hue angle of whole walnuts. The highest mean hue angle of 85.84 recorded at o days decreased significantly to value of 85.10, 83.59 and 82.48 at 90, 180 and 270 days of storage respectively.

Two ways interaction effect between packaging materials and storage durations were also found to be significant. The highest hue angle of 83.11 was recorded in HDPE [$P_3$] packed samples and lowest of 81.96 in samples packed in gunny bag [$P_1$] at 270 days from an initial value of 85.84 at o days of storage.

The decrease in the hue angle is due to increase of a value and decrease of b value. The results are in agreed with the finding of Sensei *et al*. (2013) while studying the effect of different packaging conditions on stability of peeled almonds.

**Table 4:** Effect of packaging materials and storage periods on the hue angle of whole walnuts

| Packaging materials | Storage periods (days) | | | | Mean |
|---|---|---|---|---|---|
| | 0 | 90 | 180 | 270 | |
| Gunny bags ($P_1$) | 85.84 | 84.85 | 83.16 | 81.96 | 83.95 |
| Cardboard ($P_2$) | 85.84 | 85.08 | 83.55 | 82.38 | 84.21 |
| HDPE ($P_3$) | 85.84 | 85.36 | 84.07 | 83.11 | 84.60 |
| Mean | 85.84 | 85.10 | 83.59 | 82.48 | |

C.D($P_{=0.05}$)
Packagings (A) =0.04
Storage (B) = 0.04
A × B = 0.07
Mechanical Drying (40˚C)

## Conclusion

Under the present investigations it is concluded that for maintaining quality of whole walnuts and walnut kernels, new improved scientific processing practices are to be adopted in all unit operations of post-production sequence. HDPE packaging proved to be superior with respect to maintaining the color values during 270 days ambient storage of whole walnuts compared to cardboard and gunny bags.

## References


1. Amaral JS, Casal S, Pereira JA, Seabra RM, Oliveira BP. Determination of sterol and fatty acid compositions, oxidative stability, and nutritional value of of six walnut *Juglans regia* L. cultivars grown in Portugal. Journal of Agricultural and Food Chemistry. 2003; 51:7698-7702.
2. Anonymous. All India co-ordinated research programme project. Annual Report 2004-2005. Division of Post Harvest Technology Skuast-k Shalimar. 2004, 10-11.
3. Anonymous. GAIN reports. Global Agricultural Information network. USDA Foreign Agricultural Service report number. 2016, 16049.
4. Anonymous. Tree nuts: World markets and trade. USDA office of Global Analysis, Foreign Agricultural Service, 2017.
5. Christopolous MV, Tsantili E. Effect of package atmosphere and temperature on total antioxidants and colour of walnut *Juglans regia* L. during storage. Sci Hort. 2011; 131:49-57.
6. Cosmulsecu S, Baciu A, Achim G, Botu M, Trandrafir I. Mineral composition of fruits in different walnut *Juglans regia* L. cultivars. Notulae Botanicae Horti Agrobotonici Cluj-Napoca. 2009; 37:156-160.
7. Dogan M, Akgul A. Fatty acid composition of some walnut (*Juglans regia* L.) cultivars from east Anatolia. Grasas y Aceites. 2005; 56:328-331.
8. Kuliev AA, Gigienova EI, Isamailov MN, Nazarov GA, Nasirova GM. Evaluation of some walnut kernels in California. University of California, Davis. Publication. 1987; 21410:38-46
9. Kahyaoglu T. Optimization of the pistachio nut roasting process using response surface methodology and gene expression programming. LWT Food Science and Technology. 2008; 41(1):26-33.
10. Manzocco L, Calligaris S, Mastrocola D, Nicoli MC, Lerici CR. Review of non-enzymatic browning and antioxidant capacity in processed foods. Trends in Food Science and Technology. 2001; 11:340-346.
11. McGarry R, Ozga JA, Reinecke DM. The effect of Ethephon on Saskatoon (*Amelanchier alnifolia* Nutt) fruit ripening. Journal of American Society for Horticultural Sciences. 2005; 130:12-17.
12. Michele Renee Warmund. Kernel Color of Three Black Walnut Cultivars after Delayed Hulling at Five Successive Harvest Dates Department of Horticulture. 2008, 1-31. Agriculture Building, University of Missouri, Columbia, MO 65211
13. Tapsell LC. Health benefits of walnut consumption. Acta Horticulturae. 2010; 861:409-416.
14. Rana HS, Ananda SA. Walnut cultivation. Directorate of Extention Education, Directorate of Extension Education, Dr. Yashwant Singh Parmar University of Horticulture and Forestry, Nauni, Solan (H.P.), India, 2002.
15. Ruggeri S, Cappelioni M, Ganmbelli L, Nicoli S, Carnovale E. chemical composition and nutritive value of nuts grown in Italy, Ital, J Food sci, 1996; 3:243-252.
16. Seyed Hamidreza Ziaolhagh, Mostafa Mazaheri Tehrani 2, Seyed Mohammad Ali Razavi 2, Hassan Rashidi. Roasting Process Optimization of Walnut Kernels for the Preparation of Walnut Cream Using Response Surface Methodology. Journal of nuts. 2017; 3(1):34-45.