

Influence of Different Chemical Preservatives and Local Preservation Methods of Drying Apricot

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Abstract

This study was carried out to investigate the effect of different apricot drying methods of Local and Turkey on the overall quality of sun-dried apricot stored at ambient temperature for period of three months. In Local method, the fruit before drying is destoned and cut in two pieces, while in Turkey the destoned whole fruit is used for drying. For packing of the samples white glassy bags were used. The treatments were T₀ (Local Method + Unpacked), T₁ (Local Method + Packed), T₂ (Local Method + Sulfur dioxide + Unpacked), T₃ (Local Method + Sulfur dioxide + Packed), T₄ (Turkey Method + Unpacked), T₅ (Turkey Method + Packed), T₆ (Turkey Method + Sulfur dioxide + Unpacked), T₇ (Turkey Method + Sulfur dioxide + packed). The samples were analysed physico-chemically (TSS, ascorbic acid content, moisture content, acidity, pH and dry solids), microbially (Total fungal count) organoleptically (color, flavor and texture) and overall acceptability at each 15 days interval of storage. At three months storage TSS (30.80 °Bx) was slightly reduced in all unpacked samples. Moisture content (18.50 %) was slightly increased in unpacked samples (T₀, T₂, T₄, T₆) and slightly reduced in packed samples (T₁, T₃, T₅, T₇). Ascorbic acid content (16.80 mg/100 g) was reduced in unpacked and packed samples, the loss was more in unpacked samples. Titratable acidity (0.40%) was slightly enhanced in all samples. pH (5.20) was reduced (4.4) in all samples. Dry solid (81.60) was slightly reduced in unpacked samples and increased in packed samples. Sun dried apricots samples were analysed for total microbial growth. Maximum growth was found in sample T₀ (1163.0 cfu/g) and minimum in T₇ (35.14 cfu/g). These samples were sensory evaluated. Maximum score for colour was obtained by T₇ (7.86 – 7.20) and minimum by T₀ (5 - 4). For taste maximum score was obtained by T₅ (8.6 – 8.0) and minimum by T₂ (5.6 – 4.6). Texture maximum score was obtained by T₇ (7.0 – 5.6) and minimum by T₀ (6.0 – 4.2). For overall acceptability maximum score was obtained by T₅ (7.53 – 6.36) and minimum by T₀ (5.73 – 4.53). Statistical analysis of all the treatments stored for three months at ambient temperature was found significant (p<0.05) except storage effect on moisture content and dry solids.

Keywords: Local Methods, Quality, Sun-Dried Apricot, Physico-Chemically Analysis, Organoleptically Analysis

INTRODUCTION

Apricot (*Prunus armeniaca* L) a member of the family Rosaceae is one of the most important stone fruits of temperate zones. Apricot trees have resistant to damage of the winter cold. Though the flower buds have a moderate chilling requirement, they bloom early in spring. Apricot fruits bear on spurs, the edible portion is the enlarged mesocarp of the ovary wall. The endocarp is the pit or stone, and the exocarp is the skin of fruit. The true seed is within the endocarp. The fruit is nearly smooth, yellow or orange and excellent for eating as raw as well as caned and dried.

In Pakistan total area under apricot cultivation was 13.8 (000, hectare) in 2002-2003 with a production of 129.7 (000, tons) (Agricultural Statistics of Pakistan 2002-2003). Apricot is cultivated extensively in Northern Areas of Pakistan with annual production of 41.64 (000, tons) according to a socio-economic survey conducted by the Food and Agriculture organization (FAO) and reported in the annual report of Agha Khan Rural Support Program (AKRSP) (Wahid, 1997). Battcock (1989 a) reported that 25 % of the fruit is either sold fresh or eaten, 45% is dried and 30% is wasted.

There are different varieties of apricot, but some are most suitable for drying purpose because of good color, size, shape, taste, flavor, nutritional value, calories and vitamins. Apricot contains 53 kcal energy, 85.3 % moisture, 0.9 g of protein, 0.4 g lipid, 11.6 g carbohydrates, 1.0 g fiber, 0.7 g ash and 10 mg ascorbic acid per 100 g respectively. It has pleasant taste and flavor and has high content of minerals and vitamins (Pellet and Shadarvian, 1970).

Drying of foodstuffs is an important method of preservation of food and it is applicable to a wide range of industrial and agricultural products. Sun drying is one of the most common, economic and prevalent methods of food preservation and widely used in Northern Areas of Pakistan for drying apricot. Sun or solar drying produces the best quality apricot. Artificially dried apricot does not have a bright color as sun dried apricot (Van

Arsdel, 1971). Apricots need to be picked frequently so that the fruit should neither too ripe nor too green. Under ripe fruit yield shriveled, tough dried product of poor flavor and over ripe fruit forms slabs during drying (Cruess, 1958). Apricots are generally dried from initial moisture content of about 74 – 78 % (wet basis) to 16 – 18 % (Bean *et al.* 1957) reported the moisture content of ordinary dried fruit to be in the range of 15-30%), for effective storing, marketing and processing. Dried apricots have extensive demand in several parts of the world, i.e. USA, UK, Germany, Australia, Holland, etc, and occupy an important place in the world trade.

Baltistan is being an agricultural region more than 90% inhabitant of this area directly or indirectly depend upon agriculture. Baltistan is the nucleus of fruit production. Apricot is the major fruit produced in Baltistan, presently largest area of 4000 acres under apricot cultivation (AKRSP 1999). Several varieties of apricots are grown in regions which are known by there local names with specific meaning of area, but Halman, Qouban, Margholam, Karfo-chulli, Wafo-chulli, Kho-chulli, Shara-karfo, Hangol are sweet, very juicy, delicious and attractive in color. Traditionally apricots are dried after de-stoning in open atmosphere. The fruit pits are cracked to obtain the kernel (eatable portion) for sale and domestic uses for oil extraction.

Akca *et al.* (1999) conducted research to determine yield and fruit characteristics of certain dried apricot cultivars widely grown in Turkey. The pomological characteristics, sulphur content, quantity of total dried fruit got from fresh fruit, percentage of production, the number of dried fruit per 1 kg were examined in the Turkish dried apricot cultivars. The yield of fresh fruit was between 27.0 kg per tree (Ismailaga) and 130.0 kg per tree (Soganci), and yield of dried fruit was between 7.362 kg per tree (Ismailaga) and 34.476 kg per tree (Soganci). The highest production was determined in Kabaasi (29.80%) in Kadioglu (29.45%), in Adilcevaz 5 (28.62%), in Hacihaliloglu (28.45%) and in Cataloglu (28.25%). The color of the dried fruit was observed as yellow and orange in cultivars with a higher sulphur content. Sulphur contents varied from 600 ppm (Adilcevaz 2) to 1680 ppm (Ismailaga). At the end of the study, recommended the cultivars Hacihaliloglu, Kabaasi, Adilcevaz 5, Cataloglu and Kadioglu for drying. Hansmann *et al.* (1999) reported that the peeled apricot halves (cv. Peeka) were treated with salt and blanched superficially (1 min. after reaching 95 °C) prior to dehydration. Dehydration was performed using different dehydration regimens. Objective color measurements were determined directly after dehydration and during storage for 8 months at 30 °C in order to accelerate deterioration. Isothermal (60 °C) and concurrent flow dehydration regimes yielded lighter colored products than dehumidification i.e. (45 °C) and counter-flow dehydration regimes.

Lichou (1999) worked on shelf life and quality of apricot fruits. Apricot fruits are soft and have a short shelf life, so they must be picked as close to optimum maturity as possible, in order to offer good quality fruits to consumers. A color code has been developed by Ctifi which allows growers to harvest at the right stage depending upon the cultivar. To determine this stage, fruits of several cultivars were harvested as two or three different background colors and measured before and after a few days in storage at an ambient temperature of 3 °C and 10 °C. it was shown that sugar content and acidity change until harvest, but do not evolve a lot after picking. Firmness is the main factor of variation, firmness decrease more or less quickly depending on the cultivar, and it decrease drastically after cold storage. According to these results, recommendations can be given to manage duration of storage and marketing by taking into account post harvest behavior of the cultivar especially by avoiding cold storage at very low temperature for gaining just a short period of time before distribution.

Sanchez *et al.* (1999) reported that dehydrated apricots were stored at 25 °C under five different modified atmospheres (MAs) (CO₂, N₂, 20% CO₂ – 80% N₂, 40% CO₂- 60% N₂, 60% CO₂ – 40% N₂) and under air. Color, SO₂ content and cell wall composition were evaluated during storage. All (MAs) used extended the shelf life of dehydrated apricots. In term of texture, samples stored under the different CO₂ / N₂ mixture showed a minor disruption of cell wall components. In term of browning, samples stored under CO₂ exhibited the lowest losses of color and SO₂ content at the end of storage (190 days). Overall, for a period of 125 days, samples kept under MAs composed of 20% CO₂-80% N₂ and 40% CO₂-60% N₂ best maintained the initial characteristics of texture and color of dehydrated apricots.

Mignani and Bassi (2000) examined the influence of two different rootstocks on apricot quality, that is very often very poor for processing standard. Six apricot cultivar grown on Manicoat and GF-31 rootstocks were tested for fruit firmness, color, total soluble solids, titratable acidity, total, soluble and insoluble pectin content, total and pectin bound calcium content, at three different ripening stages (unripe, breakes and ripe). Rootstock influence on quality parameters varied greatly according to cultivar, although Manicot often increased firmness, total soluble solids, titratable acidity and total calcium content. Cardarelli *et al.* (2002) reported that the apricots picked at the commercial ripening stage soluble solid contents (SSC) 12.6% were left to reach full ripening in continuously humidified air at 20 °C. Changes in the rate of ethylene production, firmness, soluble solids concentration and titratable acidity were measured. The alpha-D and beta-D-glucosidases, alpha-L-arabinofuranosidases, alpha-D and beta-D-galactosidases, beta-D-xylosidase and alpha-D-mannosidase activities were assayed. To evaluate the influence of ethylene on glycosidase activity, propylene (500 micro L x L (-1)) was applied to apricots for 24 and 48 hrs. In apricots ripened in air, ethylene production increased on the first

day and exhibited a typical climacteric pattern. Good edible quality was reached in 5 days when SSC was at least 14% and acidity was between 1.1 and 1.2% (% malic acid). During post harvest ripening, alpha-D-galactosidase, alpha-D-mannosidase and beta-D-galactosidase activity increased continuously but at a lower rate beta-D-xylosidase activity also increased but the level of activity was lower than the other glycosidase assayed. Pectinmethylesterase (PME) decreased during the post harvest ripening and propylene enhanced this pattern, by stimulating ethylene production. Even the activities of alpha-L-arabinofuranosidase, beta-D-xylosidase, alpha-D-mannosidase, and beta-D-galactosidase were greatly stimulated by the propylene treatment, which consequently induced rapid softening of this fruits.

The aim of this study is to develop improved drying techniques for the preparation of export quality dried Apricot in Baltistan. Improved quality procedure for drying fruit of export quality will boost-up the needs of fruit industry in this region. With such trade development the people of the region will encourage to grow more fruit plants which will not only increase their income but will also reduce the unemployment in the region.

MATERIALS AND METHODS

Material

Fresh apricot of good quality (Halman) was purchased from the local market of Baltistan and was brought to the Food Processing & Analytical Unit, Department of Agriculture Northern Areas Gilgit where the research work was carried out.

Preparation of the Samples

Apricots were graded, sorted according to size, maturity and soundness and then thoroughly washed with potable water to remove adhering dust, dirt, and other extraneous material. The apricots were prepared for sun-drying by two drying methods Local and Turkey. In Local or Traditional method (without sulfur), apricots fruit were cut into two equal halves and stones were removed from apricot, allowed to sunshine for drying for 3 - 4 days. In local method (with SO₂), first apricots were washed, cut in equal halves destoned, placed in wooden trays and then covered with plastic tent and sulfur fumes were smoked in plastic tent through a sulfur fumigator for of 3 – 4 hours. After completion of fumigation these wooden trays were placed for sun drying for 3 – 4 days. While in Turkish method (without sulfur), whole apricot fruits were placed in wooden trays for sun drying and destoned when the apricot become in semi dry condition. The destoned semi dried fruits were again placed under the sunshine for a period of 5 – 6 days. In Turkish method (with SO₂) first apricots were placed in wooden trays and covered them with plastic tent and sulfur fumes were smoked in plastic tent by a sulfur fumigator for a period of 4 – 5 hours. After completion of fumigation these trays containing apricots were put for sun drying. Further procedure for drying was followed as used without sulfur fumigation.

Research Plannings

The sun-dried apricot samples were prepared under the following procedures.

- T₀ = Local Method + Unpacked
- T₁ = Local Method + Packed
- T₂ = Local Method + Sulfur dioxide + Unpacked
- T₃ = Local Method + Sulfur dioxide + Packed
- T₄ = Turkey Method + Unpacked
- T₅ = Turkey Method + Packed
- T₆ = Turkey Method + Sulfur dioxide + Unpacked
- T₇ = Turkey Method + Sulfur dioxide + packed

Storage & Analysis

The samples were stored at ambient temperature for a period of three months and analyzed physico-chemically (TSS, moisture %age, ascorbic acid, titratable acidity, pH, and dry solids), microbially (total count) and organoleptically (color, taste and texture) at every 15 days interval of three months storage.

Physicochemical Analysis

Ascorbic Acid

Ascorbic acid was determined by the standard method as reported in A.O.A.C. (1984).

Preparation of Dye Solution

2, 6 - dichlorophenol indophenol dye (50 mg) and sodium bicarbonate (NaHCO₃) (42 mg) were weighed, taken in a beaker and then dissolved in distilled water. The volume was made up to 250 ml. This solution was filled and transferred to a clean volumetric flask and kept in a cool place for analytical use.

Preparation of Standard Ascorbic Acid Solution

Standard ascorbic acid (50 mg) was taken in 50 ml volumetric flask and the volume was made up with 0.4% oxalic acid solution. This solution was kept in a cool place for 24 hours before use.

Preparation of Oxalic Acid Solution

Oxalic acid (4 g) was taken in a volumetric flask and volume was made up to 1litre with distilled water.

Standardization of Dye

Standard ascorbic acid (5 ml) solution and 0.4 % oxalic acid (5 ml) was taken in a conical flask and was titrated against dye solution till light pink color persisted for 15 seconds.

$$\text{Dye factor } (f) = \frac{\text{ml of ascorbic acid solution taken}}{\text{Volume of dye used}}$$

Dye factor was determined separately for each determination

Preparation of Sample

Dried apricot (10 g) sample was taken in a beaker; added 100 ml of 0.4 % oxalic acid solution and slurry was made.

Titration of Sample

Apricot slurry (10 ml) was taken in a conical flask and titrated against the dye solution till light pink color appeared which persisted for 15 seconds. Three consecutive readings were taken for each sample.

Calculation

Ascorbic acid content was calculated by using the following formula:

$$\text{Ascorbic acid (mg/100g)} = \frac{F \times T \times 100 \times 150}{S \times D}$$

$$F = \text{Factor from standardization} = \frac{\text{ml of ascorbic acid}}{\text{ml of dye used}}$$

$$T = \text{ml of dye used in sample.}$$

$$S = \text{ml of diluted sample taken for titration.}$$

$$D = \text{ml of sample taken for dilution.}$$

Percent Acidity

Percent acidity was determined by the standard method of A.O.A.C. (1984).

Standardization of 0.1N NaOH Solution

Oxalic acid (6.3 g) was accurately weighed, dissolved in distilled water and the volume was made to 1litre by adding more distilled water. This is stock solution. NaOH pellets (4.5 g) were taken and dissolved in distilled water and the volume was made up to 1litre. The burette was then filled with roughly prepared 0.1 N NaOH solution and 10 ml of 0.1 N oxalic acid solutions was taken in a beaker. Two or three drops of phenolphthalein as indicator were added to the beaker. The 0.1 N oxalic acid was titrated against 0.1 normal NaOH solution until light pink color appeared, which persisted for 15 seconds. Three consecutive readings were taken and the normality of NaOH was calculated using the following formula:

$$N_1 V_1 = N_2 V_2$$

$$N_1 = \text{Normality of oxalic acid.}$$

$$V_1 = \text{Volume of oxalic acid.}$$

$$N_2 = \text{Normality of NaOH.}$$

$$V_2 = \text{Volume of NaOH.}$$

Titration of Sample

Apricot slurry (10 ml) was taken in a 100 ml volumetric flask and diluted up to the mark. 10 ml of these diluted samples were taken in titration flask and added two or three drops of phenolphthalein as indicator and then titration was carried out against exact 0.1 N NaOH solution, until light pink color appeared, which persisted for 15 seconds. Three consecutive readings were taken and acidity was calculated by using the following formula:

$$\% \text{ Acidity} = \frac{T \times 0.0067 \times 100 \times 100}{L \times M}$$

$$T = \text{ml of NaOH used.}$$

$$L = \text{Sample taken (in gm) for dilution.}$$

$$M = \text{sample taken (ml of dilution) for titration.}$$

Moisture

The moisture content was determined by method as reported in A.O.A.C. (1984). 10 g of sun dried apricot sample was taken in a previously dried and weighed Petri dish. The dish was then kept in oven at 60° C for overnight instead of 110 °C. Moisture content was calculated by following formula.

$$\% \text{ Moisture} = \frac{\text{Difference in weight}}{\text{Weight of sample}} \times 100$$

pH

pH of the samples was determined by using Inolab Digital pH meter according to the instruction manual of the apparatus. The specification of the apparatus is bench top, model I and made of Germany.

Dry Solids

Dry solids of the samples were determined by subtracting moisture content of the samples from 100.

$$\text{Dry solids} = 100 - \text{Moisture content.}$$

Total Soluble Solid (TSS °Bx)

The Total Soluble Solids of the apricot sample was determined by the recommended method A.O.A.C. (1984), using hand refractometer at room temperature. The representative samples were placed on dry refractometer prism and readings were taken in °Brix directly, while directing the prism towards the light source.

Microbiological Analysis

Total Fungal Count (cfu/g)

The fungal count (cfu/g, colony forming units/gram) of all the samples was determined by dilution plate method using Potato Dextrose Agar (PDA) as reported by Diliello (1982).

Reagents and Equipments

Glasswares being used were thoroughly washed, cleaned and sterilized by autoclaving at 121 °C for 15 – 20 minutes. Reagents used were NaCl, Peptone, Sabouraud Dextrose Agar (SDA) Potato Dextrose Agar (PDA) and Tartaric acid.

Procedure

Preparation of Diluent

Diluent was prepared according to the following ratio NaCl (0.85 g): Peptone (0.1 g) dissolved in 100 ml distilled water. Distributed 90 ml diluent in 250 ml conical flask and 9 ml in each 25 ml test tube. It was plugged and autoclaved at 121 °C for 15 minutes.

Preparation of Medium

Potato Dextrose Agar medium was prepared by boiling 200 g of diced potato in 1litre distilled water. 10 g of agar and 10 g of dextrose were mixed in cold water separately and added to make the solution in 1litre of volumetric flask. Heated in water bath till dissolved. Autoclaved at 121 °C for 15 minutes. Cooled to approximately 45 °C. tartaric acid solution (10 %) 3 – 4 ml per 100 ml of agar was added after cooling to adjust the pH in the range of 5.2 thus making media selective for mold and yeast. Poured 15 – 20 ml of agar medium in each sterilized Petri dish aseptically. The agar was allowed to solidify.

Sampling

Sun dried apricot (10 g) sample was weighed and mixed in 90 ml diluent to make 1:10 dilution and shaken thoroughly. Subsequently made serial dilutions 1:10 by taking 1 ml from previous dilution and added in 9 ml sterile diluent. Plates were marked and took 1 ml of diluted sample from each dilution and transferred to Petri dishes and spread with spreader. The plates were incubated at 28 ± 1 °C in inverted position for 24 hours. Colonies were counted and multiplied by its dilution factor.

$$\text{Mold count} = \text{No. of colonies} \times \text{Dilution factor}$$

Organoleptic Evaluation

Samples of the sun dried apricots were evaluated organoleptically for color, taste, texture and overall acceptability according to the methods described by Larmond (1977).

Testing Procedure

A panel of 10 trained judges were selected on the basis of their experience in sensory evaluation test Samples were presented to these trained judges to compare them and assign them scores between 1 – 9, where 1 represented extremely disliked and 9 represented extremely liked.

Statistical Analysis

All the data regarding different parameters were statistically analyzed using simple Randomized Complete Block Design (RCBD), and means were separated by LSD test as reported by Steel and Torie (1980).

RESULTS AND DISCUSSION

The aim of this study was to investigate the effect of different techniques of drying method with and without sulfur fumigation. The apricot samples were dried and packed in polyethylene bags & stored at room temperature for a period of three months. The samples were analyzed physico-chemically (ascorbic acid, moisture, TSS, pH, titratable acidity, dry solids), microbially (total counts) and organoleptically (color, flavour, texture) at each 15 days interval of three month storage. The storage period of the samples is abbreviated to D₀ (0 days), D₁ (15 days), D₂ (30 days), D₃ (45 days), D₄ (60days), D₅ (75 days), D₆ (90 days).

Total Soluble Solid (TSS) °Brix

Result regarding the drying methods, packaging, sulfur dosage and storage interval on total soluble solid of dried apricot are shown in Table 4.1. TSS content of the samples at storage period of D₀ was: T₀ (30.60 °Bx), T₁ (30.70 °Bx), T₂ (30.80 °Bx), T₃ (30.80 °Bx), T₄ (30.70 °Bx), T₅ (30.80 °Bx), T₆ (30.70 °Bx) and T₇ (30.80 °Bx), while of the D₆ was: T₀ (28.00 °Bx), T₁ (29.30 °Bx), T₂ (28.40 °Bx), T₃ (29.40 °Bx), T₄ (28.70 °Bx), T₅ (29.80 °Bx), T₆ (28.60 °Bx) and T₇ (30.00 °Bx). The TSS content was slightly reduced in all the samples in storage.

Statistical analysis of the data showed that both treatment and storage period had a significant effect

($p < 0.05$) in TSS of the sun-dried apricots. These results are in agreement with the findings of Kinh *et al.*, (2001) who reported an increase in TSS of apple pulp preserved with chemical preservatives.

Moisture Percentage (% age)

Moisture plays most important role in any food and fruit product and greatly influenced the microbial spoilage of food. Results pertaining to the response of drying methods, storage interval, sulfur dosage and packaging material on percent moisture of dried apricot are presented in Table 4.2. Moisture content of the samples at storage period of D_0 was: T_0 (18.50 %), T_1 (18.40 %), T_2 (18.60 %), T_3 (18.50 %), T_4 (18.30 %), T_5 (18.50 %), T_6 (18.40 %) and T_7 (18.30 %), while of the D_6 was: T_0 (20.20 %), T_1 (17.90 %), T_2 (20.40 %), T_3 (18.00 %), T_4 (20.20 %), T_5 (17.90 %), T_6 (20.30 %) and T_7 (17.80 %). The moisture content was slightly decreased in all the samples in storage.

Statistical analysis of the data showed that treatment of the sun-dried apricot had significant effect ($p < 0.05$) and storage interval had non significant effect on moisture content of sun-dried apricots. These results are accordance with that of Joslyn *et al.* (1954) that sulphuring or sulphiting facilitate drying by plasmolyzing the cells. The losses of moisture content in the samples may be due to this reason. During the storage of dried apricot, significant reduction in moisture content was noticed. Similar losses has been reported by Wahid *et al.* (1992) when solar dried persimmon slice were packed in polyethylene bags stored in ambient condition for 5 months. Moisture content of the product reduced to 65%.

Table 4.1. Analysis of total soluble solids ($^{\circ}\text{Bx}$) of different samples of sun-dried apricot stored at ambient temperature.

Treatments	Storage Intervals (Days)							Mean
	(D ₀) 0	(D ₁) 15	(D ₂) 30	(D ₃) 45	(D ₄) 60	(D ₅) 75	(D ₆) 90	
T_0	30.60	30.40	30.20	29.50	29.00	28.60	28.00	29.47E
T_1	30.70	30.50	30.30	30.00	29.80	29.50	29.30	30.01BC
T_2	30.80	30.50	30.10	29.80	29.20	28.80	28.40	29.66DE
T_3	30.80	30.60	30.40	30.20	30.00	29.80	29.40	30.17AB
T_4	30.70	30.50	30.30	29.80	29.20	28.90	28.70	29.73CDE
T_5	30.80	30.60	30.50	30.30	30.10	30.00	29.80	30.30AB
T_6	30.70	30.50	30.20	29.90	29.60	29.00	28.60	29.79CD
T_7	30.80	30.60	30.50	30.30	30.20	30.10	30.00	30.36A
Mean	30.74A	30.53AB	30.31B	29.98C	29.64D	29.34E	29.03F	

The values with different capital letters in each row and column are significantly different from each other.

Table 4.2. Analysis of % moisture of different samples of sun-dried apricot stored at ambient temperature.

Treatments	Storage Intervals (Days)							Mean
	(D ₀) 0	(D ₁) 15	(D ₂) 30	(D ₃) 45	(D ₄) 60	(D ₅) 75	(D ₆) 90	
T_0	18.50	18.80	19.10	19.40	19.70	19.90	20.20	19.37A
T_1	18.40	18.30	18.30	18.20	18.00	18.00	17.90	18.16B
T_2	18.60	18.90	19.20	19.50	19.80	20.00	20.40	19.49A
T_3	18.50	18.50	18.40	18.20	18.20	18.10	18.00	18.27B
T_4	18.30	18.80	18.90	19.10	19.40	19.80	20.20	19.21A
T_5	18.50	18.50	18.40	18.30	18.20	18.00	17.90	18.26B
T_6	18.40	18.80	19.00	19.30	19.60	19.80	20.30	19.31A
T_7	18.30	18.20	18.20	18.10	18.00	18.00	17.80	18.09B
Mean	18.44	18.60	18.69	18.76	18.86	18.95	19.09	

The values with different capital letters in each row and column are not significantly different from each other.

Organoleptic Evaluation

All the samples of sun-dried apricots were sensory evaluated for the color, taste, texture and overall acceptability at 15 days storage interval for the period of the three months by using nine-point hedonic scale in which high score indicated extremely liked and lower score for disliked.

Color

Color of food plays an important role for consumer attraction. The result towards the food product pertaining to the response of various treatments, of sun-dried apricots stored at room temperature on color is presented in Table 4.8. The scoring for color of the samples at storage period of D_0 was scored for T_0 (5.00), T_1 (5.50), T_2 (6.00), T_3 (6.20), T_4 (6.40), T_5 (7.20), T_6 (7.00) and T_7 (8.50), while of the D_6 was: T_0 (4.00), T_1 (4.20), T_2 (4.80), T_3 (5.60), T_4 (5.10), T_5 (5.80), T_6 (5.20) and T_7 (7.20). Maximum score was graded to sample T_7 (7.20), while minimum to T_0 (5.00) at three months storage.

Statistical analysis showed that both treatment and storage interval had significant effect ($p < 0.05$) on the color of the sun dried apricot. These results are in agreement with the findings of Brenndor *et al.* (1985) who reported that SO_2 reduces browning of fruits and vegetables. The reduction in color score might be due to maillard reaction accelerated during storage.

Table 4.7 Analysis of total fungal count (cfu/g) of different samples of sun-dried apricot stored at ambient temperature.

Treatments	Storage Intervals (Days)							Mean
	(D ₀) 0	(D ₁) 15	(D ₂) 30	(D ₃) 45	(D ₄) 60	(D ₅) 75	(D ₆) 90	
T ₀	96	283	571	960	1454	2065	2713	1163.0A
T ₁	75	135	213	398	677	963	1329	541.4B
T ₂	25	47	97	164	293	434	519	225.1BC
T ₃	19	36	67	103	131	163	189	101.1BC
T ₄	39	92	187	319	486	611	877	373.0BC
T ₅	36	51	89	191	301	469	587	246.3BC
T ₆	12	21	29	40	82	113	159	65.14C
T ₇	9	9	17	26	41	65	79	35.14C
Mean	38.88C	84.25C	158.8C	275.1BC	433.1ABC	610.0AB	806.5A	

The values with different capital letters in each row and column are not significantly different from each other.

Table 4.8 Scoring of color of different samples of sun-dried apricot stored at ambient temperature.

Treatments	Storage Intervals (Days)							Mean
	(D ₀) 0	(D ₁) 15	(D ₂) 30	(D ₃) 45	(D ₄) 60	(D ₅) 75	(D ₆) 90	
T ₀	5.00	5.00	4.80	4.60	4.40	4.20	4.00	4.57G
T ₁	5.50	5.20	5.00	4.80	4.60	4.40	4.20	4.81F
T ₂	6.00	5.80	5.60	5.40	5.20	5.00	4.80	5.40E
T ₃	6.20	6.00	5.80	5.60	5.47	5.10	5.60	5.68D
T ₄	6.40	6.20	6.00	5.70	5.80	5.30	5.10	5.79D
T ₅	7.20	7.00	6.80	6.60	6.40	6.10	5.80	6.56B
T ₆	7.00	6.80	6.50	6.20	6.60	5.60	5.20	6.27C
T ₇	8.50	8.20	8.00	7.90	7.70	7.50	7.20	7.86A
Mean	6.48A	6.28B	6.06C	5.85D	5.77D	5.40E	5.24F	

The values with different capital letters in each row and column are significantly different from each other.

CONCLUSION AND RECOMMENDATIONS

In this research work selected variety of apricot (Halman) was sun-dried using two different drying procedure Local and Turkey methods. The sun-dried apricot was packed in polyethylene white glassy bags, stored at ambient temperature (25-30 °C) for a period of three months. The products were analysed at each 15 days interval physico-chemically (TSS, moisture, ascorbic acidity, pH, titratable acidity and dry solids), microbial (total count) and organoleptically (color, taste and texture). Among all these samples T₅ (Turkey method + Packed) and T₇ (Turkey method + sulfur dioxide fumigation + Packed) were found most acceptable on the overall basis of analysis.

Suggestions for further work on the same project

1. The same study should be carried out on the dehydrated apricot.
2. The influence of irradiation should be studied on the shelf life of sun-dried apricot.
3. The influence of colored packaging should be studied on the fruit nutritive, microbial and organoleptical analysis.

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