

# DETERMINATION OF DRYING CHARACTERISTICS AND QUALITY PROPERTIES OF EGGPLANT IN DIFFERENT DRYING CONDITIONS

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## ABSTRACT

Drying is the most traditional process used for preserving eggplant a long time. The aim of this study was to determining drying characteristics and quality properties of eggplant dried by sun drying, hot air convective drying and infrared assisted convective drying. Convective drying and infrared assisted convective were carried out in a convective dryer at three different temperatures (40°, 50°, 60°C) and air velocity at 5 m/s.

The increasing of temperatures during the drying of eggplant led to a significant reduction of the drying time. However loss of nutrition was observed in eggplant samples dried at higher temperature. The biggest change in colour parameters was observed in samples dried with sun drying. So it was thought that sun drying had a negative effect on quality properties of eggplant samples.

- Keywords: eggplant, air drying, infrared -

## INTRODUCTION

Eggplant (*Solanum melongena* L.) is a common annual vegetable crop grown in the subtropics and tropics (CONCELLON, 2012). Eggplant is an important market vegetable of Asian and Mediterranean countries and has a very limited shelf life for freshness (WU *et al.*, 2007; BOULEKBACHE-MAKHLOUF *et al.*, 2013). Its shelf-life at temperature of 10–15°C is about 10 days (HU *et al.* 2010). The limited shelf-life constitutes a heavy drawback for commercial purpose (BRASIELLO *et al.*, 2013).

Drying which is the process of removal of most of the moisture present in the food is the oldest preservation method applied since ancient times (AYHAN and ALİBAŞ, 2005; ER and AKBULUT, 2011; ALİBAŞ, 2012). The removal of moisture from the food materials prevents the growth and reproduction of spoilage microorganisms, slows down the action of enzymes and minimizes many of the physical and chemical reactions (CEYLAN *et al.*, 2006; WU *et al.*, 2007; GUINE *et al.*, 2012a). Nowadays drying process of product is carried out by various methods such as sun drying, contact, convective, radiation, dielectric, vacuum, freeze drying and osmotic drying (KARABAYIR, 2006). Natural sun drying is practiced widely in the World and also Turkey, but has some problems related to the contamination by dirt and dust and infestation by insects, rodents and other animals (KOCA-BIYIK and DEMİRTÜRK, 2008). Therefore, the convective drying process carried out in closed equipments is preferred (ERTEKIN and YALDIZ, 2004).

Convective drying is the most traditional dehydration method used to preserve foods; it mainly consists of forcing air through the product to be dried. The surface area of the product to be dried, the drying time, drying temperature, air velocity, moisture content of air and atmospheric pressure determine drying efficiency (CEMEROĞLU, 2004). Convective drying processing effectively extends the shelf life of agricultural products, however this drying process involves chemical, physical, structural and nutritional changes, linked to the water loss and the high temperatures applied, which affect the product quality (GARCIA-PEREZ *et al.*, 2012). Loss of sensory and nutritive qualities is considered inevitable during traditional drying process due to the undesirable textural and biochemical changes (WU *et al.*, 2007). The expansion of dehydrated food market demands high quality products that maintain at a very high level the nutritional and sensorial properties of the initial fresh product (RUSSO *et al.*, 2013). Infrared radiation has significant advantages over conventional drying. These advantages are higher drying rate, energy saving, and uniform temperature distribution giving a better quality product. At present, many

driers use infrared radiator to improve drying efficiency, save space and provide clean working environment, etc. Therefore infrared drying can become popular as an energy saving drying method (WANG and SHENG, 2006).

Drying times of carrot pomace dried at the infrared power levels of 83, 125, 167 and 209 W were studied. According to the results, it was determined that drying rate increased and drying time decreased with increasing infrared power level (DOYMAZ, 2013).

The effect of harvest time and drying techniques on the quality characteristics, which are specifically important for maize crop were investigated. Energy expenses of the drying techniques were calculated for all harvest periods and it was found out that the expenses to reduce the moisture level from 15 to 13% with hot air drying are higher than the expenses to reduce moisture level from 29 to 13% with infrared-hot air drying combination (YILMAZ and TUNÇEL, 2008).

ABDELMOTALEB *et al.* (2009) investigated thin layer drying of garlic slices under convection and combined infrared–convection heating modes and observed increases in drying rate, thermal efficiency, rehydration ratio, flavor strength and colour difference and decreases in drying time and specific energy consumption for the combined (infrared–convection) heating mode in comparison with convection only.

Effects of infrared power, air temperature and air velocity on drying rate and quality of onion slices dried in infrared-convective dryer were studied. It was found that drying time of onion slices increased with increasing air velocity, and decreased with increasing temperature and infrared power (SHARMA *et al.*, 2005).

The objectives of this study were to investigate the drying characteristics of the eggplant samples, to examine the effect of drying conditions on the drying process, and to choose optimum drying method for quality of dried eggplant samples.

## MATERIALS AND METHODS

### Sample preparation

Fresh eggplants were obtained from Öcal Agricultural Product Limited Company (Turgutlu, Manisa, Turkey). Vegetables were washed and sliced (30 mm diameter and 6 mm thickness). Eggplant slices were placed over a metal grating in a convective oven operating at constant temperature (RUSSO *et al.*, 2013).

### Drying experiments

Eggplant slices were subjected to drying with three methods. These drying methods were:

sun drying, hot air convective drying and infrared assisted convective drying. Convective drying and infrared assisted convective drying of eggplants were carried out in a drying system consisting of solar collector, carbon fiber infrared heaters, drying chamber, condenser, heat exchanger, hot water tank, and PLC (Programmable logic controller) panel at three different temperatures (40°, 50°, 60°C) and air velocity of 5 m/s.

### Drying kinetics

In our study drying time was defined as the time passing from initial moisture content of the samples until final moisture content of samples. Drying rate was described as the amount of water removed from the sample per unit of time. Effect of temperature on drying time and drying rate of eggplant samples was determined (NASIROĞLU and KOCABIYIK, 2007).

### Specific energy consumption

Specific energy consumption is amount of energy required for removing unit amount of water from samples during drying of samples. Specific energy consumption of eggplant samples dried in different conditions was calculated as follows Eq. (1):

$$E_s = E_T / W_R \quad (1)$$

$E_s$  : Specific energy consumption (MJ/kg),  
 $E_T$  : Total energy (MJ),  
 $W_R$  : Amount of water removed during drying (kg)  
 (SHARMA and PRASAD, 2006).

### Shrinkage

Shrinkage, which occurred during drying as a result of water evaporation, was evaluated by determination of the relative volume of dried material. The relative volume was the ratio of eggplant slices volume after drying to that before drying as follows Eq. (2):

$$V_s = V / V_0 \quad (2)$$

$V_s$  = Shrinkage  
 $V$  = Volume of dried samples  
 $V_0$  = Volume of fresh samples (FIGIEL, 2010).

### Rehydration

Rehydration kinetics study was carried out for dried eggplant slices. The samples were placed in water at 45°C and waited for 5 h. The rehydrated samples were spread on absorbent paper for the removal of free water on the surface of vegetable. The change in weight was recorded after a regular interval of time. The rehydration capacity was calculated from the ratio of

sample weight after and before the rehydration as follows Eq. (3):

$$R_R = M_R / M_D \quad (3)$$

$R_R$  = Rehydration ratio  
 $M_R$  = Weight of rehydrated samples  
 $M_D$  = Weight of dried samples (RUSSO *et al.*, 2013).

### Colour parameters

Colour of dried and fresh samples was evaluated by means of a Minolta Chroma Meter CR-300 (Minolta Co. Ltd., Osaka, Japan). Instrumental colour data were expressed as CIE  $L^*$ ,  $a^*$ ,  $b^*$  coordinates, which define the colour in a three-dimensional space:  $L^*$  (dark–light),  $a^*$  (redness–green) and  $b^*$  (yellowness–blueness). Total colour difference ( $\Delta E$ ), chroma (C), hue angle (h) and R (a/b) values were calculated by using  $L^*$ ,  $a^*$ ,  $b^*$  values in Eqs. (4)–(7). Eggplant slices were placed in container without space. Colour measurements were performed twice (DEMIR and AKBULUT 2010; NASIROĞLU and KOCABIYIK, 2007).

$$\Delta E^* = \sqrt{(L^*_0 - L^*)^2 + (a^*_0 - a^*)^2 + (b^*_0 - b^*)^2} \quad (4)$$

$$C^* = \sqrt{a^{*2} + b^{*2}} \quad (5)$$

$$h = \tan^{-1} \frac{b^*}{a^*} \quad (6)$$

$$R = \frac{a^*}{b^*} \quad (7)$$

### Textural properties

For determining the textural properties of fresh and rehydrated eggplant slices, texture profile analysis (TPA) was performed using a Texture Analyser (model TA.XT.Plus). The texture profile analysis was carried out by two compression cycles between parallel plates performed on cylindrical samples (diameter 10 mm, height 3 mm) using a flat 35 mm diameter plunger, with a 5 s of time between cycles. The parameters that have been used were the following: 50 kg force load cell and 0.5 mm s<sup>-1</sup> test speed (NAYAK *et al.*, 2007; GUINE and BARROCA, 2012b; RUSSO *et al.*, 2013).

The textural properties: hardness, springiness, cohesiveness, gumminess and chewiness were calculated after Eqs. (8)–(12):

$$\text{Hardness, } H = F1 \quad (8)$$

$$\text{Springiness, } S = \Delta T2 / \Delta T1 \quad (9)$$

$$\text{Cohesiveness, } C = A2 / A1 \quad (10)$$

$$\text{Gumminess, } G = H \times C \quad (11)$$

$$\text{Chewiness} = H \times S \times C \quad (12)$$

## Total Dry Matter

Dry matter of dried and fresh samples was determined by drying the samples cut into small pieces at 105°C to constant weight. Total dry matter content of the samples was calculated from the difference in mass before and after the drying process (CEMEROĞLU, 2007; ÖZTÜRK and ÇAPUR, 2010).

## Water activity

Water activity measurement set was used for determination of water activity values of all the samples. In this system, the product to measured water activity was cut into small pieces, placed in a hermetic steel chamber. When humidity of air inside the container reached equilibrium with the product, equilibrium moisture content of samples was measured by probe in the container (HASTÜRK-ŞAHİN and ÜLGER, 2010).

## Ascorbic acid (Vitamin C)

A spectrophotometric method was used to determine the total amount of vitamin C in the eggplant slices. The absorbance value of samples was measured by means of a Uv-Visible spectrophotometer (Shimadzu Corp., Kyoto, Japan) with wavelength at 518 nm. Ascorbic acid of samples were calculated from standard curve showed absorbance values to concentrations of ascorbic acid and expressed as microgram of ascorbic acid per 100 gram of sample (HIŞİL, 2010).

## Statistical analysis

In our study drying methods in different conditions were designed as applications and a completely randomized design was used for statistical analysis. These applications were sun drying, hot air convective drying (40°, 50°, 60°C)

and infrared assisted convective drying (40, 50, 60°C). Effect of different drying methods and drying conditions on drying characteristics, chemical, physical and textural properties of eggplant samples was determined. Number of replication was two. In order to determine the differences between applications, analysis of variance (ANOVA) was carried out using Statistical Analysis Software (SAS, 2001). Data found important in result of ANOVA were evaluated with PROC MIXED procedure. For every data LSMEANS values were determined and least significant differences (LSD) between data were calculated.

## RESULTS AND DISCUSSION

### Drying kinetics of eggplant samples

In our project it was observed that drying method affected drying time of eggplant slices. Drying time of infrared assisted convective drying and convective drying was shorter than drying time of sun drying. Infrared application decreased drying time of eggplant samples during convective drying at air temperature of 50° and 60°C. Also UMESH-HEBBAR *et al.* (2004) reported that the combined infrared and hot air dryer reduced the processing time dramatically (48%), in addition to consuming less energy (63%) for water evaporation compared to hot air drying.

In convective drying, drying time of the eggplant samples showed reduction with increasing temperature. However drying rate of eggplant samples increased at higher temperature (Fig. 1). Similarly the effect of temperature on the drying kinetics and quality attributes of apple (var. Granny Smith) slices during drying was investigated and the experimental results of study showed that dehydration were faster

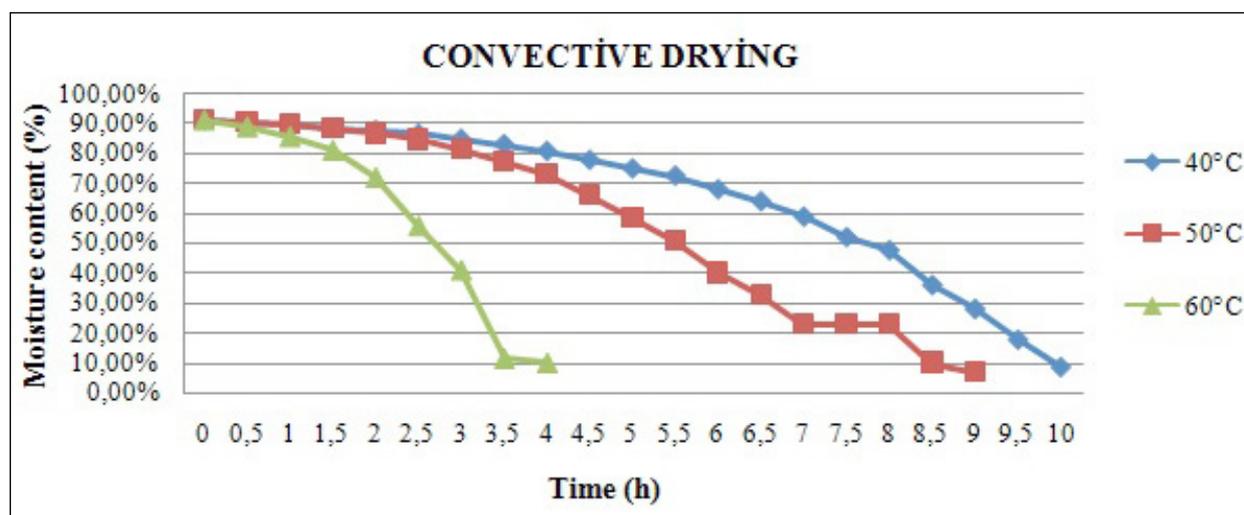


Fig. 1 - Drying curves of eggplant samples dried with convective drying at three different temperatures.

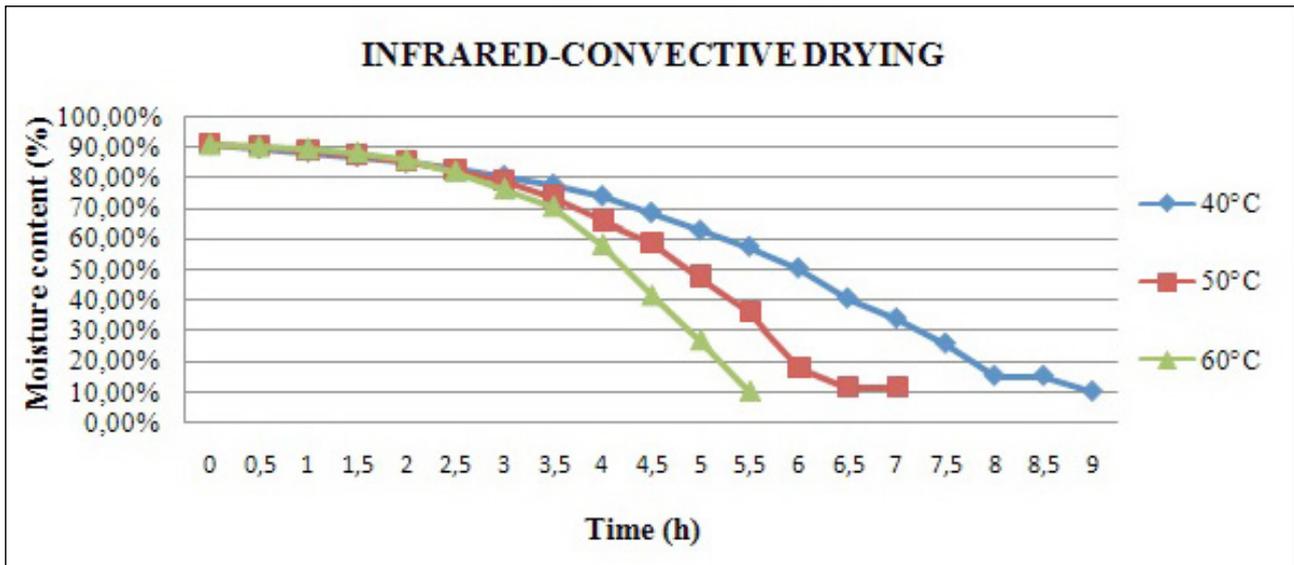


Fig. 2 - Drying curves of eggplant samples dried with infrared-convective drying at three different temperatures.

when air temperature increased (VEGA-GALVEZ *et al.*, 2012). Effect of air temperature on drying time of cornelian cherry fruits dried in convective dryer was investigated, it was observed that increasing air temperature reduced drying time by 34% (KAYA and AYDIN, 2008). Similar result were described by ERTEKIN and YALDIZ (2004) working about drying characteristics of eggplants dried using heated ambient at air temperatures from 30° to 70°C and it was stated that drying time decreased with increasing drying air temperature.

During the infrared assisted convective dry-

ing, drying time of the eggplant samples showed reduction with increasing temperature. However drying rate of eggplant samples increased at higher temperature (Fig. 2). TOĞRUL *et al.* (2005) studied drying characteristics of banana slices dried in infrared dryer at drying temperature ranging from 50° to 80°C and it was found that drying rate increased with increasing drying temperature.

When eggplant samples were dried with sun drying, it was determined that sun drying took a longer time than convective drying and infrared assisted convective drying (Fig. 3).

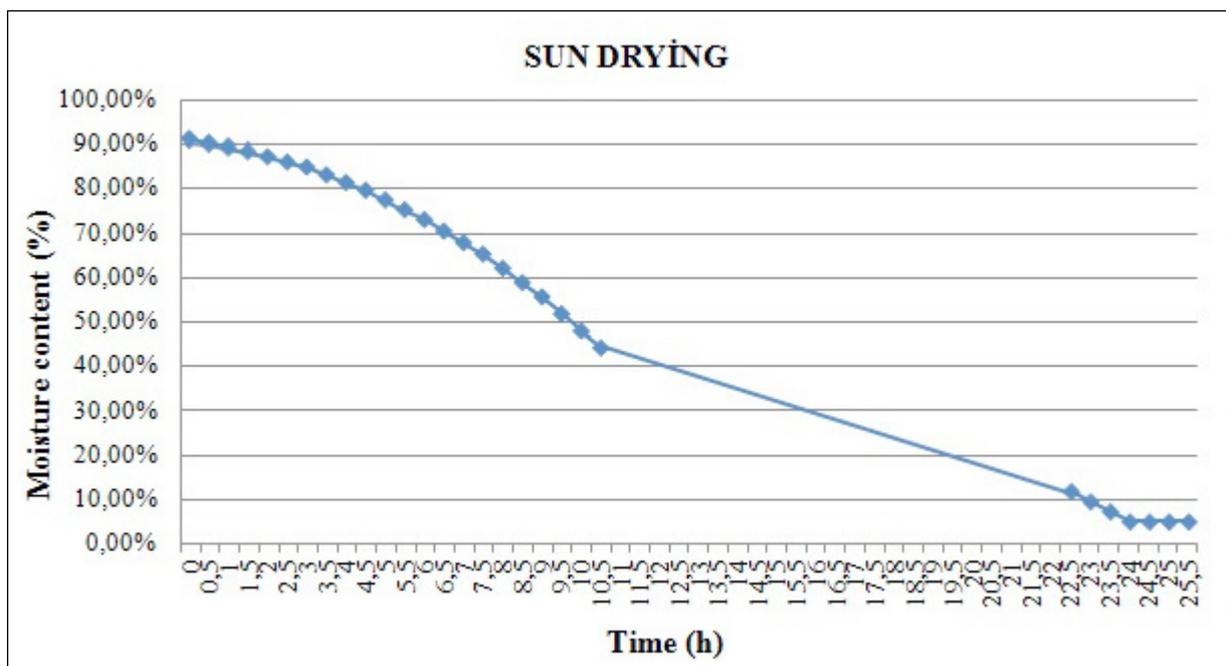


Fig. 3 - Drying curves of eggplant samples dried with sun drying.

### Specific energy consumption of dried eggplant samples

In our study amount of energy required for drying of samples was calculated. Specific energy consumptions of dried eggplant samples are showed in Table 1. As a result of statistical analysis, it was determined that there were not important differences between specific energy consumption values of dried eggplant samples

Table 1 - Specific energy consumption values of dried eggplant samples (kj/kg).

Drying methods	Eggplant
CD (40°C)	0,0023±0,001
CD (50°C)	0,0040±0,004
CD (60°C)	0,0033±0,000
ICD (40°C)	0,0018±0,001
ICD (50°C)	0,0036±0,001
ICD (60°C)	0,0038±0,0001
SD	0±0,000
	p=0.3071

CD: Convective drying, ICD: Infrared assisted convective drying, SD: Sun drying.

Table 2 - Rehydration ratios of dried eggplant samples.

Drying methods	Eggplant
CD (40°C)	5,27±0,23 <sup>c</sup>
CD (50°C)	5,71±0,26 <sup>cb</sup>
CD (60°C)	5,81±0,35 <sup>ab</sup>
ICD (40°C)	5,42±0,07 <sup>cb</sup>
ICD (50°C)	5,92±0,10 <sup>ab</sup>
ICD (60°C)	6,33±0,08 <sup>a</sup>
SD	5,50±0,31 <sup>cb</sup>
	p=0.0283
	LSD=0.539

at different drying methods ( $p>0.05$ ). The lowest specific energy consumption of eggplant slices was measured during infrared assisted convective drying at air temperature of 40°C. According to results obtained from previous study, specific energy for drying of mushroom slices in a hot air flow-infrared combination dryer increased with increasing temperature, while the specific energy for mushroom drying in the convection dryer decreased with increasing temperature (MİNAEİ *et al.*, 2011).

### Rehydration ratio of dried eggplant samples

In our project rehydration ratio values of eggplant samples dried with different drying methods were determined. Data obtained as a result of analysis were given in Table 2. Increasing air temperature increased rehydration ratio values of eggplant samples. Similarly RUSO *et al.* (2013) did scientific study about dried and rehydrated eggplant and state that samples dried at higher temperature showed faster water uptake during rehydration because of wrinkled structure.

It was determined that drying methods had a significant effect on rehydration ratio values of dried eggplant samples ( $p<0.05$ ). Especially it was observed that there was important difference between the rehydration ratio values of eggplant samples dried with convective drying at 40°C and the rehydration ratio values of eggplant samples dried with infrared assisted convective drying at 60°C. Change in rehydration ratio of dried eggplant samples was given in Fig. 4. Rehydration ratio of dried eggplant samples reached to maximum value in five hour. Drying method did not affect rehydration time of dried eggplant samples.

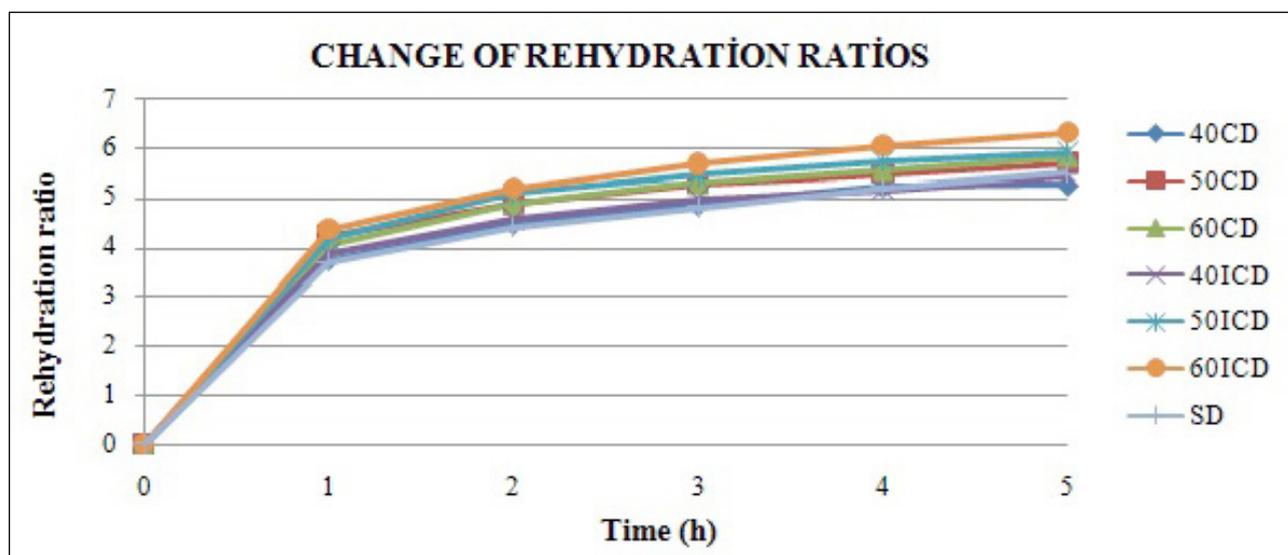


Fig. 4 - Change of rehydration for eggplant samples dried at different conditions.

### Shrinkage of dried eggplant samples

Shrinkage values of dried eggplant were determined with analysis and showed in Table 3. Increasing of air temperature in convective dryer caused increasing of shrinkage values of eggplant slice. As a result of statistical analysis it

Table 3 - Shrinkage of dried eggplant samples.

Drying methods	Eggplant
CD (40°C)	0,225±0,05
CD (50°C)	0,239±0,02
CD (60°C)	0,278±0,024
ICD (40°C)	0,217±0,032
ICD (50°C)	0,254±0,076
ICD (60°C)	0,271±0,012
SD	0,230±0,034
	p=0.6868

was found that drying conditions did not have an important effect on shrinkage values of dried eggplant samples ( $p>0.05$ ). However LEWICKI and JAKUBCZYK (2004) investigated mechanical properties of apples dried at drying temperature ranging from 50° to 80°C in a laboratory convection dryer and found that the increasing drying temperature caused the gradual decrease of shrinkage values.

Table 4 - Chemical properties of eggplant samples.

Samples	Total Dry Matter	Water Activity	Ascorbic Acid (mg/100g)	Loss of Ascorbic Acid (%)
Fresh	8,81±0,516 <sup>a</sup>	0,991±0,010 <sup>a</sup>	16,22±0,08 <sup>a</sup>	-
CD (40°C)	90,73±2,520 <sup>b</sup>	0,594±0,013 <sup>b</sup>	12,36±0,625 <sup>bc</sup>	23,76±4,20 <sup>cd</sup>
CD (50°C)	92,12±0,177 <sup>b</sup>	0,501±0,026 <sup>d</sup>	11,44±0,577 <sup>c</sup>	29,46±3,24 <sup>bc</sup>
CD (60°C)	90,25±1,582 <sup>b</sup>	0,555±0,033 <sup>bcd</sup>	9,74±0,481 <sup>d</sup>	39,92±3,25 <sup>ab</sup>
ICD (40°C)	90,27±1,117 <sup>b</sup>	0,568±0,002 <sup>bc</sup>	12,53±0,577 <sup>bc</sup>	22,73±3,21 <sup>cd</sup>
ICD (50°C)	91,43±4,582 <sup>b</sup>	0,584±0,040 <sup>bc</sup>	11,37±0,866 <sup>c</sup>	29,86±5,03 <sup>bc</sup>
ICD (60°C)	89,21±4,509 <sup>b</sup>	0,591±0,050 <sup>b</sup>	9,54±0,962 <sup>d</sup>	41,18±5,65 <sup>a</sup>
SD	87,75±0,080 <sup>b</sup>	0,522±0,005 <sup>cd</sup>	13,76±0,962 <sup>b</sup>	15,18±5,57 <sup>d</sup>
	p<0.0001	p<0.0001	p=0.0002	p=0.0053
	LSD=5.864	LSD=0.064	LSD=1.6135	LSD=10.465

Table 5 - Textural properties of fresh and rehydrated eggplant samples.

Samples	Hardness (N)	Springiness	Cohesiveness	Gumminess (N)	Chewiness (N)
Fresh	148,8±2,73 <sup>a</sup>	0,670±0,026	0,577±0,005 <sup>e</sup>	85,90±2,28 <sup>a</sup>	57,17±0,160 <sup>a</sup>
RCD (40°C)	50,78±8,23 <sup>b</sup>	1,877±1,428	0,708±0,023 <sup>dc</sup>	36,00±4,29 <sup>b</sup>	32,12±2,56 <sup>b</sup>
RCD (50°C)	47,27±3,88 <sup>b</sup>	0,816±0,003	0,693±0,019 <sup>d</sup>	32,81±3,47 <sup>b</sup>	27,49±3,56 <sup>b</sup>
RCD (60°C)	44,65±7,71 <sup>b</sup>	1,895±1,465	0,705±0,017 <sup>dc</sup>	31,48±6,02 <sup>b</sup>	27,19±4,28 <sup>b</sup>
RICD (40°C)	52,59±3,67 <sup>b</sup>	1,331±0,792	0,754±0,043 <sup>ab</sup>	39,22±0,814 <sup>b</sup>	32,39±2,13 <sup>b</sup>
RICD (50°C)	47,77±9,51 <sup>b</sup>	0,878±0,084	0,686±0,010 <sup>d</sup>	32,55±5,77 <sup>b</sup>	28,77±7,84 <sup>b</sup>
RICD (60°C)	42,08±8,68 <sup>b</sup>	0,889±0,013	0,747±0,016 <sup>abc</sup>	31,21±7,27 <sup>b</sup>	27,69±5,71 <sup>b</sup>
RSD	41,63±7,04 <sup>b</sup>	0,881±0,033	0,774±0,009 <sup>a</sup>	32,26±5,10 <sup>b</sup>	28,48±3,56 <sup>b</sup>
	P<0.0001	p=0.6138	p=0.0003	p<0.0001	p=0.0015
	LSD=15.879	LSD=0.048	LSD=11.07	LSD=9.9053	

RCD: Rehydrated Convective drying.

### Chemical properties of eggplant samples

In our project total dry matter, water activity, ascorbic acid and loss of ascorbic acid of eggplant samples were detected. These data were showed in Table 4. Eggplant samples were dried to 90% dry matter content. The highest ascorbic acid loss in dried samples was determined in eggplant samples dried with infrared assisted convective drying at 60°C. The lowest ascorbic acid loss was observed in samples dried with sun drying.

Effect of different drying methods on chemical properties of eggplant samples was examined as statistical, it was determined that drying methods had a significant effect on total dry matter, water activity, ascorbic acid and loss of ascorbic acid of eggplant samples ( $p<0.05$ ).

### Textural properties of eggplant samples

In our thesis project hardness, springiness, cohesiveness, gumminess and chewiness values of fresh and rehydrated samples were measured for determining textural properties of eggplant samples. Textural properties of eggplant samples were given in Table 5.

As a result of statistical examination of textural properties of rehydrated samples, rehydration process was found important in terms of hard-

Table 6 - Colour parameters of eggplant samples.

Samples	L*	a*	b*	Chroma	Hue angle	R (a/b)	ΔE
Fresh	61,64±1,23 <sup>a</sup>	3,74±0,02	19,55±0,648 <sup>a</sup>	19,91±0,636 <sup>a</sup>	79,27±0,197 <sup>a</sup>	0,190±0,004 <sup>b</sup>	-
CD (40°C)	50,10±0,108 <sup>b</sup>	6,97±1,72	17,96±0,616 <sup>ab</sup>	19,91±0,308 <sup>a</sup>	69,69±4,98 <sup>b</sup>	0,378±0,107 <sup>a</sup>	12,53±2,12
CD (50°C)	47,52±2,52 <sup>bc</sup>	7,20±0,101	16,98±0,062 <sup>bc</sup>	18,45±0,015 <sup>ab</sup>	66,95±0,372 <sup>b</sup>	0,426±0,008 <sup>a</sup>	14,84±1,37
CD (60°C)	47,85±2,28 <sup>bc</sup>	6,09±0,318	15,45±0,847 <sup>c</sup>	16,61±0,670 <sup>c</sup>	68,48±2,16 <sup>b</sup>	0,395±0,044 <sup>a</sup>	14,72±1,34
ICD (40°C)	47,81±0,986 <sup>bc</sup>	5,67±1,02	15,31±0,554 <sup>c</sup>	16,34±0,872 <sup>c</sup>	69,77±2,62 <sup>b</sup>	0,369±0,052 <sup>a</sup>	14,26±0,522
ICD (50°C)	47,91±1,64 <sup>bc</sup>	6,48±0,621	17,87±1,37 <sup>ab</sup>	19,01±1,50 <sup>ab</sup>	70,05±0,325 <sup>b</sup>	0,363±0,006 <sup>a</sup>	13,93±2,40
ICD (60°C)	50,17±1,00 <sup>b</sup>	5,30±0,477	17,04±1,25 <sup>bc</sup>	17,86±1,05 <sup>bc</sup>	72,58±2,66 <sup>b</sup>	0,315±0,051 <sup>a</sup>	12,10±0,055
SD	44,77±4,01 <sup>c</sup>	5,85±1,03	16,79±0,268 <sup>bc</sup>	17,80±0,082 <sup>bc</sup>	70,79±3,41 <sup>b</sup>	0,349±0,067 <sup>a</sup>	17,27±5,16
	p=0.001 LSD=4.7391	p=0.0591	p=0.0126 LSD=1.8826	p=0.0121 LSD=1.832	p=0.0343 LSD=6.0647	p=0.0491 LSD=0.1246	p=0.496

ness, cohesiveness, gumminess and chewiness values of samples ( $p < 0.05$ ). However it was determined that there was not an important difference between the springiness values of eggplant samples ( $p > 0.05$ ).

Results obtained from research indicated that hardness, gumminess and chewiness values of rehydrated samples were smaller than those of fresh samples. VEGA-GALVEZ *et al.* (2008) studied with red pepper samples (*Capsicum annuum* L.) dried at four air inlet temperatures from 50°C to 80°C and rehydrated in water at 30°C and found that firmness was significantly affected by the temperature used during drying.

#### Colour parameters of eggplant samples

In our project L\*, a\*, b\* values of fresh and dried eggplant samples were measured during determining colour parameters of samples. Chroma, hue angle, R(a/b) and total colour difference (ΔE) values were calculated by using L\*, a\*, b\* values of samples. Colour parameters of samples were showed in Table 6.

As a result of statistical examination, it found that drying method did not affect to a\* and ΔE values of eggplant samples ( $p > 0.05$ ), however it was determined that there were significant difference between L\*, b\*, chroma, hue angle, R(a/b) values of samples ( $p < 0.05$ ). So it was concluded that drying process had a significant effect on colour parameters of fresh samples. ERTEKIN and YALDIZ (2004) also investigated the effect of drying air temperature on colour parameters of the eggplant samples and suggested that increasing drying air temperature decreased the colour lightness and raised the saturation.

From the results of the present work it was concluded that drying process increased a\*, R(a/b) values of eggplant samples, while decreased L\*, b\*, chroma and hue angle values of eggplant samples. The biggest change in colour parameters was observed in samples dried with sun drying during the examination of colour parameters of fresh and dried eggplant samples. Therefore it was possible to determined that sun drying had a negative effect on quality properties of eggplant samples.

#### CONCLUSIONS

In our thesis project, the drying characteristics of the eggplant slices dried by sun drying, hot air convective drying (40°, 50°, 60°C) and infrared assisted convective drying (40°, 50°, 60°C) were studied. Air temperature in a convective dryer affected drying time of eggplant slices. Increasing drying air temperature decreased drying time and increased drying rate. Ascorbic acid value of eggplant samples dried by sun drying was quite high. However quality losses were observed in eggplant samples dried by sun drying. Convective drying at low temperature should be applied to maintain ascorbic acid content and quality of eggplant slices.

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