International Journal of Advance Research in Science and Engineering
Volume No.07, Special Issue No.04, March 2018
www.ijarse.com
IJARSE
ISSN: 2319-8354

Influence of Pre-treatments, Packaging material and Storage on the Crude and Dietary Fibre Content of Dried Tomato Slices (Variety Punjab Chuhra)

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ABSTRACT

The study was carried out to investigate the effect of different chemical pretreatments (2% ethyl oleate + 4% potassium carbonate (1 min) + 2% sodium metabisulfite (2 min). Packaging material (Low Density Polyethylene and Polyester) and Storage on the crude and dietary fibre content of the dried tomato slices (variety Punjab Chuhra). The effects of pretreatments, packaging material and storage and their interactions were found statistically significant ($p<0.05$).

Keywords: Polyester, Polyethylene, Pretreatments, Punjab Chuhra, Storage.

I.INTRODUCTION

Tomato (*Lycopersicon esculantum* L.*)* is one of the most widely consumed fresh vegetables in the world. Tomatoes are rich source of lycopene (60-90 mg kg-1), polyphenols (10-50 mg kg-1) and small quantities of vitamin E (5-20 mg kg-1) and also a nutritionally recognized vegetable for their vitamin C content, with an average tomato supplying about 40% of the adult United States Recommended Daily Allowances (RDA) of 60 mg (Charanjeet *et al.*, 2004).

The preservation of fruits and vegetables by dehydration offers a unique challenge. Due to the structural configuration of these products, the removal of moisture must be accomplished in a manner that will be least detrimental to the product quality. Tomato (*Lycopersicum esculantum* L.) has a limited shelf life at ambient conditions and is highly perishable. It creates glut during production season and becomes scanty during off-season. Over the past few years, consumers have increasingly demanded food products providing both good sensorial quality and specific nutritional properties. Thus, there exists a need to develop suitable technology for processing and preservation of this valuable product in a way that will not only check losses but also generate additional revenue for the country.

Tomato as other fruits and vegetables can be dried using various methods and the quality of dehydrated tomato depends on many parameters such as tomato variety, total soluble solid content of the fresh product, size of the tomato segments and air temperature. Processing of tomatoes using sun drying with cut pieces, drying of whole tomatoes, spray drying and convection drying using solar or mechanical systems has been used for many years (Baloch *et al.,* 2006).

Traditional sun-drying is a slow process compared with other drying methods and quality losses may result from high moisture content, colour degradation by browning, microbial growth (Lewicki *et al.,* 2002). Presently, there are few published studies comparing the single or mixed effects of calcium chloride and sodium metabisulfite dipping treatments on quality parameters of cabinet-dried tomatoes. Hence, the objective of this study was to evaluate the effects of different pre-treatments, packaging material and storage on the crude and dietary fibre content of dried tomato (variety Punjab Chuhra).

II.MATERIALS AND METHODS

One variety of fresh tomato (Punjab Chuhra) was selected for the present study. Fruits were sorted and washed with water to remove dirt and soil and finally they were cut into slices of 15mm thickness. Following pretreatments were applied to tomatoes before drying:

T0 Control: Non- pretreated samples were used as control samples.

T2: Whole tomatoes were dipped in 2% ethyl oleate + 4% potassium carbonate solution for one minute and then 2% sodium metabisulfite dipping solution was applied to sliced tomato slices for 2 minutes.

2.1 Crude fibre (%)

Crude fiber was determined by Weende method (1865) given by AOAC (2000). The sample was subjected to acid and alkali digestion, residue was obtained comprising ash. The residue was ignited and the organic matter got oxidized and inorganic residue or ash was left behind. The difference in the weight before and after ashing was determined.

$$\text{Crude fiber (\%)} = \frac{W_1 - W_2}{W} \times 100$$

Where,

W gm = weight of sample

W_1 gm = Residue (crude fiber + minerals)

W_2 gm= ash remained

2.2 Dietary fiber (%)

Dietary fiber was estimated by the dietary fibre system (Fibraplus DF). The method is given by JAOAC (1988). A known quantity of sample was incorporated in four 500ml beakers in equal amount.50ml of 0.08 M phosphate buffer (pH-6) was added to each beaker with 0.1ml α-amylase. Beakers were covered with aluminium foil and placed in water bath shaker for 15 mints at 95°C. After cooling the beakers to room temperature, 10ml of 0.275

N NaOH solutions was added to the beakers to adjust the pH to 7.5. 5 mg of protease was added to each beaker and 0.1 ml of 0.08M phosphate buffer to adjust the pH to 6. Again the beakers were incubated in water bath shaker for 30 mints at 60°C. After cooling, 10ml of 0.325N hydrochloric acid solution was added to maintain pH to 4.5. 0.3ml of amylo glucosidase was added to each beaker and incubated for 30 mints at 60° C. Solution obtained was filtered through glass crucibles. Precipitate was transferred from enzymatic digest to crucibles and washed with 20ml of 78% ethanol and 10ml of 95% ethanol and finally with% 10ml of acetone. Crucibles containing residue were dried in hot air oven and cooled. Crucibles were weighed to determine the weight of IDF (insoluble dietary fiber) residue. Duplicate residue was analyzed for protein by micro- Kjeldahl Method as outlined by Thimmaiah, 1999. Another residue was incinerated for Ash. The left over filtrate, four volumes of 95% ethanol were added to precipitate SDF (soluble dietary fiber). After one hour, the precipitate was transferred into crucibles, fitted in filtration module and the above procedure of estimating protein in sample residue and ash content in duplicate sample residue is repeated to get SDF value.

Calculations:

$$\text{Blank\%} = \text{wt. of the blank residue} - (\text{protein in blank residue} + \text{ash in blank residue}) *100$$

$$\text{IDF (\%)} = \frac{(\text{Wt. of IDF residue}) - (\text{protein in IDF residue+ ash in IDF Residue}) - \text{blank}*100}{\text{Weight of sample (g)}}$$

$$\text{SDF (\%)} = \frac{(\text{Wt. of SDF residue}) - (\text{protein in SDF residue+ ash in SDF Residue}) - \text{blank}*100}{\text{Weight of sample (g)}}$$

$$\text{TDF (\%)} = \text{IDF+SDF}$$

III.RESULTS AND DISCUSSION

3.1 Crude Fibre Content (%)

As can be seen in Table I, the minimum crude fibre content 3.23% was recorded in control (T_0) followed by the sample treated with 2% ethyl oleate + 4% potassium carbonate (1 min) + 2% sodium metabisulfite (2 min) with crude fibre content 3.91%. During storage of 180 days there was significant decrease in crude fibre content from 3.82 to 3.38% in dried tomato samples. In LDPE pouches minimum average crude fibre content of 3.48% was recorded in dried tomato samples during 180 days of storage, followed by 3.67% in PE pouches.

3.2 Dietary Fibre Content (%)

As can be seen in Table II, the minimum dietary fibre content 7.11% was recorded in control (T_0) followed by the sample treated with 2% ethyl oleate + 4% potassium carbonate (1 min) + 2% sodium metabisulfite (2 min) with Dietary fibre content 8.19%. During storage of 180 days there was significant decrease in dietary fibre

IJARSE
ISSN: 2319-8354

content from 8.13 to 7.32% in dried tomato samples. In LDPE pouches minimum average Dietary fibre content of 7.48% was recorded in dried tomato samples during 180 days of storage, followed by 7.82% in PE pouches.

The decrease in crude and dietary fibre content may be due to the increase in moisture content particularly in case of dried tomato slices stored in LDPE as it has high permeability to water. The results are in conformity with the findings of Opadotun *et al.* (2016).

IV.CONCLUSION

Fresh tomatoes are good source of crude and dietary fibre but with drying and storage there is a slight decrease in their content. The use of pre treatment and proper packaging material helps in slowing down the reduction of crude and dietary fibre.

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Table I: Effect of Pre-treatments, Packaging material and Storage on the Crude Fibre content (%) of the dried tomato slices.

Treatment		⇨ T_0PC			T_2PC			Factor Mean	
Packaging		⇨ LDPE	LPE	Sub Mean	LDPE	LPE	Sub Mean	Storage	Packaging
(days)	0	3.47	3.47	3.47	4.17	4.17	4.17	3.82	3.48
	60	3.11	3.34	3.23	3.86	4.07	3.97	3.60	3.67

IJARSE
ISSN: 2319-8354

	120	3.06	3.24	3.15	3.70	3.97	3.84	3.49	
	180	2.99	3.18	3.09	3.48	3.88	3.68	3.38	
	Mean	3.16	3.31	**3.23**	3.80	4.02	**3.91**		

CD (p≤0.05)

S: 0.017 P: 0.012 S×P: 0.024 T: 0.012 S×T: 0.024 P×T: 0.017 S×P×T: 0.034.

Where T_0= Control, T_2= 2% ethyl oleate + 4% potassium carbonate (1 min) + 2% sodium metabisulfite (2 min).

PC= Punjab Chuhra,

LDPE= Low Density Polyethylene

PE= Polyester

Table II: Table 36: Effect of Pre-treatments, Packaging material and Storage on the Dietary fibre content (%) of the dried tomato slices.

Treatment		⇨ **T_0PC**			**T_2PC**			**Factor Mean**	
Packaging		⇨ **LDPE**	**LPE**	**Sub Mean**	**LDPE**	**LPE**	**Sub Mean**	**Storage**	**Packaging**
Storage (days)	**0**	7.48	7.48	7.48	8.77	8.77	8.77	8.13	7.48
	60	6.94	7.32	7.13	7.95	8.48	8.22	7.67	7.82
	120	6.80	7.14	6.97	7.72	8.29	8.01	7.49	
	180	6.71	6.99	6.85	7.48	8.08	7.78	7.32	
	Mean	6.98	7.23	**7.11**	7.98	8.41	**8.19**		

CD (p≤0.05)

S: 0.022 P: 0.016 S×P: 0.032 T: 0.016 S×T: 0.032 P×T: 0.022 S×P×T: 0.045.

Where T_0= Control, T_2= 2% ethyl oleate + 4% potassium carbonate (1 min) + 2% sodium metabisulfite (2 min).

PC= Punjab Chuhra,

LDPE= Low Density Polyethylene

PE= Polyester