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# Physicochemical and microbiological evaluation of sun dried tomatoes in comparison with fresh tomatoes

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**Abstract:** The present study was conducted to evaluate the quality of sun dried tomatoes in comparison with fresh tomatoes. Fresh fully ripen tomatoes were washed and cut in thin slices with sterilized stainless steel knife and divided into two lots, one was taken as control and other was dipped in 3% potassium meta bisulfite solution for 5 minutes. The samples were spread over stainless steel trays covered with muslin cloth and kept in solar dehydrator for 5 days at 55±2°C. The physicochemical analyses were carried out in both dried and fresh (control) tomatoes. They were also analyzed microbiologically for bacterial and fugal count. Results showed that sun dried tomatoes are microbiologically safe. The values of moisture content and vitamin C of fresh and sun dried tomatoes statistically differ from each others at probability level of 5 %. The nutrient which is highly affected by sun drying is vitamin C. In fresh tomatoes it was 32.5mg/100g which is reduced to 24.6mg/100g after sun drying and further reduced to 15.86mg/100g during three months storage**.** The moisture content of the fresh tomatoes was 94.4% which decreased to 8.15% after drying, and then slowly increased to 9.95% in the three months storage. Statistically no major difference was found in the other nutrients during storage, which indicates that sun drying is nutritionally and microbiologically safe and can be used to preserve tomatoes and other fruits and vegetables for off season use.

**Keywords:** sun dried tomatoes, fresh tomatoes, moisture content, vitamin C.
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## INTRODUCTION

Vegetables are important items of diet in many countries. Apart from the variety which they add to the menu, they are valuable sources of nutrients especially in rural areas where they contribute substantially to protein, mineral, vitamins, fiber and other nutrients which are usually in short supply in daily diets[1].

Fruits and vegetables are dried to enhance storage stability, minimize packaging requirement and reduce transport weight[2]. Drying is a suitable alternative for post harvest management especially in developing countries where exist poorly established low temperature distribution and handling facilities. It is noted that over 20% of the world perishable crops are dried to increase shelf-life and promote food security[3].

Like other agricultural products, tomatoes are perishable and must be either consumed rapidly or preserved for later consumption. Because not all fresh tomatoes can be consumed at the time of harvest, preservation provides a larger market, allowing consumers to buy the product on a year-round basis. Today, sun-dried tomatoes have gained great acceptance in the food service segment and in the food industry as an ingredient. However, the sun-drying industry currently faces difficulties consistently producing good quality dried tomatoes[4]. Sun-drying is one of the most economical methods of food preservation. In developing countries, one of the main purposes for sun drying tomatoes is reduction of post harvest losses[5], whereas in developed countries, sun-dried tomatoes are considered a "gourmet" ingredient[6]. For perishable commodities with very high moisture contents, dehydration results in substantial reduction in weight and bulk with consequent savings in storage and distribution costs[7].

The outstanding preservative method practiced in many developing countries is sun-drying. But there is an objection over this method that considerable amount of nutrients lost during this process due to heat. The objective of this present work was to evaluate the effect of the sun drying on the nutritive properties of tomatoes as well as to determine the microbial safety of sun dried tomatoes.

## MATERIALS AND METHODS

The research work was conducted in Food Technology Centre PCSIR Labs Complex Peshawar and Department of Human Nutrition, KPK Agricultural University Peshawar. Fresh fully ripen tomatoes of good quality were selected for this purpose.

### *Sun drying*

Tomatoes were washed and cut in thin slices with sterilized stainless steel knife and divided into two lots, one was taken as control and other was dipped in 3 % potassium meta bisulfite solution for 5 minutes. The samples were spread over stainless steel trays covered with muslin cloth and kept in solar dehydrator for 5 days at 55±2°C. After drying the tomatoes were stored for three months in sterilized glass jar for further studies.

### *Physicochemical analysis*

Ground samples of fresh and sun-dried tomatoes were analyzed for their proximate composition using the recommended methods of AOAC (2000)[8]. The

moisture content was determined by oven drying method, ash was determined by igniting the sample at 600°C in muffle furnace to burn off all the organic matter and the crude protein contents by micro Kjeldal method (protein(%)=Nx6.25). The crude fat was determined using petroleum ether in a soxhlet extraction apparatus and crude fiber content by dilute acid and alkali hydrolysis. Carbohydrate content was calculated by difference of total contents from 100. Vitamin C was determined using Spectronic 20 (Shimadzu) Spectrophotometer by the method described by Hans (1992)[9]. Tomato sample (5g) was blended with 5ml 1.0% Hydrochloric acid (w/v) and centrifuged at 10,000 rpm for 10 minutes. The absorbance of the supernatant was measured at 243nm. Standard solutions were prepared in the same manner from 100µg/ml AA solution in 1% HCl. The Ascorbic acid content was calculated as mg/100g of the edible portion.

***Microbiological analysis***

Total bacterial count (TBC/g) and total fungal count (TFC/g) was determined according to the methods described by FAO (1992)[10] and APHA (2005)[11].

***Statistical analysis***

Statistical analysis of the data wherever necessary was conducted by analysis of variance (ANOVA using CR Design) and means were separated by Least Significant Difference (LSD) test as described by Gomez and Gomez (1984)[12].

## RESULTS AND DISCUSSION

The results of moisture content, ash, protein, fat, fibre, carbohydrate and vitamin C is shown in figures 1-7, while the bacterial and fungal count is shown in figure 8. Results showed that the values of moisture content and vitamin C differ statistically at 5% level of significance. The moisture content of the fresh tomatoes was 94.4 % which initially reduced to 8.15 % after sun drying and then increased slightly to 9.95 % because of the gained moisture during the three months storage. Latapi and Barrett[4] also reported the same results that the moisture content of the sun dried tomatoes increased during storage. Similarly the vitamin C content is also affected by sun drying. Fresh tomatoes contained 32.5 mg/100g Vit. C which reduced to 24.6 mg/100g after sun drying. After 3 months of storage it was further reduced to 15.86 mg/100g. The high solubility of ascorbic acid in water and the relative ease with which it is oxidized makes this vitamin particularly susceptible to processing conditions. The route and rate of oxidation of ascorbic acid is influenced by several factors including pH, trace metals, enzymes, presence of oxygen as well as time and temperature[13]. Gould[14] also reported considerable decrease in ascorbic acid content of sun-dried tomatoes and it is mostly affected by length of storage and temperature.

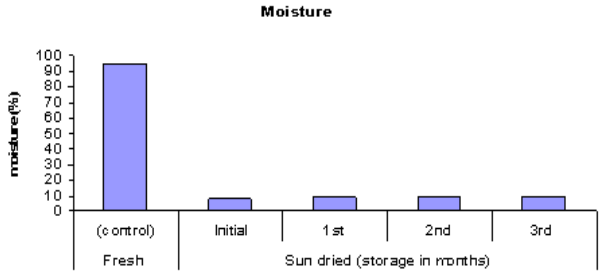


**Figure 1:** Moisture content of fresh and sun dried tomatoes at different storage time.

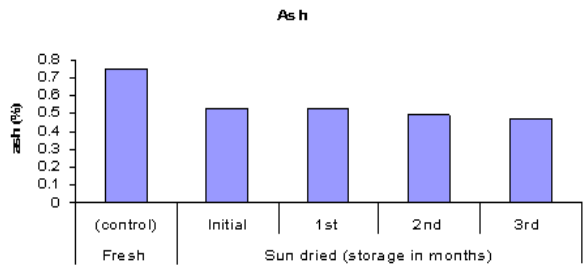


**Figure 2:** Ash content of fresh and sun dried tomatoes at different storage time.

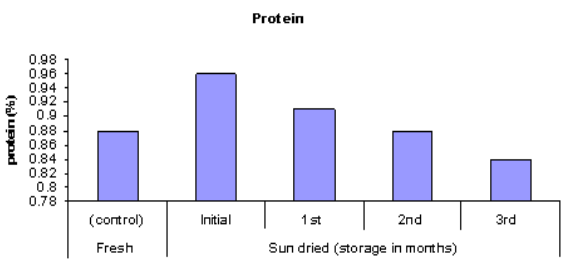


**Figure 3:** Protein content of fresh and sun dried tomatoes at different storage time.

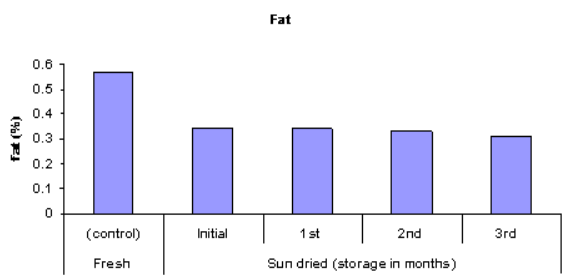


**Figure 4:** Fat content of fresh and sun dried tomatoes at different storage time**.**

The other nutrients seem not to be influenced by the drying technique, which is also proved by statistical analysis at ($p<0.05$) level of significance. Figures show that ash, protein, fat and fibre have

almost better or same results as compared to fresh except carbohydrate which is the difference of all parameters from 100. The same results are reported by Okilya *et al*[15] that jackfruit leather dehydrated in a solar dryer with appropriate pre-drying treatments have better results as compared to dried in oven.

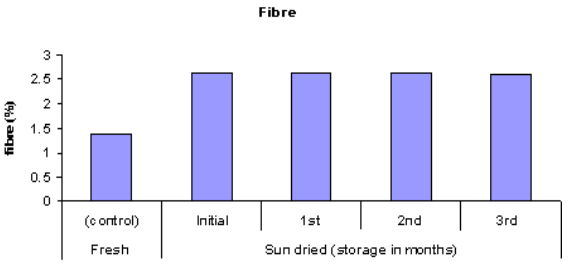


**Figure 5:** Crude fiber content of fresh and sun dried tomatoes at different storage time.

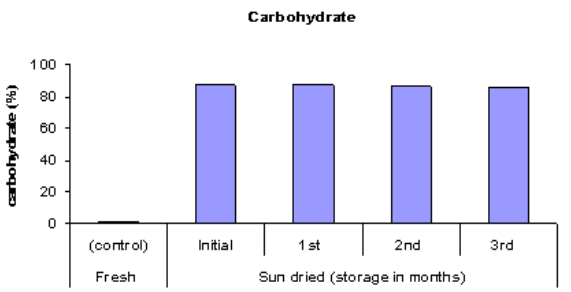


**Figure 6:** Carbohydrate content of fresh and sun dried tomatoes at different storage time.

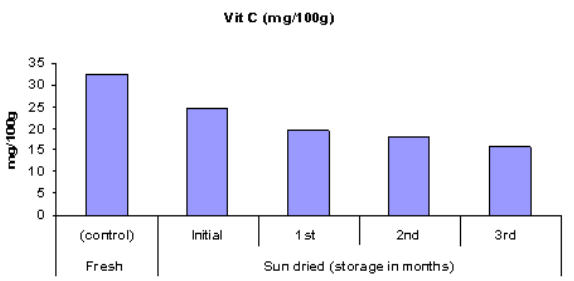


**Figure 7:** Vitamin C content of fresh and sun dried tomatoes at different storage time.

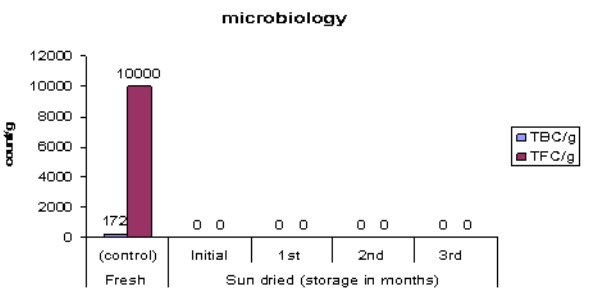


**Figure 8:** TBC and TFC of fresh and sun dried tomatoes at different storage time.

The data on the microbiological study is presented in figure 8. Graph shows that sun dried tomatoes are microbiologically safe while bacterial and mould growth was noticed in fresh tomatoes. In fresh tomatoes the total bacterial count was $1.72*10^2$ per gram while the total fungal count was $1.0*10^4$ per gram, which is exceeding the allowable limits ($10^3$/g) set by ICMSF[16] for Foods. The same results were recorded by Latapi and Barrett[4] that sun dried tomatoes were free from mold growth while mold growth was recorded in fresh tomatoes and this could be due to the presence of moisture in the fresh tomatoes.

## CONCLUSION

It is concluded from the results that this technology is nutritionally and microbiologically safe, economical and can be utilized to preserve tomatoes as well as other fruits and vegetables for off season use.

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