

Research Article

Effect of Irradiation on The Quality of Dried Figs

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Abstract: The research was conducted to find out the effect of solar irradiation on proximate composition of Figs. It was observed that the fresh figs contain 21% moisture, 3.3% ash, 6.61% crude proteins, 2.66% fats, 4.23% fibers, 69.49% carbohydrate and 410 Kcal/100 g of energy. The total plate count and total caliform count was studied. The highest value of plate count was notes 23000 cfu/g before washing while 13000 cfu/g was reduced after washing the sample and the total caliform value was reduced to 6000 from 8000 cfu/g due to the washing the sample with the double distilled water. The is sample was irradiated for 1, 2, 3, 4 and 5 kg, respectively for 45 min in gamma research unit at NIFA, Peshawar having the activity of 50 Kci. At last the sample was not infected by insects during the first three months of storage and a little difference in the color from lighter to darker transmittance.

Keywords: Fig and minerals etc, moisture content, TBC, TPC

INTRODUCTION

The word 'Fig' was usually refers to "Ficus" the fig tree and its fruit known as the common fig (*Ficus carica*) *mortan*, 2012. The common fig is a large, deciduous shrubs or small tree. The fruit is 3-5 cm long, with a green skin, sometimes ripening towards purple. The sap of the tree's green parts is an irritant to human skin. Some produced fruit, others are ornamentals, for example *F. benghalensis* (Indian banyan or weeping fig) and *F. elastic* (Indian rubber plant) but *F. carica*s of greatest economics importance as a fruit crop the major commercial production taking place in Spain, Italy, Turkey and Iran (Sozzi *et al.*, 2005).

The common fir is widely grown for its edible fruit throughout its natural range in Pakistan, as well as in the rest of the Asia region and in other areas of the world with a similar climate. Figs must be allowed to ripen fully on the tree as they do not ripen if picked prematurely. The nutrient uptake of the plant increases during fruit development (Aljane *et al.*, 2007). Figs are one of the highest sources of calcium and fiber in plant. Furthermore dried figs are the richest in fiber and contain important minerals and vitamins. Fig has a laxative effect and contains many antioxidants. Moreover, they are a good source of flavonoids and other poly phenols. The poly phenol antioxidant composition and level in dried fir fruits was determined

and analyzed by several investigators (Khan *et al.*, 2002).

Figs may be consumed fresh or canned, dried or us3d in various bakery products. Roasted figs have added to coffee the so-called Viennese coffee. A fresh fig contains total sugar (mainly glucose and fructose) but when dried this rises to about 50%. Fresh figs don not always travel well, so the dried product provides a good dietary substitute. Similarly, the potassium content rises in the dried product. The vitamin C content is low in the fresh state, increase when dried (Masi *et al.*, 2005). The quality of dried fruits is generally improved with one or more of the following pre-treatments anti-discoloration by coating with vitamin C, de-waxing by briefly boiling and quenching and sulferization by soaking or fumigating. The dried fruits have been as a source of medicine or a part of medicine in many eastern countries since the time immoral (Mohammad *et al.*, 2009). Morton (1987) pointed out the sun dried figs irradiated with gamma rays and treated with potassium meta-bisulphate (kms) at 2.5% w/v under controlled conditions resulted in 5 log reduction in microbial load just after irradiation and 1.0 and 1.3 log reduction in yeast and mold and bacterial count after 18 months of ambient storage.

Vinson (1999) studied the effect of Ozonation as a method to reduce *Escherichia coli* and *Bacillus cereus* spores in dried figs was investigated. Dried

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figs were sprinkle inoculated with *E. coli*, *B. cerceus* and *B. cerceus spores* in sterile bags at a level of 10^7 microorganism/g mixed and allowed to dry for 1 h at 25°C prior and 70% relative humidity. No significant changes were found between sweetness, rancidity, flavor, appearance and overall palatability of ozonated and non-ozonated dried figs. Ozonation was found to be effective especially in reduction of vegetative cells in dried figs and promising method for the decontamination of dried figs.

Sattar *et al.* (1989) stated that when dried fruits irradiated with electron beam using Thermo-Luminescence (TL) measurements. Thermo-luminescence glow curves for the contaminating minerals separated from the dried fruits under a temperature range of 50°C. Rubnov *et al.* (2001) studied the relationship between moisture content and equilibrium RH and temperature of dried figs indicated that there were greater variation between moisture content of whole figs than between quarters of a single fig (McDowell *et al.*, 1971) that figs contained 75% moisture, 4.5 protein, 0.2% fat, 0.6% minerals and 1.7% carbohydrates, 270 iu of vitamin A and 21.14 mb/100 g of vitamin C. the aim of this study was to find the effect of drying on proximate composition of fig and the following objectives were to be calculated:

- To study proximate composition and nutritional value of fig.
- To study the effect of irradiation on microbial growth.

MATERIALS AND METHODS

Fresh figs were selected and washed thoroughly with distilled water and were shifted to pan and put in oven for Drying. The solution used for pH was taken in the Hydro lab to observe the following things, i.e., Temperature T (°C), Specific conductivity (SP), Total Dissolved Solid (TDS %) and Dissolved oxygen (DO %).

PH: PH of the fig sample was determined by 105 ion analyzer pH meter. Two (2 g) of crushed fig were transferred to a flask and added 200 mL de-ionized water was added to the flask. The solution was boiled for 1 hour in water bath at 100°C. After boiling the solution was cooled at room temperature 27°C and then filtered through Whitman 42 filter paper. PH meter was standardized against buffer solution of 4.0-7.0 then the pH of sample was measured.

Moisture content: The Moisture content was determined by taking 2 g of well mixed sample were in a clean pan. The pan was placed in an oven at 60°C till constant weight of the sample was obtained for 44 h. After cooling in desiccators and re-weighing this

moisture percentage was calculated as follows (Henderson and Perry, 1976):

$$\text{Moisture} = \frac{W_i - W_f}{W_i} \times 100$$

where,

W_i : Initial weight of sample (before heating)

W_f : Final weight of sample (after heating)

Ash: Dried sample 1.26 g was taken in the pre-weighed crucible for the determination of ash. It was charred over the slow burning flame with the help of a blowpipe and then kept in a muffle furnace at 550-600°C for 2 h or till the appearance of grey white ash. The percentage of ash was calculated as follows (Morton, 1987):

$$\text{Ash \%} = \frac{\text{Wt of Ash}}{\text{Wt of sample}} \times 100$$

Crude fat: Dry extraction method for fat determination was employed. Approximately 1.834 g of dried sample was taken in a thimble and extracted repeatedly with petroleum spirit to the boiling point of 40 to 60°C each. The spirit was distilled by rotary evaporator and the fat was dried in an oven at 70°C. Percentage of fat in the sample was calculated with the following formula (Morton, 1987):

$$\text{Crude Fat \%} = \frac{\text{Wt of Fat}}{\text{Wt of sample}} \times 100$$

Crude protein: Protein in the sample was determined by Kjeldahl method using Kjeldtherm unit and Gerhardt vadopest 3 automatic steam heated distillation apparatus Digestion of the finely ground sample (1 g) was carried out with 1.5 g (approx) of digestion mixture (K₂SO₄+CuSO₄) and 8 mL of concentrated H₂SO₄. The volume of the digested sample was made up to 100 mL. The total protein was calculated day multiplying the amount of nitrogen with an appropriate factor (4.38) and the amount of protein was. Percent nitrogen of the sample was calculated by the following formula (Vinson, 1999):

$$\text{Nitrogen \%} = \frac{(S-B) \times 0.04 \times 100 \times 100 \times N}{\text{Wt of sample} \times V} \times 100$$

$$\text{Crude Protein \%} = (\%) \text{ Nitrogen} \times 4.38$$

where,

N = Normality

V = Volume of the sample

Crude fiber: Fiber determination involves the digestion of the sample first with dilute acid to hydrolyze the carbohydrate and proteins. Further digestion with boiling dilute alkali causes the saponification of fatty materials. The sample was

heated on a steam bath at 90-95°C for 2 h when it was filtered through a linen cloth and the residue was washed with hot water until it free from acid. The crude fiber from the sample was consulted with the following formula (Vinson, 1999):

$$\text{Crude Fiber \%} = \text{Loss in Wt. On ignition} \times 100 - F$$

Total plate count: Decimal dilution up to 10⁻¹, 10⁻² and 10⁻³ were prepared from the suspension. 1 mL each of each dilution was applied for enumeration of total mesophilic aerobic bacteria. The plates were incubated at 27°C for 24 h. Typical colonies on the plate were enumerated and colonies in 1 g sample were determined and expressed as CFU/g.

Total caliform bacteria: The most probable number of total coli from bacteria was determined by multiple tube fermentation technique. Take 10 g sample and blend with 90 mL sterile water for 10 min. This will give 10⁻¹ dilution. Make further serial dilution of 10⁻² and 10⁻³ by adding 10 mL 10⁻¹ dilution to 90 mL buffer blanks. Dilution was incubated at the 27°C for 24 h tubes were examined by gas evidence of gas effervescence produced when the tube was gently shaken. Negative tubes were re-incubated for additional 24 h and examined for gas production. A positive tube with gas formation and turbidity was sub-cultures into BGB. All BGB tube was incubated at the 35°C for 48 h and examined for gas.

RESULTS AND DISCUSSION

Analysis of data shows that the TPC are highly significant and same TBC have also significant result. The dried figs which are composed of mostly Glucose and Fructose have been used as apparent and curative for persistent constipation since long in Asian countries. The temperature of the fig suspension which is noted 19.97°C, specific conductivity is 0.694, dissolved oxygen was 2.45%, total dissolved solid was recorded 0.5 mg/g and 4.91 pH were noted for the fresh dried fig, which are shown in Table 1 and are slightly acidic in nature.

The average values for proximate composition of dried figs were given in Table 2. Which the result indicated that the figs contained 21% moisture content, 3.3% ash, 6.61% protein and 2.66% fat with 410 cal/100 energy sources and 69.49% carbohydrates are present in the dried figs.

From the analyzing of fruit (Figs) some are the constituents like moisture content, total sugar, reducing sugar, calcium and iron content have differed according to varieties. The result from the chromatographic studies shows that sugars were present highly in content in dried figs such as i.e., glucose and fructose. The result of our investigation showed that similar

Table 1: Hydro lab determination of fig

| | |
|-----------------------|------------|
| Temperature | 19.97°C |
| Specific conductivity | 0.694 DS/m |
| Dissolved oxygen | 2.4% |
| T. Dissolved solid | 0.5 mg/g |
| PH | 4.91 |

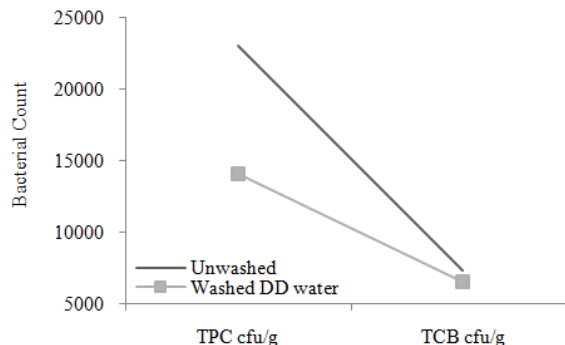


Fig. 1: Total Plate Count (TPC) and TCB in cfu/g in selected dry figs

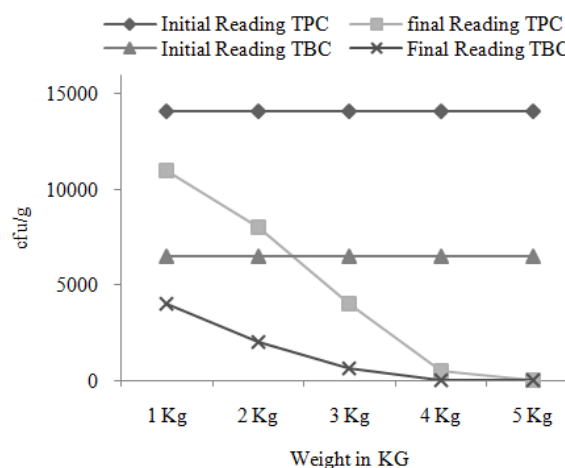


Fig. 2: Effect of irradiation on TPC and TBC

proximate composition of fig is different due to the varietal, agro climatic condition and post-harvest treatment. From the Table 2 the moisture content of fig showed that it can be stored for a long time and from the result it showed that if we decreased the moisture content of fig it will also increased the shelf life of the storing of dried fig. So from the result it was noted that the higher moisture content is very important factor which affecting the flavor of fig. The moisture content of ash in the dried fig were recorded 1.9% as shown in Table 2, which is the highest source of energy in all food constituents and provide more energy, though it will be present in very less amount in fruit (fig) but it is a good source of energy.

Figure 1 showed that the TPC (Total Plate Count) which is unwashed sample and TCB washed sample of dried figs. From the result it was showed that the unwashed samples having more number of colonies of bacteria then the washed samples in TPC, while in the

Table 2: Proximate composition of dried fig

| Proximate composition | Moisture content | Ash | Protein | Fat | Fiber | Carbohydrates | Energy |
|-----------------------|------------------|-----|---------|------|-------|---------------|-------------|
| Percent % | 21 | 3.3 | 6.61 | 2.66 | 4.23 | 69.49 | 410 cal/100 |

same Fig. 1 in TCB the number of colonies of bacteria was greater than the washed sample. From the result it is clear that the dried figs sample washed with double distill water can remove more number of bacteria from the samples of dried Fig.

Effect of irradiation on TCB and TPC: Irradiation of the sample with 1, 2, 3, 4 and 5 kg shows positive result on the spoilage of the figs, in Fig. 2. According to the final report the irradiation of 1 to 5 kg were free from any afferent infestations at the beginning but within 60 days of storage insects started appearing in packed polythene dried figs. The stored were analyzed for color intensity at the starter of experiment all the dry figs had higher color transmittance which decreased gradually during their storage (color changes from light to dark shades).

CONCLUSION

Figs contained nutrients in abundant quantities. In the present study this is observed that fig contained essential nutrients such as fat, protein, carbohydrates in appreciable amount. This is concluded that fig is important source of energy.

RECOMMENDATION

A fig is cheap source of energy so the dried figs should be used in daily basis.

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