

RESEARCH ARTICLE

ANALYTICAL CHEMISTRY

**ANALYSIS OF THE PHYSICOCHEMICAL PROPERTIES OF THE PROCESSED FRUITS AND VEGETABLE PRODUCTS**

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**ABSTRACT**

Fruits and vegetable products are processed because raw fruits and vegetables products are very soon contaminated and so these are processed in large scale without any contamination and could be eaten many times. Processed foods such as tomato juice, jam, pickle, orange juice were taken and their moisture, ash content, protein, fat content and calorific values were estimated and found no loss in the above contents in these food products.

## KEYWORDS

Processed food, contamination, ash content, moisture content, protein, fat content, calorific values

## INTRODUCTION

Processed fruits and vegetables are defined as those foods and vegetables that may be cleaned, peeled, cut, sliced and packaged. They are common for consumers who always buy many products from supermarkets instead of preparing from whole fruit by themselves. Raw fruits and vegetables products are very soon contaminated due to physiological ageing, biochemical changes and microbiological spoilage<sup>1</sup>. This deterioration is further enhanced in processed fruits and vegetables because of wounding of the tissues that occurs during peeling, cutting and slicing<sup>2</sup> so processing is done in large scale to avoid contamination and to eat as many times. Hence packaging and storage conditions must be very specific to maximize their shelf life. And therefore advanced measures must be taken against spoilage of food products. In this experimental work various analytical methods are used for the estimation of physicochemical parameters of the processed fruits and vegetables samples.

## MATERIALS AND METHODS

### *Determination of fat content*

Fat content of the processed fruit and vegetable samples was determined by the method described in AOAC<sup>3</sup>. 30 g of the material was weighed accurately which was sufficient to give about 1.0 g of fat in a suitable thimble and dry for two hours at 100±2°C. The thimble was placed in the soxhlet apparatus and the solvent was extracted for about 16 hr. The extract contained in the soxhlet flask was dried. It was then cooled in the desiccators and weighed. Alternate drying and weighing was continued at 30 min. interval

until the loss of mass between two successive weighing was not more than 2 mg.

### **Calculation:**

$$\text{Mass (\%)} = (M1-M2/M) * 100$$

*M1= mass in g of soxhlet flask*

*M2= mass in g of empty soxhlet flask*

*M= mass in g of material taken.*

Determination of the acidity of the extracted fat 10g to 30 g of the sample was weighed and transferred to thimble and plugged in from the top with extracted cotton and filter paper. The thimble was dried for one hour at 100°C. The weight of the empty dry soxhlet flask was taken. The fat was extracted in the soxhlet apparatus for one hour and the solvent was evaporated in the flask. Traces of residual solvent were removed by keeping the flask in the hot air oven at 100°C for half an hour. The flask was then cooled and 50 ml of benzene alcohol-phenolphthalein solution was added and KOH was taken in 10 ml micro burette. If the content of the flask become cloudy during titration, 50 ml of the reagent was added and the titration was continued.

### **Calculation:**

$$\text{Acidity of extracted fat (\% by mass)} = 1.41 * V / M1 - M$$

*Where, V= volume of 0.05 N KOH solution used in titration after subtracting the blank.*

*M1= mass in g of soxhlet flask containing fat.*

*M = mass in g of empty soxhlet flask*

### **Determination of protein by Kjeldahl method**

The method of protein determination of the processed samples were performed as described in AOAC<sup>4</sup>. 2 gm of samples were taken and dried at 105°C to constant weight and

transferred to digestion tube. To each sample 7 g K<sub>2</sub>SO<sub>4</sub>, 5 g selenium powder, 12 ml H<sub>2</sub>SO<sub>4</sub> and 5 ml H<sub>2</sub>O<sub>2</sub> was added. It was then heated for 60 min at 400° C. The digestion tube was then cooled to 50°C-60°C. 50 ml NaOH was added to the sample. The sample was then titrated with 0.2N HCl.

**Calculation:**

$$\text{Protein (\%)} = \frac{\text{Titer value} * \text{Volume of acid taken} * 6.25 * 100}{\text{Sample weight} * 0.2N * 1000}$$

**Determination of Ash**

Determination of the ash content of the samples was performed by the method described in AOAC<sup>5</sup>. 5g of sample was weighed into a clean dry pre weighed silica dish. Then the sample was ignited slowly over a Bunsen flame in a fume cupboard until no more fumes are evolved. Then the dish was transferred to muffle furnace and incinerated until it was free of black carbon particles and turn into white in color (about three hours). Dish was removed carefully and cooled in desiccators. Weight was taken after cooling. Process of ashing, cooling and weighing was repeated till no further loss in weight was indicated.

**Calculation:**

$$\text{Ash (\%)} = \frac{\text{weight of ash}}{\text{weight of sample}} * 100$$

**Determination of moisture content**

10 g of the material was weighed accurately in a suitable dish previously dried in an oven at 130°C for 90 min. The dish was then cooled in the desiccators and was weighed with the lid on. The process of heating, cooling and weighing was done at half an hour interval until the loss in mass between two successive weights is less than 1 mg.

**Calculation:**

$$\text{Mass (\%)} = \frac{M1 - M2}{M1 - M} * 100$$

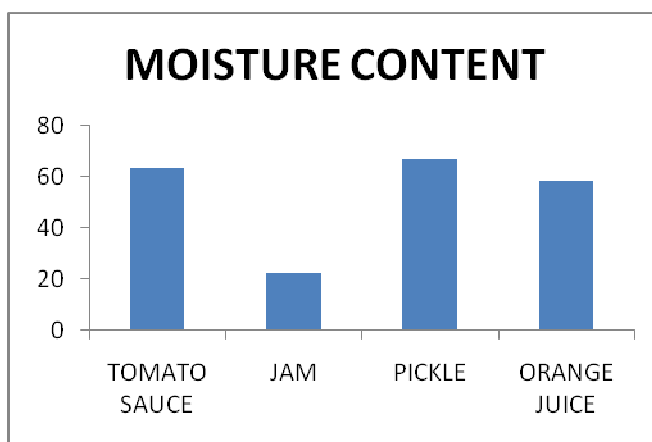
*M1= mass in g of the moisture dish with the material before drying*

*M2= mass in g of the moisture dish with the material after drying*

*M= mass of the empty moisture dish*

**RESULTS AND DISCUSSION**

The figure (A) showed the moisture content in tomato sauce and pickle to be 63.6% and 66.8% respectively followed by orange juice (58.44%) and lowest moisture content (22.4%) was observed in the jams.



**Figure (A)**

**% moisture content in the tomato juice, jams, pickle, orange juice**

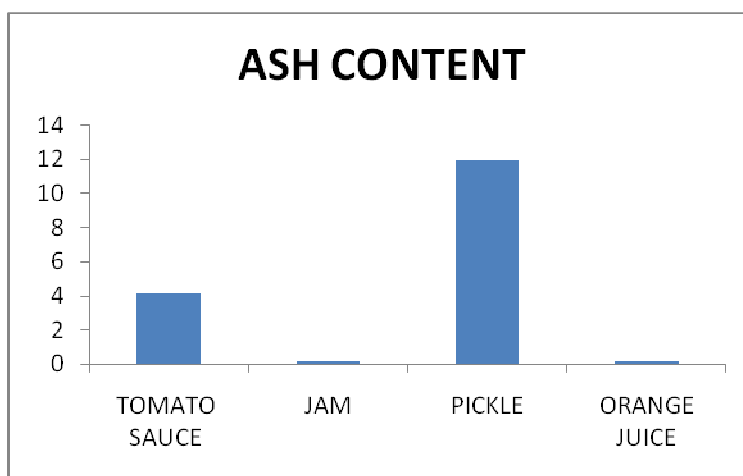
Moisture assay can be one of the most important analyses performed on the food product.

Moisture is the quality factor in the preservation of some products and affects stability in

dehydrated vegetables and fruits, dried milk, dehydrated potatoes, spices and herbs. Moisture is also used as the quality factor for jams, jellies, sugar syrups. Water is the major constituent of most food products. The approximate, expected moisture content of a food can affect the choice of the method of measurement. It can also guide the analyst in determining the practical level of

accuracy required when measuring moisture content, relative to other food constituents<sup>6</sup>.

According to figure (B) ash content was highest in case of pickle (12%) followed by tomato sauce (4.16%). Jams and orange juice were found to have similar ash content (0.12%).

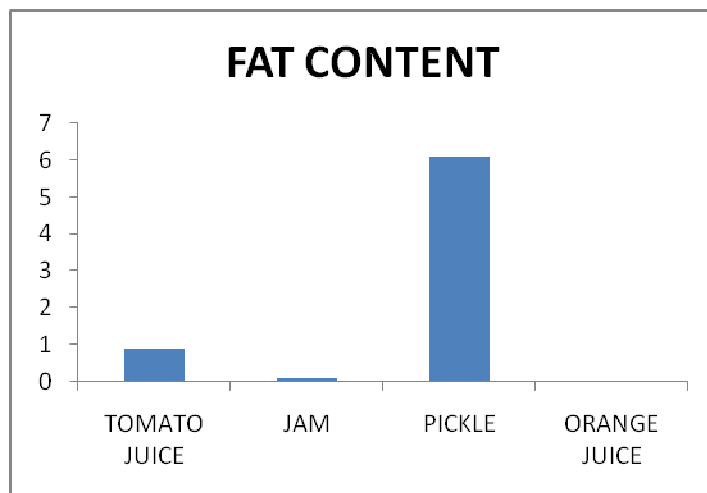


**Figure (B)**  
**% Ash content in tomato juice, jams, pickle, orange juice**

Ash is the inorganic residue remaining after the water and organic matter have been removed by heating in the presence of oxidizing agents, which provides a measure of the total amount of minerals within a food. Analytical techniques for providing information about the total mineral content are based on the fact that the minerals (the analyte) can be distinguished from all the other components (the matrix) within a food in some measurable way. The most widely used methods are based on the fact that minerals are not destroyed by heating, and that they have a low volatility compared to other food components. Ash

Contents of fresh foods rarely exceed 5%, although some processed foods can have ash contents as high as 12% e.g. dried beef<sup>7</sup>.

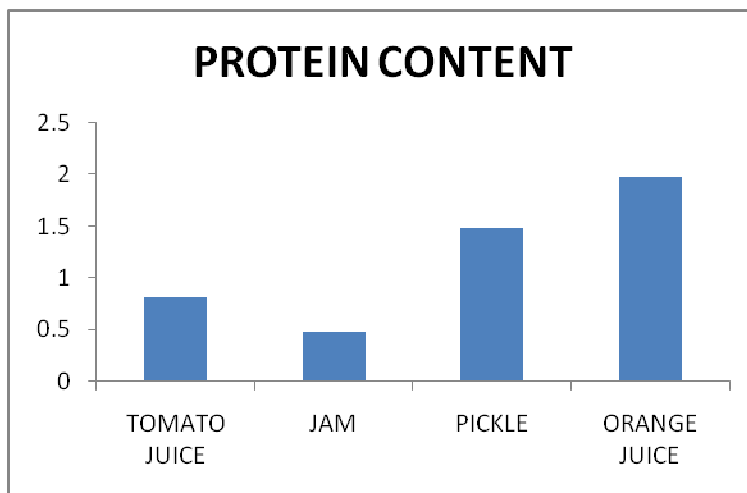
Fat content was found to be highest in the pickle (6.09%). All the other samples have value less than 1% (0.90% for tomato juice, 0.69% for jam, and 0.015% for orange juice) as observed from figure (C). Fat content of the food sample is important to know because consumers are concerned with the reduction in the intake of total fat, saturated fat and cholesterol for improving human health<sup>8</sup>. Determination of fat content is one of the most common analyses performed in foodstuff laboratory<sup>9</sup>.



**Figure (C)**  
**% Fat content in tomato juice, jams, pickle, orange juice**

As observed from fig (D) protein content was found to be 1.985% and 1.975% for pickle and orange juice respectively. Tomato sauce has %

protein content of 0.82 and the least protein content of 0.48% was found in jam.



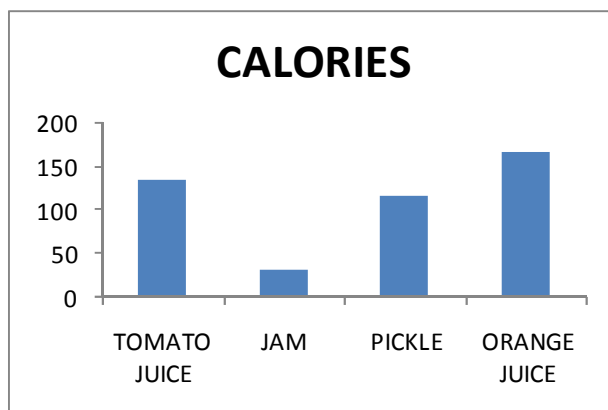
**Figure (D)**  
**% Protein content in tomato juice, jams, pickle, orange juice**

Food analysts are also often interested in the type of proteins present in a food because each protein has unique nutritional and physicochemical properties. Protein type is usually determined by separating and isolating the individual proteins from a complex mixture of proteins, so that they can be subsequently

identified and characterized. Proteins are separated on the basis of differences in their physicochemical properties, such as size, charge, adsorption characteristics, solubility and heat-stability. The choice of an appropriate separation technique depends on a number of factors, including the reasons for carrying out the

analysis, the amount of sample available, the desired purity, the equipment available, the type of proteins present and the cost. Orange juice have the highest calorific value 165.83 Kcal/

100g followed by tomato juice with 133.46 Kcal/100 g followed by pickle with 115.25 Kcal/g calorific value while jam had the lowest calorific value of 76.93 kcal/g as observed in figure (E).



**Figure (E)**  
**Calorific value (Kcal/100g) in tomato juice, jams, pickle, orange juice**

Calorie intake is an important consideration for the customers. If they are obese the fewer calories should be taken and the healthy people should have the intake of calories for their body to work properly.

This experimental study had led to the conclusion that there is a very low or rather no loss in the moisture content, protein content, fat content, calorific values and ash content of the samples taken under study. Thus the processed foods can be eaten many times without thinking of the contamination hazard

## CONCLUSION

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