A Brief Study on Raw and Soaked South Indian Almonds, Peanuts, Resins and Sauerkraut for Nutritive Value

Parul S Kamat, Neetu Mittal, Suneetha Vuppu* and Bishwambhar Mishra
School of Biosciences and Technology, VIT University, Vellore-632 014, Tamil Nadu, India
*For Correspondence: vsuneetha@vit.ac.in, Mobile Tel:-9994716743

ABSTRACT- In many Indian houses, children are made to eat soaked almonds and raisins for improving their mental ability. The idea of this project was to check if these could be a better protein source than the raw ones. Hence protein estimation of raw almonds, soaked almonds and the water in which they are soaked, was done and compared. Similarly the protein content of raw raisins was compared with soaked ones. It was found that soaked almonds have much higher protein content than the raw almonds and so does the water in which they are soaked. Whereas soaked raisins have lower protein content than the raw ones. Thus it was considered as a step in designing a high protein early morning snack which is a basic requirement for sportsmen like swimmers for building up their stamina. To make this economically suitable for even the lower middle class almonds were replaced with peanuts and was found that even soaked peanuts have higher protein content than raw peanuts. To further the research sauerkraut’s (finely shredded cabbage fermented with various lactic acid bacteria) protein concentration was estimated with varying quantity of salt concentration. It was found that beyond 20% salt concentration the protein content increased and remained uniform thereafter.

Keywords: Protein estimation, Raw almonds, Lowry’s Method, sauerkraut, High Protein Diet

Introduction

Carbohydrate is the most abundant biomolecule on earth. By the process of Photosynthesis carbohydrate is converted to CO2 and H2O. In non-photosynthetic cells carbohydrate is the central energy yielding pathway. In human body or other animals generally it is stored in the form of glycogen. In plants it is stored in the form of starch (Jansen van et al. 2004). Carbohydrate in the insoluble form works as structural element, as in the case of cell walls of bacteria and plants. In some cases these insoluble carbohydrate serve as protective elements (Suneetha et al. 2011). It is also present in the connective tissues of animals. In a complex form it is covalently attached to protein and lipids known as glycoconjugates and act as signal which determine the intercellular location. It also helps in deciding the metabolic fate of hybrid molecules (Boukari et al 2001).

The functional group of the carbohydrate is polyhydroxy aldehyde or ketone. Carbohydrates are generally represented by a empirical formula which is not applicable for all carbohydrate structures for example (CH2O)n. Carbohydrate is essential for CNS in the simplest form glucose. If brain doesn’t get sugar at any time, it can become unconscious. Every cell of our body needs glucose which is obtained by the breakdown of Glycogen (Nesamvuni et al. 2001).

Protein is the building block of our body. It consists of amino acids sequences joined by peptide bonds and other important bonds like hydrogen bond, disulphide bonds, and hydrophobic bonds forming primary, secondary, tertiary and quaternary structure of protein. Protein help in cell signaling, cell regulation, clotting, cell structure formation etc. Chicken, egg yolk, meat, beef, pork are some of the protein rich sources. Some protein serves as enzymes, example haemoglobin. Antibodies are also a kind of protein (Van Wyk et al. 2005).

Fats are derived form fatty acid and glycerol. Fatty acid contain hydrocarbon chain and carboxyl group. The bonds between the fatty acid divide the fats into different types. It is high energy derivative source but only when we are doing physical work. For sedentary lifestyle it’s over consumption leads to formation of cholesterol (Barbera et al. 1995). This can further cause obesity and can be the reason of various diseases especially heart diseases. Almond is a off-white color nut having brown skin. It is known to have high protein content. It is said that it shouldn’t be consume in high amount as it is not good for stomach. Almonds are also known to reduce the cholesterol level (Abdallah et al.1998).

Resins are formed due to dehydration of grapes. If we soaked them in milk or water and consume it, then it prevents constipation. It is also a protein rich source and is known to help in prevention of anemia as it increases the iron in blood. Peanuts are easily available in the market. In houses it is used as vegetable oil. If it is used after refining, it contains less amount of cholesterol as compared to ghee. It can be consumed directly or it can also be consumed after frying (Eckert et al. 2008).

Half-life

Half life is abbreviated as t½, is the period of time it takes for the amount of a substance undergoing decay to decrease by half. The name was originally used to describe a characteristic of unstable atoms (radioactive decay), but may apply to any quantity which follows set-rate decay. An exponential decay process can be described by any of the following three equivalent formulas:

\[ N(t) = N_0 \left( \frac{1}{2} \right)^{t/t_{0.5}} \]

Where

- \( N_0 \) is the initial quantity of the substance;
- \( N(t) \) is the quantity that has not decayed even after time \( t \);
- \( t_{0.5} \) is the half-life of the decaying quantity.

A biological half-life or elimination half-life refers to the rate at which a substance is cleared from the body. It is important in medical and pharmacological applications to determine the time it takes for the concentration of a substance to reduce by half.

Acknowledgements

The authors would like to acknowledge the help and guidance of Dr. A. Girish, Assistant Professor, School of Biosciences and Technology, VIT University, Vellore-632 014, Tamil Nadu, India, for providing the necessary facilities and support during the execution of this project.

References

half-life is the time it takes for a substance to lose half of its pharmacologic, physiologic, or radiological activity. The biological half-life of water in humans is about 7 to 14 days and that of cesium is between one and four months. This can be shortened by feeding the person Prussian blue, which acts as a solid ion exchanger which absorbs the cesium while releasing potassium ions (Kan et al. 2007).

**Shelf-life**

Shelf life is the length of time that eatables, medication, chemicals, and many other perishable items are given before they are considered unsuitable for sale, use, or consumption. It is different from expiration date. Shelf life relates to food quality while the expiration date relates to food safety. A product that has passed its shelf life might still be safe, but its quality is no longer guaranteed. Preservatives and antioxidants may be incorporated into some food and drug products to extend their shelf life. Some companies use induction sealing and vacuum/oxygen-barrier pouches to assist in the extension of the shelf life of their products where oxygen causes the loss. Raisins can be stored up to one year, in moderate conditions. Shelled peanuts should be stored in airtight containers, ideally in a refrigerator in order to preserve freshness. If stored in this way they remain fresh for three to six months. Peanuts with their shell need to be stored in a cool, dark place away from moisture. If stored in the refrigerator they maintain their freshness up to nine months.

**Materials and Methods**

Lowry’s method is used for determination of proteins in cell free extract because of its high sensitivity. Protein quantity as low as 20µg can be measured. The (—CO—NH) peptide bond in a polypeptide chain react with copper sulphate in an alkaline medium to give a blue colored complex. In addition tyrosine and tryptophan residues of protein cause reduction of the phosphomolybdate and phosphotungstate components of Folin Ciocaltaeu reagent to give bluish products which contribute towards enhancing the sensitivity of this method (Lowry et al. 1951).

**Method 1 (Preparation of sauerkraut sample)**

Cabbage is washed properly and chopped into fine pieces. This is divided into three equal parts. To the first part 20% (by weight) NaCl (sodium chloride -common salt) is added. This makes the normal sauerkraut. To the other two parts 30% and 50% NaCl is added respectively. All the different parts are mixed properly with salt and mashed and put into different air tight containers or bottles and sealed. These are then put into the incubator. In 3-4 days a brown colour pickle kind of thing is obtained. The sauerkraut is ready (Fig.1). For protein estimation it is grinded and filtered to get a clear liquid. Protein estimation is done on the day of preparation and then after 5 days of incubation using the method given below.

**Method 2 (Preparation of almonds, resins and peanuts samples)**

Almonds, Resins and Peanuts are taken and weighed. Some almonds, resins and peanuts are soaked overnight and weighed. All these samples are ground separately and filtered using filter paper to get a clear liquid. These samples along with the water in which the almonds are soaked are used for protein estimation as in Fig.2.

**Method 3 (Preparation of reagents):**

A solution of BSA was prepared by dissolving 25mg of BSA reagent in 100ml of distilled water. Folin Ciocalteau solution is prepared by dissolving equal quantities of FC reagent in water. NaOH solution to be used is 2N sodium hydroxide solution. Solution A is prepared by first dissolving 4g of sodium hydroxide (NaOH) in 1000ml of water (0.1 N of NaOH). To this 2gm of sodium carbonate (2%) is added. Solution B is prepared by dissolving 0.5% of copper sulphate and 1% Sodium Patassium tartarate. Solution C is obtained by dissolving 50ml of Solution A in 1ml of Solution B. This solution is used for protein estimation (Wilson et al. 2000).

Method 4 (Protein estimation):

All the different samples are collected. Six test tubes are taken and marked blank, S1, S2, S3, S4, S5. 0.2, 0.4, 0.6, 0.8 and 1 ml of BSA was taken in S1, S2, S3, S4, S5 test tubes respectively. The samples of almond, almond water, soaked almond, resins, soaked resins, peanuts, soaked peanuts, and sauerkraut are taken in eight different test tubes, 1 ml each. Volume in all the test tubes is made to 1 ml with water. 1 ml NaOH was added to all of these. 5 ml of Alkaline CuSO4 is added to the test tubes and the test tubes are shaken well and kept aside for 10 minutes. 0.5 ml of Folin's Reagent is added and kept for 30 minutes at room temperature after mixing. The Optical Density is measured at 660 nm. For the samples under consideration the samples have to be diluted appropriately for the spectrophotometer to record the values (Wardlaw et al. 1999). A standard graph is drawn and the amount of protein in different samples is found.

### Results

<table>
<thead>
<tr>
<th></th>
<th>Volume of BSA(µg/ml)</th>
<th>Volume of BSA/Sample (ml)</th>
<th>Volume of Water (ml)</th>
<th>Volume of Alkaline CuSO4(ml)</th>
<th>Volume of Folin's Reagent</th>
<th>OD at 660nm</th>
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<tr>
<td>Blank</td>
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### Discussion

1. The amount of protein in almonds, soaked almonds and almond water is 279 µg, 707 µg, 360 µg respectively.
2. The amount of protein in peanuts and soaked peanuts is 333 µg and 649 µg respectively.
3. The amount of proteins in raisins and soaked raisins is 483 µg and 283 µg respectively.
4. The amount of proteins in sauerkraut (20%) is 256 µg, sauerkraut (50% and 30%) is 387 µg.

### Conclusions:

Soaked almonds and the water in which are soaked have a higher protein content than dry almonds. The soaked peanuts also have higher protein content than dry peanuts. Thus almonds soaked overnight along with the water and soaked peanuts should be included in a higher protein diet.

Raisins have higher protein content than soaked raisins. So it is advisable to have dry raisins rather than soaked ones.

The minimum protein content was found to be in the sauerkraut with 20% salt. Any increase in the amount of salt increases the protein content, but at 50% and 30% salt concentration the protein content was found to be a constant.

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**Table: -1 Estimation of Protein content by Lowry's method in various samples**

Calculations

For dilution of 1:5
Almond water: 0.87 × 5 = 4.35
Almond: 0.66 × 5 = 3.3
Soaked Almonds: 1.77 × 5 = 8.85
Resins: 0.95 × 5 = 5.75
Soaked Resins: 0.69 × 5 = 3.45
Sauerkrout (20%): 0.6 × 5 = 3
For dilution of 1:10
Peanuts: 0.40 × 10 = 4
Soaked Peanuts: 1.62 × 10 = 8.1
Sauerkrout (30%): 0.47 × 10 = 4.7
Sauerkrout (50%): 0.47 × 10 = 4.7

References


