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Full Length Research Paper

Comparison of protein values from seven wild edible plants of Iran

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Plants are one of the major sources of proteins. The plants *Arum maculatum, Portulaca oleracia, Semicarpus anacardium, Carissa karandus, Cordia myxa, Solanum indicum and Chlorophytum comosum* are widely available in the wild in many regions of Iran. These are consumed as fruits and vegetables. Therefore, to study the comparison of their protein values, these plants were selected for further study. The protein values estimated (in percentage) are: *A. maculatum, (*57.0), *Portulaca oleracia* (44.8), *C. comosum* (28.4), *C. karandus* (22.6), *C. myxa* (20.2), *S. indicum (* 17.5) and *Semicarpus anacardium* (7.93). Therefore, as these wild plants are rich in proteins, these can be used as non-conventional protein sources.

Key words: Protein, nutritional value, edible plants, Iran.

INTRODUCTION

Plants are one of the major sources of proteins. Poten-tially, plants provide a cheap source of industrial enzy-mes, and biopharmaceuticals (Conklin et al., 1999). Proteins have considerable technological importance since they affect the stability and sensory quality of plant foods. Research on bioactive peptide/proteins has been increasing including work on the development of patho-gen resistant and antimicrobial compounds (Casey et al., 1982).

Biopharmaceutical proteins

Vaccines, antibiotics, and other pharmaceutical proteins have been produced in plants, including glucocerebro-sidase and granulocyte- macrophage colony stimulating factor - two of the world's most expensive drugs.

Industrial proteins

Various industrial proteins have been produced transge-nically in plants, for example, the human milk proteins lactoferrin and beta- casein as a supplement for human infant formulas and baby foods to enhance nutrition, digestibility and antimicrobial properties. Many industrial processes involve degrading plant cell walls and other carbohydrates, such as those in the paper, wood and brewing industries, in detergent manufacture, and in feed and food production. For this reason, research has fo-cused on the production of enzymes such as amylases, phytases and hydrolyses (Bickoff et al., 1995).

Recently, tobacco was modified with the human colla-gen 1-gen pro1 (1).- Collagens are used in the cosmetics and food industries, as well as for the production of medical and surgical supplies.

The tobacco procollagen was spontaneously processed into mature collagen during extraction, demonstrating a potential advantage of plants for the large-scale, low-cost production of collagens.

Because of their diversity, differences in terms of physico-chemical properties and amino acids composi-tion, plant proteins have considerable commercial poten-tial. In addition, they are cheap in comparison with most animal proteins. Most techniques for preparing plant protein substances (PPSs) have been developed for Soya, but more recently these have also included le-gumes (Peas, Beans) and Cereals (Anelli et al., 1997; Robinson, 1987).

Extraction methods

In comparison with other organic food components, pro-twins are very complex as far as their structures, hetero-geneity and associations with other cell components, par-ticularly other biopolymers. In addition, once isolated structural changes may affect their nutritional and functio-

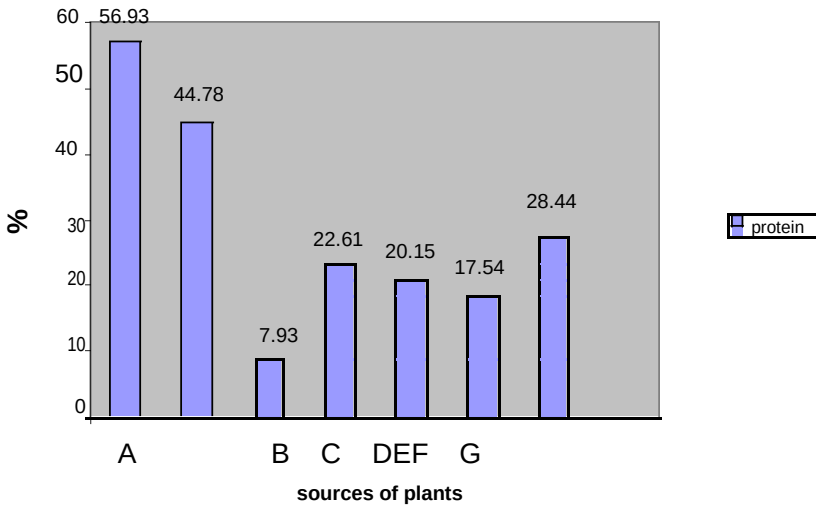

Figure 1. Amounts of protein of seven edible plants.

nal properties. So the solubility [(the first criterion of denaturation (only for non-soluble proteins)] of a particular protein varies according to the method of extraction.

For the quantification of proteins in plants various methods have been described in the literature (Moreno-Arribas et al., 2002).

The protein extract concentration (N×6.25) was determined by the standardized and regular kjeldahl method (AOAC, 1995 # 976.06). The value of 6.25 was considered as a more accurate coefficient factor than the conventional value of 6.25 for the nitrogen
to protein conversion in vegetables (Mosse, 1990).

Digestion

In a Regular Kjeltec system (Kjeltec 2330 Analyzer Unit, User Manual, 1000 7729 / Rev 1.2, FOSS, Sweden) the controlled conditions during digestion eliminate the potentially large loss of acid which might cause loss of nitrogen. Therefore, the volume of acid required is generally less than that recommended in classical methods.

Therefore only 2 - 5 ml in semi micro (100 ml) tubes in a Kjeltec system. Generally the 250 ml tubes give easier sample handling than the 100 ml tubes. 250 ml tubes give flexibility to handle the broadest range of sample size and applications. They also handle foaming pro-blems during the first part of the digestion better than the 100 mltubes (Mosse, 1990; Moreno- Aribas et al., 2002).

Salt

Since all compounds except nitrogen do not decompose at the boiling point of concentrated sulphuric acid, it is necessary to increase the boiling point with a salt, usually potassium sulphate. This salt is incorporated in the Kjeltabs together with the catalyst (contain 1.5 g K_2SO_4 and 0.15 g $CUSO_4$, 5H $_2$O) if samples with high fat or carbohydrate content are to be analyzed. Crystallization all compounds except nitrogen can occur because it takes more acid to oxidize these constituents than pro-tein, in which case an added 2 - 3 ml extra acid at the start of the digestion. Crystallization during digestion can cause nitrogen losses (Mosse, 1990; Moreno- Aribas et al., 2002).

MATERIALS AND METHODS

Seven wild edible plants occurring in Iran were evaluated for theirprotein values viz. *Arum maculatum, Portulaca oleracia, Semicarpus anacardium, Carissa karandus, Cordia myxa, Solanum indicum and Chlorophytum comosum*. These plant samples were obtained from south Iran**.** Edible parts of *Portulaca oleracia* are leaf and stem and Edible parts of *Semicarpus anacardium, Carissa karandus, Cordia myxa, Solanum indicum and Chlorophytum comosum* are them fruits. Except of *P. oleracia*. These plants such as *S. anacardium, C. karandus, C. myxa , S. indicum* (trees) often grow in jungle and them fruits are edible and tubers of *C. comosum* is edible and grows in garden. Efforts made to collect these plants in flowering and fruiting conditions for the correct botanical identification. Healthy and disease free edible plant part/s selected and dried them under shade so as to prevent the decomposition of chemical compounds present in them. All the dried material powdered in blander for further study.

Solid samples were normally treated by some form of grinding. This was accomplished in a simple coffee grinder (Model UMS; Stephan und Sohne GmbH & Co., Hameln, Germany, Foss Company)**.** The solid samples were dried in the Laboratory of the Department of Food Science and Technology, Ahvaz University). However, the consistency of the treatment was vital to obtain satisfactory results especially when the analytical method has been optimized to one set of conditions. As a recommendation, the particle size should be less than 1 mm (AOAC.1990; Gueguen and Barbot, 1988).

In the present investigation, Kjeltec 2300 Analyzer unit, 1000n7729/ Rev 1.2, Sweden was used for determination of total crude proteins in according to total nitrogen amount and 6.25 factor.

The protein fraction was extracted according to a method of the determination of nitrogen according to Kejeltec using block diges-

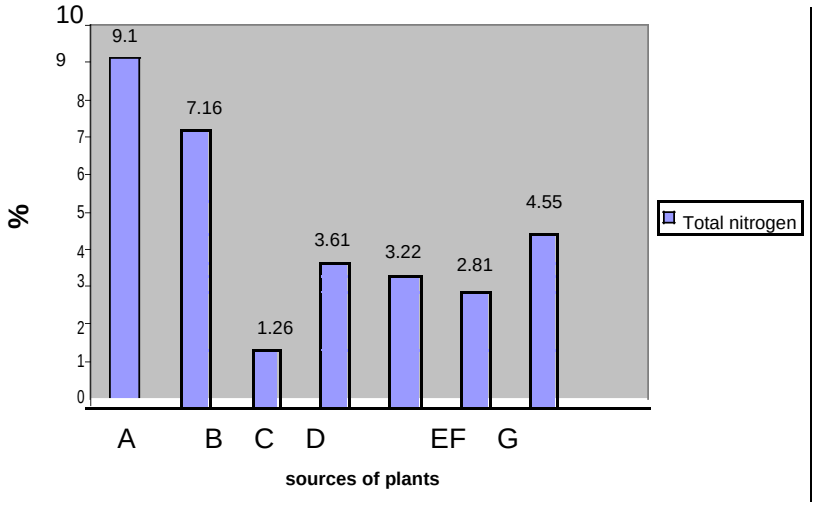

Figure 2. Amounts of total nitrogen of seven edible plants.
A = *Arum maculatum*, B = *Portulaca oleracia*, C = *Semicarpus anacardium*, D = Carissa karandus, E = *Cordia myxa*, F = *Solanum indicum* and G = *Chlorophytum comosum*.

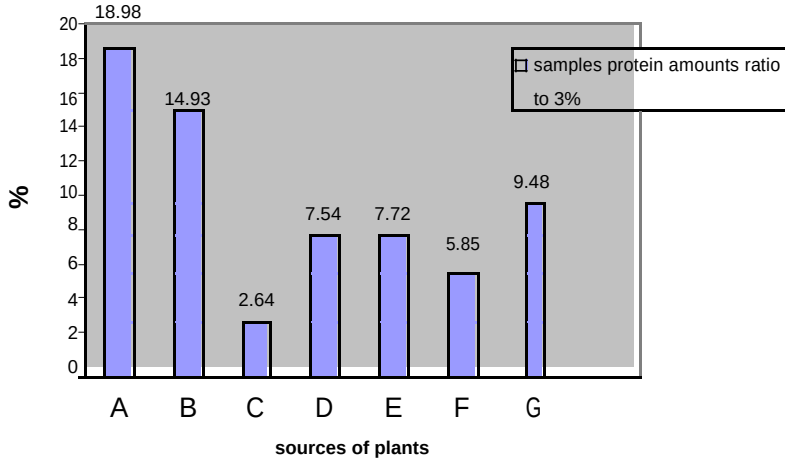

Figure 3. Samples of protein amounts ratio to vegetables protein maximum amount.
A = *Arum maculatum*, B = *Portulaca oleracia*, C = *Semicarpus anacardium*, D = Carissa karandus, E = *Cordia myxa*, F = *Solanum indicum* and G = *Chlorophytum comosum*.

tion and steam distillation. This method, was followed for the analysis of nitrogen using the Tecator Kjeltec systems. After that 1g of each sample was weighed accurately by using a 0.01 accuracy digital balance (AND, France). After that 10 ml sulphuric acid 98% was added to every sample and then one catalyst tablet (contain 1.5 g K_2SO_4 and 0.15 g $CUSO_4$, $5H_2O$) was added to each sample and then samples were put in digestion block for 1.5 - 2 h at 400°C. The digestion stage was finished when a blue green solution was obtained, and then 20 ml deionized (Fater electronic system, Iran) water was added to this solution. In next stage, samples were placed in a Kjeltec Automatic apparatus. To each sample 40% NaOH solutions were added and a receiver solution (contain1% Boric acid with Bromocresol green and Methyl red as an indicator solution) were used to collect the distillate, which was then titrated with 1% HCl solution to measure the nitrogen value in each sample. The values were calculated by following (AOAC 1995; Gueguen and Barbot, 1988; Moreno- Aribas et al., 2002; Shaid et al., 1987). Nitrogen Value × 6.25 factor equal to protein value.

RESULTS

Samples Proteins amounts, samples protein amounts ratio to vegetable protein maximum amount and samples total nitrogen % of seven wild edible plants of Iran has been showed in Figures of 1, 2 and 3.

In this study, eight treatments with tree replications were analyzed, though data statistically were analyzed by complete Randomized design. Experiment SAS program

(8.12, 2005) and means were compared with Duncan at 5%level.

Conclusion

Plants, such as vegetables and fruits, have satisfactory edible proteins only if they are safe with high quality so that they can be used by humans. The results showed that *A. maculatum* and *P. oleracia*, plants have high protein.

Therefore, as these wild plants are rich in proteins, these can be utilized as non-conventional bio-nutritional sources. These plants only grow in Iran because the cultivation condition is suitable. Iranian people always eat stem and leaf (whole plant without root) of *P. oleracia* asedible vegetable in breakfast, lunch and dinner and it is very delicious but researchers are searching on fruits nutritional value of *A. maculatum*, *S. anacardium*, *C. karandus*, *C. myxa*, *S. indicum* and stem nutritional value of *C. comosum*.

Therefore, we can conclude Despite most Vegetables and fruits are low in protein content (3 - 3.5%) but these plants especially *A. maculatum and P. oleracia* are rich from point of protein amounts respectively (56.93 and 44.78%) and *P. oleracia* is a edible vegetable and Iranian people always are eaten stem and leaf (whole plant without root) of *P. oleracia* as edible vegetable in breakfast, lunch and dinner and also the others plants except *C. comosum* always are consumed as fruits.

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