

CHEMICAL COMPOSITION OF COMMON LEAFY VEGETABLES

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ABSTRACT. The present investigation was undertaken to determine the nutrient content of different types of leafy vegetable. The varieties of leafy vegetables utilized are diverse, ranging from leaves of annuals and shrubs to leaves of trees. Leafy vegetables are generally good sources of nutrients. They are important protective foods and highly beneficial for the maintenance of health and prevention of diseases as they contain valuable food ingredients which can be utilized to build up and repair the body. Vegetables are classified according to type and nutritive values, and were subjected to proximate analysis from determination of energy values, nutritionally values and minerals.

Keywords: leafy vegetable, human nutrition, quality, chemical

INTRODUCTION

Vegetables are important in rational nutrition, thanks to a rich content of nutrients and energy, especially as a favorable influence on the functions of the physiologic human organism. Most vegetables taste like, with different shades of one variety to another, some of which are rich in essential oils, glycosides, pigments etc. which stimulates appetite. The large number of species, varieties and varieties of vegetables are raw material for preparing a variety of foods, thus improving range enriching food. The chemical composition of vegetables shows high water content, sugars, protein, starch, fat, energy value (in calories), etc. (Butnariu M., 2006).

Comparing vegetables and other foods of animal origin can say that vegetable products have a lower food value and a lower heat, but have special importance in human nutrition, the high content of vitamins, minerals etc. Many species of vegetables containing high amounts of digestible carbohydrates (starch, sucrose, glucose, fructose), non-digestible carbohydrates (cellulose, hemicellulose, pectin, protides) (Butnariu M., 2007).

Consumption of fresh vegetables enables full assimilation of vitamins in the human body. Vegetables are well represented in the composition of numerous minerals such as those of: Ca, Fe, Cu, P, Zn, Cl, Na and others. The dominant basic elements in plants and vegetables are Ca, K, Fe, Na etc. These provide alkalizing effects, neutralizing the acidity produced by other foods, especially those of animal origin [Genders. R. 1994]

Parsley – *Petroselinum crispum* – is a powerhouse of nutrition, rich in vitamins B and C, β – carotene and zinc. It also contains absorbable forms of iron and calcium. Parsley is high in boron and fluorine – both bone strengtheners. It aids digestion and is a great source of chlorophyll, a detoxifier. New research shows that flavonoids and essential oil compounds

from parsley act as powerful antioxidants, perhaps slowing the aging process and protecting cells. Parsley is a diuretic that purifies the blood and accelerates the excretion of toxins. Parsley (*Petroselinum crispum*), the world's most popular culinary herb is also known as "rock celery" and belongs to the Umbelliferae family of plants. Parsley, which has hypoglycemic activity, has been used as a folk remedy for diabetes (Chevallier A., 1996).

Apium graveolens is a plant species in the family Apiaceae commonly known as celery (var. dulce) or celeriac (var. rapaceum) depending on whether the petioles (stalks) or roots are eaten. Celery is valuable in weight – loss diets, where it provides low – calorie dietary fiber bulk. Celery contains androstenone (Huxley A., 1992).

Bergapten in the seeds can increase photosensitivity, so the use of essential oil externally in bright sunshine should be avoided. The oil and large doses of seeds should be avoided during pregnancy: they can act as a uterine stimulant. Seeds intended for cultivation are not suitable for eating as they are often treated with fungicides. There is a common belief that celery is so difficult for humans to digest, that it has negative calories because human digestion burns more calories than can be extracted. Celery seeds are also a great source of calcium, and are regarded as a good alternative to animal products [Allardice. P. 1993].

Cabbage is an excellent source of Vitamin C. It also contains significant amounts of glutamine, an amino acid which has anti-inflammatory properties. Cabbage can also be included in dieting programs, as it is a low calorie food. It is a source of indole-3-carbinol, a compound used as an adjuvant therapy for recurrent respiratory papillomatosis, a disease of the head and neck caused by human papillomavirus that causes growths in the airway that can lead to death. (Butnariu M., 2008).

In European folk medicine, cabbage leaves are used to treat acute inflammation. A paste of raw cabbage may be placed in a cabbage leaf and wrapped around the affected area to reduce discomfort. Some claim it is effective in relieving painfully engorged breasts in breastfeeding women. Fresh cabbage juice has been shown to promote rapid healing of peptic ulcers. Lettuce is a fat free, low calorie food and is good for a well-balanced diet. It is a valuable source of vitamin A and folic acid. Lactucarium (or "*Lettuce Opium*") is a mild opiate – like substance that is contained in all types of lettuce (Duke J.A., 1985). Both the Romans and Egyptians took advantage of this property eating lettuce at the end of a meal to induce sleep. Vitamin C or L – ascorbic acid is an essential nutrient for humans, in which it functions as a vitamin. Ascorbate (an ion of ascorbic acid) is required for a range of essential metabolic reactions in all animals and plants. Deficiency in this vitamin causes the disease scurvy in humans. It is also widely used as a food additive. The pharmacophore of vitamin C is the ascorbate ion. In living organisms, ascorbate is an anti – oxidant, since it protects the body against oxidative stress and is a cofactor in several vital enzymatic reactions (Bown D., 1995). Calcium is essential to almost every function in the body. For most of these, such as: blood clotting, intracellular signaling, muscle contraction, only trace amounts are needed. However, large amounts of calcium are needed to make bone. Thus, substantial amounts are needed in the diet, especially during infancy, childhood, and pregnancy. Three hormones: parathyroid hormone, calcitonin, and calciferol, work together to regulate how much calcium, is absorbed from your food, is taken from or added to bone, is excreted in the urine. A temporary deficit in the amount of calcium in the diet can be compensated for by its removal from the huge reserves in bone (Phillips R., 1990).

The purpose of this study is analyzed with the view to determine the nutrient content of tissue from different tissue leafy Vegetables commonly grown and consumed.

MATERIALS AND METHODS

The recommended methods of the Association of Official Analytical chemists [AOAC, 1999] were used for the determination of moisture, ash, crude lipid, crude fibre and nitrogen content.

Sample collection and treatment. Plant samples were collected only after careful observation to determine areas where plants grow. Three samples were collected only during adulthood. Samples were labeled and it was noted aspect of the sampling. Dried vegetable products, is ground until a fine powder and then homogenized by sieving through a sieve with 30 mesh/cm². For a comprehensive chemical analysis of plant product was used in the original method of extraction of plant material with different polarity solvents. First – cut vegetable products (50.0 g) to a fine powder was extracted in Soxhlet apparatus with

dichloromethane (non – polar solvent, the soluble lipophilic substances). After complete drying vegetable product remained was extracted with methanol (a solvent of medium polarity, which amphiphil soluble substances) and, finally, the residue was extracted with a highly polar solvent – water.

Proximate analysis. The recommended methods of the Association of Official Analytical chemists were used for the determination of moisture, ash, crude lipid, crude fibers and nitrogen content.

Mineral analysis. The mineral elements comprising sodium, calcium, potassium, magnesium, and phosphorus were determined with some modifications. 2.0 g of each of the processed samples was weighed and subjected to dry ashing in a well – cleaned porcelain crucible at 5500C in a muffle furnace. The resultant ash was dissolved in 5.0 ml of HNO₃/HCl/H₂O (1:2:3) and heated gently on a hot plate until brown fumes disappeared. To the remaining material in each crucible, 5.0 ml of de – ionized water was added and heated until a colorless solution was obtained. The mineral solution in each crucible was transferred into a 100.0 ml volumetric flask by filtration through Whatman No. 42 filter paper and the volume was made to the mark with de – ionized water. This solution was used for elemental analysis by atomic absorption spectrophotometer. A 10 cm long cell was used and concentration of each element in the sample was calculated on percentage (%) of dry matter i.e. mg/100 g sample. Phosphorus content of the digest was determined colorimetrically.

Vitamins analysis. Ascorbic acid (vitamin C) was determined titrimetrically.

Preparation of fat free sample. 2.0 g of each of the processed sample was defatted with 100 ml of diethyl ether using a Soxhlet apparatus for 2 h.

Other analysis. The moisture content of fresh parathas was determined. The parathas were then dried at 700 ± 20C in hot air oven, powdered and stored in glass bottle for further studies. The dried samples were then analyzed for true protein, crude fat, total sugar, mineral and energy by multiplication method. For biochemical characteristics, standard methods of analysis were used. The mineral content of samples was analyzed by AOAC method using the Atomic absorption spectrophotometer.

Estimation of energy value. The sample calorific value was estimated (in Kcal) by multiplying the percentage crude protein, crude lipid and carbohydrate by the recommended factor (2.44, 8.37 and 3.57 respectively) used in vegetable analysis.

The caloric value was determined based on the Atwater factor (FAO, 2006a).

RESULTS AND DISCUSSIONS

Fresh vegetables are important sources of nourishment and a vital ingredient in healthy and balanced diets. Fresh vegetables are highly recommended in any diet virtually without quantitative

restriction and the roles of vegetables in maintenance of good health are well known.

Green leafy vegetables form an indispensable constituent of diet in Romania.

Vegetable are important as food both from economic and nutritional stand point.

Their nutritive significance is their richness in minerals and vitamins which is essential is the maintenance of human health.

The importance and awareness of nutrition is public health issues has resulted in the increase demand of knowledge of the biochemical nutrients of foods.

Table 1

CHARACTERISTICS OF THE STUDIED SAMPLES

Nr. crt.	Vegetables (100 grame)	Water (%)	Energy (kcal)	Proteins (grame)	Vitamin C (mg)	Ca (mg)	P (mg)	Mg (mg)	Ratio Na:K
1.	Leaf parsley <i>Petroselinum crispum</i>	87.71	36	2.97	133.0	138	58	50	0.0492:0.0468
2.	Celery leaves <i>Anethum graveolens</i>	85.95	43	3.46	85.0	208	66	55	0.0474:0.0456
3.	Lettuce <i>Lactuca sativa</i>	94.91	14	1.62	24.0	36	45	6	0.0483:0.0418
4.	Cabbage <i>Brassica oleracea</i>	92.52	24	1.21	51.0	47	23	15	0.0362:0.0346

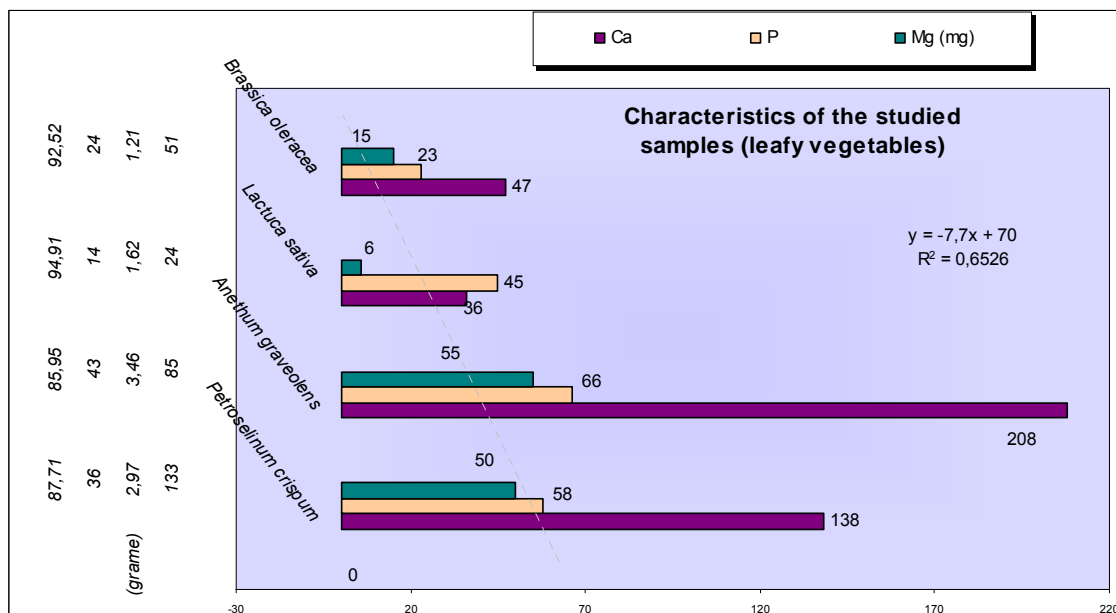


Fig. 1 Characteristics of the studied samples (leafy vegetables)

They are good sources of carotene, ascorbic acid, riboflavin, folic acid and minerals like calcium, iron, and phosphorous.

Vegetables also contain phytochemical which are nutritionally and medicinally useful but times reduce the bioavailability of nutrients in human system.

Since sodium and potassium are important intercellular and extra cellular action.

The Na and K ratio are important in determine the health status of an individual.

The processing methods produce Na and K ratio less than 1 which is in accordance with the recommended ratio.

The result showed that the values of the minerals were highest in the *Anethum graveolens* sundried samples.

CONCLUSIONS

Originality of research is to contribute to understanding the chemical composition of common leafy Vegetables, by identifying new constituents and the content for some of them.

Scientific novelty of the study is to establish ratio Na: K. Green Leafy Vegetables occupy an important place among the food crops as these provide adequate amounts of vitamins and minerals for humans.

They are rich source of carotene, ascorbic acid, riboflavin, folic acid and minerals like calcium, iron and phosphorous. In nature, there are many underutilized greens of promising nutritive value, which can nourish the ever increasing human population.

The nutritive value of greens remains underutilized due to lack of awareness and promotion of appropriate technologies for their effective utilization.

Ascorbic acid is necessary for healthy teeth, gums and bones and is essential for proper functioning of adrenal and thyroid glands.

Also, ascorbic acid is an anti – oxidant and as such acts as a general de – toxicant.

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