

Investigation and Measurement of Some Mineral and Vitamins in Eggplant Fruit Calyx, and the Possibility of Being Used As Food Supplements and Alternative Medicine

Khuloud Al Nachar*, Jameela Hasian, Racha Al Khatib

Department of phytochemistry and Pharmacology, Faculty of pharmacy, Damascus university, Damascus city, syrian arab republic

*Corresponding author: Khuloud Al Nachar, Department of phytochemistry and Pharmacology, Faculty of pharmacy, Damascus university, Damascus city, syrian arab republic, E-mail: kholudalbeak@gmail.com

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Abstract

Food supplements are Plenty present in medicinal markets and have taken a great importance as they compensate for many of the minerals and vitamins lacking in human body, but most of them rely on introducing a chemicals substances in there composition without making an attention to their representation or its harmful effects in the body ,this research has been interested in this regard and studied the components of eggplant calyx (cones) by confirming the existence of some minerals and vitamins with the identification of values and calibrated It, all these results has been compared with previous studies of these elements in edible part of the eggplant with mentioned of the daily recommended intake and the value of minerals and vitamins was greater than that in the edible part. So this study show the importance of these minerals and vitamins and link their presence with each other in influencing the health of the body and how it could protect it from certain diseases. Hence, we can say that this neglected and damaged eggplant calyx in our system Food is a natural and balanced food supplements, therefore this discovery will be important in the manufacture of dietary supplements.

keywords: Eggplant fruit calyx, Magnesium, Calcium, Vitamin C, Zinc

Introduction

Eggplant (*Solanum melongena* L.), is a vegetable crop, economically important, consumed widely in Syria. Its native is related to the South East Asian region and was domesticated over 4000 years ago [1].

Many studies have been proved the effectiveness of fruit in the treatment of many diseases such as diabetes, gonorrhoea, cholera, bronchitis, dyspnea, dysentery, debilitation and treatment of hemorrhoids thus, this extracts were either completely effective treatment or effective adjuvant treatment [2,3].

Eggplant is low in calories and has various macro- and micro-minerals, which are beneficial for human health [4].

These minerals have an important effect on human body such as the production of protein and fatty acids, supporting the immunity system and regulating blood sugar. However, the body does not get any benefit from some of the minerals found if the ratios of other minerals excess, for example increase zinc inhibits the absorption of magnesium and manganese, and cause the lack of copper and cause a less absorption of iron in the body [5]. In addition, vitamin B5 and vitamin C are crucial to human nutrition, particularly, in the inflammation resistance [6].

Today, more than 2 billion people in the world are estimated to be deficient in key minerals, particularly, iron and zinc. Most of these people live in low income countries and are typically deficient in more than one micronutrient [7].

Although there are a few studies describing the mineral content in eggplant fruit [8], there is no information about the mineral content in eggplant calyx.

Hence, the present investigation was undertaken to detect and calibrate: calcium, manganese, magnesium, zinc, iron, copper, phosphorus, potassium, sodium, vitamin C and vitamin B5 ineligible part of eggplant and its effect on various organs and functions in the body.

Materials and Methods of Research

Chemical reagents

All the reagents used were analytical grade and obtained from Panreac, Spain.

Plant materials

Eggplants (*Solanum melongena*) were purchased from local markets in Damascus. The fruit calyx were obtained, dried, and stored away from moisture.

Moisture content determination [9]

5 g of cones powder is taken in a petri dish.

- is then calculated : $\text{weight after drying} - \text{weight before drying} \times 100$ Weight problem

Dry matter = 100- Humidity

Determination of ash content [10]

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. The three main types of analytical procedure used to determine the ash content of foods are based on this principle: *dry* ashing, *wet* ashing and *low temperature plasma dry* ashing. The method chosen for a particular analysis depends on the reason for carrying out the analysis, the type of food analyzed and the equipment available. Ashing may also be used as the first step in preparing samples for analysis of specific minerals, by atomic spectroscopy or the various traditional methods.

Dry Ashing

Dry ashing procedures use a high temperature muffle furnace capable of maintaining temperatures of between 500 and 600 °C. Water and other volatile materials are vaporized and organic substances are burned in the presence of the oxygen in air to CO₂, H₂O and N₂. Most minerals are converted to oxides, sulfates, phosphates, chlorides or silicates. Although most minerals have fairly low volatility at these high temperatures, some are volatile and may be partially lost, *e.g.*, iron, lead and mercury. If an analysis is being carried out to determine the concentration of one of these substances then it is advisable to use an alternative ashing method that uses lower temperatures.

The food sample is weighed before and after ashing to determine the concentration of ash present. The ash content can be expressed on either a *dry* or *wet* basis:

$$\% \text{ Ash (dry basis)} = \frac{M_{\text{ASH}}}{M_{\text{DRY}}} \times 100$$

Ashes: 5 g of eggplant cones powder is taken and placed in a porcelain jar and then placed in a 550 ° C incineration oven for 2 hours. Weight after incineration the weight of the empty jar X100 \Weight problem Preparation of new samples from the ash sample: Preparation of precipitation from ash sample 100/5 ml: Take 5 g of ashes in a 100 ml in flask → add 5 ml HCL (25%) → add distilled water to 50 mL → heat for less than 100 ° C → refrigerate → Complete with the distilled water to the mark → filter.

The result filter is ready for metallurgical analysis

Determination of mineral content [10]

Phosphorus

The spectrophotometer is measured at a wavelength of 436 nm using an ammonium molibdate detector and the color intensity (yellow color) is measured with a standard series of phosphorus (KH₂PO₄)

Note: (Initial dilution is extended ten times to fit the concentration with the standard series)

Sodium and potassium

The electrode is measured by the flame of the electrolytes by blowing bonat/ air Standard series of 25% NaCl. and reading each metal along a specific wave by comparing it with a standard series and each series starting at 0.5 ppm and ending with 5ppm.

Note: (Initial expansion was extended ten times to fit the standard deviation)

Iron and zinc

With an atomic absorption device with a standard series, using a gas (acetylene/air) With the use of measuring bulb

Vitamin B5 and vitamin c

The proportion of vitamin B5 is determined by the HPLC according to the approved reference

Column: Vinyl column (SB-Vinyl) with dimensions of 5Micron.25cm x 4.6mm

Wave length: 280 nm

Flow of the mobile phase: 1 ml / min

Injection quantity: 20µL

Mobile phase A: Water: Methanol: Snow vinegar: Tri-ethylamine (97: 2: 1: 0.12)

With 100 mg Sulfonic Acid

Mobile phase B: Water: Methanol: Ice Acetic Acid: Tri ethylamine (27: 72: 1: 0.12)

B5

We carefully weigh 10 mg of B5 into a 100 ml flask.

Add approximately 70 ml of the extension solution (monosodium phosphate M.0.05 at pH = 6.8

To the former volumetric flask 100 mL, then put the volumetric flask on the ultrasonic wave bath for five minutes

We complete the signal by the extension solution and then take the previous mixture 4 ml into a 10 mL volumetric flask

We even complete the signal by the extension solution

Vitamin C is neutralized by HPLC according to House Method.

The sample transporter phase is composed of acidic potassium phosphate of 50 mM and methanol.

The sample is methanol or electrolytic water. Wave length nm254

Results and Discussion

The analysis of fruits calyx revealed low moisture content (10.6%), that makes them less susceptible to infection by micro-organisms. High level of ash content have also been reported (11.6%).

Analyses of the mineral showed that the contents of minerals were moderate and sufficient for the daily need (table 1).

Minerals and vitamins	Daily recommended intake (mg)	Percentage of ingredients in eggplant cones (mg /100g)	Percentage of ingredients in edible part(mg /100g)
Phosphorus	1000	350	47
Magnesium	410	180	15
Potassium	3400	1400	2
Sodium	2300	100	3
iron	15	4.7	0.38
Zinc	11	1	0.22
Manganese	1.8-2.3	0.68	
Calcium	1300	450	18
Copper	0.9	0.46	0.12
Vitamin B5	5	7,3	
Vitamin C	75	45	12

Table 1: Comparison between Minerals and vitamins in edible part of eggplant [11], daily recommended intakes and Percentage of ingredients in eggplant cones

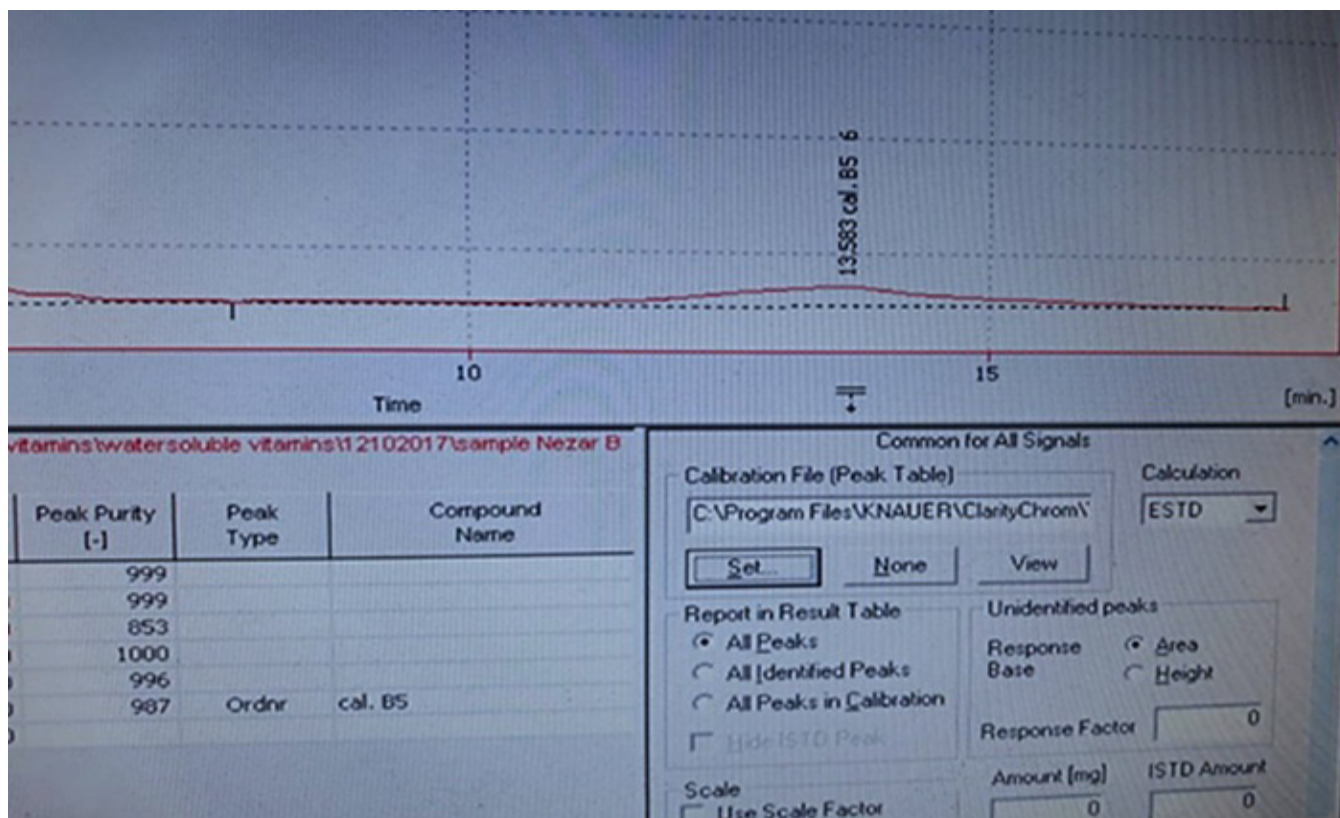


Figure 1: Graphical curve of vitamin b5

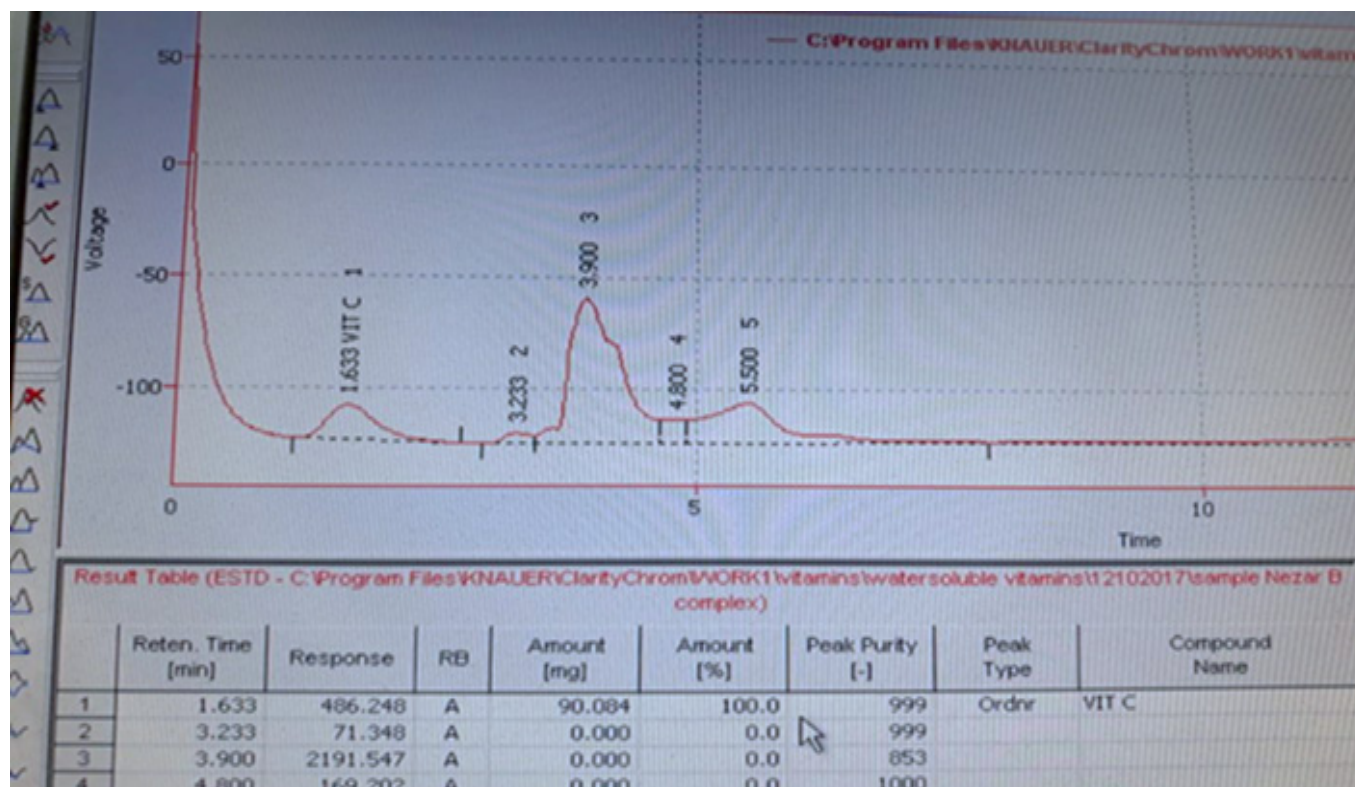


Figure 2: Graphical curve of vitamin c

Discussion

Magnesium (Mg) level was 180 mg / 100 g compared to 15 mg / 100 g in eatable part. Since the daily recommended intakes is 410 mg. [12], the amount of magnesium is important, especially for protein [13] and of DNA [14] manufacture , removes toxic ammonia from the body, supporting the immune system ,regulate blood sugar because it promotes the secretion of insulin [15], reduces anxiety , improves the quality of sleep and mood because serotonin depends on magnesium [16], relieves asthma attacks [17] and helps to support the muscle system and bones to protected from muscle spasm [18].

manganese with a concentration of 0.68 mg / 100 g and a daily recommended intakes of 2.3-1.8 Mg [19], the amount present is equivalent to one third of the allowable amount, which is important for the nervous system , helps in protein and amino acids digestion [20], supports bone mineral density with (calcium, zinc and copper) [21], play a role in regulating blood sugar because it is concentrated in the pancreas and it is involved in insulin production [22,23] a blood vessel expander that reduces the risk of stroke [24,25] and necessary for brain functions through Its antioxidant activity [20].

Zinc level was of 1 mg / 100 mg versus 0,22 mg / 100g in the edible part of the previous studies The daily recommended intakes

is 11 mg [19], which means that the amount is moderated ,zinc is important for protein, nucleic acids and DNA production, Cell regeneration Where it prevents degradation of The blood vessels inner walls endothelium keeping the Arteries and veins healthy , an antioxidant properties [26], and maintain the integrity of the immune system so it prevents cancers development, reduces lungs inflammation and inhibits viruses [27], also pancreas contains amount of zinc so any deficiency in it well cause a lack in Insulin secretion [28].

It is obvious that zinc quantity is good so it does not affect the amount of magnesium and manganese because the zinc increases their lacking.

Therefore the zinc amount is good for body elements balance because its increase makes a copper lack and a decrease in iron absorption so it is better for anemia patient to take (iron + copper + folic + vitamin C) [29].

Iron (Fe) level was 4.7 mg / 100 g compared with 0.38mg / 100g from eatable part. The daily recommended intakes is 15 mg [19], one third of the resulting quantity is equivalent to one third of the daily recommended intake, makes it very important in Enzymes function, help absorbing oxygen, convert blood sugar into energy, and protect body from anemia [30], However. Body does not get any benefit from iron found in food or medicine if the

person suffers from deficiency of copper [31] or vitamin C [32] therefore the calibration has been done also on copper and vitamin C.

Copper (Cu) level was 0.46 mg / 100 g compared with 0.12 mg / 100 g from the eatable part of the previous studies. Since the daily recommended intakes is 0.9mg [19], therefore the resulting quantity is a half of the quantity required. This is very important and useful. Because Copper helps to form body collagen [33], iron absorption [34]. Metabolism [34], energy production [35], red blood cells formation [36], maintain bones health [37], prevent cardiovascular disease [38], prove immune function, and has an antioxidant activity [39].

Vitamin C level was 45 mg / 100 g vs 12 mg / 100 g in the eatable part of the previous studies Since The daily recommended intakes were 90 mg [40] This is very important because it helps in Bones, skin and blood vessels composition and maintenance [41], has an important role in a number of physical functions including the collagen [42], keratin [43], and some neurotransmitters [42], production, promotes iron absorption [44], its antioxidant activity may reduce the risk of some cancer types [45], prevent acute respiratory infections (Moser and Chun, 2016), protect against cardiovascular disease [46], and has beneficial effect on diabetic patients as it reduces the risk of kidney, eye and nerve deterioration [41].

In the field of bone health, these elements have an important effect to increasing density and protection, as mentioned earlier, but this importance remains incomplete without the effect of calcium and phosphorus.

With **calcium** calibrations, the concentration was 450 mg/100 g versus 18 mg/100 g in the treated part of previous studies since the daily recommended intakes are 1300 mg [47], the result of concentration is very substantial for body's need, such as it is an adjunct to many enzymes [48], plays a key role in natural blood clotting [49], and it helps skin by regulating the color of it [50] and allows to protect itself. help reduce the risk of colorectal cancer [51], About 99% of it found in bones and teeth [52] It is essential for bone development, growth and maintenance [53], and the healthy communication between the brain and other parts of the human body in addition to it regulates muscle contraction, including myocardium [54], Phosphorus (P) concentration was 350 mg / 100 g compared with 47 mg / 100 g in eatable part in the previous studies. Daily recommended intakes are 700 mg [55], and here we find that the amount contained in eggplant cones equal to half the amount appropriate to the body need.

Phosphorus is an important element as it interacts with calcium to strength, build bones and muscles [56], work to strength the nerves and increase men's sexual ability [57], has a beneficial effect for hair healthy growth and protect it against fallout and Damage [58] and it helps cells to control proteins rate within the body, also the excess amount of it causes in calcium and magnesium absorption [59]. Therefore, its concentration in the extract is beneficial without causing damage to the level of calcium and manganese. Thus, the useful minerals for bone health in this summary are fully and balanced.

To confirm the benefit of nutritional of the extract on heart and blood vessels, this study includes comparing sodium and potassium value.

Sodium (Na) concentration is 100 mg / 100g versus 3 mg / 100g in eatable part in previous study. Daily recommended intakes are 2300 mg [60,61] Since these salts can spoil the internal epithelial layer of the micro vascular, this increases the problem of thrombosis and affects the immune system and increases it leads to atherosclerosis [62], sodium is responsible for sending signals through the nerves and enables the muscles to contract, the balance between the two can help the heart and blood vessels and the amount needed for it (4700 mg potassium/800 mg sodium) [2] or 14/1 This helps to balance fluid body [63] and this is achieved in Eggplant cones where we find its importance clear by its role in maintaining the fluid of volume of intracellular and cross-membrane electrochemical gradients. The FDA has agreed on the following health claim: "Dietary foods are containing a good potassium source containing low sodium content may reduce the risk of hypertension and stroke Cerebral [64]. And observational studies suggest that potassium is associated with control of blood glucose and type 2 diabetes [65].

In addition, it indicates that increased potassium consumption from fruits and vegetables is associated with increased bone mineral density [66], Here we see that potassium has an important effect on bone health, heart patients [67], and diabetes [68].

Vitamin B5 (ban tonic acid) was calibrated as a result of the calibration of 7.3 mg / 100 g. The daily recommended intakes are 5 mg [69] because it enhances the health of the skin, hair, eyes [70] and liver and assists in the formation of red blood cells and the conversion of food into glucose [71]. Studies suggest that taking vitamin B-5 can help lower cholesterol and triglyceride levels in the blood [72], its decrease causes respiratory infections [73] and increases insulin sensitivity [74].

Conclusion

This study revealed that eggplant calyx extract contained minerals and vitamins with concentrations higher than the edible part, which is generally important and useful food for cardiovascular and diabetics patients and has a significant role in maintaining the health of bones, muscles and alleviate the inflammation with good support for the role of immunity of the body and some studies prove that the combination of the following elements (phosphorus, potassium and vitamin C) in there appropriate amounts for the body, they well calms the pain. eggplant cone has very important minerals which billions of people are estimated to be deficient and can be a alternative to this deficiency.

We hope that those who are interested in health benefit from the eggplant cones, do not expose them to damage their richness with beneficial nutritional supplements to the human body.

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