

# Nutritional and Phytochemical Evaluation of Egusi Melon Seeds: *Citrullus colocynthis* L

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## Abstract

Feeding the population of the world with nutritionally adequate food is a massive challenge. Thus, determining the nutritive content of food becomes valuable in ensuring the food's nutritional status. Current investigation aimed to determine the nutritional and phytochemical composition of seeds of *Citrullus colocynthis* which is used as major ingredient in West African cuisine. Higher contents of carbohydrate, proteins, fat and fiber of 7.8, 27.6, 50.7 and 8.50 g/100g were found in *Citrullus colocynthis* seeds. The results of minerals were Ca, K, Na, P, Fe, Mg, and Zn. High content of magnesium, calcium and phosphorus were recorded in seeds 26.4, 21.4 and 16.8mg/100g as compared to other minerals present. Steroids, alkaloids, glycosides, carotenoids and flavonoids were also present. Since, phytoconstituents help to maintain nutritional status as well as prevent various disorders. Therefore, they should be included as dietary supplement.

**Keywords:** Proximate composition, minerals, phytoconstituents

## Introduction

*Citrullus colocynthis* is a wild fruit and belongs to the *Cucurbitaceae* family. This herb is perennial, commonly trailing and usually grows wild in the sandy lands of North West, the Punjab, Sind and Central and southern India and Coromandal coast. It is also native to Arabia, West Asia, and Tropical Africa and in the Mediterranean region (Borhade *et al*, 2013). Herbal medicines are most importantly recognized as one of the fields of traditional medicine worldwide. Various extracts of traditional medicinal plants have been examined to recognize their therapeutic potential (Sannadgol *et al*, 2011). *Citrullus colocynthis* seeds are used as a source of remedies for the treatment of various diseases (Masha *et al*, 2014). It possesses antiviral, antidiabetic, antiulcerogenic, anticancer and anti-malarial properties that also help in curing cardiovascular related diseases (Meena, Meena and Patni, 2014).

*Citrullus colocynthis* contains carbohydrate, protein, amino acid, tannins, saponins, total phenols, flavanoids, flavones, glucosides, terpenoids, alkaloids, anthranol, steroids, cucurbitacins, saponarin, cardiacglycoloids, trace elements and many other chemical groups. They exhibit many pharmacological effects (Al-Snafi, 2016). This study highlights the chemical constituents and pharmacological effects of *Citrullus colocynthis*. The seeds of *Citrullus colocynthis* are known to have economic benefits. People do not know about the importance of *Citrullus colocynthis* seed because it is a wild plant. Through this several diseases can be cure of a person. The aim of the study to aware people with the neutraceutical properties of this seed because it is not so common in daily consumption. There is also limited literature on the effect of variety on the nutritional, phytochemical and antioxidant properties of the *Citrullus colocynthis* seeds.

## Materials and Methods

### Collection of plant material

The seeds were obtained from the botanical garden of Banasthali University, Rajasthan, India. The seeds were dried at 100° C in an oven for half an hour. The dried sample of seeds was milled with a mechanical blender and stored in air tight containers in a refrigerator for further analysis.

### Reagents

In this experiment, the used nitric acid and perchloric acid were purchased from Merck, India. For standard calibration of respective elements, we purchased Na, K, Ca, Fe, Mg, P and Zn standard solution (100mg/ml) from Sigma Company Mumbai, India. We prepared the respective desired from the stock solution using lab made double distilled water.

### Determination of proximate composition

Seeds powder was taken in a clean, dry and weighed crucible. It was oven dried later on at 110° C. It was weighed repeatedly until a constant weight was acquired. The crucible was cool down in desiccators every time before weighing. Proximate analysis included the estimation of moisture ash, fat, protein, crude fiber and carbohydrate of seeds. Total ash was estimated by weighing the furnace in incinerated residue at 550° C for 12 hours. Protein was analyzed by using micro-Kjeldahl distillation method. Carbohydrate content was determined by the difference method.

### Determination of minerals

Chemical estimations were carried out for determining sodium (Na), potassium (K), calcium (Ca), iron (Fe), magnesium (Mg), phosphorus (P), and zinc (Zn). The estimation of Ca, Fe, Mg, P and Zn was done by using atomic absorption spectrophotometer (AAS) (model VGP 210, Buck Scientific, USA). Flame photometer was used to determine Na and K.

The data recorded for respective elements was done in triplicate measurements for its authentication and used for standard deviation calculation.

### Phytochemical screening

The seeds of *Citrullus colocynthis* were screened for phytochemicals (tannins, steroids, terpenoids, alkaloids, glycosides, carotenoids and flavonoids) according to the procedure as described by (Tiwari *et al*, 2011; Boaky *et al*, 2015).

### Statistical Analysis

All the results were shown in Mean and Standard Deviation.

## Results and Discussion

### Proximate and mineral content

Table 1 revealed the amount of estimated moisture, ash, fiber, fat, protein and carbohydrate content in seeds of *Citrullus colocynthis*. On the basis of the results recorded, fat and protein was found to be higher than that is (50.7±1.5 and 27.6±0.3 g/100 g). Ash and fiber were also present in fair amount 27.6±0.3 and 8.5±0.2. The proximate analysis of *Citrullus colocynthis* showed that the seed contained (dry weight): moisture was found 3.17±0.3 g/100 g. On the contrary, slightly difference was seen in a study conducted by Ojeh *et al* (2007) that is 4.6±0.3 g/100 g. The low moisture content in the *Citrullus colocynthis* will help in improving its life span. The ash content of the *Citrullus colocynthis* was found 2.29±0.2 g/100 g. Similar results were found in a study conducted by (Dhellit *et al*, 2006) which indicates the presence of minerals that is 2.94±0.1 g/100 g. The crude fiber was found in *Citrullus colocynthis* 8.50±0.2 g/100 g. On the contrary, Ekop (2007) have reported that the presence of crude fiber is 5.51±0.64 g/100 g. The content of fat was seen to be 50.7±1.5 g/100 g. Similar results were found in a study conducted by (Akubugwo *et al*, 2008) that is 50.4±0.5 g/100 g. The protein content was found 27.6±0.3 in *Citrullus colocynthis*. On the contrary, slightly decreased amount was seen in a study conducted by (Taiwo *et al.*, 2016) that is 23.4±0.2 g/100 g. Thus, these seeds can be incorporated as a supplementation of protein for the human and animal food nutrition. The carbohydrate amount

was seen  $7.7 \pm 2.3$  g/100 g. On the contrary, slightly increased amount was seen in a study conducted by (Taiwo *et al.*, 2016) i.e.  $10.6 \pm 0.2$  g/100 g.

The minerals obtained in *Citrullus colocynthis* were calcium, potassium, sodium, phosphorus, iron, magnesium and zinc with the content recorded  $21.4 \pm 0.2$ ,  $13.4 \pm 0.2$ ,  $12.1 \pm 0.4$ ,  $16.8 \pm 0.1$ ,  $4.8 \pm 0.7$ ,  $26.4 \pm 0.2$  and  $8.0 \pm 0.1$  mg/100 g. On the contrary, significant differences were seen in a study on *Citrullus colocynthis* L. conducted by (Abbah, Sanni and Ejembi, 2014) results were ( $28.2 \pm 0.2$ ,  $96.1 \pm 0.4$ ,  $13.0 \pm 0.2$ ,  $125.3 \pm 3.1$ ,  $1.3 \pm 0.2$ ,  $31.4 \pm 0.2$  and  $1.2 \pm 0.1$  mg/100 g). Ash indicates the presence of minerals. Magnesium, phosphorus and sodium were found to be higher ( $26.4 \pm 0.2$ ,  $16.8 \pm 0.1$  and  $12.4 \pm 0.4$  mg/100 g) as compared to the other minerals. Calcium, potassium, iron and zinc were found in appreciable amount  $21.4 \pm 0.2$ ,  $13.4 \pm 0.2$ ,  $4.8 \pm 0.7$  and  $8.0 \pm 0.1$  mg/100 g. The role of minerals is very crucial in human's life such as calcium is essential for the prevention of diseases along with its contribution in the medicinal influences of the plant (Aliyu *et al.*, 2008). Iron helps in the formation of hemoglobin. Its deficiency can cause impaired learning ability as well as behavioural problems in children. Due to its deficiency a person can also suffer from anemia (Jacob, Etong and Tijjani, 2015). Potassium works as a cofactor that functions in protein synthesis, activation of enzymes, major solute functioning in water balance and thus affecting osmosis, operation of stomata. Phosphorus is a component of nucleic acids, phospholipids, adenosine triphosphate (ATP) and several coenzymes (Soetan, Olaiya, and Oyewole, 2010). Sodium is a cellular activator, plays a decisive role in cell excitability processes in the genesis and transmission of action potentials. It acts as an activator of protein fraction in enzymatic reactions (Constantin and Alexandru, 2011).

Magnesium is advantageous in maintaining blood pressure and helpful in preventing from sudden heart attack, cardiac arrest and stroke. Calcium and magnesium are the important components of bone contributing in the development of its structure. Magnesium's deficiency can lead to uncontrolled twisting of muscles and convulsion, which may eventually cause death. It is commonly observed in those with chronic alcoholism (Rude *et al.*, 2010). Zinc helps to boost up our immunity and has a significant role in maintaining appropriate functionalism of some sense organs like the capability to taste and smell. It contributes in the metabolism of carbohydrate and protein and also promotes vitamin A metabolism from its storage site in the livers. It also facilitates DNA and RNA synthesis that are essential in cell production (Jacob, Etong, and Tijjani *et al.*, 2015).

#### **Phytochemical content**

The results of phytochemicals in *Citrullus colocynthis* seeds studied were presented in Table 2. The screening of seeds showed the presence of steroids, alkaloids, glycosides, carotenoids and flavonoids while tannin and terpenoids were absent. Steroids were known for their antibacterial activity specifically associated with membrane lipids and cause leakage from liposomes (Epan, Savage, and Epan, 2007). In *Colocynthis seeds*, alkaloids were present in efficient amount. They are widely used as a basic agent for analgesic, antispasmodic and antibacterial (Oseni and Okoye, 2013).

Flavonoids and C-glycosides show a significant antioxidant, anticancer and antitumor, hepatoprotective, anti-inflammatory, anti-diabetes, antiviral, antibacterial and antifungal activity (Xiao *et al.*, 2016). Carotenoids are a family of pigmented compounds that are synthesized by plants and microorganisms but cannot be obtained from animals. They contribute in the photosynthetic machinery in plants and provide them protection against photo-damage. Fruits and vegetables are the major sources of carotenoids in human diet. It helps to protect from chronic diseases (Rao and Rao, 2007). Tannins and flavonoids are found to exhibit anti-diarrheal activity through inhibition of intestinal motility and anti-secretory effects in general as per the reports (Sharma and Chauhan, 2017). Flavonoids are observed effective in antimicrobial substances. They have the ability to complex with extracellular and soluble proteins and to complex with bacterial cell walls (Mujeeb, Bajpai, and Pathak, 2014).

#### **Conclusion**

The analysis on the seeds of *Citrullus colocynthis* carried out in our present work implies that it has good nutritional value due to the high content of the major nutrients, carbohydrate, proteins and fat. Our analysis also



indicated that *Citrullus colocynthis* have a good source of micronutrients and phytochemicals that are required for biochemical and physiological processes in the living system.

### Conflict of Interest

None declared

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Figure 1 (a-b) Egusi melon – Seeds and Fruit of *Citrullus colocynthis*

Table 1 Nutritional composition of *Citrullus colocynthis* seeds

Nutrients	Amount
Moisture (g/100g)	3.2±0.3
Ash (g/100g)	2.3±0.2
Crude fiber (g/100g)	8.5±0.2
Fat (g/100g)	50.7±1.5

Protein (g/100g)	27.6±0.3
Carbohydrate (g/100g)	7.7±2.3
Calcium (mg/100g)	21.4±0.2
Potassium (mg/100g)	13.4±0.2
Sodium (mg/100g)	12.1±0.4
Phosphorus (mg/100g)	16.8±0.1
Iron (mg/100g)	4.8±0.7
Magnesium (mg/100g)	26.4±0.2
Zinc (mg/100g)	8.0±0.1

Values are reported as mean ± SD

**Table 2** Phytochemical screening of *Citrulluscolo cynthis* seeds

Phytochemicals	<i>Citrullus colocynthis</i> seeds
Tannins	-
Steroids	+
Terpenoids	-
Alkaloids	+
Glycosides	+
Carotenoids	+
Flavonoids	+

(+) Present, (-) Absent

