

## Comparison of Nutritional properties of *Prosopis cineraria* (Ghaf) with other food products

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### Abstract

*Prosopis cineraria* (Ghaf) tree is an integral part of the cultural heritage of United Arab Emirates (UAE) and to natural desert ecology. Ghaf tree is considered as one of the highly valued trees in many arid and dry areas in the world. In the present research work, we have attempted to compare the nutrient content of the Ghaf leaves with pulses, cheese, milk, soya; to understand its health benefits and nutritional properties. Nutritional analysis shows that it as a good source of proteins and minerals like sulphate (5.1 mg/g), magnesium (0.1371 mg/g), calcium (0.4363 mg/g), phosphorous (0.34 mg/g), nitrate (1.35 mg/g), Iron (0.01878 mg/g) and potassium (0.5035 mg/g). This study demonstrates that *P. cineraria* leaves can be used as nutraceutical food with rich nutrition, disease prevention and health promoting effects. This research was carried out as an awareness of nutrition value of ghaf plant as nutraceutical. We need to spread awareness on the importance of Ghaf tree and the role they played in the functioning of a healthy ecosystem and thereby protecting the species from extinction.

**Keywords:** *Prosopis cineraria*, leguminosae, nutritional value, traditional usage, ghaf

### 1. Introduction

The *Prosopis cineraria* occurs in most of the world's hot arid and semi-arid regions as native or introduced species (Pasicznik *et al*, 2001) [10]. It is a multipurpose tree of desert locally known as Ghaf and is regarded as the backbone of rural economy. Since all the parts of the tree are useful, it is called kalptaru. It is also known as the 'wonder tree' and the 'king of desert' (Singh *et al*, 2013; Tarachand *et al*, 2012) [14, 15]. Bedouin traditional lifestyle in UAE has been very much associated with the *Prosopis* trees and their products (Lemons *et al*, 2003) [7]. As the country rapidly modernizing and continuous population grows, inadequate nutrient sources, exorbitant cost of animal protein is considered the main reasons for malnutrition and undernourishment among people. Due to rapid change in socioeconomic conditions of the country, less number of people get benefit by the plant as was practiced earlier. Therefore, the plant has been badly neglected for scientific studies (Islam *et al*, 2019) [6]. The negligence is reflected from the fact that almost no scientific work has been carried out on the plants especially from the medicinal and nutritional potential point of view. Moreover, the *Prosopis sp.* is considered as the national symbol of UAE (Philp, 2013) [12]. In our previous study on Ghaf (Figure 1) as potential desert nutraceutical, we compared the nutrient content of ghaf with spinach and lettuce (AlGhais *et al* 2020) [1].



**Fig 1:** The tree of *Prosopis cineraria*, leaves (Wikimedia.org and botanicimage.com)

### Pulses

Chana dal (Figure 2) is baby chickpeas that has been split and polished. It looks and tastes like small kernels of sweet corn, and is one of the most popular ingredients in Indian cuisine.



**Fig 2:** Chickpea (*Cicer arietinum*) (Wikimedia.org)

The chickpea or chick pea (*Cicer arietinum*) is an annual legume of the family Fabaceae, subfamily Faboideae. Its different types are variously known as gram or Bengal gram, garbanzo or garbanzo bean, Egyptian pea, Chana, and chole. Chickpea seeds are high in protein. It is one of the earliest cultivated legumes, and 7500-year-old remains have been found in the Middle East. The chickpea is important in Indian, Mediterranean and Middle Eastern cuisine. In 2017, India produced 67% of the world total for chickpeas (FAOSTAT, 2018) [13].

### Soya

Soya chunks (Figure 3) are known for its various health benefits: It is known for high protein content-its exceeds than eggs, meat, milk. It is known to reduce the risk of osteoporosis in menopausal women and also ease

other symptoms as it's a good source of isoflavones.

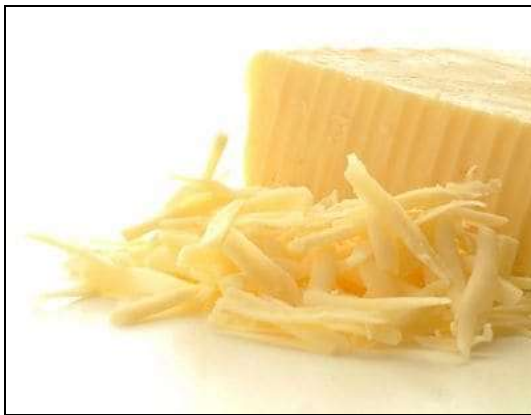


**Fig 3:** Soya chunks (Wikimedia.org)

Soya protein is a complete protein since it provides all of the essential amino acids for human nutrition. Soy foods are a great source of vitamins and minerals. B-vitamins, iron, zinc and an array of antioxidants round out the nutritional qualities of soy. In addition, many soy foods are enriched with vitamin B 12, calcium, and vitamin D to help vegetarians get these much-needed nutrients. Soya chunks are an excellent source of high-quality protein, which most other legumes lack, making the soya and its food products a superior protein source for people following a strict vegetarian diet. This kind of protein is next only to the protein we get from animal foods, many of which contain high levels of saturated fat and dietary cholesterol.

### Cheese

Cheese (Figure 4) contains the goodness of a number of essential nutrients, including protein, calcium, zinc, phosphorus, magnesium, vitamin A, vitamin B2 (riboflavin) and vitamin B12.



**Fig 4:** Cheese (Wikimedia.org)

Cheese is a great source of calcium, fat, and protein. It also contains high amounts of vitamins A and B-12, along with zinc, phosphorus, and riboflavin. Cheese made from the milk of 100 percent grass-fed animals is the highest in nutrients and also contains omega-3 fatty acids and vitamin K-2.

### Milk

Milk (Figure 5) is a nutrient-rich, white liquid food produced by the mammary glands of mammals. It is the primary source of nutrition for infant mammals (including humans who are breastfed) before they are able to digest other types of food (Van Winckel *et al*, 2011) [16].



**Fig 5:** Milk (Wikimedia.org)

Dairy farms produced about 730 million tonnes of milk in 2011, ("Food Outlook – Global Market Analysis", 2012) from 260 million dairy cows ("World Dairy Cow Numbers", 2014). India is the world's largest producer of milk, and is the leading exporter of skimmed milk powder, yet it exports few other milk products (Anand, 2013; "Government scraps incentive on milk powder exports to check prices", 2015) [2]. The composition of milk differs widely among species. Human milk contains, on average, 1.1% protein, 4.2% fat, 7.0% lactose (a sugar), and supplies 72 kcal of energy per 100 grams. Cow's milk contains, on average, 3.4% protein, 3.6% fat, and 4.6% lactose, 0.7% minerals ("Milk contains traces of ash", 2008) and supplies 66 kcal of energy per 100 grams.

In our previous study we investigated that ghaf is a potential desert nutraceutical and compared the nutrients of ghaf with spinach and lettuce (AlGhais *et al* 2020) [1]. Therefore, to continue our further research and to meet the increasing demand of nutrition and protein, alternative strategies and unconventional sources of nutrition and protein for human and animal, this study have been considered recently. Despite fabulous importance of ghaf in desert culture, there is less scientific studies and minimal awareness, in the developed communities about *P. cineraria* as nutraceutical. Hence, the objectives of this study were to compare the nutrient content of the Ghaf leaves with pulses, cheese, milk, soya; to understand its health benefits and nutritional properties. This research was carried out as an awareness of nutrition value of ghaf plant as nutraceutical. We need to spread awareness on the importance of these trees and the role they played in the functioning of a healthy ecosystem and thereby protecting the species from extinction.

## 2. Material and methods

### 2.1 Sample collection

Samples of leaves (five) of ghaf were collected from Dahan garden, Ras Al Khaimah, UAE. Samples (five) of pulses, cheese, milk, soya was collected from local supermarkets of Ras Al Khaimah, UAE. Samples were kept in sterile polythene bags till their use.

### 2.2 Chemicals

The chemicals used in the present investigation were of analytical grade and of high purity from Merck. Standard used for analysis were purchased from Germany and USA.

### 2.3 Preparation of sample for nutrient analysis

The samples (leaves) were washed with sterile water. Weighed 10g of sample (each) by analytical balance (RADWAG-PS 2100. R2, Poland) and transferred it into

sterile mortar pestle and then grounded the sample to make a clear fine solution. For milk, 10mL sample was taken. Prepared sample for nutrient analysis as described by AlGhais *et al*, 2020<sup>[1]</sup>. Clear samples were used for nutrient analysis by Hatch spectrophotometer DR3900 (Germany).

#### 2.4 Sample preparation for Essential metal analysis

Weighed accurately 1g of each sample and prepared sample for essential metal analysis as described by AlGhais *et al*, 2020<sup>[1]</sup>.

#### 2.5 Statistical analysis

Data are expressed as mean. Pair wise comparisons were performed. Experimental error was determined for triplicate and expressed as standard deviation (SD).

### 3. Results and Discussion

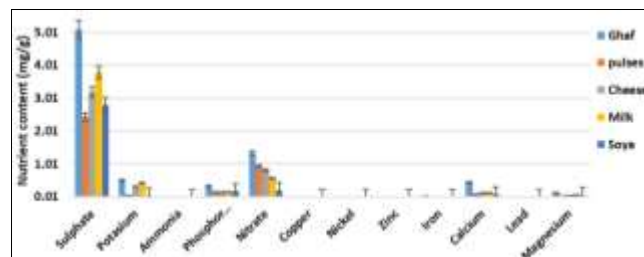
This is probably the first report of comparison of ghaf nutrient content and metal, with pulses, cheese, milk, soya; to understand its health benefits and nutritional properties. In the present investigation the leaves of ghaf, and samples (five) of pulses, cheese, milk, soya was used for nutrient analysis and essential metal analysis. For nutrient analysis in all types of samples, Hatch spectrophotometer was used. For metal analysis AAS was used. Different types of nutrient like sulphate, potassium, ammonia, phosphorous, nitrate was investigated (Table 1).

**Table 1:** Nutritional values of Ghaf compared with pulses, cheese, milk, soya

Elements	Ghaf (mg/g)	Pulses (mg/g)	Cheese (mg/g)	Milk (mg/g)	Soya (mg/g)
Sulphate	5.1	2.45	3.2	3.8	2.8
Potassium	0.5035	0.0523	0.32	0.42	0.051
Ammonia	0.0037	0.0032	0.0025	0.0011	0.0048
Phosphorous	0.34	0.152	0.154	0.161	0.18
Nitrate	1.35	0.95	0.81	0.56	0.21
Copper	0	0	0	0	0
Nickel	0	0	0	0	0
Zinc	0	0	0	0	0
Iron	0.01878	0.0008	0.0012	0.01112	0.0015
Calcium	0.4363	0.085	0.123	0.131	0.086
Lead	0	0	0	0	0
Magnesium	0.1371	0.026	0.053	0.062	0.052

According to the present research findings, Ghaf leaves have maximum amount of sulphate (5.1 mg/g), magnesium (0.1371 mg/g), calcium (0.4363 mg/g), phosphorous (0.34 mg/g), nitrate (1.35 mg/g), Iron (0.01878 mg/g) and potassium (0.5035 mg/g) as compared with pulses, cheese, milk, soya (Table 1, figure 6). Similar work was reported by Murthy *et al* 1995 that *P. cineraria* fresh, ripe pods contain 7-10% preformed water, and on a dry matter basis contain 9-17% crude protein, 1.2-4.3% ether extractives, 16-34% crude fiber, 47-61% nitrogen free extracts, 28% acid detergent fiber, 8% acid detergent lignin, 4-5% ash, 0.14-0.29% silica, 0.3-0.5% calcium and 0.40-0.44% phosphorus. *P. cineraria* flour is gluten-free, and a premium source of calcium, potassium, magnesium, zinc, and iron, in addition to amino acids such as lysine that is low in other cereals (Pasiecznik *et al*; 2004 and Saura-Calixto, 1999)<sup>[11, 13]</sup>. There were not found any traces of copper, nickel, zinc, lead in any of the samples. According to AlGhais *et al* 2020<sup>[1]</sup>, amount of phosphorous and nitrate in ghaf leaves detected

more than lettuce and spinach. According to our previous research work, Ghaf a potential desert nutraceutical (AlGhais *et al* 2020)<sup>[1]</sup>, described that ghaf leaves contained more amount of sulphate, potassium, nitrate, iron, magnesium as compared to spinach and lettuce.



**Fig 6:** Graphical Comparison of Nutrients and metals between Ghaf, pulses, cheese, milk, soya.

### 4. Conclusion

*P. cineraria* is a naturalized constituent of many natural and cultivated ecosystems in the world. According to the results of analysis, we tried to bring the attention toward this significant tree can be used as a source of functional foods which can be added value in food product development. Nutritional analysis shows that it as a good source of proteins and minerals like sulphate Magnesium, calcium, phosphorous, nitrate, Iron and potassium as compared to milk, cheese, pulses and soya. This research was carried out as an awareness of nutrition value of ghaf plant as nutraceutical and to spread awareness on the importance of Ghaf tree and the role they played in the functioning of a healthy ecosystem and thereby protecting the species from extinction.

We hope that the potential of *P. cineraria* could be best connected, towards a possible integration into the food security and healthcare system.

### 5. Ethics approval and consent to participate

Not applicable.

### 6. Consent for publication

Not applicable.

### 7. Availability of data and materials

The relevant data and materials are available in the present study.

### 8. Competing interests

The authors declare that they have no competing interests. All procedures followed were in accordance with the ethical standards (institutional and national).

### 9. Funding

Not applicable.

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