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Proximate and Elemental Profile of Kalongi (*Nigella sativa* L.)

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Abstract

The aim of this study was to find out the proximate and elemental analysis of plant *Nigella sativa* belonging to the family Ranunculaceae which is traditionally used in different parts of Pakistan. The plant seeds were collected from market and ground them to make powder by using electric grinder. Then this powder was stored in refrigerator at 4°C prior to analysis. The results from the proximate analysis indicate that the plant seeds contained some important nutrients such as crude fat 44.23%, moisture 9.36%, crude protein 18.467%, and crude fiber 10.23%, carbohydrates 34.980% and ash (47.834%). The mineral elements were also analyzed. Results showed that Potassium in seeds were 0.258 mg/kg while Iron 0.4698 mg/kg, Zinc 0.0139 mg/kg, Manganese 0.6798mg/kg, Phosphorus 0.072mg/kg Sodium 0.268mg/kg and Copper 0.017mg/kg respectively.

Keywords: Proximate composition, mineral element, kalongi (*Nigella sativa* L.)

Introduction

Medicinal plants play a significant role in providing primary health care services to rural people and are used by about 80% of the marginal communities around the world. Each medicinal plant species has its own nutritional composition besides possessing pharmacologically important phytochemicals. These nutrients are essential for the physiological functions of human body. Such nutrients and biochemical like carbohydrates, fats and proteins play an important role in satisfying human needs for energy and life processes. Several workers approximately three quarter of the world's population depend on plants and plant extracts for their health care. India offers a unique opportunity for drug discovery researchers (Shaded *et al.*, 2006). Many researchers are focusing on medicinal plants since only a few plant species have been thoroughly investigated for their medicinal properties, potential, mechanism of action, safety evaluation and toxicological studies (Ravi shankr *et al.*, 2007).

Its common name is Kalongi and is also known as "black cumin". It is an annual flowering plant, belonging to the family Ranunculaceae, native to south west Asia and cultivated in countries like Middle Eastern Mediterranean region, Saudi Arabia, Pakistan & India. Holy Prophet (SAW) said that the "black seed can heal every disease except death". It grows about 45 cm in height, leaves 2.5-5.0 cm long, linear-lances late. Flower pale blue, 2.0-2.5 cm across, solitary on long peduncles; capsule 1.2 cm long; seeds flattened, oblong, angular, funnel shaped, small, 0.2 cm long and 0.1 cm wide, black in color (Hassan *et al.*, 2005). It is regarded as valuable remedy for number of diseases. In the Indian system of medicine, the seeds are used as astringent, bitter, stimulant, diuretic, anthelmintic, jaundice, intermittent fever, dyspepsia, paralysis, piles and skin diseases (Bharani *et al.*, 2001).



Fig. 1: Nigella sativa plant, seeds and classification

Scientific classification	
Kingdom:	Plantae
(unranked):	Angiosperms
(unranked):	Eudicots
Order:	Ranunculales
Family:	Ranunculaceae
Genus:	<i>Nigella</i>
Species:	<i>N. sativa</i>
Binomial name	
<i>Nigella sativa</i> L.	

Material and method

Collection and Treatment of Sample

The plant seeds were collected from market and ground them to make powder by using electric grinder. Then powder was stored in refrigerator at 4°C prior to analysis. After this, analysis was carried out.

Proximate Composition

Determination of proximate composition include carbohydrates, crude protein, crude fat, crude fiber, dry matter, ash and moisture was carried out in accordance to AOAC. 1990.

Estimation of Mineral Element

Mineral elements estimations indicate the concentration of inorganic elements present in the sample. The determination was carried out using standard procedures. During the determination, the sample was first ashes and dissolved in a solvent, and the resultant solution aspirated into an air-acetylene flame. The mineral element determined were; Zinc (Zn), Manganese (Mn), Copper (Cu), Potassium (K), Sodium (Na), Iron (Fe), Phosphorus (P) and this was done by spectrophotometric methods, using flame emission spectrophotometer for Sodium (Na) and Potassium (K) and atomic absorption spectrophotometer for others. Before determining the concentration of any element in the sample, a calibration curve of the element in the sample was prepared using prepared standard stock solutions for the elements (Pendias and Pendias, 1992).

Results & Discussion

Proximate Composition

The results of proximate composition of *Nigella sativa* presented in Table 1. Results showed that the moisture content in *Nigella sativa* was 9.34%. This result indicated low shelf life of seed hence long storage would lead to spoilage due to its susceptibility to microbial attack. This supports the practice of storage in dry form by users (Elizabeth, 2005). Moisture content is among the most vital and mostly used measurement in the processing, preservation and storage of food (Choudhary *et al.*, 2006).

Table 1: Proximate Composition of Nigella sativa

Sr. No.	Parameters	Composition
1	Moisture content	9.34%
2	Ash content	47.834%
3	Crude Fiber content	10.23%
4	Crude Fat content	44.23%
5	Crude protein	18.467%
6	Carbohydrates	34.980%
7	Dry matter	90.66%

Noted results showed that 47.834% ash was present in the seeds of *Nigella sativa* from total dry matter. Dry matter in food contributes the residue remaining after all the moisture has been removed as well as the organic material (fat, protein, carbohydrates, vitamins, organic acid etc.) have been incinerated at a temperature of about 500°C (Jasmine *et al.*, 2007). Ash content is generally taken to be a measure of the mineral content of the original food (Zubaida *et al.*, 2007).

Crude fiber in food or plant is an indication of the level of non-digestible carbohydrate and lignin. The crude fiber obtained for *Nigella sativa* was 10.23% of total dry matter. This low level is considered appropriate, because it aids absorption of glucose and fat. Although crude fiber enhances digestibility, good for those patients that are suffering from bawaseer, anal fissures, constipation, its presence in high level can cause intestinal irritation, lower digestibility and decreased nutrient usage. Crude fiber is made up largely of cellulose together with a little lignin which is indigestible in human (Qadir, 1991).

Crude fat content obtained for *Nigella sativa* was 44.23% of total dry matter. Fat provides very good sources of energy and aids in transport of fat soluble vitamins, insulates and protects internal tissues and contributes to important cell processes (Okaka *et al.*, 2001). Furthermore, it is good to add lipid (fat) to most of our diets, because many body functions depend on lipids.

The crude protein in *Nigella sativa* was noted as 18.463% of total dry matter. The recommended dietary allowance (RDA) for protein is 56g for individual having weight 70kg and 46g for adult having weight 50kg; children may consume 2kg/day (Devi *et al.*, 2008). The plant is a moderate source of protein. According to Gurib-Fakim. (2005), proteins from plant sources have lower quality but their combination with many other sources of protein such as animal protein may result in adequate nutritional value.

Noted results showed that total dry matter in case of *Nigella sativa* plant seeds was 90.66%. The plant and animal material would be its **solids**, i.e. all its constituents excluding water.

The dry matter of food would include carbohydrates, fats, proteins, vitamins, minerals and antioxidants (e.g., thiocyanate, anthocyanin, and quercetin). Carbohydrates, fats, and proteins, which provide the energy in foods (measured in kilocalories or kilojoules), make up ninety percent of the dry weight of a diet.

Nigella sativa has carbohydrates value (49.980%). This plant is a moderate source of carbohydrate when compared with the Recommended Dietary Allowance (RDA) of 130g. There is no specific dietary requirement for carbohydrate

because energy can also be derived from protein, fat and alcohol. However, a diet that does not contain carbohydrate can lead to muscle breakdown, ketosis and dehydration. This can be prevented by 50 to 100 grams of carbohydrate per day, but levels above this are desirable. Sources of complex carbohydrates, such as starch, are recommended as these often also provide necessary vitamins, elements (minerals) and dietary fiber.

Mineral Element Composition

Table 2 presents the result of mineral element composition of *Nigella sativa* in mg/kg. The zinc content of *Nigella sativa* was 0.0139mg/kg. The Recommended Dietary Allowance (RDA) for zinc is 13mg/kg (Anonymous, 1998). Zinc is essential in the activation of certain enzymes. These include dehydrogenase, alkaline phosphatase and carboxypeptidase. Zinc containing organic compounds is employed as astringent and anti-fungal agents. It aids wound healing and metabolism of nucleic acid and insulin. Zinc in excess causes anemia and if deficient in the body can lead to dermatitis.

The value obtained for phosphorus was 0.072mg/kg. Phosphorus is the second most plentiful mineral in your body. The first is calcium. Your body needs phosphorus for many functions, such as stronger bones, teeth, involve in storage and usage of energy, filtering waste and repairing tissue and cells. Effect of phosphorus deficiency in the body results in anemia, imbalance heart beat while excess in the body can cause many complications (Fuji *et al.*, 2003). it also involves in activation of many enzymes in the body and maintenance of the structure of nucleic acid and potentiation of action of insulin and some biological function that controlled by this element. Several epidemiological studies linking phosphorus efficiency with the risk factors of cardiovascular diseases

Table 2: Mineral Element Profile of *Nigella sativa*

Sr. No.	Minerals	Concentration
1	Zn ²⁺	0.0139mg/kg
2	P ²⁺	0.072mg/kg
3	Mn ²⁺	0.6798mg/kg
4	Cu ²⁺	0.017mg/kg
5	K ²⁺	0.258mg/kg
6	Fe ²⁺	0.4698mg/kg
7	Na ⁺	0.268mg/kg

The manganese content of *Nigella sativa* was 0.6798mg/kg. The Recommended Dietary Allowance (RDA) for manganese varies between 2mg/kg to 8mg/kg (Iqbal, 2002). Certain trace elements such as copper, iron, and manganese constitute essential part of any balanced diet. Some of them are micronutrient to the plants and if not present in the right proportion may have adverse effect on human and plants.

The content of copper was 0.017mg/kg. The Recommended Dietary Allowance of copper according to Kajita *et al.*, (2001) is 3.5mg. Copper is very vital in diet because it is involved in the proper usage of iron (Fe) and especially for the synthesis of cytochrome oxidase, which contains both iron (Fe) and copper (Cu). Excess copper can lead to jaundice (Wilson's disease).

The potassium content was 0.258mg/kg. According to National Research Council (1974), the Recommended Dietary Allowance of potassium is 18-56mg/kg for adults. Potassium is very vital in regulation of water and

electrolyte balance and acid-base balance in the body, as well as responsible for nerve action and functioning of the muscles. Deficiency of potassium leads to muscle paralysis (Ahmed *et al.*, 2005).

The iron content of *Nigella sativa* was 0.4698mg/kg. According to Pravin *et al.*, (2009), the recommended daily requirement of iron for man is 6 – 40mg/kg. Iron is very important in the formation of hemoglobin in red blood cells and deficiency of iron leads to anemia. *Nigella sativa* could be used to improve the anemic condition of a patient.

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