



## Review Article

# A review to investigate the nutrient profile of the nutrient-dense seed *Lepidium sativum* L.

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## Abstract

*Lepidium sativum* is an annual, underutilized herb that belongs to the *Brassicaceae* family and has similar basic properties like mustard and water cress. Garden cress is grown throughout the Middle East, Europe, and the United States. Garden cress seeds are known throughout history for their medicinal properties and are cultivated for a variety of culinary purposes. Seeds have been used to treat many disorders such as asthma, uterine tumours, ulcers, colds, wounds, skin problems, irregular menstrual cycles, ischias, and ethmoidal polyps because of their nutritional and antioxidant activity. Besides showing strong medicinal properties, garden cress seeds have a rich proximate profile with high concentrations of energy, protein, ash, fat, and fibre compared to the common staple cereals and millets. Various parts of garden cress plants like leaves and seeds are consumed in many forms such as salad, sprouts and spices. The seeds are bitter in taste, thus to improve taste and quality, different processing techniques like roasting, germination, soaking and boiling etc. are used. Malnutrition is currently a major concern in all segments of society and garden cress seeds being rich in protein and energy can be utilized to combat malnutrition. The objective of this review is to enhance community health by consolidating a scientific understanding of the nutritional composition of *L. sativum*.

**Keywords** antioxidant, garden cress, malnutrition, nutritional composition, proximate composition

## Introduction

*Lepidium sativum* is a therapeutic plant that grows all year, especially in the Middle East, Europe, and the United States [1]. *Lepidium sativum* belonging to *Brassicaceae* family, *Plantae* Kingdom, *Magnoliophyta* Division, *Magnoliopsida* Class and *Brassicales* Order is similar to mustard and watercress and grows rapidly. This plant grows erect and smooth, reaching a height of 15-45 cm in mild temperate zones, although the ideal months to sow are January, February, and November [2-3]. The seeds of garden cress physically resemble some oilseeds. The seed is divided into the dicotyledonous endosperm, seed coat and embryo, in which endosperm is the major part constituting about 80-85 per cent [4]. *L. sativum* commonly known for its culinary properties has also been used to treat disorders such as asthma, uterine tumours, blisters, haemorrhoids, sneezing, lesions, dysmenorrhea and rheumatism etc. due to its rich antioxidant profile consisting of flavonoids, phenols, cardiotonic glycosides, cardiac glycosides, alkaloids, and coumarins [5-6].

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In India, this plant is mainly consumed as salad, sprouts and spice. Many household techniques are also used to enhance the quality and palatability of seeds, such as soaking, boiling, and roasting, but still, consumption has not markedly improved. Processing improves the shelf life and quality of the food which ultimately enhances the acceptability of food products among consumers [7]. The consumption of garden cress seeds is still very low as the crop is underutilized and needs more attention to be part of the daily diet. Therefore, the main focus of this review is to compile the available information about *L. sativum*'s nutritional profile to make people aware of its nutritional importance and increase the consumption of these nutritious and healthy seeds among them.

### Nutritional importance

The nutritional importance of garden cress seeds in the form of proximate composition parameters as reported in various research has been summarized in Table 1.

**Table 1. Proximate composition of garden cress seeds (As per literature)**

Nutritional parameters	Gopalan et al., (2010)	Zia-Ul-Haq et al., (2012)	Doke and Guha (2014)	Jain et al., (2016)	El-Salam et al., (2019)	Hanan et al., (2019)	Manju and Dobhal (2022)
Moisture	-	2.9	4.14	-	7.05	7.61	6.25
Crude protein	25.5	24.2	22.47	22.81	19.73	22.4	23.90
Crude fat	24.5	23.2	27.48	23.4	14.18	24.18	12.68
Crude fiber	7.6	11.9	7.01	8.29	18.79	14.28	8.09
Total ash	-	7.1	4.65	5.25	4.8	2.98	4.89
Total carbohydrate	33	30.7	34.24	40.25	35.45	36.14	44.19
Physiological energy	454.5	428.4	474	462.84	346.9	451.78	386.28

### Proximate composition

#### Moisture

Moisture percentage directly affects the consistency, viability and storability of food products. As moisture is a crucial medium for the multiplication of microbes, the low moisture content depicts that food items can be preserved for a longer period without any physical or chemical changes. The low moisture content of garden cress seeds depicts their strong stability and long shelf-life. Moisture percentage of whole garden cress seeds flour has been reported to be 3.2, 5.83, 7.05, 4.14, 7.16 and 6.25, respectively [8-13].

The effect of processing on the moisture content of garden cress seeds powder was observed by Rajshri and Haripriya [14]. The moisture content was 5.25, 3.53 and 4.89 per cent in untreated, roasted and germinated garden cress seed powder, respectively. The moisture content of garden cress seeds flour with whole seed, endosperm and bran was 4.14, 2.58 and 4.2 per cent, respectively [15].

#### Crude protein

Proteins are vital to any living organism. They carry out a wide range of functions essential for the sustenance of life and thus become one of the most important nutrients required by the body and must be supplied in adequate amounts in the diet. According to Prajapati and Dave [15] and Gokavi et al., [16], the crude protein content of various fractions of garden cress seeds, such as whole meal, endosperm and bran was 22.5, 27.7 and 12.6 per cent, respectively. The crude protein content of garden cress seed powder was found in the range of 25-39 per cent [2]. The garden cress seeds contain 25.3, 23.90, 22.5, 25.5 and 24.2 per cent crude protein, respectively [8, 13 and 17-19].

According to Chaudhary and Gupta [20], the crude protein percentage of whole and treated (soaked+dried+roasted) garden cress seeds was found to be 26.31 and 24.17 per cent, respectively. Similarly, Rajshri and Haripriya [14] observed the effect of different processing techniques on the



crude protein content of garden cress seeds powder and concluded that processing increased the crude protein content. Untreated, roasted and germinated garden cress seeds powder was found to have a crude protein content of 22.21, 25 and 25.42 per cent, respectively. The highest crude protein was observed in germinated seeds, followed by roasted seeds, this may be due to the fact that germination caused the liberation of reserve nitrogen, which leads to the formation of biologically better quality proteins.

### **Crude fat**

Garden cress seeds contain a high concentration of  $\omega$ -6 (31.05 per cent) and oleic acid (22.1 per cent), as well as other fatty acids including linoleic acid, erucic acid, stearic acid and arachidic acid [21]. According to Falana et al., [22], garden cress seeds had 30.2 per cent linolenic acid and 3.9 per cent erucic acid. The crude fat content of the whole meal, endosperm and bran of garden cress seeds was found 27.5, 33.1 and 6 per cent, respectively [15-16]. Crude fat percentage was reported to be 27.5, 24.5, 23.2 and 14.18 per cent, respectively [17-19, 23].

The effect of processing on fat content was observed by Jain et al., [24]. The fat content of untreated seeds powder, soaked and boiled seeds powder was 23.40, 23.13 and 22.07 respectively. Similarly, Chaudhary and Gupta [20], reported the fat content of untreated and treated (soaked+dried+roasted) seeds as 24.96 and 23.34 respectively. According to Rajshri and HariPriya [14], untreated, roasted and germinated garden cress seeds powder had a fat content of 20.92, 16.31 and 5.57 per cent, respectively. According to Manju and Dobhal [13], the fat percentage was 12.68 and 12.12 per cent, respectively, of raw and roasted garden cress seed flour. The drop in fat percentage after roasting could be due to increased lipolytic enzyme activity during roasting, which converted fat components into fatty acids and glycerol.

### **Crude fibre**

Crude fibre is the indigestible substance obtained as a residue of a precisely defined digestion procedure. It consists of substances from the vegetable cell wall. The crude fibre content in foods is proven to be advantageous. Crude fibre plays important role in the promotion of overall health and the prevention of numerous diseases. According to Gokavi et al., [16], the crude fibre of whole meal, endosperm and bran of garden cress seeds was 7.01, 4 and 14.29 per cent, respectively. The crude fibre of garden cress seeds has been reported 7.01, 7.6, 6.75 and 7 per cent, respectively, by various researchers [2, 18-19 and 25]. The effect of processing was observed on crude fibre content [24]. The crude fibre content of untreated seeds powder, soaked and boiled seeds powder was 8.29, 8.71 and 8.98 per cent respectively. Similarly, Chaudhary and Gupta [20] reported the crude fibre content of untreated and treated (soaked+dried+roasted) seeds as 9.72 and 7.59 per cent, respectively. According to Rajshri and HariPriya [14], untreated, roasted and germinated garden cress seeds powder had crude fibre content of 2.16, 2.06 and 3.0 per cent, respectively. The crude fibre content of raw and roasted garden cress seed flour was 8.09 and 8.13 per cent, respectively [13].

### **Total ash**

Total ash provides a measure of the total amount of minerals within a food. Garden cress seeds contain a good amount of ash which indicates a higher concentration of minerals in it. The total ash content of garden cress seed flour analyzed by various authors ranged from 4.4 to 7.1 per cent [9, 11, 23, 25-27]. According to Prajapati and Dave [15], the total ash content of the whole meal, endosperm and bran of garden cress seeds powder was 4.65, 4.06 and 6.19 per cent, respectively.

The effect of different processing on the ash content of garden cress seed flour was observed. Results showed the ash content of untreated, soaked and boiled seeds powder of garden cress as 5.25, 5.38 and 5.12 per cent, respectively [24]. Similarly, Chaudhary and Gupta [20], reported the ash content of untreated and treated (soaked+dried+roasted) seeds as 4.95 and 4.72 per cent, respectively. According to Rajshri and HariPriya [14], untreated, roasted and germinated garden



cross seeds powder had an ash content of 5.03, 4.99 and 4.8 per cent, respectively. The ash content of raw and roasted garden cress seed flour was recorded as 4.89 and 5.12 per cent, respectively, [13].

### **Total carbohydrate**

Carbohydrates are the primary source of energy in the body fuelling the brain, kidneys, heart muscles and central nervous system. Food items with high carbohydrate content provide enough calories and thus can be utilized to treat protein energy malnutrition. Gopalan et al [18], Zia-Ul-Haq et al, [19], Angel and Devi [23], Doke and Guha [11] and Alshehry [25], observed the carbohydrate content of garden cress seed flour as 33, 30.7, 35.45, 34.24 and 38.40 per cent, respectively. According to several studies, there should be adequate carbohydrates to generate energy to spare protein for its fundamental job of creating the body and healing worn out tissues instead of serving as a source of energy.

The total carbohydrate content of the whole meal, endosperm and bran of garden cress seeds was 34.24, 28.45 and 50.31 per cent respectively, [15]. The carbohydrate content of whole, dehusked and germinated garden cress seeds powder was reported as 33.46, 29.94 and 39.46 per cent, respectively [28]. The effect of processing on carbohydrate content was analyzed and results showed that the carbohydrate content of untreated, soaked and boiled garden cress seeds powder was 40.25, 39.49 and 40.9 per cent, respectively [24]. The total carbohydrate content of raw and roasted garden cress seed flour was reported by Manju and Dobhal [13], as 44.19 and 45.12 per cent, respectively.

### **Physiological energy**

According to Chand et al., [8] and Doke and Guha [11], the physiological energy of garden cress seeds flour was 454 and 474 kcal/100g, respectively. Hassan and Rahman [29], reported the caloric value of garden cress seeds as 480.01 kcal/100g. Physiological energy is the one which is utilized in the formation of substances required by the body as well as for bodily functions. Manju and Dobhal [13], observed the physiological energy of raw and roasted garden cress seeds flour as 386.28 and 384.04 Kcal/100g, respectively.

### **Conclusion**

The current review was done to find out the nutritional composition of garden cress seeds. On compilation of the results of various studies, it can be concluded that garden cress is a herb with high content of crude protein, fat and energy and thus can be utilized in combating PEM. The high crude fibre content of garden cress seeds may be useful in preventing the diseases like hypertension, diabetes mellitus, obesity and constipation etc. The inclusion of garden cress seeds in daily diet can be helpful in managing nutrient deficiency disorders.

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