

## AlivSeeds: A Promising Superfood with Distinct Food Applications and Health Benefits

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Aliv seeds are an underappreciated superfood that have a nutrient-dense profile and are known for having greater levels of dietary fibre, protein, and iron. These are used in traditional medicine because they also have important medicinal qualities like antibacterial, anti-inflammatory, and antioxidant actions. Apart from their health advantages, aliv seeds are often utilised as a functional ingredient in traditional snacks, drinks, baked goods, and other products. Even with their potential, aliv seeds are still underutilised in food formulations, therefore more education and study are needed to fully realise their advantages. Thus, this article examines the nutritional makeup, health advantages, and variety of culinary uses of aliv seeds, emphasising its potential as a main component of functional foods and therapeutic diets.

### Introduction

Alivseeds are obtained from Asario, which is also widely known as Garden cress. Another name for aliv seeds is “Halim seeds”. Aliv plant is thought to originated in Ethiopia's and Eritrea's highlands. This plant belongs to the Family Brassicaceae or Cruciferae and is scientifically known as "Lepidium sativum L.". Due to their great adaptability and widespread popularity, aliv seeds are currently grown on a limited scale in many countries, most notably in Europe, Pakistan, India, and most African nations. Around 5,000 hectares of aliv plants are grown in Madhya Pradesh, Rajasthan, Gujarat, Uttar Pradesh, and Maharashtra state of India. A dozen of names exist for this seed worldwide, including garden peppercress, peppergrass, pepperwort, town cress, passer age, etc. It is known as garden cress in English, Lepido in Spanish, Algaro in Nigeria, Chandrasur in India, Hurf Rashad, and Thuffa in Arabic. The main purpose of aliv plant cultivation is for its seeds, which are typically harvested in 70–90 days and yield approximately 800–1000 kg/hectare. The seeds are pale brown to black in colour, odourless, and mucilaginous. They are made up of endosperm (80–85%), seed coat (12–17%), and embryo (1-3%).

Increasing knowledge of the advantages of natural and nutrient-rich ingredients has led to a growing trend in recent years towards combining healthy elements into conventional food. Aliv seeds are oval, smooth, tiny, and have a reddish-brown colour. Endosperm encases the embryo within the seed coat, which covers 12–17% of the seed. The bran has 74.3% dietary fibre and a strong water-holding capacity. These tiny seeds, which are often neglected, are a great complement to the modern diet since they contain a wide variety of bioactive substances and a novel nutritional load. Aliv seeds are widely recognised as a superfood since they are a great source of vital nutrients like proteins, fibre, vitamins, and minerals. They are especially well-known for having a high iron content, which makes them a great dietary supplement to fight anemia—particularly in adolescent girls and women. Furthermore, these seeds' antioxidants and omega-3 fatty acids promote cardiovascular health and provide protection against chronic illnesses. Beyond their nutritional profile, aliv seeds are incredibly versatile and exhibit medicinal qualities as well. This makes them a functional food with potential uses in controlling and preventing a variety of health disorders, in addition to being a nutritional powerhouse. Nowadays, these seeds are being used more frequently in baked goods, drinks, and healthy snacks because

of their distinct flavour, texture, and nutritional advantages. Their capacity to form gels when soaked in water allows for creative applications in the manufacture of food products. Moreover, aliv seeds have a long history of use in human nutrition as evidenced by its inclusion in traditional cuisines from many countries. Due to the increasing desire from consumers for functional foods that offer health advantages beyond basic nutrition, there is a great deal of opportunity for employing these seeds in novel processing applications.

Thus, aliv seeds are a nutrient-dense dietary source with a variety of health advantages and adaptable culinary uses. It is becoming more and more crucial to comprehend the nutritional components and possible culinary uses of aliv seeds due to recent interest of food industry in functional foods. The objective of this article is to present a thorough review of this new superfood through studying the nutritional profile of aliv seeds, emphasising their essential ingredients and health advantages, and addressing their present and future use in food products.

### **Nutritional composition**

Aliv seeds have a high content of macro and micronutrients and are classified as oilseeds. The garden cress seeds, weighing 100 g, provides 33 g of carbohydrates, 25 g of proteins, 24 g of fats, 4.25 g of minerals, 3 g of dietary fibre, and 454 kcal calories. 90% of the seeds' carbohydrates are made up of non-starch polysaccharides and the remaining portion is starch. This makes it one of the favoured foods with prebiotic qualities that helps to control digestive tract digestion. Therefore, through fermentation by anaerobic bacteria present in the stomach, aliv seeds can function as a non-viable food component. Aliv seeds have a protein level of 22.5%, which is more than that of regularly consumed cereals like teff (11%), maize (8–11%), sorghum (8.3%), and wheat (11.7%), but still quite equivalent to linseed (28–30%). Specific amino acids like leucine (8.21 g/100 g protein), valine (8.04 g/100 g protein), glutamic acid (19.33 g/100 g protein), aspartic acid (9.76 g/100 g protein), phenylalanine, lysine, and glycine are present in the seeds in significant amounts (98% w/w). Furthermore, by employing protein isolates and the isoelectric point approach, a greater concentration of critical amino acids from the seed can be achieved. Nonetheless, the nutritious composition of the seed can be enhanced by various processing techniques. For instance, soaking the seed can increase its ash (by 2.48%) and protein (by 2.1%) content while also retaining more fatty and amino acids. Furthermore, the seeds have a significant content of important fats, such as approximately 30% of oleic acid, 32% of linolenic acid, 2.10% of arachidic acid, and 13.40 % of eicosaenoic acid. Calcium (377 mg), magnesium (430 mg), phosphorus (723 mg), vitamin B1 (0.59 mg), vitamin B2 (0.61 mg), and vitamin B3 (14.3 mg) are the micronutrients that are most abundant in aliv seeds. Garden cress seeds stand out as the most iron-rich plant source ever reported. These seeds are higher in iron than other plant-based sources and contain 100 mg of iron per 100 g which is known for having great bioavailability, meaning the body can absorb and use it more effectively. Apart from their nutritious components, the aliv seeds also have anti-nutritional chemicals that lower food intake and nutrient availability and its food processing applications. The two main anti-nutritional ingredients in raw seeds are oxalates (134.0%) and phytin phosphorus (447.2 mg/100 g), which are eliminated or decreased after processing such as soaking, roasting, etc.

The seed has a number of phytochemicals, including saponins, flavonoids, alkaloids, tannins, and terpenes, that may have useful properties. Seeds include a high concentration of tocopherols, xanthones, tannins, anthraquinones, and anthocyanidins, as well as phenolic components such as sinapic acid and sinapin. Additionally, it contains 582.23 µg/100 g of protocatechuic acid, 1460.80 µg/100 g of ellagic acid, and 3001.75 µg/100 g of gallic acid. Additionally, kampferol (70,966 µg/100 g), narengin (61,055 µg/100 g), hesperidin (4934.99 µg/100 g), and quercetin are the main flavonoid components present in aliv seeds. However, the seeds contain the lower amounts of quercetin, 7-hydroxyflavon, and rosmarinic acid.

Aliv seeds are regarded as "superfood" due to their high nutritional content, which is important for increasing the nutritional and therapeutic value of formulated and blended food items. Even though aliv seeds are widely used throughout the world, they are still considered an underutilised product.

### **Food processing applications**

Aliv seeds are used to make a variety of processed food products, some of which are shown in Fig. 1. In India, aliv seeds are often ground into flour and used to make a variety of traditional dishes that improve the overall acceptability, colour, and texture of the food. Using aliv seeds, for instance, cereals or millets can be turned into iron-rich RTE flakes. The iron, protein, and trans-fat free fat content of the flakes are increased by the inclusion of seeds. According to a study, the designed flake product's iron, protein, and fat content increased by 4.41 mg/100 g, 13.15, and 114.28%, respectively, in comparison to the control. Aliv seeds are commonly utilised to enhance the nutritional value and overall attractiveness of traditional meals like pinni and panjiri (a blend of wheat flour, ghee, and powdered jaggery). To improve iron and calcium levels, aliv seeds can be added to chikki- another popular Indian sweet snack.

The micronutrients, particularly minerals, of aliv seeds increase significantly after processing like boiling which may be as a result of the minerals released from anti-nutritional chemicals. Researchers use the boiled aliv seed powder (1–5%) to make nutritionally enriched drinks with added sugar, fat, skim milk, and sodium salt of carboxymethyl cellulose. This beverage provides a better source of iron for children, the elderly patients recovering from illness or injury, and malnourished individuals. As a result, aliv seeds are frequently added to products to increase their iron, phosphorus, fibre, and protein levels. These seeds can be added to a variety of products, such as ladoo, namakpare (made with ajwain, salt, oil, water, and refined wheat flour), and biscuits. The mucilages from aliv seeds are utilised in the food sector in place of tragacanth and arabic gum in food preparation. Additionally, the aliv seeds are added to a variety of goods to improve their flavour and texture, including soup, falooda, and citrus-based coolants. They are also used to make homemade drinks like chia seeds and energy bars.

In addition to increasing the nutritional value, aliv seeds also increase the health-improving properties of nutraceutical components like polyphenols. For instance, according to one study, adding aliv seed increases the antioxidant content of the cookies, especially the phenolic and flavonoid contents. Such a formulation of products show promise as a therapeutic food, particularly for those with medical conditions. Additionally, to make the snacks as well as traditional festival snacks, iron-rich flour from aliv seed powder can be blended with other flours as wheat flour, pearl millet flour, rice flour, etc. Additionally, aliv seeds are used to make a variety of bakery goods, including as bread, cake, and muffins that are fortified. The inclusion of the seed to these goods increases their protein, fibre, ash, and beneficial fat content, such as alpha-linoleic acid. Furthermore, mucilage from aliv seeds can be extracted and used to make a variety of food products. In Egypt, for example, freshly cut potato strips are coated with mucilage from aliv seeds both with and without ascorbic acid to lower the fat content of the fried product by reducing the oil uptake. Thus, in terms of health, such products are better option for consumption. Owing to the significant quantity of omega-3 (n-3) polyunsaturated fatty acids found in seeds, several blended products like composite flour, extruded snacks can be formulated which have improved or higher omega-3 fatty acid content than reference ones. However, a technology like the microencapsulation of aliv seed oil is advised to prolong the shelf life of blended products because of the auto-oxidative nature of omega-3 fatty acids.



Fig. 1 Food applications of aliv seeds

The majority of Ethiopians eat the aliv seed in a special dish called "FetoFitfit," which consists of pieces of injera (a spongy, sour flatbread) combined with water, salt, and lemon. This peculiar delicacy is often only eaten once a year, mostly on New Year's Day, because it is thought to be able to ward off evil spirits all year long. In Ethiopia, aliv seed powder is used to cure a variety of illnesses in conjunction with other therapeutic foods. For example, the crushed seeds and minced garlic bulbs are blended and consumed with injera as a stomach discomfort treatment.

### Health Benefits

Gallic acid, coumaric acid, protocatechuic acid, caffeic acid, kaempferol glucuronide, and many other bioactive chemicals are abundant in garden cress and are important in promoting health and avoiding disease. Tocopherols are the primary source of the antioxidant activity found in garden cress seeds, along with phytosterols and phenolic substances. By scavenging the free radicals and reducing oil oxidation, the tocopherols protect against a number of illnesses. These substances lessen the chances of developing chronic illnesses and some forms of cancer by shielding human cells from oxidative damage. They help to eliminate the blood of toxins and shield cells from injury brought on by free radicals. Anaemia or iron deficiency can be treated with vitamin C and iron-rich garden cress seeds without the need for extra supplements. Long-term ingestion of aliv seeds raises the haemoglobin levels and heals anaemia. Due to its high iron content, garden cress seeds promote the growth of red blood cells.

The aliv seeds also help the nursing mother to sustain the production and flow of high-protein, high-iron breast milk. These seeds are great galactagogue, and nursing women should definitely eat them. The seeds have aphrodisiac, aperient, and diuretic properties that help with rheumatism, inflammation, bronchitis, and muscle soreness. The seed can be used as a poultice for sprains and effectively treats skin conditions, coughs, diarrhoea, and asthma. In addition, the seed has antibacterial and antifungal qualities and works well in the treatment of diabetes and hypertension. In a rabbit-based investigation, the seeds significantly increased the amount of collagen deposition where the fracture occurred, and this was linked to a significant improvement in the tensile strength of the broken tibia. The traditional use of aliv seeds as a bone-healing agent is supported by this research.

There are numerous other applications of aliv seeds in the medicinal field. For instance, they have a laxative action of their own that helps to ease constipation. They are helpful for diabetics because they can help control blood sugar levels and relieve rheumatism. Aliv seeds aid in lowering blood cholesterol, promote bone fracture repair, and offer pain relief for a variety of ailments. They can stimulate hunger, which is helpful for controlling weight and nutrition, and they help coagulate blood, which is advantageous for the healing of wounds. In nutshell, aliv seeds provide a wide range of health advantages, which makes them an invaluable

supplement to a balanced diet. There are further advantages to aliv seeds, especially for mental health. Because they contain higher concentrations of important fatty acids, such as:

- Linolenic Acid (26–34%): An essential omega-3 fatty acid for cognitive and mental well-being. It helps to preserve the structural integrity of brain cells and promotes the creation of new neurones.
- Linoleic Acid (7.5–11.8%): An essential omega-6 fatty acid for general well-being. It supports heart and skin health as well as brain function.
- Arachidic Acid (2.5–3.5%): This lesser-known fatty acid aids in a number of physiological processes and contributes to normal brain activity.

These seeds are a good dietary supplement for improved human health because of the combination of these fatty acids. Their significance in a balanced diet is highlighted by their higher nutritional richness and positive effects on brain function. When crushed garlic bulbs and diluted aliv seeds are sprayed onto a bleeding cut, the infection is lessened and the bleeding stops. To relieve toothache and stomach pain, the seeds are ground and combined with lemon juice. This suggests that the seeds are used to treat a variety of illnesses on domestic level, indicating the need for more research into the formulation and calculation of a seed's ideal dose for treating a variety of diseases, as well as the creation of recipes for the industrial production of a wide range of enriched and therapeutic food products.

### Future perspectives

Aliv seeds have an excellent prospect because of their growing popularity as food ingredients and health advantages. Technological developments in agriculture may improve the nutritional profiles of these seeds by increasing their levels of antioxidants, omega-3 fatty acids, and important minerals. This enhanced nutritional profile is probably going to be utilised in the functional foods industry, where aliv seeds might be utilised more extensively in nutraceuticals, dietary supplements, and health-oriented goods that target particular problems. Taking advantage of the functional qualities of aliv seeds, innovative applications in the food business could involve adding them to new functional goods including drinks, snacks, and RTE meals.

Another advantage of garden cress seeds is their sustainable nature. Their easy cultivation and low environmental impact make them ideal for urban agricultural projects and sustainable farming methods. Aliv seeds support the growing use of complementary and alternative medicine, with contemporary research validating and expanding on traditional usage. Ongoing scientific investigation, however, is also expected to uncover additional health advantages and possible applications for aliv seeds, resulting in novel formulations and medicinal usage. Moreover, in order to increase the seed production in agriculture, more effort needs to be done in the areas of product formulation, promotion, and evidence generation. There aren't many studies examining the nutritional makeup of the various aliv seed variants (black and reddish brown), which calls for more research. Furthermore, more research is required on the application of various approaches, such as the microencapsulation of nanoparticles, in the formulation of seed-based drugs and the production of functional foods.

Numerous issues exist, nevertheless, such as the nutritional content's fluctuation due to growth conditions and processing techniques. Their efficacy may be impacted by a low nutritional bioavailability. In addition to decreasing palatability and nutrient loss, processing problems might cause allergic reactions in certain people. Low consumer awareness and expensive costs prevent them from being widely accepted on the market. Further, the compliance with various regulatory requirements and guaranteeing sustainable cultivation enhances the difficulty of using them. Better processing methods, increased customer knowledge, and research are desperately needed to overcome these obstacles.



## Conclusion

Aliv seeds have great promise as a food in the future for preventing malnutrition and hunger, treating a variety of illnesses, producing a range of nutritious drinks and food products, and developing blended supplements for use in both modern and traditional food industries. Nonetheless, there is a great deal of need for more study on aliv seeds in order to develop functional foods, edible coatings, edible packaging, nutraceuticals, etc. The pharmaceutical and cosmetic industries may also investigate their potential uses. The underutilisation and unfamiliarity of aliv seeds in typical food formulations necessitates the increased consumer education and awareness in order to fully utilise the seed. Hence, it is imperative for nutrition experts, food scientists, and technologists to focus on expanding the body of knowledge and customising strategies to enhance the seed's cultivation, processing, formulation, and consumption.

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