

Lettuce: A dive into its nutritional value and economic significance

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Lettuce is a rich source of nutraceutical and pharmaceutical, antioxidants phyto chemicals compounds which are rich in anticarcinogenic properties. It is one of the most well-known green vegetables in the world, lettuce has several purposes outside of food. Customers can select from a variety of varieties in the lettuce category. Furthermore, lettuce is a great source of health-promoting bioactive substances like chlorophyll, carotenoids and polyphenols. In addition, there are differences in the nutrient makeup and

antioxidant components of different types of lettuce, particularly between green and red variants. The nutritional value of lettuce is contingent upon its composition, namely its antioxidant content, which can serve as a vitamin. The health advantages are dependent on how they enter the bloodstream and function biochemically. In the digestive tract, certain ingredients may be changed or released from the food matrix.

Key Words: *Lettuce; Economic importance; Antioxidant; Flavonoids; Phenolic acids*

INTRODUCTION

Lettuce (*Lactuca sativa* L.) has chromosome number $2n=18$, which places it in the Compositae (Asteraceae) family. Originating from the Mediterranean region, this crop is widely grown for salads worldwide [1]. The Latin word "Lactuca" for milk is the source of lettuce's name, as chopped leaves release a milk-like substance known as sap. Also referred to as "The King of salad crops" it is frequently found in fast food. It grows a short stem at the beginning of the season and the cluster of leaves varies greatly among variations in terms of shape, personality and color. A temperate region's annual crop for the cool season is lettuce. A popular salad crop in North America, Australia and the majority of Europe and South America is lettuce. Consumption and production of lettuce are highest in the USA. China holds the top spot in the global lettuce production rankings, while India grows lettuce in kitchen gardens to supply continental hotels [2].

Since lettuce is a crop native to temperate regions, it requires chilly temperatures to germinate. It may be cultivated satisfactorily at mean temperatures between 130°C and 16°C. When the soil temperature rises above 22°C, seeds do not germinate as intended. The ideal range of temperatures for seed germination is between 18°C and 21°C. The finest soil types for growing lettuce are sandy loam or silt loam; the ideal pH range for commercial production of lettuce is 5.8 to 6.6 [3].

A good source of vitamins A, C and B complex, as well as pyridoxine, riboflavin and thiamine is lettuce. It also offers some protein, carbs, dietary fiber and a negligible quantity of fat. Additionally, lettuce offers elements primarily present in the leaf, such as calcium, iron and copper [4]. Most people eat lettuce raw in salads and sandwiches. In Chinese cooking, the leaves are occasionally cooked as an herb [3].

Typically, it is used shredded in a salad with other salad vegetables including tomato, cucumber, onion and carrot. Chop the fragile leaves and heads and eat them as salad. Moisture (93.4 g), protein 2.1 g, fat 0.3 g, minerals 1.2 g, fiber 0.5 g, carbohydrates 2.5 g, calcium 50 mg, phosphorus 28 mg, iron 2.4 mg, vitamin A 1650 I.U., thiamine 0.09 mg, niacin 0.50 mg, riboflavin 0.13 mg, vitamin C 10 mg and energy 2.1 kcal are all present in one hundred grams of edible lettuce [5].

One of the most popular green vegetables consumed worldwide, lettuce has a number of therapeutic benefits in addition to its economic significance. It is a grade commercially significant salad crop that is available year-round on the market. Lettuce contains various health-promoting and therapeutic components, including flavonoids, phenolic acids and antioxidants [6]. The prevention and treatment of diseases like cancer and heart problems have

been studied while using these helpful components for health. Lettuce has anti-inflammatory characteristics that aid in managing inflammation. It is advantageous in lowering the risk of diabetes and enhances bone health and bodily metabolism. Additionally, the antioxidant activity of flavonoids can lower the risk of cardiovascular disease and cancer. Lettuce is a rich source of nutraceutical and pharmaceutical, antioxidants phytochemicals compounds which are rich in anticarcinogenic properties [7]. Due to the bioactive chemicals found in vegetables, eating lettuce has health benefits for people [8]. Consuming vegetables has been linked in certain epidemiological studies to a decreased risk of chronic illnesses such cancer and cardiovascular disease [9]. One of the main natural sources of phytochemicals is lettuce [10]. Bioactive nutritional components, such as glycosylated flavonoids, phenolic acids, carotenoids, vitamin B groups, ascorbic acid, tocopherols and sesquiterpene lactones are essential. Furthermore, the results showed that the plasma redox status of healthy individuals was not changed by consuming lettuce stored in packaging with a modified environment [11]. *Lactuca sativa* has also been shown by various researchers to be effective in treating oxidative damage, cancer, diabetes, Alzheimer's disease and other illnesses [12,13].

LITERATURE REVIEW

Natural antioxidants that have been isolated and identified from plant sources include: Organic fertilizers can be used to improve the quality of leafy vegetables and human health by reducing the amount of toxic substances like nitrates produced by conventional fertilizers in vegetables like lettuce [14]. For agricultural use and ecological balance, organic fertilizers replace inorganic fertilizers. Plant leftovers, livestock manure, farm yard manure and industrial wastes are the main sources of organic fertilizers. Organic fertilizers give lettuce the nutrients it needs to grow, yield more, and improve its quality [15].

In addition to being a protective agricultural input that improves the physical, chemical and biological properties of soil and increases soil fertility, porosity and water holding capacity, vermicompost is a very nutrient-dense organic fertilizer that is more potent than traditional compost at promoting growth. The best way to improve the vegetative development, quality and yield performance of lettuce crops is to use vermicompost. Higher levels of readily available nutrients, such as nitrate and ammonical nitrogen, phosphorus, potassium, calcium and magnesium that are produced from wastes, are found in vermicompost.

Sustainable agriculture and ecologically friendly systems use bio-fertilizers and bio-pesticides, respectively. In addition to chemical fertilizer, biofertilizers offer an inexpensive, sustainable source of plant nutrition.

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These are laboratory-cultured strains of beneficial soil microorganisms that have been carefully chosen and packaged in an appropriate carrier. Both soil application and seed/seedling treatment are possible with them. Nitrogen and phosphorus are produced by biofertilizers for plants. Biofertilizers reduce environmental contamination and decrease the amount of chemicals used in agriculture by focusing on maintaining the health of the soil. These are also the perfect input to lower cultivation costs and support organic farming. They are used as soil microorganisms to improve plant availability and uptake of mineral nutrients, as well as to improve the quality and performance of lettuce crops during their vegetative growth. With no negative effects on the soil or environment, rhizobium radiobacter culture is utilized as a seedling therapy to boost nutrient availability and improve lettuce crop output by 10% to 25% [16].

Lettuce is highly remunerative crop since its production period is short, yield is high and market prices are very high. It has nutraceutical value and is also used in fast food items however; it is a cool season European vegetable. Cultural practices for which have been standardized best temperate climates thus, cultivation of this crop in plains of north India is a major challenge, also since it is eaten fresh and cooked. Lettuce is potential crop for its economic importance, medicinal, nutraceutical, pharmaceutical value and increasing demand for organic products [17].

A popular green vegetable that serves as the foundation for salads is lettuce. Lettuce come in many varieties, however they are always referred to by the scientific name *Lactuca sativa*. Lettuce's high vitamin content is mostly responsible for its health advantages. The kind of lettuce one eats affects its health advantages. Lettuces can be categorized into four types:

- Head lettuce (capitata)
- Leaf lettuce (crispa)
- Romaine lettuce (longifolia)
- Celtnce lettuce (augustana)

The rounded shape of head lettuce gives rise to its name. This variety comprises the popular grocery store varieties, butter head and iceberg lettuces. Instead of developing a head, leaf lettuces are affixed to a stem. Some of these lettuces have reddish-brown leaves or are deeper in color. Another type of lettuce that is frequently found in grocery shops is romaine. It is sometimes referred to be the Caesar salad's primary component. Celtnce lettuce has a characteristically large stem that is also referred to as asparagus lettuce or stem lettuce. This type of lettuce is more common in China than it is in the West.

We searched for lettuce using the following terms: Phytochemicals, nutrition, metabolism, health benefits and bioavailability. English-language study reports, reviews and original research articles were chosen and evaluated. Additionally, we went over the citations and added any that were missing [17]. One of the leafy vegetables that is most commonly consumed worldwide, lettuce has a number of therapeutic benefits in addition to its economic significance. It is a popular salad crop that is of major commercial value and is available all year long in the market. Antioxidants, flavonoids and phenolic acids are just a few of the health-promoting and medicinally useful ingredients found in lettuce. The prevention and treatment of diseases like cancer and heart problems have been studied while using these helpful components for health. Lettuce has anti-inflammatory characteristics that.

Health benefits of lettuce

Based on their nutritional makeup, different types of lettuce have different health benefits. The sort of lettuce that typically has the fewest nutrients is iceberg lettuce.

Bone strength

Vitamin K, which is found in lettuce, aids with bone growth. The risk of bone fracture can also be decreased by consuming sufficient levels of vitamin K.

Hydration

More than 95% of uncooked lettuce is water. Therefore, eating lettuce helps the body stay hydrated. While consuming liquids is essential, foods that contain water can also greatly aid in maintaining proper hydration.

Improved vision

Vitamin A, which is found in lettuce, is beneficial to eye health. One can lower their chance of cataracts by taking vitamin A. Furthermore, preventing macular degeneration is vitamin A.

Improved sleep

It's also been demonstrated that extracts from some varieties of lettuce improve sleep. Whether lettuce in its natural state can have a comparable impact is unknown until more research is done.

Nutrition

Different types of lettuce have different nutritional values. Together with trace levels of iron and vitamin C, almost all lettuces have a high concentration of vitamin A.

Nutrients per serving

Chopped iceberg lettuce in a cup contains: Ten calories one gram of protein, zero grams of fat, two grams of carbs, one gram of fiber, one gram of sugar vitamin A content in iceberg lettuce is 7% of the recommended daily intake. Iron and vitamin C are also present in trace amounts. Compared to other lettuce kinds, it has fewer vitamins and minerals.

In general, most people can safely consume lettuce. It's not a typical allergy. It's not a huge deal to eat too much lettuce because it's low in calories. However, there have been numerous cases of *E. coli*-contaminated lettuce in recent years. Lettuce, particularly romaine, is recalled occasionally. These outbreaks are probably caused by contaminated lettuce from surrounding animal farms' drainage [18].

DISCUSSION

Health beneficial component of lettuce

Lettuce is a low-calorie, leafy green vegetable that is rich in many nutrients and health-promoting chemicals. Lettuce contains several chemicals that are good to health, such as:

Fiber: Dietary fiber, which is included in lettuce can support regular bowel movements and avoid constipation, both of which can aid in promoting digestive health.

Vitamins and minerals: Vitamins A, K, C and folate are among the many vitamins and minerals that are abundant in lettuce. These nutrients are necessary for a number of body processes, such as blood coagulation, bone health and immunological support.

Antioxidants: Beta-carotene and flavonoids, two types of antioxidants found in lettuce, can help shield cells from injury from dangerous substances known as free radicals. Chronic disorders such as cancer and heart disease are linked to a lower likelihood of antioxidant-induced damage.

Water content: Lettuce is high in water content, which can help keep you hydrated and support overall bodily functions.

Low-calorie content: Lettuce is very low in calories, making it a healthy choice for those looking to manage their weight.

Phytonutrients: Phytonutrients found in lettuce, like quercetin, may have anti-inflammatory and anti-allergic effects. It's crucial to remember that lettuce varieties can differ in terms of their nutritional value. When it comes to nutrients, romaine lettuce, for instance, is well-known for being high in vitamin K, but other types may have slightly different profiles. Including a diversity of vegetables in your diet, such as lettuce, can have a positive impact on your health and help you maintain a well-rounded, nutrient-rich diet.

Economic importance of lettuce

In the fields of nutrition and culinary arts, lettuce is a valuable and adaptable vegetable that provides a number of advantages. The following are some of the main points about lettuce's significance:

Nutrient content: Lettuce is a good source of essential nutrients such as vitamins (e.g., vitamin A, vitamin K, vitamin-C, folate), minerals (e.g., potassium) and dietary fiber. These nutrients are crucial for maintaining overall health, supporting immune function, promoting healthy skin and

aiding in digestion.

Low-calorie option: Due to its incredibly low calorie content, lettuce is a great option for anyone trying to watch their weight or cut back on calories. It can provide bulk and crunch without adding a lot of calories as a base for salads, wraps or sandwiches.

Hydration: Due to its high water content, lettuce might aid in maintaining proper hydration. Many body processes, such as digestion, temperature regulation and nutrition delivery, depend on enough hydration.

Dietary fiber: In addition to encouraging regular bowel movements and reducing constipation, the fiber in lettuce helps digestive health. Additionally, it increases the sensation of fullness, which can help regulate appetite.

Versatility in culinary applications: A flexible ingredient, lettuce can be utilized in a wide range of culinary applications, such as salads, sandwiches, wraps, soups and stir-fries. Its flavor is neutral and its texture is mild, making it a common addition to many different types of recipes.

Texture and crunch: Lettuce provides a pleasing texture and crunch to many dishes, enhancing their overall sensory appeal. This makes it a favorite choice for adding a fresh and crisp element to meals.

Dietary diversity: With a wide spectrum of nutrients, lettuce is a part of a varied diet that also includes other fruits and vegetables. A more well-rounded and nutritious eating pattern can be achieved by including lettuce in your diet.

Antioxidants: With a wide spectrum of nutrients, lettuce is a part of a varied diet that also includes other fruits and vegetables. A more well-rounded and nutritious eating pattern can be achieved by including lettuce in your diet.

Allergen-free: Lettuce is not a common allergen, making it a safe and accessible food choice for most people.

Lettuce is not a power house of nutrients compared to some other vegetables; it plays a valuable role in promoting a balanced diet, supporting hydration and adding texture and flavor to a wide range of dishes. It's an excellent choice for those seeking to increase their vegetable intake and create more satisfying and nutritious meals. Lettuce is a rich source of nutraceutical and pharmaceutical, antioxidants phyto chemicals compounds which are rich in anticarcinogenic properties [19].

Among the latest developments seen in plants is the extraction of bioactive substances. According to some earlier research, one of the intriguing and abundant sources of antioxidant polyphenols that promote human health is lettuce [20]. A number of studies have examined different techniques for extracting lettuce. Processing lettuce fresh cut makes it easier to extract polyphenols from the tissue. Polyphenols are the body's reaction to cell damage like shredding or cutting leaves. Following the preceding protocol, lettuce must be homogenized using an extractive solution and kept between 4 and 50°C for 48 hours. No matter how long they take, these methods won't yield food-grade polyphenol extracts. Therefore, Chemat et al., [21] described some novel techniques utilizing non-toxic and GRAS "green" extraction technology.

CONCLUSION

Finally, because it provides dietary fiber, a number of essential minerals, a variety of vitamins and bioactive substances including chlorophyll, phenolic compounds, carotenoids and even Sesquiterpenoids lactones, lettuce has a high nutritional value. Understanding the bioavailability and metabolism of phytonutrients can help with understanding the final distribution of these chemicals and their associated health effects. Lettuce may offer certain health benefits in the areas of cardio protection, anti-cancer, anti-diabetic and anti-aging, particularly because of its antioxidant components. These potentials support the preclinical and clinical application of lettuce extracts,

which can be studied further, according to both *in vitro* and *in vivo* evidence. Purified phytochemicals taken out of lettuce, however, might make the creation of effective functional meals possible. Additionally, more research might concentrate on the development tactics and growing environments.

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