

Review Paper

Loofah (*Luffa cylindrica* L.) and its role in medicine, agriculture, and industry: A review

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Abstract:

Loofah is a creeping plant that grows in nature on abandoned building structures and fence walls in some cities and villages. The sponge in the fruit holds the seeds. This sponge is used in rural areas of some countries to wash and clean household dishes and their seeds are thrown away. Natural cellulose fibers obtained from the world of plants have many uses. They can remove dead skin cells and make the skin glow. These cellulose fibers can clean and tighten the skin. Loofah can be cut into large or smaller pieces or different shapes and used as pads, cushions, and other practical items in handicrafts. Luffa fiber is a green alternative as a medium for root growth in hydroponic plants. The bud, flower, and ripe fruit of this plant can be used for food consumption. This fiber can be used as a filter in the engines of cars, and in water treatment plants. The fibers of this plant are used to absorb heavy metals from wastewater, including metals from olive oil factories, and its waste is also used as fertilizer.

Keywords: Luffa, Application, Sponge, Fibers.



Figure 1 Loofa

1. Introduction

The smooth luffa is a vigorous, annual, climbing vine with medium-sized leaves and a cucumber-vine appearance, and it has a fetid odor when the foliage is crushed (Figure 1). The stem is five-angled or almost smooth, with a fine, sparse pubescence [1]. The leaves are more or less ovate in overall shape or at times broadly kidney-shaped, cordate at the base, and acute or acuminate at the tip. Planting this plant is not very typical in Iran, but nowadays it is grown in some greenhouses. Three to seven angles or lobes characterize Luffa, and the surface is slightly rough [2]. The matured fruit is brown and dry, which develops a spongelike structure. Unripe fruits are generally harvested at the young stage as vegetable sources, whereas the fully ripened fruit is non-edible and very fibrous. The fibrous network of matured dried fruits of these plants is termed luffa sponge or *Luffa cylindrica* fibers [3].

The fruit of this plant is used in different ways and has many medicinal effects, although many of the medicinal properties of luffa have not yet been fully determined [4]. This plant is brewed and its fresh fruit is used as food [5]. But if it is allowed the fruit of this plant to dry, a sponge-like form is obtained, which has many properties and can be used to make various types of fiber [6]. The luffa sponge is completely vegetable and does not contain any chemical or artificial substances. One of its main uses is to use it as a bath towel or face cleansing pad [7].

2. The effects and properties of luffa on the body

The effects of luffa on the body include seasonal allergies [8], treating local pains [9], solving menstrual problems [10], increasing milk in lactating women [11], removing dead skin from the body [12], stimulating the skin to produce healthy cells [13], improving blood circulation on the body surface [14], strong exfoliation [15]. The skin, the disappearance of spots and pimples, the increase in the fat burning of the fatty tissues of the skin [16]. This plant is very useful for solving oral problems and preventing colds. Luffa is also used to solve sinus problems [17]. Some people use this plant to treat muscle pain, arthritis and chest pain [18].

3. Luffa in medicine

Massaging the body surface with this natural fiber removes dead skin cells [19]. This plant is a natural exfoliator and facilitates the breathing of skin cells. Other properties of luffa for skin health include removing wrinkles and treating pimples and acne. Dried luffa fruit is windbreaker and has antiseptic properties [20].

Luffa helps relieve sciatica and disc pain. For this purpose, some of the plant should be brewed, some of that milk and some of it should be applied as a poultice to the pain area [21]. The use of herbal infusion helps to treat diabetes, kidney blockage and anemia [22]. Consuming brewed luffa is useful for treating jaundice, cancerous swellings, smallpox, toothache and scarlet fever [23].

Using a Luffa reduces the feeling of stress and discomfort in the body, and after using it, you can feel how calm you are and be surprised by this state [24]. This plant does not harm your skin. This sponge is made of natural and organic materials and easily prevents skin infections.

The Chinese believe that luffa can cool the body and blood. This plant can cure rheumatism, reduce phlegm, drain meridians, strengthen blood circulation, and kill insects [25].

It is reported that luffa extract has anti-stress, anti-viral, growth enhancing and immune system enhancing properties [26].

4. How to use luffa for human consumption

To use the healing properties of this plant, you must use the infusion of the plant. To prepare luffa infusion, boil 10 grams of the aerial parts of the plant including branches, leaves, and flowers in 1500 cc of water until the volume of water is reduced by half. Press the plant well to extract its juice completely, then filter it and consume it. You can also use this infusion topically [26].

To use this plant as a natural and vegetable fiber, the dried skin of the plant is separated. This skin is rough, but it softens in contact with warm water and soap and can be easily used for washing and massaging the skin. After each use of luffa for bathing, it is necessary to expose it to sunlight to dry completely [27]. It should be noted that pregnant and lactating women should avoid excessive consumption of this plant.

5. Nutritional value and medicinal properties of luffa

Luffa is a widespread vegetable in India and some Asian countries. Luffa is healthy food and contains a lot of fiber, vitamins, and minerals. The important nutrients of this plant include vitamin B₂, vitamin C, carotene, niacin, calcium, phosphorus, iron, and small amounts of iodine and fluorine. Luffa contains flavonoids, saponin, luffangulin, saponin, oleanolic acid, and cucurbitacin (Table 1). This plant is used for weight loss, jaundice, blood purification, hypoglycemia, constipation, skin care, strengthening the immune system, wound healing, eye problems, stomach worms, and asthma [28].

Table 1 Pharmacological actions of *Luffa Cylindrica*

No.	Pharmacological actions	Reference
1	Anti-inflammation	[29]
2	Anti-fungus	[30]
3	Analgesia and sedation	[31]
4	Anti-myocardial ischemia	[32]
5	Anti-hypertriglyceride	[33]
6	Immunostimulation	[34]
7	Anti-allergy	[35]
8	Anti-asthma	[36]
9	Miscellaneous	[37]

6. Use of luffa in animal husbandry

Luffa leaf meal has a low level of protein, ash, and ether extract, but this meal has a high level of crude fiber. The protein in it helps the structural formation of cells and the lipids in it are used as a source of energy. The crude fiber in Luffa plays a vital role in digestion, thus reducing the risk of digestive disorders [38].

Luffa is a good source of zinc and other minerals. According to researchers, high levels of zinc increase hatching and protect genetic material [90].

Luffa leaf meal contains a significant amount of calcium, which is useful in proper bone formation [40].

Flavonoids play a key role as antioxidants, anti-diarrhea, anti-chromosomal mutation, anti-cancer and antibacterial. The phenolic compounds in Luffa extract have high antioxidant activity. Tannins are known to improve feed efficiency, weight gain and gut health. Tannins also have antibacterial and antiviral functions [41-43].

7. Application in industry

Some researchers proposed environmentally friendly porous ceramics obtained from luffa for fast, efficient, and compact solar thermal energy storage. The structure of these strong ceramics was designed by dipping flour paste into a luffa and reacting with molten silicon. These materials are light, highly conductive, have a high energy density, and are used in making solar cells [44]. Luffa has also been used as a durable biofiber reinforcement for epoxy systems [45].

Conflicts of interest

The author declares that there is no conflict of interest. The authors alone are responsible for the accuracy and integrity of the paper's content.

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