



Value Added Kohila (*Lasia spinosa*) Based Food Products and Its Therapeutic And Nutritional Properties: A Review

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Abstract The goal of the current study was to gather the traditional, phytochemical, and nutritional advantages of the essential medicinal plant kohila (*Lasia spinosa*), an indigenous vegetable with great potential in Sri Lanka but little commercial acceptance because of its high fiber content. The plant has alkaloids, and its leaves in particular include tannins and phenolic chemicals. Fresh shoots, leaves, corms, and rhizomes are often grown and used as eatable food since they are regarded as financial assets as well. People use leaf extract as the least expensive source of multivitamins to increase their nutritional value. The kohila plant offers a wide range of therapeutic benefits, including anti-helminthic, anti-bacterial, anti-inflammatory, anti-hyperlipidemic, anti-oxidant, anti-diabetic, and anti-tumor activity. This study covers the prospective application of kohila in the nutritional concern due to its various therapeutic and nutritional properties.

Keywords: Food, *Lasia spinosa*, Kohila, Nutritional properties, Therapeutic activities

I. INTRODUCTION

A. Kohila (*Lasia spinosa*)

The Kohila (*Lasia spinosa*), which has spread over New Guinea, China, Malaya, and the Peninsula, originated in India. It belongs to the family Araceae and is an evergreen plant that thrives in muddy places. The soft and immature leaves, which range in size from 5 to 32 cm in width and 15 to 45 cm in length, are the most flavorful. They have spread over Sri Lanka and thrive in the marshlands, where they thrive mainly in lowland shaded areas near water reservoirs and nearby ponds. Some of the species including kiri kohila, wel kohila, kalu kohila, guru kohila, and goda kohila. Although being one of Sri Lanka's undervalued native vegetables, it is grown as a food crop in some areas. Its young leaves and rhizomes are eaten as edible plant

parts and are suggested as well in ayurvedic medicine for a variety of diseases. It is a significant ethnobotanical medicinal herb that is advised for colic, rheumatism, intestinal conditions, and piles. (Yusuf M et al, 2009)

II. METHODOLOGY

A. Benefits expression of kohila

Because of this crop's antidiarrheal, antimicrobial (Hussain R *et al.*, 2021), anti-inflammatory, and antinociceptive effects (Rahman A *et al.*, 2019), kohila leaves and rhizomes are frequently used. In 2007 (Ngomdir M. et al. Substantial anti-cestodal efficacy is shown by stalk and leaves (Temjenmongla and Yadav, 2006). The antinociceptive, anti-inflammatory, and anti-diarrheal properties of crude root extracts were present. (Temjenmongla and Yadav, 2006) A corm, a plant organ generated from the plant stem and used as a medicine for throat infections, is an underground storage organ. The thick underground stems of the tuber, which are also used to purify blood, can be used to treat rheumatoid arthritis, constipation, and other conditions (Rahmatullah et al., 2010).

According to recent studies, rhizomes, which are swollen stems that grow horizontally, have a possibility to have considerable antioxidant capacity, cytotoxic activities, and antimicrobial property against a small number of specific bacteria and fungi strains, in addition to being used to treat lung inflammation, bloody coughing, and hemorrhoids. The entire plant was used to treat breast and uterine cancer. (Bahorum T, 2014).

B. Therapeutic properties

As shown in Table I, kohila has a number of ayurvedic beneficial qualities, including anthelmintic, antinociceptive, and anti-cestodal actions. Anthelmintic features are anti-parasitic characteristics that are used to kill or stun parasitic organisms (helminths) and other internal parasites so they can be eliminated from the body

with little or no adverse impact on the host. The leaves can be used as a folk remedy for a number of digestive disorders. The leaf extract has high anthelmintic efficacy and is active on several phases of the parasite life cycle. As a result, it reduces unwanted toxins in the intestines and has an effect on further intestinal illnesses.

In addition, methanol extract from kohila leaves displayed exceptional anthelmintic activity. By avoiding unpleasant detection or harmful induction by sensory neurons, antinociceptive activity reduces pain. Kohila leaf methanolic extract has a notable antinociceptive effect on mice. The 400 mg/kg b.w. methanolic crude extract significantly inhibited and reduced sense of smell (47.65%). (Goshwami D et al., 2012). However, more tests in laboratories are required to identify the precise extract nutrients that are responsible for the remarkable medicinal properties found. Tapeworm infections are treated with anti-cestodal medications. Native American medicines utilize kohila leaf extract because it has strong anti-cestodal properties. In India, intestinal worm illnesses are frequently treated with the porridge (pudding) made from young delicate leaves. (Temjenmongla and Yadav AK, 2006)

C. Antioxidant activity

Kohila contains higher fiber and antioxidants, which allows it to express greater healing and protective properties. Antioxidants are compounds that stop oxidation, particularly one used to counteract the deterioration of foods that have been preserved. Free radicals are stabilized by the antioxidants. They may thereby prevent some of the free radicals that cause mutilation. (Bahorum T et al., 2014). The rhizome of

kohila shows a broad antioxidant dimension. The main components of the total antioxidant activity are the polyphenols and ascorbic acid found in the rhizome of the kohila plant. Polyphenolic substances include phenolic acids, flavonoids, stilbenes, and lignans alone or in combination (Kankanamge SU *et al.*, 2017). The contribution of polyphenols to antioxidant activity ranges from 14 to 48%. Ascorbic acid also contributes in small amounts (between 34 and 56%) to the overall antioxidant activity. Moreover, carotenoids may also support to the total antioxidant action by a lesser extent (0.4-1.8 µg/g fresh weight and 0.9-7.2 µg/g fresh weight for *c*-carotene and *β*-carotene separately) (Priyadarshani, A.M.B and Jansz ER, 2006). While antioxidants can work independently or in concert with fiber, kohila is a rich source of dietary fiber that can help to lessen the negative impacts of various diseases, including cancer.

D. Antimicrobial activity and Cytotoxicity

Antimicrobial and phytochemical-rich plant extracts may help researchers discover new antibiotics that are effective against resistant microorganisms that cause transmissible illnesses. Although other research indicated that the rhizome of the kohila plant also contained antibacterial compounds, the kohila leaves extract did not demonstrate significant antimicrobial activities (Durajan G, 2012). Cytotoxicity is a property that makes cells poisonous. Both the isolated chemical (meridinol) and the extractives (rhizome) exhibited significant cytotoxicity toward brine shrimp nauplii. The kohila leaf extracts shown notable cytotoxic effects (Abebe, W 2016). Studies revealed that the leaf extract is powerful against all stages of the parasite life cycle. (Yadav AK and Temjenmongla, 2012).

Table I: Common pharmacological properties of kohila

Pharmacological property	Usage
Anti-hyperglycemic activity	The anti-hyperglycemic activity of <i>L. Spinosa</i> leaf extracts from glucose-loaded hyperglycemic rats were evaluated using the oral glucose tolerance test (OGTT). Additionally, against diabetic albino rats induced by dexamethasone, <i>L. Spinosa</i> stem hydro-alcoholic extracts' anti-diabetes potential has been demonstrated. (Hasan MN, 2014).
Anti-hyperlipidemic activity	Another study employing rats revealed that the leaves of <i>L. spinosa</i> may be able to prevent hyperlipidemia-related pancreatitis and demonstrated that impact by the animals' significantly higher serum HDL (High-density lipoprotein) cholesterol levels. (Mahmood SB, 2015).
Anti-bacterial activity	<i>Escherichia coli</i> , <i>Bacillus cereus</i> , <i>Staphylococcus aureus</i> , and <i>Vibrio parahemolyticus</i> have all been demonstrated to be somewhat susceptible to the moderate activity of petroleum ether, ethyl acetate, and methanolic extracts of rhizome. (Mahmood SB, 2015).
Anti-nociceptive activity	One study revealed that the methanolic extracts of <i>L. spinosa</i> had significant anti-nociceptive effects and blocked both the peripheral and central pain

	pathways. They may also have narcotic-like anti-nociceptive effects. (Hasan MN, 2014).
Antioxidant activity	Numerous investigations explored the 1,1-diphenyl-2-pecrylhydrazyl (DPPH) steady radical free radical foraging activity of the <i>L. spinosa</i> extracts (Hasan MN, 2014). The findings of the study carried out in Sri Lanka demonstrated that ascorbic acid and polyphenols play a major part in the rhizome's overall antioxidant activity. (Shefana AG and Ekanayake S, 2010).
Anti-inflammatory activity	The hydro-alcoholic root extract of <i>L. spinosa</i> had a significant inhibitory impact on the oedema production in a dosage dependent manner in mice with xylene-induced ear edema model. By decreasing vasodilation, the root extract of <i>L. spinosa</i> has anti-inflammatory properties. (Deb D et al., 2010).
Anti-diarrheal activity	The anti-diarrheal activity was tested using a mouse as the model of diarrhea caused by castor oil. The findings supported the traditional usage of <i>L. spinosa</i> in the treatment of diarrhea and showed that the root extract of the plant has substantial anti-diarrheal activity (Deb D et al., 2010).

E. Nutritional perspective

Kohila's nutritional attributes were listed in Table 02. Some nutritional composition of tubers includes fiber (0.8g), ash (0.8g), vitamin C (22 mg), and vitamin A (1311 mg) in the leaves (Weerakoon and Raja 1993). Kohila is recommended for those with diabetes and high cholesterol since it has a tendency to reduce the absorption of sugar and fat. Additionally, it has a lot of iron and is rich in vitamins and minerals (Nirmala M, 2016).

Table II: Nutritional values of kohila (Weerakoon and Raja 1993)

Nutrient component	Value per 100 g	
	Tuber	Leave
Energy	53 kcal	34 kcal
Moisture	85.9 g	89.8 g
Protein	1.7 g	4 g
Fat	0.1 g	0.6 g
Carbohydrates	11.3 g	3.2 g
Thiamin	100 µg	30 mg
Calcium	21 mg	155 mg
Phosphorus	74 mg	26 mg
Iron	0.4 mg	16.3 mg

F. Dietary fiber content

Dietary fiber plays a crucial role in the physiology of the gastrointestinal tract. Regular bowel movements are seen to be the most consistent benefit of eating enough dietary fiber. Dietary fiber has been shown to be an excellent way to lessen the symptoms of Crohn's disease, hemorrhoids, and diverticular disease (Klurfeld OM, 1987). Kohila is without a doubt the most reputable and reliable source of dietary fiber that Sri Lankans are aware of. From a modern dietary suggestion to an old Sinhalese medical treatment, it is utilized to regulate intestinal function. It produces a large variety in bulky stool, which gives a decent motion, and its tubers and leaves are rich in dietary fiber, which makes them less available for bacterial fermentation in the gastrointestinal tract. Additionally, it aids in the control of dietary-related illnesses like diabetes, cardiovascular disease, and cancer (Pankaj, S., and Dibakar, C.D. 2013). The rhizomes are a rich source of dietary fiber (40–75%, d.b. or 7.2–7.5% w.b.), with 35–60% insoluble fiber and 4–18% soluble fiber. (Shefana AG and Ekanayake S, 2010).

G. Value added food products

Kohila is readily available in nearby markets all year round. It can be eaten raw in salads or sautéed with spices. Additionally, natives make a hot stew with coconut milk. Due of its inconvenience and hefty nature, convenience food is now preferred by the majority of people. People are therefore unwilling to eat veggies that are uncooked. It is considered a valuable plant and food on a global scale. Kohila's high fiber content can be increased by altering the method used to make the powder. Only a small number of studies focused on Kohila and its value-added foods have been documented. According to them, kohila flour was used to produce noodles and biscuits while boosting the fiber content. However, kohila-based value-added food items can also include a wide range of curry, crispy, snack,

bakery, breakfast, porridge, soup, dried, and extruded food items. Furthermore, it is possible to create extraordinary food products by using locally accessible underutilized but high in nutrients plant components. The products may be well known to consumers and producers, who promote them accordingly.

III. CONCLUSION

Compared to previous decades, the population is more health-conscious these days, particularly with regard to non-communicable diseases. They therefore prefer to eat vegetables that are more therapeutic. The plants examined here have the potential to yield valuable medicines with high nutritive values. Antioxidants are usually provided by Kohila to treat chronic illnesses, and they work independently of dietary fiber to lessen the negative consequences of disease. In view of its medicinal and nutritional qualities, the rhizome can therefore be considered to be valued functional sustenance.

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