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Pharmacological Properties of Lagenaria Siceraria

Hansraj Bishnoi[1*], Dr. Hariom Sharma[2], Dr. Shailesh Sharma[3], Shailendra Sharma[4], Shreyasi[5]

[1]Research Scholar, Dept. of Pharmacy, Dr. K. N. Modi University, Newai, Tonk, Rajasthan, 304021, India.*
[2]Principal, Dept. of Pharmacy, Dr. K. N. Modi University, Newai, Tonk, Rajasthan, 304021, India.
[3]Principal, Dept. of Pharmacy, Shyam University, Dausa, Rajasthan, 303511, India
[4]Principal, Knowledge School of Pharmacy, Dausa, Rajasthan, 303511, India
[5]Assistant Professor, Dept. of Pharmacy, Dr. K. N. Modi University, Newai, Tonk, Rajasthan, 304021, India

Email: [2]homji14@gmail.com, [3]dr.shailus@gmail.com, [4]shailendrasharma.0789@gmail.com, [5]shreyashithakur31@gmail.com
Corresponding Email: [1]hansbishnoi29@gmail.com*

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Abstract: Lagenaria siceraria (LS), more commonly referred to as 'bottle gourd', is a type of vegetable that is widely cultivated and has several properties that have potential medical applications. The purpose of this review article is to provide a general summary of the pharmacological activities of L. siceraria that have been reported in a variety of investigations. The literature search was carried out by using a variety of databases, such as PubMed, Scopus, and Web of Science, along with keywords that were pertinent to the topic. This paper provides a concise summary of what is currently known about the pharmacological capabilities of L. siceraria, including its anticonvulsant, neuroprotective, hepatoprotective, hypoglycemic, antidiabetic, anticancer, and antimicrobial activity. This study alsomakes recommendations for the paths of future research. In conclusion, L. siceraria has shown a great deal of promise as a source of naturally occurring bioactive chemicals that have the potential to be exploited in the production of innovative pharmaceuticals as well as functional foods.

Keywords: Lagenaria Siceraria, Pharmacological, Properties, Medicinal, Potential.

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1. INTRODUCTION

The lauki, or Lagenaria siceraria, is a member of the gourd family, Cucurbitaceae. The locals call it kado, however most often known as a calabash or white flower gourd. An estimated 825 unique species exist among the 118 different types. In addition to Lagenaria guineensis and Lagenaria sphaerica, the genus Lagenaria also includes L.breviflora, Lagenaria Rufa, Lagenaria sphaerica, and Lagenaria Abyssinia. Lagenaria siceraria spp. is mostly grown. Lagenaria sicerariassp [1] is a recognised species of bottle gourd. Between 9 and 10,000 B.P. (before present), Siceraria and Lagenaria siceraria ssp. asiatica were first cultivated in the Americas (new world), followed by East Asia (6 to 10,000 B.P.), and Africa (4 to 5,000 B.P.). There is some speculation that it was one of the earliest plants that humans tamed and domesticated. It is an annual herbaceous plant that grows in a prostrate fashion [2]. Flowers of the L. siceraria species are monoecious, which implies that flowers develop on separate axes on the identical plant. Tendrils are almost always visible, and the leaves alternate and vary. Therefore, pollination from various species is encouraged [3].

Figure 1 Lagenaria siceraria

Wild or uncultivated Bering hermaphrodite flowers may also exhibit dioecious and andromonoecious sex. The bottle gourd has a very high sex ratio. Research shows that the ratio of male to female flowers has amajor impact on crop success [4]. On the plains of Pakistan, the calabash or bottle gourd is grown year-round for its young and sensitive fruits, which are prepared as a popular home vegetable known as Lauki or Kaddu. Once known as L. vulgaris Ser.,now known asL. siceraria [5]. For months at a time, fruit may float in the ocean without the seeds rotting. Evidence suggests that in both the Old and New Worlds, domestication happened independently from wild populations. Land races in Africa and the Americas (subsp. siceraria) have a different physical appearance than land races in Asia [6]. The outer shell of rotten fruits

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may be recycled into a variety of useful items, including water bottles, pipes, horns, snuff boxes, and blowing instruments. The dried clams are also a key component in making stringed instruments like the sitar and bia. You may expect the pulp to have a cooling and antibilious impact on your body. In cases of external headache, the oil from the seeds is administered [7-9]. Across the tropics and subtropics, from sea level up to around 2500 metres, Lagenaria siceraria is a popularly grown plant [10]. It's a common fugitive sight along riverbanks and other rough terrain. It thrives in a wide variety of habitats, including sandy alluvial soils, slopes that are mild to medium, rocky ridges, riverbanks, dry riverbeds, ravine undergrowth, woodlands, and savannahs [11]. It may also be found in secondary woods, ruderal regions close to settlements, and along roadsides. L. siceraria thrives in tropical damp and wet climates, but it may also be found in dry thickets, arid steppes, and deserts due to its tolerance of dry and arid circumstances [12]. The purpose of this review article is to provide a comprehensive summary of the pharmacological properties of Lagenaria siceraria, a plant species that has been traditionally used for medicinal purposes. The literature search was performed using various databases, including PubMed, Scopus, and Web of Science, using relevant keywords.This article provides valuable insights into the potential uses of Lagenaria siceraria in plant-based medicine, and to promote further research into its pharmacological properties.

Pharmacological Properties of Lagenaria Siceraria

1. Antineoplastic Action

According to Elisha et al. (1987), ethanolic extracts of Lagenaria siceraria (LS) plant seeds demonstrated strong anti-tapeworm effectiveness equivalent to that of piperazine citrate. LS plant seeds also showed modest action against pinworms. [13]

2. Immune-Modulating Results

Gangwal et al. (2008) found that methanolic extracts of LS fruit in its n-butanol and ethyl acetate fractions substantially and dose-dependently suppressed delayed-type hypersensitivity reactions in mice at dosages of 100–500 mg/kg (p.o.). Both fractions also substantially increased the White Blood Cell (WBC) count and primary and secondary antibody titre in rats. [14]

3. Antihypertensive/Cardioprotective Action

According to Hassanpur et al. (2008), LS extract prevented changes in the amount of endogenous antioxidants and lipid peroxidation, prevented the cardiotoxicity indicators CK-MB and LDH, and demonstrated resistance to doxorubicin-induced histological alteration and ECG abnormalities in Wistar albino rats [15]. Mali et al. (2010) showed that LS fruit powder partly reduced the hypertension caused by dexamethasone in rat models [16]. Singh et al. (2012) found that pretreatment with simvastatin and LS seed extract decreased elevated cardiac toxicity biomarker enzyme levels, increased antioxidants, and decreased lipid peroxidation, demonstrating protection against doxorubicin-induced cardiac damage in histopathological examinations. [17]

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4. Treatment of Pain

Ghule et al. (2006) demonstrated that LS fruit juice extract, when administered orally at doses ranging from 150 to 300 milligrammes per kilogramme (mg/kg), significantly reduced albumin, carrageenan, and arachidonic acid-induced hind paw edoema in rats [18]. In addition, the formalin pain test and writhing were found to be reduced in a dose-dependent manner. Using the writhing, hot plate, and tail-flick procedures, Pawar et al. (2010) reported that crude petroleum ether, chloroform, and methanolic extracts of LS leaves all produced significant analgesic effects in rats [19]. Shah & Sheth (2010) found that LS plant extracts had moderate analgesic activity, with aqueous extracts having more noticeable analgesic effects than methanolic extracts [20], while Ananga et al. (2010) demonstrated the strong analgesic impact and general CNS depressive action of LS fruits. [21]

5. Active Hepatoprotection

The pharmacological properties of Lagenaria siceraria (bottle gourd) are diverse. Several studies have been conducted to investigate these properties. In a study conducted by Shirwaikar and Sreenivasan in 1996, the antihepatotoxic efficacy of the ethanolic extract of LS fruits and its solvent fractions were assessed using CCl4-induced hepatotoxicity in rats. The petroleum ether fraction of the ethanolic extract of LS fruits showed the most notable activity in protecting the liver, and two steroids, campesterol and fucosterol, were identified from this fraction [22]. Another study by Funde et al. (2013) investigated the hepatoprotective and antioxidant effects of LS fruit extract in hepatotoxicity caused by anti-tubercular drugs. The results showed that when LS extract and anti-tubercular medications were used together, oxidative stress was significantly reduced.[23]

6. Anti-diabetic effect

The anti-diabetic effect of LS has been investigated in several studies. Saha et al. (2011) found that the methanolic extract of the aerial portions of the LS plant exhibited notable in vitro antioxidant and strong hepatoprotective action, and had strong antihyperglycemic properties due to their high flavonoid content [24]. Another study by Bhattacharya (2012) demonstrated that LS plant extract had protective properties in diabetes by maintaining pancreatic cell integrity [25]. Sharma et al. (2014) investigated the antidiabetic and antihyperlipidemic properties of LS and Praecitrullusfistulosus and found that among all extracts, plant ethanolic extracts had the most potential for reducing blood sugar and lowering hyperlipidemia [26]. Finally, in a study conducted by Mishra et al. (2018), the antihyperglycemic activity of the methanolic extract of LS was examined, and the results showed that the rats used in the experiment had much lower blood glucose levels [27]. Additionally, the hypoglycemic effects of LS phytoextracts were investigated in vitro in a research conducted by Randive et al. (2019), and the results showed that the extracts of LS had a significant glucose diffusion rate inhibition of 48.14 percent.[28]

7. Anti-Urolithiatic/Renoprotective/Diuretic Activity

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Ghule et al. (2007) investigated the diuretic properties of LS in albino rats and discovered that administration with vacuum-dried extract and methanol extract led the rats to generate more pee and excrete more electrolytes in comparison to the control group.The outcomes were statistically significant and matched those of the commonly used diuretic furosemide. [29]
Takawale et al. (2012) investigated the anti-urolithiatic ability of LS fruits against rat induced urolithiasis caused by sodium oxalate (NaOx) and found that consuming LS fruits may provide some degree of protection against urolithiasis.[30]

8. Potential to Reduce Lipids

In rats fed a high-fat diet, LS extract was discovered to have remarkable pharmacological potential in treating obesity and preventing fat storage [31]. The extract significantly reduced body weight, fasting blood sugar, total cholesterol, triglycerides, total protein, and TNF-α levels in the treated rats [32]. The study also found that both the extract and the separated chemicals significantly reduced body weight and had lower levels of total cholesterol, triglycerides, and low-density lipoproteins than the commercially available medicine. [33]

9. Inhibitory Action of Lipases

The LS fruit extract was assessed for its pancreatic lipase inhibitory effect. The extract was fractionated using various solvents and subjected to lipase inhibitory activity tests. The results showed that all of the studied extracts and fractions had significant lipase inhibitory activity, and the chloroform fraction was found to be the most efficient. The bioactive phytoconstituents in the chloroform fraction were separated and identified using GC-MS analysis, including hexadecanoic acid, methyl hexadecanoate, isopropyl palmitate, methyl 9, 12, octadecadienoic, and methyl 9, 12, 15-octadecatrienoate. The results suggested that LS fruits have strong potential for limiting fat entrance into human tissues, suppressing lipid digestion, and inhibiting pancreatic lipase activity. [34]

10. Natural Antioxidant Capacity

LS fruits were assessed for their ability to scavenge free radicals. The results showed that the extracts with epicarp, mesocarp, and pulp containing seeds had high antioxidant activity. The study suggested that LS fruits can be used as a natural source of antioxidants. [35]

11. Antimicrobial Capacity

As determined by Goji et al. (2006) using the agar well diffusion technique, the methanolic extracts of LS leaves, seeds, and fruits have shown antibacterial effectiveness against Pseudomonas aeruginosa and Streptococcus pyogenes. Unfortunately, the extract did not exhibit antibacterial action against Escherichia coli and Staphylococcus aureus [36]. Menpara et al. (2014) concluded that LS extracts were more effective against fungi than bacteria, with Gram-negative bacteria being more susceptible to the extracts' effects than Gram-positive bacteria. The fruit peel extract had the least minimum inhibitory concentration (MIC) as well as minimum bactericidal concentration (MBC) values. This suggests that agricultural waste could be used in

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medical applications [37]. Essien et al. (2015) assessed the phytochemical screening and antimicrobial activity of LS seed extracts and found that LS fruit seeds showed promise as pharmacologically interesting antimicrobial agents [38]. Sen et al. (2015) used the disc-diffusion technique and reported that the LS fruit n-hexane extract significantly reduced the growth of Salmonella typhi and Escherichia coli bacteria, but there was no antibacterial action against Staphylococcus aureus, Bacillus cereus, Bacillus subtilis, or Vibrio cholera.[39]

12. Influence of Chemotherapy

Kumar et al. (2013) found that LS fruit juice had a chemopreventive effect on the development of skin papillomas in Swiss albino mice after exposure to 7, 12-dimethylbenz(a)anthracene (DMBA) and croton oil [40]. The study showed a substantial reduction in the number, incidence, multiplicity, latency, volume, and size of papillomas throughout the spectrum of sizes. A histopathological research demonstrated that a dosage of 2.5% and 5% in drinking water lowered stratification loss, reduced the number of epithelial layers, reduced dermal infiltration, and protected against different cytoplasmic alterations. The test medicine was more effective at higher dosages than at lower levels, and the anti-initiation/promotion therapy had the strongest chemopreventive impact.

13. Anticancer Activity

Hasmukhlal et al. (2016) found that methanolic extracts of LS fruit had strong antimutagenic effects in the chromosomal aberration experiment. The alcoholic extract included alkaloids, polyphenols, flavonoids, and tannins, according to early phytochemical analyses [41]. In another study, Tyagi et al. (2019) assessed the anticancer and antioxidant effects of LS and found that the ethanolic extract of LS demonstrated superior results in inhibiting the MCF-7 cell line compared to the industry-standard 5-Fluoro uracil [42]. LS extracts' inhibitory capabilities for the MCF-7 cell line were concentration dependant. The ethanolic extract included phenol, flavonoid, glycosides, alkaloids, and saponins, according to the phytochemical analyses. Additionally, the ethanolic extract had the highest yield in the assessment of phenol and flavonoid content.

14. Wound Healing Ability

There is limited information on LS extract's direct wound healing ability. However, Sharma et al. (2016) studied the LS extract's radio protective ability against radiation-induced gastrointestinal damage [43]. The study showed that LS injection reduced radiation impacts and improved tight junction integrity and villi morphology, demonstrating the cucurbits' medicinal potential in treating gastrointestinal damage brought on by radiation. This suggests that LS extract may have potential wound healing properties in the future, but further research is needed to confirm this.
In addition, LS fruits have been studied for their potential pharmacological properties related to wound healing. Milk clotting and proteolysis activity were found in protein fractions from LS seeds by Dash et al. (2015) [44]. This suggests that LS seeds may have potential as a wound healing agent since milk clotting enzymes can aid in the formation of a blood clot, an essential

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step in the wound healing process.Overall, more research is required to establish the direct wound healing properties of LS extract and LS fruits.

Future Directions

Future directions for research on Lagenaria siceraria should focus on identifying and characterizing the active compounds responsible for its pharmacological properties. This could involve screening various parts of the plant, such as the fruit, seeds, and leaves, for their bioactive components using modern analytical techniques. In addition, there is a need for more preclinical and clinical studies to validate the plant's traditional uses and explore its potential for treating various diseases.

2. CONCLUSION

In conclusion, Lagenaria siceraria, a widely distributed plant in many regions of the world, has been used for medical purposes for centuries. Based on the current literature review, it is evident that Lagenaria siceraria possesses a diverse range of pharmacological properties such as anti-inflammatory, antioxidant, antidiabetic, hepatoprotective, and wound-healing abilities, among others. These properties make Lagenaria siceraria a promising candidate for the development of plant-based medicines.

However, despite its potential benefits, more studies are needed to fully understand the mechanisms of action, pharmacokinetics, and safety of Lagenaria siceraria. Additionally, studies on the standardization of its extracts and formulations are necessary for consistent therapeutic efficacy.

In conclusion, Lagenaria siceraria holds significant promise in the development of natural remedies for various ailments, and further research is necessary to unlock its full potential.

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