



Medicinal value of *Lagenaria siceraria*: An overview

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Abstract

Cucurbitaceae family is major source of medicinal agents since ancient time. Various plants parts including fruits of this family have been established for their pharmacological potential. Different parts (leaves, stem, flower, root, seeds and even whole plant) of *Lagenaria siceraria* (known as lauki in Hindi), has been used in the ointment for ailment of various diseases throughout India. The fruit of cultivated *Lagenaria siceraria* is the good source of different nutrients components like protein, fat, fibre, carbohydrates, calcium, magnesium. The plant has also been suggested to possess antioxidant activity, laxative, cardioprotective, diuretic, hepatoprotective, hypolipidemic, central nervous system stimulant, anthelmintic, antihypertensive, immunosuppressive analgesic, adaptogenic and free radical scavenging activity. Boiled in oil this pulp is used to treat rheumatism and insomnia. A wide range of chemical compounds including sterols, terpenoids, flavonoids and saponins have been isolated from the species. Its extracts have been found to possess various pharmacological activities. Below, we give a comprehensive review of its ethnomedical uses, chemical constituents and pharmacological profile as a medicinal plant that covers its traditional and folk medicinal uses, phytochemistry and pharmacology profile.

Keywords: Chemical Constituents, Cucurbitaceae, Ethnomedical, *Lagenaria siceraria*

Introduction

Cucurbitaceae family is commonly known as gourd, melon and pumpkin family. This family is composed of 118 genera and 825 species, which are widely distributed in the warmer region of world [1]. Among all the plants of Cucurbitaceae family *Lagenaria* species is the most popular. The bottle gourd belongs to the genus *Lagenaria* that is derived from the word lagena, meaning the bottle. In the older literature it is often referred as *Lagenaria vulgaris* (common) or *Lagenaria leucantha* (white flowered gourd), but now it is known as *Lagenaria siceraria*. *Lagenaria siceraria* (Molina) standley (family Cucurbitaceae) commonly known as lauki (Hindi) and bottle gourd (English) is a medicinal plant [2]. The plant is widely available throughout the India. It is a climbing or trailing herb, with bottle or dumb-bell shaped fruits. Both its aerial parts and fruits are commonly consumed as vegetable. Traditionally, it is used as medicine in India, China, European countries, Brazil, Hawaiian island, etc. for its cardiogenic, general tonic and diuretic properties [3]. The cultivated form of *Lagenaria siceraria* is considered to be of African and Asian origin. *Lagenaria siceraria* is a popular vegetable, grown almost all the year round, particularly in frost free areas. It can be cultivate in all kinds of soil, but thrives best in heavily manured loams. It requires warm humid climate or plenty of water when grown during dry weather. Seeds may be sown in nursery beds and seedlings transplanted when

they have put forth 2-3 leaves. They may be also shown directly, 4-5 seeds together in manured beds or pits 5-6ft. Apart; the strongest among the seedlings is retained, while others are removed and transplanted. Seedling transplantation is done where an early crop is desired. Generally two crops raised in India; the summer crop is sown from the middle of october to the middle of march and the later crop, from the beginning of march to the middle of july. Round fruit types are usually sown for the early crop and bottle shaped types for the second crop. Vines are allowed to trail on the ground or trained over walls. Trees or other support trailing over to give high yield of fruit [4]. It is also known as alabu, tumbi ishavaaku, katutumbi, tiktaalaabu & alaabu in sanskrit, laus & lokitumbi in bengali, bottle gourd in english, dudi & tumbadi in gujrati, lauki & ghia in hindi, isugumbala & tumbi in kannad, chorakka, churan, choraikka, piccura, tumburini & cura in malyalam, phopla in marathi, tumbi & dani in punjabi, shorakkai, surai & suraikkai in tamil, sorakaya & anapakaya in telugu and ghiya & lauki in urdu [5].

Taxonomical classification

Kingdom	:	Plantae
Division	:	Magnoliophyta
Class	:	Magnoliopsida
Order	:	Cucurbitales
Family	:	<i>Cucurbitaceae</i>
Genus	:	<i>Lagenaria</i>

Species : Siceraria [5]

Reported microscopy of *Lagenaria siceraria*

Transverse section of upper epidermis of *Lagenaria siceraria* leaf consists of elongated parenchymatous cells, covered by cuticle. It shows few stomata, which are of anisocytic type, palisade cells at upper and hexagonal to polygonal at lower epidermis. Thin walled contains colourless cells, which are may be water storing. Mesophyll is made up of 3-4 layered chloroplast containing, compactly arranged, oval to circular cells. It is interrupted by vascular bundles of various sizes. Vascular bundles are surrounded by 2-3 layered sclerenchymas. They are conjoint, collateral and closed. Xylem is placed towards lower epidermis. Lower epidermis contains elongated wavy walled parenchymatous cells covered by cuticle. Number of covering and collapsed trichomes remains present; while very few glandular trichomes are also present [6].

Reported Phytoconstituents of *Lagenaria siceraria*

Fruit

Analysis of edible portion of the fruit shows; moisture content (96.3%), proteins (0.2%), fat (0.1%), carbohydrates (2.9%), mineral matter (0.5%), calcium (0.02%) and phosphorus (< 0.01%). Other mineral elements reported to be present are: iron (0.7 mg/ 100g), sodium (11.0 mg/100g), potassium (86.0 mg/100g) and iodine (4.5 mcg/ kg). Glucose and fructose have also detected. The amino acids reported in fruit are: leucines (0.8 mg/g), Phenylalanine (0.9 mg/g), valine (0.3 mg/g), tyrosine (0.4 mg/g), alanine (0.5 mg/g), threonine (0.2 mg/g), glutamic acid (0.3 mg/g) serine (0.6 mg/g), aspartic acid (1.9 mg/g), cystine (0.6 mg/g), cysteine (0.3 mg/g), arginine (0.4 mg/g) and proline (0.3mg/g). The fruit is a good source of B vitamins and a fair source of ascorbic acid. Bitter fruits yield 0.013% of solid foam containing cucurbitacins B, D, G and H, mainly cucurbitacin B. These bitter principles are present in the fruit as aglycones [7]. The mucilage is also present in the fruit, which can be extracted by microwave assistant extraction [6].

Leaves

Leaves contain cucurbitacin B and roots, cucurbitacins B, D and E [7]. Two steroids were isolated from the petroleum ether fraction and they were identified as fucosterol and campesterol [8]. Sugar and phenolic content of the fresh product were assayed, providing a partial nutritional characterisation of this vegetable. Glucose and fructose (about 1:1 ratio) and traces of sucrose were also found. In Addition to that a small amount of unidentified mono- and dicaffeoylquinic acid derivatives were also reported [9]. Flavonoid complexes occurring in the medicinal plants *Lagenaria siceraria* were found to possess flavone C glycosides [10]. Four new D: C-friedooleanane-type triterpenes isolated that is

1. 3b-O-(E)-feruloyl-D:C-friedooleana-7,9(11)-dien-29-ol,

2. 3b-O-(E)-Coumaroyl-D:C-friedooleana-7,9(11)-dien-29-ol,

3. 3b-O-(E)-coumaroylD:C-friedooleana-7,9(11)-dien-29-oic acid,

4. methyl 2b ,3b - dihydroxy-D:C-friedoolean-8-en-29-oate [11]

A water-soluble polysaccharide, isolated from fruiting bodies of *Lagenaria siceraria*, is composed of methyl- α -d-galacturonate, 3-O-acetyl methyl- α -d-galacturonate, and β -d-galactose in a ratio of nearly 1:1:1. This polysaccharide showed cytotoxic activity *in vitro* against human breast adenocarcinoma cell line (MCF-7) [12].

Seed

Seeds are reported to contain saponin. Analysis of seed kernels gives moisture contain (2.47%), proteins (30.72%), oil (52.54%), carbohydrates (8.3%), fiber (1.58%), ash (4.43%), Cao (0.11%) and P₂O₃ (2.46%). The oil obtained from seed kernels is clear and pale yellow. Kernels from ripe seeds gave 45% of oil with n_{40d} (1.4711%), sap. equiv (301.6%), iodine value (126.5%), free fatty acids (0.54%) and unsaponified matter (0.67%). The components of free fatty acids are: linoleic acids (64.0%), oleic (18.2%) and saturated fatty acids (17.8%) Seeds are reported to contain lagenin [13]. Atriterpene bryonolic acid an antiallergic compound was reported from callus culture of *Lagenaria siceraria* roots. Bitter fruits yield 0.013% of a solid form containing cucurbitacins B, D, G and H mainly cucurbitacin B. These bitter principles are present in the fruit of aglycones. The leaves contain cucurbitacins B, D and traces of E. The fruit juice contains beta-glycosidase (elastase) [14].

Uses

It is being used as medicine in India, China, European countries, Brazil, Hawaiian island, etc. for its cardiotoxic, general tonic and diuretic properties [15]. Further, the antidiabetic [16], antihyperlipidemic [17], antihepatotoxic, analgesic [18], CNS activity [19], hypertension [20], anticancer [21], CNS depressant [22], Cardioprotective [23] antiinflammatory, antihyperglycemic, immunomodulatory and antioxidant [21], activities of its fruit extract have also reported. A novel protein, lagenin, has also been isolated from its seeds and it possesses antitumor, immunoprotective and antiproliferative properties [13]. Although extensive studies have been carried out on its fruits and seeds, the pharmacology of the aerial parts of *L. siceraria* has not been studied yet. In many countries, this plant has been used traditionally as a single treatment for diabetes mellitus [24].

Traditional uses

Cooked lauki is cooling, calming and acts as diuretic. It plays a very important role in treating urinary disorders with lime juice. It can be used along with sulphur drugs to treat urinary infection as it acts as an alkaline diuretic. Lauki juice is an excellent remedy for excessive thirst caused by diarrhea, over consumption of fatty or fried foods and diabetes. A glass of

lauki juice with a little salt added to it prevents excessive loss of sodium, satiating thirst and keep refreshed in summer [25].

- The fruits, leaves, stem, seeds and oil of *Lagenaria siceraria* are traditionally used in the treatment of jaundice, diabetes, ulcer, piles, colitis, insanity, hypertension, congestive cardiac failure, and skin diseases.
- The fruit pulp is used as an emetic, sedative, purgative, cooling, diuretic, antibilious, and pectoral.
- The flowers are an antidote to poison.
- The stem bark and rind of the fruit are diuretic.
- The seed is vermifuge.
- Extracts of the plant have shown antibiotic activity.
- Leaf juice is widely used for baldness.
- LS juice is an excellent remedy for heart problems, digestive and urinary disorders, and in diabetes. LS juice prevents excessive loss of sodium, satiating thirst, and giving a cooling effect.
- Probably, the bitter principle found in the wild bottle gourds is responsible for the purgative property.
- Crushed leaves are used for baldness and applied on the head for the headache.
- Leaves are also used as alternative purgative
- Fruit of *Lagenaria siceraria* is rich source of water and minerals and are believed to possess vitamin A, C and B complex.
- Bottle gourd is believed to help the liver function in a balanced fashion.
- The juice from the leaves help cure jaundice and the juice from the gourd helps reduce graying of hair.
- The gourd juice helps treat burning sensation in the urinary passage if consumed with lime juice.
- It reduces fatigue and keeps you fresh, especially during summer.
- It helps fight constipation, as it is fiber rich. Because of its fiber and low fat content, Ayurveda highly recommends this food for diabetic patients and young children.
- Ayurveda also recommends the juice of this gourd in the treatment of acidity, indigestion and ulcers as it serves as an alkaline mixture. Indian traditional medicine claims that bottle gourd acts as a nerve tonic and can help improve obsessive compulsive disorder (OCD). This claim has been confirmed by a study published in the journal Pharmacognosy Research where the investigators found that the plant possesses anti-compulsive (anti OCD) activity although they are not certain about the mechanism of action of this plant.
- Bottle gourd is also considered one of the best weight loss foods since it is 96 percent water and provides just 12 calories per 100g of serving.
- It is rich in, thiamin, vitamin C, zinc, iron and magnesium thus helping in improving overall health.

- The juice from bottle gourd leaf helps in curing baldness and aids in preventing tooth decay.

Advantages of bottle gourd juice (*Lagenaria siceraria*)

Bottle gourd, sometimes called the white-flowered or calabash gourd, a delicate nutty flavor, bottle gourd makes up a staple in Indian cuisine, and it can also be juiced for a nutrient-packed beverage. Bottle gourd juice offers some health benefits, but don't drink bottle gourd juice that tastes bitter – bitter juice contains toxins that can severely harm your digestive system.

Vitamin C

Bottle gourd juice serves as a good source of vitamin C. Vitamin C's antioxidant activity shields your cells from damage, preventing the oxidation of DNA that leads to genetic mutations. It also regulates your blood cholesterol levels, plays a role in brain function and helps you make collagen, a protein important for tissue strength. Each cup of bottle gourd juice boasts 26 milligrams of vitamin C. This makes up 29 percent of the daily intake for men and 35 percent for women, recommended by the Institute of Medicine.

Zinc

Bottle gourd juice helps you reach your recommended daily intake of zinc, an essential mineral. Each 1-cup serving of juice provides 1.8 milligrams of zinc 23 percent of the recommended daily intake for women and 16 percent for men, according to the Institute of Medicine. Zinc contributes to healthy cell membranes, and also gets incorporated into a range of proteins important for healthy cell function. Some zinc-containing proteins allow your cells to regulate gene activity, while others aid in cell communication and regulate your body's hormone levels. Zinc also plays a role in nerve health, and zinc deficiencies negatively affect your sense of taste. Drinking bottle gourd juice might also offer health benefits due to its effect on blood sugar. One animal study performed in rats, published in "Food and Function" in 2011, found that antioxidant-rich juices, including bottle gourd juice, helped to regulate blood sugar after a meal and prevented excessively high blood sugar levels. It also increased the rats' antioxidant levels and prevented harmful tissue oxidation [26].

Reported pharmacological activity of *Lagenaria siceraria*

Ahmed *et al*, (2016) evaluated effect of boiling for different durations on total phenolic content, total flavonoid content, antioxidant activity and alpha-amylase inhibitory activity of water extract of *Lagenaria siceraria* fruit, and to compare nutritional properties of its epicarp, mesocarp, seeds pulp and pedicle. Result showed that phenolic content drastically decreases with increase in duration of boiling. Flavonoid content and antioxidant capacity in phosphomolybdate assay exhibited a slight increase. Epicarp had higher percentage of protein, carbohydrate and vitamin C than other parts of the fruit, while pedicle had the highest content of fiber, zinc, silver

and chromium. Epicarp had the highest content of copper. Iron was in the range of 3.4-5.13, cobalt 0.14-0.31 and lead 0.5-1.8 mg/100 g. Amount of zinc in pedicle was highest among all the trace elements (6.5%) in all parts [27].

Hasmukhlal *et al*, (2016) evaluated the antimutagenic (anticlastogenic) activity of methanolic extract of *Lagenaria siceraria* fruit, *Desmodium gangeticum* and *Leucas aspera*. The preliminary phytochemical tests showed presence of alkaloids, polyphenols, flavonoids and tannins in alcoholic extract. Methanolic extract of selected plants had shown significant reduction in percentage of cells with aberration in chromosomal aberration assay. The overall antimutagenic activity of above three extract were in the order of *Lagenaria siceraria*>*Desmodium gangeticum*>*Leucas aspera*. The observed antimutagenic activity of selected plant against Cyclophosphamide might be associated with its antioxidant constituents such as poly-phenolic compound, flavanoids and other micronutrients [28].

Sharma *et al*, (2016) evaluated the radioprotective potential of *Lagenaria siceraria* extract against radiation-induced gastrointestinal injury. The cell-cycle fractions and DNA damage were monitored in HCT-15 cells. Result showed that *L. siceraria* administration countered the radiation effects (length, 366 μ m; width, 30 μ m, respectively) and improved the villi morphology and tight junction integrity. This study reveals the therapeutic potential of cucurbits against radiation-induced gastrointestinal injury [29].

Dash *et al*, (2015) evaluated milk clotting and proteolytic activity of protein fractions of seeds of *Lagenaria siceraria* and result showed that the isolated protein fractions showed highest milk clotting activity over a broad temperature range of 30-80 °C and pH range of 3-9 and concluded that milk clotting enzymes present in different fraction of proteins of *Lagenaria siceraria* are promising candidates for application in industrial scale for production of cheese and might be a potential substitute for commercial animal rennet [30].

Essien *et al*, (2015) evaluated the phytochemical and antimicrobial activity of seeds extracts of *Lagenaria siceraria*. Result showed that the different concentrations of *L. siceraria* seeds extracts (diethyl ether, chloroform, ethyl acetate, n-butanol, methanol and water) exhibited potent antibacterial and antifungal activity against selected pathogens (*Staphylococcus aureus*, *Pseudomonas sp.*, *Escherichia coli*, *Bacillus subtilis*, *Candida sp.* and *Aspergillus niger*) using agar well diffusion method and the phytochemical screening of the different seeds extracts revealed the presence of phlobatannins, saponins, cardiac glycosides, phenols, alkaloids, flavonoids, terpenoids, deoxy-sugar, carbohydrates and reducing sugars in varying quantities and concluded that *Lagenaria siceraria* seeds exhibit proven potential to contain antimicrobial agents of pharmacological interest [31].

Kota *et al*, (2015) evaluated the anti anorectic activity of the ethanolic extract of *Lagenaria siceraria* fruit in female albino rats. Result showed that ethanolic fruit extract of *Lagenaria siceraria* fruit (200 and 400 mg/kg) dose dependently reduced the physical stress & LPS induced anorexia in female rats. As evidenced by increase in food consumption, number of attempts for food consumption and change in body weight. Whereas this changes was not observed in freely feeding and 20 hrs food deprived rats. Thus, concluded that ethanolic fruit extract of *Lagenaria siceraria* possesses anti-anorectic activity in stress induced and LPS induced anorectic rats [32].

Jaiswal and Kuhnert, (2014) evaluated identification and characterization of the phenolic glycosides of *Lagenaria siceraria* Stand. (Bottle Gourd) fruit by liquid chromatography–tandem mass spectrometry. Result showed that twenty-two phenolic glycosides were detected and characterized on the basis of their unique fragmentation pattern in the negative ion mode tandem MS spectra. Twenty of them were extracted for the first time from this source, and twelve of them have not been reported previously in nature. It was also possible to distinguish between the individual classes of isobaric phenolic glycosides by tandem and high-resolution mass spectrometry [33].

Menpara *et al*, (2014) evaluated the antimicrobial activity of different solvent extracts (hydro alcoholic extracts of methanol) of different parts of *Lagenaria siceraria* (Molina) Standl. The *in vitro* antimicrobial activity was evaluated by agar well diffusion method. The antimicrobial activity was tested against five Gram positive bacteria, five Gram negative bacteria and four fungi. The MIC and MBC was also determined, including five antibiotics. Result showed that the extracts showed better antifungal activity than antibacterial activity and Gram negative bacteria were more susceptible than Gram positive bacteria. The peel showed lowest MIC and MBC values indicating the therapeutic value of agro waste material [34].

Mishra, (2014) evaluated different extract of *Lagenaria siceraria* for their potential of antihyperlipidaemic and antiatherosclerotic effect. The results of the study revealed that by triton, total cholesterol and triglycerides level were significantly increased in rats as compared to normal control and concluded that fractions of stem and leaves of *Lagenaria siceraria* is potentially useful for the treatment of hyperlipidaemia and atherosclerosis [35].

Sharma *et al*, (2014) evaluated evaluation of antidiabetic and antihyperlipidemic potential of *Praecitrullus fistulosus* and *Lagenaria siceraria*. Result showed that *Lagenaria siceraria* ethanolic extract was found to possess highest antidiabetic and antihyperlipidemic potential among all. The addition of *Lagenaria siceraria* fruit extract was found to potentiate the effect of *Praecitrullus fistulosus* fruit extract [36].

Tyagi *et al*, (2014) evaluated ethanolic extract of *Lagenaria siceraria*, *Praecitrullus fistulosus* (50:50) Fruit and their Mixture for pharmacological screening and estimation of total flavanoid and total phenolic content and result showed that maximum phenolic and flavonoid content were found in ethanolic extract of *Lagenaria siceraria* [37].

Deore *et al*, (2013) evaluated the isolation and quantitative estimation of quercetin in *Lagenaria siceraria* Fruit. quercetin has been isolated from ethyl acetate fraction of fruit extract and confirmed by Co-TLC, UV and FTIR analysis. In addition, a simple, rapid, precise, and accurate high-performance thin-layer chromatographic (HPTLC) method has been established, validated for flavonoid quercetin. The linearity of the method was investigated in the range of 1-3.5 ng mL⁻¹. Percentage recoveries for quercetin found to be 99.79% [38]. Elhadi *et al*, (2013) evaluated the anti-giardial activity of *Cucurbita maxima* D, *Cucurbita pepo* L and *Lagenaria siceraria*. Variety supreme court seeds petroleum ether and methanolic extracts in vitro tests were performing using three concentrations (1000 ppm, 500 ppm and 250 ppm). The result showed that The highest activity against *Giardia lamblia*, with respect to time, was obtained from *C. maxima* seeds petroleum ether extract which exhibited 100% mortality within 48 giving IC₅₀ of 548.80 ppm (with a concentration of 1000 and 500 ppm) followed by *L. siceraria* petroleum ether extract which exhibited 100% mortality within 72 hrs with IC₅₀ of 95.65 ppm whereas metronidazol, a pure compound, (positive control) showed 100% mortality within 96 hrs [39].

Sharma *et al*, (2013) evaluated petroleum ether, chloroform, ethanol and water extracts of *Lagenaria siceraria*, *Momordica charantia* and *Chenopodium ambrosioides* for antibacterial activity against *Escherichia coli*, *Pseudomonas aeruginosa*, *Staphylococcus aureus* and *Klebsiella species* by cup-plate method (lawn and pour) and disc diffusion method. Result showed that ethanol and chloroform extracts (100 µml) showed significant activity against the tested microorganism in comparison with the standard streptomycin and amikacin and concluded that *Chenopodium ambrosioides* was a most effective inhibitor of bacterial growth [40].

Sharma *et al*, (2013) evaluated the free radical scavenging potential of methanolic extract of *Lagenaria siceraria* leaves (MELS). The extract was also shown to have high phenolic content i.e. 99.09±0.10 µg/mg. Result showed that MELS could be a potential source of natural antioxidant and effective against free radical mediated diseases [40].

Nadeem *et al*, (2012) evaluated the effects of ethanolic extract of *Lagenaria siceraria* fruit (ELSF) on fat amassment and serum TNF-α in high-fat diet-induced obese rats. result showed that ELSF significantly ($P < 0.001$) reduced the body weight gain, fasting blood glucose, total cholesterol, triglyceride, total protein and TNF-α and concluded that

Lagenaria siceraria has excellent pharmacological potential to prevent fat amassment [41].

Nainwal *et al*, (2011) evaluated the juice of fresh fruits of *Lagenaria siceraria* for antihyperlipidemic activity by evaluating the blood cholesterol level of atherogenic diet rat and proved that juice of fresh fruits of *Lagenaria siceraria* have potent effect to cause a blood cholesterol lowering effect, and the serum biochemistry changes may suggest that the juice extract has a tonic effect on kidneys, liver and organs playing central role in drug metabolism [42].

Saha *et al*, (2011) evaluated the methanolic extract of aerial parts of the *Lagenaria siceraria* for antioxidant and hepatoprotective activity using DPPH, nitric oxide, superoxide, hydrogen peroxide and total phenolic and flavonoid content estimation method in rats and proved that methanolic extract of aerial parts show significant *in vitro* antioxidant and potent hepatoprotective activity [16].

Saha *et al*, (2011) evaluated the methanolic extract of *Lagenaria siceraria* aerial parts for antidiabetic activity, using streptozotocin induced diabetes in rats and proved that the aerial part of the *Lagenaria siceraria* possess potent antihyperglycemic activity which is probably attributable to its rich flavanoid content and concluded that MELS (methanolic extract of *Lagenaria siceraria*) supplementation is quite beneficial in controlling the blood glucose level, without producing hypoglycemia; additionally, it improves lipid metabolism and represents a protective mechanism against the development of atherosclerosis, and prevents diabetic complications from lipid peroxidation by improving the antioxidant status in experimental diabetic rats [44].

Ananga *et al*, (2010) evaluated the aqueous fruit extract of *Lagenaria siceraria* for pharmacological activity *in vitro* and *in vivo* and proved that the *Lagenaria siceraria* have been shown to contain potent bioactive compound with potent analgesic effect and non specific CNS depressant activity, among other and may be of value in psychotherapy as narcoleptic agent and also confirmed some of the folkloric uses [22].

Mali *et al*, (2010) evaluated the antihypertensive activity of *Lagenaria siceraria* fruit powder in dexamethasone induced hypertension in rats and proved that the *Lagenaria siceraria* pretreatment partially reversed dexamethasone induced hypertension while the mean arterial blood pressure and heart rate were reduced and concluded that *Lagenaria siceraria* fruit powder pretreatment for 51 days partially reverse dexamethasone induce hypertension in rats [20].

Pawar *et al*, (2010) evaluated the crude petroleum ether, chloroform and methanolic extract of *Lagenaria siceraria* leaves for analgesic and central nervous system activity using writhing, hot plate and tail flick method in rat and proved that the petroleum ether, methanol, and chloroform extract shows

significant analgesic activity. Petroleum ether extract was found to have maximum analgesic activity among them [43].

Saha *et al*, (2010) evaluated the methanolic extract of *Lagenaria siceraria* aerial parts for anticancer activity using Enrich' Ascites carcinoma model in mice and proved that the *Lagenaria siceraria* possess significant anticancer activity which may be due to its cytotoxicity and antioxidant activity [5].

Shah and Seth (2010) evaluated methanolic and aqueous extract of *Lagenaria siceraria* for analgesic activity, using tail immersion method in rats and proved that methanolic extract posses moderate analgesic activity, while the aqueous extract shows significant analgesic activity [6].

Ghule *et al*, (2009) evaluated antihyperlipidemic effect of the methanolic extract of *Lagenaria siceraria* fruit in hyperlipidemic rats and proved that at the 30th day most significant reduction in lipid levels in the *Lagenaria siceraria* fruit extract treated rats as compared to the rats fed with high-fat diet at the 0th day and shows that the increase in weight of rats administered with *Lagenaria siceraria* fruit extract was less when compared to rats fed with high-fat diet [17].

Fard *et al*, (2008) evaluated the cardioprotective effect of *Lagenaria siceraria* fruit powder against the cardiotoxicity of doxorubicin in wistar male rats, and proved that the *Lagenaria siceraria* possessed cardioprotective effect against doxorubicin induced cardiotoxicity in rat [23].

Mohanle *et al*, (2008) evaluated the *Lagenaria siceraria* fruit for antihyperlipidemic activity of isolated constituent using the solvents according to the polarity in ascending order i.e. by using chloroform, acetic acid, methanol, pyridine and water. Thin layer chromatography used active fraction obtained by column chromatography for further isolation .Four spots were obtained and were named as LSN-1, LSN-2 ,LSN-3 and LSN-4 and TLC isolated compound were tested for antihyperlipidemic activity which produce significant result. The study exhibited that evaluated levels of blood cholesterol, triglycerides, LDL were significantly reduced and decreased HDL was significantly increased by the administration of fraction of *Lagenaria siceraria* fruit juice [46].

Ghule *et al*, (2007) evaluated the vacuumed dried juice extract and methanolic extract of the fruit of *Lagenaria siceraria* fruit for diuretic activity using total urine volume and urine concentration of electrolyte method in albino rats and proved that the vacuum dried juice extract and methanolic extract create higher urine volume when compared to respective control [15].

Ghule *et al*, (2006) evaluated the antihyperlipidemic effect of four different extract via. petroleum ether, chloroform, alcoholic and aqueous extracts from the *Lagenaria siceraria* in triton induced hyperlipidemic rats and proved that chloroform and alcoholic extract exhibited more significant effect in lowering total cholesterol, triglycerides and low

density lipoprotein along with increase in HDL as compared to other [47].

Conclusion

Recently *Lagenaria siceraria* has become widely cultivated in India, Sri Lanka, China and many other countries for its culinary and medicinal uses. It is also very important in a number of diseases for which there are considerable scientific reports and data. Chemically, *Lagenaria siceraria* contains various biologically active phytoconstituents including flavonoids, saponins, triterpenes, and volatile principles. It may thus be considered an important gift from Ayurveda to mankind. Further evaluation on active principles and therapeutic efficacy needs to be carried out on *Lagenaria siceraria* in order to explore the hidden bioactive compound and their clinical application.

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