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LAGERSTROEMIA SPECIES: A REVIEW

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ABSTRACT

Lagerstroemia species family Lytharceae, a popular Indian medicinal plant, has long been used in ayurvedic system of medicine. The plant has been found to possess diverse number of pharmacological activities. The present paper gives an account of pharmacological activities. The review reveals that wide range of phytochemical and pharmacological activities. The review reveals that wide range of phytochemical constituents have been isolated from the plant and it possesses important activities like anti- inflammatory, antipyretic, analgesic, anti-hyperglycemic, and antioxidant. Various other activities anti-inflammatory, antifungal, antiviral, antineoplastic and osteoblastic activities has also been reported. These reports are very encouraging and indicate that herb should be studied more extensively for its therapeutic benefits. Clinical trials using *Lagerstroemia* (Banaba) for variety of combinations in different formulations should also be conducted.

Keywords: *Lagerstroemia indica*, Lythraceae, Phytochemical screening.

INTRODUCTION

Lagerstroemia speciosa (Lytharceae) is a shrub to large tree with multiple trunks or stems diverging from just above the ground level. The genus Lagerstroemia was first described by Carlos Linnaeus. The name Lagerstroemia recognizes Magnus von lagerstroem, a Swedish naturalist who provided specimens from the east for Linnaeus [1]. The Lagerstroemia genus or crape myrtle, which belongs to the Lythraceae family, Myrtales order containing more than 50 species [2]. It is originally endemic to south East Asia, Indian subcontinent and northern parts of Australia [3-4]. Banaba is widely distributed in Philippines, India and Malaysia. The fruits are subglobose capsule type, and they are 2-3.2 cm long [5]. Banaba extracts possess good antiobesity effect, without any adverse effects [23]. The chemical constituents of Lagerstroemia speciosa include ellagitannins and related compounds in leaves and fruits [6]. It is also widely cultivated as an ornamental plant in tropical and subtropical areas. It is a small to medium-sized tree growing to 20 m tall, with smooth, flaky bark. The leaves are deciduous, oval to elliptic, 8-15 cm long and 3-7 cm broad, with an acute apex. The flowers are produced in erect panicles 20-40 cm long, each flower with six white to purple petals 2-3.5 cm long [7]. Banaba has a long history of folkloric medical applications that include blood pressure control, urinary dysfunctions (helps ease urination), controls the cholesterol levels, treatment of diarrhea, facilitates bowel movement, Diabetes and as analgesic [8]. From China, Korea, Japan and Indian Subcontinent *Lagerstroemia indica* is an often multi-stemmed, deciduous tree with a wide spreading, flat topped, rounded, or even spike shaped open habit. Planted in full sun or under canopy, the tree is a popular nesting shrub for songbirds and wrens. Crepe myrtle (দশেফিুরুস), Kolkata West Bengal, India. Many hybrid cultivars have been developed between *L. indica* and L. faueri [9].

Synonyms/Common Names/Related Substances: Banaba extract, banglang (Vietnam), bang-lang (Cambobia), bungor (Malaya, Sabah), Byers

wonderful white crape myrtle, crape myrtle, crepe myrtle, corosolic acid, ellagitannins (flosin B, reginin A, lagerstroemin), flos-reginae Retz, Glucosol TM, glucosal, intanin (Thailand), jarul (India), *Lagerstroemia*, *Lagerstroemia indica*, *Lagerstroemia parviflora*, *Lagerstroemia speciosa*, leaf extract, lasubine, Lythraceae (family), lythraceae alkaloids, *Munchausia speciosa*, Pride-of-India, pyinma, Queen's crape myrtle, Queens flower.

Taxonomy

Scientific classification
Kingdom: Plantae
Order: Myrtales
Family: Lythraceae
Genus: *Lagerstroemia*;
Species: L. *indica*.
Binomial name: (*Lagerstroemia indica* (L.) Pers. [9]

PLANT DESCRIPTION

Shrubs or small trees to 7 m tall. Branchlets slender, 4-angled or subalate, puberulous, glabrescent. Leaves sessile or with petiole to ca. 2 mm; leaf blade elliptic, oblong, obovate, or suborbicular, typically at least some suborbicular to obovate and mucronate, 2.5–7[–10] × 1.5–4 cm, papery to slightly leathery, glabrous or with slight indumentum on veins abaxially, lateral veins 3–7 pairs, base broadly cuneate to rounded, apex acute, obtuse with small mucro, or retuse. Panicles subpyramidal,7–20 cm, puberulous, densely flowered. Floral tube 6-merous, 7–11 mm, smooth walled or obscurely to decidedly 6-ribbed, glabrous; sepals 3.5–5.5 mm, adaxiallyglabrous; annulus present; epicalyx absent. Petals purple, fuchsia, pink, or white, orbicular, 1.2–2 cm including claw 6–9 mm. Stamens 36–42, dimorphic. Ovary glabrous. Capsules ellipsoidal, 1–1.3 × 0.7–1.2 cm, 4–6-valved.Seeds including wing ca. 8 mm [11].

A Close view of the crape myrtle flower.

Chemical constituents: Corosolic acid (I) is useful as an ingredient in medicines, cosmetics and health foods, is known tobe contained in Eriobotrya japonica (loquat), *Lagerstroemia spesiosa* (banaba), Rhabdosiajaponicas (IsodonisHerba), Epilobiumangustifolium (fireweed), Elliottiapaniculata (Hotsutswuji) and many other plants and it has been found to have pharmaceutical actions such as an anti-diabetic action and a blood glucose level lowering action. In small scale in the laboratory, corosolic acid is prepared in low yield by chromatographic isolation from plant extracts [10]. The chemical constituents of *Lagerstroemia speciosa* include ellagitannins and related compounds in leaves and fruits. Extracts of leaves contain alanine, isoleucine alpha amino butyric acid and menthionine, but no alkaloids or glucosides or sterols orflavonoids. Leaves also contain lageracetal, amyl alcohol, ellagic acid, beta sitosterol, new tannin-lager tannin; 3, 3, 4-tri-O-methylellagic acid and 3-O-methyllagic acid

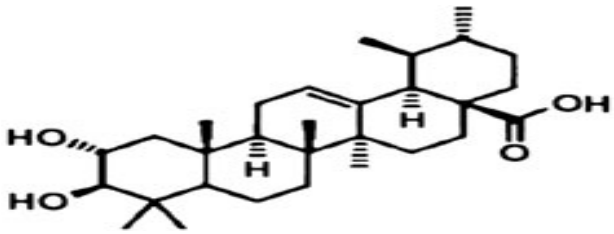

Figure 1.Corosolic acid.

PHARMACOLOGICAL ACTIVITIES

The following pharmacological activities have been reported on the genus:

Antimicrobial activity: The antibacterial activity of leaves of *L. speciosa* has been reported. *L. speciosa* leaf powder extracts were tested against Staphylococcus aureus, Bacillus subtilis, Pseudomonas aeruginosa and Escherichia coli with ampicillin as standard [12]. Based on the zone of inhibition, the water extract was more effective than the ethanol extract. The inhibitory efficacy of methanol extract of *L. speciosa* leaves was tested against 12 oral isolates of Streptococcus mutans using the agar well diffusion method [13]. Results showed significant inhibitory activity against cariogenic isolates with zones ranging from 0.0−0.9 cm, 0.8−2.1 cm and 1.0−2.6 cm for extract concentrations of 10, 25 and 50 mg/ml, respectively. Flowers of *L. speciosa* have also been reported to possess antibacterial activity. Methanol extract of flower was tested against S.mutans and S. aureus using the agar well diffusion assay [14].

Anti-inflammatory activity: The anti-inflammatory activity of ethyl acetate and ethanol leaf extracts of *L. speciosa* had been examined using the carrageenan-induced acute inflammation and formalin-induced chronic paw oedema assays [15.

Antioxidant: Saumya and basha 2011 worked on the antioxidant effect of *Lagerstroemia speciosa* (banaba) leaf extract in streptozocin induced diabetic mice. They found that aqueous banaba leaf extract (150mg/kg body weight) duly reduced STZ generated reactive intermediate and radical species helping to regulate normal levels of antioxidative markers like super oxide dismutase, catalase, glutathione-s-transferase and reduced glutathione[16].

Antitussive: Mazumder et al, 2004 worked on the activity of evolution of antitussive activity of *Lagerstroemia parviflora* leaf extract, when cough induced by sulfur dioxide gas in mice, the *Lagerstroemia parviflora* extract showed maximum inhibition of cough reflex at 90 min after drug administration [17].

Cytotoxic activity: Using the brine shrimp (Artemiasalina) lethality bioassay, the ethanol fruit extract of *L. speciosa* showed prominent cytotoxic activity. Lethal concentration (LC50) was 60 µg/ml and LC90 was 100 µg/ml [18].

Anti-obesity activity: Significant reduction of body weight and parametrial adipose tissue weight was observed in obese female KK-AY mice when fed with a hot water *L. speciosa* leaf extract. Although blood glucose levels and serum lipids were comparable between the control diet and test diet groups, the triglyceride content in the liver was reduced, confirming the anti-obesity activity of *L. speciosa* [19].

Xanthine oxidase inhibition: Valoneic acid dilactone isolated from aqueous leaf extract of *L. speciosa* was reported to have potent inhibitory effect onxanthine oxidase (XOD), suggesting its potential in preventing and treating hyperuricemia. The inhibitory effect was non-competitive and stronger than that of allopurinol, a clinical drug. XOD is the key enzyme in hyperuricemia as it catalyses the oxidation of hypoxanthine to xanthine and subsequently uric acid. [20, 21].

Antiviral activity: When tested for anti-human rhinovirus (HRV) activity in HeLa cells, orobol 7-O-D-glucoside (O7G) isolated from *L. speciosa* leaves showed broad-spectrum anti-HRV activity towards HRV of groups A and B. The inhibitory concentration (IC50) of O7G ranged from 0.58−8.80 µg/ml and the cytotoxic concentration (CC50) was more than 100 µg/ml. The compound has great potentials to be developed into a potent anti-human rhinovirus agent. [22].

Conclusion

L.*indica* is one of the widespread species of this plant that currently no usage in the Iranian folk medicine. In this respect, pharmacognostical and chemical studies on the plant are substantial steps which could

serve in the identification of its compounds. It further requires more advanced studies to evaluate chemical, pharmaceutical and pharmacological researches to establish the drug standardization. Due to the anti-diabetic properties of some *Lagerstroemia* species, we were keen to evaluate other species of this genus for finding of similar potent compounds. *Lagerstroemia species* extracts has been made worldwide for the treatment of particular silent disease. In the past 12 years studies regarding *Lagerstroemia* species extracts were reported.

REFERENCES

1. Origin of *Lagerstroemia*, accessed on 24 January 2013, www.ntbg.org
2. Cabrera RI, Reinert JA, McKenny CB. Differential Resistance Among Crape Myrtle (*Lagerstroemia)* Species, Hybrids and Cultivars to Foliar Feeding by Adult Flea Beetles (Alticalitigata), Hort. Sci. 2008; 43:403-407.
3. Knox GW, Norcini JG, *Lagerstroemia* Cultivars under Evaluation at the NFREC-Monticello, Proc. Fla. State Hort. Soc. 1991; 104:346-347.
4. Anderson NO, Flower Breeding and Genetics, Springer, Dordrecht 2007; 439-457.
5. Liu F *et al*, An Extract of *Lagerstroemia Speciosa L*. has Insulin- like Glucose Uptake-Stimulatory and Adipocyte Differentiation-Inhibitory Activities in 3T3-L1 Cells, J. Nutr. 2001; 131:2242-2247.
6. Shoback, edited by David G. Gardner, Dolores, 2011. Greenspan's Basic & Clinical Endocrinology 9th ed., New York: McGraw-hill medical.
7. *Lagerstroemia*; retrieved on 11/23/2010 Article. Available from: http://en. Wikipedia.org/wiki/
8. Takayama H, Kitajima M, Ishizuka T, and Seo S; "US patent application publication", Pub. No.: US 2005/0020681 A1; Pub. Date: Jan. 27, 2005.
9. Flora, The Gardeners Bible, ABC Publishing, Ultimo, NSW, Australia, 2005
10. Vijaykumar K, Murthy PB, Kannababu S, Syamasundar B, and Subbaraju GV;"Quantitative Determination of Corosolic acid in *Lagerstroemia Speciosa* Leaves, Extracts and Dosage Forms", International Journal of Applied Science and Engineering, 2006; 4,2:103-114.
11. *Lagerstroemia indica* Linnaeus, Sp. Pl., ed. 2, 1: 734. 1762. ziwei.
12. Ambujakshi HR, Surendra V, Haribabu T, Goli D. Antibacterial activity of leaves of *Lagerstroemia speciosa (L*) Pers. Journal of Pharmacy Research 2009; 2(6):1028.
13. Vivek MN *et al*. Anti-cariogenic activity of *Lagerstroemia speciosa (L.).* Science, Technology and Arts Research Journal 2012; 1,1:53-56.
14. Pavithra GM *et al*. AA.Antinociceptive, antidiarrhoeal and cytotoxic activities of *Lagerstroemia speciosa (L.)* Pers. Pharmacologyonline 2011; 1:604-612.
15. Suzuki Y, Unno T, Ushitani M, Hayashi K, Kakuda T. Antiobesity activity of extracts from *Lagerstroemia speciosa L*. leaves on female KK-Ay mice. Journal of Nutritional Science and Vitaminology 1999; 45:791-795.
16. Unno T, Sugimoto A, Kakuda T. Xanthine oxidase inhibitors from the leaves of *Lagerstroemia speciosa (L.)* Pers. Journal of Ethnopharmacology 2004; 93:391-395.
17. Unno T, Sakane I, Kakuda T. Inhibition of xanthine oxidase by an aqueous extract of banaba leaves (*Lagerstroemia speciosa).* Journal of the Japanese Society for Food Science and Technology 2000; 47:740-743.
18. Choi HJ, Bae EY, Song JH, Baek SH, Kwon DH.Inhibitory effects of orobol 7-O-D-glucoside from banaba (*Lagerstroemia speciosa L*.) on human rhinoviruses replication. Letters in Applied Microbiology 2010; 51:1-5.
19. Suzuki Y, Unno T, Ushitani M, Hayashi K, Kakuda T., J. Nutr. Sci. Vitamin. 1999; 45:791-795.