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A REVIEW ON *LAGERSTROEMIA SPECIOSA*

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ABSTRACT: *Lagerstroemia speciosa* is commonly known as crape myrtle belonging to the Lythraceae family. *Lagerstroemia speciosa* or Banaba is a medicinal tree traditionally used to lower blood sugar in the body. Its high content of corosolic acid makes it an effective anti-diabetic drug. Banaba is also recommended for kidney, bladder problems and hypertension. Leaves of the species have been traditionally used over thousands of years as folkloric treatment by the native Indians and Japanese for illness, ailments particularly for lowering blood sugar levels and weight loss. The flower extracts of the species has some pharmacological properties like antioxidant and antimicrobial activities, whereas fruit extracts reported anti-nociceptive, anti-diarrhea and cytotoxic activities. Research on leaf extracts reveals that anti-bacterial, anti-viral, anti-inflammatory, anti-obesity, anti-fibrotic, anti-diabetic and xanthine oxidase inhibition, diuretic, decongestant activities and roots are applied for treating mouth ulcers. In addition to that bark is used to relieve the abdominal pains. The species also has essential metals like sodium, potassium, iron, zinc and magnesium which were clinically proved. Thus these reviews will emphasis on the phyto-constituents and biological activities of the plant which will heal and cure mankind for healthy living.

INTRODUCTION: The family Lythraceae¹ consists of about 24 genera and nearly 500 species wide spread in the temperature regions. In India it is represented by 11 genera and about 45 species. This data shows that *Lagerstroemia speciosa* is spread all over the world. *Lagerstroemia speciosa* is belongs to the family Lythraceae. The genus *Lagerstroemia* was first described by Carlos Linnaeus.

The name *Lagerstroemia* was recognized by Magnus von Lagerstroem a Swedish naturalist who provided specimens from the east for Linnaeus. Indians commonly called it as "Pride of India" and also called as Giant crape myrtle², queens crape myrtle and banaba by Philippines. This tree is widely distributed in Philippines, India and Malaysia. Traditionally, leaves, bark and roots of *Lagerstroemia Speciosa* have been used in folk medicines and are remedy for various illness and ailments. Leaves have been used to treat diabetes mellitus³ and serve as diuretic and decongestant. The red-orange leaves have high levels of corosolic acid that can reduce blood sugar. Its fresh leaves are also used as emergency tincture of wounds and sanitizing the surface of the skin.

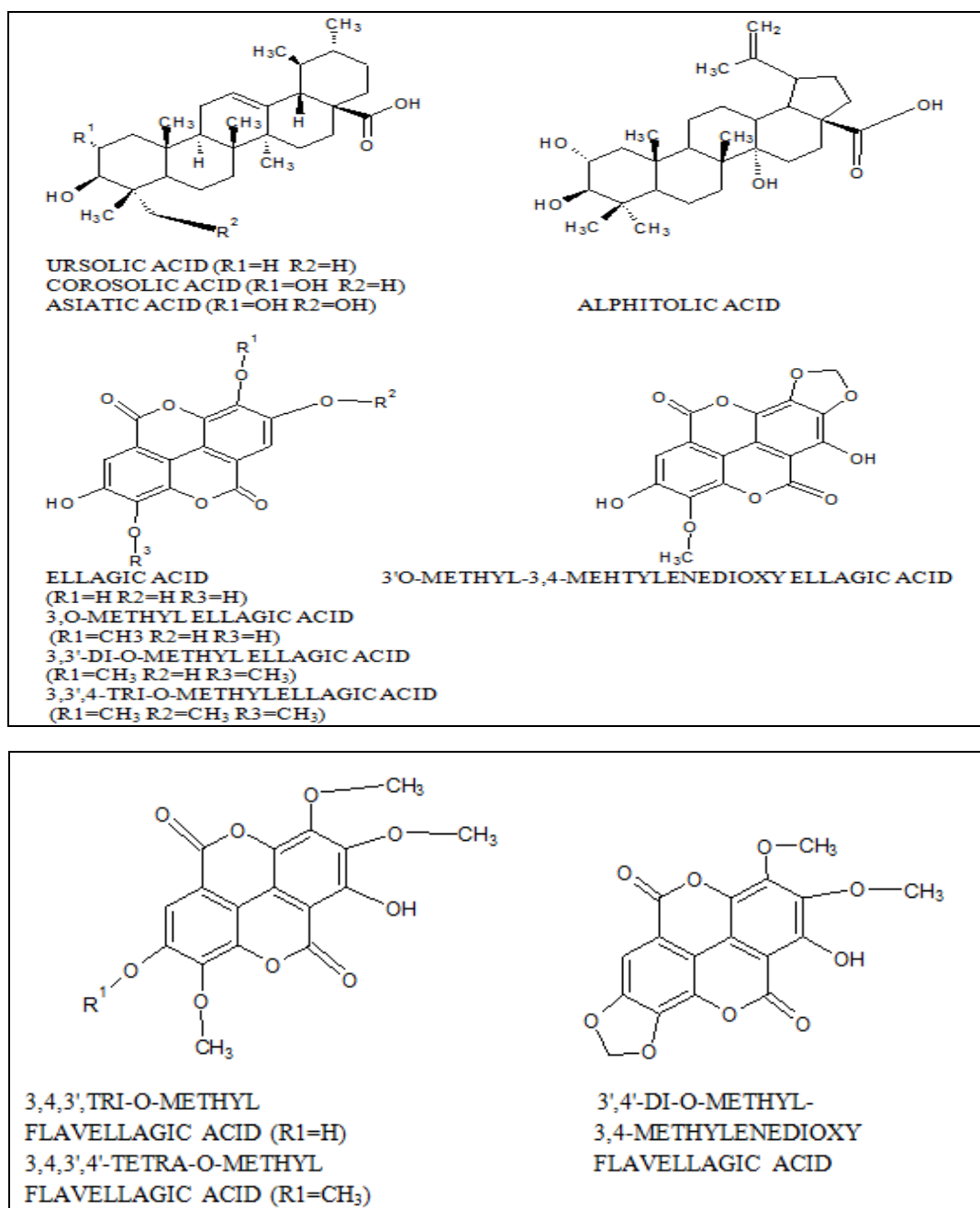
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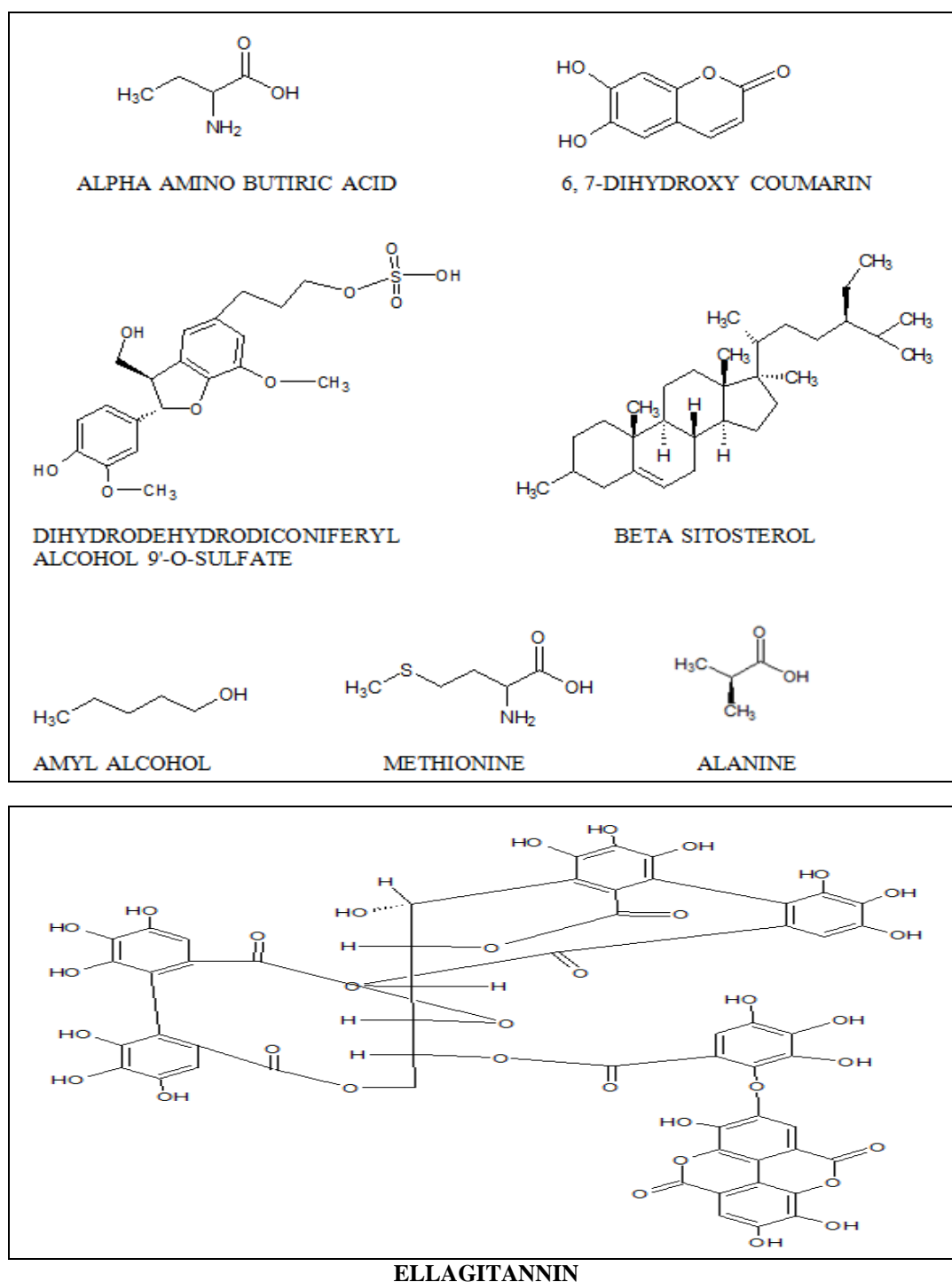
Roots are used for treating mouth ulcers and bark is used as stimulant, relief of abdominal pains and febrifuge. Philippines consume the leaves of the *Lagerstroemia Speciosa* as herbal tea for lowering blood sugar level and reducing body weight. Because of its "insulin like principle" is used as a remedy for diabetes. Recently, Glucosol™ and Banabamin herbal products have been developed from *Lagerstroemia Speciosa* as an anti-diabetic drug.

Chemical Constituents: The chemical constituents⁵ of *Lagerstroemia Speciosa* include corosolic acid⁶,

lageracetal, amyl alcohol, ellagic acid, gallic acid, 4- hydroxyl benzoic acid, beta sitosterol, 3,3,4-tri-O-methyl ellagic acid, 3-O-methyl-3,4-methylenedioxy ellagic acid, Asiatic acid, alphitolic acid, 3,3¹-di-O- methyl ellagic acid, 3,4,3¹,4¹- tetra-O-methyl flavellagic acid, 3¹, 4¹-di-O-methyl-3,4-methylenedioxy flavellagic acid, 3-O-methyl ellagic acid, 6,7-dihydroxy coumarin, alanine, isoleucine, alpha amino butyric acid, ellagitannin⁷ and methionine. This species also consists of metals like Iron, Magnesium, and Zinc⁴.

Structures:





Pharmacological Properties:

Anti Diabetic Activity and Hypoglycemic Activity: Custer⁸ C. Deocaris *et al.*, 2005 performed hypoglycemic activity of irradiated 80% ethanol extract of banaba leaves was tested on alloxan treated diabetic mice and they found significant decline in blood glucose levels within 1.5 hours.

William⁹ V. Judy *et al.*, 2003 screened anti diabetic activity of 80% w/w aqueous ethanol leaf

extract from *Lagerstroemia speciosa* standardized to 1% corosolic acid (GlucosolTM). It has been demonstrated in a randomized clinical trial involving Type II diabetics and found that GlucosolTM in a soft gel capsule formulation showed a 30% decrease in blood glucose levels compared to a 20% reduction seen with dry powder filed hard gelatin capsule formulation, suggesting that the soft gel formulation has a better bioavailability than a dry powder formulation.

Amornnat Thuppha¹⁰ et al., 2009 evaluated the hypoglycemic effect of water extract from leaves of *Lagerstroemia speciosa* in normal and streptozotocin (STZ) induced diabetic rats and found that water extract of leaves of *Lagerstroemia speciosa* can reduce fasting blood glucose of STZ induced diabetic rats.

Barun¹¹ Kanti Saha et al., 2009 studied the hypoglycemic effect of hot water extract of *Lagerstroemia speciosa* of leaves on chemically induced diabetes in rats. These studies thus strongly suggest that the hot water extract of *Lagerstroemia speciosa* attributed its prominent hypoglycemic activity on experimental diabetic rats through suppression of gluconeogenesis and stimulation of glucose oxidation using the pentose phosphate pathway.

Anti - Obesity Activity: Yuko^{1, 3, 12} Suzuki et al., 1999 studied the anti-obesity of 5% hot water extract from banaba leaves and results suggest that banaba had a beneficial effect on obese female KK-A^Y mice.

Antiviral Activity: Nutan¹³ et al., 2013 screened anti-HIV activity of aqueous and 50% ethanol extracts of leaves and stems of banaba by *in vivo* reporter gene based assays and found the novel anti-HIV activity of banaba because of presence of Gallic acid and ellagic acid through the inhibition of reverse transcriptase and HIV protease.

Choi³ HJ, et al., 2010 tested for anti-human rhinoviruses (HRV) activity in HeLa cells, orobol 7-O-D-glucoside (O7G) isolated from *Lagerstroemia speciosa* leaves which showed broad-spectrum anti-HRV activity towards HRV of groups A and B.

Cytotoxic Activity: Fatema¹⁴ Nasrin et al., 2012 performed evaluation of cytotoxic activity of methanol extract of *Lagerstroemia Speciosa* leaves and barks by brain shrimp lethality bioassay method. They found the considerable cytotoxic potency with methanol extract of leaves of *L. Speciosa*.

Antibacterial Activity: LMV Laruan¹⁵ et al., 2013 studied phytochemical and antibacterial study of methanol extract of *Lagerstroemia speciosa* (L.) Pers. by a modified method of Kirby-Bauer

technique. They found that the extract exhibited high anti bacterial activity against *E. coli*, *Staphylococcus aureus* and *Pseudomonas aeruginosa*.

Anti-inflammatory Activity: Priya¹⁶ TT et al., 2008 worked on the anti-inflammatory activity of ethyl acetate and ethanol leaf extract of *Lagerstroemia Speciosa*. It had been examined using the carrageenan-induced acute inflammation and formalin-induced chronic paw oedema assays. Ethyl acetate extracts significantly reduced inflammation in a dose dependent manner, which was not observed with ethanol extract for both the acute and chronic inflammatory models.

Anti nociceptive Activity: Ahosan Morshed¹⁷, et al., 2010 screened antinociceptive activity of chloroform extract of bark of *Lagerstroemia speciosa*, using an acetic acid-induced gastric pain model in Swiss albino mice. They observed that *L. Speciosa* have potent antinociceptive activity.

Antimicrobial Activity: Asish Bhaumik¹⁸, et al., 2014 studied the bioactive compounds of methanol, ethanol and chloroform extract of fruit of *Lagerstroemia speciosa* by agar well diffusion method using bacterial cultures, *Staphylococcus auerus*, *Bacillus subtilis*, *Pseudomonas aeruginosa*, *Escherichia coli* and fungal cultures *Asperigillus niger*, *Asperigillus flavus*, *Candida albicans*. They found that all the extracts exhibited moderate to good anti-microbial activity against the test microorganisms.

Pavithra¹⁹ G. M., et al., 2013 studied antimicrobial activity of methanol extract of flower of *Lagerstroemia speciosa*, using agar well diffusion method and found that extract was effective in inhibiting all test micro organisms (5 isolates of Streptococcus, 5 isolates of *Staphylococcus aureus*, *Candida albicans* and *Cryptococcus neoformans*).

Xanthine Oxidase Inhibition: Unno^{3, 20} T et al., 2004 studied Xanthine oxidase on aqueous leaf extract of *Lagerstroemia speciosa* and found that extract having the inhibitory activity on Xanthine oxidase, suggesting its potential in preventing and treating hyperuricemia.

Anti-fibriotic activity: Prabhu^{3, 21} VV, et al., 2010 screened the effect of ethanol leaf extract of *Lagerstroemia speciosa* on male albino wistar rats

with liver fibrosis induced by carbon tetra chloride (CCl₄) and confirmed the potent anti-fibrotic effect¹³.

Anti-oxidant Activity: Fatema¹⁴ Nasrin et al., 2012 studied the anti-oxidant activity of methanolic extract of *Lagerstroemia* leaves and barks for their antioxidant activity and found significant anti-oxidant activity.

Syed Junaid²² et al., 2013 screened anti-oxidant activity of methanol extract of dried seeds of *Lagerstroemia speciosa* and found a marked anti-oxidant activity of dried seed extract.

Pavithra²³ G.M, et al., 2013 studied antioxidant activity of methanol extract of flowers of *Lagerstroemia speciosa* by employing DPPH radical scavenging assay and observed considerable anti-oxidant activity of flower extracts.

Saumya²⁴ S M, et al., 2011 studied antioxidant activity of aqueous leaf extract of banaba extract by TEAC assay, superoxide, hydroxyl, hydrogen peroxide and nitric oxide radical scavenging activities and found potential antioxidant activity.

Pharmacognostic Study: Woratouch Thitikornpong²⁵ et al., 2011 studied the Pharmacognostic evaluation of leaves of *Lagerstroemia speciosa* and provided the important information for the correct identification and herbal standardization of *Lagerstroemia speciosa* leaves.

Vijayaraghavulu²⁶ sai saraswathi et al., 2011 studied the Pharmacognostic and preliminary Phytochemical study of *Lagerstroemia speciosa* leaves

Caligiani² et al., 2013 worked on a simple GC-MS method for the screening of betulinic, corosolic, maslinic, oleanolic and urosolic acid contents in commercial botanicals used as food supplement ingredients. They found that only *Lagerstroemia speciosa* was rich in maslinic acid.

CONCLUSION: *Lagerstroemia speciosa* is one of the wide spread species and has been used traditionally in folk medicine. Studies done on *Lagerstroemia speciosa* in the past 15 years revealed that, it is a natural plant insulin that has no side effects and more than 40 phytoconstituents

like glycosides, flavones, ellagic acids, triterpenes and tannins are present in leaves, stem, flowers, fruit, bark and roots. Finally, concluding that the whole banaba tree from root to leaves and flower had a glucose lowering effect and could be used to fight against diabetes, obesity, kidney diseases, hypertension and others. Further research is needed to isolate new active principles and to screen pharmacological activities of the phytoconstituents.

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CONFLICT OF INTEREST: We declare that, there is no conflict of interest regarding the publication of this paper.

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