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Exploration of phytochemistry & medicinal approach of *Callistemon viminalis*: A review

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Abstract:
Callistemon viminalis is an evergreen shrub or small tree that consists of pendulous branches covered with narrow light green leaves. The plant is covered with spikes (up to 6inches) of bright blood red flowers that resemble bottle brushes in late spring. It is a copious source of nectar for birds and hummingbirds. Young leaves are covered with brown hairs and the flowers give way to the woody fruit capsules which produce their seeds annually. Weeping bottlebrush is used as a screen plant, to control Soil erosion or as a display or as an urban forestry tree. It grows easily in moist, acidic and well-drained soils that consist of full sunlight . It is not suitable for the areas where wind flows high . It is drought tolerant and it performs best with regular irrigation. It is great for gardens, street parks etc.

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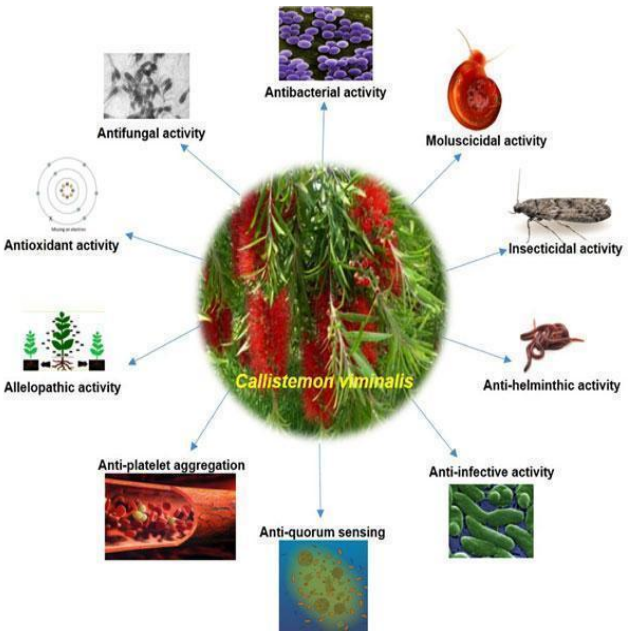
The assessment covers existing properties of different parts of the plant like(branches,fruits,flowers,leaves,bark) of *Callistemon viminalis* plant . The bioactive compounds chemical structure was described for environmental factors. . All the outcomes showed the medicinal uses C. *viminalis* plant. In some studies work, *Callistemon viminalis* were used in extracts for the prepaaration of metallic oxide nanoparticles (Hefny etal.,2017).

To synthesize Fe_2O_3 nanoparticles chemical extract of *callistemon viminalis* were used. which were characterized using the process: TEM,Uv-vis, FTIR, EDS,HR-SEM.The physical properties of the plant were used to study different rising temperatures. . It was noticed that there was a rise in temp. that produced small size particles. The size was deliberated as 32,22and 26nm for annealing at 300,400 and 500 degrees Celsius(Hassan et al., 2018; Spencer,1991).

Graphical abstract:



Keywords:
Bioactive compounds, *Callistemon viminalis* and biological activities

I. Introduction:

Plant has medicinal value as ittends to prevent the growth of bacteria,tending to prevent the growth of yeast, insecticidal and medicinal description. The genus Callistemon has provided many horticulture specimens. Callistemon is usually known for its flowering that has an adaptable nature and is quick to grow.

Taxonomy of the plant:

C.viminalis belongs to the kingdom plantae{plants},subkingdom is viridiplantae{green coloured plants},to the superdivision embryophyta,Division is Tracheophyta, to the Class :Magnoliopsida and the Order: Myrtales
Family: Myrtaceae – myrtles, myrtacées
Genus :Callistemon – commonly called as bottlebrush
Species is *Callistemon viminalis* (Sol. ex Gaertn.) Cheel – known as weeping bottle-brush.
Its species include *Melaleuca viminalis* (Sol. ex Gaertn.) Byrnes, Metrosideros viminalis Sol. ex Gaertn., *C. viminalis* (Sol. ex Gaertn.) G. Don, (Salem et al., 2017).

Growing native plant: *Callistemon viminalis:*

Although the species is sensitive to drift, it can still ruin the appearance of the crying shape. Other bottle brushes sometimes make plants flow better in the sun.One of the popular species is "captain cook". It occurs in different regions with cold and dry climates. Appears in streets and botanical gardens. *C.viminalis* is easy to grow with seeds and cuttings. The Callistemon species produces viable seeds that can germinate easily in any seedling. The one made with this seed will not be like the previous part. The piece obtained from a cutting (usually easily infected) is genetically like the previous piece. The plant has a nice flexible branch shape and is known for its aesthetic beautify having scarlet flowers. The plantproduces a variety of more terrifying color. Generally, the plant reaches a height of 8 m, with leaves long, 0.3 m, and 0.6 m wide. They are covered with 1415 cm long spines and 1502.50 cm long red spines.The flowers are green or pink, small and soundproof. The flowers mature into woody capsules.(Kamal Ahmad et.al, 2017).

Photochemical and Cytotoxicity activities of leaf extract of *C. viminalis* leaves extract:

To identify and isolate new bioactive compounds from the methanolic leaf extract of *Callistemon viminalis*, these compounds were collected in Cairo (Egypt) and their hepatoprotective and cytotoxic potential were evaluated. insulation. Through NMR, spectral analysis and studies by mass spectrometry, pure new compounds were identified. The MTT recovery assay was used to evaluate the HepG2 cells for their viability and to evaluate the cytotoxicity and hepatoprotective activity of methanol leaf extract on hepatocellular carcinoma cells (Hep G2 cell line). The leaves show strong cytotoxic activity and weak hepatoprotective effect on hepatocellular carcinoma cells (Hep G2 cell line)(Ahmed, 2020; Salem et.al., 2013 and Liu et.al, 2016).

Microscopic study of plant:

When the plant was evaluated for microscopic studies, single-cell stomata can be seen on the leaf surface, which are irregular characteristic skin tissues, 7-8 layers of cortical tissue, bone marrow rays, endoderm, xylem blood vessels, lamellar glands, stellate area, and the middle part of the sclera. And its constituent metabolites were characterized. Certain reactions in the processing of different substrates will produce a certain colour corresponding to a certain metabolite. When treated with hydrochloric acid and hydrophilic acid, the medullary blood vessels and ducts will turn pink. When treated with weak iodine, mangrove bark essential oil appears bright red on the mangrove bark. The calcium oxalate in the bark reacts with sulfuric acid to produce a synthetic colour.

Phytochemical evaluation of new compounds:

Phytochemical examination of*Callistemon viminalis's* leavesled to theisolation of commonly occurring compounds: Callistemon A and B. Callistemonol A (1) has a new furan ring structure, which combines β,α-trione and phloroglucinol, while Callistemonol B (2) is an acyl phloroglucinol originated with a five-member ring There are two methyl substituents on the acyl side chain. Thecharacterization of the structures was done by extensive spectroscopic studies namelythe parameters like 1D and 2D NMR and calistemonol A (1) is an exemplary form of a naturally occurring dibenzofuran having two phenyl residues, and may It be an example of free radicals assisting in the formation of this new biological genetic pathway to generate Dibenzofuran. The CC free radical binds to the SAM enzyme. In addition, the proposed antibacterial analysis and biophysical and time killing studies showed that the compounds 1 and 2 have formidable bactericidal activity against a group of methicillin-resistant microorganisms (Wu et al., 2019).

Essential oils:

42 kinds of essential oil components are extracted from leaves, which are suitable for various chemical classifications such as acids, aldehydes, alcohols, ketones, esters, hydrocarbons, and N content of compounds. Pinene, as well as α-terpineol and menthyl acetate, as well as the minor components β-pinene, Mir-Zen. R-cymenborneol, α-humulene, alloaromadendrene, sratuleno, terrenal terlineral. Although the basic components of C.viminalis have been extensively studied, including India, Brazil, Egypt, Australia, South Africa, and Cameroon, in the performance and graphic ecological names, there is a way to indicate that the main oil componentscome from northern plains of India such as 1.8- Cineole, α-pinene and methyl acetate, but in South Africa, 1,8-cynosol is in higher form. Ca located in the Ecuador region and Egypt, India, Cameroon, and Austria. In various geographic models, 1,8-cineole has been regarded as a good marker and effective component of various species(Ahmad et al., 2017; (Wollenweber etal.,2000).

Medicinal uses of plant:

C. viminalis is the ornamental plant and is significant because of its many benefits and verified by the experimental studies (Liu et al., 2016). Being a medicinal plant, it consists of biological values. Medicinal properties were carried out from the different parts of plants such as bark, branches, flower, fruit and leaves of *C. viminalis.* (Salem et al.., 2017; Goyal et al.,2012)

Snail baits activity:

The crude extract of *C. viminalis* has reported the activity of snail granules. The crude methanol powder extracted from the leaves, fish, and fruits of *C. viminalis* was used as a pellet in the experiment to combat human snail fever by changing the fatty acid content and snail fever. Various snail extracts are effective against snail fever virus Biomphalaria alexandrina snails. The LC50 values of the bark, fruit and leaves of *C. viminalis* are columns 6.2, 32 and 40 of the examined fruit. (Wu et al., 2019; Islam, 2010).

Antihelminthic property:

The essential oil is extracted from *C. viminalis. C. viminalis* essential oil exhibits insect repellent activity against tapeworms and earthworms, and its vitreous activity is better than that of piperazine phosphate.(Salem et al.,2017).

Anti-infectious property:

Plant extracts of *C. viminalis*were selected to inhibit human pathogenic *Pseudomonas aeruginosa*, which has been shown to reduce mortality by up to 60% with toxin research potential and 50% antibiotic toxin reduction Research potential.-Contagious for toxin research. The leaves of the *C. viminalis* plant show two different compounds, callistemones A and B. (Wu et al., 2019; Wong etal.,2020 & Abdelmalek,2021).

Anti-quorum Sensing activity:

Anti-Quorum compounds are known to be found in the algae and can reduce pathogenicity of bacteria. Bacterial cell communication or population definition controls the manner of development of many important organisms from medicinal point of view. Two biomonitoring strains were used to test the anti-QS activity of 50 medicinal plants from South Florida. *Agrobacterium tumefaciens* and *Chromobacterium violaceum*; among these, six exhibited QS inhibition: *Bucida buceras* L. (Combretaceae) , *Chamaesyce hypericifolia* (L.) Millsp. (Euphorbiaceae),G. Don (Myrtaceae), *Callistemon viminalis* (Sol. Ex Gaertn.), *Conocarpus* stands upright L.(Combretaceae),*Quercus virginiana* Mill. (Fagaceae), *Tetrazygia bicolor* (Mill.) Cogn. (Melastomataceae). This research not only focussed on providing a new possible mechanism of action and verification for traditional plant applications, but also provides a potential new therapeutic approach for treatinginfections caused by bacteria. (Adonizio et al., 2006).

II. Conclusion:

From the higher description concerning the extracts effects from completely different components of *C. viminalis* plant , it is confirmed that the Eos and extracts are biologically very important as anti-bacterial agents, insecticidal activities, a decent media for nanoparticle synthesis and important from pharmacological and medicinal point of view. A lot more studies in field can reveal more unknown compounds with their wider applications in industryto produce pharmaceuticals and for other purposes. Similarly, the plant has proven to be ecologically important as a weed controller so more applications of this plant in terms of ecological and environmental aspects can lead to the influential perspectives of *Callistemon viminalis* in future.

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