

**A SCIENTIFIC REVIEW ON GLORY OF A HOLY TREE - CRATEVA RELIGIOSA****Sanjay K. Gowda, Chandra Prakash K.\* and Varsha Jain B. A.**

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**ABSTRACT**

*Crateva religiosa* is a rare traditional herb commonly called as Varuna being worshipped from ages, have immense varied treatment potential and inculcate medicinal properties in it. The parts of the plant like Leaves, Stem Bark and Roots have been explored for many medicinal properties. The plant is enriched with phytoconstituents like Alkaloids, Glycosides, Saponins, Terpenoids, Phenols and Volatile Oils. It has been used traditionally by various Tribal Public and Rural Community to treat Kidney Stone, Hypertension, Malaria, Diabetes, Respiratory disorders, Pain, Inflammation and so on. But only a few of them have been evidenced in modern science. Traditional literature of the plant noted that the traditional and alternative medicinal healers uses and practice prescribing the formulations containing *C. religiosa* for various ailments. The scientific data for the use of this plant for its

Analgesic, Anti-inflammatory, Antimicrobial, Antioxidant, Hepatoprotective, Antifungal, Antiarthritic are reported confirming its biological property. In the present study botanical aspects, folkloric applications, biological and pharmacological properties of extracts has been compiled to ease researchers for further studies in the said domain and to generate scientific data for traditional use and witness the chemical entities responsible for claimed medicinal properties of the plant.

**KEYWORDS:** *Crateva religiosa*, Pharmacological activities, Traditional uses, Formulations.

**INTRODUCTION**

*Crateva* is a large branched deciduous tree, sometimes referred to as Varuna, belong to Capparidaceae Family.<sup>[1]</sup> It is also known as a holy garlic pear/temple tree and Barna Tree

respectively in English and Hindi. The tree is sacred because of its association with the Neptune Sun-Rahu (one of nine planets) and used to worship Lord Shiva specially in Mahashivaratri.<sup>[2]</sup>

*Crateva religiosa* is distributed globally in Myanmar, Indonesia, India, China, Sri Lanka, Malaysia. It is found up to Tripura and Manipur in India, West India, the Gangetic plains and Eastern India.<sup>[3]</sup> It can also be found on the islands of Sikkim, Andaman and Nicobar.<sup>[4]</sup> It is primarily found on the river banks and on the temple side.<sup>[5][6]</sup>

The Plant is well known for its various pharmacological properties like Anti-oxaluria, Diuretic, Antioxidant, Anti-inflammatory, Antirheumatic, Laxative, Antipyretic, Antilithitic, Hepatoprotection, Antiperiodic, Antihelminthic, Lithotriptic, Antimycotic, Contraceptive, Vesicant and Rubefacient properties. *Crateva religiosa* bark is effective for urinary problems and the treatment of kidney stones.<sup>[1]</sup> Besides, the fruit rind is used in dyeing as a mordant. The wood is very rough, yellowish and uniform. It is used to make drums, pebs, sweatshirts as well. It is also being grown as ornamental tree because of its delightful ambience.<sup>[7]</sup>

The present review enumerates the Taxonomy, Ethnobotany, Traditional uses, available Formulations, Biological and Pharmacological activities of *Crateva religiosa*.

## **Taxonomy and Ethnobotany**

### **Taxonomical classification<sup>[8]</sup>**

**Species:** *Crateva religiosa* G. Forst.

**Genus:** *Crateva*

**Family:** Capparaceae

**Subclass:** Dilleniidae

**Class:** Magnoliopsida (Dicotyledons)

**Division:** Magnoliophyta [Flowering plants]

**Superdivision:** Spermatophyta [Seed plants]

**Subkingdom:** Tracheobionta [Vascular plants]

**Kingdom:** Plantae [plants]

### **Botanical aspects**

It is a deciduous tree which may be small or medium in size. The tree is very much variable as several different species are grouped under this name. Some of them have the leaves

which are white in colour and others are green beneath. The flower colour, shape and size of the fruit differs in the different species. The most noticeable differences are observed in the seeds which may be crested with hardpoints or smooth.

**Bark:** Pale grey coloured smooth bark.

**Leaves:** Leaves have 3 elongated leaflets which are 2 to 6 inches long located on a common stalk which is 1.5 to 4 inches long.

**Flowers:** Flowers are 2 to 3 inches grown across. They are white, reddish-yellow or pale yellow in a loose cluster individually on a stalk which is 1 to 2 inches long. It has 4 Sepals and Petals which are 1 to 1.5 inches long. Stamens are longer than petals and numerous. The ovary is situated on about 1.5 inches elongated stalk.

**Fruits:** 1 to 2 inches long Fruit is a berry, oblong or globose with woody rind, seeds are embedded within the yellow pulp.<sup>[6]</sup>

*Crateva religiosa* flowers abundantly during March to May, at the time it sheds all its leaves. The flowers are large, actinomorphic, hermaphrodite and complete. Flowers open in the late afternoon between 19:00 and 20:30 h followed by anther dehiscence at 19:30–21:00 h. Flowers extend its pollen and nectar to the honey bees, bugs, moths birds and butterflies. The plant is self-incompatible and obligate out-crosser. Fruit-set is limited to only 22%. The beauty of the flowers and fruits are adversely affected by the development of floral galls induced by the insect, *Neolasioptera crataevae* Mani, order Diptera.<sup>[9]</sup>

### Phytochemistry

Preliminary evaluation for Phytochemicals reveals the plant contains Alkaloids, Terpenoids, Flavonoids, Glycosides, Steroids and Phenols. The plant Contain higher level of Flavonoids than the Alkaloid content which is closely followed by Saponins. The Phenol content is of little percentage in *Crateva religiosa* G. Forst bark.<sup>[10]</sup>

Rekha D et. al. has been reported that *C. religiosa* leaves found to have eleven compounds. The major compounds are Hexanedioic acid, bis (2-ethyl hexyl) ester- (36.29%) , Oleic acid (15.19%), 1, 2-Benzene dicarboxylic acid, diisooctyl ester-(14.98 %), n-Hexadecanoic acid(13.10 %) and Squalene(10.42 %).<sup>[11]</sup>

Ogunwande IA *et al.*, has been reported that the oil of *C. religiosa* whole Plant contains 41.1 % and 43.5 % of aliphatic compounds and oxygenated monoterpenes respectively. The other notable constituents like linalool and nonanal found in 30.2 % and 17.2 % respectively. Decanal (6.3 %) and  $\alpha$ -terpineol (5.2 %) also occurs in considerable amounts. The oil is free from sesquiterpene hydrocarbons and contains the trace amount of oxygenated sesquiterpenoids and monoterpene hydrocarbons.<sup>[12]</sup>

Sharma S *et al.*, reported that normal and galled flower of *Crataeva religiosa* shows the presence of eighty-four and sixty-four phytochemicals respectively, which provides the that under stressed environments large no. of secondary metabolites and fatty acids were produced and the flower gall extract contains much larger unsaturated fatty acid composition than the normal flower extract. Fatty acids like Palmitic acid and oleic acid were present in a higher percentage in flower gall extract compared to normal flower extract. Whereas myristic acid is noticed exclusively in gall extract.<sup>[13]</sup>

Surabhi Sharma *et al.*, reported for phenols being in higher concentration in galled flower as compared to other in-vitro and in-vivo floral tissues. The minimum amount of phenols was measured in normal flower callus. Total phenols were higher in galled flower followed by galled flower callus, normal flower, and normal flower callus.<sup>[14]</sup>

**Table no. 1: Secondary metabolites of *crateva religiosa* G. forst bark.**

Sl. no.	Category	Constituents	Reference
1	Glycosides	$\beta$ -k-Strophanthin Drebyssogenin f (or Pregn-5-en -one,11-(acetyloxy)- 3,14-dihydroxy-12-(2-hydroxy-3-methyl-oxobutoxy)-(3 $\beta$ ,11 $\alpha$ ,12 $\beta$ ,14 $\beta$ )	[15]
2	Phenols	Phenol,2,4-bis(1,1-dimethylethyl)-	
3	Terpenoids	Lupeol Lup-20(29)-en-3-one (Lupenone) 1-Menthol	
4	Saponins	Giganteumgenin N (Barrigenol R1) or (Olean-12-ene3,15,16,21, 28-hexol)	
5	Steroid	Stigmasterol $\beta$ -Sitosterol	
6	Essential Oils (Major)	Linalool Nonanal Decanal $\alpha$ -Terpineol	[16]

**Table no. 2: Chemical constituents of *C. religiosa* leaves and their expected biological activities as per Dukes Phytochemical and Ethnobotanical database.**

Sl No.	Compound Name	Molecular formula	Nature of compound	Activity
01	Dodecanoic acid	C <sub>12</sub> H <sub>24</sub> O <sub>2</sub>	Lauric acid	Antiviral, Antioxidant, Candidicide, Antibacterial, Hypocholesterolemic, COX-1 and COX-2 inhibitor.
02	Tetradecanoic acid	C <sub>14</sub> H <sub>28</sub> O <sub>2</sub>	Myristic acid	Nematicide, Antioxidant, Cancer protective,
03	n-Hexadecanoic acid	C <sub>16</sub> H <sub>32</sub> O <sub>2</sub>	Palmitic acid	Antioxidant, Pesticide, Hypocholesterolemic, Antiandrogenic Nematicide, Flavor, Lubricant. Hemolytic 5-Alpha reductase inhibitor,
04	Oleic Acid	C <sub>18</sub> H <sub>34</sub> O <sub>2</sub>	Oleic acid	Anemiagenic Insectifuge, Anti-inflammatory, 5-Alpha reductase inhibitor, Hypocholesterolemic, Antiandrogenic, Cancer protective, Dermatitigenic, Flavor
05	1,2 Benzenedicarboxylic acid, diisooctyl ester	C <sub>24</sub> H <sub>38</sub> O <sub>4</sub>	Plasticizer compounds	Anti-microbial, Anti fouling
06	Squalene	C <sub>30</sub> H <sub>50</sub>	Triterpene	Antibacterial, Antitumor, Antioxidant, Chemo preventive, Lipoxygenase Cancer protective, Immunostimulant, Pesticide

### Traditional uses

*Crateva religiosa* has been used traditionally by various communities of different regions for various diseases and complications. Many formulations containing *Crateva religiosa* plant parts were used in Siddha and other Medicinal Systems. Details are depicted in the Table No. 3.

**Table no. 3: Traditional uses of *crateva religiosa*.**

Region	Vernacular name	Form/ROA	Indication	Reference
Reserve of Seshachalam Biosphere, Eastern Ghats, India	Velimirichettu		Renal calculi, vesical calculi, bronchitis, skin diseases, fever. Gastric problem,	[17]
Akha's tradition. China. Thailand	Pak ku lu (Akha name)	Poultices	Fractures (Leaves)	[18]
district Una, Himachal	Barna	As bowls	Diabetes	[19]

Pradesh		for storing the water		
Maritime region of Togo	Awatayisan	Oral (Bark) Decoction	Hypertension	[20]
Himalayan and adjacent hilly regions	Shiplikan	Leaf bud pickle		[21]
Dhamrai Sub-district in Dhaka District, Bangladesh	Boinna	Leaf juice is applied to swelling	Tumour	[22]
Villagers of Sivagangai District, Tamilnadu	Maavalingam	Leaf paste is spread over hands and legs upto 1 – 3 weeks.	Diabetes	[23]
South Benin	Wontonzonzwen	Leaves, Decoction, oral	Malaria	[24]
Nupeland, North Central Nigeria	Kulanchi	Leaves & stem- Decoction Root- Smoked & steam bath	Malaria	[25]
Nilgiri Biosphere, Thuvaipathy, Coimbatore, Tamilnadu, India.		Stem and leaves	The antidote to poison and cures cold and cough.	[26]
Adi Community. D' Ering Wildlife Sanctuary, Arunachal Pradesh, India	Pekisiye	Leaves Paste	Headache	[27]
Akwapim North district of Ghana		Topically apply Stem bark Boil	swollen parts of body parts, Leprosy	[28]
Niger State, Nigeria	Ekanchi-wuriagi (N)	root	TB and Respiratory disorders	[29]
Rampal, Bagha District, Bangladesh			Pain (including headache, toothache, muscle pain), Antidote to poison, Respiratory tract disorders (including asthma, pneumonia,	[30]

			bronchitis, sore throat cold, cough, influenza, tonsillitis,). Skin diseases (including abscess, eczema, acne, infections, boils, scabies, itch, warts, dermatitis, sores, rash, scar,). Gastrointestinal disorders (including dysentery, stomachache diarrhoea, acidity, indigestion, bloating, colic, constipation, lack of appetite,	
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### Ayurvedic Preparations and Formulations

**Varunadi quath** – To treat nephritis, urinary calculi and other urinary tract disorders, U.T.I Burning micturition, dysuria, pyelitis, Prostatitis, , prostate enlargement.

**Varunadya ghrta** – To decrease the phlegm, metabolic disorders, fat deposition, migraine, rheumatoid arthritis, headaches and inflammatory conditions.

**Varunadya taila** – To treat of renal calculus or renal stone.<sup>[11]</sup>

Some of the reported formulations from traditional practitioners and its composition is depicted in the Table No.4

**Table no. 4: Traditional formulations containing *C. religiosa* practised by traditional healers.**

Formulation components	Form	Frequency	Indication	Practised by	Ref
Leaves of <i>Acalypha indica</i> L. (100 g), <i>Allium sativum</i> bulbils (50 g) <i>Albizia lebbbeck</i> (L.) Benth leaves (100 g), <i>Crateva religiosa</i> G.Forst barks (50 g), <i>Cardiospermum halicacabum</i> L. leaves (100 g), <i>Delonix elata</i> (L.) Gamble (100 g), <i>Cynodon dactylon</i> (L.) Pers. rhizomes (100 g), <i>Indigofera parviflora</i> Heyne ex Hook. & Arn. roots (100 g) <i>Ferula foetida</i> (Bunge) Regel Leaves (50 g), roots of <i>Jatropha curcas</i> L. (50 g), (100 g), <i>Moringa oleifera</i> Lam bark. <i>Pongamia pinnata</i> (L.) Pierre roots (100 g), dried rhizome of <i>Zingiber officinale</i> Roscoe (50 g), leaves of <i>Vitex negundo</i> L. (100 g), Sugar obtained from the inflorescence of <i>Borassus flabellifer</i> L. (1 kg)	They made as jam	once a daily 5-g in the morning with warm water	knees Pain	Siddha practitioners of Virudhunagar district, Tamil Nadu, India. (non-institutionally trained)	[31]
<i>Albizia lebbbeck</i>	Crushed the	Once in the	Ailments of	Siddha	



(L.) Benth. Root barks (100 g), Azima tetracantha Lam. Root barks (100 g), Azadirachta indica A.Juss Root barks. (100 g), Root barks of Cardiospermum halicacabum L. (100 g), Root barks of Crateva religiosa G.Forst. (100 g), Root barks of Clerodendrum phlomidis L.f. (100 g), Root barks of Indigofera parviflora Heyne ex Hook. & Arn. (100 g), Roots of Pergularia daemia (Forssk.) Chiov. (100 g), Roots of Phyla nodiflora (L.) Greene (100 g), Root barks of Moringa oleifera Lam. (100 g), Stems of Sarcostemma acidum (Roxb.) Voigt (100 g) , Root barks of Vitex negundo L.(100 g), Root barks of Volkameria inermis L. (100 g)	ingredients, add to 3 litres of water and boil until the water is reduced to 1 litre. Filter the decoction. Then, again concentrate d to 500 mL in low flame	morning about ½ to 1 teaspoon at a time taken with warm water till cure.	Musculoskeletal	medicine practitioners in the district of virudhunagar In Tamil Nadu state. India (non-institutionally trained)	
Allium sativum L. Bulbils (3 g), Crateva religiosa G.Forst. Barks (5 g), Piper nigrum L. Seeds (2 g)	The constituents are grounded well with small amount of water and	Taken before food, 1 time in the morning for 7 days	Arthritis	Siddha medicine practitioners in the district of virudhunagar In Tamil Nadu state.	

	consumed			India (non-institutionally trained)	
Crateva religiosa G.Forst Leaves.	Crushed leaves are externally applied	Until cure Once in a day,	Swelling due to vitiated Vata humour	Siddha medicine practitioners in the district of virudhunagar In Tamil Nadu state. India (non-institutionally trained)	
The bark of C. religiosa crushed with whole-plant S. ovalifolia Roxb.	juice	2 months	Rheumatism	traditional healers of Malda district, India	[32]
Allium sativum L. Alpinia galanga (L.) Willd. Crateva religiosa G. Forst, Cleome viscosa L. Crateva adansonii DC. subsp. trifoliata, Curcuma sp. Erythrina stricta Roxb. var. suberosa (Roxb.) Niyomdham, Link ex A. Dietr Myristica fragrans Houtt. Piper nigrum L., Piper sarmentosum Roxb. and Zingiber montanum mixed with camphor and sodium chloride	The powder is taken along with warm drinking water		Spastic paralysis	Royal Thai Traditional Medicine	[33]

## Pharmacological activities

### Anti-arthritic activity

Aqueous and ethanol bark extract of *Crateva religiosa* studied for its antiarthritic activity by Freund adjuvant arthritis induced model. The extracts exhibit a clear arthritis protective effect by reducing the inflammation in test animals evidenced by shifting the damaged hematologic and biochemical parameters towards normal supported by decrease in the pathological lesions. Also it is noted that the ethanolic extracts were potent compared to that of aqueous extracts.<sup>[34]</sup>

### Anti-inflammatory activity

Petroleum ether, chloroform, ethanol and aqueous extract of *C. religiosa* (Hook and Frost) bark studied for its anti-inflammatory activity by Carrageenan, serotonin and Histamine induced oedema of paw and inflammation induced by Formaldehyde. The extracts exhibit a clear antiinflammatory effect by reducing the inflammation in test animals. It is noted that the aqueous and ethanolic extracts exhibited superior activity over chloroform and Petroleum ether extracts.<sup>[35]</sup>

The Leaves extracts of Diethyl ether and methanolic extracts were studied for its anti-inflammatory property by Rat hind paw oedema model induced by sub plantar injection of albumin. The extracts show anti-inflammatory activity that is proportional to the concentration of the extracts administered. The extract prepared by diethyl ether exhibited better anti-inflammatory activity compared to methanolic extract and even better than standard drugs like aspirin and diclofenac. The mechanism of action was suggested that the antiinflammatory property may be due to its inhibitory action on the 5-lipoxygenase pathway, arachidonic acid metabolism and cyclooxygenase Pathway.<sup>[36]</sup>

### Analgesic activity

Pet ether, chloroform, ethanol and aqueous extract of *C. religiosa* bark (Hook and Frost) was evaluated for its analgesic effect against the acetic acid-induced writhing model. The extracts shows significant analgesic activity noted that aqueous and ethanolic extract shows superior activity compared to chloroform and pet ether extract.<sup>[37]</sup>

### Antimycotic activity

Pet ether, chloroform, ethanol and aqueous extracts of bark of *C. religiosa* Hook and Forst was evaluated for its Antimycotic activity by Disc diffusion method. Aqueous extract inhibits

the growth of *A. niger* and *C. marinus* at Minimum inhibitory concentrations 0.5 and 1 mg/mL, respectively. whereas petroleum ether and aqueous extracts are unable to inhibit the development of *C. albicans*, *C. krusei*, *C. tropicalis* and *C. marinus* up. The ethanolic extract which is followed by chloroform extracts has improved efficiency against to tested mycological pathogens thus demonstrating the occurrence of a larger amount of active constituents with antifungal effect.<sup>[38]</sup>

### **Anti-oxidant activity**

Aqueous extract of *C. religiosa* was studied for its Antioxidant activity against Paracetamol induced hepatotoxicity. The aqueous extracts of *C. religiosa* on the dose level of 200 and 400 mg/kg bw show the dose-dependent elevation in GSH, GPX, SOD, CAT and TP levels than the paracetamol treated group and hence exhibited a significant increase in enzymatic and non-enzymatic antioxidants which indicates its antioxidant potential.<sup>[39]</sup>

### **Anxiolytic activity**

Methanolic and aqueous extract of leaves of *Crataeva religiosa* was demonstrated for its anxiolytic activity evaluated by Open Field test, Light and dark box models. The extracts exhibited significant anxiolytic activity noted that Methanolic extract displayed superior activity when compared with and aqueous leaf extract, standard and control treatment groups using light and box test.<sup>[40]</sup>

### **CNS depressant activity**

Petroleum ether, chloroform, methanol and aqueous leaves extracts were studied for its CNS depressant activity against Pentobarbitone induces sleeping time and locomotor activity using actophotometer. *Crataeva religiosa* leaves extract produced a quicker onset of sleep latency when compared to control. It also increased the duration of sleeping time significantly. The extracts of *Crataeva religiosa* possibly acts by increasing the GABAergic inhibition in the CNS through membrane hyperpolarization which results in decreased firing rate of critical neurons or through direct activation of GABA receptors by the extracts.<sup>[41]</sup>

### **Hepatoprotective activity**

Ethanolic (80%) extracts of *C. religiosa* leaves was evaluated for its Hepatoprotective activity against liver injury induced by Paracetamol. The ALT and AST were reduced significantly after extract administration which indicates the plasma membrane stabilisation and hepatic

tissue repair caused by paracetamol. The protein levels also become normal from hypoproteinemia.<sup>[42]</sup>

### **Wound healing activity**

Methanolic extract of *C. religiosa* leaves was studied for its wound healing potential. Different ointments of the extracts (0.0, 50 and 100 mg/kg) formulated with soft paraffin, wool fat, hard paraffin and cetostearyl alcohol were found to be beneficial in wound healing. The exhibited activity is superior compared to penicillin. The wound treated using the extract dried quicker demonstrating that the extract had extra wound healing mechanism when compared to that of penicillin.<sup>[43]</sup>

### **Suppression of T. lymphocyte activity.**

Leupeol isolated from the n-hexane extract of *C. religiosa* stem bark shows immunosuppression property by suppressing T lymphocyte activity. It exhibits a significant decrease in phagocytic function, decrease in Delayed-Type Hypersensitivity response in mice, It also shows a significant decrease in the CD4<sup>+</sup> and CD8<sup>+</sup> T cell count. It also lowers IL-2, IL-5, IL-4, IFN $\gamma$  and TNF- $\alpha$  which is estimated by Cytometric bead array immunoassay.<sup>[44]</sup>

### **Antibacterial activity**

In Benin traditional veterinary medicine *Crateva religiosa* Forst leaves are used to treat bacterial infections of *Thryonomys swinderianus* which is commonly named as agouti/kholan. The antibacterial potential was assessed by microtest method employing p-iodonitrotetrazolium contrary to microorganisms like *Escherichia coli*, *Yersinia enterocolitica*, *Shigella sonnei*, *Pasteurella pestis* and *Staphylococcus aureus* is taken from *T. swinderianus*. Various extracts obtained from aerial parts were found efficacious against the tested microorganisms at different concentration levels ( $0.31 \leq \text{MIC} \leq 10$  mg/ml). Ethyl acetate extracts with MIC values of 0.62 mg/ml and 0.31 mg/ml were more potent against *E. coli* and *P. pestis*, *S. sonnei*, *S. aureus* respectively when compared to other extracts. The findings give an example of the classical use of *C. Religiosa* for the prevention of *Temminck Swinderianus* infections.<sup>[45]</sup>

Antibacterial activity of total alkaloids extracts of *C. religiosa* leaves and roots is evaluated on pathogenic germs in comparison to Amoxicillin + clavulanic acid (AMC), a conventional broad-spectrum antibiotic. Total alkaloid extracts from leaves and roots were found to be

more active than AMC against species of *Staphylococcus aureus*, *Klebsiella pneumoniae*, *Streptococcus agalactiae*, *Escherichia coli* and *Citrobacter freundii* following agar-well diffusion method using two concentrations (50 mg/ml and 200 mg/ml). Total alkaloids extracts of *C. religiosa* leaves and roots (200 mg/ml) gave the largest inhibition diameters against all microorganisms tested compared to AMC.<sup>[46]</sup>

The antimicrobial activity of the methanol extracts when compared to those of gentamycin and chloramphenicol against *Pseudomonas aeruginosa*, *Bacillus subtilis* and *Salmonella typhi*. The lowest MIC value of 0.70mg/ml for *Staphylococcus aureus* shows that it was more susceptible to the antimicrobial effect of the methanol extract. The diethyl ether extract had no antimicrobial activity while the methanol extract had a broad spectrum of antimicrobial activity. The extract had no antifungal effect. The chromatographic fractionation confirmed the antimicrobial agent to be steroidal terpenoids.<sup>[32]</sup>

### **Pesticidal activity**

The organic extracts of cyclohexane, methanol, chloroform of *Crataeva religiosa* was assessed on the insects like *Sitophilus zeamais*, *Callosobruchus maculatus* which devastate the crops maize and niébé. The results show that the chloroform extract delivers an improved death rate on *Sitophilus zeamais* as well as *Callosobruchus maculatus* while *Callosobruchus maculatus* is more sensitive to the treatment.<sup>[47]</sup>

The biological impact of *Crataeva religiosa* is evaluated on the external forms of *C. serratus*. The extract decreases the viability of larvae, eggs. It also reduces the fertilisation potential of survived females. It alters the sex ratio in favour of the males which results in the risk of declining population growth. Additionally, it postpones the total development time.<sup>[48]</sup>

### **CONCLUSIONS**

*Crataeva religiosa* has been used for the treatment of a variety of diseases in folklore and traditional medicine from centuries. The Medicinal Properties of the plant is due to the rich source of Phytoconstituents in it. Lupeol is the only one constituent to which isolated study is done. Although Pharmacological screening of the various parts of the plant has been explored confirming the biological profile in relation to its traditional use, the constituents accountable for the particular pharmacological properties have to be confirmed by suitable molecular mechanisms and remain unexplored extensively till date. Many traditional uses of these plant do not have scientific evidence where we can focus on. Bioassay-guided separation, detection

of bioactive components is essential, and in-depth analysis is also key to the exploration of the structure-activity relationship of such chemical components. The authors have given up-to-date details on the existing ethnopharmacological and phytochemical status of the plant-based on these facts.

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### CONFLICT OF INTEREST

Authors have No Conflict of Interest.

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