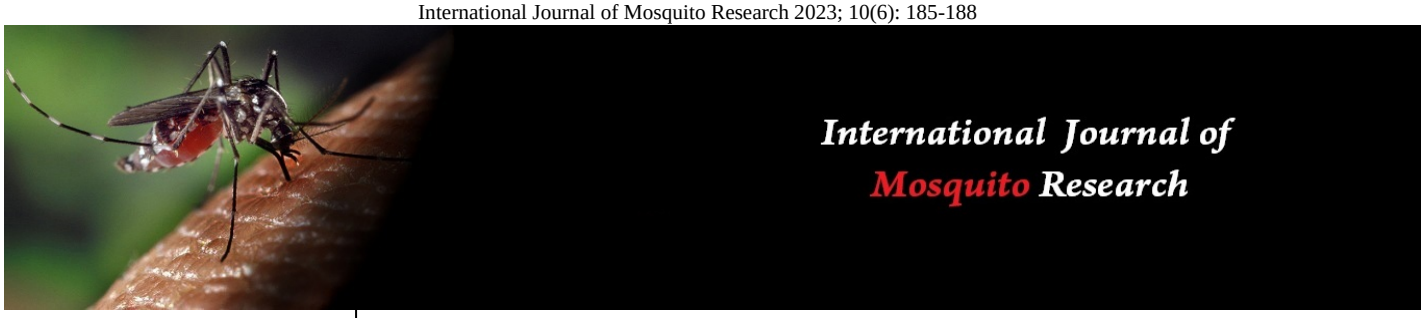

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Dr. Balasundar S
Associate Professor, Department of Dravyaguna Vijnana, Sri Sairam Ayurveda Medical College and Research Centre, Chennai, Tamil Nadu, India

Ramakrishna Allam
Associate Professor, Department of Dravyaguna Vijnana, Sri Sairam Ayurveda Medical College and Research Centre, Chennai, Tamil Nadu, India

Govardhan Sahani
Associate Professor, Department of Shalya Tantra, Sri Sairam Ayurveda Medical College and Research Centre, Chennai, Tamil Nadu, India

KM Divya
Assistant Professor, Department of Agada Tantra, Sri Sairam Ayurveda Medical College and Research Centre, Chennai, Tamil Nadu, India

Corresponding Author:
Dr. Balasundar S
Associate Professor, Department of Dravyaguna Vijnana, Sri Sairam Ayurveda Medical College and Research Centre, Chennai, Tamil Nadu, India

A review on ayurvedic herbal based mosquitocide

Dr. Balasundar S, Ramakrishna Allam, Govardhan Sahani and KM Divya

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Abstract
Mosquitocides are substances or agents specifically designed to kill or control mosquitoes. There are several reasons for the need of mosquitocides, and they play a crucial role in public health and environmental management. Some of the key reasons for the need of mosquitocides are disease control, public health protection, epidemic prevention and livestock protection. The widespread application of chemical insecticides resulted in a number of health problems as well as the emergence of resistant mosquito populations. They can be liquids, creams, coils, sprays, or any combination of these. Mosquitocides are intended to specifically target and eliminate mosquitoes, but they may also have unintended consequences for people, pets, and the environment. It's crucial to remember that the precise adverse effects can change based on the kind of mosquitocide applied. Among the health issues mentioned are irritability of the skin and respiratory tract, ocular irritation, toxicity in animals, and effects on the environment. Therefore, keeping this view in concern, alternative control measures can be considered, where the ayurvedic herbal mosquitocide is elaborately reviewed and concluded.

Keywords: Mosquitocides, ayurveda, disease control, environmental management

1. Introduction
A wide variety of flying and crawling insects attack humans, such as fleas, ticks, midges, chiggers, flies, and mosquitoes. Over 100 bacterial, protozoal, and parasitic diseases are spread to humans globally by them. An infectious vector only has to bite a victim once to spread illness.

These days, mosquito bites frequently result in infections. More diseases are spread to people by mosquitoes than by any other type of biting bug. More than 700,000,000 people contract various forms of viral encephalitis, yellow fever, dengue fever, Bancroftian filariasis, and epidemic polyarthritis each year thanks to mosquitoes as their carriers. Every year, 3,000,000 people die from malaria, which is spread by the bite of a mosquito carrying the single-cell protozoan Plasmodium.

There are so many chemical mosquito repellents available in the market. Studies proved that these repellents are toxic to human beings. It is necessary in this era to make a mosquito repellent which that not produce toxicity to human beings. In the classical text of Ayurveda, a unique formulation called *Dhoopa Kalpana* (Herbal fumigator) is mentioned. It is a fumigation technique mainly used in the treatment of allergic conditions. In the olden days, people used to practice *Dhoopana* (Fumigation) as a technique to overcome mosquitoes and there is ancient literature called *Uddisa Tantra,* a Sanskrit text that includes various Ayurvedic treatments where a special mentioning of herbal fumigation and is mentioned as *Mashaka Nivarana Prayoga* (*Mosquito repellent*) and based on this formulation, it is reviewed for its mosquitocide property.

2. Review of literature
The *Uddishatantra* [1] is a religious text in the form of a conversation between Lord *Shiva* and *Ravana*. In this text, 10 chapters are explained and in the 10th chapter *Mashaka nivarana dhoopana yoga* is explained, *i.e.*, the herbal-based mosquito repellent. The formulation includes ayurvedic herbs are mentioned in Table 1. The part used and the chemical composition of the ingredients is described in Table 2.

Table 1: The herbal drugs present in the mosquitocide formulation

S. No.	Ayurvedic drug name	Botanical name	Proportion
1	*Bhallathaka*	*Semecarpus anacardium* Linn. f.	1 Part
2	*Vidanga*	*Emblica ribes* Burm.f.	1 Part
3	*Shunti*	*Zingiber officinale* Rosc.	1 Part
4	*Pushkaramoola*	*Inula racemosa* Hook.f.	1 Part
5	*Jambu*	*Syzygium cumini* Linn.	1 Part

Table 2: The herbal drugs with its Chemical constituent and part used

S. No.	Ayurvedic drug names	Major Chemical constituents	Part used
1	*Bhallathaka*	Bioflavanoids, tetrahydrobustaflavone, tetrahydramentoflavane, nallaflavone	Fruits
2	*Vidanga*	Embelin, christembine, homoembelin	Fruits
3	*Shunti*	volatile oil α–Curcumene, β–DCurcumene, β Bourbornene, d-Borned	Rhizome
4	*Pushkaramoola*	Alantolactone, Isoalantolactone, Inunolide, Didydoisoalantolacctone	Root
5	*Jambu*	Eugenia tritespenoids, Oleanolic acid, Glucose, Fruticose, Gallic acid.	Fruit

Fig 1: *Semecarpus anacardium*

Fig 2: *Emblica ribes*

Fig 3: *Zingiber officinale*

Fig 4: *Inula racemosa*

Fig 5: *Syzygium cumini*

Fig 6: *Mashaka nivarana dhoopana yoga* (Herbal Mosquito repellent)

3. Method of preparation
All the ingredients are taken in dry form as described in Table 1 and made into powder and preserved in an air tight container.

4. Method of usage: Used as mosquitocide

5. Review on herbs used in the formulation
5.1 Bhallataka [2]
Semecarpus anacardium belongs to family Anacardaceae. A deciduous tree of moderate size that releases a black juice. pubescent on the underside of leaves, petiole, inflorescence, and young branches. The leaves are highly coriaceous, oblong-obovate, rounded at the apex, and cartilaginous at the edge. Fasciculate flowers have an upright, complex, terminal panicle arrangement and are yellowish-green in colour. Fruits are drupes, smooth, shiny, oblong or obliquely oval, and when ripe, purplish black in colour. Cup-orange red (fruits ripen from November to February; flowers bloom year-round, mostly in May and June) Major Chemical constituents are Bioflavonoids, Steroids, Terpenoids, Tetrahyd robustaflavone, Tetra hydramen to flavane, *etc*. According to a study conducted, the phytochemical analysis of hexane extract of the *S. anacardium* seeds [3], which showed the presence of steroids and terpenoids. These phytochemical groups might be responsible for the larvicidal activity.

5.2 Vidanga [4]
Emblica ribes belongs to family Myrsinaceae. A big, scandent shrub with long, slender branches and lenticels scattered in its bark. The leaves are glabrous, whole, coriaceous, 5-9 X 2-3.8 cm, elliptic or elliptic-lanceolate, acuminate, short and obtuse, and covered in minute, reddish-sunken glands all over the surface. The base may be rounded or acute. Pentamerous flowers are terminal, greenish yellow in hue, numerous, tiny, and arranged in panicled racemes. The fruit is globose, with a diameter of 3-4 mm, smooth and succulent while ripe, turning black when dry and pointed in a persistent manner like a peppercorn. Embelin, christembine, homoembelin, homorapanone, vilangine, and quercitoletc are the main chemical ingredients. According to a study, chloroform extract of Embelin shows larvicidal and pupicidal effects on mosquitoes [5].

5.3 Shunti [6]
Zingiber officinale belongs to family Zingiberaceae. A perennial herb with an upright habit. The stem is 15-150 cm long, upright, and leafy. The leaves are 10-30 cm long, linear, acuminate, lanceolate, and glabrous. The flowers are lip-orbicular, dull purple with creamy spots, with a shoot up to 12 cm long and sheathed in bracts 2-5 cm x 2 cm in light green. The primary chemical components of rhizomes include 1-5% of volatile oil with a yellowish hue, as well as starch, other contents, gingerine and other resins, yellow bitter substance, and oily resinous material as the primary active ingredient. In oil, gingerol does not become volatile. A study found that the death rate of *Aedes aegypti* mosquito larvae increased with the concentration of ginger extract. At 100% concentration, the maximum mortality was observed [7].

5.4 Pushkaramoola [8]
Inula racemose belongs to family Asteraceae. A robust, tall herb. Roughly 0.3 to 1.3 metres tall, the stem is grooved. The leaves are crenate, leathery, rough on top, and heavily hairy underneath. Racemes, or huge flowers, have a diameter of 3.8 to 5 cm. Broad outer bracts with triangular points that are folded back, and linear, sharp inner bracts. Fruit is pappus, 8 mm long, reddish, and achene, 4 mm long, lender, and hairless. Principal chemical components are an essential oil (1.3%) including alantolactone (C15H20 O2) and inulin (10%) found in roots. The main component of the oil extracted from the European species Inula helenium is alantolactone. A study revealed that the ethanol extract derived from the roots of Inula racemose shows larvicidal activity against Asian tiger mosquito, Aedes albopictus [9].

5.5 Jambu [10]
Syzygium cumini belongs to family Myrtaceae. It is a moderate-sized, glabrous tree. Leaves are coriaceous, shiny, whole, oval-oblong or lanceolate-oblong, long-acuminate, with several parallel, confluent lateral nerves close to the edge. The flowers are tetramerous, greenish, and grouped in three flowered cymes that form a large, calyx-tube funnel-shaped trichotomous panicle. Berries might be rectangular or subglobose, purple or blue, smooth, and luscious when mature. Fruits containing oleanolic acid, glucose, fructose, gallic acid, and the Eugenia triterpenoids A and B are the main chemical constituents. Myricetin, quercentin, and kaempfesol are present in the stem bark and roots. According to a study conducted it shows that *Syzygium cumini*, also known as jamun or java plum, has potential as a mosquito control agent [11].

6. Conclusion
A key component of preventing serious vector-borne illnesses including dengue, filariasis, yellow fever, and malaria is controlling mosquito populations. Chemical insecticide use was excessive, which resulted in resistant insect populations and adverse effects on a variety of non-target creatures and the environment as a whole. As a result, alternative methods of control, such as herbal mosquitocides from Ayurveda, have been examined. These readily available herbal remedies work well against mosquitoes of all life stages. The market is flooded with repellents made of chemicals and plants.
Due to the widespread use of chemical pesticides, insect populations became resistant, which limited management and frequently had detrimental effects on a variety of non-target organisms as well as the environment as a whole. Furthermore, current toxicity studies demonstrate that these chemical repellents are bad for the environment and for people. Ayurvedic books describe using herbal medications for fumigation, which keeps mosquitoes away from people and the environment without posing any risks. On reviewing the drugs mentioned as mosquitocide in the ancient ayurvedic text, it is very clear that all drugs have larvicidal and pupicidal activity on mosquitoes in the studies conducted.

7. Reference
1. Lankesh R, Uddisa Tantra, Shivadatti Hindi commentry; Varanasi Krishnadas Academy; c1998.
2. Sastry JLN. Text book of Dravyaguna Vijnana, First Edition, Choukambha Orientalia publications, Varanasi. 2004;2:135.
3. Sivaraman G, Gabriel PM, Rajiv GM, *et al*. Larvicidal potential of *Hydnocarpus pentandra*, oken seed extracts against *Aedes aegypti* Linn. And *Culex quinquefasciatus*

Say (Diptera: Culicidae). International journal pure and applied zoology. 2012;2(2):109-12.
4. Sastry JLN. Text book of Dravyaguna Vijnana, Vol.2, First Edition, Choukambha Orientalia publications, Varanasi; c2004, 318.
5. Stalin A, Daniel Reegan A, Rajiv Gandhi M, *et al*. Mosquitocidal efficacy of embelin and its derivatives against *Aedes aegypti* L. and Culex quinquefasciatus Say. (Diptera: Culicidae) and computational analysis of acetylcholinesterase 1(AChE1) inhibition. Comput Biol Med. 2022 Jul;146:105535.
6. Mosquitocidal efficacy of embelin and its derivatives against *Aedes aegypti* L. and *Culex quinquefasciatus* Say. (Diptera: Culicidae) and computational analysis of acetylcholinesterase 1 (AChE1) inhibition, Computers in Biology and Medicine. 2022;146:105535.
7. Sastry JLN. Text book of Dravyaguna Vijnana, First Edition, Choukambha Orientalia publications, Varanasi. 2004;2:519.
8. Lintje B, Zul FA. *Zingiber officinale* rosc: Activity as Natural Insectiside of *Aedes aegypti* Larva, A multifaceted review Journal in the field of pharmacy, Sys Rev Pharm. 2022;13(2): 98-101.
9. Sastry JLN. Text book of Dravyaguna Vijnana, Vol.2, First Edition, Choukambha Orientalia publications, Varanasi; c2004, 298.
10. Qing H, Xin CL, Rui QS. Mosquito Larvicidal Constituents from the Ethanol Extract of *Inula racemose* Hook. f. Roots against *Aedes albopictus*; c2014, 738796.
11. Sastry JLN. Text book of Dravyaguna Vijnana, First Edition, Choukambha Orientalia publications, Varanasi. 2004;2:228.
12. Samivel K, Arulsamy J, Kalimuthu K. Novel insecticides of *Syzygium cumini* fabricated silver nanoparticles against filariasis, malaria, and dengue vector mosquitoes, International Journal of Mosquito Research. 2018;5(5):95-106.