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## Review on tribal medicinal practices of north-east India for mosquito Repellency

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### Abstract

Mosquitoes are the small flies which belong to the family culicidae. Female mosquitoes are the main culprits in spreading of many diseases like Malaria, Dengue, Chikengunia, Yellow fever, Nile fever etc. According to the WHO research, a no of deaths were reported because of mosquitoes. Mosquitoes are more attracted towards lactic acid, carbon dioxide, sweat, alcohol and many other flower and fruit fragrances discharged through number of perfumes and soaps. Anything that is used as a coating on the body or clothing and which masks ones odour and helps in repelling mosquitoes are called as mosquito repellents. A number of mosquito repellents are available in the market both in natural and artificial forms. Repellents based on natural sources are gaining today's market, as people are more resolute to eco friendly products and practices. There are number of age old practices for repelling insects which were followed and are still in practice by tribal dwellings like burning of leaves, roots and application of oils extracted from plant sources like Eucalyptus leaves, Azardirachta Indica, Aloe vera etc. The chemical formulations emitted from plant sources helps in repelling mosquitoes, oviposition attractants as well as growth regulators. In the present study, a small attempt was made to review the tribal practices for repelling mosquitoes followed by tribes of North-East India.

**Keywords:** Mosquito Repellents, North-East India, Tribal Practices, Medicinal plants for Mosquito Repellency.

### 1. Introduction

Plant based medicinal practices have been used for generations in tribal areas. Knowledge on traditional practices using plant resources obtained through ethnobotanical studies will stand as a valuable resource in developing new products. Plant based mosquito repellents are gaining today's market as consumers are paying more attention to biodegradable and eco friendly products. Majority of plants contain repelling compounds like alkaloids, terpenoids, phenolics, proteinase inhibitors and growth regulators to prevent attack of plant eating insects. The major function of these compounds is to defend against phytophagous insects, mosquitoes and other biting diptera, especially those volatile components released as a result of herbivory. The repellency of plants have been explored by man from thousands of years. man has been using plants in different forms like burning of leaves of Azardirachta Indica, Growing of plants like Ocimum Sanctum and Aloe vera in and around houses, Application of plant extracts of Aloe vera and Eucalyptus on exposed body parts were still in practice in tribal areas as well as many villages.

#### 1.1 Review on Mosquito Repellent Plant Sources Used By Tribes of North-East India

India is a hotspot of more than 427 tribal communities with diversified and rich traditional knowledge on different medicinal and indigenous practices, as tribes generally depend on forest for their livelihood and healthcare needs. They do have a very rich knowledge on herbal medicines since time immemorial in treating diseases. knowledge on traditional practices is very important in developing innovative medicines or products. Since people are more focused on herbal products, knowledge on traditional practices would help companies to develop natural products based on plant sources. Ethnobotanical studies have gained popularity to explore the traditional practices. Neem (Azadirachta Indica) is one of the best known source used by almost all the tribes round the world in one or the other form for repelling insects, bacteria as well as mosquitoes, the active constituent in neem leaves is a tetranotriterpenoids called azadirachtin. Citronella grass, cymbopogon nardus, is another well known source for repelling mosquitoes which contain citronella oil, burned traditionally in southeast Asia for repelling mosquitoes. Researches and ethnobotanical studies have proven that members of Mint Family and Ocimum were extensively used throughout Africa for repelling insects.

**Table 1:** Plant sources used by different tribes of North-East India for Mosquito Repellency

Sl. No.	State	Tribes	Plant Sources	Family	Common Name	Form of Usage
1.0	Sikkim Debnath <i>et.al</i> (2016) <sup>[4]</sup>	Lepcha community in Darjeeling	<i>Artemisia vulgaris</i> L	Asteraceae	Common worm wood, Mugwort.	Fumes from the fresh plant acts as insect and mosquito repellents
			<i>Clausena anisata</i>	Rutaceae	Horse wood.	Fumes from the burned dried plant acts as mosquito repellent.
			<i>Curcuma Longa</i>	Zingiberaceae	Turmeric	Rhizome paste applied externally on body parts.
			<i>Hyptis suaveolens</i> (L.) poit.	Lamiaceae	Pig nut.	Leaf juice applied externally on body parts
			<i>Lantana Camara</i>	Verbenaceae	Lantana	Leaf oil applied externally on body parts
	Das <i>et.al</i> (2012) <sup>[3]</sup>	Eastern Sikkim Himalayan Region	<i>Acorus Calamus</i>	Araceae	Sweet Flag Sweet cane	Dried Root/Rhizome burned with charcoal/dung acts as mosquito repellent.
			<i>Adhatoda Vasica</i>	Acanthaceae	Malabar nut Addasaramu (Telugu)	Fumigants from burned bark, leaves and root acts as Mosquito repellent
			<i>Anacardium Occidentale</i>	Anacardiaceae	Cashew	The smoke of burnt rind of fruit is used as mosquito repellent
			<i>Artemisia Vulgaris</i>	Asteraceae	Indian Wormwood	The smoke of burnt plant/twigs is used as mosquito repellent
			<i>Atherosperma moschatum</i>	Monomiaceae	Southern sassafras	Plant oil applied externally on exposed body parts
2.0	Meghalaya Laloo <i>et.al</i> (2006) <sup>[6]</sup>	Sacred forests of Meghalaya	<i>Litsea citrata</i> Bl.	Lauraceae	May chang	Fruit extracts acts as insect repellent
			<i>Randia longiflora</i> Lamk.	Rubiaceae	Indigo berry	Fruit extract insecticidal and insect repellent and used in insecticidal preparation
3.0	Assam Ratul <i>et.al</i> (2013) <sup>[10]</sup>	The Jaintias of North Cachar hills, Bodo communities of Goalpara district of Assam	<i>Kaempferia galanga</i> L	Zingiberaceae	Aromatic ginger, Sand ginger	Rhizome extracts acts as insect repellent
			<i>Ocimum gratissimum</i> Linn	Labiatae	Ram tulsi	Plant juice is used as insect and mosquito repellent
	Barukial <i>et.al</i> (2011) <sup>[2]</sup>	Golaghat District of Assam	<i>Flemingia involucrate Benth</i>	Papilionaceae	Makhioti	External application of leaf extract on skin to repel mosquitoes and different types of insects.
			Sarat <i>et.al</i> (2008) <sup>[11]</sup>	Dijuvelly, Haakmuthia, Lengteng, Kandali, Amoni, Sapanala, Kuthori and Jagadomba tribes of Nagaon district	<i>Adhatoda vasica</i> Nees	Acanthaceae
<i>Ocimum sanctum</i> L	Laminaceae	Tulsi			Juice of raw leaves applied externally.	
4.0	Arunachal Pradesh Murtem <i>et.al</i> (2016) <sup>[7]</sup>	Upper Subansiri District of Arunachal Pradesh (Tagin, Hill Miri, Galo tribes)	<i>Canarium bengalense</i> Roxb.	<i>Burseraceae</i>	<i>Pacific almond, Galip nut</i>	Incense burnt from oleoresin of plant act as mosquito repellent.
5.0	Tripura Sudipta <i>et.al</i> (2012) <sup>[13]</sup>	Nabincherra, Jaithang, Boonang, Baithangbari, Kalacherra, Balidhum, Noangang, Baruakandi, Chandra Halam Para, Biragibari, Shailenbari and Gobindapur villages of Tripura.	<i>Azadirachta indica</i> A. Juss	Meliaceae	Neem	Smoke produced by burning leaves and stem is used as mosquito repellent
			<i>Kaempferia rotunda</i> Linn	Zingiberaceae	Bhumi Champa/Peacock Ginger. Kondakaluva (Telugu)	Incense burnt from flower and rhizome of plant act as mosquito repellent.
			<i>Kalanchoe pinnata</i> Pers	Crassulaceae	Miracle Leaf/ Life plant	Juice of raw leaves applied externally to prevent insect bites
			<i>Ocimum sanctum</i> L	Laminaceae	Tulsi	Application of raw juice externally on exposed body parts.
6.0	Mizoram Prabhat <i>et.al</i> (2010) <sup>[9]</sup>	Tribes of Tropical Evergreen forest, Tropical semi-evergreen forest and sub tropical Hill forest	<i>Adhatoda zeylanica</i>	Acanthaceae	Malabar Nut Addasaramu (Telugu)	Dried leaves are burned and the fumes acts as mosquito repellent.
			<i>Callitris glauca</i>	Pinaceae	Cypress pine	Application of oil from wood on external body parts to repel mosquitoes
			<i>Clousena anisata</i>	Rutaceae	Horse Wood	Fumigants from dried leaf sources acts as mosquito repellent

			<i>Ocimum tenuiflorum</i> Linn.	Lamiaceae	Holy basil. Tulsi (Telugu)	Juice of raw leaves applied externally/Plant grown/kept inside house
			<i>Santalum album</i>	Santalaceae	Indian Sandal wood	Essential oils obtained from wood applied externally on exposed body parts
	Prabhat Kumar <i>et.al</i> (2011)	Indo-Burma Hotspot Region.	<i>Adhatoda zeylanica</i> Medik	Acanthaceae	Malabar nut Addasaram	Leaf paste is applied on exposed body parts during night.
			<i>Ocimum tenuiflorum</i> L.	Lamiaceae	Tulsi	Crude extracts of leaf oil acts as mosquito repellent.
7.0	Manipur Neli Lokho (2012) <sup>[8]</sup>	Senapati district	<i>Acorus calamus</i> Linn	Acoraceae	Sweet flag	Extracts from rhizome is applied externally on the body parts during night time.
			<i>Artemisia nilagirica</i> (Clarke) Pamp	Asteraceae	Indian Wormwood Masipatri (Telugu)	The leaves are rubbed against skin of animals to repel mosquitoes
			<i>Artemisia parviflora</i> Roxb	Asteraceae	Red stem Worm wood Mugwort	Paste applied externally or dried stems are burned, and the fumes acts as mosquito repellent.
			<i>Arundo donax</i> Linn	Poaceae	Spanish cane, wild cane, river reed, giant reed	Fumigants from dried leaf sources acts as mosquito repellents
			<i>Chenopodium ambrosioides</i> Linn	Chinopodiaceae	Pig weed , goose foot Pappukura (telugu)	Dried plant parts burned and the fumes acts as mosquito repellents
			<i>Nicotiana tabacum</i> Linn	Solanaceae	Cultiated tobacco	The juice of the leaves can be rubbed on the body as an insect repellent. (Kamal kishore 2014)
			<i>Oroxylon indicum</i> (Linn.) Vent	Bigoniaceae	Broken Bones Tree. Mandukaparnamu, Tundiklamu (telugu)	Fresh plant parts are crushed or ground and applied as paste on exposed body parts
Ashalatha <i>et.al</i> (Jan 2004)	Sacred groves of Manipur	<i>Artemisia nilagirica</i> (C.B. Clarke) pamp.	Verbenaceae	Laibak-ngou	External application of leaf juice on skin for repelling different types of insects as well as mosquitoes.	
8.0	Nagaland Jamir <i>et.al</i> (2016) <sup>[5]</sup>	Phom tribe of Longleng district	<i>Ageratum conyzoides</i> L.	Asteraceae (sunflower family)	Goat Weed	Fumigants of the dried plant is used as mosquito repellents.
			<i>Arisaema concinnum</i>	Araceae	Chinese Cobra Lily	Fumes from dried tubers acts as mosquito repellents
			<i>Curcuma longa</i>	Zingiberaceae	Turmeric	Paste applied externally on body.
			<i>Cymbopogon citratus</i> Stapf.	Poaceae	Lemon grass Nimma gaddi(Telugu)	Leaf extract applied externally on body parts as an insect-repellent
			<i>Lantana Comara</i>	Verbenacea	Lantana Pulikampa (Telugu)	Oil extracted from leaves applied externally on exposed body parts.
	Shankar <i>et.al</i> (2016) <sup>[12]</sup>	North East India Assam, Arunachal Pradesh, Mizoram, Manipur, Meghalaya and Nagaland.	<i>Azardirachta indica</i> A.Juss.	Meliaceae	Neem tree	Fumigants from dried leaves, bark and fruits acts as mosquito repellent
			<i>Elsholtzia blanda</i> (Benth)	Lamiaceae	Pheiri Bantulsi	Leaf juice is applied externally on body
			<i>Eucalyptus globules</i> Labill.	Myrtaceae Family	Southern blue gum, Blue Gum,	Extracts of fresh leaves applied on Skin
			<i>Homalomena aromatic schott.</i>	Araceas	Sugandhamantri	The burnt smoke of dried rhizome is used as mosquito repellent.
			<i>Ocimum gratissimum</i> L.	Lamiaceae	Ram tulsi	Essential oils from plant leaves applied externally as mosquito repellent
Premkumar Singh <i>et.al</i> (2015)	Zeliang tribe, Naga Tribe	<i>Elsholtzia blanda</i> (Benth)	Lamiaceae	Lomba	Fumigants of the dried plant is used a mosquito repellents	

## 2. Conclusion

Mosquitoes are responsible for variety of diseases. Apart from, the technological advancements used for their control, the mosquito continue to cause major health problems to public. Herbal/ plant based insect repellents should provide protection against insects besides posing no harm to the humans. On the contrary, environmental protection is also the major objective as chemical based repellents would harm the environment in one or the other way. This study attempted to record the traditional practices of tribal people of North-East India against insect/mosquito repellent. A number of traditional practices do exist since ancient times which are purely plant based, and are practiced by tribes and villagers till now in India and other parts of the world. Plants do have different types of phytochemicals like phenols, tannins, alkaloids which play an active role in repelling mosquitoes. Majority of tribal practices in North East states of India includes application of extracts from plant sources like Lantana Camra, Ram tulsi, Tulsi, Sweet Basil, Cypress Pine, Sandal wood, lemon grass and the fumigants from the burned parts of plants like Neem, Horse wood, Malabar Nut, worm wood etc.

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