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Ethnobotanical tribal practices for mosquito repellency followed by people of north India

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Abstract

Mosquitoes are small flies that belong to the family Culicidae. Most of the female mosquitoes are ectoparasites which depend on human blood and are responsible for spreading of dangerous diseases like malaria, dengue fever, chikungunya, zika virus and other diseases. Mosquito repellents are substances which help in preventing mosquito bites. No of repellents are available in the market in different forms like sprays, lotions, roll-ons, coils, dup sticks, repellent liquids, lamps etc. Before the availability of repellents in market, traditional practices are well known to repel mosquitoes. Till date many tribes and villagers still follow traditional practices using leaves, roots, bark, flowers from many plants in one or other way to repel mosquitoes. The present paper reviews the tribal medicinal practices that were followed by people of North India for mosquito repellency. The present study of review on ethno botanical practices for mosquito repellency revealed that people of North India depend on Holy basil, Sweet basil, Neem and five leaved chaste tree for mosquito repellency.

Keywords: Mosquitoes, Repellents, Mosquito repellents, North India, Tribal practices for mosquito repellency

1. Introduction

Mosquito repellents are substances or products that makes the surface unpleasant or unattractive for mosquitoes to bite. Most of the mosquito repellents that are available in the market have one active ingredients and one secondary ingredient. The active ingredient helps in repelling mosquitoes whereas secondary ingredient helps in giving cosmetic appeal to the product/repellent. Traditionally, various things have been used to repel mosquitoes which include smoke, plant extract, oils and muds. With the increase of technology, individual compounds have been isolated for preparation of new mosquito repellent formulations. DEET, (full form) Pyrethrin, Picardian, Permethrin, Pyrethroids, IR 3535 and many other synthetic repellents are available in the market. The synthetic repellents are often powerful and longer lasting compared to natural repellents but at the same time, synthetic repellents have many disadvantages and are likely to cause irritation to eyes, throat, lips and sensitive areas, and are said to have very pungent chemical smell. Due to the above-mentioned disadvantages, people have become nature conscious and are concentrating more on natural based products and practices for keep away mosquitoes.

1.1 Phytochemicals

The chemical compounds present in plants which are responsible to help the plants to thrive predators or pathogens. The name is derived from the Greek word *Phyton* which means plant. Few phytochemicals acts as poison where as many other phytochemicals are known to be used in tribal medicinal practices. Alkaloids, saponnins, steroids, tannins and terpenoids are the main phytochemicals that are said to be responsible for mosquito repellency in plant sources.

1.2 Review on Mosquito repellent plant sources used by Tribes of North India

Plants were well known to be used in the tribal medicinal practices since time immemorial. 20,000 species of plants were pointed by World Health Organization globally in many medicinal uses. Many plants are likely to process certain types of phytochemicals in order to protect themselves from herbivorous animals and insects. These phytochemicals even help in repelling insects which always depend on the plant juices for their feed. Repellents have an important place in protecting the man from mosquito stings. Plant sources such as Neem, Tulsi, Aloe era and Turmeric were known to be used in tribal medicinal practices for repelling mosquitoes since ancient times. Polishing of house floor with leaf plant extracts obtained mainly from the species of Azadirachta, Artemisia, Lantana, Ocimum and Cymbopogon is routinely done to drive away mosquitoes and other insect's flies as common tradition among

the community members of rural tribal people. Here is the list of plant species used from generations by various tribes of North India

Table 1: Traditional practices for mosquito repellency followed by people of North India- Jammu and Kashmir, Himachal Pradesh, Punjab, Uttarkhand, Haryana, Rajasthan and Uttar Pradesh

Sl. No.	State	Tribes	Plant Sources	Family	Common Name	Form of Usage
1.	Jammu and Kashmir Lone <i>et.al</i> (2013) ^[12]	Bandip district of Jammu and Kashmir	<i>Anthemis cotula</i> Linn.	Asteraceae	Dog- or hog's-fennel, stinking chamomile.	Seeds possess a pungent smell and hence are kept in the books and garments as insect repellents.
2.	Himachal Pradesh Savitha Rani <i>et.al</i> (2015)	North-West Himalayas.	<i>Ocimum sanctum</i> L.	Lamiaceae	Holy basil Tulsi	Local people grow Tulsi as the religious plant and believe that the leaves of the plant act as mosquito repellent.
	Neelam Kumar (March 2014) ^[16]	Tehsil Joginder nagar, Mandi district	<i>Ocimum basilicum</i> Linn	Lamiaceae	Sweet basil Sabza	Leaf extract of basil as external application
	Thakur <i>et.al</i> (April 2014) ^[20]	Bharmour Forest Division, Himachal Pradesh	<i>Origanum vulgare</i>	Lamiaceae	Origanum	Leaves has strong aromatic smell which acts in repelling mosquitoes in dry as well as fresh form. Dry(incense), Fresh (juice extracts)
2.0	Punjab Khan <i>et.al</i> (2016)	Arian and Batwal Tribes	<i>Albizialebeck</i> (L.)	Fabaceae	Annatto	Burning of stem bark produces fumes which acts as mosquito repellents
			<i>Azadirachtaindica</i> (L.)	<i>Meliaceae</i>	Bonpland's croton	Smoke from burning of dried leaves, bark and flowers are used as mosquito repellents
			<i>Vitexnigundo</i> Linn	<i>Verbenaceae</i>	Chaste Tree.	Smoke from burning of dried leaves acts as mosquito repellent
3.0	Uttarakhand Shah <i>et.al</i> (2014)	Nainital catchment area of Uttarakhand	<i>Anaphalis contorta</i> (D. Don) Hook. f.	Asteraceae	Pearly everlasting	Leaf Paste is applied on external body parts which were mostly exposed.
			<i>Salvia longifolia</i> Nutt.	Lamiaceae	Sage	Paste acts as mosquito repellent
	Matur <i>et.al</i> (2013) ^[13]	Tarai Region of Kumaun	<i>Bixa orellana</i> L	Bixaceae	Annatto	Pulp of seeds acts as mosquito repellent.
			<i>Croton bonplandianus</i> Baill.	Euphorbiaceae	Bonpland's croton	Twig extract has antitumor properties, and leaf extract is used as a mosquito repellent.
	Haryana Vashistha <i>et.al</i> (2013) ^[21]	Ambala District, Haryana	<i>Coronopus didymus</i> (L.) Sm.	Brassicaceae	Swine cress	Fumigants from the whole plants parts acts as insect repellent.
			<i>Erigeron linifolius</i> Willd.	Asteraceae	Flax- leaf fleabane, Wavy- leaf flea bane	Seed is aromatic and insect repellent.
	Rajasthan Santosh, (2012)	Tribes of Rajasthan	<i>Commiphora wightii</i> or <i>Commiphora mukul</i> (Guggul)	Burseraceae	Guggul.	Resin Incense was burned to repel mosquitoes.
			<i>Vetiveria Zizanioides</i> (Linn)/ <i>Chrysopogon zizanioides</i> (L)	Poaceae/Gramineae	Vetiver, Khas Khas, Khus.	Oil extracts from the plant contains Vetivone, Zinanal and Epizizizanal. Zinanal and Epizizizanal. The oil when applied externally acts as mosquito repellence
4.0	Uttar Pradesh Jameel <i>et.al</i> (2013) ^[7]	Tribes of Uttar Pradesh	<i>Azdirachta Indica</i>	Meliaceae	Neem	Oil extracted and mixed with kerosine and the oil when used in lamps acts as mosquito repellent
			<i>Cannbis sativa</i>	Cannabaceae	Marijuana, Gallow Grass	Fumigants from the leaves acts as insect repellent.
			<i>Lantana Camara</i>	Verbenaceae	Lantana.	Oil extracted from leaves acts as mosquito repellent
			<i>Melia azedarach</i>	Miliaceae	China berry	Oil extracted from the leaves acts as mosquito repellent
	Rajesh Kumar <i>et.al</i> (2012)	Tribes of Uttar Pradesh	<i>Azadirachta indica</i> A. Juss	Meliaceae	Neem	External application of leaf oil, Incense burnt from dried leaves

					act as mosquito repellent.
		<i>Calotropis procera</i>	Asclepiadaceae	Rubber Bush	Incense burnt from dried leaves act as mosquito repellent.
		<i>Urena lobate</i>	Malvaceae	Caesar weed	Paste of leaves mixed with coconut oil and applied externally on skin to repel mosquitoes.

2. Conclusion

Mosquitoes are the main culprits in spreading variety of diseases. Despite the advances in techniques and products used for the control of mosquitoes, it tends to increase the resistance power towards the products developed and continue to pose serious health problems. On the contrary, people became environment conscious and started showing interest towards eco-friendly products. An insect repellent of plant origin should pose less harm to the humans without any side effects. Therefore, use of botanical derivatives in mosquito repellents instead of chemicals could ultimately result in less cost per production as well as less effect on environment. Varieties of plant species around the world has mosquito repellent property. More studies have to be carried out to find out the mosquito repellent plants. Different plant compounds responsible for repellence can be discovered and can be used as an alternative to synthetic repellents. On the other hand, plants that are responsible for repelling mosquitoes need to be maintainable and the source of plant parts that act as repelling agents should be obtained from parts that can be easily grown instead of using the whole plant like leaves, stems and bark. The plants that are said to be repellent should be easily harvested and stored. Plant based mosquito repellents are known to be used by tribal people and many villagers since generations. The knowledge on tribal practices or ethnobotanical studies paves way in the development of many new products. The present review has enlightened the use of Lantana, Neem, Tulsi, five leaved chaste tree and paste of annatto seeds for mosquito repellence as used by people of North India.

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