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Mini review: Herbal mosquito repellent formulation for textiles using herbal extracts

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ABSTRACT

Mosquitoes are small, midge like flies that constitute the family Culicidae. Which transmit extremely harmful diseases such as malaria, yellow fever, Chikungunya, West Nile Virus, dengue fever, filariasis, Zika virus and other arboviruses rendering it the deadliest animal family in the world. Many medicinal herbs and essential oil has been reported to have many pharmacological activities, one of which is their property to repel the mosquitoes. Essential oils are volatile mixtures of hydrocarbons with a diversity of functional groups, and their repellent activity has been linked to the presence of mono - terpenes and sesquiterpenes. A mosquito repellent is a substance applied to skin, clothing, or other surfaces which discourages mosquitoes from landing on that surface. Herbal repellents are cost effective, easily available and low toxic as compared to synthetic repellents.

Keywords: Repellent, mosquito repellent, essential oil, Vector-borne disease.

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INTRODUCTION

Mosquito repellents: Personal protection measures are the first line protection against mosquito bites. In the protection against arthropods repellent play important role, because they can be used anywhere and anytime. They prevent the vector borne disease incidence by reducing man-vector contact. Approximately 2700 species of mosquito are found all over the world; the three most significant of these are the Aedes, Anopheles, and Culex According to the World Health Organization (WHO), more than 1 million people dies every year due to mosquito bites and the majority are due to malaria. In 1897-1898 while working in India, British Army Doctor Ronald Ross first discovered and demonstrated how malaria parasites get transmitted first between a patient and a mosquito, and then between hosts via mosquitoes. For this work Ronald Ross was honoured with the Nobel Prize in 1902. But it was Henry Shortt and Cyril Garnham who in 1948 discovered that malaria parasites develop to the final stage in the life cycle in the liver before entering the blood stream.[1]

Plants based essential oils have received much attention plant based repellents that reduce vector borne disease have the advantage that they are economic and environmentally safe. Essential oils are composed of highly volatile substances having major and minor constituents which have repellent activity.[2]

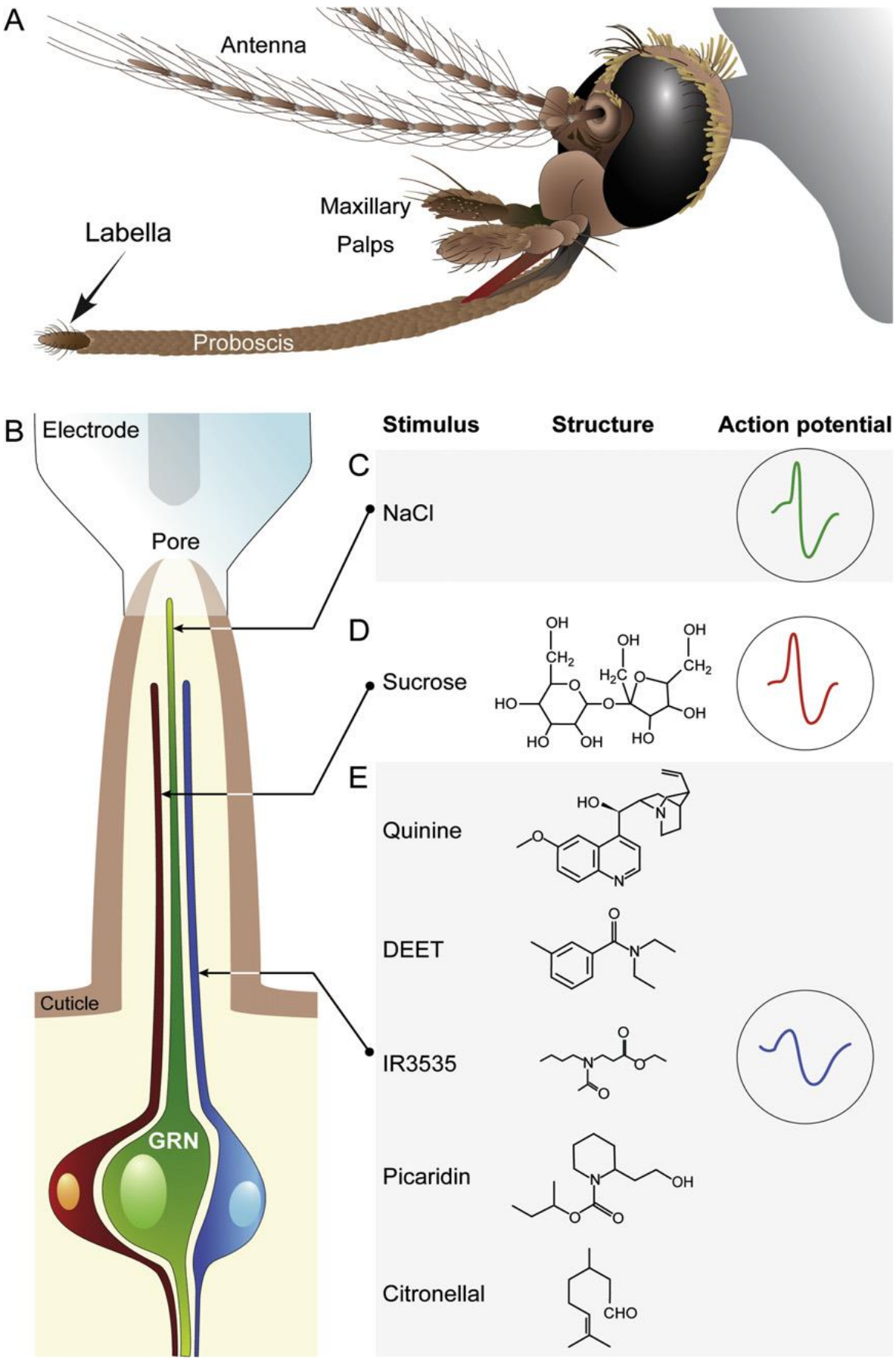
MECHANISM OF MOSQUITO REPELLENTS

The action of mosquito repellent agents can be broadly divided into two types:

1. Olfactory mode

2. Tactile mode

Mosquitoes usually use the warm and humid convection rising from the human body as a mode for contacting humans by sensing an increase in atmospheric carbon-dioxide concentrations. In Olfactory mode which is also called as transpiration repellence**,** humidity-sensing holes of mosquitoes which helps the mosquitoes in locating the living organisms are blocked hence they cannot locate humans. While the tactile mode is based on the action of repellent substances on the mosquito's nervous system which causes them to enter in a confused state and resist their behaviour at sub-lethal/mortal/toxic doses, before knockdown due to their contact with fabric surface. The tactile mode action is also called as direct-contact repellency which drives the insects away from the surface before they can suck blood.[3,4]



(A) Location of sensilla on the labella of Ae. aegypti. (B) Electrophysiological recordings from sensilla on activated by quinine, a feeding deterrent, and the insect repellents DEET, IR3535, Picaridin, and citronellal, the labella revealed action potentials from at least 3 gustatory receptor neurons (GRNs). (C) The largest amplitude action potential responded to increasing concentrations of NaCl. (D) A somewhat smaller amplitude action potential responded to sucrose. (E) The smallest amplitude action potential.[4]

MOSQUITO REPELLENT FINISH BY HERBAL METHOD[5,6,7]

Herbal repellents are superior to chemical repellents as they are eco friendly, non allergic, non toxic. To apply herbal repellent first herbal extracts are prepared then those extracts are applied on textiles.

1. Extraction of Herbal Extracts

Fresh herbs are sorted out and shadow dried, after drying the herbs are grounded to fine powder. For extraction appropriate amount of dry powder is mixed with solvents like methanol, ethanol, hexane etc. or in water and kept either overnight or for few days or few hours in the closed container. Then the extract is filtered through filter paper. After filtering the herba1l extracts are condensed by evaporating the solvents and stored for later use.

2. Application of Herbal Extracts

Various areas where mosquito repellent textiles are used . To make textiles mosquito repellent herbal extracts need to be applied on textile substrate for this following method can be used:

2.1. Direct Application Method

In this method, the prepared extract is directly applied on the fabric using pad-dry-cure method. The fabric is padded in extract, squeezed, dried and cured.

2.2. Microencapsulation Method

In this method the herbal extracts are enclosed in microcapsules. The fabric is then finished using exhaustion method. The fabric is kept immersed in the microcapsule solution and then removed, squeezed, dried.

CONCLUSION

In the past, focus of chemical mosquito repellent manufacturers was solely on the efficacy and response of mosquitoes but after the introduction of herbal mosquito repellent remarkable work has begun on entomological studies and toxicological actions of mosquito repellents. Various researchers have reported the use of herbal extracts as mosquito repellents. Examined and found remarkable repellent properties of essential oil extracted from the leaves of peppermint plant. They reported 100% protection till 150 min against the larval and adult stages of Aedes aegypti**.**

Herbal repellent reduce the toxicity and side effects as compared to the synthetics. Pharmaceutical industry, researchers have raised concern about the mosquito repellent products using herbal ingredients. The use of a lipid-based formulation system such as liposomes should yield a better impact on the stability, as well as the release of the active ingredient i.e. essential oil. The natural and herbal finishing agents which were applied on the fabric have very good mosquito repellent property. These are eco-friendly, bio-degradable, non-toxic and non-allergic to the skin and have a great potential as commercial repellent products.

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