EUROPEAN JOURNAL OF BIOMEDICAL AND PHARMACEUTICAL SCIENCES
http://www.ejbps.com

ISSN 2349-8870
Volume: 4
Issue: 5
41-44
Year: 2017

A REVIEW ON STRATEGIES FOR CONTROL OF MEDICALLY- IMPORTANT INSECTS USING COMMON HERBS FROM TRADITIONAL MEDICINE

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Article Received on 01/03/2017 **Article Revised on 21/03/2017** **Article Accepted on 10/04/2017**

ABSTRACT
Insects play important role as vectors of many diseases such as Malaria, Leishmaniasis and Dengue fever. Most of these diseases are often seen in communities of developing Countries. The composition of some plants can be used as alternatives to synthetic insecticides. Compared to chemical insecticides, adverse effects of these plants on humans and the environment are minimal and hence a lot of research in this field has been conducted recently in many parts of the world. This study was a review of relevant literatures on medicinal plants from traditional medicine with insecticidal and repellent properties. This present study proposes that some traditional medicinal plants such as garlic (*Allium sativum*), bitter melon (*Citrullus colocynthis*), laurel (*Laurus nobilis*), basil (*Ocimum basilicum*) have insect repellent and insecticidal properties. The plants can be used in different ways including raw plant extracts, boiling oil and fumigation. According to results from studies in different regions of the world; herbs, insecticidal and repellent effects of medicinal plants are encouraged due to their compatibility with the environment. They can be good alternatives to synthetic pesticides, chemical repellents and can be used to avoid human interactions with insects as well as damage caused by insects.

KEYWORDS: Insect repellent, Medicinal herbs, Strategy, Traditional medicine.

INTRODUCTION
Insects are a group of invertebrates animals, which despite their benefits to the environment, have caused economic and social damages.[1] Throughout history, insects have caused damages and nuisance to humanity and are responsible for the transmission of diseases and many deaths among humans.[2] Insects are important agents in the transmission and spread of many diseases, not only in rural areas but also in urban areas.[3]

Female Anophele mosquito is known to transmit malaria, Aedes mosquitoes cause Dengue fever and Culex mosquitoes transmit Lymphatic Filarial disease. In 2010, 216 million cases of malaria was globally reported and about 65 million malaria-related deaths were estimated. Increased preventive activities have reduced malaria mortality rate by 25% globally and by 33% in the WHO African region from 2000 to date.[4]

Anopheles Stephensi in India and some Countries in West Asia is responsible for 40 to 50% cases of malaria. Among the species that transmit malaria particularly in Iran, *Anopheles stephensi* is the most important vector.

According to the WHO, Eastern Mediterranean Countries, including Iran, are exposed to several diseases because majority of the diseases are transmitted by insects and other arthropods.[5,6] Insect bites, in addition to local symptoms (itching, redness and burning) can transmit dangerous diseases, especially in the tropical regions. One way of controlling these diseases is to protect people from mosquitos' bites.[5]

Frequent use of synthetic insecticides for insect control has disrupted natural systems and caused resurgence of the insect population. It has also caused resistance to insects, unwanted effects on non-target organisms, environmental pollution and human health problems that require research for alternative measures.[7]

The composition of some plants can be used as an alternative to synthetic insecticides. Compared to chemical insecticides, adverse effects of these pesticides on humans and the environment are minimal.[8] The use of herbal insecticides, is a proper approach to protect the environment and maintain good human health.[4] Traditional herbal medicines have been used as an insecticides or insect repellents, but many of them are still unknown.[9,10]

METHODS

This study was a review of relevant literatures on medicinal plants from traditional medicine with insecticidal and repellent properties.

DISCUSSION

In a study by Barat shooshtari on three plants, plant Melis (*Melissa officinalis*), Rosemary (*Rosmarinus officinalis*) and Lavanda (*Lavandula angustifolia Mill*) it was found that these plants have insect repellency activities. The parts of the plant containing the active ingredients were collected and dried in a suitable place. The plants where dried further by electric mill powder and alcoholic extract oil were prepared. In order to evaluate the repellency effect of the plants on Anopheles mosquito, essential oils and extracts disposal plants. were used. In this study, animals and human nature against mosquito repellent plants were compared. *An. stephensi* repellent effect of essential oils and extracts repellent with chemical composition N and N- diethyl-3-methylBenzamid were used as a control., Statistically, there was significant association between the impact of higher oil and essential oils of lavender extract.[5]

In a similar study on the effect of *Andrographis paniculata* plant and *Eclipta Alba* on *An. stephensi.* The plant extracts with hexane, ethyl acetate, benzene, chloroform and methanol were checked for repellent properties against *An.stephensi* and methanol extracts had more insecticidal properties than other plants compounds.[11]

In a study by Govindarajan these two plants (*Eclipta alba* and *Andrographis paniculata*) with the absorbent materials in *Culex quinquefasciatus* and *Aedes aegypti* mosquitoes were pre-tested and after 24 hours resulted in killing of mosquitoes. In this study, most plants used have insecticidal properties with methanol as the active compound and have caused more death of mosquitoes. Other compounds also have insecticidal properties and these plants on human samples did not show any allergic reactions.[12] In a study by Vazifehshenas, Essential oil of garlic (*Allium sativum*) and mandarin (*Citrus nobilis var. deliciosa*) against adult German cockroaches was evaluated. The essential oils were extracted by distillation using Clevenger apparatus. Tests of impregnating a filter paper on the bottom of plastic containers with varying amounts of essential oils were done. Garlic essential values of between 0.19 to 0.36 ml and 0.17 ml to 0.09 on females and values of the males, and mandarin essential oils values between 5.82 to 7.23 ml and 5.50 mm to 3.15 mm on females and values per liter square meter was used on males. Probit analysis of the data showed increased mortality after 24 hours with increased oil concentration among the cockroaches. Garlic oil toxicity (LC50 equal to 0.12 m and 0.26 ml males and females, respectively) was significantly higher than tangerine essential oil. Also, males compared to females were more sensitive to the essential oil of garlic and mandarin.[13]

Razmi and colleagues also studied the impact of allicin and thyme against the baby's *H. anatolicum* which had the same result. and had the same results. In this study, the effects of ticks laying against *H. anatolicum* compounds was evaluated. the second group of 7 ml thyme in a liter of drinking water for five days was administered to the control group with untreated water. After two weeks of infant feeding and skin mites, nymphs collected from the rabbit ears were counted. In this study, all infants were cultured in test groups compared with the control group had died. The results of this study seem to Alciane and thyme are anti-mite.[14]

A study conducted on the effect of chamomile by Joodaki Shirazi on malaria vector, Anopheles stephensi, using skin of human volunteers were evaluated to determine the duration of protection. In this study, the side effects and allergic reactions on the skin of human volunteers were seen immediately after testing. Insecticide DEET 20%, showed 6 hrs. duration of protection, but 50% of alcoholic essential oil of chamomile, showed shorter time compared to DEET insecticide, the protective effects have been shown to protect for one hour. According to the study, to increase the duration of protection of daisies compounds, a special formulation for enhancing durability of the plant on human skin is required. This plant can be a potential option for the development of herbal repellents and is an alternative to chemical repellents.[15]

Another study carried out to determine the effectiveness of Eucalyptus in reducing the cockroach population with brown tape. In this study, contact toxicity, fumigant toxicity and repellent properties on high instar nymphs of cockroaches were tested in vitro. The study results showed that concentrations above 5% of eucalyptus oil in contact with cockroach nymphs caused 100% mortality in less than 24 hours, while no deaths were observed in the control group. The concentration required in killing 50% and 95% of the nymph population of cockroaches after 24 hours, were 8/2% and 7/5% respectively. The use of fumigant resulted in 100% mortality in a population of cockroaches in less than 24 hours.

Eucalyptus essential oil concentrations' at various percentages was tested on population of cockroaches. The highest percentage repellency was observed at concentrations of 5% cockroaches in the separation of 49.5% of the population and were cockroach nymphs.[16]

A study on the use of medicinal plants as well as their duration of protection against insect bites was performed on 30 plants. In this study, three groups of plants; plant oils, essential oils and oils division with ethyl alcohol and their effects on three mosquito species, *Aedes aegypti, Anopheles minimus* and *Culex quinquefasciatus* were tested under laboratory conditions.

Zingiber cassumunar and *Ocimum basilicum* in vegetable oils showed repellent properties and prevented insects from stinging. *Cymbopogon nardus* plant essential oils showed repellency properties against all the three species of mosquitos' used in this study (*Aedes aegypti, Anopheles, minimus* and *Culex quinquefasciatus*). Combining essential oil and ethyl alcohol plants against all the mosquito species (*Aedes aegypti, Anopheles minimus* and *Culex quinquefasciatus*) showed repellency properties of less than 2 hours duration.[17]

Laboratory studies were conducted on the plant *Cymbopogon citratus* used in Ethiopia traditionally as a repellent for *Anopheles arabiensis.* In this study, the plant extract with methanol at concentrations of 1, 1.5, 2 and 2.5 milligrams per square centimeter were prepared and their repellent properties tested. Different concentrations of the plant extract showed different results. All the four concentrations (1, 1.5, 2 and 2.5 milligrams per square centimeter) of this plant showed repellency properties combined with a concentration of 2.5 milligrams per square centimeter higher than other compounds.[18]

Another laboratory research conducted on repellency properties of *Acanthus ilicifolius* and *Clerodendron inerme* plants in combination on *Anopheles stephensi, Aedes aegypti* and *Culex quinquefasciatus.* In this study different concentrations of the plants on various stages of the mosquitoes were examined. Lethal concentrations (LC50 and LC90) for mosquito larvae in different stages were also effective. Mortality of mosquito larves was apparent after the effects of the plant extracts. Adding the extracts of these plants to the breeding sites of these mosquitos larves (drinking water and ditch water) reduces the density of the tissue.[19]

In a study that was done on the essential oil of 38 plants, three different concentrations of the essential oil of these plants were for *Culex quinquefasciatus, Aedes aegypti* and *Anopheles dirus* under laboratory conditions and tested on human subjects. M l0 / 1 of essential oil on the skin of the forearm 30 cm^2 of the volunteers. None of the oils at concentrations of 10% or 50% prevented mosquito bites for up to 2 hours. However, undiluted essential oils *Zanthoxylum limonella, Pogostemon cablin* and *Syzygium aromaticum* were more effective and had complete repellency properties for 2 hours. The oil repellency property of *Syzygium aromaticum* was 100% for 2-4 hours against all the three species of mosquitoes.[20]

In an article, the impact of 20 kind of herbs from traditional medicine on insects. Plants such as garlic, bitter melon, laurel and basil repellents and insecticidal properties on different stages of insect life cycles were affected. Garlic has bacteriostatic properties against many insects such as *Delia radicum* and *Musca domestica.* Bitter melon and incense have repellent and bacteriostatic properties. Incense smoke powder, bay leaf have repellent and insecticidal properties. In spite of Neems impact on broad population of insects, it has no allergic or toxic effects on humans.[9]

In a study on the impact of extracts from Ervatamia coronaria and *Caesalpinia pulcherrima* on *Culex quinquefasciatus, Aedes aegypti* and *Anopheles stephensi.* Killing eggs laid by these mosquitoes and the repellency properties of the plants in different concentrations were studied under laboratory conditions. Crude extract of *E. coronaria* impact has 100% mortality on three types of mosquito eggs at concentrations of ppm 150, 200 and 250. Crude extract of C. *pulcherrima* has same effect, at concentrations of ppm 225, 300 and 375 have repellent property of methanol extract of *E. coronaria* more than that of *C. pulcherrima*. Testing for repellency, these plants in three different concentrations showed that the higher concentration of 5 mg per cubic centimeter for 150, 180 and 210 minutes had 100% repellency properties against *Culex. quinquefasciatus, Aedes aegypti* and *An. Stephensi.*[21]

Other studies on the effects of some plants on housefly (*Muscas domestica*) using WHO tests. These plants include *Cinnamomum verum* (Cinnamon), *Myristica fragrans* (cloves) and *Syzygium aromaticum* (nutmeg Hindi). The tests includes ethyl alcohol in concentrations of 1%, 5% and 10% and Cypermethrin was used as a controlled substance. The results showed that 10 percent of essential oils *S. aromatic* and *M. fragrans* are much more effective than Cypermethrin. S. *aromaticum* and *M. fragrans* recorded 98% and 100% mortality at 24 hours on mostly flies. Based on the results of this study Hindi nutmeg and clove essential oil plants have the potential alternative to replace synthetic insecticides and can be used against flies at homes.[22]

Study on the effect of Eucalyptus globulus and Rosmarinus officinalis beauty as well as their combinations on *Periplaneta Americana, Blattella germanica, Supella longipalpa, Culex pipiens, Anopheles stephensi* and *Musca domestica* in laboratory conditions has been conducted. Combination of the essential oils of plants on all insects caused mortality rate of 100%. Essential oil plant of *E.globules* alone against *An. stephensis* recorded a mortality rate of 98.3% and *R. officinalis essential oil on P. americana* had mortality rate of 81.5%.[23]

CONCLUSION

This research shows that herbs can be used as repellents and insecticides. Due to the harmful effects of pesticides

on humans, animals and the environment as well as the impact of unwanted materials on various creatures, traditional medicine can be helpful in this regard and plants that can be used to lethal effect against insect repellent and with minimal damage to living organisms, ecosystems and biological processes of diseases transmitted by arthropods can be prevented. At the same time the negative effects of using insecticides and chemical industries can be prevented.

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