



A systematic review on traditional medicinal plants used for traditional control of insects

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Abstract

Ethnomedicinal plants have been used since ancient times to repel/kill insects all over the world. This distribution of knowledge and services of traditional plants in village vaidyas is kept hierarchical and there is very little ethnobotanical documentation of most of the country herbal plants species. This study was initiated to document insecticidal/repellent and larvicides. Different traditional medicinal plants publications and related research sources were reviewed by various studies with different researchers over the past two decades. The review distributed a total of 25 traditional medicinal plants in 12 families and different parts of these plants were prepared and applied in various forms.

Keywords: medicinal plants, traditional application, insecticides, larvicide, repellent

Introduction

Medicinal plants are cultivated or found in the wild all over the world and are used for a diversity of purposes including conventional herbal medicine (infusions, tincture and decoction) and extraction of phytochemicals for homeopathic and Ayurvedic medicines, cosmetics, nutraceuticals/dietary supplements, functional foods and Aromatherapy oils [1-16]. In village areas, folk treatments with inexpensive ingredients ensure health safety for poor people [17-25]. Besides, medicinal plants support the livelihood of tribal communities as they collect the raw materials from the forest and sell them in the local market. More than 6,000 medicinal plants from various regions are available throughout the year and possible owing to immense diversity in indigenous flora available [26]. The diversity of plant species creates a rainbow of millions of colour combinations in our minds. Human beings named a plant species according to their behaviour, use, habitat and distinctive features.

Presently, almost 70% of synthetic drugs are obtained from plants, and some people rely on conventional medicines [27]. So, healthy plant material is essential to maintain product quality. Presently, medicinal plants have become popular owing to the increasing market demand for plant-based products in health-related industries, and their supply is insufficient owing to low production and low quality due to pests and disease damages [1]. Plant protection plays a vital role in prevent or reduce damage and to create a healthy material climate, cultural practices and other control practices, the status of these pests can change depending on the nature of damage caused during plant growth and during storage of harvested material. This review discusses currently used control measures with examples from field studies on Twenty five medicinal plants and how these measures can be integrated to make crop cultivation profitable and environmentally friendly. For example, (Gahukar, 2012) [28], reviewed the current use of plant-derived substances against insects.

Vector control and personal protection against vector-borne diseases are presently the most important measures to prevent vector-borne diseases [29]. The common approach to

controlling vectors and reducing the spread of human pathogens is based on chemical-based interventions. Moreover, in the past, frequent use of chemical insecticides, repellents and larvicides has resulted in global resistance development, ecological disruption and toxic effects on humans and non-target species [17]. New plant-based insecticides, repellents and larvicides need to be developed to control targeted pests that are environmentally safe, biodegradable and anti-insect.

Plants have been used since ancient times in human history against blood-sucking insects, and even now, people in many parts of the world use plant products [27, 30]. In current years, much effort has focused on plant extracts or phytochemicals as potential sources of vector control [31,32]. Many extract and compounds from various plant families have been evaluated to show new and promising insecticides and larvicides. Furthermore, repellents play a key role in preventing vector-borne diseases by reducing human-vector contact. Many researches have reported the effectiveness of plant extracts or essential oils as efficient insecticides, larvicides and repellents without posing hazards or toxicity or some effects on non-target organisms and the environment [29].

Many plant species contain and produce substances that protect them by killing or repelling insects that feed on them [18]. These substances fall into different categories, including repellents, feeding deterrents, toxins, and growth regulators [33]. Eventhough the primary functions of these compounds are defence against phytophagous insects, they are also effective against many mosquitoes and other biting Diptera, particularly the volatile components released as a result of herbivores [34].

The fact that many of these compounds are repellents/killers of hematophagous insects may be an evolutionary relict of a plant-feeding ancestor [34]. Always will be room for improved insect control methods. This information has been transmitted down by word of mouth for mainly generations, leading to the decay or loss of traditional knowledge and usage custom of insecticidal/repellent plants [35]. Therefore, special attention is now required to document and preserve these practices and registered medicinal plant species. This

study was initiated to document insecticidal, repellent and larvicidal plants that could be used as a source for development of new plant based insecticides, repellents and larvicides.

Materials and methods

The data about insecticidal, larvicidal and insect repellent plants was collected from published articles, theses and research reports. Various ethnobotanical publications and related ethnobotanical sources have been reviewed by different researchers over the past two decades. Google Scholar, Research Gate, and PubMed were browsed using some principle key words such as insecticide, repellent, larvicide, and medicinal plants. Appropriate data collection format was prepared to tabulate the scientific, family and

local names of each species, plant part used method of applications for each species. The information was entered into an Excel spread sheet.

Results

The diversity of medicinal plants

The review distributed a total of twenty five medicinal plants in twelve families, of which six and three species were in the Lamiaceae and Rutaceae, Verbenaceae, Solanaceae family, respectively. Most of the families which were six in number contain single medicinal plants such as Meliaceae, Caricaceae, Rhamnaceae, Euphorbiaceae, Cactaceae and Cucurbitaceae are shown in (Table.1). All the twenty five medicinal plant species reported to be used to repelling/and killing insects and larvae.

Table 1: Traditional medicinal plants used insecticide, larvicidal and repellent.

S. No.	Botanical Name	Family	Common Name	Habit	Parts	Methods of Application	Insects
1	<i>Azadirachta indica</i>	Meliaceae	Nimtree or Indian lilac	Trees	Leaves	Burn leaf to generate smoke	Insecticides
2	<i>Carica papaya</i> Linn.	Caricaceae	Papaya or pawpaw	Trees	Leaves	Crushing the dried leaves and apply the juice on the exposed parts of the body.	Mosquitoes and ticks repellent
3	<i>Citrus aurantifolia</i> (Christm.)	Rutaceae	Key lime or acid lime	Trees	Peels of fruits	Peels crushed and applying on exposed parts of the body. Fruit is squeezed with leaf of <i>L. ocyimifolia</i> seed of <i>L. sativum</i> , <i>Salvia schiperi</i> , <i>R. chalapensis</i> and <i>A. sativum</i> , all of these are mixed together in water and drunk for Hen.	Insect repellent
4	<i>Citrus sinensis</i> (L.) Osb.	Rutaceae	sweet orange	Trees	Peels	Dried peels burned to generate smoke	Mosquitoes and house fly repellent
5	<i>Eucalyptus globulus</i> L.	Rutaceae	Tasmanian blue gum	Trees	Leaves	Peels crushed and applying on exposed parts of the body	Insecticides
6	<i>Eucalyptus citrodora</i>	Myrtaceae	lemon-scented gum	Trees	Whole plant and leaves	Burning whole plant and crushing leaves and applying on exposed body parts	Repel Mosquitoes, coachroaches, ticks, house fly and other haematophagous insects
7	<i>Eucalyptus camaldulensis</i> Dehn.	Myrtaceae	<i>River red gum</i>	Trees	Leaves	Burn whole plant to generate smoke	Insecticides
8	<i>Lantana camara</i> L.	Verbenaceae	Lantana	Shrub	Whole part	Growing of plants as a living fence to repel insects like ticks	Repellent of pests
9	<i>Vitex negundo</i> L.	Verbenaceae	Chinese chaste tree, five-leaved chaste tree, or horseshoe vitex	Tree	Leaves	Burn whole plant to generate smoke	Larvicidal Insecticidal
10	<i>Vitex trifolia</i>	Verbenaceae	Common Blue Vitex, Legundi, Lenggundi, Lagundi,	Shrub/ small Tree	Leaves	Burn whole plant to generate smoke	Larvicidal, Insecticidal
11	<i>Solanum macrocarpon</i>	Solanaceae	<i>African Eggplant</i>	Shrub/ small tree	Fruits	Fruit juice sprayed in the house	Insecticidal
12	<i>Solanum nigrum</i>	Solanaceae	Makoi or black nightshade	Shrub	leaf	Not explained	Insecticidal
13	<i>Nicotiana tabacum</i>	Solanaceae	Tobacco	Shrub	Leaf	Burn leaf to generate smoke	Deter mosquitoes indoor
14	<i>Ziziphus spinachrist</i>	Rhamnaceae	red date	Tree	Leaf/root	Leaf/root is added on fire and fumigates to eradicate flies	Insect repellent
15	<i>Ricinus communis</i>	Euphorbiaceae	Castor bean	Tree	seed	Seed crushed and its juice	Insecticidal

						rubbed on the skin	
16	<i>Opuntia ficusindica</i> (L.) Mill.	Cactaceae	Pear cactus	Herb	Stem	Stem of. <i>Ficusindica</i> is collected with small node and fumigated in the house	Kill malarial vector
17	<i>Momordica foetida</i>	Cucurbitaceae	Bitter melon	Climber	whole plant	smoke/ Whole plant juice sprayed in the house	Mosquito repellent, Insecticide
18	<i>Ocimum basilicum</i>	Lamiaceae	Sweet basil	Shrub	Leaf	Leaf spread in room, bed, house	insect repellent
19	<i>Ocimum lamiifolium</i> Hochst.	Lamiaceae	Damakese	Shrub	Leaves, whole plant	Burning dried parts to generate smoke, making juice and applying on skin essential oils were extracted by steam distillation show effect repellency Growing plant nearby houses	Mosquitoes repellent
20	<i>Ocimum americanum</i> L	Lamiaceae	Lime basil	shrub	leaves	About 5 leaves—juice applied to the skin	Insects
21	<i>Ocimum tenuiflorum</i>	Lamiaceae	Holy basil	Shrub	Shrub	Dry 10 leaves and smoke	insects
22	<i>Allium sativum</i> L.	Lilliaceae	Garlic	Herb	bulb	Crushing 3–5 bulbs and applying juice to the body	Insects
23	<i>Leucas aspera</i> L	Lamiaceae	Thumbai	Shrub	Leaves	Crushing 3–5 bulbs and applying juice to the body	Insecticide /snake bite
24	<i>Moringa olifeira</i> L.	Moringaceaea	Trumstick	Tree	Leaves	15–20 leaves put in the house	Insecticides
25	<i>Moringa olifeira</i> L. seed	Moringaceaea	Trumstick	Tree	Leaves	20–30 seeds crushed and rubbed on skin	Insecticides

Discussion

Various parts of the plant like leaf, stem, root, plant resin are prepared in different forms. The internal community most powerful part was leaves and roots take the second proportion. A review of various ethno-botanical studies suggests that burning plants or hanging fresh plants deters insects that entering or resting in house was identified and bite insects [36]. It is mainly made by smoking various repellent plants in a traditional charcoal oven. It was also used to prevent insects from landing or climbing on skin, clothing or other surfaces and to kill dangerous insects [37, 38]. Another method to prepare extracts of various parts of the plant and spray them at home [39], and grow plants as living fences to repel or kill insects [31, 35]. Aqueous extract of various plants showed effect of larvicidal activity against larvae of different insects. In general, smoking was the most widely used method, followed by skin application.

The review identified a number of medicinal plants used as repellents, insecticides 18 and larvicidal 7 to various types of insects and their larvae. Some of these act as both insecticides and repellents [39-43]. This indicates that plants contain a range of phytochemicals that can provide an alternative source of insect control agents.

Conclusion

This systematic review on clearly demonstrates the presence of many medicinal plants as insecticidal, repellent and larvicidal agents. Therefore, this information points to the need for research on bioactive compounds with anti-insect potential in specific plants as a remedy for the harmful effects of synthetic pesticides. These medicinal plants will have a promising role in the development of future commercial insecticidal agents such as larvicidal, repellent and plant growth regulatory used as a preventive medicine point of view.

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