Int. j. adv. multidisc. res. stud. 2023; 3(1):600-603

Received: 10-12-2022
Accepted: 20-01-2023

International Journal of Advanced Multidisciplinary Research and Studies

ISSN: 2583-049X

Use of Ayurvedic Drugs in Insect Repellent and Pesticides

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Abstract
Insects can be the cause of major ecological problems; they can transmit microbes and parasites that affect humans, and damage food crops, trees, and homes. The total economic cost of insect-related damage and disease is immeasurable. In traditional medicine system several medicinal plants have been identified as insecticides or insect repellents, but many of them are still unknown. Therefore, the aim of this study was to review the insecticidal or insect repellent activity of certain medicinal plants. The use of a wide range of synthetic insecticides has been restricted recently, due to the high cost, harmful environmental effects, their non-biodegradable nature, and increasing insecticidal resistance. An efficient alternative source for insecticides is botanical, which can provide a simple and sustainable method of insect control. Herbal medicines have been used for thousands of years as sources of bioactive and therapeutic substances with industrial and agricultural purposes.

Keywords: Repellent, Insecticides, Pesticide, Medicinal Plants

Introduction

Medicinal plants, and their derivatives or extracts, have been evaluated for different pest control strategies, assessing their toxic, lethal, repellent, antifeedant, fumigant, growth regulation, and deterrent effects on oviposition [1]. Several plants have been used in Traditional medicine as powerful insecticides, and for their insect repellent activities. Studies on the relationship between plants and human beings are now in progress throughout the world. In India, many projects are undertaken in documenting knowledge of traditional medicinally useful plants. Fossil records revealed that the human use of plants as traditional medicine date back to middle Palaeolithic age, approximately 60,000 years ago [2]. The environmental hazards posed by synthetic pesticides provide an impetus for investigations into some ecofriendly and bio-rational alternatives [3]. WHO estimated that each year there are 25 million cases of pesticide poisoning and as many as 20,000 unintentional deaths, primarily in developing countries [4]. Due to high pesticide residue level recently 130 containers of fresh grapes sent from India were rejected by Netherlands [5].

Ayurvedic Drugs Used as Insectide, Repellency and Pesticide

Recent investigations support the claims about the efficacy of many of medicinal plants, including *Allium sativum*, *Nerium oleander*, *Ocimum basilicum*, *Azadirachta indica and Curcuma longa etc*.

1. **Allium sativum:** Allium sativum (A. sativum), commonly known as garlic, is a species in the onion family Alliaceae. It is a perennial herb with a tall, erect flowering stem that grows up to 3 feet. The garlic plant's bulb is the most commonly used part of the plant. With the exception of the single clove types, the bulb is divided into numerous fleshy sections called cloves. The cloves are used for consumption (raw or cooked) or for medicinal purposes. Garlic has been used throughout history for both culinary and medicinal purposes [6, 7]. The bulb extracts of A. sativum contains an array of phytochemicals in it. Aquous and methanol extracts of garlic bulbs showed insecticidal, antibacterial, antifungal and antioxidant activities providing evidence for its usage in traditional and folk medicine [8].
2. **Nerium oleander:** Nerium oleander Linn, Apocynaceae is known as white oleander. Al-Yahya *et al*. (2000) stated that N. oleander has shown insecticidal properties [9]. It has also been shown that N. oleander leaves possess antibacterial properties (Farnaz, 1996; Siddiqui *et al*., 1997) [10]. The metabolism of oleandrin, a cytotoxic component of N. oleander

has been studied [11] Polysaccharides isolated from the flowers of N. indicum exert partial protection [12].

3. **Ocimum basilicum:** Basil (Ocimum spp.), belonging to the Lamiaceae family, is a pleasent by smelling perennial shrub which grows in several regions all over the world [13, 14] It is well reported that variations of the essential oils depends on type of cultivar but also the agronomical practices and environmental conditions affect the composition of sensory important compounds [15, 16]. Basil essential oil has been extensively used in the flavouring of confectionery and baked goods condiments
   sausages and meat, salad dressing, non-alcoholic beverages, ice creams; it has also found wide application in perfumery, as well as in dental and oral products [17].
4. **Azadirachta indica:** Among the natural products, one of the most promising natural compounds is Azadirachtin, an active compound extracted from the Azadirachta indica A. Juss (neem) tree (Family Meliaceae) whose antiviral, antifungal, antibacterial and insecticidal properties have been known for several years [18]. Azadirachtin is active in nearly 550 insect species [19] Salako, stated that the use of A. indica has obvious advantages, which include: i) it is relatively cheap and easily available; ii)its complex mixture of active ingredients which function differently on various parts of the insects life cycle and physiology makes it difficult for pests to develop resistance to it; iii) it is systemic, thereby protecting the plant from within. his has resulted in wheat, barley, rice, sugar cane, tomatoes, cotton etc being protected from damaging insects for up to ten (10) weeks; iv) it parades a wide spectrum of pesticidal activity. Insects controlled by A. indica include migratory locust, army worms, whitefly and even head lice. and v) it is found to be safe to beneficial organisms such as earthworms [20].
5. **Curcuma longa:** *Curcuma longa* is a major spice crop grown abundantly in India and other tropical countries. Turmeric rhizome is used as a food additive (spice), preservative and colouring agent(Agarwal *et al*., 2007) in Asian countries, including China and India [21]. The fresh juice, alcoholic and aqueous extracts and essential oils of *C. longa* have demonstrated insecticidal effects against a number of insect pests and also repelled mosquitoes [21, 22, 23, 24]. *Curcuma longa* is harvested when the aerial part of this plant senesces after flowering and its rhizomes develop an intense yellow color indicating the presence of concentrated pigments [25, 26].

Use of Ayurvedic Drugs as Pesticides

1. **Aegle marmelos:** Sahare *et al.* [27] also explained that coumarin present in bael leaves possessess antimicrofilarial activity) e oviposition, feeding behavior, and adult emergence were negatively affected by bael oil fumigation [28].
2. **Glycyrrhiza glabra:** Glycyrrhiza glabra are active plants towards control of stored grain insect pests especially pulse beetle. [29] Glycyrrhiza glabra is a perennial medicinal plant. Commercially, it is known as liquorice or mulathi consisting of dried roots and rhizomes of the plant. It is used for the preparation of expectorant, and anti-inflammatory drugs as well as demulscent to improve the flavour of various bitter medicinal preparations. Glycyrrhizi is one of the important active constituents of the drug. During survey, a leaf spot disease was noticed inG. glabra plants growing in Udaipur, India. [30]
3. **Withania somnifera:** W. somnifera is highly susceptible to the root knot nematode; Meloidogyne incognita. Infestation results in root galling, stunted growth of the plant and low productivity [31].
4. **Ocimum sanctum:** Mosquitocidal activity of Tulsi was investigated using its eugenol and triglyceride (isolated from Tulsi's hexane extract) on fourth instars Aedes aegypti larvae [32]. When seeds of Tulsi was placed in water, it exude within one hour, a mucilaginous substance (polysaccharides) and larvae which came in contact with seeds became firmly attached to it and died due to drowning of larvae [33].
5. **Solanum indicum:** Solanum xanthocarpum (Family: Solanaceae) is an important medicinal herb in Ayurvedic medicine. Various studies indicated that S. xanthocarpum possesses antiasthmatic, hypoglycemic, hepatoprotective, antibacterial, and insect repellent properties. The fruits are reported to contain several steroidal alkaloids like solanacarpine [34], and solamargine. Other constituents like caffeic acid coumarins like aesculetin and aesculin [35], steroids carpesterol, diosgenin, campesterol, daucosterol, and triterpenes like cycloartanol and cycloartenol were reported from the fruits [36]. Steroidal glycoalkaloids are naturally occurring, secondary plant metabolites that are formed in a number of foods including potatoes, tomatoes, and egg plants [37].

Discussion

In order to stop the spread of insect borne diseases and damage, save the environment, and improve the quality of public health, significant effort should be made to find new insect control strategies. The main approaches to insect control have consisted of using synthetic pesticides such as organochlorine and organophosphorus compounds, which have not been very successful, especially from an ecological point of view [38]. Since, botanicals are more eco-friendly, economic, species specific, biodegradable and have lesser or no harmful effects on non-target organisms including human being can be possible alternative to the chemical pesticides [38].

Conclusion

Overall, many medicinal plants have been used traditionally as insecticidal agents, and the biological actions of a wide range of anti-insect plants have been evaluated in recent investigations. Further studies evaluating the efficacy and safety of these herbs are recommended. In addition, understanding the pharmaceutical and pharmacological aspects of these plants is required in order to produce natural anti-insect agents. In view of the good number of plants used as insecticides and insect repellents, this work can concentrate more on those as prevention is most desired than cure and this is very relevant in the case of malaria, which is a devastating disease in the study area. The real benefits of botanical insecticides can be best realized in developing countries, where farmers may not be able to afford synthetic insecticides and the traditional use of plants and plant derivatives for protection of stored products is long

established. Even where synthetic insecticides are affordable to growers (e.g., through government subsidies), limited literacy and a lack of protective equipment result in thousands of accidental poisonings annually.

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