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Research Article

Use of Botanical Extracts as Biopesticides

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Abstract

The chemical pesticides which are used in agriculture and other related sectors are causing the various detrimental effects on environment as well as on our health. As per as global research is conducted for alternatives of chemical pesticides and according to this process various research are conducted to test the efficacy and it's effects in natural products for pest control and crop protection. Herbal plant extracts were used as alternative for the chemical pesticides. In the present research work aqueous extracts of leaves of *Citrus limon, Cymbopogon citratus, Mentha piperita, Ocimum basilicum* were used to treat the mites *Tetranychus urticae* causing leaf disease in tomato plant. The effect of different concentrations of plant extracts on eggs of mites, leaf dipping method and leaf spraying method were analysed to calculate the efficacy of extracts on mites control. Further field trails to be conducted for large scale production of the plant extracts to use as biopesticides.

Keywords: Herbal Extract; Biopesticides; *Tetranychus urticae*

Introduction

By the use of chemical pesticides which causes hazards to environment by exposure of 40 variety of sources in them which includes pesticides residues such as water and food, farm use and occupational exposure. By the use of active chemical components of 42 pesticides which includes organophosphates and carbamates know to cause respiratory diseases, skin cancer, cardiovascular disease etc. Because of this reason it is important to develop or improve other means of methods with regards to its environment and public health. Methods which include biological and physical control under them soil covering nets, hymenopteran plastic control, eco trap mass control, hybrid biological and chemical control techniques are in use. The protein hydrolysates, fruit mimicking, sticky traps (ladd traps) and natural products based pesticides which are included in the use of spray baits are also considered as an alternative. By a variety of mechanisms biopesticides are used to control pests, pathogens and weeds. They also inhibit the development or reproduction of a pest or an insect pathogen, growth, feeding etc. In 17h century plant extract was the earliest recorded biopesticides. Plant extract like nicotine was used to control the plum beetle.

Renewable natural pesticides are the richest source of plants. Plant extracts are viable alternative to synthetic pesticides and are compatible with the use of beneficial organisms, pest resistant plants. Specifically plant extract provides safe and a preserving healthy environment in order to decrease reliance on synthetic pesticides. Reduced environmental degradation, increased safety for farm workers, increased food safety, reduction in pesticide resistance and improves profitability of production are the benefits of botanical pesticides. Alkaloids and terpenoids which are majority in many plant compounds have now been known to affect insects behavior, growth, development, reproduction and survival.

The *Citrus limon* is a small evergreen tree in the flowering plant family *Rutaceae*, native of south Asia. It is rich in vitamin C. It contains numerous phytochemicals including polyphenols, terpenes

and tannins [3]. the *Cymbopogon citratus*, commonly known as West Indian lemon grass or simply lemon grass. Leaves of *Cymbopogon citratus* are often found in herbal supplements and are traditionally used in medicines.

Mentha piperita is a member of *lamiaceae.* The leaves contain rosmarinic acid, azulenes, choline, and carotenes. In addition to these they also contain flavonoid glycosides, luteolin, eriocitrin, 7 Orutinoside, diosmin, isorhoifolin, hesperidin, eriodictyol 7 O glucoside, and narirutin. Menthol, menthone, pulegone, menthofuran, 1,8 cineole, methyl acetate, and isomenthone are the major components of essential oils.

Ocimum basilicum is a member of *lamiaceae.* From tropical area it is native to central Africa to Southeast Asia. Volatile oils, saponins, coumarins, alkaloids, tannins, anthra quinones, anthocyanins, flavonoides di terpenoids, tri terpenoids, pyredines, Pyrrolidines, irridoides, quinones, sugars and insect moulting hormones are also included.

Lycopersicon esculentum is the edible fruit commonly known as Tomato. Which belongs to the nightshade family, Solanaceae. *Lycopersicon esculentum* has its origin in the South American Andes. By the Spanish it was brought to Europe and in the 17th century it was cultivated and later introduced from Europe and Asia, Africa and the middle east. It is the world's largest vegetable crop. It tops the list of canned vegetables but after the potato and sweet potato.

Tetranychus urticae (common names included red spider mite and two spotted spider mite) is considered to be a pest, generally a species of plant feeding mite. Spider mites are the most widely known member of the family tetranchydae. This spider mite is extremely polyphagous; it can feed on hundreds of plants, including most vegetables and food crops such as peppers, tomatoes, potatoes, beans, maize, and strawberries, and ornamental plants such as roses [3].

Materials and Methods

Preparation of plant extracts

The four plants *Citrus limon, Cymbopogon citratus, Mentha piperita, Ocimum basilicum* selected for the experiment were screened for the miticidal activity. In laboratory materials were stored to dry up using blender, the dried materials were grounded and to the dried powder ethanol was added. Using Soxhlet machine the mixture was extracted in 5-6 hours. Ethanol was removed from the extract in a rotary evaporator. For each plant sample 200 g of dried material were used to prepare the extract.

Mites

T. urticae a test organism was reared on green bean plants. In the experiment the green bean plants used were grown in a greenhouse.

Effects of the plant extracts on eggs, adult and larvae of *Tetranychus urticae*

First instar larvae and 3 days old adults were used in all the experiments. Four concentrations of plant extracts and an untreated control were used for assays. Using the leaf discs of green bean leaves experiments were carried out. On a moistened filter paper disc the leaf discs were placed, and with 10 individuals each disc was infected. To prevent the mites from escaping Vaseline was used. Each treatment was replicated five times [1-8].

Effect of plant extracts on eggs

On a moistened filter paper leaf discs were placed into the petri dishes and female of the same age were put on leaf discs. After two days the eggs were counted. In every petri dish 10 eggs were placed and other eggs were removed. Different concentrations of extracts were sprayed on the eggs. Number of larvae hatched were recorded.

Effects of the plant extracts on adult and larvae Leaf dipping method

Leaf discs were treated by dipping them into the known concentrations of extracts solution, and then left to dry for 30 minutes. The treated leaf discs and individual mites which are lined with moistened filter paper are placed in Petri dishes. After 1, 3, 6, days the result was assayed by counting the number of larvae and the living adults.

Leaf spraying method

The green tomato leaf discs were placed into the Petri dishes on moisturized filter paper. The 12 adults were placed in every Petri dish. Then the different concentration of the plant extracts were sprayed. The results were assayed after 1, 3 and 5 days by counting the number of living adults.

Results and Discussion

Effect on eggs

All the eggs treated with aqueous extracts of *Citrus limon, Cymbopogon citratus* were found to have ovicidal effect.

Effect of the plant extracts on larvae

Leaf dipping method

Significant mortality and the highest effect on *T. urticae* of 5 plants (from table 1) in all the plant extracts highest effect of mortality was found in 15% concentration and least effect was found in the 5% concentrations of the plant extract. *Citrus limon* showed highest activity.

Effect of the plant extracts on adult

Leaf dipping method

The effects of the adults placed on the leaves which was treated with different plant extracts was determined at a concentration of 12% (from table 1). At the concentration of 12% of Mentha piperita the highest effect of the plant extracts was determined. Among the plant extracts the plant extract of the *Mentha piperita* showed the highest mortality rate. The lowest was observed concentration of 5% in *Ocimum basilicum.*

Leaf spraying method

As shown in the table 1, the adults placed on the leaf discs treated with different plant extracts and sprayed with the plant extracts. the highest effect was determined at a concentration of 15% of *Ocimum basilicum.* Among the plant extracts the plant extract of the *Ocimum basilicum* showed the highest mortality rate. The lowest was observed at 5% concentration in *Cymbopogon citratus.*

	Leaf dipping method	Larvae	Adult	Leaf spraying method
Plant	**Concentration (%)**	**Mortality (%)**	**Mortality (%)**	**Mortality (%)**
Citrus limon	5	44	25	45
	10	52	38	60
	15	78	47	70
Cymbopogon citratus	5	35	35	35
	10	49	50	68
	15	67	67	72
Mentha piperita	5	56	39	55
	10	65	58	69
	15	72	69	75
Ocimum basilicum	5	49	23	55
	10	56	45	75
	15	76	56	80

Table 1

Conclusion

The plant extracts obtained from *Citrus limon, Cymbopogon citratus, Mentha piperita, Ocimum basilicum* showed remarkable miticidal activity. Further field trails are to be conducted with different plant extracts compositions as biopesticides for commercial production of them in future.

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