Research Article

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HERBAL PLANTS AS AN ANT REPELLENT

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Abstract: The present study focused on developing effective ant repellent from herbal plant extracts. The extracts of mentioned plants were prepared by grinding with water. The aqueous extracts were treated individually as well as in different combination against 15 ants at dose levels of 1%, 5%, 10%. Observations were made at 5 min of time intervals for total period of 15 min. Highest % repellency was recorded in cucumber-mint (100%) , lemon-garlic (100%), garlic-mint (100%) & all plant mixture (100%) extracts at 10 % concentration. The minimum % repellency was shown by lemon-mint (67%) extracts. As the dose increases, the repellant effect also increased. The use of such plant extracts can control the population of serious pests like aphids and mealybugs in an environmental friendly way.

Keywords: Herbal Extracts, Ant Repellent, Biorational Control, *Alium sativum, Mentha piperita, Cucumis sativus, Citrus limonum*

INTRODUCTION

The ants are the most dominant group of social insects belonging to order Hymenoptera of class Insecta. Ants can contaminate and destroy some agricultural products and stored foods. They get attracted towards sweet, food and play role as a scavenger. But if they visit to our prepared food like chappaties, bread, nuts, flour, sugar sweet medicine, and attraction to oily sweat on cloths become nuisance. Ant invasions are the bane of homeowners. They can devastate plants and take over kitchens. Even when one room is cleaned up, desperate ants can show up in the strangest places to start another invasion of a home. Poisons and chemicals are effective, but dangerous in the kitchen, a favorite ant hideout, and around children and pets. Fortunately, there are a number of natural ways to keep ants out of the home (Fig.3) [3].

To kill them by using synthetic insecticides will be harmful to nature and poisonous to man and pet animals. The insecticidal properties of number of plants have been discovered long ago. Botanical plant extracts are environmentally less harmful than synthetic pesticides to control pests. They possess one or more useful properties such as biodegradability, broad spectrum of activity & ability to reduce insect resistance. Synergistic effect due to mixing of different plant species plays a key role to control pests. High cost of chemical insecticide leads to search alternative source for pest management. Certain ant species stain or cause feeding damage to textiles. To control these insect pests, peoples are using synthetic insecticides which are toxic to non-target insects.

Therefore, objective of this study is to control these ants by using biorational control methods. Hence laboratory assays were carried out to evaluate the repellent property of plant extracts of four indigenous native botanicals namely *Alium sativum, Mentha piperita, Cucumis sativus* & *Citrus limonum* against ant.

The natural ant repellant plays an important role in earth's natural ecosystem. Therefore objective of present work is:

- To eliminate toxic effects occurring due to repeated use of synthetic chemical insecticides.
- Use of natural herbal plant extracts for control of ants.
- To develop new rationale & ecofriendly process to control the Ants by using herbal plant extracts.

Fig.1: Ants Social insects, (source[3]).

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MATERIALS AND METHODS

Extracts from plants viz. ginger (rhizome), mint (leaves), Garlic (bulb), & cucumber (fruit) (Fig.2a, b, c &d) were prepared by grinding the above mentioned part of plant in distilled water. Extracts were centrifuged for 5 min & supernatant was collected & used for ant repellant activity. The extracts of mentioned plants were prepared by grinding with water. The aqueous extracts were treated individually as well as in different combination against 15 ants at dose levels of 1%, 5%, 10%. Observations were made at 5 min of time of intervals for total period of 15 min.

Fig.2a: Cucumber *Cucumis sativus*,

Fig.2b: Garlic *Alium sativum*

Fig.2c: Mint *Mentha piperita*

Fig.2d: Lemon *Citrus limonum*

RESULTS

Data of % ant repellency values of herbal plant extracts of lemon, garlic, mint, cucumber in concentration 1 to 10 % at 5 min intervals (Table1), Data of % ant repellency values of herbal plant extract mixture of Ginger + Mint, Cucumber + Mint, Garlic+ Lemon, Lemon + Mint, all plant extracts in concentration 1 to 10 % at 5 min interval (Table.2) were tested. The statistical data of % ant repellency of herbal aqueous plant extract mixtures (Table 3) was analyzed. Highest % repellency was recorded in cucumber-mint (100%), lemon-garlic (100%), garlic-mint (100%) & all plant mixture (100%) extracts at 10 % concentration. The minimum % repellency was shown by lemon-mint (67%) extracts. As the dose increases, the repellant effect also increased. The plant extract mixtures cucumber-mint (100%), lemon-garlic (100%), garlic-mint (100%) & all plant mixture (100%) extracts at 10 % concentration showed least t-value (Fig.3); indicate high effectiveness and promising ant repellent.

Table.1: Data of % ant repellency values of herbal plant extracts at 5 min intervals

Treatment (Concentration)	No. of Ants	% Ant Repellency values at 5 min of intervals		
		5 min	10 min	15 min
Lemon (1%)	15	0	11	25
Lemon (5 %)	15	11	25	43
Lemon (10 %)	15	25	43	67
Garlic (1 %)	15	11	43	100
Garlic (5%)	15	25	43	100
Garlic (10 %)	15	25	100	100
Mint (1%)	15	25	43	100
Mint (5 %)	15	25	67	100
Mint (10 %)	15	25	100	100
Cucumber (1%)	15	25	43	67
Cucumber (5 %)	15	43	67	67
Cucumber (10 %)	15	67	67	100
Control	15	00	00	00
Sugar	15	00	00	00
α Cypermethrin (1%)	15	100	00	00

Table.2: Data of % ant repellency values of herbal plant extract mixture at 5 min interval

Treatment (Concentration)	No. of Ants	% Ant Repellenacy values at 5 min of intervals.		
		5 min	10 min	15 min
Ginger + Mint (1%)	15	11	11	43
Ginger + Mint (5 %)	15	11	25	67
Ginger + Mint (10 %)	15	11	25	100
Cucumber + Mint (1 %)	15	11	43	67
Cucumber + Mint (5%)	15	11	67	67
Cucumber + Mint (10 %)	15	25	43	100
Cucumber + Lemon (1%)	15	11	25	43
Cucumber + Lemon (5 %)	15	25	43	67
Cucumber + Lemon (10 %)	15	43	43	88
Garlic+ Lemon (1%)	15	11	25	43
Garlic+ Lemon (5 %)	15	11	43	100
Garlic+ Lemon (10 %)	15	11	43	100
Lemon + Mint (1%)	15	11	11	25
Lemon + Mint (5%)	15	11	25	43
Lemon + Mint (10%)	15	25	43	67
All plant Extract (1%)	15	25	43	67
All plant Extract (5%)	15	43	67	88
All plant Extract (10%)	15	67	100	100
Control	15	00	00	00
Sugar	15	00	00	00
α Cyperomethrin (1%)	15	100	00	00

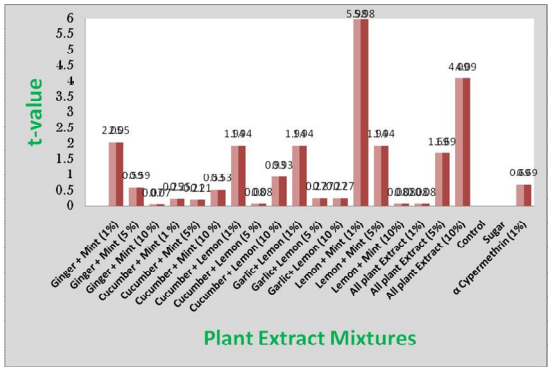

Fig.3: Graph of concentration of plant extracts mixture against t-value

Table.3: Statistical data of % ant repellency of herbal aqueous plant extract mixtures

Treatment (Concentration)	S.D.	RSD	CV (%)	SEM (±)	t- Value	Confidence Limit	
						Lower	Upper
Ginger + Mint (1%)	18.48	00.84	84.00	10.68	-02.05	22.00	21.89
Ginger + Mint (5 %)	29.15	00.85	85.73	16.85	-00.59	34.00	09.94
Ginger + Mint (10 %)	47.85	01.06	106.33	27.66	00.07	45.00	01.94
Cucumber + Mint (1 %)	28.09	00.70	70.21	16.24	-00.25	40.00	04.06
Cucumber + Mint (5%)	32.33	00.67	67.35	18.68	00.21	48.00	03.92
Cucumber + Mint (10 %)	39.15	00.69	69.91	22.63	00.53	56.00	11.99
Cucumber + Lemon (1%)	16.05	00.62	61.73	09.28	-01.94	26.00	17.99
Cucumber + Lemon (5 %)	21.07	00.47	46.82	12.18	00.08	45.00	00.97
Cucumber + Lemon (10 %)	25.98	00.45	44.79	15.02	00.93	58.00	13.96
Garlic+ Lemon (1%)	16.05	00.62	61.73	09.28	-01.94	26.00	17.99
Garlic+ Lemon (5 %)	45.08	00.88	88.39	26.05	00.27	51.00	07.04
Garlic+ Lemon (10 %)	45.08	00.88	88.39	26.05	00.27	51.00	07.04
Lemon + Mint (1%)	08.09	00.51	50.56	04.68	-05.98	16.00	27.96
Lemon + Mint (5%)	16.05	00.62	61.73	09.28	-01.94	26.00	17.99
Lemon + Mint (10%)	21.07	00.47	46.82	12.18	00.08	45.00	00.97
All plant Extract (1%)	21.07	00.47	46.82	12.18	00.08	45.00	00.97
All plant Extract (5%)	22.51	00.34	34.11	13.01	01.69	66.00	21.99
All plant Extract (10%)	19.05	00.21	21.40	11.01	04.09	89.00	45.04
α Cyperomethrin (1%)	47.37	1.43	143.54	0.82	-0.69	14.11	51.89

DISCUSSION

All herbal extracts selected for the studies were reported to show repellent activity in more than one insect. Highest % repellency was recorded in cucumber-mint (100%), lemon-garlic (100%), garlic-mint (100%) & all plant mixture (100%) extracts at 10% concentration. Ants dislike catnip, geranium, hyssop, lavender, sage, southernwood, spearmint and tansy. Placing any of these herbs at doorways will help to prevent ants from entering[1]. Cinnamon, mint, chili pepper, black pepper, cayenne pepper, cloves or garlic –these were reported to work as ant repellents. Many plants – including the ones listed – give off a strong scent to repel ants and other insects in the wild, and it works just as well in home[2]. Cucumber/Citrus Peels leaving in the areas shows ant activity.

Cucumber and citrus peels are toxic to the types of fungi that ants feed on, and therefore avoided by the ants [2]. Cinamon sticks, garlic, fresh cloves reported repellent activity for ants. While garlic cloves aren't as aromatically pleasing as cinnamon sticks, they work really well[3]. A cinnamon stick, coffee grinds, chili pepper, paprika, cloves, or dried peppermint leaves near the openings will repel ants. The juice of a lemon at the entry spot and leave the peel there repeals the ants. Planting mint around the foundation of the house will also keep ants away. Place cloves of garlic around indoor and outdoor ant pathways[4].

Anita Singh et al.2012 reported repulsion of aphids and mealy bugs under laboratory condition for three plants extracts namely, *A. indica, A. Juss, E. globules L.*

and O. basilicum L. Repellency was recorded by methanol leaf extract in the following order *A. indica* > *E. globules* > *O. basilicum* as against aphids and mealybugs. After 24 h of release of aphids and mealybugs, the highest repellency was recorded in the case of *A. indica, A. Juss* leaf extract (99.0 and 97.0%) followed by *E. globules* L. leaf extract (96.0 and 93.0%). The repellent property of the mint, cucumber, ginger and lemon extracts under discussion resulted to the effect of scent or active compound of these herbal extracts. The scent of these may interephere the pheromone or queen substance released by queen which is species specific. The queen substance released through last abdominal segment is handed over from one ant to another also the scent of food may also be blocked by these plant extracts. Herbal repellents tested against mosquitoes and aphids and many other insects but not much work has been reported by entomologist for ants. The affected food material by ants generally kept in sun or it is cleaned but if peels of cucumber, cloves of garlic, leaves of mints if kept in contact with invasion area by ants repel the ants.

CONCLUSION

From statistical analysis, plant extract mixtures cucumber-mint (100%), lemon-garlic (100%), garlic-mint (100%) & all plant mixture (100%) extracts at 10 % concentration showing least t-value. It was found to be highly effective and promising ant repellent. All the results were compared with standard alpha cyperomethrin (1%). It was found that plant extract mixtures has higher margin of safety than existing ant repellents. It will be our further endeavor to develop eco-friendly and non-toxic ant repellent product.

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