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EFFICACY OF SOME NATIVE BOTANICAL EXTRACTS ON THE REPELLENCY PROPERTY AGAINST THE PINK MEALY BUG, *MACONELLICOCCUS HIRSUTUS* (GREEN) IN MULBERRY CROP

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Abstract

Mulberry, *Morus alba*, (L.) leaves are the predominant food source for Silkworm, *Bombyx mori* rearing. Pink mealy bug infests the mulberry plants and cause Tukra diseases that leads to qualitative loss of leaves. Hence a study was carried out to evaluate the efficacy of various indigenous native botanical extracts for their repellency property against pink mealy bug *Maconellicoccus hirsutus* (Green) at the Tamil Nadu Agricultural University, Coimbatore. The native botanicals such as Andrographis leaf extract, Leucas leaf extract, Neem seed kernel extract, vitex leaf extract, fish oil rosin soap, ocimum leaf extract and lawsonia leaf extract at different dose levels viz., 1, 2, 4, 8 and 10 per cent respectively. After 48 Hor (Hour of release) the highest repellency was recorded in case of Andrographis leaf extract (99.0%) followed by Leucas leaf extract and NSKE (99.0%). Vitex leaf extract and FORS showed on par results among various treatments. The ocimum leaf extract (90.1%) also recorded a moderate repellent effect and the least repellency was recorded in case of Lawsonia leaf extract (81.3%). Similar trend was recorded during 24 hour of release also. As the dose increases the repellent effect also increased irrespective of the native botanical extracts against mealy bugs.

Introduction

Among the major pests of mulberry, the pink mealy bug *Maconellicoccus hirsutus* (Green) is one of the most important pest which damaged the tender leaves and cause TUKRA disease and leads to a qualitative loss of leaves. Generally insecticides are not advisable for mulberry ecosystem, because of the residual toxicity and also it directly influences the silkworm rearing [13]. Recently non-chemical avenues like botanicals acted as an efficient alternative for the pesticides in mulberry garden. Hence the efficacy of native botanicals was tested for its repellency property against the mealy bug on mulberry crop.

Materials and Methods

To determine the repellency property of certain traditional native botanical extracts, *viz.,* Nelavembu leaf extract, (*Andrographis paniculata L.*), Thumbai leaf extract (*Leucas aspera L.*), Neem seed Kernel extract (*Azadirachta indica*), Karunotchi leaf extract (*Vitex negundo*), Fish oil rosin soap, Tulsi leaf extract (*Ocimum sanctum*), Maruthani leaf extract (*Lawsonia inermis*) and an untreated check at five different concentrations such as 1, 2, 4, 8 and 10 percent respectively against mealy bugs on mulberry.

The present research study was conducted under green house condition in the Department of Sericulture, Tamil Nadu Agricultural University during November 2002.

Preparation of native botanical leaf extracts

Methanol leaf extract was prepared using soxhlet extraction principle. The freshly collected leaves were washed thoroughly with running tap water then washed with distilled water and the excess water was drained and by means of the muslin cloth the excess moisture was removed, then the leaves were allowed to air dry or shade dry. The leaves must be completely dried without any trace of moisture, which was made into fine powder by means of a blender or a mixer grinder. Each leaf sample was extracted separately at 50°C for 8 hours in 300 ml of the above solvent. Later the crude extract was then evaporated to obtain concentrated slurry of about 10ml. The concentrated extract thus obtained was filtered through a sterilized Whatmann No.1 filter paper. The filtrate obtained was a pure native botanical extract from which we can prepare different required dose levels [9].

Neem seed kernel extract

Neem seed Kernels were collected washed thoroughly in the running tap water till the adhered fruit

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particles were removed away. The kernels were shade dried for few days. The outer rind of the seed was broken and kernels gathered. It was ground well by means of a blender or mixer grinder, to make into paste form. About 20 litres of water was added and 10 ml of soap solution or 0.1% Teepol was added. This setup was kept undisturbed for overnight, filtered through muslin cloth and used for spraying in the next morning. [1].

A promising variety of mulberry (Kanva-2) was selected as a test variety for this study. About 75 days old mulberry plant under green house condition was developed with necessary culture practices. The indigenous native botanical plant extracts were treated by means of an atomizer on the apical portion of the mulberry plant. It was allowed to dry for a while in the normal green house temperature. About 20 second instar mealy bug nymphs were released on the treated portion and were examined for its repellent movement.

The plant extracts of different dose levels *viz.,* 1, 2, 4, 8 and 10 percent were treated on the mulberry plants. The repellent effect of the native botanical leaf extracts were calculated by the repellent movement of these mealy bugs away from the corresponding treated portion of the mulberry leaves. Appropriate observations were recorded at 24 and 48 hours after insect release on the mulberry plants. The experimental treatments were replicated thrice and subjected to the statistical analysis for its significance among various native botanical leaf extract treatments.

Results and Discussion

The results revealed that the treatment of various native botanical extracts against mealy bugs after specific time intervals the feeding repellency was recorded in the mulberry crop.

At one percent concentration, among the treatments the botanical extracts of nelavembu (48.5%) showed higher repellency followed by *Leucas* leaf extract (45.1%) and Neem seed kernel extract (NSKE-43.2%). *Vitex* leaf extract and Fish oil rosin soap showed on par repellency against mealy bugs. *Ocimum* leaf extract stands the next position (22.4%). The least repellency was recorded from *Lawsonia* leaf extract (18.3%) against mealy bugs during 24 hours of release (Table 1).

At same level of concentration after 48 hours of insect release the highest repellency was noticed from *Andrographis* leaf extract (52.3%), followed by *Leucas* leaf extract (49.2%) and NSKE (47.5%) against mealy bugs. *Vitex* leaf extract (43.9%) and FORS showed similar repellency and recorded on par results even after 48 hours of insect release. *Ocimum* leaf extract recorded a minimum repellency (30.5) followed by a least repellency effect on *Lawsonia* leaf extract (21.0%). Among the botanical extracts there was not a marked or significant difference between 24 hours and 48 hours of release. Similar trend as like 1% concentration was noticed in case of 2% concentration both at 24 hours of release (66.8% to 25.0%) and at 48 hours of release (72.0% to 32.4%).

Higher repellency effect was observed at 4% level concentration during 24 hours after release. Maximum repellency was recorded from *Andrographis* leaf extract (79.8%) followed by *Leucas* leaf extract (75.3%) and NSKE (68.1%) against mealy bugs. Fish oil rosin soap recorded higher repellency percentage than *Vitex* leaf extract during 24 hours of release. *Ocimum* leaf extract showed a moderate repellency (39.0%) over the mealy bugs. The *Lawsonia* leaf extract (34.5%) recorded the least repellency effect against mealy bugs (Table 1).

Table 1.Efficacy of certain native botanical extracts on the repellency property against the pink mealy bug on mulberry

Percent Repellency										
Dose percentage	**1 %**		**2%**		**4%**		**8 %**		**10 %**	
Leaf extracts	**24 hrs.**	**48 hrs.**	**24 hrs.**	**48 hrs.**	**24 hrs.**	**48 hrs.**	**24 hrs.**	**48 hrs.**	**24 hrs.**	**48 hrs.**
Andrographis sp leaf extract	48.5^{a} (44.14)	52.3^{a} (46.32)	66.8^{a} (54.82)	72.0^{a} (58.05)	79.8^{a} (63.29)	84.7^{a} (66.97)	95.8^{a} (78.17)	96.8^{a} (79.70)	98.2^{a} (82.29)	99.0^{a} (84.26)
Neem seed kernel extract	43.2^{a} (41.09)	47.5^{a} (43.57)	60.2^{ab} (50.89)	68.1^{abc} (55.61)	70.1^{ab} (56.85)	74.5^{ab} (59.67)	93.5^{b} (75.23)	95.1^{ab} (77.21)	97.2^{ab} (80.37)	99.0^{a} (84.26)
Leucas aspera leaf extract	45.1^{a} (42.19)	49.2^{a} (44.54)	63.1^{ab} (52.59)	70.3^{ab} (56.98)	75.3^{ab} (60.20)	78.7^{ab} (62.51)	93.8^{b} (75.58)	95.2^{ab} (77.34)	97.8^{a} (81.47)	99.0^{a} (84.26)
Fish Oil Rosin soap	40.1^{a} (39.29)	44.8^{a} (42.02)	50.5^{b} (45.29)	55.7^{c} (48.27)	62.3^{b} (52.12)	67.9^{b} (55.49)	91.8^{bc} (73.36)	93.5^{b} (75.23)	94.3^{c} (76.19)	95.6^{b} (77.89)
Ocimum sanctum leaf extract	22.4^{b} (28.25)	30.5^{b} (33.52)	28.1^{c} (32.01)	35.2^{d} (36.39)	39.0^{c} (38.65)	42.3^{c} (40.57)	87.7^{d} (69.47)	89.3^{c} (70.91)	88.4^{d} (70.09)	90.1^{c} (71.66)
Vitex negundo leaf extract	39.5^{a} (38.94)	43.9^{a} (41.50)	51.2^{b} (45.69)	55.3^{c} (48.04)	60.2^{b} (50.89)	68.1^{b} (55.61)	90.5^{cd} (72.05)	93.1^{b} (74.77)	95.0^{bc} (77.08)	95.2^{b} (77.34)
Lawsonia inermis leaf extract	18.3^{b} (25.33)	21.0^{b} (27.27)	25.0^{c} (30.00)	32.4^{d} (34.70)	34.5^{c} (35.97)	40.1^{c} (39.29)	75.3^{e} (60.20)	78.2^{d} (62.17)	77.5^{e} (61.68)	81.3^{d} (64.38)
Control	0.0^{c} (0.00)	0.0^{c} (0.00)	0.0^{d} (0.00)	0.0^{e} (0.00)	0.0^{d} (0.00)	0.0^{d} (0.00)	0.0^{f} (0.00)	0.0^{e} (0.00)	0.0^{e} (0.00)	0.0^{e} (0.00)
SEd	2.77	3.06	3.79	4.36	5.03	5.93	1.29	1.49	1.88	2.44
CD (p = 0.05 %)	5.78	6.37	7.89	9.07	10.46	12.35	2.68	3.11	3.92	5.09

Values are mean of three replications; Means are arc sine transformed values.

Means followed by the same alphabet do not differ significantly in LSD

Not much difference (or) hike in repellency was observed among the botanical extracts treatments during 48 hours of release. Whereas the *Vitex* leaf extract (68.1%) recorded higher repellency than FORS (67.9%) as the time prolongs. Rest of the treatments showed similar effects against mealy bugs.

At 8% dose level concentration during 24 hours of release, highest repellency was recorded from the *Andrographis* leaf extract (95.3%), *Leucas* leaf extract and NSKE showed on par repellency during 24 hours of release (93.8% and 93.5%). Fish oil rosin soap (19.8%) showed a slightly higher repellency than the *Vitex* leaf extract (90.5%). *Ocimum* leaf extract recorded a moderate level (87.7%) of repellency against mealy bug. *Lawsonia* leaf extract showed a very low level of repellency when compared to other botanical treatments. At the same level of concentration, the repellency effect of various botanicals expressed a similar trend for even 48 hours of release (Table 1).

For 10% dose level, 24 hours of release there were no marked difference in repellent effect between various native botanicals. At higher concentration level all the treatments showed maximum repellency where as *Lawsonia* leaf extract (78.2%) alone showed a minimum repellent effect against mealy bug.

No significant effect was noticed in case of time duration between treatments *i.e.* 24 and 48 hours of release. During 48 hours of release all the native botanical extracts reported highest repellency effect without any deviation from the earlier dose levels. The lowest repellency was recorded by *Lawsonia* leaf extract even after 48 hours of release.

As the time duration increases throughout the experiment no significant hike in repellent effect was recorded among all the botanical extracts treatments.

As the time increases the repellency property also increased but it was not upto the mark. Irrespective of the botanical extract treatments, as the concentration level increases the repellency property was also increased to a marked level. The dose level was directly proportional to the percent level of repellency property against the mealy bugs.

The leaf extract of *Andrographis* recorded higher repellency due to some bio-active alkaloid which has to be focused in future for its characterization. Presence of Azadirachtin and other tetranortriterpenoids were responsible for the repellency of NSKE [2]. The leaf extract of *Vitex negundo* was found to be toxic against *S. littoralis* [8], *Plutella xylostella* [11]. The active biomolecule sabeniene present in *Vitex negundo* exhibited a maximum repellency against mosquito *Culex quinquefasciatus* [4]. The presence of toxic compounds like terpenes, cinol, sabeniene, sesque terpenes in *Vitex negundo* extract might be the reason for its higher repellency property [6; 14; 12;10 & 3]

As the dose level increases, the level of repellency also increases *i.e.,* the level of repellency is directly proportional to the dose level of the native botanical against meal bugs. No spectacular difference was noticed in case of the increase in the time duration over the repellency property of the native botanicals.

Thus from the fore going discussion, it was concluded that among the treatments, *Andrographis* leaf extract showed excellent repellency followed by *Leucas* leaf extract NSKE, *Vitex* leaf extract and FORS recorded on par results. *Ocimum* recorded a moderate repellency and least was recorded in *Lawsonia* leaf extract. The present research work is in agreement with that of the earlier work.

Focus has to be given on these non-chemical pest management aspects and to identify the active principles present in the *Andrographis* sp. and *Lecuas* sp. and its biomolecule characterization for the better action against the pest under field conditions.

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References

1. Baskaran, V. and Narayanasamy, P., 1995. *Traditional Pest Control.* Caterpillar Publications, Annamalai Nagar, Tamil Nadu, pp. 90.

2. Jeyasankar, A. Raja, N. and Ignacimuthu, S., 2005. Botanical pesticides for Insect control. In : *Green Pesticides for Insect Pest Management* (Eds. S. Ignacimuthu and S. Jayaraj), Narosa Publishers, New Delhi. pp. 115-132.

3. Kannan, R. and Sathyaseelan. V., 2009. Effect of some indigenous pesticidal plants and species against Drug store beetle, *Stegobium paniecum* Linn. (Anobiidae: Coleoptera) in Coriander, *Coriandrum sativum* Linn. In: *Pest Management in store grains* (Eds. P. Narayanasamy, S. Mohan and J.S. Awaknavar), Satish Serial Publishing House, NewDelhi.pp. 127-131.

4. Kannathasan, K., Senthilkumar, A., Chandrasekaran, M. and Venkatesalu, V., 2007. Different larvicidal efficacy of four species of *Vitex negundo* against *Culex quinquefasciatus* larvae. *Parasitol.Res*., 101(6):1721-1723..

5. Manadhar, N.P., 2002. *Plants and people of Nepal*. Timber press, Oregon. pp. 342.

6. Mani, M., 1989. A review of the Pink mealy bug *Maconellicoccus hirsutus* (Green). *Insect Science and its Application*., 10, 157-167.

7. Menegium, A. M., Lovata, L., Yamaoka, R. S., Nagashima, G.T. and Pasini, A., 2007. Influence of mulberry cultivar *Morus* spp on the production and quality of silk worm, *Bombyx mori*.L. *Neotrop. Entomol*., 36(5): 670-674.

8. Mesbah. H. A., Mourad, A. K. and Rokaia, A. Z., 2006. Efficacy of some plant oils alone and or combined with different insecticides on the cotton leaf worm. *S.littoralis* (Boisd) in Egypt. *Commum. Agric. Appl. Biol. Sci*., 71(2): 305-328.

9. Reardon, R. C. and Edwards, W. G., 1998. Pink hibiscus mealy bug *Maconellicoccus hirsutus*, USDA, APHIS, Washington, D.C. pp. 6.

10. Sathyaseelan, V., Amala hyacinth, A.M. and Selvamuthukumaran, T., 2009. Evaluation of Repellent Property of Certain native botanical powders against Rice weevil, *Sitophilus oryzae* (Curculionidae: Coleoptera) on Soghum. In: *Pest Management in store grains* (Eds. P. Narayanasamy, S. Mohan and J. S. Awaknavar), Satish Serial Publishing House, New Delhi. pp. 111-116.

11. Sheng,Y. Y. and Bao, T. X., 2006. Toxicity and Oviposition- deterrence of *Vitex negundo* extracts to *Plutella xylostella. Journal of Applied Ecology*., 17(4): 695-698.

12. Upadhyay, R. K., Rohatgi, L., Chaubey, M. K. and Jain, S. C., 2006. Ovipositional Responses of the Pulse beetle, *Bruchus chinensis* (Coleoptera: Bruchidae) to extracts and compounds of *Capparis deciduas*. L. *Journal of Agricultural and Food Chemistry,* 54 (1): 9747-9753.

13. Yamamoto, M., Toda, M., Sugita. K. and Sasak. S., 2007. Study on usage of pesticides in various countries*. Kokur. Iyakuhin Shokukin Eisei Kenkyusko Hokoku*. 125, 92-100.

14. Zettler, L., Peter, J., Follett, R. and Gill. F., 2002. Susceptibility of *Maconellicoccus hirsutus* (Homoptera: Pseudococcidae) to Methyl bromide. *Journal of Economic Entomology*., 95(6): 1169-1173.