ISSN: 2230-9926

Available online at http://www.journalijdr.com

IJDR

International Journal of DEVELOPMENT RESEARCH

International Journal of Development Research
Vol. 4, Issue, 8, pp. 1504-1507, August, 2014

Full Length Research Article

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

***Madhuri Thinnaluri, Bhaskar, R. N., Mahesh and Narayanaswamy, T. K.**

UAS, GKVK, Bangalore-560065

ARTICLE INFO

Article History:
Received 04th May, 2014
Received in revised form
24th June, 2014
Accepted 03rd July, 2014
Published online 05th August, 2014

Key words:
Pink Mealy Bug,
Mulberry,
Tukra,
Botanicals,
Repellency

ABSTRACT

Mulberry, *Morus alba* L., the only host plant of silkworm (*Bombyx mori* L.,) is attacked by about 300 species of insect pests. Among them, pink mealy bug, *Maconellicoccus hirsutus* Green is the most serious causing more than 35 per cent yield loss besides impairing nutritional quality of mulberry leaves. The management of pink mealy bug by using plant products is gaining attention due to proven specificity, biodegradability, low toxicity to non target organisms and low residual toxicity in the mulberry ecosystem. A preliminary attempt has been made to manage the mealy bug on mulberry by using plant extracts of natural pesticide origin. The seed kernel and leaf extracts of *Azadirachta indica, Pongamia pinnata, Madhuca longifolia* and only leaf extracts of *Lantana camara, Adathoda vasica* were directly used as a foliar spray on M-5 mulberry saplings. Neem seed kernel extract @ 4 per cent exhibited maximum repellence property against mealy bug after 24 (96.53%) and 48 (97.57%) hours of spray. However, Leaf extract of *Lantana camera* exhibited least repellency (24.46 and 26.20%) property than other leaf extracts experimented**.** Increase in repellency over control after 24 hours of treatment found highest in Neem seed kernel extract @ 4 per cent (94.68%), followed by Neem seed kernel extract @ 2 per cent (94.40%), *Pongamia* seed kernel extract@ 4per cent (93.94%) and least was recorded in *Lantana* leaf extract@ 8 per cent (79.01%) and found significant. The trend was same even after 48 hours of treatment.

INTRODUCTION

Mulberry is the indispensable food for mulberry silkworm and is known for its luxuriant growth. About 300 insect and non-insect species of pests are known to inflict the damage to mulberry in different parts of the world. Among the pests, sucking pests are considered as major pests causing considerable damage to mulberry in all the growing stages of crop particularly in the apical portion (Reddy and Narayanaswamy, 2003). However, the pink mealy bug *Maconellicoccus hirsutus* Green (Pseudococcidae: Homoptera) is considered as an important cosmopolitan sucking pest and regular in occurrence. During infestation they prefer tender portion of the plant because of succulence. It sucks the sap simultaneously releasing toxins which results in short internodes, curling, wrinkling and crumpling of apical leaves virtually stopping the growth of the plant by suppression of stem elongation affecting the yield of leaves. Further the affected region swells and turns into deep green color. Therefore, the symptoms of mealy bug infestation in mulberry collectively called as tukra (Misra, 1919). Besides, reduction in leaf area, yellowing of leaves, premature leaf fall occurs due to impaired function of the petiole due to mealy bug infestation. The tukra affected mulberry plantations recorded three to six tonnes of leaf yield/ha/ year (Kumar *et al*., 1992). Palanidurai (1996) reported that substantial reduction in number of leaves / plant by 13.6 per cent. Further Satyaprasad *et al.* (2000) reported that, mealy bug incidence caused an estimated loss in leaf yield of 4500 Kg/ha/yr amounting to 34.24 per cent (Manjunath *et al*., 2003), thus depriving the farmer from brushing about 450 dfls/ha/yr, leading to decline in cocoon production by 150 Kg/ha/yr (10-15 per cent). Generally insecticides are not advisable for mulberry ecosystem, because of the residual toxicity and also it directly influences the silkworm rearing. Recently non-chemical avenues like botanicals acted as an efficient alternative for the pesticides in mulberry garden (Sathyaseelan and Bhaskaran, 2010**)**. Hence the efficacy of native botanicals

****Corresponding author: Madhuri Thinnaluri***
UAS, GKVK, Bangalore-560065

was tested for its repellency property against the mealy bug on mulberry.

MATERIALS AND METHODS

This experiment was laid out during post rainy season of 2011-2012 in Randomized Block Design with three replications. Well established 45 days old M5 variety mulberry saplings were raised at UAS, GKVK, Bangalore.

Culturing of pink mealy bug

The pure culture was released on well matured pumpkin which was cleaned using water and treated with 0.1% Bavistin 50 WP. The wounds present on pumpkins were plugged using wax. The culture was maintained throughout the research period without contamination. Chacko *et al.* (1978) and Singh (1978).

Preparation of cuttings

M5 mulberry variety was selected for this experiment. The plant selected for preparation of cuttings were healthy and free from scale insects, tukra infestation *etc*. The shoot was about 6 to 8 month old with a thickness of 10 to 15 mm diameter. The middle portion of the shoot with uniform thickness was used. Cuttings were 15 to 20 cm length with three to four good eye buds. Sharp knife was used to get clean cut ends without damaging the bark. Polythene bags are filled with sand, soil and manure at 1:1:1 ratio. Bags were watered before planting and cuttings are planted in a slanting position keeping one bud above the soil.

Lay out of the experiment

After 45 days the well established M5 mulberry saplings were caged and maintained for each individual botanical treatment @ 12 saplings/each. Out of which six saplings for seed kernel extracts and six saplings for leaf extracts (Neem, *Pongamia* and Mahua) except *Lantana camera* and *Adathoda vasica* (only leaf extracts) inside the cotton net.

Preparation of plant extracts and spraying

Plant extract was prepared by homogenizing 10 g of plant material (leaf) in 100 ml of distilled water using pestle and mortar. The homogenate was filtered through three layered muslin cloth. The resulting clear solution is used as foliar spray (8% and 10 %) on M_5 mulberry saplings (45 days old) with an interval of 3-5 days. Further the seed kernel extracts @ 2 and 4% (4 g of seed kernel powder in 100 ml of distilled water) along with one per cent soap solution also sprayed on each mulberry sapling(Plate: 4-7). The leaf and seed kernel extracts were sprayed (using hand sprayer) for 25 days on mulberry sapling as drenching spray of extracts both on ventral and dorsal surface of leaves. The control batch (sprayed with water) was also maintained within the net. All the mulberry saplings were treated (5 ml) with botanical at a time. Care was taken to wash the hand sprayer with water thoroughly well before using another botanical to avoid contamination. The repellent effect of the botanical extracts were calculated by the repellent movement of these mealy bugs away from the corresponding treated portion of the mulberry leaves. Observations were recorded at 24 and 48 hours after the release of crawlers on the mulberry saplings.

RESULTS AND DISCUSSION

The effect of botanicals against mealy bug crawlers after 24 and 48 hours on treated M5 mulberry sapling revealed significant results. All the seed kernel extracts showed positive response on repellency of mealy bug crawlers. Among treatments the seed kernel extracts of neem @ 4 per cent recorded highest of 96.53 and lowest of 70.90 per cent repellency was recorded for Mahua seed kernel extract @ 2 per cent, followed by neem seed kernel extract @ 2 per cent (91.73%), *Pongamia* seed extract @ 4 per cent (84.73%), *Pongamia* seed kernel extract @ 2 per cent (75.47%), Mahua seed kernel extract @ 4 per cent (74.87%), respectively. On contrary, the observations for leaf extracts (8%) of all botanicals recorded significant difference but the leaf extracts of *Lantana* recorded significantly lowest (24.46%) repellency percentage compared to other leaf extracts experimented .Further, lowest repellency was observed in the control (5.13%) against pink mealy bugs during 24 hours of release (Table 2). The significant difference in repellency was also observed at 48 hours after botanical spray. Among the botanicals, highest repellency was noticed in NSKE @ 4 per cent (97.57 %), followed by NSKE @ 2%(94.47%), PSKE @ 4% (86.93 %), PSKE @ 2% (78.03%), MSKE @ 4% (77.53%), MSKE @ 2% (74.20%), NLE @ 10% (72.37%), NLE @ 8% (63.50%), MLE @ 10% (53.27%), ALE @ 10% (50.00%), MLE @ 8% (45.77%), ALE @ 8% (41.83%), PLE @ 10% (32.88%), PLE @ 8% (28.90%), LLE @ 10% (27.36%), LLE @ 8% (26.20%) and least repellency was observed in control batch (8.33%) (Table 2).

Based on the above observation it is confirmed that, from 24 to 48 hours of release there was a positive increase in repellency per cent of all botanicals but it is vary according to the percentage of botanical sprayed as well as time. It was very much vivid from the data that, the more per cent increase in repellency was observed in MLE @ 10% (3.80%) which was found highest among other botanicals noticed after 24 to 48 hours of observation. The trend was not same with the previous observation however all botanical leaf extracts were recorded higher per cent repellency which ranged from 3.60 to 1.47 per cent for ALE @ 8% and LLE @ 10% respectively.
Increase in repellency over 24 hours was highest in MLE @ 10% (3.8%), followed by ALE @ 8% (3.60%), MLE @ 8% (3.57%), MSKE @ 2% (3.30%), check (3.20%), ALE @ 10% (3.07%), PLE @ 8% (2.80%), NSKE @ 2% (2.74%), MSKE @ 4% (2.67%), PSKE @ 2% (2.57%), PLE @ 10% (2.38%), PSKE @ 4% (2.20%), NLE @ 10% (2.04%), NLE @ 8% (1.77%), LLE @ 8% (1.73%), LLE @ 10% (1.47%) and NSKE @ 4% (1.04%) (Table 2).

Increase in repellency over control after 24 hours of treatment found highest in NSKE @ 4% (94.68%), followed by NSKE @ 2% (94.40%), PSKE @ 4% (93.94%), PSKE @ 2% (93.19%), MSKE @ 4% (93.14%), MSKE @ 2% (92.75%), NLE @ 10% (92.69%), NLE @ 8% (91.68%), MLE @ 10% (89.59%), ALE @ 10% (89.00%), MLE @ 8% (87.79%), ALE @ 8% (86.53%), PLE @ 10% (83.08%), PLE @ 8% (80.18%), LLE @ 10% (80.18%), LLE @ 8% (79.01%) and found significant in release of crawlers. The trend was same

Treatments Details

Tr. No	Treatments
T1: NSKE @ 4%	Neem (*Azadirachta indica*) seed kernel extract @4% + Soap powder @1%
T2: NSKE @ 2%	Neem (*Azadirachta indica*) seed kernel extract @2% + Soap powder @1%
T3: NLE @ 10%	Neem (*Azadirachta indica*) leaf extract @ 10%
T4: NLE @ 8%	Neem (*Azadirachta indica*) leaf extract @8%
T5: PSKE @ 4%	Honge *(Pongamia pinnata)* seed kernel extract @ 4% + Soap powder @1%
T6: PSKE @ 2%	Honge *(Pongamia pinnata)* seed kernel extract @2%+ Soap powder @1%
T7: PLE @ 10%	Honge (*Pongamia pinnata*) leaf extract @ 10%
T8: PLE @ 8%	Honge (*Pongamia pinnata*) leaf extract@ 8%
T9: MSKE @ 4%	Mahua (*Madhuca longifolia*) seed kernal extract @4% + Soap powder @1%
T10: MSKE @ 2%	Mahua (*Madhuca longifolia*) seed kernal extract@2% + Soap powder @1%
T11: MLE @ 10%	Mahua (*Madhuca longifolia*) leaf extract @10%
T12: MLE @ 8%	Mahua (*Madhuca longifolia*) leaf extract@8%
T13: LLE @ 10%	*Lantana (Lantana camara)* leaf extract@ 10%
T14: LLE @ 8%	*Lantana (Lantana camara)* leaf extract @8%
T15: ALE @ 10%	Adusoge (*Adathoda vasica)* leaf extract @10%
T16: ALE @ 8%	Adusoge (*Adathoda vasica)* leaf extract @ 8%
T17	Control

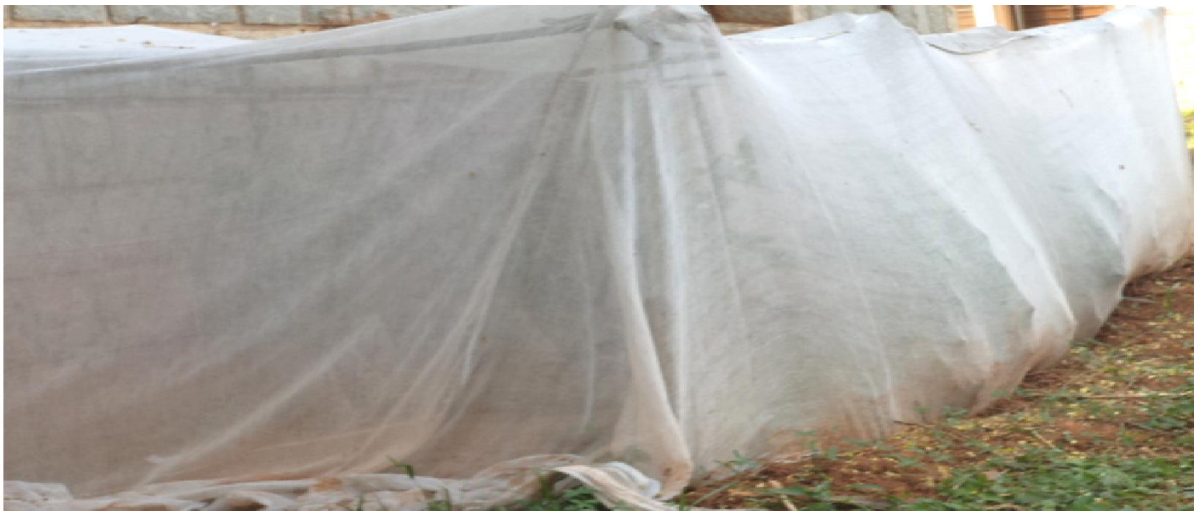
Table 2. Repellent (%) effect of botanicals on pink mealy bug *M. hirsutus*, 24 and 48 hours after the spray

Treatments	After 24 hrs	After 48 hrs	Increase in repellency	Increase in repellency over control	
				24 hrs	48 hrs
NSKE @ 4%	96.53	97.57	1.04	94.68	91.46
NSKE @ 2%	91.73	94.47	2.74	94.40	91.18
NLE @ 10%	70.33	72.37	2.04	92.69	88.48
NLE @ 8%	61.73	63.50	1.77	91.68	86.82
PSKE @4%	84.73	86.93	2.20	93.94	90.41
PSKE @ 2%	75.47	78.03	2.57	93.19	89.32
PLE @ 10%	30.50	32.88	2.38	83.08	74.52
PLE @ 8%	26.10	28.90	2.80	80.18	70.78
MSKE @ 4%	74.87	77.53	2.67	93.14	89.25
MSKE @2%	70.90	74.20	3.30	92.75	88.77
MLE @ 10%	49.47	53.27	3.80	89.59	84.36
MLE @ 8%	42.20	45.77	3.57	87.79	81.77
LLE @ 10%	25.90	27.30	1.47	80.18	69.55
LLE @ 8%	24.46	26.20	1.73	79.01	68.15
ALE @ 10%	46.93	50.00	3.07	89.00	83.26
ALE @ 8%	38.23	41.83	3.60	86.53	80.06
Control	5.13	8.33	3.20	-	-
F- test	*	*	*	*	*
S.Em±	1.15	1.20	0.40	0.48	0.80
CD at 5%	3.32	3.46	1.18	1.40	2.33

*Significant at 5%

Infested pumpkin

Crawlers



Layout of the experiment (caged condition of mealy bug upto 25 days)

even after 48 hours of treatment, even here all the seed kernel extracts were recorded highest repellency over control which was ranging from 91.46 to 88.77 per cent and 88.48 to 68.15 per cent in NSIKE and MSKE @ 2%;NLE @ 10% and LLE @ 8% respectively. These results are in conformity with the findings of Satyaseelan and Bhaskaran (2010), who reported that, the botanical extract of NSKE @10 per cent showed maximum repellency of 97.2 and 99.0 per cent against mealy bugs after 24 and 48 hours of release on mulberry. Further, spraying of NSKE against *Phenacoccus manihoti* under laboratory conditions on cassava leaves recorded less attractive to first instar nymph than untreated leaves and the *Pseudococcus* feeding on treated leaf died at second instar (Mourier, 1997). This may be due to the presence of biochemical constituents of the botanicals with property of repellency and also their availability during the infestation of mealy bug. However, the presence of Azadirachtin and other tetranortriterpenoids were responsible for the repellency of NSKE. Further the repellency is more at 48 hours after spray when compared to 24 hours after spray. As the time duration increased the repellency property also increased. Irrespective of the botanical extract treatments, as the concentration increases the repellency property was also increased to a marked level .The dose level was directly propotional to the per cent level of repellency property against the mealy bugs. The same type of effect was reported on other crops.

REFERENCES

CHACKO, M.J., BHAT, P.K., ANANDA RAO, L.V., DEEPAK SINGH, M.B., RAMANARAYAN, E.P. AND SREEDHARAN, K., 1978. The use of the lady bird beetle, *Cryptolaemus montrouzieri* for the control of coffee mealy bugs. *J. Coffee Res.,* 8: 14-19.

KUMAR, P., KISHORE, R., NOAMANI, M. K.R. AND SENGUPTA, K., 1992, Effect of feeding tukra affected mulberry leaves on silkworm rearing performance. *Indian J. Seric.,* 31 (1): 27-29.

MANJUNATH, D., SATHYA PRASAD, K. AND SIDDE GOWDA, D. K., 2003, Ecological approaches for the management of mealy bug, *M. hirsutus* attacking mulberry. *National Conference on Tropical Sericulture for Global Competitveness.* Central Sericultural Research and Training Institute, Mysore, p 41.

MISRA, C.S., 1919, Tukra disease of mulberry. *Proc. 3rd Ent. Mtg*., Pusa, pp.610-618.

MOURIER, M., 1997, Effect of neem (*Azadirachta indica*) kernel water extract on Cassava mealy bug, *Phenacoccus manihoti* (Hom: Pseudococcidae). *J. Appl. Ent.,* 121(4): 231- 236.

PALANIDURAI, S., 1996, Ecology and management of pink mealybug, *Maconellicoccus hirsutus* (Green) in mulberry. *M.Sc.(Seri) Thesis*, Tamil Nadu Agricultural University, Coimbatore, pp.74.

REDDY, D. N. R. AND NARAYANASWAMY, K. C., 2003, *Pests of Mulberry*. Zen Publishers, Bangalore, P. 75.

SATYA PRASAD, K., SUJATHA, C.R., MANJUNATH, D. AND DATTA, R.K., 2000, Screening of popular mulberry varieties for tukra infestation, *National Conference on Stratagies on Sericulture Research and Development,* Central Sericultural Research and Training Institute, Mysore.

SATYASEELAN, V. AND BHASKARAN, V., 2010, Efficacy of some native botanicals extracts on the repellency property against the pink mealy bug, *Maconellicoccus hirsutus* (Green) in mulberry crop. *Recent Research in Science and Technology,* 2(10):35-38.

SINGH, S.P., 1978, Propagation of a coccinellid beetle for the biological control of citrus and coffee mealy bugs. *Scientific Conf.* CPA, Dec. 1978, pp. 2.

****