

# EFFECT OF BOTANICAL EXTRACT AGAINST MANGO MEALY BUG *DROSICHA MANGIFERAE* (GREEN)

Abdul Ghani Lanjar\*, Maqsood Anwar Rustamani\*, Abdul Waheed Solangi\*,  
and Sajjad Ali khuhro\*

\*Department of Entomology, Sindh Agriculture University Tandojam

Corresponding Author: Abdul Waheed Solangi Email:solangiwaheed@gmail.com

**ABSTRACT:** To examine the effect of botanical extracts against mango mealy bug, *Drosicha mangiferae* (Green) the experiment was carried out in mango orchard at Kamaro Sharif near Tando Allahyar, Sindh during 2013. Two methods of spraying were carried out; five treatments with three replications were laid out. For this purpose, the plants in the orchard were bifurcated in to two groups. Method (1) the plants were sprayed before complete settlement of all 1<sup>st</sup> instars of mango mealy bug on the plant panicles during their upward movement from soil to mango plants; method (2) the plants were sprayed after complete settlement of all 1<sup>st</sup> instars on the plant panicles. Result revealed that the spraying mango plant after complete settlement of all 1<sup>st</sup> instars of mango mealy bug was more effective than spraying the plants during settlement of 1<sup>st</sup> instars of mango mealy bug. In both methods of spraying neem leaf extracts had significantly reduced ( $P < 0.01$ ) mealy bug population (~ 78.10%) followed by eucalyptus (~ 71.05%), Dhatura (~ 63.30%) and Akk (~ 58.43%). It is concluded that application of neem extract after settlement of mealy bug population onto plant panicle was the most effective method to control mealy bug population on mango trees.

**Key word:** Plant extract, *Drosicha mangiferae* (Green), mango plant, spraying method.

## INTRODUCTION

Mango (*Mangifera indica* L.) a member of family Anacardiaceae is known as king of fruits for its sweetness, excellent flavor, delicious taste and high nutritive value [1] and [2]. This important tropical fruit is being grown in more than 100 countries [3]. Pakistan is standing at 5th place by contributing 916.4 MT mangoes, which is 3.9% in the total world production [4]; [5]. A number of insect pests are known to attack the mango trees that influence yield of mango with respect to quantity and quality. These insect pests include mango leaf hopper, Red-banded thrips, mango-tip borer, mango scale, bark beetle, mango midges, fruitflies, mango mealy bugs, etc.[6]. The mango mealy bug, *Drosicha mangiferae* is one of the most important pests and also a serious threat to mango orchards [7]; [8]. The nymphs and female bugs suck sap from inflorescence, tender leaves, shoots and fruit panicles. As a result, the affected inflorescences are shriveled and get dried. Severe attack affects the fruit set and causes fruit drop. They also secrete honey dew on leaves, fruits and shoots consequently sooty mould develops on these plant parts [9]. Due to the growth of sooty mould on the leaves, photosynthetic activity is affected [10]. Some plant extracts are used as bio-pesticides that control insect population by non-toxic mechanisms [11]. Bio-pesticides are the substances or mixture of substances used to prevent, destroy, repel, attract, sterilize or mitigate the pests [12]. The use of locally available plants, such as *Derris*, *Nicotiana* and *Ryania*, is an ancient way to control pests during prehistoric period [13]. Azadirachtin is a non-toxic plant material to birds and mammals and is non-carcinogenic that is derived from the neem tree (*Azadirachta indica*), which affects the reproductive and digestive process of a number of important pests [14]. Neem products have a repellent effect on some mealy bugs [15]. Young cassava mealybugs (first instar nymphs) were repelled by leaves treated with a 10% neem kernel water extract, and those that settled and started feeding died in the second instar. *Eucalyptus camaldulensis* and some other botanicals are also used as weed control in farmlands to

maximize yields [16]. The consumption of bio-pesticide in some of the developed countries is almost 3000 g ha<sup>-1</sup>. [17] During present investigation efforts are undertaken to control mealy bug population on mango trees by utilizing different plant extracts. The aim of the study is to avoid environmental pollution and to develop eco-friendly management of mango mealy bug in mango orchards.

## MATERIALS AND METHODS

The experiment was conducted on the effect of bio-pesticide (plant extracts) on mango mealy bug, *Drosicha mangiferae* (Green) at mango orchards at Kamaro Sharif near Tando Allahyar, Sindh.

### Preparation of extract

For the preparation of the extract fresh leaves of akk, dhatura, *eucalyptus* and neem plants was collected and processed. The leaves of each plant species were taken separately and boiled in 30 liter water for 45 minutes. After cooling the extract, it was filtered through muslin cloth. It was then sprayed onto mango trees. Two methods of spraying were used. For this purpose, the plants of variety Sindhri in the orchard were bifurcated in to group I and II, each treatment was replicated three times. Three trees were randomly selected and labeled.

### Spraying method I

The plants of group I was kept for experimentation. Spraying of bio extracts was carried out when 1<sup>st</sup> instar mango mealy bug emerged from soil and started their upward movement to be settled on mango plant panicles. The upward movement has lasted 15-20 days. As their 1<sup>st</sup> appearance was recorded on plant panicles, the plants were sprayed with bio extracts. Fortnightly spraying of bio extracts was kept continue till the last group of 1<sup>st</sup> and 2<sup>nd</sup> instars of mealy bug was to be settled mango plant panicles. The observations on mealy bug population were taken as pretreatment and post treatment i.e. one day before spray (Pre-treatment observation) and three observations after sprays (Post treatment) at the intervals of two days up to 6 days.

## Spraying method II

The plants of group II was kept for experimentation. The application of plant extracts was made when the upward movement was over and all 1<sup>st</sup> instars and 2<sup>nd</sup> instars of mealy bug have completely settled themselves to plant panicles. Plants were sprayed with bio extracts at fortnightly interval until the down ward movement of the adult mealy bugs was started to soil for oviposition. The observations on mealy bug population were taken at the intervals of two days up to 6 days after each spray. The data were analyzed statistically (statistix 0.8).

## RESULTS

### Spraying method I

The mango plants were sprayed five times since the appearance of mango mealy bug onto them the 1<sup>st</sup> spray was made on 08-01-2013. The data in table 1 revealed that maximum reduction in mealy bug population was recorded on day 2 after spray in all treatments during all five sprays. Neem leaves extract was found the most effective, which reduced mealy bug population 129.67 to 39.33 followed by *eucalyptus* (126.00 to 53.00, akk (128.67 to 71.00) and dhatura (117.00 to 91.33) as compared to control trees where population was further enhanced from 155.00 to 160.67. Similar trend in population reduction was recorded during 2<sup>nd</sup> spray, which was done on 22-01-2013. Minimum population 32.67 was recorded on the trees sprayed with neem leaves extracts and maximum 100.67 bugs on plants sprayed with dhatura as compared to the populations on control plants,

which was 201.67 bugs. After 3<sup>rd</sup> spray which was done on 05-02-2013. Minimum mealy bug population (39.33 per panicle) was recorded on mango plants treated with neem extract followed by akk (51.00), eucalyptus (56.33) and dhatura (93.66), while population on check plant was (203.00) bug per panicle. At 4<sup>th</sup> application on 19-02-2013 the neem reduced the mealy bug population from (100.67 to 30.67) followed by dhatura (11.00 to 51.33), eucalyptus (119 to 44), akk (134 to 73) while check plants had (204.67). During 4<sup>th</sup> spray neem leaves extract again proved the best in suppressing mealy bug population while dhatura was least effective. Fifth spray was done 16 days before the end of the activities of mealy bug on mango plants. The results of 5<sup>th</sup> spray (5-3-2013) showed that the maximum decline in mango mealy bug population was recorded on 6<sup>th</sup> day as compared to 2<sup>nd</sup> day as recorded during spray 1<sup>st</sup> to 4<sup>th</sup> sprays. This could be due to the down ward movement of mature females from plant to soil. However, maximum reduction in mealy bug population (11.00) per panicle was recorded on plants treated with neem extract followed by eucalyptus (19.00), akk (32.67) and dhatura (43.00) as compared to check plant that had (87.00) mealy bug per panicle. Statistical analysis showed that the treatment difference were highly significant ( $P < 0.01$ ). LSD showed no significant difference between akk and *eucalyptus* leaf extracts. It is concluded that neem leaf extract was the best bio-pesticide to reduce mango mealy bug population on mango trees.

**Table 1. Mean population per branches of mango mealy bug before and after application of bio-pesticides.**

Observations	Post-Sprays	Neem	Akk	Dhatura	Euclyptus	Control
Pre Obs:		129.67	128.67	117.00	126.00	155.00
1 <sup>st</sup> Spray Jan. 8, 2013	1 day	72.67	103.33	111.00	66.33	128.00
	2 day	39.33	71.00	91.33	53.00	160.67
	6 day	81.00	92.67	108.00	88.33	148.00
Pre Obs:		106.33	116.33	134.00	117.67	201.67
2 <sup>nd</sup> Spray Jan. 22, 2013	1 day	63.67	98.00	114.67	86.67	175.33
	2 day	32.67	69.00	100.67	55.33	196.00
	6 day	79.00	92.67	108.33	83.00	202.67
Pre Obs:		99.67	115.67	132.00	121.67	216.33
3 <sup>rd</sup> Spray Feb. 5, 2013	1 day	73.33	78.67	120.00	91.33	203.00
	2 day	39.33	51.00	93.66	56.33	218.33
	6 day	71.67	87.67	106.66	87.67	217.00
Pre Obs:		100.67	111.00	134.33	119.00	204.67
4 <sup>th</sup> Spray Feb. 19, 2013	1 day	56.33	82.00	95.67	73.67	204.67
	2 day	30.67	51.33	73.00	44.00	205.67
	6 day	60.33	90.67	92.67	71.33	200.67
Pre Obs:		85.00	94.67	122.67	110.00	198.00
5 <sup>th</sup> Spray March. 5, 2013	1 day	48.67	80.00	98.67	75.33	204.67
	2 day	25.33	54.33	74.67	45.00	198.67
	6 day	21.00 <sup>a</sup>	44.7 <sup>c</sup>	51.13 <sup>d</sup>	36.17 <sup>b</sup>	174.32 <sup>e</sup>

**Table 2. Mean mealy bug population per branch after application of bio-pesticides when completely settled on mango panicles.**

No. of spray		Neem	Akk	Dhatura	<i>Eucalyptus</i>	Control
	Pre- treatment	334.33	326.34	342.44	361.18	346.27
		Post- treatment				
	1 day	135.00	194.00	217.67	189.67	357.67
1 <sup>st</sup> Spray Jan. 22, 2013	2 day	122.00	182.33	206.33	177.00	347.67
	6 day	112.33	173.67	200.00	167.00	356.67
	1 day	104.33	167.00	192.00	160.67	360.67
2 <sup>nd</sup> Spary Feb. 5, 2013	2 day	96.66	159.67	185.00	150.67	351.67
	6 day	82.33	153.33	178.67	140.00	355.67
	1 day	70.33	145.33	176.67	130.67	331.00
3 <sup>rd</sup> Spary Feb. 19, 2013	2 day	63.00	136.67	177.67	121.67	337.00
	6 day	52.67	130.33	170.33	111.33	334.00
	1 day	44.33	123.67	162.00	104.67	323.00
4 <sup>th</sup> Spary March. 5, 2013	2 day	35.00	116.67	157.00	95.00	324.33
	6 day	26.00	109.00	150.33	85.00	300.00
	1 day	21.33	103.00	150.00	70.67	298.33
5 <sup>th</sup> Spary March. 20, 2013	2 day	16.00	95.33	146.33	58.33	292.33
	6 day	10.00a	88.33c	141.67d	43.67b	286.33e

### Spraying method II

The mango plants were sprayed the population of 1<sup>st</sup> instar mango mealy bug finished their upward movement and completely settled on mango plant panicles. The plants were sprayed five times with the interval of 15 days. The 1<sup>st</sup> spray was made on 22-01-2013. The data in table No-2 revealed that neem leaf extract reduced mealy bug population to 112.33 followed by *eucalyptus* (167.00), akk (173.67) and dhatura (200.00) per panicle as compared to control trees (366.67). Similar, at 2<sup>nd</sup> spray on 5-02-2013, minimum population 82.33 was recorded on the trees sprayed with neem leaves extract and maximum 140.00 bugs per panicle on the plant sprayed with *Eucalyptus* as compared to akk (153.33), dhatura (178.67) and control (355.67). After 3<sup>rd</sup> spray on 19-02-2013, minimum mealy bug population (52.67 per panicle) was recorded on mango plants treated with neem extract followed by *Eucalyptus* (111.33), akk (130.33), and dhatura (170.33) while population on check trees was (334.00) mealy bug per plant. In 4<sup>th</sup> application on 05-03-2013, neem reduced the mealy bug population to 26.00, *eucalyptus* (85.00), akk (190.00) and dhatura (150.33). During 4<sup>th</sup> spray mealy bug population in check plant was recorded as (300.00) bugs per plant. Fifth spray was done 20-3-2013 that was few days before the end of the activities of mealy bug on mango plants. A natural decline in population of mealy bug was observed. However, the population of mealy bug on 6 day of the 5<sup>th</sup> spray on check plant was recorded as (286.33) per panicle in comparison to that neem leaves extract highly reduced mango mealy bug population to 10.00 per panicle and the least reduction (141.67) was recorded on plant treated with dhatura. However, (88.33) and (43.67) was recorded on plant treated with akk and *Eucalyptus*, respectively. Statistical analysis showed that the treatment difference

were highly significant ( $P < 0.01$ ). LSD showed no significant difference in the efficacy of all plant extracts. It is concluded that neem leaf extract is the best bio-pesticides to reduce mango mealy bug population on mango trees at the interval of 15 days.

### DISCUSSION

The result of present study indicated that the mango mealy bug is one of the serious pests of mango. Its damage is more severe at the inflorescences and flowering setting. [18] reported the drastic effect of mango mealy bug on mango orchards, character and yield components. The mango plants were sprayed five times since the appearance of mango mealy bug in mango orchards. The maximum reduction in mealy bug population was recorded on day 2 after spray in all treatments during all five sprays in both methods of spraying. Neem leaves extract was found the most effective in reducing mealy bug population followed by *eucalyptus*, akk and dhatura as compared to control trees. [19] reported that the principal active compound in neem is *azadirachtin*, a bitter, complex chemical that is both a feeding deterrent and a growth regulator. Meliantriol, salanin, and many other minor components of neem are also active in various ways. In insects, neem is most active as a feeding deterrent, but in various forms it also serves as a repellent, growth regulator, oviposition (egg deposition) suppressant, sterilant, or toxin. However, [20] recorded the same effectiveness of neem leaf extracts; however, the effectiveness was up to 15 days, which was not observed in our study that could be due to variation in extraction method. Our results showed that the 1<sup>st</sup> and 2<sup>nd</sup> instars were more affected than later instars/ stages. It is in agreement with the findings of [21] recorded that in young mealy bugs are sensitive to neem kernel water

extract NKWE). The better results of NLE may be due to antifeedant or repellent property and this is in line with the observation of [22] who has reported that neem plant extracts deter insects from feeding. [23] also reported that neem compound *azadirachtin* has antifeedant effect on insects. [24] mentioned that beside neem, *Eucalyptus camaldulensis* and some other botanicals are also used against mealy bug orchards to maximize the yield.

## CONCLUSION

It is concluded that neem leaf extract is the best bio-pesticide which reduced mango mealy bug population on mango trees up to two days. Continuous spraying on the plants brought sizeable reduction in the population. Early instars were found more vulnerable to be controlled by neem extract.

## LITERATURE CITED

- [1] Jedele, S., Hau, A. M. and von Oppen, M., "Analysis of the world market for mangoes and its importance for developing countries". *Conference on International Agricultural Research for Development (Göttingen, Germany)* (2003).
- [2] Tharanathan, R. N., Yashoda, H. M. and Prabha, T. N., "Mango (*Mangifera indica* L.) the king of fruits an overview". *Food Reviews International*, **22**, 95–123 (2006).
- [3] Saucó, V., "Mango World Production" (Outside Israel, Egypt and India). *Acta Hort.*, **455**: 15–22 (1997).
- [4] FAO Production Yearbook., Food and Agricultural Organization of the United Nations, Rome (2010).
- [5] Minfal, Agriculture Statistics of Pakistan. *Govt. of Pakistan, Min. of Food, Agri. and Livestock Economic Wing, Islamabad* (2010).
- [6] Mohan, S., A. Sirohi and Gaur, H.S., "Successful management of mango mealy bug, *Drosicha mangiferae* by *Photorhabdus luminescens*, a symbiotic bacteria from entomopathogenic nematode, *Meterorhabdites indica*". *International Journal of Nematology*. **14**(2): 195-198 (2004).
- [7] Karar, H., J. Arif, S. Saeed and Sayed, H.A., "A threat to mango". *DAWN Sci-tech. World*, December, 23 (2006).
- [8] Hussain, S.L., M.A. Saleem and S. Freed. "Toxicity of some insecticides to control mango mealybug, *Drosicha mangiferae*, a serious pest of mango in Pakistan". *Pakistan Journal of Zoology* **44** (2): 353–359 (2012).
- [9] Karar H, A.H. Sayyed, M.J Arif., M. Ashfaq and Aslam. M., "Integration of cultural and mechanical practices for management of the mango mealybug *Drosicha mangiferae*" *phytoparasitica* **38** (3): 223-229 (2010).
- [10] Batra, H.N. and Pruthi, H.S., "Some important fruit pests of north west India". *ICAR. Bull.No.80*, 113 (1960).
- [11] Schmutterer. H., "Properties and potential of natural pesticides from the neem tree, *Azadirachta indica*." *Annual Review of Entomol.* **35**: 271-297(1990a).
- [12] Khater, H.F., "Eco smart Bio rational insecticides alternative insect control strategies. in insecticides, Perveen, F. (Ed.). In Tech, Rijeka, Croatia, ISBN 979-953-307-667 (2011).
- [13] Pretty, J., "the Pesticide destocks towards a more sustainable agriculture". *Earth scan*, London (2009).
- [14] Kalra, A. and Khanuja, S. P. S., "Research and Development priorities for bio pesticide and bio fertilizer products for sustainable agriculture in India" *Business Potential for Agricultural Biotechnology* Asian Productivity Organization, 96-102 (2007).
- [15] Saxena RC., "Insecticides from neem in insecticides of Plant Origin". ACS Symposium Series 387. *American Chemical Society, Washington DC, USA.* pp. 110-135 (2002).
- [16] Yadav, J.B., R.S. Singh and R.A. Tripathi. "Evaluation of Bio-pesticides against pest complex of Okra." *Annals of Plant Protection Sci.*, **16** (1): 492-498 (2008).
- [17] Tiwari. and Srivastava. K.J., "Studies on bio-efficacy of some plant extracts against Pathogens of onion." *J. crop Science* **24** (1): 6-10(2005).
- [18] Singh, A.K. and Kumar. M., "Efficacy and economics of neem based products against cotton jassid, *Amrasca biguttulla* Ishida in okra." *Crop Research (Hisar)* **26**(2) : 271-274 (2003).
- [19] Schmutterer. H., "Potential of azadirachtin-containing pesticides for integrated pest control in developing and industrialized countries." *J. Insect Physiology*. **34**: 713-719 (1988).
- [20] Mishra, N. C. and S. N. Mishra. "Impact of biopesticides on insect pests and defenders of okra". *Indian J. Plant Protection*. **30** (1): 99-101(2002).
- [21] Mourier. M., "Effects of neem (*Azadirachta indica*) emul water extracts on cassava mealybug, *Phenacoccus manihoti*". *Journal of Applied Entomology*, **121**(4):231-236 (1997).
- [22] Gilani G Neem the wonder tree. 3-7 (2001).
- [23] Redfern. R., "laboratory evolution of boranadiolone as a rodenticide for use against warfarin resistant and non resistant rats and mice" *Journal of hyg London* **84**(2): 263-208 (1980).
- [24] Ogunnika, C.B., "Medicinal plants a potential agro forestry components in Nigeria". 3rd Annual Conference of School of Agriculture and Agricultural Technology, The Federal University of Technology, Akure, Ondo State, Nigeria, pp: 2-7.