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BIOEFFICACY OF DIFFERENT PLANT EXTRACTS AGAINST MELON FRUIT FLY IN BITTER GOURD

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ABSTRACT

An experiment was carried out during the year 2009 to find the bio-efficacy of different Plant extracts against melon fruit fly, Bactrocera cucurbitae (Coquillett) (Diptera: Tephritidae) in bitter gourd (Momordica charantia L.), which is a serious pest of cucurbitaceous vegetables. The experiment consisted of three varieties Ambika, Rama Krishna and Phauja and five different treatments (including check) i.e. Methomyl, Neem seed extract, Parthenium hysterophorus L. extract and Eucalyptus leaves extract. All the botanicals showed significant results and minimized the percent damage as compared to the check. The minimum population of melon fruit fly adults m^{-2} were found in Methomyl and Neem seed extract treatments, followed by Parthenium plant extract and Eucalyptus leaves extract. The maximum adults m^{-2} were found in the control plots. The minimum percent damage (41.94%) was found in Neem seed extract treated plots. The results of the experiment revealed that botanicals can be replaced for the management of melon fruit flies instead of using the synthetic pesticides in order to save the environment from their hazards.

Key words: Melon fruit fly, bitter gourd, extracts, population, damage.

INTRODUCTION

Bitter gourd (*Momordica charantia* L.); a member of Cucurbitaceae is a cross-pollinated plant. It is a common vegetable grown in Asia and other part of the world. Fruit fly (*Bactrocera cucurbitae*), and Red Pumpkin beetle (*Aulacophora foveicollis*) are the major pests of Bitter gourd. (Singh *et al.,* 2006). The melon fruit fly, *Bactrocera cucurbitae* (Coquillett) (Diptera: Tephritidae) is distributed widely in temperate, tropical, and sub-tropical regions of the world (Dhillon *et al*., 2005). It has been reported to damage 81 host plants

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and is a major pest of cucurbitaceous vegetables, particularly the bitter gourd (*Momordica charantia*), muskmelon (*Cucumis melo*), Snap melon (*C. melo* var. *momordica*), and snake gourd (*Trichosanthes anguina*) (Dhillon *et al*., 2005).

The extent of losses varies between 30 to 100%, depending on the cucurbit species and the season (Sapkota *et al*., 2010). It prefers to infest young, green, soft-skinned fruits. It inserts the eggs 2 to 4 mm deep in the fruit tissues, and the maggots feed inside the fruit. Pupation occurs in the soil at 0.5 to 15 cm below the soil surface (Dhillon *et al*., 2005). Fruit flies are estimated to cause annual loss to fruit and vegetable farmers in Pakistan of over US$ 200 million. Different chemical and attractants are used to attract and kill the adults of fruit fly (Muhammad *et al*., 2007).

Plants rich in bioactive chemicals may provide potential alternative to currently used insect controlling agents. There are 34 local plants including harmal, kuth, balcher and neem, which carry repellent, anti-feedant qualities against stored grain insect pests (Jilani *et al.,* 1989). Plants contain thousands of compounds which are virtually an untapped reservoir of pesticides that can be used directly or as templates for synthetic pesticides (Singh and Sehgal, 2001). Neem leaf dust and commercial formulation of neem can minimize the population and damage of fruit fly species. It also blocks the ovary development (Mahfuza *et al.,* 2007).

Datta and Saxena (2001) studied that the *Parthenium hysterophorus* and its derivatives can be used for control of different insects. Therefore, the present study was conducted to investigate the effect of the extracts of the mentioned plants on melon fruit fly, its population reduction and the percent damage it causes to bitter gourd.

MATERIALS AND METHODS

To study the Bio-efficacy of various plant extracts on fruit fly, *Bactrocera cucurbitae* (Coquillett) in bitter gourd (*Momordica charantia* L.), an experiment was conducted at Research Farm of Khyber Pakhtunkhwa Agricultural University Peshawar during 2009. Three different varieties Ambika, Rama Krishna and Phauja were sown in April 2009. The experiment was laid in a randomized complete block design (RCBD) with split plot arrangement replicated three times. The varieties were assigned to the main plots and treatments to sub plots. The detail of the treatments is given below:

1. Methomyl (synthetic insecticide as a standard)
2. Neem seed Extract
3. *Parthenium* plant (weed) Extract
4. *Eucalyptus* leaf Extract
5. Check

Uniform cultural practices were applied to all the treatments. After germination the field was observed daily till the infestation started. The treatments (extracts) were applied when the pest population started on the plants. The data were recorded before spraying the extracts and pesticide, and after 24 hours, 48 hours and 72 hours of the pesticides application. The data recorded were subjected to ANOVA technique by using MSTATC computer software and significant means were separated by using Fishers LSD test (Steel and Torrie, 1980).

RESULTS AND DISCUSSION

The data regarding the effect of treatments on the population of Fruit fly presented in Table-1. The statistical analysis of the data showed that the interaction of varieties, time and with treatments is non significant. Similarly the interactions of variety into treatment and variety into time are also non-significant.

While interaction of treatment and time is significant. Minimum number of fruit fly adults m^{-2} (2.44 and 2.83) were found in plot treated with Methomyl and Neem, respectively followed by *Parthenium* (3.38) and Eucalyptus (3.41) as compared to the check (4.58 adults m^{-2}). The Population of fruit fly adults/m^2 at 0 hour was 2.80. After 24 hour the population was 3.28 adults m^{-2}. At 48 and 72 hours the population was 3.51 and 3.73 adults m^{-2}, respectively.

The Table-1 also revealed that the population in Methomyl and Neem treated plots at 0 hour, 24 hours, 48 hours and 72 hours were reduced gradually. The number of adults m^{-2} were increased with the passage of time and maximum number after 72 hours was found. Methomyl and Neem Crude Seed extract minimized the population and the damage of Fruit flies. These findings are similar to the results of (Dhilion *et al.* 2005; Oke, 2008) who reported that insecticides can gave effective control against the melon fly. Further more they studied that Neem products can also control the melon fruit fly. Our results are also in line with the Masood *et al.,* (2009) who studied in field and laboratory trails that Neem and its derivates can minimize the melon fruit fly (*Bactrocera cucurbitae*) population.

Mahfuza *et al.,* (2007) found that Neem leaf dust and commercial formulation of Neem can easily control the population of *Bactrocera cucurbitae* and *Bactrocera dorsalis*. They also found that Neem blocks the ovarian development and can be used as safe alternative of insecticides for the control of *Bactrocera* Species. Parthenium treated plots showed less population than control plot. It also shows that the Parthenium plant extract have good effect on fruit

fly which confirms the results of Datta and Sexna (2001) who studied that Parthenium can be used for insect/pest management.

The data regarding percent damage by fruit fly presented in Table-2. The statistical analysis of variance showed that the interaction on variety, time and treatment is non significant.

Similarly the interactions of variety into treatment and variety into time are non significant while the treatment, time and the interaction of treatment and time are significant. The Table-2 shows that the minimum percent damage 41.94 and 42.47 was observed in the plot treated with Neem and Methomyl respectively. In the Parthenium treated plot the recorded percent damage was 45.92. There was 43.75% damage in plot treated with Eucalyptus. The highest percent damage was observed in the check plot that was 51.56 percent. The percent damage at 0 hour was 41.60. After 24 and 48 hours the percent damages reached to 45.33 and 46.33, respectively. The damage increased to 47.24 percent after 72 hours.

The Table-2 also revealed that at 0, 24, 48 and 72 hours the percent damage in Methomyl was 50.2, 48.6, 38.8 and 32.5. This showed that the damage was reduced up to a great extent. The plot, which was treated with Neem the percent damage at 0 hour, was 44.3 that reduced to 43.0 after 24 hours. The percent damage at 48 hours and 72 hours was 42.5 and 38.2 respectively. In Parthenium treated plot the percent damage at 0, 24, 48 and 72 hours was 40.5, 45.3, 47.8 and 50.3 respectively.

The observed percent damage in Eucalyptus at 0 hour was 35.7. The percent damage increased after 24 hours and reached to 40.3 percent. At 48 and 72 hours the damage was 46.7 and 52.5 respectively. The maximum percent damage was observed in the check plot. At 0 hours the damage was 37.6 percent that reached to 49.7 percent after 24 hours. There was 56 percent damage after 48 hours that increased and reached to 63 percent after 72 hours. The plot treated with Methomyl and Neem showed minimum percent damage which confirms the results of Shivayya and Kumar (2008) who studied that contact and systemic insecticides have their own limitations in controlling the melon flies.

Our results also confirms the results of Sapkota *et al.,* (2010), who reported that the cucurbit fruit fly causes about 50% losses in squash yield under farmers field conditions in uncontrolled situations. Application of locally made botanical pesticide offers superior yield in terms of minimum percent infestation.

Table-1. Melon fruit fly population as affected by bitter gourd varieties, various treatments and their time of application during the year 2009.

			V x T x Tr			
Variety	**Treatment**	**0 hr**	**24 hr**	**48 hr**	**72 hr**	**V x Tr**
Ambika	Methomyl	2.7	2.7	2.0	1.7	2.3
	Neem	3.7	3.7	3.7	3.4	3.6
	Parthenium	2.7	3.4	3.7	4.4	3.6
	Eucalyptus	2.4	2.7	3.4	4.0	3.0
	Check	3.0	4.0	5.0	6.0	4.5
Rama Krishna	Methomyl	3.0	3.0	2.0	1.4	2.4
	Neem	2.0	2.0	2.4	2.4	2.2
	Parthenium	2.4	3.7	4.0	4.0	3.5
	Eucalyptus	3.4	3.7	3.7	4.0	3.7
	Check	2.7	4.0	5.0	6.0	4.5
Phauja	Methomyl	3.4	3.4	2.7	1.7	2.8
	Neem	2.7	2.7	2.7	3.0	2.8
	Parthenium	2.4	2.7	3.7	4.0	3.2
	Eucalyptus	3.0	3.4	3.7	4.0	3.6
	Check	3.0	4.7	5.4	6.4	4.9
	Treatment		Tr x T			Mean
	Methomyl	3.0 f	3.0 f	2.3 h	1.6 i	2.44 c
	Neem	2.8 fg	2.8 fg	2.9 fg	2.9 fg	2.83 c
	Parthenium	2.5 gh	3.3 ef	3.8 cd	4.2 c	3.38 b
	Eucalyptus	2.9 fg	3.3 ef	3.6 de	4.0 cd	3.41 b
	Check	2.9 fg	4.3 c	5.2 b	6.2 a	4.58 a
	Variety		V x T			Mean
	Ambika	2.9	3.6	3.6	3.9	3.38
	Rama Krishna	2.7	2.2	3.5	3.6	3.21
	Phauja	2.9	2.9	3.7	3.9	3.40
	Means	2.80 d	3.28 c	3.51 b	3.73 a	

Means followed by the same letter in the above table are non significant at 5% significance level.

LSD for Treatment = 0.49, LSD for Time = 0.21, LSD for Treatment x Time = 0.62

Table-2. Percent damage of the bitter gourd as affected by bitter gourd varieties, various treatments and their time of application during the year 2009.

			V x T x Tr			
Variety	**Treatment**	**0hr**	**24hr**	**48hr**	**72hr**	**V x Tr**
Ambika	Methomyl	51.4	47.4	39.0	31.67	42.4
	Neem	56.7	55.0	48.4	45.4	51.4
	Parthenium	44.7	46.7	48.4	47.4	46.8
	Eucalyptus	35.4	41.0	48.4	52.4	44.3
	Check	37.0	50.0	56.7	62.4	51.5
Rama Krishna	Methomyl	46.7	46.7	37.4	32.4	40.8
	Neem	32.0	32.7	38.0	31.7	33.6
	Parthenium	40.0	47.4	50.0	54.7	48.0
	Eucalyptus	38.4	42.0	46.0	52.4	44.7
	Check	40.4	51.7	57.4	65.0	53.6
Phauja	Methomyl	52.4	51.7	40.0	33.4	44.4
	Neem	44.0	41.4	41.0	37.4	41.0
	Parthenium	36.7	41.7	45.0	48.7	43.0
	Eucalyptus	33.4	37.7	45.7	52.7	42.4
	Check	35.4	47.4	54.0	61.7	49.6
	Treatment		Tr x T			Mean
	Methomyl	50.2 cd	48.6 de	38.8 klm	32.5 n	42.47 b
	Neem	44.3 fghi	43.0 ghij	42.5 hijk	38.2 lm	41.94 b
	Parthenium	40.5 ijkl	45.3 efgh	47.8 def	50.3 cd	45.92 ab
	Eucalyptus	35.7 mn	40.3 jkl	46.7 defg	52.5 bc	43.75 b
	Check	37.6 lm	49.7 cd	56.0 b	63.0 a	51.56 a
	Variety		V x T			Mean
	Ambika	45.0	48.0	48.13	47.9	47.23
	Rama Krishna	39.5	44.0	45.8	47.3	44.12
	Phauja	40.4	44.0	45.2	46.8	44.03
	Mean	41.60 c	45.33 b	46.33 ab	47.24 a	

Means followed by the same letter in the above table are non significant at 5% significance level.

LSD for Treatment = 5.72, LSD for Time = 1.72, LSD for Treatment x Time = 6.52.

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