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Effects of different synthetic and botanical pesticides against red pumpkin beetle under field conditions

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Abstract
To study the effect of different synthetic chemicals (Lambda-cyhalothrin and Bestox) and botanicals (Neem extract and Parthenium extract) pesticides against the Red pumpkin beetle (*Aulacophora foveicollis*) three varieties of Cucumber *(Cucumis sativus)* (Local, Super green and Ambika) were grown. The research trail was conducted at the new Developmental Research Farm (NDRF) of The University of Agriculture Peshawar during 2012. Two weeks after the first spray minimum damage was found in the Lambda-cyhalothrin (24.8%) and Bestox (26.7%) treated plots. Maximum percent damage 51.5% was found in the control plots. After the second spray damage of the Red Pumpkin Beetle reduced to 8.2% and 10.7% in the Lambda-cyhalothrin and Bestox treated plots respectively and the maximum damage were found in the control plot that was 70.8%. No significant effect of botanical pesticides was observed.

Keywords: Red pumpkin beetle. Cucumber, synthetic chemicals, Botanicals, Damage

1. Introduction
Cucumber (*Cucumis sativus*) is a broadly cultivated plant of the gourd family Cucurbitaceae. Cucumbers originated in India. A large number of genetic varieties of cucumber have also been observed in various parts of India. It has been grown for at least 3,000 years in Western Asia, and was introduced to other parts of Europe by the Romans. Records of cucumber cultivation were seen in France in the 9th century, in England in the 14th century, and in North America by the mid-16thcentury. Cucumber belongs to the family Cucurbitaceae which has 750 species and of 90 genera (Sitterly, 1972) [9]. Cucumber is the 4th most important vegetable crop after tomato, cabbage and onion (Tatlioglu and Eguchi, 1998) [11].
A number of insect/pests attack on cucumber, Worth to mention is fruit fly (*Bacterocera cucurbitae*), red pumpkin beetle (*Aulacophora foveicollis*) and hadda beetle (*Epilachna* Sp.) (Singh *et al*, 2006) [8].
Red pumpkin Beetle (*Aulacophorav foveicollis*) has been noted as a major insect pest of cucurbitaceous vegetables particularly cucumber and melons. This insect pest is distributed all over the south East Asia. The adult beetle is red oblong and almost 6-8 mm long and egg laying occurs at the base of cucumber stem. One female can lay 150-300 eggs. The adult beetles attack on the leaf lamina making irregular holes and also feed on cotyledons and flowers. They feed on seedlings, fresh and tender leaves and flowers. They usually occur in large numbers (Rahman *et. al*, 2007) [7].
Pyrethrum and neem are easily available at commercial level pesticides based on plant seed and leaves extraction which are used to control many insect pest of cucurbits (Betman, 2006) [2]. There are plenty of insecticides that control the red pumpkin beetle among which malathion, parathion, carbryl and methoxychlor are more effective (Robert, 2006) [5].
The present study aimed to determine the efficacy of botanical and chemical insecticides against the Red Pumpkin Beetle on Cucumber.

2. Materials and Methods
To study the efficacy of botanicals and chemical pesticides against the insect pest of cucumber, the research trail was conducted at the New Developmental Research Farm (NDRF) of the University of Agriculture Peshawar during April, 2012. The experiment was laid out in Randomized Complete Block (RCB design) with split plot arrangement in open field condition. The field was divided into three main, plots nine sub plots and 45 sub-sub plots. The varieties of cucumber viz. Local (V1), Super green (Proline) (V2) and Ambika (V3) were sown. Each variety was replicated three times. There were five treatments including one control in each variety/replication.

The experiment comprised of the following Treatments
T_0 Control (Check)
T_1 Neem seed extract (Botanical)
T_2 Partheniumplant extract (Botanical)
T_3 Bestox (Alpha -cypermethrine) (Synthetic insecticide)
T_4 Lambda- cyhalothrin (synthetic insecticide)

Standard agronomic practices were applied to the crop throughout the growing season. After germination of the crop the field was observed on a weekly basis. And the insect pests feeding on *C. sativus* were recorded. After the start of the infestation the field plots were sprayed with the pesticides using knapsack sprayer.

2.1 Preparation of botanical Extracts

i. Neem seed water extract

In order to obtain twenty percent solution of neem seed water extract 1kg of neem seed and twenty gram of detergent was taken in muslin cloth and dipped in five liter boiled water for twenty four hours.

ii. Parthenium plant extract

One kilogram of Parthenium plants were shade dried and then grind in order to make fine powder. 200 grams of this fine powder were added to 1 lit of water to make 20% parthenium plant extract.

2.2 Pesticides

The neem seeds, parthenium and synthetic insecticides were brought from local market. Bestox and Lambda- cyhalothrin were applied @ 0.01% and 0.005%, respectively.

2.3 Data recording

The pre-treatment data were recorded one day before and post- treatment data after twenty four hours, forty eight hours and seventy two hours of pesticides application. After wards the data were recorded at weekly intervals. Two sprays were done. Firs spay was done at the seedling stage. After 1 month second spray was done. The data were recorded as damaged leaves by randomly selected three plants in each replication of each treatment.

The percent damage of leaves by the Red Pumpkin Beetle was determined by using the

Following formula as was used by (Ali *et. al.* 2011) [1].

$$\text{Percent damage of red pumpkin beetle} = \frac{no\ of\ damaged\ leaf}{total\ no\ of\ leaf} \times 100$$

2.4 Data Analysis

The data recorded was statistically analyzed using MSTATC software to determine differences among the treatment means for the different parameters. The significant means were subjected to LSD test to decipher the differences among the treatment means (Steel and Torrie, 1980) [10].

3. Results and discussion

Table1 shows the mean% damage of red pumpkin beetle *(A. foveicollis)*. The statistical analysis shows that the interaction of variety and time is non-significant. Similarly the interaction of treatment, time and variety is non-significant. Furthermore the interaction of treatment, time and the interaction of variety and treatmentare significant and the treatment and time are also significant.

The interaction of variety and treatment further shows that the mean percent damages of red pumpkin beetle in Local variety treated with Neem, Parthenium, Bestox, Lambda-cyhalothrin and control plots were 39.3, 36.0, 29.4, 29.2, and 40.3% respectively. In Super green variety the mean% damage treated with Neem, Parthenium, Bestox, Lambda-cyhalothrin and control plots was 30.3, 33.6, 29.0 28.6, and 37.1% respectively. In variety Ambika the mean%t damage was 35.2, 32.4, 29.1, 26.9, and 39.5% in Neem, parthenium, bestox. Lambda-cyhalothrinand Control plots respectively. It showed that the minimum damage of red pumpkin beetle was recorded in the variety Super green followed by Ambika and maximum damage was recorded in the Local variety. And the minimum damage was found in the chemical treated plots. In the control plots the damage was maximum.

The data in the Table1 further shows that the lowest mean damage of red pumpkin beetle was observed in the plots treated with the Lambda- cyhalothrin and Bestox. In Neem and Parthenium treated plots the infestation was recorded higher. The damage of red pumpkin beetle recorded in Neem and Parthenium treated plots were 34.96 and 34.08% respectively. Highest damage of red pumpkin beetle was found in the control plots i.e 39.0%. Lowest mean% damage of 28.24% of red pumpkin beetle was recorded in lambda-cyhalothrin followed by Bestox 29.19%.

The mean percent damage of red pumpkin beetle at 0 hour was 31.12 percent after 24 hours the percent damage reached to 32.25% at 48 hours the damage was 31.55% at 72 hours the damage was 32.13% and after 1st and 2nd week the damage was 33.28 and 38.24% respectively.

The table-1 also shows that at 0 hour, 24 hours, 48 hours, 72 hours and after1st and 2nd week the percent damage of red pumpkin beetle in Lambda-cyhalothrin treated plots was 33.0, 33.0, 29.7, 26.8, 22.0 and 24.8% respectively followed by the Bestox which was 33.2, 33.2, 30.4, 28.0, 23.4 and 26.7% respectively. This shows that the damage of red pumpkin beetle was reduced up to great extent till after the first week of spray. After the second week the pest infestation again increased and the damage in the Lambda-cyhalothrin increased from 22.0% to 24.8% and in the Bestox 23.4% to 26.7%. In the Neem treated plots the percent damage of red pumpkin beetle increased with the time at 0 hour the damage was 27.0% at 24 hours 30.0, 48 hours 31.7, 72 hours 34.3 after one week 39.7 and after two weeks 46.7 percent. And in Parthenium treated plots the damage of red pumpkin beetle also increased with the passage of time. At 0 hour the mean% damage was 32.0%, 24 hours 32.0%, 48 hours 29.7%, 72 hours 32.7% and after one and two week was 36.5 and 41.3% respectively. The maximum percent damage of red pumpkin beetle *(Aulacophora foveicollis)* was found in the control plots which were at 0 hour 30.2%, 24 hours 32.9%, 48 hours 36.0%, 72 hours 38.7%and after 1st and 2nd week was 44.5 and 51.5% respectively. The minimum damage of red pumpkin beetle damage was found in Lambda-cyhalothrin and Bestox followed by Parthenium and Neem. Maximum damage of red pumpkin beetle was found in control plots.The damage of red pumpkin beetle *(Aulecophora fovecollis)* was reduced up to a great extent by the use of synthetic insecticides. Our result is somewhat similar to the Rahman and Prodhan (2009) [6]. They studied the effect of some synthetic chemicals on the red pumpkin beetle and yield of cucumber using a farmer's field at one location, Madhupur, Tangail during the year 2005-2006.

Table 1: Mean percent damage of red pumpkin beetle after first spray on Cucumber *(C. sativus)* during 2012

Variety	V x T x Tr							V x Tr
	Treatment	Before spray	24 hr	48 hr	72 hr	1 week	2 week	
Local	Neem	31.4	34.2	36.4	38.7	43.6	51.4	39.3a
	Parthenium	33.3	33.3	31.1	33.6	39.7	45.3	36.0bc
	Bestox	33.6	33.6	30.5	28.2	23.7	26.9	29.4ef
	Lambda	34.5	34.5	31.2	27.8	22.4	24.8	29.2ef
	Control	30.6	33.9	37.0	39.5	46.2	54.9	40.3a
Super Green	Neem	22.2	25.8	27.3	30.2	35.7	40.8	30.3e
	Parthenium	33.2	33.2	30.5	31.8	34.5	38.8	33.6d
	Bestox	33.1	33.1	30.1	27.5	23.3	26.7	29.0f
	Lambda	33.3	33.3	29.8	27.0	23.0	25.1	28.6f
	Control	29.5	31.7	33.7	37.2	41.9	47.4	37.1b
Ambika	Neem	27.6	29.9	31.6	34.1	39.9	48.0	35.2c
	Parthenium	29.7	29.7	27.5	32.6	35.4	39.7	32.4d
	Bestox	32.9	32.9	30.6	28.3	23.3	26.7	29.1ef
	Lambda	31.1	31.1	28.3	25.7	20.6	24.4	26.9g
	Control	30.4	33.2	36.3	39.4	45.5	52.2	39.5a
Treatment		Tr x T						Mean
	Neem	27.0n	30.0kl	31.7ijk	34.3gh	39.7de	46.7b	34.96b
	Parthenium	32.0ij	32.0ij	29.7lm	32.7hi	36.5f	41.3d	34.08c
	Bestox	33.2hi	33.2hi	30.4jkl	28.0mn	23.4op	26.7n	29.19d
	Lambda	33.0hi	33.0hi	29.7lm	26.8n	22.0p	24.8o	28.24e
	Control	30.2kl	32.9hi	36.0fg	38.7e	44.5c	51.5a	39.00a
Variety		V x T						Mean
	Local	32.7	33.9	33.2	33.5	35.1	40.7	34.89
	Super Green	30.2	31.4	30.5	30.7	31.7	35.7	31.75
	Ambika	30.3	31.4	30.8	32.0	32.9	38.2	32.6
Mean		31.12d	32.25c	31.55cd	32.13c	33.28b	38.24a	

Within a coloum and rows means followed by different letters are significant as 5% level of probability (LSD test)
LSD value for treatment = 0.7251
LSD value for time = 0.7943
LSD value for Tr x T = 1.776
LSD value for V x Tr = 1.256

Table2 shows the mean percent damage of red pumpkin beetle after second spray. Statistical analysis of data showed that the interaction of variety, time and treatment was non significant and the interaction of treatment into time, variety into treatment, and variety into time were significant. Furthermore the time and treatment were also significant.

Table2 further shows the interaction of variety and treatment. The minimum mean percent damage of red pumpkin beetle in local variety was recorded in Lambda-cyhalothrin treated plots *i.e.* 19.4% followed by Bestox *i.e.* 21.4%. In Neem and Parthenium plots the damage was 59.5 and 47.2% respectively. And the maximum damage in Local variety was recorded in control plots *i.e.* 63.5%. The minimum damage of red pumpkin beetleinSuper green variety was recorded in lambda-cyhalothrin treated plots *i.e.* 18.6% followed by Bestox *i.e.* 20.7%. In Neem and Parthenium plots the damage was 48.8 and 41.9% respectively. And the maximum mean percent damage in super green variety was recorded in control plots *i.e.* 54.6%. And the minimum damage of red pumpkin beetle in Ambika variety was recorded in lambda-cyhalothrin treated plots *i.e.* 18.9% followed by Bestox *i.e.* 21.4%. In Neem and Parthenium plots the percent damage was 56.0 and 42.6% respectively. And the maximum damage in super green variety was recorded in control plots *i.e.* 60.4%. It showed that the minimum damage of red pumpkin beetlewas recorded in the variety Super green followed by Ambika and maximum damage was recorded in the Local variety. And the minimum damage was found in the chemical treated plots. In the control plots the damage was recorded maximum.

The data in the table2 further shows that the minimum damage of red pumpkin beetle was observed in the plot which was treated with the Lambda- cyhalothrin and Bestox. In Neem and Parthenium treated plots the infestation was higher. The minimum damage of red pumpkin beetle which was found in Lambda-cyhalothrin treated plot is 19.00% followed by Bestox which is 21.18%. The mean percent damage of red pumpkin beetle which was recorded in Neem and Parthenium treated plots are54.79 and 43.95 respectively. The maximum damage 59.53% of red pumpkin beetle was found in the control plots.

The damage of red pumpkin beetle at 0 hour was 38.24% after 24 hours the damage reached to 39.10% at 48 hours the damage was 38.90% at 72 hours the damage was 39.43% and after 1st and 2ndweek the damage was 40.49 and 41.98% respectively.

The table2 also shows that at 0 hour, 24 hours, 48 hours, 72 hours, after 1st and 2nd week the percent damage of red pumpkin beetle in Lambda-cyhalothrin treated plot was 24.8, 24.4, 22.4, 19.6, 14.3 and 8.2% respectively followed by the Bestox which was 26.7, 26.6, 24.4, 21.5, 16.8 and 10.7% respectively. This shows that the damage of red pumpkin beetle was reduced up to great extent in the Lambda-cyhalothrin and Bestox treated plots. In the Neem treated plot the damage increased with the time at 0 hour the damage was 46.7% at 24 hours 48.9, 48 hours 51.9, 72 hours 54.3 after 1stweek 59.8 and 2nd week 66.8%. In Parthenium treated plots the damage of red pumpkin beetle also increased wih the passage of time. At 0 hour the damage was 41.3%, 24 hours 41.3%, 48 hours 38.5%, 72 hours 42.0% and after 1st and 2nd week was 47.3 and 53.1% respectively. The maximum damage of red pumpkin beetle was found in the control plots which were at 0 hour 51.5%, 24 hours 54.2%, 48 hours 56.9%, 72 hours 59.5% and after 1st and 2nd week was 64.0 and 70.8%respectively. The minimum damage of red

pumpkin beetle was found in Lambda-cyhalothrin and Bestox followed by Parthenium and Neem. Maximum damageof red pumpkin beetle was found in control plot.

Table2 also shows that the minimum mean percent damage of red pumpkin beetle was found on variety Super Green which was 36.96% followed by Ambika 39.88% and the maximum damage was found on the Local variety which was 42.24%.Our results are also somewhat similar to the Mehmood and Shakeel (2006) [3]. They studied eight insecticidal/non insecticidal treatments including check (no spray) against red pumpkin beetle on cucumber during kharif, 2004. In the present study Synthetic chemicals successfully controlled the red pumpkin beetle which confirms the results of Muhammad and Bilal (2004) [4]. They studied the toxicity of some insecticides, advantage 20EC, Match 50EC, Tracer 240SC, Deltaphos-R 10+350EC in field concentrations against the haemocytes of Red Pumpkin beetles, *A. foevicollis* Lucas.

Table 2: Mean percent damage of red pumpkin beetle after second spray on Cucumber *(C. sativus)* during 2012.

Variety	V x T x Tr							V x Tr
	Treatment	**0 hr**	**24 hr**	**48 hr**	**72 hr**	**1 week**	**2 week**	
Local	Neem	51.4	53.2	56.5	59.3	64.6	72.0	59.5b
	Parthenium	45.3	45.3	42.2	44.9	49.8	55.9	47.2e
	Bestox	26.9	26.9	24.7	21.4	17.0	11.6	21.4g
	Lambda	24.8	24.8	22.8	19.6	15.0	9.5	19.4hi
	Control	54.9	57.6	60.12	63.1	68.5	76.5	63.5a
Super Green	Neem	40.8	43.7	46.4	49.0	53.4	58.3	48.8d
	Parthenium	38.8	38.8	37.1	41.1	46.6	49.3	41.9f
	Bestox	26.7	26.2	23.9	21.7	16.2	9.4	20.7gh
	Lambda	25.1	25.1	22.6	19.3	12.8	6.6	18.6i
	Control	47.4	50.2	53.3	55.1	58.6	63.2	54.6a
Ambika	Neem	48.0	49.8	52.9	54.8	60.3	70.3	56.0c
	Parthenium	39.7	39.7	36.4	39.9	45.7	54.1	42.6f
	Bestox	26.7	26.7	24.7	21.5	17.3	11.3	21.4g
	Lambda	24.4	23.3	21.9	20.0	15.1	8.6	18.9i
	Control	52.2	54.9	57.3	60.2	64.9	72.7	60.4b
Treatment		Tr x T						Mean
	Neem	46.7i	48.9h	51.9g	54.3f	59.8d	66.8b	54.79b
	Parthenium	41.3j	41.3j	38.5k	42.0j	47.3hi	53.1fg	43.95c
	Bestox	26.7l	26.6l	24.4m	21.5op	16.8q	10.7s	21.18d
	Lambda	24.8lm	24.4m	22.4no	19.6p	14.3r	8.2t	19.00e
	Control	51.5g	54.2f	56.9e	59.5d	64.0c	70.8a	59.53a
Variety		V x T						Mean
	Local	40.7de	41.5cd	41.3d	41.6cd	43.0bc	45.1a	42.24a
	Super Green	35.7k	36.8ijk	36.7jk	37.2hijk	37.7ghij	37.4ghij	36.96b
	Ambika	38.2fgh	38.9fg	38.6fgh	39.3ef	40.6de	43.2b	39.88b
Mean		38.24d	39.10d	38.90cd	39.43c	40.49b	41.98a	

Within a coloum and rows means followed by different letters are significant as 5% level of probability (LSD test)

LSD value for treatment = 0.8116
LSD value for time = 0.8890
LSD value for Tr x T = 1.988
LSD value for V = 3.270
LSD value for V x Tr = 1.406
LSD value for V x T = 1.540

4. Conclusion and Recommendation

The synthetic insecticides Lambda-cyhalothrin and Bestox minimized the percent damage of Red Pumpkin Beetle and effectively controllled this pest as compared to the botanical pesticides. Lambda-cyhalothrin and Bestox should be used @ 0.01 and 0.005% respectively, for the control of Red Pumpkin Beetle to get the better yield.

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