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Efficacy of some selected chemical insecticides and bio-pesticides against tomato fruit worm, (*Helicoverpa armigera*) under the agro climatic condition of Gilgit Baltistan, Pakistan

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Abstract
A Field Studies were carried out for the control of Tomato fruit borer (Helicoverpa armigera) during July 2014 at District Skardu Baltistan Pakistan. Variety of tomato grown was Shalkot when fruit setting starts in Skardu region we applied chemical insecticide and bio-pesticide at their recommended doses. The aim of investigation is to promote use of environment friendly bio-pesticides. Data were taken as number of fruit borer larvae plant-1 of tomato. Data was recorded at weekly interval. The data after first week of application of pesticides and bio-pesticides revealed that lowest number (0.93) of H. armigera larvae plant-1 recorded in the plot treated with Volium Flexy 300 EC fallowed by Delegate 25 EC where (1.19) numbers of H. armigera larvae plant-1 while on the other hand Bio-pesticides also shown control of fruit borer at some extant which was recorded as 1.24 and 1.26 numbers of H. armigera larvae plant-1 by Sea-buckthorns and Populus extracts while in the check plot highest number(1.56) of fruit borer larvae plant-1 was recorded. Overall performance of synthetic insecticides and bio-pesticides against Tomato fruit borer H. armigera the data showed that Volium Flexy 300 EC lowest (0.64) numbers of H. armigera larvae plant-1 fallowed by Delegate 25 EC, Sea-buckthorns and Populus Extracts (0.98, 1.02, 1.03) while highest number of (1.38) H. armigera larvae plant-1 was recorded from the check plot. From the results of present investigation we concluded that although percent mortalities showed by Populus and Sea-buckthorns plant extracts was low as compared to the synthetic insecticides but theses bio-pesticides were helpful to some extant for control of tomato fruit borer because of organic in nature the bio-pesticides have less environmental hazards while the synthetic insecticides have lots of ill effects on environment.

Keywords: Tomato, Bio-pesticides, Synthetic insecticides, *Populus euphratica* (Populus), *Hippophae rhamnoids* (Sea-buckthorns)

1. Introduction
Tomato (*Lycopersicon esculentum* Mill) is one of the most important vegetables, mostly grown in home gardens and by the market gardeners. It can be used both in fresh or processed farm. In Pakistan usually consumed as salad. Tomato is a good source of vitamins A, B and C also helps in healing of wounds due to antibiotic properties (Baloch, A.F, 1994) [3]. The area under cultivation of tomato, during 2009-10 was 63 thousand/ha, with a total production of 562.9 thousand tones, and yield 10522 Kg/ha (Agricultural Statistics of Pakistan, 2010). Tomato is attacked by a number of pests including Tomato fruit worm (*Helicoverpa armigera*) Larvae of fruit worm are polyphagus it can attack tomato fruit at any stage of growth decreasing its market value (Gajete *et al*. 2004) [5].
Like other Vegetables tomato is more prone to the insect pest and disease attack because of its tenderness and softness. It was attached by numbers of pest but in Gilgit Baltistan tomato fruit borer is one of the major pest causing economic yield to the farmers, yield lost recorded of up to 35% in tomato and up to 37.79% (Dhandapani *et al*. 2003) [4].
Yield of tomato in Pakistan is low as compared to the developed countries there are many factors that cause yield reduction. Although chemical insecticides are commonly used for the control of fruit borer showing best control of fruit borer but the synthetic insecticides leave ill effect on our environment (Natekar *et al*., 1987) [8].
Bio-pesticides are eco friendly and have no ill effect on human health. Bio- pesticides gaining popularity in recent years because of side effects of synthetic pesticides on human health, Natural enemies and environment. Neem and Nicotine are usually used as bio-pesticides

however many other plants are under consideration for using as bio-pesticides (Suman Gupta., 2010) [11]

By keeping the current status of fruit worn attacked in Baltistan region the present investigation were conducted to check the efficacy of different synthetic pesticides and bio-pesticides.

2. Materials and Methods

Extracts of Neem and Tobacco leaves

The leaves and soft branches of Populus and sea-buckthorns were collected from the forest jungle of District Skardu and washed with distilled water until the dust and other pollutants was completely removed after proper washing plant parts are allowed to shelter dry for one week. 50 gm of powdered botanicals from Populus and sea-buckthorns was weighed and then allowed to passed through a cellulose extraction thimble (Whatman, UK). Plant materials were properly extracted by using 250 ml ethanol for 5 hours at (78c) in a Soxhlet apparatus (250 ml) and the final obtain extracts were pour in to the glass flask separately. The abstract was measured and from each glass flask final 200 ml volumes was made and pour into the round bottom flasks. The glass flasks contain pure plant materials were fitted to the bottom of Rotatory evaporator (Buchi; R-114; Switzerland) separately and evaporated to dryness at a temperature 85c. Then flasks which contain plant dried materials were separated from the Rotatory evaporator and weighed. The weight of dried extracts of Populus and sea-buckthorns was calculated by subtracting the already noted weight of empty round bottom flask, after weight in each flask coating plant materials few milliliters of ethanol were added to help in dissolution of extract with water. Finally add 50 ml of distilled water in the extract to get 1gml-1 (100% w/v) concentration (M. Prishanthini, 2014) [7].

Chemical control

For chemical control of Tomato fruit borer we used two insecticides

Delegate 25 EC and Volium Flexy 300 EC in Potato field at Skardu region at their recommended dose while Populus and Sea-buckthorns were applied at the rate of 3.0% (Table. I).The experiment was carried out in Randomized Complete Block (RCB) design with three replications and 4 treatments including check plot. The grown variety was Shalkot and the plot size was 360 m2. All the insecticides were applied in the field as foliar application. Data were recorded as number of larvae plant-1 at weekly interval. All the treatments were applied soon after fruit setting and repeated after 15 days interval. Data were taken as number of fruit borer larvae plant-1 of tomato.

Table 1: Dose of treatments used against Tomato fruit borer
Treatments Active ingredient Recommended dose

Treatments	Active ingredient	Recommended dose
Delegate 25 EC	Spintoram	60g /acre 100ml water
Volium Flexy 300 EC	Thiamethaxim +chlorantraniliprole	80ml/acre 100ml water
Populus Extract @ 3.00%	Populus Extract	
Sea-buckthorns Extract @ 3.00%Sea-buckthorns Extract		

Statistical analysis

The experiment was laid out in Randomized Complete Block (RCB) design with four treatments and three replications. The collected data were analyzed with analysis of variance ANOVA and means was separated by using LSD test at 5% level of significance (Steel and Torrie, 1980).

3. Results

When tomato fruit setting starts in Baltistan region we applied following treatments against tomato fruit borer Delegate 25 EC and Volium Flexy 300 EC as synthetic pesticides while Populus and Sea-buckthorns extracts were applied at the rate of 3.0% as bio-pesticides. Data were taken as number of fruit borer larvae plant-1. The data after first week of application of pesticides and bio-pesticides revealed that lowest number (0.93) of *H. armigera* larvae plant-1 recorded in the plot treated with Volium Flexy 300 EC fallowed by Delegate 25 EC where (1.19) numbers of *H. armigera* larvae plant-1 while on the other hand Bio-pesticides also shown control of fruit borer at some extant which was recorded as 1.24 and 1.26 numbers of *H. armigera* larvae plant-1 by Sea-buckthorns and Populus extracts while in the check plot highest number(1.56) of fruit borer larvae plant-1 was recorded. Data taken after 2nd week of application of treatments showed that lowest number (0.81) of *H. armigera* larvae plant-1 was recorded in the plot which was treated with Volium Flexy 300 EC fallowed by Delegate 25 EC, Sea-buckthorns and Populus (1.09, 1.19 and 1.21) respectively while highest (1.53) number of *H. armigera* larvae plant-1 was recorded in the control plot. Statisticaly there is a significant different among the treatments but Volium Flexy 300 EC showed best results while control plot was non-significant Ganeshan *et al*. (1995) [6].

Data collected after 3rd week of treatment application revealed that population of *H. armigera* larvae plant-1 was slightly increased as compared to 2nd week. But here also lowest number (0.87) of *H. armigera* larvae plant-1 was recorded in the plot which was treated with Volium Flexy 300 EC while highest number (1.47) of *H. armigera* larvae plant-1 was recorded in the check plot which was statistically non-significant. While number of *H. armigera* larvae plant-1 in the plot treated with Delegate 25 EC, Sea-buckthorns and Populus Extracts (1.14, 1.19 and 1.20) noted respectively. Data collected on 4th week after application of treatment was same to the 2nd week as lowest number (0.64) of *H. armigera* larvae plant-1 was recorded in the plot treated with Volium Flexy 300 EC followed by Delegate 25 EC, Populus and Sea-buckthorns (1.01, 1.01 and 1.03) respectively while highest (1.35) number of *H. armigera* larvae plant-1 was recorded in the control plot.

Number of *H. armigera* larvae plant-1 was starts decline from the 5th and 6th week after application of treatments in the study area highest number (1.24, 1.18) of *H. armigera* larvae plant-1 was recorded in the check plot. From the treatments bio-pesticides showed considerable results as (0.91, 0.54 and 0.93, 0.57) number of *H. armigera* larvae plant-1 by Sea-buckthorns and Populus Extracts. From the synthetic pesticides once again lowest number (0.41, 0.19) of *H. armigera* larvae plant-1 showed by Volium Flexy 300 EC fallowed by Delegate 25 EC was (0.87, 0.47) respectively (Table. II). The findings of our results are quite similar to the findings of (JAWAD ALI, 2013) as they also used synthetic and bio-pesticides for the control of Tomato fruit borer.

Table 2: Mean number of larvae of *H. armigera* plant-1 on different dates during 2014

Treatments	4th-Jun	11-Jun	18-Jun	25-Jun	2-Jul	9-Jul	Means
Delegate 25 EC	1.19ab	1.09ab	1.14ab	1.01ab	0.87ab	0.57ab	0.98
Volium Flexy 300 EC	0.93b	0.81b	0.87b	0.64b	0.41b	0.19b	0.64
Populus Extract@2.00%	1.26ab	1.21ab	1.19ab	1.03ab	0.93ab	0.57ab	1.03
Sea-buckthorns Extract@2.00%	1.24ab	1.19ab	1.20ab	1.01ab	0.91ab	0.54ab	1.02
Control	1.56c	1.53c	1.47c	1.35c	1.24c	1.18c	1.38
Lsd Value	0.54	0.71	0.64	0.57	0.41	0.27	

Mean in column followed by dissimilar letters are statistically different at 5% level of probability

Overall efficacy of synthetic and bio-pesticids against Tomato fruit borer *H. armigera* the data showed that Volium Flexy 300 EC lowest (0.64) numbers of *H. armigera* larvae plant-1 fallowed by Delegate 25 EC, Sea-buckthorns and Populus Extracts (0.98, 1.02, 1.03) while highest number of *H. armigera* larvae plant-1 was recorded from the check plot (1.38) (Fig. I)

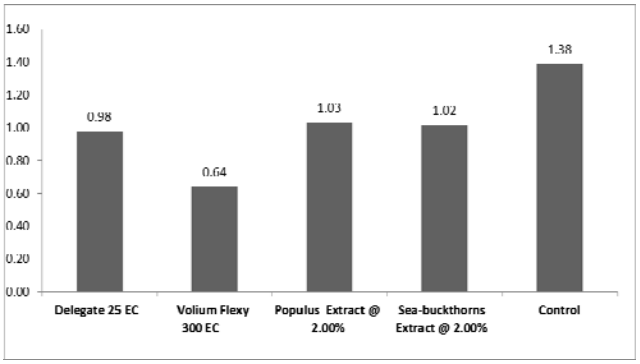

Fig 1. Overall mean number of larvae of *H. armigera* plant-1 on different dates during 2014

4. Discussions

In the present field investigation we check the efficacy of different chemical insecticide (Volium Flexy 300 EC and Delegate 25 EC) and bio-pesticide make from leaves and soft branches of Populus and Sea-buckthorns plant were used against Tomato fruit borer. The grown variety of tomato was Shalkot. All the treatments were applied soon after fruit setting and repeated after 15 days interval. Data were taken as number of fruit borer larvae plant-1 of tomato. Data was recorded at weekly interval. The data after first week of application of pesticides and bio-pesticides revealed that lowest number (0.93) of *H. armigera* larvae plant-1 recorded in the plot treated with Volium Flexy 300 EC fallowed by Delegate 25 EC where (1.19) numbers of *H. armigera* larvae plant-1 while on the other hand Bio-pesticides also shown control of fruit borer at some extant which was recorded as 1.24 and 1.26 numbers of *H. armigera* larvae plant-1 by Sea-buckthorns and Populus extracts while in the check plot highest number(1.56) of fruit borer larvae plant-1 was recorded. Overall performance of synthetic insecticides and bio-pesticides against Tomato fruit borer *H. armigera* the data showed that Volium Flexy 300 EC lowest (0.64) numbers of *H. armigera* larvae plant-1 fallowed by Delegate 25 EC, Sea-buckthorns and Populus Extracts (0.98, 1.02, 1.03) while highest number (1.38)of *H. armigera* larvae plant-1 was recorded from the check plot. From the results of present investigation we concluded that although percent mortalities showed by Populus and Sea-buckthorns plant extracts was low as compared to the synthetic insecticides but theses bio-pesticides were helpful to some extant for control of tomato fruit borer because of organic in nature the bio-pesticides have less environmental hazards while the synthetic insecticides have lots of ill effects on environment (Peng *et al*. 2010) [9]. The synthetic insecticides kills non targeted species of beneficial insects including (predators, parasite and parasitoids) while the bio-pesticides have no effect on the beneficial insects (Zehnder, 2007) [12]. From the present investigation we conclude that for environmental safety and health hazards and protection of beneficial insects we suggest the use of Populus Extract @ 3.00% and Sea-buckthorns Extract @ 3.00% for the control of Tomato fruit borer in Baltistan region.

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