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EVALUATION OF DIFFERENT INSECTICIDES AGAINST *VIRACHOLA ISOCRATES* INFESTATION IN POMEGRANATE ORCHARDS OF GILGIT-BALTISTAN, PAKISTAN

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ABSTRACT

Pomegranate (*Punica granatum)* is a native tree of Iran and cultivated throughout the world including Himalayan regions of Pakistan and India. Pomegranate fruit is also considered as a medicinal fruit. It can act as antioxidant, anti-tumoral or anti-hepatotoxic agents, and improve cardiovascular health. Pomegranate fruit is cultivated in Gollapor vellay, Diamer, Gilgit and Ghizer areas of Gilgit-Baltistan, Pakistan. Pomegranate fruit borer (*Virachola isocrates*) is the main insect pest infesting the fruit orchards in this region. Present study was designed to evaluate the infestation level of pomegranate fruit borer against different commercial insecticides available to local formers. Two commercially available insecticides chlorpyrifos and cypermethrine along with neem seed oil were used against the pomegranate fruit borer. Results of the study showed that cypermthrin was recorded with maximum efficacy against *V. isocrates* followed by chlorpyrifos. All the treatments were significantly different from each other. Neem oil was also evaluated as effective treatment to reduce infestation in pomegranate orchards. This study will be helpful in control program of pomegranate fruit borer for this region and will also be very helpful to local pomegranate growers for selection of effective insecticide for the management of pomegranate fruit borer.

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INTRODUCTION

Pomegranate (*Punica granatum)* is a native tree of Iran having 5-8 meters height. It is mainly found in Iran, Himalayan region of Pakistan and India, China and throughout the Mediterranean region (Facciola, 1990). It is also cultivated in North and Tropical Africa and has become more common fruit in commercial markets of Europe and USA (Morton, 1987). The fruit of pomegranate is considered a functional medicinal fruit because it has valuable compounds in different parts of the fruits and have many medicinal effects. These can act as antioxidant, anti-tumoral or anti-hepatotoxic agents, and improve cardiovascular health (Davidson et al., 2009).

In Pakistan, Balochistan is the main producer of pomegranates, although Khyber Pakhtunkhwa and Punjab are also producing pomegranates in isolated areas on a small scale. From last decades in Gilgit

Baltistan it is rapidly grown in Diamer, Gilgit and Ghizer areas (Aslam et al., 2006).

Pomegranate fruit is attacked by various insect pests. Among them pomegranate borer is a main pest which attacks it and reduces yield up to 50% to 90% (Gupta and Dybey, 2003). The caterpillars feed on seeds by boring the fruit. The fruit carry holes, rots and drops. Severe damage on 30 to 40 days old fruits specially from April to August (Murugan and Thirumurugan, 2001).

Pomegranate is attacked by more than forty five insect pests (Butani, 1979) of which pomegranate fruit borer (*Virachola isocrates*) is the main insect pest infesting both cultivated and wild pomegranate. It is also known as Anar butterfly in India and Pakistan (Singh and Singh, 2000). This pest has been reported to cause 40-90 per cent damage in pomegranate orchards (Atwal, 1986). It is a direct pest of regular occurrence, the caterpillars of which bore into developing fruit and feed on the seeds. The holes made by the larva invite secondary infection causing fruit to rot and drop (Kambrekar et al., 2015). The most effective control of this insect pest is the chemical control. Organophosphates and pyrethroids are reported as most effective insecticides group against this pest (Balikai et al., 2011).

Keeping in view the importance of pomegranate crop in Gilgit-Baltistan and the economic importance of pomegranate fruit borer which is a major insect pest of pomegranate in this region, the present study was conducted. Results of this experiment will be helpful in control program of pomegranate fruit borer for this region and will also be very helpful to local pomegranate growers for selection of effective insecticide for the management of pomegranate fruit borer.

MATERIAL AND METHODS

The study was designed to evaluate the susceptibility level of pomegranate fruit borer against different commercial insecticides available to local farmers in Gilgit-Baltistan, Pakistan. Study was conducted in pomegranate field areas of Directorate of Agriculture Research in Gullapor valley Gilgit-Baltistan, Pakistan during the 2018.

Two commercially available insecticides chlorpyrifos and cypermethrin along with Neem seed oil were used against the pomegranate fruit borer (Table 1). For insecticidal sprays Knapsack spryer was used in pomegranate orchards. Two field sprays were applied during the experiment with twenty days' interval after the first field spray at petal fall stage. To estimate the infestation, 20 fruits from sample trees were randomly observed for damage. Each fruit sample was examined in suitable light conditions and recorded how many of these showed infestation. The infestation (%) percentage caused by pomegranate fruit borer was calculated. Observations on fruit infestation for different treatments were recorded before first spray (pre-spray) and thereafter the data were recorded 10, 20 and 30 days after each spray application. Randomized Complete Block Design was laid down for this field experiment with three replications. Statistics 8.1 software was used for data analysis and Microcal Origin was used for graphical presentation of data.

Table 1: Insecticides (treatments) used in the experiment.

S. No	Treatment	Active Chemical	Doses (Field Dose)
1	T 1	Cypermethrin	250 ml/ 100Liter
2	T 2	Chlorpyrifoes	250 ml/ 100Liter
3	T 3	Neem seed oil	500 ml/ 100Liter
4	T 4	Control	Water Spray

RESULTS AND DISCUSSION

Overall results about mean fruit infestation in pomegranate orchards showed that maximum fruit infestation was recorded in case of control and minimum was in case of cypermethrin. In case of cypermethrin the minimum infestation (7.1, 2.5. and 1.7) was recorded after ten days, twenty days and thirty days of sprays. Chlorpyrifos showed mean fruit infestation of 8.1, 5.7 and 3.5 after 10, 20 and 30 days of spray respectively. In case of neem seed oil, the maximum infestation of 8.7, 6.4 and 4.6 was estimated after 10, 20 and 30 days respectively. Present results showed that before spray, all fields were with maximum fruit infestation caused by pomegranate fruit borer and infestation rate decreased after the treatments (Table 2).

Table 2: Effect of treatments on fruit infestation.

Treatment	Mean Infestation			
	Before Treatment	After 10 days	After 20 days	After 30 days
Cypermethrin	11.0 A	7.1 B	2.5 C	1.7 C
Chlorpyrifos	10.8 A	8.1 B	5.7 B	3.5 BC
Neem Seed Oil	10.0 A	8.7 B	6.4 B	4.6 BC
Control	10.6 A	11 A	10.0 A	11.6 A
P	1.000	0.0002	0.0000	0.0000
CV	18.54	21.64	16.73	19.48

Before spray maximum fruit infestation rate was observed and it became decreasing after first spray and minimum infestation was recorded after the third spray and same trend was in case of days. This trend was observed with all insecticides cypermethrin, cypermethrin and neem seed oil. Infestation was recorded as decreasing with the passage of time and maximum was after ten days while minimum was recorded after 30 days with all treatments (Figure 1, 2, 3).

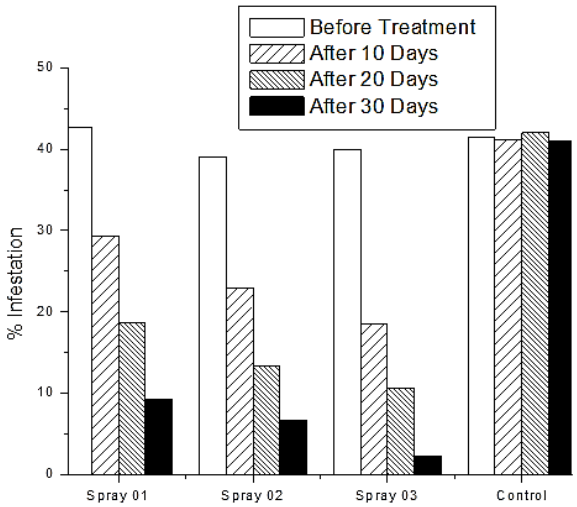

Figure 1: Effect of Cypermethrin on fruit infestation caused by *V. isocrates*.

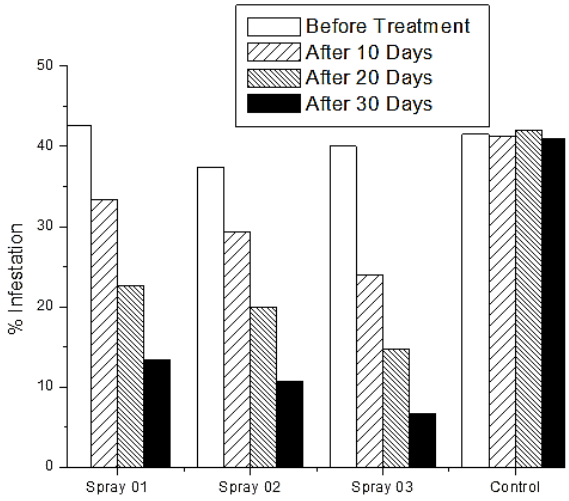

Figure 2: Effect of Chlorpyrifos on fruit infestation caused by *V. isocrates*.

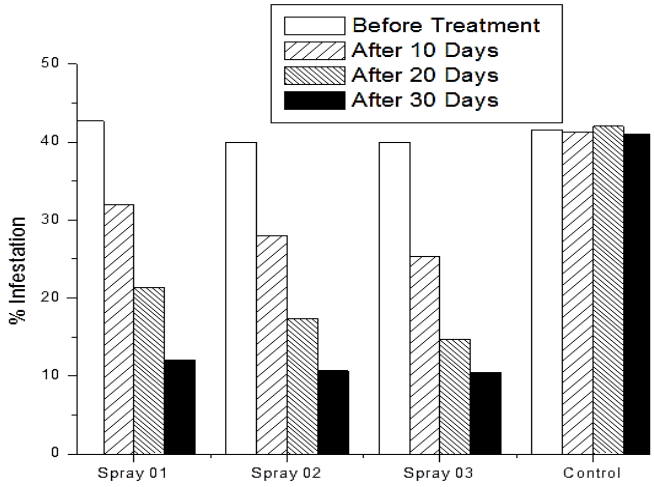

Figure 3: Effect of neem seed oil on fruit infestation caused by *V. isocrates*.

Results of present study show that cypermethirn was most effective against pomegranate fruit borer while neem oil was found least effective against fruit infestation. Maximum fruit infestation was recorded in case of control. Results showed that there was significant difference of fruit infestation among the first, second and third spray and there was also significant difference among the results after 10, 20 and 30 days of sprays (Table 2). Maximum weights of fruits were observed in case of cypermethrin followed by chlorpyrifos. Minimum fruit weight was recorded in control (Table 3).

Table 3: Effects of treatments on weight of pomegranate.

Treatments	Weight (g) (weight of 15 fruits)
Control	833.33 D
Chlorpyrifos	2012.7 B
Cypermethrin	24054.0 A
Neem Seed Oil	1533.3 C
P	0.000
CV	27.14

According to present study, use of chemical insecticides was much effective against *V. Isocrates* fruit infestation in pomegranate orchards and same results were also reported that use of chemical insecticides were effective to control insect pest in pomegranate fields (Awate et al., 1977). Results of present study showed that cypermethrin gave maximum efficacy against pomegranate borer while Dubey et al. (1993) reported that phospsamidon was the most effective. One previous study showed that endosulfan was the most effective insecticides against this insect pest (Shevale, 1994). A previous study was also reported that methomyle insecticide has the maximum efficacy against *V. Isocrates* infestation (Hussain et al., 2016).

Present study showed that cypermthrin was the most favorable insecticide for local pomegranate farmers of this region to control pomegranate fruit borer infestation. From this study it is also concluded that the use of botanical insecticides like neem seed oil which showed good results against fruit infestation, can also be used. Present study will be helpful in IPM program for pomegranate fruit borer control program in future for this region.

AUTHOR'S CONTRIBUTION

All the authors designed the study, performed the experimental work, collected and analyzed the data, wrote the manuscript and reviewed it.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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