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Management of *Papilio demoleus* L. using Insecticides on Kinnow nursery plants at Talwandi Sabo, Punjab

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Abstract

The present investigation was conducted on management of *Papilio demoleus* L. (citrus butterfly) using selected insecticides at Guru Kashi University campus on nursery plants of kinnow during 2019-2020. The result revealed that both insecticides (Quinalphos 25 EC and Chlorpyrifos 20 EC) was showing significant reduction in population of citrus butterfly larvae. When compared, quinalphos 25 EC was more effective than chlorpyrifos 20EC. Hence, both insecticides are effective against *Papilio demoleus* L.

Keywords: *Papilio demoleus*, Larva, Quinalphos, Chlorpyrifos, Population

Introduction

In India, kinnow has become major citrus fruit that grown in the northern region, especially in Punjab, Haryana, Rajasthan and Himachal Pradesh (Sharma *et al.*, 2007; Ladanyia 2008) [1, 2]. It is used in food, cosmetics, pharmaceutical industries due to its attractive colour, distinctive flavour and rich in vitamin C, B, β -carotene, calcium and phosphorus (Sogi and Singh, 2001; Ejaz *et al.*, 2006) [3, 4]. The production of citrus is affected by the attack of pests and diseases (Abbot, 1999) [5]. Around 165 insect pests causes up to 30 percent yield loss in India (Bhutani, 1979) [6]. Out of these pests, citrus butterfly, *Papilio demoleus* L. commonly known as the lime or citrus swallowtail, is a major pest of nurseries, young seedlings, and new flush of full-grown up citrus plants throughout Asia (Vattikonda and Sangam, 2016) [7]. Its larval stages are voracious feeder (Bhutani, 1979; Bhutani and Jotwani, 1975) [6, 8]. In other to control its infestation these are the control measures: cultural, mechanical, biological, and chemical control. The cultural, mechanical, and biological control practices are not very effective during severe infestation also it demands for intensive labour as well as specialised knowledge for implementation that tends towards use insecticides. Therefore, present investigation was conducted to evaluate the two insecticides against larvae of citrus butterfly on nursery of kinnow.

Materials and Methods

Present investigation was conducted at Talwandi Sabo, Punjab, India during 2019-2020 on kinnow nursery plants. Randomized complete block design (RCBD) was used with three replication. Each replica was having five nursery plants. The below treatment was used in present study (Table 1).

Table 1: Details of Treatment, Dose and Method of Application

Treatment No.	Treatment	Dose	Method of application
T ₀	Untreated Control	-	-
T ₁	Quinalphos 25 EC	2.0 ml/l	Spray
T ₂	Chlorpyrifos 20 EC	2.0 ml/l	Spray

Data was collected by counting number of larvae before spray and the number of dead larvae at 1st, 3rd and 7th days after spraying (DAS). The collected raw data was transferred on the excel sheet in Microsoft excel 2016. Further ANOVA was done using RBD.

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Results and discussions

The present investigation revealed the following results:

At 1 DAS: It is evident from the data presented in table 2 and graph 1 that all the treatment checked citrus butterfly larvae infestation and proved significantly better than untreated control during 2019-2020. The mean larvae infestation at 1 DAS ranged from 11.8 ± 0.193 to 21.46 ± 0.264 . The minimum infestation (11.8 ± 0.193 larvae/plant) was found in the plants treated with Quinalphos 25 EC followed by Chlorpyrifos 20 EC (14.6 ± 0.263 larvae/plant). The maximum larvae infestation (21.46 ± 0.264 larvae/plant) was recorded in untreated control.

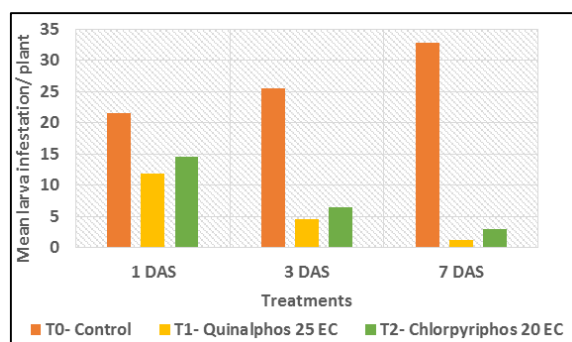
At 3 DAS: All the treatment proved significantly better than untreated control during 2019-2020 (Graph 1). The mean

larvae infestation at 3 DAS ranged from 4.6 ± 0.183 to 25.53 ± 0.375 . The minimum infestation (4.6 ± 0.183 larvae/plant) was found in the plants treated with Quinalphos 25 EC followed by Chlorpyrifos 20 EC (6.46 ± 0.128 larvae/plant). The maximum larvae infestation (25.53 ± 0.375 larvae/plant) was recorded in control (Table 2, Graph 1).

At 7 DAS: The mean larvae infestation at 7 DAS during 2019 ranged from 1.266 ± 0.199 to 32.8 ± 0.687 . The minimum infestation (1.266 ± 0.199 larvae/plant) was found in the plants treated with Quinalphos 25 EC followed by Chlorpyrifos 20 EC (2.93 ± 0.195 larvae/plant). The maximum larvae infestation (32.8 ± 0.687 larvae/plant) was recorded in control (Table 2, Graph 1).

Table 2: Efficacy of two insecticides on mean larvae infestation of citrus butterfly during 2019-2020 at Talwandi Sabo after single spray

Treatment No.	Treatment Name	Mean larvae infestation /plant			
		Before Treatment	1 DAS	3 DAS	7 DAS
T0	Control	20.4 ± 0.18	21.46 ± 0.26	25.53 ± 0.37	32.8 ± 0.68
T1	Quinalphos 25 EC	20.73 ± 0.19	11.8 ± 0.19	4.60 ± 0.18	1.266 ± 0.19
T2	Chlorpyrifos 20 EC	20.60 ± 0.20	14.6 ± 0.26	6.46 ± 0.12	2.93 ± 0.19
F test		NS	S	S	S
CD		0.29	1.04	0.49	2.43
SE(m)		0.09	0.32	0.15	0.75
CV%		0.76	3.46	2.12	10.47



Graph 1: Effect of two insecticides on larval infestation of citrus butterfly during 2019-2020 at Talwandi Sabo, Punjab

The relative performance of different treatments with regards to their mean infestation after single spray was as follows: Quinalphos 25 EC > Chlorpyrifos 20 EC. Many research work was conducted using insecticides. Murthy *et al.* (2009) [9] also studies the efficacy of some eco-friendly new insecticides like novaluron 10 EC, emamectin benzoate 5 SG, chlorpyrifos 20 EC and neem oil 1500 ppm on eggs and 2nd and 4th instar larvae of citrus butterfly under laboratory conditions. The result revealed that maximum unhatched eggs (94.44%) were recorded with novaluron followed by emamectin benzoate, chlorpyrifos and neem oil. The maximum larval mortality was recorded with novaluron followed by emamectin benzoate, chlorpyrifos and neem at 3 and 7 DAS. Similarly, Ghosh *et al.* (2015) [10] reported carbaryl insecticide as effective on 4th instar larvae of citrus butterfly under laboratory condition.

Conclusion

P. demoleus is identified as destructive pest of kinnow nursery plants at Talwandi Sabo, Punjab. Both chlorpyrifos and quinalphos are found as most effective in controlling such pest infestation.

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