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Gaikwad DS
PG Student, Department of Agricultural Entomology, College of Agriculture Parbhani, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani, Maharashtra, India

Lad AG
Assistant Professor, Department of Agricultural Entomology, College of Agriculture Parbhani, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani, Maharashtra, India

Fand DN
Ph.D. Scholar, Department of Entomology, Post Graduate Institute, Mahatma Phule Krishi Vidyapeeth Rahuri, Maharashtra, India

Deokar BD
PG Student, Department of Plant Pathology, College of Agriculture Parbhani, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani, Maharashtra, India

Khedkar PB
PG Student, Department of Agricultural Entomology, College of Agriculture Latur, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani, Maharashtra, India

Corresponding Author:
Gaikwad DS
PG Student, Department of Agricultural Entomology, College of Agriculture Parbhani, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani, Maharashtra, India

Efficacy of newer insecticides against pomegranate thrips (*Scirtothrips dorsalis*/*Rhipiphorothrips cruentatus*)

Gaikwad DS, Lad AG, Fand DN, Deokar BD and Khedkar PB

Abstract
During Hast Bahar 2022–2023 the field experiment was carried out on the Department of Horticulture, College of Agriculture, VNMKV, Parbhani farm to investigate the bio-efficacy of newer pesticides against pomegranate thrips and Research showed that the most effective spray treatment for thrip population reduction was Cyantraniliprole 10 OD, which was followed by Spinosad 45 SC and flonicamide 50 WG, indicating that these insecticides were comparable to one another and somewhat more effective than the other spray treatments. *Verticillium* + *Beauveria* + *Metarhizium* (consortium) treated plants had the highest incidence of any treated plants.

Keywords: Bio-efficacy, management, pomegranate, thrips, hast bahar

Introduction
Punica granatum L., often referred to as anar, dalim, or dalimbe, is a highly versatile subtropical minor fruit crop that is a member of the Punicaceae family, one of the smallest plant families. The pomegranate originated in Iran and was introduced to the Mediterranean region before 2000 BC, whence it was initially farmed (Evereinoff, 1949) [4]. Due to its drought-tolerant hardiness, low maintenance requirements, consistent and good yields, fine table and therapeutic qualities, improved quality retention, and ability to be placed in rest during periods of low irrigation potential, pomegranate cultivation is unique in its own right, especially in the hot, semi-arid, and desert regions of India such as Maharashtra, Uttar Pradesh, Andhra Pradesh, Gujarat, Karnataka, and Tamil Nadu where cultivation has spread. In India it is cultivated over 2.78 lakh ha area with a production of 31.87 lakh MT. in Maharashtra area under pomegranate in Maharashtra 1.62 lakh ha with a production of 17.48 lakh MT tones, (2022).

An extensive review of the literature found that 91 insects, 6 mites, and 1 snail pest were feeding on the pomegranate crop in India. *Deudorix* (*Virachola*) *isocrates* (Fab.), the most poisonous adversary of the pomegranate butterfly, has the ability to destroy over 50% of the fruits. Many serious issues have resulted from the overuse and improper application of insecticides, including mealy bugs *Planococcus lilacinus* (Cockerell), *Anaphothrips oligochaetus* (Karny), mites Aceriagranati Can. & Massal; *Oligonychus punicae* (Hirst.); aphids *Aphis punicae* (Passerini), Thrips *Rhipiphorothrips cruentatus* (Hood), *Scirtothrips dorsalis* (Hood), and whiteflies (Pomegranate whitefly, *Siphoninus phillyreae* (Haliday). These sucking pests attack the crop during its flowering and fruiting stages, weakening the plant's resistance to disease and producing honeydew on its leaves.

The polyphagous thrip species (*Scirtothrips dorsalis* Hood.) that infests pomegranates is known to harm a number of seasonal field crops, vegetable crops, and fruit crops. Thrip nymphs and adults both use their mouth parts to rasp and sucke in order to feed. They induce laceration on the surface of the developing fruiting portions and deformity that gives the fruits a corcky appearance. As a result, the quality of the fruits deteriorates, fetching poor prices on the domestic market and being rejected for export.

Thrips have the ability to harm any stage of development, from the vegetative stage to fruit harvest, thus it's imperative to control them more skill fully. It has been found that a number of insecticides work well to control pomegranate pests. But the majority of them need to be sprayed in large amounts, which may pose problems of residues. In recent years several new pesticides are available and claimed to be effective at low doses to control pest with little harm to environment.

Materials and Methods

The Department of Horticulture, College of Agriculture, VNMKV, Parbhani conducted field experiments on the bio-efficacy of newer insecticides against pomegranate aphid during Haste Bahar 2022–2023 with an established pomegranate orchard (variety Bhagwa) with spacing of 4 x 4 m. The experiment was set up with eight treatments replicated thrice in Randomized Block Design (RBD), and some insecticide molecules were chosen to assess their effectiveness against pomegranate aphid.

Treatment details of insecticides against sucking pests and Fruit Borer

Tr. no.	Treatments	Dose (ml/10 lit.)
T_1	Cyantraniliprole 10.26% OD	15
T_2	Chlorantraniliprole	3.0
T_3	Spinetoram	8.4
T_4	Spinosad 45% SC	3.2
T_5	Thiamethoxam + Lambda cyhalothrin 5% EC	4.0
T_6	Flonicamid 50% WG	3.0
T_7	*Verticillium* + *Beuveria Metarizhium* (consortium)	40
T_8	Water spray/ Untreated Control	-

Application of insecticides

When insect pests started to appear in the pomegranate orchard, insecticides were administered in the recommended dosages. By applying plain water to a control plot, the amount of spray water to use before applying an insecticidal treatment was determined. In order to escape the midday heat, the spraying was done early in the morning. A measured amount of pesticides was placed in a 500 ml beaker, combined with a small amount of water, and then transferred to a spray tank that already contained a known amount of water.

Method of observations

From the net plot of each treatment in each replication, one observation plant was chosen at random, and four twigs (10 cm each) of the plant were labeled appropriately to reflect the four orientations (i.e. East, West, South & North). The total number of thrips nymphs and adults was counted one day prior to, one, three, seven, and fourteen days following the administration of pesticides.

Results and Discussion

A. Performance after first spray

The before initiation of insecticidal treatments, the mean pre-count of aphids ranged from 11.50 to 14.73 thrips/10 cm twig and it was found non-significant All the insecticidal treatments were significantly superior over untreated control in minimizing the incidence of thrips on pomegranate.

The overall mean thrips count observed in insecticidal spray treatments during post spray period of 1DAS recorded cyantraniliprole 10 OD (1.99 /10 cm twig) followed by Spinosad 45 SC (2.01 thrips/10 cm twig) and Flonicamid 50 WG (2.53 thrips/10 cm twig) which were statistically at par with each other.

At 3 DAS, treatment with cyantraniliprole 10 OD (2.10 aphids/10 cm twig) followed by Spinosad 45 SC (2.29 aphids/10 cm twig) and Flonicamid 50 WG (2.94 aphids/10 cm twig) showed lowest incidence and statistically at par with each other.

The data recorded at 7 and 14 DAS indicated that cyantraniliprole 10 OD showed lowest incidence (2.88 and 3.29 thrips/10 cm twig) followed by Spinosad 45 SC (2.46 and 3.63 thrips/10 cm twig), Flonicamid 50 WG (3.56 and 4.4 thrips/10 cm twig) and Thiamethoxam 12.60 + Lambda cyhalothrin 9.50 ZC (4.17 and 4.10 thrips/10 cm twig). These four treatments were equally effective statistically.

B. Performance after second spray

The thrips population on untreated plants (control) showed an increase from 11.46 to 14.25 thrips/10 cm twig during a span of 14 days.

The post treatment observations recorded on 1 and 3 DAS indicated that all the insecticidal treatments were significantly superior over untreated control in reducing thrips population. Among these treatments, the plants treated with Cyantraniliprole 10 OD recorded lowest count (1.38 and 1.46 thrips/10 cm twig) which was statistically at par with Spinosad 45 SC (2.21 and 2.38 thrips/10 cm twig) and Flonicamid 50 WG (2.10 and 2.38 thrips/10 cm twig).

The treatment of Cyantraniliprole 10 OD (1.98 and 3.25 thrips/10 cm twig) emerged as the most effective insecticides in managing this pest followed by Spinosad 45 SC (2.48 and 3.75 thrips/10 cm twig), Flonicamid 50G W (2.73 and 4.19 thrips/10 cm twig) and Thiamethoxam 12.60 + Lambda cyhalothrin 9.50 ZC (3.21 and 4.42 thrips/10 cm twig) which were statistically at par with each other at 7 and 14 DAS.

C. Performance after third spray

According to the data recorded on 1 and 3 day after third spray Cyantraniliprole 10 OD was found most superior treatment (0.93 and 1.67 thrips/10 cm twig) followed by Spinosad 45 SC (1.32 and 1.75 thrips/10 cm twig) and Flonicamid 50G W (1.63 and 2.10 thrips/10 cm twig). These treatments showed equal effectiveness against thrips.

The post treatment count of live count of thrips at 7 days after third spray clearly indicated the superiority of Cyantraniliprole 10 OD in minimizing thrips incidence (1.96 thrips/10 cm twig) followed by Spinosad 45 SC (1.80 thrips/10 cm twig), Flonicamid 50G W (2.58 thrips/10 cm twig) and Thiamethoxam 12.60 + Lambda cyhalothrin 9.50 ZC (3.25 thrips/10 cm twig) and were statistically at par with each other also were significantly superior over rest of the treatments.

The data recorded on 14 DAS showed that Cyantraniliprole 10 OD was the most effective treatment (2.42 thrips/10 cm twig) followed by Spinosad 45 SC, Flonicamid 50GW, Thiamethoxam 12.60 + Lambda cyhalothrin 9.50 ZC, recording 2.68, 3.54, and 4.26 thrips/10 cm twig, respectively. It indicated that these insecticides were at par with each other and comparatively more effective than rest of the spray treatments. Highest incidence amongst the treated plants was found on the plants treated with *Verticillium* + *Beauveria* + *Metarhizium* (consortium) (8.42 thrips/10 cm twig).

At 14 DAS, the order of efficacy of insecticides against pomegranate thrips was cyantraniliprole > spinosad > Flonicamid > thiamethoxam> Thiamethoxam + Lambda cyhalothrin

Previous studies, such as those conducted by Kadam *et al.* (2012) [5], found that spinosad @ 56.25 g a.i./ha was the most effective treatment against pomegranate thrips at 14 DAS and was comparable to fipronil @ 25 g a.i./ha, lambda cyhalothrin @ 12.5 g a.i./ha, and imidacloprid @ 27 g a.i./ha. Similarly, Dongarjal (2017) [2] reported that the most promising treatments to control the thrips population on pomegranate were fipronil 50 g a.i./ha, thiamethoxam 25 g a.i./ha, clothianidin 20 g a.i./ha, and flonicamid 50 g a.i./ha, all of

which were found to be comparable with one another.

Elango *et al*. (2018) [3] Imidacloprid 17.8 SL (0.00712%) was efficient against thrips on pomegranate trees planted at high density, according to Hood, with a maximum reduction of 70.8%. Khandare *et al.*, (2020) [6] research also validates the sequence in which insecticides that target pomegranate thrips—spinosad, fipronil, lambda cyhalothrin, clothianidin, and thiamethoxam—are most effective. The most promising treatments to reduce the occurrence of thrips on pomegranates were fipronil 50 g a.i./ha, clothianidin 20 g a.i./ha, thiamethoxam 25 g a.i./ha, and flonicamid 50 g a.i./ha, which were comparable to one another. The most successful therapy for pomegranate thrips at 14 DAS was spinosad @ 56.25 g a.i./ha, which was followed by fipronil @ 25 G a.i./ha, lambda cyhalothrin @ 12.5 g a.i./ha, and imidacloprid @ 27 g a.i.

Table 1: Bio-efficacy of newer insecticides against thrips infesting pomegranate (Hasta bahar 2022-23)

Sr. No	Treatments	Conc. (%)	Pre-count	Average no of thrips / 10 cm twig											
				1st spray				2nd spray				3rd spray			
				1 DAS	3 DAS	7 DAS	14 DAS	1 DAS	3 DAS	7 DAS	14 DAS	1 DAS	3 DAS	7 DAS	14 DAS
T_1	Cyantraniliprole 10.26% OD	0.006	12.83 (3.40)	1.99 (1.51)	2.10 (1.58)	2.88 (1.83)	3.29 (1.95)	1.38 (1.37)	1.46 (1.38)	1.98 (1.56)	3.25 (1.90)	0.93 (1.17)	1.67 (1.45)	1.96 (1.57)	2.42 (1.68)
T_2	Chlorantraniliprole 10.26% OD	0.015	14.40 (3.68)	4.10 (2.13)	4.73 (2.27)	5.60 (2.46)	8.08 (2.92)	3.54 (1.99)	4.10 (2.13)	4.68 (2.26)	7.47 (2.81)	3.22 (1.90)	3.45 (1.98)	3.90 (2.08)	6.45 (2.61)
T_3	Spinetoram 11.70 SC	0.010	11.50 (4.00)	3.88 (2.09)	4.82 (2.30)	4.92 (2.33)	7.20 (2.77)	3.71 (2.03)	3.80 (2.06)	4.07 (2.13)	6.63 (2.65)	3.38 (1.96)	4.71 (2.28)	5.00 (2.34)	5.21 (2.36)
T_4	Spinosad 45% SC	0.015	14.07 (4.11)	2.01 (1.58)	2.29 (1.65)	2.46 (1.69)	3.63 (2.01)	2.21 (1.63)	2.38 (1.68)	2.48 (1.71)	3.75 (2.03)	1.32 (1.33)	1.75 (1.49)	1.80 (1.49)	2.68 (1.75)
T_5	Thiamethoxam 12.60% + Lambda cyhalothrin 9.50% ZC	0.018	13.50 (3.65)	3.74 (2.06)	3.84 (2.08)	4.17 (2.16)	4.10 (2.13)	2.38 (1.69)	2.63 (1.77)	3.21 (1.91)	4.42 (2.20)	2.15 (1.60)	2.42 (1.68)	3.25 (1.92)	4.26 (2.16)
T_6	Flonicamid 50% WG	0.015	13.67 (3.57)	2.53 (1.73)	2.94 (1.85)	3.56 (1.99)	4.44 (2.20)	2.10 (1.61)	2.48 (1.71)	2.73 (1.78)	4.19 (2.15)	1.63 (1.44)	2.10 (1.59)	2.58 (1.72)	3.54 (2.00)
T_7	*Verticillium* + *Beauveria* + *Metarhizium* (consortium)	40	11.80 (3.77)	7.15 (2.76)	7.41 (2.81)	7.84 (2.88)	8.20 (2.94)	7.10 (2.76)	6.42 (2.63)	6.20 (2.57)	6.70 (2.67)	6.10 (2.56)	6.48 (2.62)	7.65 (2.84)	8.42 (2.98)
T_8	Water spray/ Untreated Control	-----	14.73 (3.72)	11.75 (3.49)	11.80 (3.51)	12.42 (3.59)	12.46 (3.59)	12.93 (3.66)	13.50 (3.74)	14.00 (3.80)	14.92 (3.93)	14.46 (3.87)	15.38 (3.98)	15.88 (4.05)	16.12 (4.08)
S.E +			0.239	0.135	0.144	0.160	0.174	0.148	0.147	0.153	0.192	0.145	0.147	0.166	0.180
C.D. at 5%			NS	0.411	0.437	0.485	0.529	0.448	0.446	0.464	0.582	0.439	0.446	0.505	0.547
C.V %			11.20	10.81	11.07	11.71	11.79	12.23	11.91	11.97	13.06	12.68	11.94	12.81	12.73

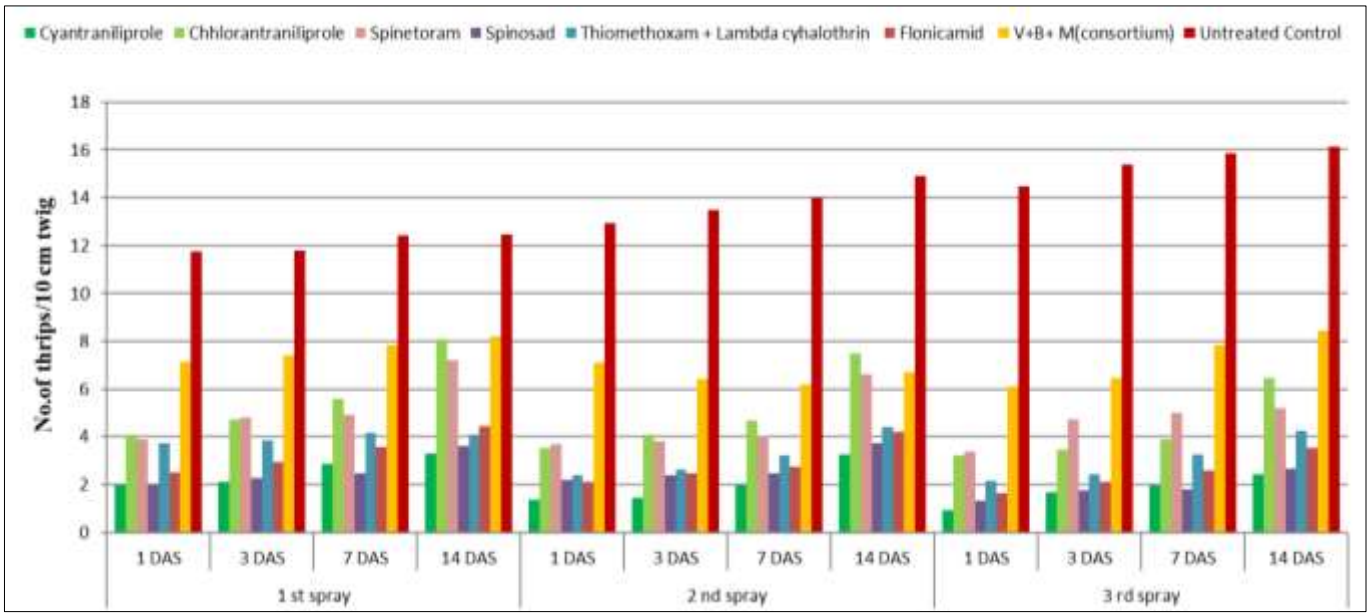

Fig 1: Bio-efficacy of newer insecticides against thrips infesting pomegranate (Hasta bahar 2022-23)

Summary and Conclusion

The trial results indicate that thrips are a important pest of pomegranates. The most effective insecticides to reduce the incidence of pomegranate thrips were Cyantraniliprole 10 OD, spinosad 45 SC, and Flonicamid 50G W. were the most effective insecticides to minimize the incidence of pomegranate thrips and were statistically at par with each other also were significantly superior over rest of the treatments

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