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Relative efficacy of some newer molecules against thrips, *Scirtothrips dorsalis* Hood (Thysanoptera: Thripidae) on rose

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Abstract
A field experiment was conducted at the experimental farm of Cardamom Research Station, Pampadumpara, Idukki District, Kerala during 2016-17 to evaluate the bio-efficacy of new molecules against thrips, *Scirtothrips dorsalis* on rose. The results revealed that significantly lowest population of thrips per three buds was recorded in fipronil 5 SC @ 0.15%, imidacloprid 17.8 SL @ 0.02%, tolfenpyrad 15 EC @ 0.1% and diafenthiuron 50 WP @ 0.12%. The insecticides dimethoate 30 EC @ 0.15%, acetamiprid 20 SP @ 0.02% and thiacloprid 21.7 SC @ 0.1% were also proven to be efficient in managing thrips population of rose as compared to thiamethoxam 25 WG @ 0.02%, chlorpyriphos 20 EC @ 0.25% and chlorfenapyr 10 SC @ 0.1%. The maximum per cent reduction over untreated check was obtained from fipronil 5 SC (82.35%), imidacloprid 17.8 SL (78.55%), tolfenpyrad 15 EC (73.52%) and diafenthiuron 50 WP (72.95%).

Keywords: Rose, *Scirtothrips dorsalis*, new molecules, efficacy, CRS, Pampadumpara

1. Introduction

Flowers are indivisible from the communal fabric of human life. It plays an important role in country’s economic growth with respect to agriculture. Flowers being adorable Creation of God befits all occasions be it at birth, marriage or death [13]. India's 'flower power' continues to bloom with the country emerging as the second largest grower of flowers around the world, surpassed only by China. About 249 million hectares across the country was used for floriculture, producing 2143 metric tonnes of loose flowers and 76,732 lakh cut flowers, according to the latest data of the National Horticulture Board for 2014-15. The major flower growing states are Karnataka, Tamil Nadu and Andhra Pradesh in the South, West Bengal in the East, Maharashtra in the West and Rajasthan, Delhi and Haryana in the North. In most part of the country flower growing is carried out on small holdings, mainly as a part of the regular agriculture systems. This is applicable for the state like Kerala because, spices and plantation crops are highly suited to this location and hence, concentration on other horticultural crops like vegetables, fruits and flower crops are negligible.

Rose (*Rosa* spp.) is a woody perennial flowering shrub often denoted as symbol of love, adoration and innocents not in our time only but also for thousands of years and it has been growing on the earth since time immemorial. It is the principal flower crop grown all over the country as cut flower and as well as loose flower with the uses like veni making, bouquet preparation, stage decorations, garland making, worship and value added products like rose water, gulkand, rose attar and rose oil (Otto of rose), *etc*. Rose oil is commercially used for the preparation of cosmetics, perfumes and flavours which are exported. Rose contains 200 species and more than 18,000 cultivars [8]. On account of its importance, the larger percentage of the area in many states is used for growing rose. Roses are highly susceptible to sucking pests infestation *viz*. thrips, aphids, scale insects, *etc*. Among them, thrips is considered as highly destructive insect pest leading to 90% yield loss in an unchecked condition.

The thrips species, *Scirtothrips dorsalis* Hood (Thysanoptera: Thripidae) is one of the major pest of roses, causing 28–95% damage [5]. It is important to detect and manage thrips on roses, even at low densities, because even a few individuals on flowers may result in rose petal discoloration. Thrips are tiny insects that reproduce rapidly, congregate in tight places that make pesticide coverage difficult, and feed with rasping-piercing-sucking mouth parts, resulting in deformation of flowers and leaves [4]. Tolerance for thrips on floriculture crops is particularly low.

Keeping in outlook the monetary value of the crop an attempt was intended to appraise the effectiveness of existing new molecules against thrips on rose.

2. Material and Methods

The present investigations were carried out in Cardamom Research Station, Pampadumpara, Idukki District, Kerala during 2016-17 to evaluate ten synthetic insecticides *viz.*, acetamiprid 20 SP, chlorfenapyr 10 SC, chlorpyriphos 20 EC, diafenthiuron 50 WP, dimethoate 30 EC, fipronil 5 SC, imidacloprid 17.8 SL, thiacloprid 21.7 SC, thiamethoxam 25 WG and tolfenpyrad 15 EC against the thrips of rose. An untreated check was also maintained. The standard agronomic practices were given at a proper time as per the Package of Practice by Kerala Agricultural University. The experiment was laid out in RBD with three replications. The insecticidal sprays were given for the two times and observations were taken at 15 and 30 days after spraying (DAS). The nymphal and adult populations of *S. dorsalis* were recorded on ten plants selected at random per plot. In each plant three flowers/buds were looked for the thrips population and mean was calculated. The data gathered were transformed in to square-root values for statistical scrutiny, wherever necessary [7].

3. Results

3.1 First foliar application

The data on the incidence of thrips, *S. dorsalis* on plants treated with synthetic insecticides ranged from 0.7 (fipronil 5 SC) to 8.35 (thiamethoxam 25 WG) number per three buds is presented in the Table 1. In pre-treatment observation, there was no statistical difference in all treatments and the post treatment findings indicated that, all the insecticidal treatments significantly reduced the thrips population up to thirty days. During 15th DAS, fipronil 5 SC (0.7/3 buds) was the most effective insecticide followed by tolfenpyrad 15 EC (41.6/3 buds). The insecticides, imidacloprid 17.8 SL (2.2/3 buds) and acetamiprid 20 SP (2.5/3 buds) stood next and were at par with each other. Chlorfenapyr 10 SC (7.6/3 buds) harboured more thrips followed by thiamethoxam 25 WG (7.1/3 buds). Moreover 30th day observation also proved that, fipronil 5 SC (0.7/3 buds) and imidacloprid 17.8 SL (1.5/3 buds) gave excellent results in managing thrips and were at par with each other. Dimethoate 30 EC (2.8/3 buds) was found to be the next best insecticide. Chlorpyriphos 20 EC (12.2/3 buds), thiamethoxam 25 WG (9.6/3 buds) and chlorfenapyr 10 SC (6.0/3 buds) nursed the maximum thrips population than any other insecticides treated. Summarizing the results of first spray, the insecticides *viz.* fipronil 5 SC and imidacloprid 17.8 SL hampered thrips population by more than 90 per cent whereas, dimethoate 30 EC, tolfenpyrad 15 EC, acetamiprid 20 SP, thiacloprid 21.7 SC and diafenthiuron 50 WP were also able to inhibit the thrips population by more than 80 per cent.

3.2 Second foliar application

The influence of insecticidal sprays on the incidence of thrips, *S. dorsalis* was realized among the treatments (Table 1). Significant difference among the periods of observation was evident. Interaction between the treatment and period of observation was also significant. The incidence of thrips on plants treated with synthetic insecticides ranged from 8.05 (fipronil 5 SC) to 16.35 (chlorpyriphos 20 EC) number per three leaves. On 15th DAS, the thrips population on the plants treated with fipronil 5 SC (6.4/3 buds) and tolfenpyrad 15 EC (7.5/3 buds) were significantly lower than all other treatments except, diafenthiuron 50 WP (7.5/3 buds) and imidacloprid 17.8 SL (7.5/3 buds) which were equal between themselves. Thiamethoxam 25WG, chlorpyriphos 20 EC and chlorfenapyr 10 SC nursed vast amount of thrips than other insecticides while, untreated plants (22.5/3 buds) harboured the huge population. Likewise 30th day observation also depict that, fipronil 5 SC (9.7/3 buds), diafenthiuron 50 WP (10.0/3 buds), imidacloprid 17.8 SL (10.5/3 buds) and tolfenpyrad 15 EC (10.8/3 buds) effectively managed the thrips and were at par with each other. Dimethoate (10.9) stood next with good results. On the other hand, thiamethoxam 25 WG, chlorpyriphos 20 EC and chlorfenapyr 10 SC cherished enormous number of thrips. Briefing the outcome of second spray, the insecticides *viz.* fipronil 5 SC, diafenthiuron 50 WP, imidacloprid 17.8 SL and tolfenpyrad 15 EC were capable to diminish the thrips population by more than 60 per cent.

Table 1: Evaluation of synthetic insecticides against thrips on rose

Sl. No.	Treatment	Dose (lit^{-1})	*Thrips population / three flower buds							
			First foliar application				Second foliar application			
			Before spray	Days after spraying (DAS) 15	30	Mean	Before spray	Days after spraying (DAS) 15	30	Mean
1	Acetamiprid 20 SP (Manik)	0.2 g	16.3 (3.92)	2.5 (1.58)abc	7.6 (2.80)cd	5.05 (2.19)	25.4 (5.06)	11.5 (3.26)abc	17.4 (4.06)c	14.45 (3.66)
2	Chlorfenapyr 10 SC (Intrepid)	1ml	16.6 (3.90)	7.6 (2.71)d	6.0 (2.38)bc	6.8 (2.54)	23.3 (4.85)	12.4 (3.52)c	17.4 (4.22)c	14.9 (3.87)
3	Chlorpyriphos 20 EC (Dursban)	2.5 ml	17.4 (3.89)	3.5 (1.91)bcd	12.2 (3.31)d	7.85 (2.61)	26.3 (5.15)	13.5 (3.60)c	19.2 (4.34)c	16.35 (3.97)
4	Diafenthiuron 50 WP (Gama)	1.2g	15.9 (3.90)	4.2 (1.84)bc	7.2 (2.40)bc	5.7 (2.12)	24.8 (4.97)	7.5 (2.76)ab	10.0 (3.19)a	8.75 (2.98)
5	Dimethoate 30 EC (Rogor)	1.5 ml	19.2 (4.06)	4.7 (2.01)cd	2.8 (1.71)ab	3.75 (1.86)	26.8 (5.17)	10.5 (3.25)abc	10.9 (3.34)ab	10.7 (3.29)
6	Fipronil 5 SC (Regent)	1.5 ml	25.5 (4.98)	0.7 (1.02)a	0.7 (1.05)a	0.7 (1.04)	28.0 (5.30)	6.4 (2.52)a	9.7 (3.13)a	8.05 (2.83)
7	Imidacloprid 17.8 SL (Nagamida)	0.2 ml	21.4 (4.33)	2.2 (1.47)abc	1.5 (1.26)a	1.85 (1.36)	27.4 (5.24)	7.5 (2.77)ab	10.5 (3.26)a	9.0 (3.01)
8	Thiacloprid 21.7 SC (Alanto)	1ml	16.3 (3.92)	4.5 (1.99)bcd	5.8 (2.35)bc	5.15 (2.17)	24.3 (4.96)	11.9 (3.46)bc	15.6 (3.98)bc	13.75 (3.72)
9	Thiamethoxam 25 WG (Actara)	0.2g	15.8 (3.67)	7.1 (2.67)d	9.6 (2.97)cd	8.35 (2.82)	24.0 (4.93)	12.8 (3.60)c	19.1 (4.40)c	15.95 (4.0)
10	Tolfenpyrad 15 EC	1ml	11.4	1.6	7.8	4.7	26.0	7.5 (2.66)a	10.8	9.15

	(Keefun)		(3.14)	(1.18)ab	(2.70)cd	(1.94)	(5.13)		(3.23)a	(2.94)
11	Untreated check	-	21.18 (4.72)	31.0 (5.46)e	31.8 (5.60)e	31.40 (5.53)	28.1 (5.32)	22.5 (4.75)d	26.2 (5.12)d	24.35 (4.94)
	CD (P=0.5)	-	NS	0.822	0.857	-	NS	0.745	0.681	-
	CV (%)	-	33.486	42.676	37.201	-	12.349	25.497	19.949	-
	SEm±	-	1.828	0.856	0.930	-	0.396	0.702	0.588	-

*Mean of three replications. Figures in parentheses are √X+0.5 transformed values

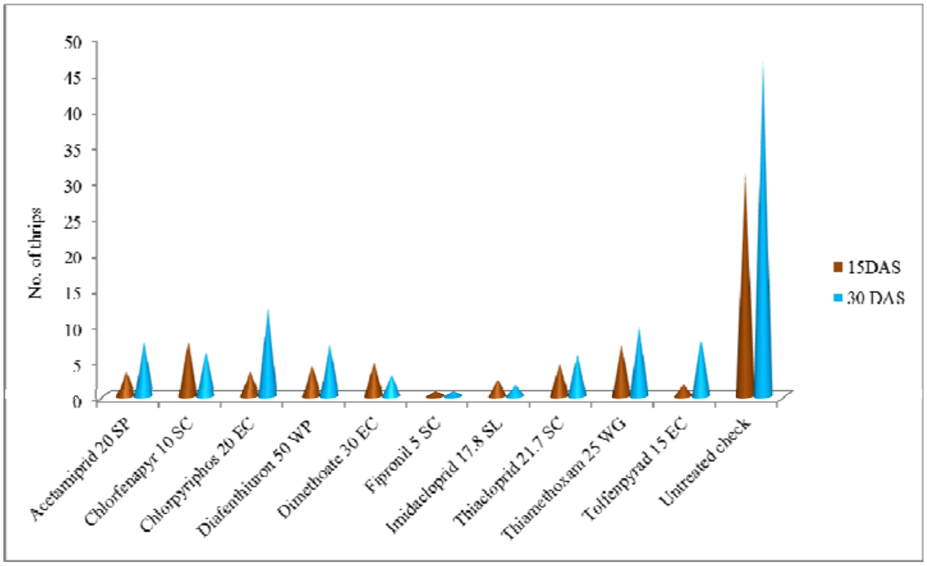

Fig 1: Influence of different synthetic insecticides on the incidence of thrips in rose during first spray

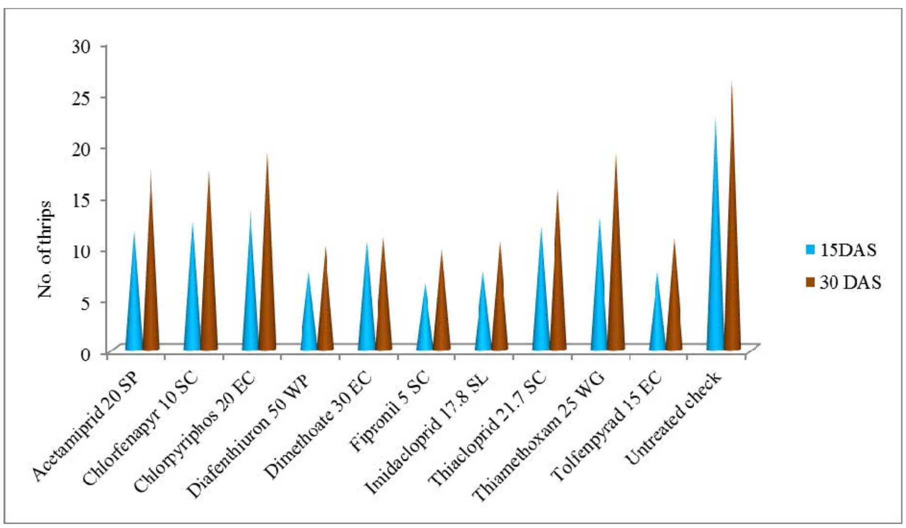

Fig 2: Influence of different synthetic insecticides on the incidence of thrips in rose during second spray

4. Discussion

The insecticide application provides an immediate solution to control the insect pests and seems to be most important pest management tool in boosting agricultural production [17]. Of the ten insecticides evaluated, the significant superiority preferably towards the control of thrips, *S. dorsalis* was fipronil 5 SC, imidacloprid 17.8 SL, tolfenpyrad 15 EC and diafenthiuron 50 WP (Figs. 1&2). The insecticides dimethoate 30 EC, acetamiprid 20 SP and thiacloprid 21.7 SC were also found to be good in managing thrips population in rose.

Fipronil 5 SC was found to be an efficient one compared to pyrethroids, organo phosphorus compounds and carbamate insecticides [14]. The present finding is in accordance with the report from [17]; fipronil 5 SC was the most effective insecticide with 83.06 per cent reduction in thrips population in cotton. Similarly, [15] and [12] found that fipronil 5% SC was very effective against thrips on cotton and chilli. [18] and [19] reported that, fipronil @ 50 g ai/ha at fortnightly interval was found to be the best treatment against the leafhopper. In a similar experiment [20]. Recorded that among some novel insecticides diafenthiuron 0.045% proved most effective against *S. dorsalis* followed by fipronil 0.01%.

Imidacloprid is a systemic insecticide, which acts as an insect neurotoxin and act on the central nervous system [3]. revealed that imidacloprid + fipronil 80WG (94.28%) followed by imidacloprid 200SL (85.06%) were effective against thrips on onion. Lasenta 80 WDG gave best control against onion thrips because it is the combination of two active ingredients imidacloprid and fipronil while in other insecticides there is only one active ingredient. Due to presence of two active ingredients they enhance the activity of insecticide and killed more insects as compared to other insecticides. Among insecticides, crown (imidacloprid 25% WP) proved to be highly effective with more than 90% population reduction on varieties B.H.163 and V.H. 159 [1]. Contrary fact was given by [9] as the order of efficacy was acetamiprid>thiamethoxam>imidacloprid>thiacloprid on sucking pests in *Bt* cotton but imidacloprid performed well in the case of present study when compared to acetamiprid and thiamethoxam.

Tolfenpyrad is a contact insecticide belongs to pyrazole group that inhibits an organism's energy metabolism and also acts as a contact fungicide. The present findings are also in conformity with the findings of [10], tolfenpyrad 150 and 125 a.i./ha were found superior over to acetamiprid 20 SP, imidacloprid 17.8 SL and thiamethoxam 25 WG in controlling population of aphids and thrips [2]. and [16] confirmed the effectiveness of tolfenpyrad 15 EC against sucking pests.

Considering the overall effectiveness, the insecticides thiamethoxam 25 WG, chlorpyriphos 20 EC and chlorfenapyr 10 SC were least efficient than the other insecticides evaluated. An opposing finding was conveyed by [11] as; actara (thiamethoxam 25 WG) proved an excellent controlling agent against thrips. Similarly, [6] found that thiamethoxam 0.01% was effective against thrips on *Bt* cotton [3]. Observed that chlorfenapyr 36 SC is better than imidacloprid 200 SL which was not in line with the present findings.

5. Conclusion

In the present investigation, fipronil 5 SC, imidacloprid 17.8 SL, tolfenpyrad 15 EC and diafenthiuron 50 WP, dimethoate 30 EC, acetamiprid 20 SP and thiacloprid 21.7 SC were found more effective against thrips infesting rose. Neonicotinoids and the phenyl-pyrazole are insecticides with systemic properties. These insecticides can be genuinely recommended and included in the IPM Programme of thrips in rose growing areas, looking to their effectiveness, economics and safety to the natural enemies.

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