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Efficacy of Fipronil 80WG: A phenyl Pyrazole against grape Thrips (*Scirtothrips dorsalis* Hood)

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Abstract
The experiment was conducted to know the efficacy of Fipronil 80% WG with different concentration (30g.a.i./ha, 40g.a.i./ha, 50g.a.i./ha and 60g.a.i./ha) along with two standard check (Thiamethoxam 25WG @ 25g.a.i./ha and Imidacloprid 17.8SL @ 25g.a.i./ha) and a control against thrips (*Scirtothrips dorsalis* Hood) in grape ecosystem. The results concluded that Fipronil 80% WG @ 50g.a.i./ha and Fipronil 80% WG @ 60g.a.i./ha along with Imidacloprid 17.8SL @ 25g.a.i./ha were on par with each other and recorded highest mortality of thrips followed by Fipronil 80% WG @ 40g.a.i./ha and Thiamethoxam 25WG @ 25g.a.i./ha the least mortality was observed in Fipronil 80% WG @ 30g.a.i./ha and in control. The yield data reveals that, the highest yield was observed in fipronil 80 WG @ 60 g a.i./ha which was 42.33 per cent more than the control and superior over all the treatment and least in the control.

Keywords: thrips, grapes, fipronil, imidacloprid, thiamethoxam

Introduction
Grape (*Vitis vinifera*) is one of the most important commercial fruit crop. It is successfully grown in some tropical and sub-tropical region of world. The main grape growing states in India are Maharashtra, Karnataka, Andra Pradesh and Tamil Nadu. Karnataka is one of the important state growing different varieties of grapes and grapes are grown in 24.23 thousand ha and the estimated production is about 449.89 thousand metric tons (Anon, 2017) [2]. The important grape growing districts in Karnataka are Bangalore, Kolar, Bijapur, Bagalkot, Belgaum, Koppal and Gulbarga (Anon, 2007) [2]. Extensive and intensive cultivation of grapes leads to more insect pest incidence in the vine yard (Alexendri 1973) [1]. Bournier (1977) [3] listed 132 pests attacking Grapes in world. In India as many as 94 species of insects and mites have been reported (Tandon and Verghese 1994) [14]. Among the various sucking pests like thrips, mealybug, leaf hopper, whitefly and scales, thrips (*Scirtothrips dorsalis* Hood) are considered as serious on grapes in south India with significant economic impact. Due to lack of alternate effective pest control methods, chemical insecticides are widely used by farmers. Therefore, Fipronil 80% WG, a newer molecules reported to be effective against thrips on other crops were tested to see their potential in controlling thrips population on grapes.

Material and Method
A field experiment was conducted at University of Agricultural Sciences, GKVK, Bangalore during Sept-Oct 2014 to evaluate the bio-efficacy of Fipronil 80% WG at different concentrations against the grape Thrips (*Scirtothrips dorsalis* Hood). The experiment was laid out in RCBD, comprising of seven treatments (Table 1) and four replications. Five vine each were considered as a replication.

Table 1: Treatment details of insecticides and botanicals against grape thrips under field conditions

Sl. No.	Treatments	Trade Name	Dosage
T_1	Fipronil 80% WG	Regent 80WG	30g.a.i./ha
T_2	Fipronil 80% WG	Regent 80WG	40g.a.i./ha
T_3	Fipronil 80% WG	Regent 80WG	50g.a.i./ha
T_4	Fipronil 80% WG	Regent 80WG	60g.a.i./ha
T_5(SC)	Thiamethoxam 25WG	Actra	25g.a.i./ha
T_6(SC)	Imidacloprid 17.8SL	Confider	25g.a.i./ha
T_7	Untreated Control	-	Water spray

Data collection

The field spray was taken using knapsack sprayer with a spray volume of 1000 lt/ha. First spray was taken 15 days after pruning and second spray was given after 15 days of the first spray. Further observations were recorded a day before and 1, 3, 5, 7, 10 and 15th days after the treatment. Observations recorded on 5 randomly selected top three leaves of particular vine by gently tapping the leaves against a white sheet and the number of thrips present on white sheets were counted.

The yield of each treatment and replication wise was recorded separately and subjected to statistical analysis to test the significance of mean yield in different treatments.

Data analysis

The numerical data recorded and converted to per cent mortality and was subjected to arcsine transformation, and analyzed using Statistical Analysis Software. Analysis of variance (ANOVA) also constructed to test for significant differences between the variables.

The per cent mortality of thrips was calculated by using the formula

$$\text{Per cent mortality} = \frac{\text{Number of Thrips (Pre count) - Number of Thrips (Post count)}}{\text{Number of Thrips (Pre count)}} \text{ X } 100$$

Results and Discussion

Results for mortality of thrips are given in the table 2. During the first spray, the pre-treatment population of thrips ranged from 14.25 to 16.5 per top three leaves indicating no significant difference in initial population before spray leading to uniform distribution. The mean data revealed that, one day after imposing the spray, the highest percent mortality of thrips population (36.34) was recorded in T4 which is on par with T3 and T6 (Standard check), and significantly differ with T5 (Standard check) and superior over rest of the treatment. However lowest percent mortality was observed in case of untreated control. Almost similar trend was observed 3, 5, 7, 10, and 15 days after spray. Mortality of thrips was proportional to the concentration i.e. as the concentration decreased lead to decrease in percent mortality. Thus mortality observed was in the decreasing order i.e. fipronil 80WG @ 60g.a.i./ha > Fipronil 80WG @ 50g.a.i./ha > fipronil 80WG @ 40g.a.i./ha >fipronil 80WG @ 30g.a.i./ha.

Second spray taken fifteen days after first spray and the data revealed that, one day after imposing the spray, the highest percent mortality of thrips population (35.87) was recorded in T4 and superior over rest of treatment. The treatment T3 and T6 are found to be on par with each other on first day of spray and least superior over T4, but during 3,5, 7, 10 and 15 DAS, T4, T3 and T6 are found to be on par and superior over the rest of the treatment. Mortality of thrips was proportional to the concentration as observed in first spray. The obtained results are in confirmation with the Shanmuga *et al*., (2016) [10], where it was found that Fipronil 80 WG was most effective chemical for control for thrips populations in grape ecosystem. The results of Patil *et al*., (2017) [7] explains the Fipronil 5%SC was most effective against grape thrips. Similar results with Fipronil 80 WG was found in onion ecosystem (Hosamani *et al*., 2012) [5] and in chilli ecosystem (Reddy and Sreehari, 2009 and Halder *et al*., 2015; Jadhav *et al.* 2004) [8, 4, 6]. The results for standard checks were in support with (Sunitha *et al*., 2008; Sunitha and Jagginavar, 2010) [12, 13], where they found that Imidacloprid 17.8SL was most effective nionicotinoid molecule followed by Thiamethoxam 25%WG, and in chilli ecosystem Imidacloprid 17.8SL was found to be most effective in controlling thrips (Shitole *et al*., 2002) [11]. But the results were in contrast with the results of Tirkey and Kumar (2017) [15], which implies that Thiamethoxam 25%WP was more effective than Imidacloprid 17.8SL in chilli ecosystem.

The yield varied from 19.25 t ha^{-1} in untreated check to 27.4 t ha^{-1}in fipronil 80 WG @ 60 g a.i. ha^{-1} treated plot which was 42.33 per cent more than the control and superior over all the treatment. T6 (SC) found to be on par with T2 and T3. The untreated control recorded a yield of 19.25 t ha^{-1} (Table 3).

Table 2: Bio efficacy of fipronil 80 WG in grapes

Treatments	Mortality of thrips (%)												
		1st spray						2nd spray					
	DBS	1 DAS	3DAS	5 DAS	7 DAS	10 DAS	15DAS	1 DAS	3 DAS	5 DAS	7 DAS	10 DAS	15 DAS
T_1	16.5	16.43 (23.86)^c	33.73 (35.50)^c	53.29 (46.89)^c	60.84 (51.26)^c	48.66 (44.23)^c	23.30 (28.85)^c	16.65 (24.06)^c	33.56 (35.40)	47.42 (43.52)^c	61.21 (51.48)^c	53.37 (46.93)^c	46.08 (42.75)^c
T_2	15.8	29.55 (32.92)^b	51.22 (45.70)^b	65.47 (54.02)^b	69.60 (56.55)^b	63.54 (52.87)^b	45.77 (42.57)^b	31.06 (33.86)^b	52.70 (46.55)^b	66.14 (54.43)^b	76.65 (61.19)^b	69.65 (56.60)^b	60.90 (51.32)^b
T_3	14.25	34.72 (36.10)^a	62.38 (52.17)^a	74.09 (59.46)^a	83.06 (65.74)^a	77.42 (61.66)^a	65.51 (54.05)^a	33.74 (35.50)^{ab}	59.16 (50.28)^a	75.42 (60.33)^a	85.66 (67.81)^a	77.47 (61.69)^a	68.19 (55.69)^a
T_4	15	36.34 (37.07)^a	63.63 (52.91)^a	75.35 (60.23)^a	85.31 (67.48)^a	78.30 (62.24)^a	66.59 (54.71)^a	35.87 (36.78)^a	62.09 (52.01)^a	77.92 (62.00)^a	86.41 (68.48)^a	78.96 (62.71)^a	70.93 (57.38)^a
T_5	15.35	30.23 (33.35)^b	51.80 (46.03)^b	65.12 (53.81)^b	69.39 (56.41)^b	63.58 (52.88)^b	49.17 (44.52)^b	31.96 (34.41)^b	51.83 (46.06)^b	67.24 (55.10)^b	77.53 (61.72)^b	69.82 (56.68)^b	61.44 (51.62)^b
T_6	14.25	35.11 (36.33)^a	61.35 (51.56)^a	74.03 (59.37)^a	84.55 (66.88)^a	77.50 (61.69)^a	65.26 (53.89)^a	33.36 (35.28)^{ab}	58.64 (49.99)^a	75.79 (60.55)^a	85.82 (67.94)^a	77.71 (61.86)^a	68.61 (55.94)^a
T_7	14.85	1.66 (7.34)^d	3.02 (9.98)^d	4.37 (12.05)^d	3.38 (10.53)^d	2.04 (8.08)^d	1.35 (6.67)^d	1.69 (7.39)^d	1.74 (7.45)^d	2.02 (8.08)^d	1.37 (6.72)^d	2.74 (9.52)^d	1.37 (6.72)^d
'F' test	NS	*	*	*	*	*	*	*	*	*	*	*	*
S.E.m (±)	-	0.57	0.509	0.683	0.63	1.77	0.7	0.75	1.01	0.92	0.39	0.87	0.91
CD@ 0.05	-	1.69	1.51	2.03	1.87	2.39	2.28	2.21	2.98	2.74	2.77	2.60	2.73

Table 3: Effect of fipronil 80 WG on yield of grapes

SI. No.	Treatments	Dose (g.a.i.ha^{-1})	Bunch yield t ha^{-1}	Percent increase over control
1.	Fipronil 80WG	30	23.25^{c}	20.77
2.	Fipronil 80WG	40	25.75^{ab}	33.77
3.	Fipronil 80WG	50	26.9^{ab}	39.74
4.	Fipronil 80WG	60	27.4^{a}	42.33
5.	Thiamethoxam 25WG	0.25	25.35^{b}	31.69
6.	Imidacloprid 17.8SL	0.3	26.4^{ab}	37.14
7.	Untreated check	-	19.25^{d}	-

Conclusion

The results of the experiment conclude that Fipronil 80WG @ 60 and 50 gm ai/ha was most effective in controlling the thrips population in grape ecosystem and resulting in the higher yield of grapes.

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