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BIO EFFICACY OF VIRTAKO 1.5 GR (CHLORANTRANILIPROLE 0.5% + THIAMETHOXAM 1%) AGAINST PESTS COMPLEX IN ONION

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ABSTRACT

The experiment to evaluate the bioefficacy of Virtako 1.5 GR (Chlorantraniliprole 0.5% + Thiamethoxam 1%) at 5000, 6000 and 7000 g/ha along with Chlorantraniliprole 0.4 % GR at 8750 g/ha, Thiamethoxam 75% SG at 93.5 g/ha, Fipronil 80% WG at 75 g/ha and Dimethoate 30% EC at 667 ml/ha against pest complex of onion was conducted in Randomized Block Design with three replications at Horticulture farm, R.C.A., Udaipur during *Rabi*, 2017 and Rabi, 2018. The results reveal that all the treatments were significantly superior to untreated control. The highest mean reduction in the population of thrips was recorded in case of application of Virtako 1.5 GR (Chlorantraniliprole 0.5% + Thiamethoxam 1%) at 7000 g/ha which caused 69.45, 74.04, 83.93, 88.61 and 93.62 during *Rabi*, 2017 and 68.05, 73.03, 84.08, 88.12 and 92.20 per cent reduction in the mean population of thrips at 7, 14, 21, 28 and 35 days after application during *Rabi* 2018, respectively. It was followed by Virtako 1.5 GR (Chlorantraniliprole 0.5% + Thiamethoxam 1%) at 6000 g/ha which caused 64.51, 69.07, 80.03, 81.42 and 88.17 & 63.22, 68.78, 82.08, 81.68 and 87.01 per cent reduction in the population of thrips at 7, 14, 21, 28 and 35 days after application during *Rabi* 2017 & 2018, respectively and found at par with above treatment. The highest marketable yield of onion 172.28 and 178.60 q/ha was recorded in case of application of Virtako 1.5 GR (Chlorantraniliprole 0.5% + Thiamethoxam 1%) at 7000 g/ha during *Rabi* 2017 and 2018, respectively. It was found at par to spray of Virtako 1.5 GR (Chlorantraniliprole 0.5% + Thiamethoxam 1%) at 6000 g/ha which yielded 166.12 and 167.55 q/ha during *Rabi* 2017 and 2018, respectively.

Key words: .Onion, bioefficacy, chlorantraniliprole, thiamethoxam, virtako

INTRODUCTION

Onion, (*Allium cepa* Linnaeus) belongs to the Alliaceae family, is the most important bulb crop of Kharif and Rabi season in India. It is rich source of vitamin B, C, phosphorus, potassium, and calcium plus trace amounts of other nutrients. India is the second largest producer of onion (20%) in the world after China (25%). In India out of total vegetable production onion share is 10.4 %. In Rajasthan the production and cultivated area of onion was 1149.29 thousand tonnes and 62.5 thousand hectare, respectively (Anonymous, 2016). Onion crop suffers severely by various insect-pests like thrips (*Thrips tabaci* Lindeman), head borer (*Helicoverpa armigera* Hubner), cut worm (*Agrotis ipsilon* Hufnagel) and mite (*Tetranychus telarius* Linnaeus). Out of these insect pests thrips is considered as most important insect which causes severe loss to the onion crop. Adult thrips are yellowish to yellowish brown with narrow wings. Eggs are laid in clusters in leaf tissues. Both nymphs and adults are the damaging stages which feed by rasping the leaves and other tissues of plants and suck the sap, as a result, it causes silver patches and streaks on leaves. Besides direct damage to foliage, it can indirectly aggravate purple blotch (Straub *et al*., 1992). It is also a vector of "Iris Yellow Spot Virus" which is a tospovirus causing adverse effects on bulb and seed yield of onion crop in India. Seedlings are killed due to heavy infestation and the plant growth is retarded.

The chemical insecticides have been the primary tactics for thrips management, however, despite the ease of use and availability of numerous classes or modes of action of insecticides, rapid development of resistance to insecticides has been a key problem (Ravi kumar *et al*., 2016). Considering these issues, an experiment was undertaken in order to find out the effectiveness of newer

insecticides for the control of onion thrips.

MATERIALS AND METHODS

1. BIO-EFFICACY:

The experiment on the bioefficacy of Virtako 1.5 GR (Chlorantraniliprole 0.5% + Thiamethoxam 1%) at 5000, 6000 and 7000 g/ha along with Chlorantraniliprole 0.4 % GR at 8750 g/ha, Thiamethoxam 75% SG at 93.5 g/ha, Fipronil 80% WG at 75 g/ha and Dimethoate 30% EC at 667 ml/ha against pest complex of onion was conducted in Randomized Block Design with three replications at Horticulture farm, R.C.A., Udaipur during *Rabi*, 2017 and Rabi, 2018. Onion variety Chandra was sown on 23th December and 18th December during 2017 and 2018, respectively. Sowing was done in plots each measuring 5 x 5 sq. m. at row to row and plant to plant spacing of 15 cm x 10 cm. There were eight treatments replicated three times. Each treatment was applied once at 8 days after transplanting.

The observation on the population of thrips was recorded on leaves through visual observation with 10X hand lens on ten randomly selected and tagged plants. The observation was recorded one day before and at weekly intervals after application, till four weeks and mean reduction in population was calculated at weekly intervals.

The per cent correct mortality of the pests was calculated from the formula given by Henderson and Tilton (1955):

$$\text{Percent corrected mortality} = 100\left[1 - \frac{T_a \times C_b}{T_b \times C_a}\right]$$

T_a = Number of pests after treatment,

T_b= Number of pests before treatment

C_a= Number of pests in control after treatment

C_b= Number of pests in control before treatment

2. EFFECT ON NATURAL ENEMIES:

The effect of Virtako 1.5 GR (Chlorantraniliprole 0.5% + Thiamethoxam 1%) along with other treatments on natural enemies was studied by counting the population of common predatory fauna *viz.;* population of *Coccinella* spp and *Chrysoperla spp* at regular interval in each replication.

3. YIELD OF ONION:

The weight of onion bulbs and yield per hectare was calculated for each treatment separately.

RESULTS AND DISCUSSION

1. BIOEFFICACY:

The data presented during *Rabi,* 2017 and 2018 in Table 1 and 2 reveals that all the treatments were found significantly superior to untreated control. The highest mean reduction in the population of thrips was recorded in case of application of Virtako 1.5 GR (Chlorantraniliprole 0.5% + Thiamethoxam 1%) at 7000 g/ha which caused 69.45, 74.04, 83.93, 88.61 and 93.62 during *Rabi*, 2017 and 68.05, 73.03, 84.08, 88.12 and 92.20 per cent reduction in the mean population of thrips at 7, 14, 21, 28 and 35 days after application during *Rabi* 2018, respectively. It was followed by Virtako 1.5 GR (Chlorantraniliprole 0.5% + Thiamethoxam 1%) at 6000 g/ha which caused 64.51, 69.07, 80.03, 81.42 and 88.17 & 63.22, 68.78, 82.08, 81.68 and 87.01 per cent reduction in the population of thrips at 7, 14, 21, 28 and 35 days after application during *Rabi* 2017 & 2018, respectively and found at par with above treatment.

Application of Fipronil 80% WG @ 75 g/ha was followed the above treatments which caused 60.84, 65.40, 73.67, 77.98 and 83.49 & 59.62, 65.01, 74.05; 77.04 and 82.45, per cent reduction in the population of thrips at 7, 14, 21, 28 and 35 days after application during *Rabi* 2017 & 2018, respectively. The next effective treatment was Virtako 1.5 GR (Chlorantraniliprole 0.5% + Thiamethoxam 1%) at 5000 g/ha 55.98, 60.55, 70.02, 79.71 and 81.42 & 54.86, 61.02, 71.05, 78.29 and 80.11 per cent reduction in the population of thrips at 7, 14, 21, 28 and 35 days after application during *Rabi* 2017 & 2018, respectively which was found at par with Thiamethoxam 75% SG @ 93.5 g/ha with 48.10, 52.67, 59.91, 73.34 and 80.44 & 47.1, 52.21, 59.01, 74.14 and 80.05 per cent reduction in the population of thrips during *Rabi* 2017 & 2018, respectively. The application of Dimethoate 30% EC @ 667 ml/ha was found least effective against thrips with 35.82, 40.38, 50.05, 64.66 and 72.94 per cent reduction during *Rabi* 2017 and 35.10, 42.00, 52.00. 65.04 and 72.02 per cent reduction in the population of thrips during Rabi 2018. The present findings are in agreement with those of Shweta *et al*., 2019 and Nirgude, 2017 who reported that lowest mean thrips population was recorded in thiamethoxam 25 WG in onion. Wagh *et al*. (2017) recorded that the chlorantraniliprole 18.5 SC @ 30 g a.i. /ha emerged as most effective treatment to reduce the thrips population and it gave highest marketable yield of tomato. Pathak *et al*. (2018) found that, significantly lowest mean thrips population was recorded in basal application of Chlorantraniliprole 0.4% @ 10 Kg/ha.

2. EFFECTS ON NATURAL ENEMIES:

The data presented in the Table-3 to 6 reveals that no significant difference was recorded in the population

Table 1. Efficacy of Virtako 1.5 GR (Chlorantraniliprole 0.5% + Thiamethoxam 1%) against Thrips on onion during *Rabi*, 2017

S.No.	Treatments	Dose (g/ml ha^{-1})	Mean reduction (%) in Thrips population, days after spray					
			PTP	7 DAS	14 DAS	21 DAS	28 DAS	35 DAS
1.	Untreated control	-	32.00	-	.	-	.	-
2.	Virtako 1.5 GR	5000	32.00	48.44 (55.98)	51.09 (60.55)	56.80 (70.02)	63.23 (79.71)	64.47 (81.42)
3.	Virtako 1.5 GR	6000	26.33	53.44 (64.51)	56.21 (69.07)	63.45 (80.03)	64.46 (81.42)	69.88 (88.17)
4.	Virtako 1.5 GR	7000	23.33	56.44 (69.45)	59.37 (74.04)	66.37 (83.93)	70.28 (88.61)	75.36 (93.62)
5.	Chlorantraniliprole 0.4 % GR	8750	26.00	38.90 (39.44)	41.55 (44.00)	45.51 (50.88)	53.74 (65.03)	61.37 (77.04)
6.	Thiamethoxam 75% SG	93.5	22.33	43.91 (48.10)	46.53 (52.67)	50.71 (59.91)	58.91 (73.34)	63.75 (80.44)
7.	Fipronil 80% WG	75	28.67	51.26 (60.84)	53.97 (65.40)	59.13 (73.67)	62.01 (77.98)	66.03 (83.49)
8.	Dimethoate 30% EC	667	28.00	36.76 (35.82)	39.46 (40.38)	45.03 (50.05)	53.52 (64.66)	58.65 (72.94)
	SEm±		2.014	0.940	0.962	0.599	1.044	1.606
	C.D. at 5%		6.108	2.896	2.965	1.846	3.217	4.948

PTP = Pre treatment population.

Figures in parenthesis are retransform per cent value

Table 2. Efficacy of Virtako 1.5 GR (Chlorantraniliprole 0.5% + Thiamethoxam 1%) against Thrips on onion during *Rabi*, 2018

S.No.	Treatments	Dose (g/ml ha-^{1})	Mean reduction (%) in Thrips population, days after spray					
			PTP	7 DAS	14 DAS	21 DAS	28 DAS	35 DAS
1.	Untreated control	–	30.00	–	–	–	–	–
2.	Virtako 1.5 GR	5000	31.00	47.79 (54.86)	51.36 (61.02)	57.45 (71.05)	62.23 (78.29)	63.52 (80.11)
3.	Virtako 1.5 GR	6000	26.00	52.67 (63.22)	56.03 (68.78)	64.96 (82.08)	64.66 (81.68)	68.87 (87.01)
4.	Virtako 1.5 GR	7000	23.33	55.58 (68.05)	58.71 (73.03)	66.48 (84.08)	69.84 (88.12)	73.79 (92.20)
5.	Chlorantraniliprole 0.4 % GR	8750	26.66	38.44 (38.65)	50.78 (60.02)	51.95 (62.02)	54.35 (66.03)	59.39 (74.07)
6.	Thiamethoxam 75% SG	93.5	22.00	43.36 (47.14)	46.27 (52.21)	50.19 (59.01)	59.43 (74.14)	63.47 (80.05)
7.	Fipronil 80% WG	75	28.67	50.55 (59.62)	53.74 (65.01)	59.37 (74.05)	61.37 (77.04)	65.23 (82.45)
8.	Dimethoate 30% EC	667	27.00	36.33 (35.10)	40.39 (42.00)	46.15 (52.00)	53.76 (65.04)	58.07 (72.02)
	SEm±		1.638	0.916	0.948	1.070	1.578	1.689
	C.D. at 5%		4.970	2.824	2.922	3.297	4.862	5.204

PTP = Pre treatment population.

Figures in parenthesis are retransform per cent value

Table 3. Efficacy of Virtako 1.5 GR (Chlorantraniliprole 0.5% + Thiamethoxam 1%) against *Coccinella* spp. on onion during *Rabi*, 2017

S.No.	Treatments	Dose (g/ml ha-^{1})	Mean population of *Coccinella* spp.				
			PTP	7 DAS	14 DAS	21 DAS	28 DAS
1.	Untreated control	–	1.53 (1.84)	1.52 (1.80)	1.55 (1.90)	1.55 (1.90)	1.55 (1.90)
2.	Virtako 1.5 GR	5000	1.52 (1.80)	1.58 (2.00)	1.58 (1.99)	1.52 (1.80)	1.58 (2.00)
3.	Virtako 1.5 GR	6000	1.57 (1.97)	1.55 (1.90)	1.61 (2.10)	1.55 (1.90)	1.61 (2.10)
4.	Virtako 1.5 GR	7000	1.53 (1.85)	1.53 (1.84)	1.62 (2.12)	1.64 (2.20)	1.62 (2.12)
5.	Chlorantraniliprole 0.4 % GR	8750	1.51 (1.79)	1.57 (1.97)	1.64 (2.20)	1.61 (2.10)	1.64 (2.20)
6.	Thiamethoxam 75% SG	93.5	1.55 (1.90)	1.51 (1.77)	1.55 (1.90)	1.58 (2.00)	1.55 (1.90)
7.	Fipronil 80% WG	75	1.54 (1.88)	1.60 (2.07)	1.56 (1.92)	1.58 (2.00)	1.56 (1.92)
8.	Dimethoate 30% EC	667	1.56 (1.92)	1.57 (1.96)	1.58 (2.00)	1.59 (2.04)	1.58 (2.00)
	SEm±		0.019	0.019	0.021	0.022	0.020
	C.D. at 5%		NS	NS	NS	NS	NS

PTP = Pre treatment population.

Figures in parenthesis are retransform per cent value

Table 4. Efficacy of Virtako 1.5 GR (Chlorantraniliprole 0.5% + Thiamethoxam 1%) against *Coccinella* spp. on onion during *Rabi*, 2018

S.No.	Treatments	Dose (g/ml ha-^{1})	Mean population *Coccinella* spp.				
			PTP	7 DAS	14 DAS	21 DAS	28 DAS
1.	Untreated control	-	1.52 (1.80)	1.52 (1.80)	1.56 (1.94)	1.51 (1.78)	1.57 (1.98
2.	Virtako 1.5 GR	5000	1.52 (1.82)	1.64 (2.20)	1.61 (2.10)	1.55 (1.90)	1.62 (2.12)
3.	Virtako 1.5 GR	6000	1.58 (2.00)	1.55 (1.90)	1.62 (2.12)	1.57 (1.98)	1.58 (2.00)
4.	Virtako 1.5 GR	7000	1.51 (1.78)	1.52 (1.80)	1.59 (2.02)	1.59 (2.02)	1.62 (2.12)
5.	Chlorantraniliprole 0.4 % GR	8750	1.48 (1.70)	1.57 (1.98)	1.61 (2.10)	1.59 (2.01)	1.58 (2.00)
6.	Thiamethoxam 75% SG	93.5	1.51 (1.80)	1.51 (1.78)	1.56 (1.94)	1.60 (2.06)	1.57 (1.98)
7.	Fipronil 80% WG	75	1.55 (1.90)	1.58 (2.00)	1.57 (1.96)	1.56 (1.92)	1.54 (1.88)
8.	Dimethoate 30% EC	667	1.58 (2.00)	1.61 (2.10)	1.65 (2.22)	1.60 (2.06)	1.62 (2.12)
	SEm±		0.022	0.026	0.018	0.017	0.015
	C.D. at 5%		NS	NS	NS	NS	NS

PTP = Pre treatment population.

Figures in parenthesis are retransform per cent value

Table 5. Efficacy of Virtako 1.5 GR (Chlorantraniliprole 0.5% + Thiamethoxam 1%) against *Chrysoperla* spp. on onion during *Rabi*, 2017

S.No.	Treatments	Dose (g/ml ha-^{1})	Mean population *Coccinella* spp.				
			PTP	7 DAS	14 DAS	21 DAS	28 DAS
1.	Untreated control	-	1.56 (1.92)	1.54 (1.87)	1.57 (1.98)	1.57 (1.98)	1.57 (1.98)
2.	Virtako 1.5 GR	5000	1.54 (1.88)	1.61 (2.08)	1.61 (2.08)	1.54 (1.88)	1.61 (2.08)
3.	Virtako 1.5 GR	6000	1.60 (2.05)	1.57 (1.98)	1.64 (2.18)	1.57 (1.98)	1.64 (2.18)
4.	Virtako 1.5 GR	7000	1.56 (1.93)	1.56 (1.92)	1.64 (2.20)	1.67 (2.28)	1.64 (2.20)
5.	Chlorantraniliprole 0.4 % GR	8750	1.54 (1.87)	1.60 (2.05)	1.67 (2.28)	1.64 (2.18)	1.67 (2.28)
6.	Thiamethoxam 75% SG	93.5	1.57 (1.98)	1.53 (1.85)	1.57 (1.98)	1.61 (2.08)	1.57 (1.98)
7.	Fipronil 80% WG	75	1.57 (1.96)	1.63 (2.15)	1.58 (2.00)	1.61 (2.08)	1.58 (2.00)
8.	Dimethoate 30% EC	667	1.58 (2.00)	1.59 (2.04)	1.61 (2.10)	1.62 (2.12)	1.61 (2.08)
	SEm±		0.018	0.018	0.019	0.022	0.022
	C.D. at 5%		NS	NS	NS	NS	NS

PTP = Pre treatment population.

Figures in parenthesis are retransform per cent value

Table 6. Efficacy of Virtako 1.5 GR (Chlorantraniliprole 0.5% + Thiamethoxam 1%) against *Chrysoperla* spp. on onion during *Rabi*, 2018

S.No.	Treatments	Dose (g/ml ha-^{1})	Mean population *Coccinella* spp.				
			PTP	7 DAS	14 DAS	21 DAS	28 DAS
1.	Untreated control	-	1.54 (1.88)	1.56 (1.92)	1.59 (2.02)	1.54 (1.86)	1.60 (2.06)
2.	Virtako 1.5 GR	5000	1.55 (1.90)	1.67 (2.28)	1.64 (2.18)	1.57 (1.98)	1.64 (2.20)
3.	Virtako 1.5 GR	6000	1.61 (2.08)	1.57 (1.98)	1.64 (2.20)	1.60 (2.06)	1.61 (2.08)
4.	Virtako 1.5 GR	7000	1.54 (1.86)	1.54 (1.88)	1.61 (2.10)	1.61 (2.10)	1.64 (2.20)
5.	Chlorantraniliprole 0.4 % GR	8750	1.51 (1.78)	1.60 (2.06)	1.64 (2.18)	1.61 (2.09)	1.61 (2.08)
6.	Thiamethoxam 75% SG	93.5	1.54 (1.88)	1.54 (1.86)	1.59 (2.02)	1.62 (2.12)	1.60 (2.06)
7.	Fipronil 80% WG	75	1.57 (1.98)	1.61 (2.08)	1.59 (2.04)	1.58 (2.00)	1.57 (1.96)
8.	Dimethoate 30% EC	667	1.61 (2.08)	1.64 (2.18)	1.67 (2.30)	1.62 (2.14)	1.64 (2.20)
	SEm±		0.016	0.015	0.022	0.018	0.014
	C.D. at 5%		NS	NS	NS	NS	NS

PTP = Pre treatment population.

Figures in parenthesis are retransform per cent value

Table 7. Effects of Virtako 1.5 GR (Chlorantraniliprole 0.5% + Thiamethoxam 1%) on bulb yield of onion during *Rabi*, 2017 & 2018

S.No.	Treatments	Dose (g/ml ha^{-1})	Yield (Quintal /ha)	
			2017	2018
1.	Untreated control	-	117.25	120.35
2.	Virtako 1.5 GR	5000	161.10	162.20
3.	Virtako 1.5 GR	6000	166.12	167.55
4.	Virtako 1.5 GR	7000	172.28	178.60
5.	Chlorantraniliprole 0.4 % GR	8750	158.60	160.00
6.	Thiamethoxam 75% SG	93.5	160.35	161.88
7.	Fipronil 80% WG	75	164.45	166.80
8.	Dimethoate 30% EC	667	154.00	155.75
	SEm±		5.126	3.840
	C.D. at 5%		15.548	11.647

of grubs and adults of *Coccinella* spp and *Chrysoperla carnea* among different treatments of Virtako 1.5 GR (Chlorantraniliprole 0.5% + Thiamethoxam 1%) at 5000, 6000 and 7000 g/ha along with Chlorantraniliprole 0.4 % GR at 8750 g/ha, Thiamethoxam 75% SG at 93.5 g/ha, Fipronil 80% WG at 75 g/ha, Dimethoate 30% EC at 667 ml/ha and untreated control. Thus the data indicates that Virtako 1.5 GR (Chlorantraniliprole 0.5% + Thiamethoxam 1%) at 5000, 6000 and 7000 g/ha did not cause adverse effect on the common natural enemies (predators) present in onion ecosystem. The present findings are in close agreement with findings of Wagh *et al*. (2017) who reported that chlorantraniliprole 18.5 SC @ 30 g a.i./ha was found safer to the predatory coccinellids in tomato.

3. MARKATEABLE YIELD:

The data presented in Table-7 revealed that all the treatments yielded significantly higher marketable yield over untreated control. The onion yield among different treatments ranged from 154.00 to 172.28 and 155.75 to 178.60 q/ha against 117.25 and 120.35 q/ha in untreated control during *Rabi* 2017 and 2018, respectively. The highest marketable yield of onion 172.28 and 178.60 q/ha was recorded in case of application of Virtako 1.5 GR (Chlorantraniliprole 0.5% + Thiamethoxam 1%) at 7000 g/ha during *Rabi* 2017 and 2018, respectively. It was found at par with spray of Virtako 1.5 GR (Chlorantraniliprole 0.5% + Thiamethoxam 1%) at 6000 g/ha which yielded 166.12 and 167.55 q/ha during *Rabi* 2017 and 2018, respectively. It was followed by Fipronil 80% WG at 75 g/ha which recorded 164.45 and 166.80 q/ha during *Rabi* 2017 and 2018, respectively. The Virtako 1.5 GR (Chlorantraniliprole 0.5% + Thiamethoxam 1%) at 5000 g/ha and Thiamethoxam 75% SG recorded 161.10 and 162.20 & 160.35 and 161.88 q/ha during *Rabi* 2017 and 2018, respectively. The present findings are in close agreement with findings of Shweta *et al*., 2019 and Nirgude, 2017 who reported that thiamethoxam 25 WG was significantly superior among the chemicals tested and recorded higher onion bulbs yield. Wagh *et al*. (2017) recorded that the chlorantraniliprole 18.5 SC @ 30 g a.i./ha emerged as most effective treatment and it gave highest marketable yield of tomato. Pathak *et al*. (2018) found that, significantly highest onion seed yield (4.91q/ha) were recorded in basal application of Chlorantraniliprole 0.4% @ 10Kg/ha.

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