

Efficacy of Virtako 1.5 G against maize stem borer

■ M. Anuradha

Maize Research Centre, ANGRAU, Rajendranagar (Hyderabad) India

ARTICLE INFO

Received : 18.11.2018
Revised : 09.03.2019
Accepted : 16.03.2019

KEY WORDS :

Virtako 1.5 G,
Against maize,
Stem borer

ABSTRACT

A field experiment was conducted during *Rabi* 2011-12 and *Kharif* 2012 at Maize Research Centre, Rajendranagar, Hyderabad with DHM 117 maize hybrid in Randomized Block Design with eight treatments for bio-efficacy of Virtako 1.5 G @ 4, 5, 6, 7 kg/ha against maize stem borer along with three standard checks, Chlorantriliprole 0.4 G @ 10 kg/ha, Thiamethoxam 75 SG @ 0.125 kg/ha, carbofuran 3 G @ 33 kg/ha at 15-18 days after sowing and an untreated control. Two years pooled data shows that among all the treatments, Virtako 1.5 G @ 7 kg/ha followed by chlorantriliprole and virtako 6 kg/ha were highly effective in reducing the stem borer damage with 3.98, 4.41, 4.78 per cent infestation and 1.99, 1.94, 2.57 per cent dead hearts, respectively compared to 11.19 per cent infestation and 5.64 per cent dead hearts in control. Virtako 1.5 G@ 7 kg/ha and 6 kg/ha were effective in reducing the aphid population to 5.33 aphids/plant compared to 12.33 aphids/plant in control. The population of *Coccinella* spp. and spiders differed slightly among the treatments. Virtako did not cause any of the phytotoxic symptoms on maize even at the dosage of 12 kg/ha. Highest grain yield of 10.11 t/ha and 5.09 t/ha was obtained in the plots treated with Virtako @ 7 kg/ha as compared to 9.15 and 4.28 t/ha in control during *Rabi* and *Kharif*, respectively.

How to view point the article : Anuradha, M. (2019). Efficacy of Virtako 1.5 G against maize stem borer. *Internat. J. Plant Protec.*, **12**(1) : 53-57, DOI : 10.15740/HAS/IJPP/12.1/53-57, Copyright@ 2019: Hind Agri-Horticultural Society.

In India, maize ranks fifth in total area, fourth in production and third in productivity. Around 250 species of insect and mite species are attacking maize in field and storage conditions (Mathur, 1991). Among them, spotted stem borer, *Chilo partellus* (Swinhoe) is the most serious one during *Kharif* season causing 26.7-80.4 per cent yield losses in different agroclimatic regions of India (Panwar, 2005). Annual loss of 11.05 crores in *Rabi* is due to *Sesamia inferens*, Walker (Siddiqui and Marwaha, 1993). Effectiveness of

endosulfan 35 EC spray and whorl application of carbofuran 3G for controlling stem borers was reported by Sajjan, 1983. Consequent to the ban of endosulfan, necessity of suggesting alternate chemicals arose. An experiment has been conducted to evaluate the bio-efficacy of Virtako 1.5 G against maize stem borer and aphid apart from its crop safety (phytotoxicity), effect on beneficial insect population *i.e.*, common predatory beetle, *Coccinella* sp., spiders and finally grain yield.

MATERIAL AND METHODS

A field experiment was conducted during two consecutive years *i.e.*, Rabi 2011-12 and Kharif 2012 at Maize Research Centre, ARI, Rajendranagar, Hyderabad, adopting all standard package of practices for maize crop. The maize hybrid grown was DHM 117. The trial was conducted in Randomized Block Design with eight treatments replicated thrice. The crop was sown on 9.12.2011 and 16.08.2012. Soil application of various doses of Virtako, chlorantraniliprole 0.4 G, carbofuran 3G and soil drenching with thiamethoxam 75 SG were given on 30.12.2011 and 4.9.2012. The plot size was 6 rows of 6m.

Bioefficacy:

The eight treatments evaluated for bio-efficacy were Virtako 1.5 G @ 4, 5, 6, 7 kg/ha, Chlorantraniliprole 0.4 G @ 10 kg/ha, Thiamethoxam 75 SG @ 0.125 kg/ha, carbofuran 3 G @ 33 kg/ha and an untreated control.

Observations on stem borer damage in terms of per cent infestation and per cent dead hearts were recorded plot wise at 30 days after application of Virtako. Infestation per cent includes dead hearts and plants with leaf injury (shot holes, midrib tunneling, entry/exit holes on stem).

Aphid population per plant was recorded at 30 days after imposing treatments.

Beneficial insect population:

The population of grubs and adults of *Coccinella*

spp. and spiders was recorded by counting the number from five randomly selected plants per plot in each replication at 45 days after sowing.

Phytotoxicity:

An additional treatment, Virtako @ 12 kg/ha was applied in the soil and phytotoxicity on maize plants was assessed by critical visual observation at 1, 3, 5, 7 and 10 days after application on ten randomly selected plants per plot for leaf injury, wilting, vein clearing, necrosis, epinasty and hyponasty on maize plants as per CIB guidelines (0-10 rating scale as given below).

Scale	% Symptoms	Scale	% Symptoms	Scale	% Symptoms
0	0	4	31-40	8	71-80
1	1-10	5	41-50	9	81-90
2	11-20	6	51-60	10	91-100
3	21-30	7	61-70		

Yield:

Observation on cob yield/plot was recorded at harvest and expressed as grain yield/ha.

The data was subjected to two-way statistical analysis after square root or angular transformation whichever is applicable and also Duncan's multiple range test.

RESULTS AND DISCUSSION

The findings of the present study as well as relevant

Table 1: Effect of Virtako 1.5G on stem borer incidence

Tr. No	Treatments	Rabi, 2011-12		Kharif 2012		Pooled	
		Total infestation	Dead hearts	Total infestation	Dead hearts	Total infestation	Dead hearts
T ₁	Untreated check	9.81(18.22)d	5.92(14.08)d	12.56(20.70)c	5.37(13.39)c	11.19(19.46)d	5.64(13.73)d
T ₂	Virtako 4 kg/ha	7.20(15.56)c	3.98(11.50)c	6.84(15.12)b	4.55(12.30)bc	7.02(15.34)c	4.26(11.90)c
T ₃	Virtako 5 kg/ha	6.24(14.46)bc	3.30(10.42)bc	5.91(13.82)ab	4.86(12.57)bc	6.08(14.14)bc	4.08(11.49)c
T ₄	Virtako 6 kg/ha	5.77(13.89)b	2.74(9.52)ab	3.78(11.16)ab	2.41(7.23)ab	4.78(12.53)ab	2.57(8.38)ab
T ₅	Virtako 7 kg/ha	4.29(11.94)a	2.21(8.51)a	3.55(10.56)a	1.77(6.03)a	3.98(11.32)a	1.99(7.27)a
T ₆	Chlorantraniliprole 0.4G 10 kg/ha	4.40(12.09)a	2.34(8.79)a	4.53(12.22)ab	1.54(7.12)ab	4.41(12.08)a	1.94(7.96)a
T ₇	Thiamethoxam 75SG 0.125 kg/ha	6.79(15.07)bc	3.49(10.74)bc	6.77(15.00)b	4.18(11.71)bc	6.78(15.03)c	3.84(11.23)c
T ₈	Carbofuran 3G 33kg/ha	6.63(14.89)bc	3.22(10.31)bc	6.00(14.10)ab	4.11(11.62)bc	6.32(14.49)bc	3.67(10.97)bc
	C.D. (P=0.05)	1.43	1.24	4.04	5.5	2.04	2.69

Figures in parenthesis are angular transformed values. Means followed by the same letter are not significantly different from each other using Duncan's multiple range test

discussion have been presented under the following heads:

Bioefficacy:

Infestation:

During 2011, Virtako 1.5G @ 7 kg/ha recorded the lowest mean stem borer damage of 4.29 % which was on par with chloraniliprole (4.4 %). Virtako @ 6 kg/ha (5.77 %), Virtako @ 5 kg/ha (6.24%) were found to be significantly similar to each other. Highest infestation per cent *i.e.*, 9.81 was observed in untreated check.

During 2012, The lowest mean stem borer damaged plants was recorded in the plots treated with Virtako @ 7 kg/ha with 3.55 % which was on a par with Virtako @ 6 kg/ha (3.78%), chloraniliprole (4.53 %) and Virtako @ 5 kg/ha (5.91%). Virtako @ 4 kg/ha (6.84 %) was on par with Carbofuran (6.0 %) and Thiamethoxam (6.77

%) while it was significantly highest (12.56 %) in untreated check.

Two years pooled data shows that lowest infestation (3.98 %) was observed in the plot treated with Virtako @ 7 kg/ha followed by chloraniliprole (4.41 %) and Virtako @ 6 kg/ha (4.78 %) which were significantly on par, while it was 11.19 % in control (Table 1).

Dead hearts:

In 2011, lowest dead heart formation (2.21%) was observed in plots treated with Virtako @ 7 kg/ha which was on par with Virtako @ 6 kg/ha (2.74 %) and chlorantraniliprole (2.34 %). Dead hearts in untreated check (5.92 %) were significantly different from the dead hearts in plots treated with Virtako @ 5 kg/ha, Virtako @ 4 kg/ha and checks.

In 2012, dead hearts caused due to stem borer were

Table 2: Efficacy of Virtako 1.5 G against aphids in maize

Tr. No	Treatments	Dose		Aphid population (nos./plant) at 30 DAA	
		g. a.i./ha	kg/ha	Rabi 2011-12	Kharif 2012
T ₁	Untreated check	---	---	12.33(3.62)	10.33 (3.34)
T ₂	Virtako 1.5G	60	4	6.67(2.72)	5.67(2.56)
T ₃	Virtako 1.5G	75	5	6.33 (2.67)	4.67(2.33)
T ₄	Virtako 1.5G	90	6	5.67(2.56)	4.00(2.16)
T ₅	Virtako 1.5G	105	7	5.33 (2.49)	3.33(2.02)
T ₆	Chlorantriliprole 0.4G	40	10	9.33 (3.18)	5.33(2.48)
T ₇	Thiamethoxam 75SG	94	0.125	7.00(2.81)	6.67(2.76)
T ₈	Carbofuran 3G	1000	33	10.67(3.389)	7.67(2.93)
C.D. (P=0.05)				0.28	0.14

Figures in parenthesis $\sqrt{x+0.5}$ transformation

Table 3: Effect of Virtako 1.5G on natural enemies

Tr. No.	Treatments	Dose (kg/ha)	Mean No. / 5 plants			
			Rabi, 2011-12		Kharif 2012	
			Coccinellids	Spiders	Coccinellids	Spiders
T ₁	Untreated check	---	8.33de	1.33c	7.67c	1.00c
T ₂	Virtako 1.5G	4	6.67ab	1.00bc	6.33b	0.67bc
T ₃	Virtako 1.5G	5	8.00d	0.67ab	7.67c	0.33ab
T ₄	Virtako 1.5G	6	7.33c	0.67ab	6.00b	0.33ab
T ₅	Virtako 1.5G	7	6.33a	0.33a	5.33a	0.00a
T ₆	Chlorantriliprole 0.4G	10	6.33a	1.00bc	6.00b	0.67bc
T ₇	Thiamethoxam 75SG	0.125	7.00bc	1.00bc	5.00a	0.00a
T ₈	Carbofuran 3G	33	8.67e	0.67ab	5.33a	0.67bc
C.D. (P=0.05)			0.34	0.41	0.51	0.52

Figures in parenthesis $\sqrt{x+0.5}$ transformation

significantly similar in Virtako @ 7 kg/ha, Virtako @ 6 kg/ha and chlorantraniliprole treated plots recording 1.54 to 2.41 per cent. Highest per cent dead hearts (5.37) were observed in untreated check.

Two years pooled data shows that lowest dead hearts (1.94 %) was observed in the plot treated with chloraniliprole followed by Virtako @ 7 kg/ha (1.99 %) and Virtako @ 6 kg/ha (2.57 %) which were significantly on par, while it was 5.64 % in control (Table 1).

In the trial conducted during *Rabi* 11-12, aphid population was lowest (5.33) in the plot treated with Virtako @ 7 kg/ha. Thiamethoxam was on par with all the other doses of virtako as against 12.33 aphids/plant in control at 30 days after application. During *Kharif* also virtako @ 7 kg/ha followed by 6 kg/ha were best in reducing the aphid population because 3.33 and 4.0 aphids/plant were recorded. Among checks, Chlorantriliprole was better with 5.33 aphids/plant

Table 4: Effect of Virtako on maize yield

Treatments	Dose (kg/ha)	Rabi, 2011-12			Kharif, 2012		
		Mean cob wt/plot (kg)	Grain yield/plot (kg)	Grain yield (t/ha)	Mean cob wt/plot (kg)	Grain yield/plot (kg)	Grain yield (t/ha)
T ₁ -Untreated check	---	30.93d	24.74	9.15	9.27b	7.7	4.28
T ₂ -Virtako 1.5G	4	31.63cd	25.30	9.37	9.50b	7.89	4.38
T ₃ -Virtako 1.5G	5	32.03bcd	25.62	9.48	10.47a	8.7	4.83
T ₄ -Virtako 1.5G	6	32.50abcd	26.00	9.63	10.73a	8.92	4.96
T ₅ -Virtako 1.5G	7	34.13a	27.30	10.11	11.03a	9.17	5.09
T ₆ -Chlorantriliprole 0.4G	10	33.63ab	26.74	9.96	10.97a	9.12	5.07
T ₇ -Thiamethoxam 75SG	0.125	32.87abc	26.30	9.74	10.83a	8.99	4.99
T ₈ -Carbofuran 3G	33	33.43abc	26.90	9.89	10.97a	9.12	5.07
C.D. (P=0.05)		1.87			0.62		

Table 5 : Phytotoxicity of Virtako 1.5 G at 1, 3, 5, 7 and 10 days after application in maize (Rabi, 2011-12 and Kharif, 2012)

Treatments	Dose (kg/h a)	Score values on																													
		1 DAA						3 DAA						5 DAA						7 DAA						10 DAA					
		A	B	C	D	E	F	A	B	C	D	E	F	A	B	C	D	E	F	A	B	C	D	E	F	A	B	C	D	E	F
Untreated check	---	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Virtako 1.5G	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Virtako 1.5G	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Virtako 1.5G	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Virtako 1.5G	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Virtako 1.5 G	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chlorantriliprole 0.4G	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Thiamethoxam 75SG	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carbofuran 3G	33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

A: Leaf injury on tips and leaf surface; B: Wilting; C: Leaf vein clearing; D: Necrosis; E: Epinasty; F: Hyponasty; DAA: Days after application

against 10.33 in untreated check (Table 2).

Beneficial insect population:

The mean coccinellid and spider population differed slightly among different treatments and did not follow any specific pattern but it was highest in the untreated check. Coccinellid beetles ranged between 6.33 to 8.67 per 5 plants whereas spider population was observed ranging between 0.33 to 1.33 during *Rabi* 2011. During *Kharif* 2012, coccinellid beetles ranged between 5.00 to 7.67 per 5 plants whereas spider population was observed ranging between 0.00 to 1.00 (Table 3).

Phytotoxicity:

Virtako 1.5 G did not show any phytotoxic symptoms like leaf injury, wilting, vein clearing, necrosis, epinasty and hyponasty at any day after soil application on various parts of maize plant at any of the dosages tested during *Rabi* 2011 and *Kharif* 2012 (Table 5).

Yield:

During *Rabi* 2011-12, highest grain yield (10.11 t/ha) was obtained in the plot treated with Virtako @ 7 kg/ha which was on par with chlorantraniliprole (9.96 t/ha), thiamethoxam (9.74 t/ha) and Virtako @ 6 kg/ha (9.63 t/ha) while lowest grain yield (9.15 t/ha) was obtained in untreated plot.

Virtako @ 7 kg/ha recorded the highest grain yield of 5.09 t/ha which was on a par with chlorantraniliprole (5.07 t/ha), thiamethoxam (4.99 t/ha), Virtako @ 6 kg/

ha (4.96 t/ha), Virtako @ 5 kg/ha (4.83 t/ha) followed by Virtako @ 4 kg/ha (4.38 t/ha) as against 4.28 t/ha in untreated check during *Kharif* 2012 (Table 4).

Conclusion:

Soil application of Virtako 1.5G @ 7 kg/ha at 15 days after sowing was effective in managing stem borer in maize besides recording the highest grain yield which was on a par with Virtako @ 6 kg/ha. Hence, soil application of Virtako @ 6 kg/ha at root zone can be recommended as optimum dose for checking stem borer in maize apart from Chlorantraniliprole and Thiamethoxam. Application of Virtako did not affect the predator population and also did not cause any adverse effects on the maize crop.

REFERENCES

- Mathur, L.M.L. (1991).** *Genetics of insect resistance in maize*. In K.R. Sarkar, N.N. Singh, and J.K.S. Sachan (Eds.) *Maize Genetics Perspectives*, 238-259pp.
- Panwar, V.P.S. (2005).** Management of maize stalk borer, *C.partellus*. In: Zaidi PH, Singh NN, editors. *Stresses on maize in tropics*. Directorate of Maize Research, N.Delhi 2005.pp.324-375
- Sajjan, S.S. (1983).** Chemical control of maize borer, *C.partellus*. In: Joginder Singh editor. *Techniques of scoring for resistance to the major insect pests of maize*. IARI, N.Delhi 1983.pp.54.
- Siddiqui, K.H. and Marwaha, K.K. (1993).** *The vistas of maize entomology in India*.N.Delhi: Kalyani Publishers; 1993. pp.184

★ ★ ★ ★ ★ 12th Year of Excellence ★ ★ ★ ★ ★