

BIOEFFICACY OF NEW INSECTICIDE MOLECULE CYANTRANILPROLE 10.26 OD AGAINST PESTS OF POMEGRANATE

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ABSTRACT

The field experiment was conducted to assess the bio-efficacy of new insecticide molecules with the fungicides and soluble fertilizers against the pest complex infesting pomegranate viz., aphids, thrips and fruit borer. Among the evaluated treatments, the combination treatment of Cyantraniliprole 10.26 % OD (0.3 ml) + Propineb 50 WP (1 g) with soluble fertilizer (0:52:34) (5 g per lit water) was found most effective for the control of aphids, thrips and fruit borers followed by combination treatment of Cyantraniliprole 10.26 % OD (0.2 ml) + Carbendazim 50 WP (1 g) with soluble fertilizer (0:52:34) (5 g per lit water). However, it was also found effective for the control of fruit borer and recorded least average 1.17 per cent fruit damage as against 10.77 per cent fruit damage in untreated control at harvest, with gaining highest marketable yield of 19.7 kg per plant (14.57 t/ha) of pomegranate fruit.

KEY WORDS: *Aphid, Bioefficacy, Fruit borer, pomegranate, Thrips*

INTRODUCTION

The pomegranate, *Punica granatum* L. belonging to family Puniceae is a native of Iran and it is an ancient favourite table fruits of tropical and sub-tropical regions of the world. Pomegranate is rich in tannins and possess anti-atherosclerotic properties due to its potential anti-oxidative nature and also reduces blood pressure (Aviram and Dornfeld, 2001). India ranks first in area (1,93,000 ha) and production (21.98 MT) of pomegranate and its average productivity was 11.39 t/ha during 2015-16 (Anonymous, 2017). Export potential of this crop is attracting the farmers towards its cultivation. The export trade from India is 23657.13 MT (worth 22498.45 US\$) during year 2012-13 (Anonymous, 2013). Future demand for

export quality pomegranate may certainly show increasing trend.

Such an important fruit crop is attacked by several insect and non-insect pests as well as diseases. About 91 insects, 6 mites and a snail pest found damaging pomegranate crop in India. The major pests observed during different fruiting season in pomegranate area are thrips (*Scirtothrips dorsalis* H.) and aphids (*Aphis punicae* P.), which cause serious damage by desapping and scaring the fruit rind that has resulted into threatened export quality of fruits. Moreover, the fruit borer (*Virachola isocrates* F.) recorded throughout the year in most part of India and causes 50 per cent loss in marketable yield (Balikai *et al.*, 2011). Therefore, present investigation has

been conducted to study the efficacy of new insecticide molecule in combination with fungicides and liquid fertilizer for the control of pests of pomegranate as a sustainable approach in pest management.

MATERIAL AND METHODS

The present investigation was carried out at experimental farm of AICRP on Arid Zone Fruits, Department of Horticulture, MPKV, Rahuri, Dist.- Ahmednagar (MS). Three separate blocks each consisting of nine plants of pomegranate variety 'Bhagwa' (three-year-old) maintained at the spacing of 4.5 x 3.0 m for fruits production in the ambia bahar season. For each treatment, 10 L spray fluid was prepared by taking into account spray fluid rate of 500 l/ha. Hand operated knapsack sprayer equipped with hollow cone nozzle was used to carry out spraying operation. Among total four spray with interval of 15-20 DAS, first spray was taken at the flowering and fruit setting stage and last spray was taken at the fruit development stage. In case of sucking pest's observations, five twigs of each plant were observed to record the number of aphids and thrips on five cm portion of each of twig. Average of 5 twigs was represented the count of average survived aphids and thrips per twig for the assessment of pest infestation. The values of survival populations were subjected to statistical analysis by converting to angular transformed values (T) using formula, $T = \sqrt{n+0.5}$, where n = Natural count of survived population of aphids and thrips. Fruit damage due to borer was recorded on the basis of infested fruits over healthy fruits at the time of harvest and per cent damage was worked out. The pomegranate fruit yield obtained of each treatment / plant in the field at each picking made at 15 days interval commencing from 150 days after "bahar" treatment up to termination was recorded in kg per plant and expressed in tones per hectare.

RESULTS AND DISCUSSION

In present experiment, it was found that all the treatments were found significantly superior in suppressing aphid and thrips population and fruit borer damage over untreated control during the period of experimentation.

Among the different treatments, the combination treatment of Cyantraniliprole 10.26 % OD (0.3 ml) + Propineb 50 WP (1 g) with soluble fertilizer (00:52:34) (5 g per lit water) was found most effective and compatible for the control of aphids and thrips with observed average survived aphid and thrips population i.e. 2.68 to 4.73 (3.94) and 1.89 to 4.10 (3.07) as against 14.47 to 16.10 (15.73) and 14.73 to 18.27 (18.27), respectively per twigs in untreated control on first to 15th days after spray throughout the period of experimentation.

However, the combination treatment of Cyantraniliprole 10.26 % OD (0.2 ml) + Carbendanzim 50 WP (1 g) with soluble fertilizer (00:52:34) (5 g per lit. water) was found 2nd most effective and compatible treatment for the control of aphids and thrips and recorded less average survived aphids and thrips population i.e. 2.92 to 5.27 (4.32) and 2.24 to 4.33 (3.32) as against pooled mean of 15.31 and 16.16, respectively per twigs in untreated control. Rest of treatment viz., Cyantraniliprole 10.26 % OD (0.2 & 0.3 ml), Emamectin benzoate 5 SG (0.5 g) and Spinosad 45 SC (0.2 ml) were found least effective for the control of aphids and thrips.

As the evidence from the compatibility studies on physical, chemical and phytotoxic effect, it is clearly indicated that the role of acidic and alkaline pH with EC of spray tank solution was slightly lowered and maintain at normal pH i.e. 6.5 to 7.5 and EC at 1 mmhos without showing any adverse effect on discoloration, foaming, sedimentation and phytotoxic effect on foliage, flower bud, fruit setting

and natural enemies survival. The ineffectiveness of new molecule Cyantraniliprole 10.26 % OD (0.2 & 0.3 ml per lit. water) alone without the combination with fungicides and soluble liquid fertilizer clearly indicates that, the pH & EC of water source used for spraying has played vital role and showed incompatibility as the pH & EC of spray fluid was slightly alkaline i.e. nearly 8.0.

In case of fruit borer incidence and damage, the observations of present study revealed that Cyantraniliprole 10.26 % OD (0.3 ml) + Propineb 50 WP (1 g) with soluble fertilizer (00:52:34) (5 g per lit. water) was found significantly superior for the control of fruit borer and recorded least average 1.17 per cent fruit damage as against 10.77 per cent fruit damage due to pomegranate butterfly in untreated control at harvest and the treatment of Cyantraniliprole 10.26 % OD (0.2 ml) + Carbendazim 50 WP (1 g) with water soluble fertilizer (00:52:34) (5 g per lit. of water) was found next best treatment in registering the least fruit damage i.e. 2.05 per cent damage due to the fruit borer on pomegranate followed by the treatment Emamectin benzoate 5 SG (0.5 g per lit. of water) in recording least damage i.e. 2.19 per cent. However, the rest of the treatment in combination of new molecule Cyantraniliprole with fungicide and alone were not found much effective in reducing the fruit damage.

Our findings are also confirmed the findings of Anonymous (2013), who stated that DuPont™ Benevia® insecticide is compatible with many commonly used fungicides, liquid fertilizers, herbicides and insecticides. Patel *et al.* (2014) proved cyantraniliprole @ 90-100 g a.i. / ha. for control of sucking pests on cotton. Walunj *et al.* (2015) reported that the treatments of cyantraniliprole 10.2% OD at 60.9 a.i. / ha. was found most effective for the control of thrips infesting pomegranate. Several

workers reported the cyantraniliprole as most effective for the control of sucking pests as well as lepidopteran borers of the horticultural crops, which might be confirmative as the internal borer are difficult to control with conventional insecticides by Caveron *et al.* (2013) and Rath and Nayak (2013). Burt and Karr (2008) showed that cyantraniliprole (HGW86) 10 % OD is to be active against a broader spectrum of insects like sucking insects and lepidopteron.

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Table 1: Pooled data on bio-efficacy of new insecticide molecule against aphids on pomegranate

Tr. No.	Treatments	Dose (per lit.)	Pre-count	Average Number of Survived Aphids / 5 cm Apical Twig (Pooled Data of Two Sprays)					
				1 DAS	3 DAS	7 DAS	10 DAS	15 DAS	Pooled Mean
T ₁	Cyantraniliprole 10.26 % OD	0.2 ml	13.67 (3.76)	6.87 (2.69)	4.77 (2.28)	3.99 (2.11)	5.83 (2.50)	6.70 (2.67)	5.63 (2.45)
T ₂	Cyantraniliprole 10.26 % OD + Carbendazim 50 WP	0.2 ml + 1.0 g	14.20 (3.83)	6.03 (2.53)	4.10 (2.13)	3.33 (1.95)	5.03 (2.34)	6.41 (2.61)	4.97 (2.31)
T ₃	Cyantraniliprole 10.26 % OD + Carbendazim 50 WP + 00:52:34 (Ferti.)	0.2 ml + 1 g + 5 g	13.80 (3.78)	5.27 (2.38)	3.80 (2.06)	2.92* (1.84)	4.50 (2.22)	5.13 (2.36)	4.32 (2.17)
T ₄	Cyantraniliprole 10.26 % OD	0.3 ml	13.93 (3.80)	6.40 (2.60)	4.47 (2.22)	3.68 (2.04)	5.63 (2.46)	6.60 (2.64)	5.30 (2.39)
T ₅	Cyantraniliprole 10.26 % OD + Propineb 50 WP	0.3 ml +1.0 g	14.47 (3.86)	5.73 (2.47)	4.03 (2.12)	3.15 (1.90)	4.90 (2.31)	5.8 (2.50)	4.71 (2.25)
T ₆	Cyantraniliprole 10.26 % OD + Propineb 50 WP + 00:52:34(Ferti.)	0.3 ml +1 g + 5 g	14.33 (3.85)	4.73 (2.28)	3.40 (1.96)	2.68* (1.77)	4.27 (2.17)	4.63 (2.25)	3.94 (2.08)
T ₇	Emamectin Benzoate 5 SG	0.5 g	14.07 (3.82)	7.87 (2.86)	5.53 (2.44)	4.67 (2.26)	6.33 (2.61)	7.33 (2.79)	6.34 (2.59)
T ₈	Spinosad 45 SC	0.2 ml	14.93 (3.93)	7.57 (2.81)	5.10 (2.35)	4.42 (2.21)	6.07 (2.56)	7.03 (2.74)	6.03 (2.52)
T ₉	Untreated Control	-	14.80 (3.91)	16.10 (4.07)	15.03 (3.94)	14.47 (3.87)	15.73 (4.03)	15.27 (3.97)	15.31 (3.97)
S. Em.±		-	0.11	0.086	0.07	0.07	0.082	0.089	-
CD at 5 %		-	NS	0.26	0.23	0.21	0.24	0.26	-

Note: Figures in parenthesis are ($\sqrt{x+0.5}$) transformed values, DAS- Day after spray

Table 2: Pooled data on bioefficacy of new insecticide molecule against thrips on pomegranate

Tr. No.	Treatments	Dose (per lit.)	Pre-count	Average Number of Survived Thrips / 5 cm Apical Twig (Pooled Data of Two Sprays)					
				1 DAS	3 DAS	7 DAS	10 DAS	15 DAS	Pooled Mean
T ₁	Cyantraniliprole 10.26 % OD	0.2 ml	10.87 (3.36)	5.23 (2.38)	3.83 (2.06)	3.25 (1.92)	4.34 (2.19)	5.60 (2.45)	4.44 (2.2)
T ₂	Cyantraniliprole 10.26 % OD + Carbendazim 50 WP	0.2 ml + 1.0 g	11.47 (3.44)	4.80 (2.28)	3.06 (1.87)	2.63 (1.74)	3.50 (2.00)	5.10 (2.35)	3.81 (2.04)
T ₃	Cyantraniliprole 10.26 % OD + Carbendazim 50 WP + 00:52:34 (Ferti.)	0.2 ml + 1 g + 5 g	11.33 (3.44)	4.23 (2.16)	2.70 (1.76)	2.24 (1.63)	3.10 (1.89)	4.33 (2.20)	3.32 (1.92)
T ₄	Cyantraniliprole 10.26 % OD	0.3 ml	12.47 (3.60)	5.03 (2.33)	3.63 (2.01)	2.95 (1.84)	4.23 (2.17)	5.34 (2.40)	4.23 (2.15)
T ₅	Cyantraniliprole 10.26 % OD + Propineb 50 WP	0.3 ml +1.0 g	10.47 (3.31)	4.63 (2.24)	2.90 (1.83)	2.47 (1.70)	3.30 (1.94)	4.47 (2.23)	3.55 (1.98)
T ₆	Cyantraniliprole 10.26 % OD + Propineb 50 WP + 00:52:34(Ferti.)	0.3 ml +1 g + 5 g	10.73 (3.35)	4.00 (2.10)	2.43 (1.69)	1.89 (1.52)	2.93 (1.84)	4.10 (2.14)	3.07 (1.85)
T ₇	Emamectin Benzoate 5 SG	0.5 g	11.73 (3.50)	6.13 (2.55)	4.36 (2.18)	4.07 (2.10)	5.23 (2.38)	6.77 (2.08)	5.31 (2.48)
T ₈	Spinosad 45 SC	0.2 ml	11.87 (3.50)	5.63 (2.46)	4.13 (2.13)	3.72 (2.03)	4.80 (2.30)	6.13 (2.56)	4.46 (2.28)
T ₉	Untreated Control	-	11.07 (3.39)	14.73 (3.89)	15.90 (3.53)	15.13 (3.94)	16.80 (4.15)	18.27 (4.33)	16.16 (4.37)
S. Em.±		-	0.14	0.065	0.065	0.07	0.08	0.07	-
CD at 5 %		-	NS	0.215	0.20	0.22	0.25	0.23	-

Note: Figures in parenthesis are ($\sqrt{x+0.5}$) transformed values, DAS- Day after spray

Table 3: Effect of different treatments on per cent fruit borer damage on pomegranate

Tr. No.	Treatments	Dose (per lit.)	Average Per Cent Fruit Borer Damage at Harvest			Average Per Cent Fruit Damage
			R I	R II	R III	
T ₁	Cyantraniliprole 10.26 % OD	0.2 ml	4.42 (12.14)	3.37 (10.58)	2.80 (9.63)	3.53 (10.78)
T ₂	Cyantraniliprole 10.26 % OD + Carbendazim 50 WP	0.2 ml + 1.0 g	3.63 (10.98)	3.06 (10.07)	2.66 (9.39)	3.12 (10.15)
T ₃	Cyantraniliprole 10.26 % OD + Carbendazim 50 WP + 00:52:34 (Ferti.)	0.2 ml + 1 g + 5 g	1.69 (7.47)	2.36 (8.84)	2.10 (8.33)	2.05 (8.21)
T ₄	Cyantraniliprole 10.26 % OD	0.3 ml	2.42 (9.01)	3.80 (11.24)	4.16 (11.77)	3.47 (10.67)
T ₅	Cyantraniliprole 10.26 % OD + Propineb 50 WP	0.3 ml +1.0 g	3.77 (11.20)	2.56 (9.21)	2.75 (9.55)	3.03 (9.98)
T ₆	Cyantraniliprole 10.26 % OD + Propineb 50 WP + 00:52:34(Ferti.)	0.3 ml +1 g + 5 g	1.69 (7.47)	0.78 (5.07)	1.05 (5.88)	1.17 (6.14)
T ₇	Emamectin Benzoate 5 SG	0.5 g	2.22 (8.57)	1.81 (7.73)	2.54 (9.17)	2.19 (8.49)
T ₈	Spinosad 45 SC	0.2 ml	4.12 (10.71)	3.44 (10.69)	4.95 (12.86)	4.17 (11.75)
T ₉	Untreated Control	-	10.22 (18.64)	9.70 (18.15)	12.38 (20.60)	10.77 (19.13)
S. Em.±						0.63
CD at 5 %						1.91

MS received : April 07, 2018]

[MS accepted : April 17, 2018]