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Evaluation of certain newer insecticides in management of leafhopper (*Orosius albicinctus*): A vector of phyllody in sesame (*Sesamum indicum*)

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Abstract
A field experiment was conducted at dry land farm, S.V. Agricultural College, Tirupati during *kharif*, 2019-20 to evaluate the efficacy of nine insecticides *i.e.*, Thiacloprid 21.7 SC @ 0.25 ml l^{-1}, Thiamethoxam 25 WG @ 0.2 g l^{-1}, Spinosad 45 SC @ 0.3 ml l^{-1}, Spiromesifen 240 SC @ 1.0 ml l^{-1}, Diafenthiuron 50 WP @ 1.25 g l^{-1}, Dinotefuran 20 SG @ 0.4 g l^{-1}, Flonicamid 50 WG @ 0.3 g l^{-1}, Pymetrozine 50 WG @ 0.6 g l^{-1}, Dimethoate 30 EC @ 2.0 ml l^{-1} against sesame leafhoppers. The pooled results of two sprays revealed that pymetrozine was most effective in reducing the leafhopper population, followed by dimethoate and thiamethoxam which were statistically at par with each other, while, spinosad and spiromesifen showed least efficacy in reducing leafhopper population.

Keywords: sesame, leafhoppers, insecticides, pymetrozine

Introduction

Sesame (*Sesamum indicum* L.) is an important oilseed crop, popularly known as "Queen of Oilseeds". Worldwide, it is grown in India, Ethiopia, Myanmar, Thailand, Niger, Uganda, Tanzania, Paraguay, Sudan, Pakistan and China (Anonymous, 2010) [3]. India holds first place in world with nearly an area of 19.47 lakh ha and production of 8.66 lakh tons and productivity of 413 kg ha^{-1} (Evangilin *et al.*, 2020) [4]. Sesame is cultivated predominantly in states of Andhra Pradesh, Telangana, Uttar Pradesh, Tamil Nadu, Karnataka, Orissa, Rajasthan and Gujarat. In Andhra Pradesh, sesame is majorly grown in Srikakulam, YSR Kadapa, Vizianagaram, Prakasam, Visakhapatnam, East Godavari and SPS Nellore districts. Pests and diseases are one of the major constraints in causing considerable decline in sesame yield in terms of both quality and quantity. The pest attack causes a heavy seed yield loss of about 25 to 90% (Ahuja and Kalyan, 2002) [2].

Sesame phyllody is one of the major diseases caused by phytoplasma and is transmitted by leafhopper, *Orosius albicinctus* Distant (Thangjam and Vastrad, 2015) [10]. The transmission of phyllody phytoplasma depends on abundance of insect vector, movement between the plants, time spent on plants and mode of transmission of pathogen. Many of the conventional insecticides have been effectively tried against leafhoppers for its management. Application of newer molecules from new insecticide groups and with different modes of action has a tremendous opportunity in the management of various pests. Most of the newer insecticides are ecologically safe with high target specificity, low threat to non target organisms and less persistent. Considering the potential, the present experiment was carried out to assess the efficacy of newer molecules of insecticides in comparison to conventional insecticide dimethoate against sesame leafhoppers.

Material and Methods

A field trial was conducted at dry land farm, S.V. Agricultural College, Tirupati during *kharif*, 2019-20. The experiment was taken up with sesame variety "Gowri" in a randomized block design with ten treatments including control and the treatments were replicated thrice in a plot size of 5 × 5 m. The insecticidal treatments tested for their efficacy against leafhoppers were Thiacloprid 21.7 SC @ 0.25 ml l^{-1}, Thiamethoxam 25 WG @ 0.2 g l^{-1}, Spinosad 45 SC @ 0.3 ml l^{-1}, Spiromesifen 240 SC @ 1.0 ml l^{-1}, Diafenthiuron 50 WP @ 1.25 g l^{-1}, Dinotefuran 20 SG @ 0.4 g l^{-1}, Flonicamid 50 WG @ 0.3 g l^{-1}, Pymetrozine 50 WG @ 0.6 g l^{-1} and Dimethoate 30 EC @ 2.0 ml l^{-1}. The plots sprayed with water alone served as control. Two foliar sprays were taken up during the crop period and treatments were imposed at an interval of 20 days. Ten plants were randomly selected in each replication and the data was collected on number of leafhopper population from three leaves each from top, middle and bottom portions of the plant at one day before spray and three, seven, ten and fifteen days after each spray. The data on per cent reduction in leafhopper population was calculated using the following formula given by Abbott (1925) [1].

$$\text{Population reduction over control (\%)} = \frac{\text{Population in untreated check} - \text{population in treatment}}{\text{Population in untreated check}} \times 100$$

The data on per cent reduction over control was transformed using angular transformation methods and subjected to statistical analysis using Analysis of Variance (ANOVA).

Results and discussion

First spray - *kharif*, 2019

Pre-treatment counts on leafhopper population recorded one day prior to the insecticidal treatment indicated a non significant distribution of leafhopper population in the experimental area. At 3 DAT (Days After Treatment), all the treatments showed effective reduction in leafhopper population over control. However, pymetrozine (T_8) @ 0.6 g l^{-1} was found to be most promising and effective in recording 90.62% reduction over control and was significantly superior over other treatments. The next best treatment was dinotefuran 20 SG @ 0.4 g l^{-1} by recording 88.52% reduction over control and was statistically at par with treatment pymetrozine. The next effective treatments were dimethoate @ 2.0 ml l^{-1}, thiamethoxam @ 0.2 g l^{-1}, flonicamid @ 0.3 g l^{-1} by recording 87.39, 77.24, 76.64 per cent reduction over control, respectively and were statistically at par with each other. Spiromesifen @ 1.0 ml (59.35%) was found to be least effective in recording lowest per cent reduction over control.

At 7 DAT, pymetrozine (93.60%) was found as most superior treatment in recording highest per cent reduction over control and was statistically found significant over other insecticidal treatments. The next best treatment were diafenthiuron @ 1.25 g l^{-1}, dimethoate @ 2.0 ml l^{-1} and thiamethoxam @ 0.2 g l^{-1} by recording 81.54, 81.50 and 78.68 per cent reduction in leafhopper population over control, respectively and were statistically on par with each other. The next effective treatments in decreasing order of efficacy in reducing leafhopper population were flonicamid and dinotefuran by recording 69.39 and 64.81 per cent reduction and were statistically on par with each other. However, spinosad and spiromesifen remained as least effective treatments by recording 52.17 and 42.22 per cent reduction over control, respectively.

At 10 DAT, pymetrozine (89.98%) recorded highest per cent reduction of leafhopper population over control and was significantly superior over other treatments. Dinotefuran, dimethoate and diafenthiuron were recorded as next best treatments by showing 79.83, 77.25 and 70.29 per cent reduction, respectively and were statistically at par with other. Spinosad and spiromesifen showed least efficacy in reducing leafhopper population by recording 44.09 and 38.88 per cent reduction over control, respectively. At 15 DAS, pymetrozine was most effective and best treatment in recording 71.60 per cent reduction in leafhopper population, the second best treatment was thiamethoxam showing 63.87 per cent reduction and was found statistically at par with the first best treatment pymetrozine. The third effective treatment was dimethoate (60.97%) and was statistically at par with second best treatment thiamethoxam. Next effective treatments were flonicamid and dinotefuran which showed 54.69 and 50.77 per cent, respectively and were at par with other. The least effective treatments were spinosad and spiromesifen by recording 41.28 and 38.69 per cent reduction over control.

Results on overall efficacy of treatments during first spray revealed that pymetrozine was found as the best effective treatment by recording 86.25 per cent reduction in leafhopper population over control and was significantly superior over other treatments. Dimethoate and dinotefuran were second best treatments by showing 77.18 and 72.34 per cent reduction and were statistically at par with other. However, dinotefuran shared its efficacy with thiamethoxam (68.79%) which were at par with each other, thiamethoxam being the next effective treatment. Spinosad and spiromesifen showed least efficacy towards reduction in leafhopper population which followed similar trend as shown in three seven, ten, fifteen days after treatment during first spray.

Second spray - *kharif*, 2019

At 3 DAT (Days After Treatment), all the treatments showed effective reduction in leafhopper population over control. Pymetrozine @ 0.6 g l^{-1} was found to be most potential and effective by showing 94.14 per cent reduction over control and was significantly superior over other treatments. The next best treatments were thiamethoxam @ 0.2 g l^{-1} and dinotefuran @ 0.4 g l^{-1} by recording 86.89 and 83.31 per cent reduction, respectively over control and were found statistically at par with the best treatment pymetrozine. The next effective treatments were dimethoate @ 2.0 ml l^{-1} and diafenthiuron @ 1.25 g l^{-1} by recording 80.70 and 74.65 per cent reduction over control, respectively and were statistically at par with each other and with dinotefuran and thiamethoxam. Spiromesifen @ 1.0 ml (54.01%) was found to be least effecting in recording lowest per cent reduction over control. At 7 DAT, pymetrozine (91.97%) was found as most efficient treatment in recording highest per cent reduction over control and was statistically found significant over other insecticidal treatments. The next best treatment were, dimethoate @ 2.0 ml l^{-1} and thiamethoxam @ 0.2 g l^{-1} by recording 81.46 and 78.89 per cent reduction in leafhopper population over control, respectively and were statistically at par with each other. The next effective treatments in decreasing order of efficacy in reducing leafhopper population were dinotefuran, thiacloprid and diafenthiuron by recording 75.57, 72.14 and 71.79 per cent reduction and were statistically at par with each other and with dimethoate and thiamethoxam. However, spinosad and spiromesifen remained as least effective treatments by recording 52.17 and 42.22 per cent reduction over control, respectively.

At 10 DAT, pymetrozine was found superior in managing the leafhopper population and significant over all other treatments by showing 98.92 per cent reduction over control. Thiamethoxam was notices as second best treatment by recording 87.31 per cent reduction which was statistically at par with dimethoate showing 83.33 per cent reduction over control. The next effective treatments showing efficacy were diafenthiuron, dinotefuran and thiacloprid, where the per cent reduction was noticed as 74.25, 69.86 and 64.96 and were statistically at par with each other. The least efficacy in per cent reduction of population was observed in spiromesifen (55.46%) and spinosad (59.60). At 15 DAT, pymetrozine was remained as most promising treatment in recording 74.72 per cent reduction of population when compared to control and was found significantly superior over other insecticidal treatments (1.18 leafhoppers as against 4.66 in control). The second best treatments were dimethoate (67.63%) and thiamethoxam (66.21%) which were statistically at par with each other and with pymetrozine. The next effective treatments were dinotefuran (62.92%) and diafenthiuron (58.58%) which show similar efficacy with thiamethoxam and dimethoate. However, spiromesifen and spinosad with 37.12% and 40.60% was found to be the significantly least effective treatments in reducing leafhopper population.

The overall results of second spray in management of leafhoppers in sesame revealed that pymetrozine was found to be the best and most effective treatment in recording highest per cent reduction in leafhopper population (90.04%) over control. The treatment was found significantly superior when compared with other treatments. The second best treatment was thiamethoxam by showing 80.38 per cent reduction over control. The third effective treatment was dimethoate (78.32%) and was statistically at par with thiamethoxam. The fourth effective treatment was dinotefuran (73.41%) but was statistically shown similarity in efficacy with dimethoate. Spinosad (57.41%) and spiromesifen (52.42%) were noticed to be very least effective in recording per cent reduction of leafhopper population.

Overall efficacy – *kharif*, 2019

The pooled data on overall efficacy of two sprays using different insecticides at 3 DAT revealed that pymetrozine was found to be the most effective and first best treatment in reducing leafhopper population by showing 92.13 per cent reduction of population over control and was significantly superior among all other treatments. The second best treatment was dinotefuran with 86.13 per cent reduction was significantly at par with pymetrozine. The treatment dimethoate was the third effective treatment showing 83.96 per cent reduction and at par with pymetrozine and dinotefuran. The efficacy of other treatments in decreasing order was thiamethoxam (82.71%), diafenthiuron (74.44%), flonicamid (72.21%) and thiacloprid (67.30%). Thiamethoxam and diafenthiuron were statistically at par with other. At 7 DAT, the highest per cent reduction of leafhopper population was recorded in plots treated with pymetrozine (92.62%) which was statistically found superior over other treatments. The next best treatments were dimethoate and thiamethoxam with 81.49 and 79.08 per cent reduction over control and were at par with each other. The next order of efficacy of treatments was diafenthiuron, dinotefuran, flonicamid and thiacloprid with 75.65, 71.46, 68.88 and 67.30 per cent reduction, respectively. Spinosad and spiromesifen with 60.06 and 54.86 per cent reduction over control, respectively were found to be least effective treatments against leafhoppers.

At 10 DAT, pymetrozine which recorded 95.03 per cent reduction of leafhopper population was found to be the best effective treatment and significantly superior when compared to other treatments. The next best treatment was dimethoate with 80.88 per cent reduction over control and statistically different from other treatments, followed by dinotefuran with 71.84 per cent reduction over control and at par with dimethoate statistically. The next order of treatments was diafenthiuron, thiamethoxam, thiacloprid and flonicamid with 72.81, 71.84, 64.16 and 60.27 per cent reduction. The treatments diafenthiuron and thiamethoxam were statistically at par with other. Thiacloprid and flonicamid were at par with other. Spinosad and spiromesifen with 53.28 and 48.33 per cent reduction over control, respectively were found to be least effective treatments against leafhoppers. At 15 DAT, the highest per cent reduction in leafhopper population was recorded in plots treated with pymetrozine (73.19%), which was statistically significant over other treatments. The second best treatments were thiamethoxam and dimethoate with 65.18 and 64.50 per cent reduction over control and were found at par with each other, followed by dinotefuran, flonicamid and diafenthiuron with 57.13, 53.52 and 53.51 per cent reduction over control, respectively and statistically at par with each other. The least effective treatments were plots treated with spinosad (41.03%) and spiromesifen (37.93%).

The overall pooled data on per cent reduction resulted that pymetrozine (88.29%) was found as promising and effective treatment in reducing leafhopper population and by recording highest per cent reduction over control and was significantly superior when compared with other insecticidal treatments, followed by dimethoate and thiamethoxam with 77.92 and 75.12 per cent reduction over control and were statistically found at par with each other. The next effective treatments were dinotefuran, diafenthiuron and flonicamid with 72.92, 69.29 and 64.14 per cent reduction. Both dinotefuran and diafenthiuron were found to be statistically at par with each other. Spinosad (55.84%) and spiromesifen (49.95%) were noticed to be least effective treatments in recording lowest per cent reduction of leafhopper population.

The results from present findings were in conformity with Mutkule *et al.* (2018) [7] and Ingale *et al.* (2019) [5] who reported the superior efficacy of thiamethoxam in effective management of leafhoppers in groundnut and sunflower crop, respectively. The results were also in agreement with Reddy *et al.* (2019) [9] who reported the efficacy of pymetrozine in showing highest per cent reduction of leafhopper population. Pymetrozine is a novel azomethine pyridine insecticide, having systemic and translaminar activities and is highly specific against sucking insect pests. It affects the nerves controlling the salivary pump and causes immediate and irreversible cessation of feeding due to obstruction of stylet penetration, followed by starvation and insect death. The results were in accordance with Jadhav *et al*. (2017) [6] and Prajapat *et al.* (2020) [8] who reported that spiromesifen did not show any significant reduction of leaf hopper population in okra and sesame, respectively.

Table 1: Efficacy of different insecticides against sesame leafhoppers after first spray during *kharif*, 2019

S. No	Treatment	Dose per liter	PTC	Per cent reduction of leafhopper population over control after I spray								Mean % reduction
				3 DAT		7 DAT		10 DAT		15 DAT		
				Mean	ROC (%)	Mean	ROC (%)	Mean	ROC (%)	Mean	ROC (%)	
T_1	Thiacloprid 21.7 SC	0.25 ml	4.37	1.33	73.10^{cd} (59.35)	1.21	58.83^{cd} (50.29)	1.43	63.14^{cd} (52.76)	2.35	45.01^{def} (42.15)	61.51^{e} (51.70)
T_2	Thiamethoxam 25 WG	0.2 g	4.43	1.10	77.24^{bc} (62.35)	0.62	78.68^{b} (63.14)	1.84	52.16^{de} (46.29)	1.53	63.87^{ab} (53.29)	68.79^{cd} (56.07)
T_3	Spinosad 45 SC	0.3 ml	4.33	1.53	68.42^{cd} (55.92)	1.42	52.17^{de} (46.27)	2.11	44.09^{ef} (41.29)	2.50	41.28^{ef} (39.97)	53.51^{f} (47.04)
T_4	Spiromesifen 240 SC	1.0 ml	4.27	1.60	59.35^{d} (50.47)	1.71	42.22^{e} (39.88)	2.41	38.88^{f} (38.49)	2.62	38.69^{f} (38.48)	46.80^{g} (43.18)
T_5	Diafenthiuron 50 WP	1.25 g	4.13	1.23	74.40^{c} (60.01)	0.53	81.54^{b} (65.19)	1.14	70.29^{bc} (57.25)	2.22	47.92^{def} (43.82)	68.65^{cd} (55.98)
T_6	Dinotefuran 20 SG	0.4 g	4.40	0.53	88.52^{a} (71.16)	1.09	64.81^{cd} (53.65)	0.79	79.83^{b} (63.56)	2.10	50.77^{cde} (45.46)	72.34^{bc} (58.31)
T_7	Flonicamid 50 WG	0.3 g	4.23	1.13	76.64^{bc} (61.97)	0.90	69.39^{bc} (56.77)	1.67	57.19^{d} (49.25)	1.93	54.69^{bc} (47.72)	65.70^{de} (54.20)
T_8	Pymetrozine 50 WG	0.6 g	4.30	0.47	90.62^{a} (72.37)	0.19	93.60^{a} (75.67)	0.39	89.98^{a} (71.80)	1.22	71.60^{a} (57.88)	86.25^{a} (68.30)
T_9	Dimethoate 30 EC	2.0 ml	4.23	0.60	87.39^{ab} (69.56)	0.58	81.50^{b} (64.63)	0.87	77.25^{b} (61.85)	1.67	60.97^{bc} (51.37)	77.18^{b} (61.56)
T_{10}	Control	--	4.53	4.90	-	3.10	-	4.07	-	4.27	-	-
SEm±		-	-	-	2.54	-	3.10	-	2.58	-	2.01	1.18
CD (5%)		-	NS	-	7.62	-	9.30	-	7.75	-	6.03	3.55
CV (%)		-	-	-	7.04	-	9.38	-	8.35	-	7.47	3.72

*Figures in parentheses are angular transformed values; PTC: Pre treatment count; DAT – Days After Treatment; ROC – Reduction over control
Numbers followed by same letter in each column are not significantly different; NS – Non Significant

Table 2: Efficacy of different insecticides against sesame leafhoppers after second spray during *kharif*, 2019

S. No.	Treatment	Dose per liter	PTC	Per cent reduction of leafhopper population over control after I spray								Mean % reduction
				3 DAT		7 DAT		10 DAT		15 DAT		
				Mean	ROC (%)	Mean	ROC (%)	Mean	ROC (%)	Mean	ROC (%)	
T_1	Thiacloprid 21.7 SC	0.25 ml	3.27	1.85	63.94^{de} (53.22)	1.32	72.14^{bcd} (58.23)	1.71	64.96^{def} (53.80)	2.43	48.05^{de} (43.90)	62.67^{ef} (52.37)
T_2	Thiamethoxam 25 WG	0.2 g	2.45	0.64	86.89^{ab} (69.64)	0.99	78.89^{bc} (62.79)	0.62	87.31^{b} (69.63)	1.58	66.21^{ab} (54.50)	80.38^{b} (63.74)
T_3	Spinosad 45 SC	0.3 ml	3.57	1.88	62.89^{de} (52.60)	1.62	64.99^{d} (53.86)	1.96	59.60^{ef} (50.61)	2.76	40.60^{ef} (39.55)	57.41^{fg} (49.33)
T_4	Spiromesifen 240 SC	1.0 ml	2.77	2.41	54.01^{e} (47.33)	1.73	62.68^{d} (52.44)	2.15	55.49^{f} (48.22)	2.92	37.12^{f} (37.49)	52.42^{g} (46.42)
T_5	Diafenthiuron 50 WP	1.25 g	3.83	1.36	74.65^{bcd} (60.07)	1.32	71.79^{bcd} (57.90)	1.25	74.25^{cd} (59.65)	1.93	58.58^{bc} (49.97)	69.79^{de} (56.72)
T_6	Dinotefuran 20 SG	0.4 g	3.20	0.87	83.31^{abc} (66.75)	1.17	75.57^{bcd} (60.66)	1.47	69.86^{de} (56.79)	1.73	62.92^{b} (52.52)	73.41^{cd} (59.03)
T_7	Flonicamid 50 WG	0.3 g	2.53	1.68	68.61^{cde} (56.11)	1.51	68.06^{cd} (55.63)	1.83	62.25^{def} (52.24)	2.22	52.54^{cd} (46.49)	63.01^{ef} (52.57)
T_8	Pymetrozine 50 WG	0.6 g	1.80	0.33	94.14^{a} (78.62)	0.37	91.97^{a} (74.88)	0.06	98.92^{a} (85.19)	1.18	74.72^{a} (59.88)	90.04^{a} (71.72)
T_9	Dimethoate 30 EC	2.0 ml	2.83	1.03	80.70^{bcd} (64.08)	0.87	81.46^{b} (64.56)	0.81	83.33^{bc} (66.05)	1.49	67.63^{ab} (55.52)	78.32^{bc} (62.30)
T_{10}	Control	--	5.13	5.24	-	4.70	-	4.91	-	4.66	-	-
SEm±		-	-	-	4.01	-	2.78	-	2.56	-	1.99	1.51
CD (5%)		-	NS	-	12.03	-	8.34	-	7.68	-	5.97	4.53
CV (%)		-	-	-	11.40	-	8.02	-	7.37	-	7.05	4.58

*Figures in parentheses are angular transformed values; PTC: Pre treatment count; DAT – Days After Treatment; ROC – Reduction over control
Numbers followed by same letter in each column are not significantly different; NS – Non Significant

Table 3: Overall cumulative efficacy of different insecticidal treatments against sesame leafhoppers during *kharif*, 2019

S. No.	Treatment	Dose per liter	PTC	Per cent reduction of leafhopper population over control after I spray								Mean % reduction
				3 DAT		7 DAT		10 DAT		15 DAT		
				Mean	ROC (%)	Mean	ROC (%)	Mean	ROC (%)	Mean	ROC (%)	
T_1	Thiacloprid 21.7 SC	0.25 ml	3.82	1.59	68.40^{de} (56.04)	1.26	67.30^{de} (55.18)	1.57	64.16^{d} (53.31)	2.39	46.58^{de} (43.06)	62.02^{d} (51.99)
T_2	Thiamethoxam 25 WG	0.2 g	3.44	0.87	82.71^{bc} (66.14)	0.81	79.08^{bc} (62.93)	1.23	71.84^{c} (58.13)	1.56	65.18^{b} (53.94)	75.12^{b} (60.11)
T_3	Spinosad 45 SC	0.3 ml	3.95	1.71	66.22^{de} (54.53)	1.52	60.06^{ef} (50.93)	2.04	53.28^{ef} (46.92)	2.63	41.03^{ef} (39.84)	55.84^{e} (48.38)
T_4	Spiromesifen 240 SC	1.0 ml	3.52	2.19	56.86^{e} (48.97)	1.72	54.86^{f} (47.85)	2.28	48.33^{f} (44.06)	2.77	37.93^{f} (38.02)	49.95^{f} (44.99)
T_5	Diafenthiuron 50 WP	1.25 g	3.98	1.30	74.44^{cd} (59.69)	0.93	75.65^{bcd} (60.65)	1.19	72.81^{c} (58.67)	2.08	53.51^{cd} (47.04)	69.29^{c} (56.38)
T_6	Dinotefuran 20 SG	0.4 g	3.80	0.70	86.13^{ab} (68.97)	1.13	71.46^{bcd} (57.81)	1.13	74.26^{bc} (59.61)	1.92	57.13^{c} (49.13)	72.92^{c} (58.70)
T_7	Flonicamid 50 WG	0.3 g	3.38	1.41	72.21^{d} (58.54)	1.20	68.88^{cde} (56.14)	1.75	60.27^{de} (51.05)	2.08	53.52^{cd} (47.04)	64.14^{d} (53.25)
T_8	Pymetrozine 50 WG	0.6 g	3.05	0.40	92.13^{a} (73.75)	0.28	92.62^{a} (74.93)	0.22	95.03^{a} (77.24)	1.20	73.19^{a} (58.86)	88.29^{a} (70.02)
T_9	Dimethoate 30 EC	2.0 ml	3.53	0.82	83.96^{abc} (66.72)	0.73	81.49^{b} (64.56)	0.84	80.88^{b} (64.18)	1.58	64.50^{b} (53.50)	77.92^{b} (62.01)
T_{10}	Control	-	4.83	5.07	-	3.90	-	4.49	-	4.47	-	-
SEm±		-	-	-	2.53	-	2.29	-	1.55	-	1.45	0.89
CD (5%)		-	NS	-	7.59	-	6.87	-	4.64	-	4.36	2.68
CV (%)		-	-	-	7.13	-	6.72	-	4.70	-	5.27	2.76

*Figures in parentheses are angular transformed values; PTC: Pre treatment count; DAT – Days After Treatment; ROC – Reduction over control
Numbers followed by same letter in each column are not significantly different; NS – Non Significant

Conclusion
Although all the treatments with different insecticides showed their superior efficacy against leafhoppers in sesame when compared to control, pymetrozine @ 0.6 g l^{-1} and thiamethoxam @ 0.2 g l^{-1} can be recommended for the effective management of leafhoppers in sesame. Spinosad and spiromesifen did not show any spectacular effect in reducing leafhopper population when compared to other treatments.

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