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# Evaluation of certain new insecticides for foliar application against thrips

**Ramakrishna Rao, T Murali Krishna, K Devaki, NP Eswara Reddy and P Sudhakar**

**Abstract**
The evaluation of insecticides as foliar spray for the management of thrips and the pooled data of the three seasons (*Kharif*, 2012) revealed that all the chemicals exhibited significant superiority over untreated control, however the chemical treatments thiacloprid 21.7SC, imidacloprid 200SL and monocrotophos 36WSC showed superiority over rest of the treatments. The mean efficacy of all the insecticides were high in second spray when compared to first spray in terms of per cent foliar damage by thrips. Hence, it could be concluded that spraying of thiacloprid 21.7SC, imidacloprid 200SL and monocrotophos 36 WSC could be recommended to the farmers for effective management of the thrips for enhanced yields in groundnut.

**Keywords:** Evaluation, insecticides, thrips and foliar application

## Introduction
Groundnut (*Arachishypogaea* L.) is a leading oilseed crop in India and an important oilseed crop of tropical and subtropical regions of the world. The seeds are rich source of edible oil (43-45%) and protein (25-28%) and also a valuable source of vitamins namely B, E and K. Groundnut cake, after the oil extraction is a high protein animal feed and haulm provides quality fodder. The cake is used as cattle and poultry feed and also serves as a organic manure with high nitrogen content. The kernels are used in many Indian cuisines, in confectionary and also eaten raw, cooked or fried. Handpicked selected grade is exported. It is used as peanut butter in preparation of sandwiches and peanut candy. Besides causing direct damage to the crop, thrips are known to cause more indirect damage by acting as vectors of viral diseases. In recent years thrips have emerged as a major pest of groundnut in Southern Zone of A.P. The farmers are recommended to practice seed treatment with imidacloprid 200 SL @ 2 ml/kg of seed and one spraying of insecticide particularly during *Rabi* season. This pest has acquired resistance to few insecticides. Hence, there is a need to search for an alternate insecticide for seed treatment and foliar application which is economically feasible.

## Material and Methods
Field experiments were conducted to study the *"Population dynamics and molecular characterization of thrips and their management in groundnut"* during *Kharif* 2012 at S.V. Agrl. College Farm, Tirupati, Andhra Pradesh. The experimental location is situated at an altitude of 182.9 m above MSL on 79°E longitude and 13°N latitude in the Southern agro-climatic zone of Andhra Pradesh. Laboratory studies pertaining to molecular characterization of thrips and morphological, biochemical parameters were under taken at Institute of Frontier Technology, Regional Agricultural Research Station, Tirupati. The materials used and methods employed in the present investigations are illustrated in detail

### Evaluation of certain new insecticides against thrips for foliar application
A study has been designed to evaluate some newer insecticides against thrips of groundnut *Kharif*, 2012. (Fig. 1). Field experiments were conducted at S.V. Agricultural College Farm, Tirupati to know the efficacy of new insecticides on groundnut thrips during *Kharif*, 2012. The crop was sown in 15th July, 2012. The variety Narayani was used for the trial and experiment was laid out in randomized block design with twelve treatments involving eleven insecticides and untreated check with three replications (Table 1).

**Field Preparation and Agronomic Practices**
The land was thoroughly ploughed, leveled and the test crop of groundnut was sown in randomized block design. The individual plot size was 7.0 × 4.2 m for studies on new insecticides. Groundnut variety Narayani was procured from Regional Agricultural Research Station, Tirupati.

**Particulars of Seed rate, spacing and varieties employed in the field trial**

| Crop | Season | Seed rate kg ha$^{-1}$ | Spacing | Variety |
|---|---|---|---|---|
| Groundnut | *Kharif* | 150 | 30.0 × 10.0 cm | Narayani |

Hoeing and weeding were done during fourth week after sowing and crops were maintained, with recommended agronomic practices of the region.

**Observations Recorded**
Observations were recorded at weekly intervals for thrips incidence from 10 plants selected at random in all the treatments. Two sprays were given, first spray at 15 DAS and second spray at 15 days after the first spray. Plant population and pod yield were also recorded.

**Statistical Analysis**
Data collected were subjected to statistical analysis through ANOVA as per Snedecor and Cochran (1967).

**Yield and yield economics**
The crop was harvested soon after attaining maturity. The pods were harvested separately for each treatment, dried properly and pod weight was recorded. Further, the plot wise yield was computed on hectare basis for statistical interpretations. The cost of cultivation was worked out as per the recommended package of practices. The economics of different treatments was worked out based on the pod yield and cost of protection. Treatment cost was added to each treatment, and then sale price of the pod was also considered to work out gross profit. Based on the cost of cultivation and the gross profit of economy of different treatments, the cost benefit ratio (CBR) was calculated.

**Results and discussion**
The results of the present study on the *"Population dynamics and molecular characterization of thrips and their management in groundnut"* with field experiment conducted during *Kharif,* 2012 at S.V. Agricultural College Farm, Tirupati.

**Evaluation of different insecticides as foliar spray against thrips during *Kharif,* 2012**
All the treatments exhibited more or less similar results as in case respect to per cent foliar damage by thrips. The results regarding the *Kharif,* 2012 were presented hereunder.

**Efficacy of treatments against thrips at 7 days after first spraying**
The results showed that all the treatments were significantly superior over control (36.50%) and different from each other in terms of per cent foliar damage by thrips. Among all the treatments, thiacloprid 21.7SC was found to be the superior treatment by recording least per cent foliar damage (13.63%) and it was on par with monocrotophos 36WSC (13.93%) and imidacloprid 200SL (15.47%). Among the other treatments, the best treatments observed were thiamethoxam 25WG (18.02%), dimethoate 30EC (19.23%) and spinosad 45SC (20.04%) which were on par with each other. The other treatments, emamectin benzoate 5SG (21.93%), acetamiprid 20SP (23.05%), diafenthiuron 50WP (23.65%), chlorfenapyr 10SC (23.78%) and fipronil 5SC (24.79%) were found to be moderately effective and on par with each other with respect to per cent foliar damage by thrips. (Table 1, Fig. 1)

**Efficacy of treatments against thrips at 14 days after first spraying**
At fourteen days after spraying, thiacloprid 21.7SC was significantly superior by recording least per cent foliar damage (15.19%) over rest of the treatments and it was on par with imidacloprid 200SL (16.28%), monocrotophos 36WSC (16.43%) and thiamethoxam 25WG (17.25%). The next effective treatment with respect to less per cent foliar damage by thrips was dimethoate 30EC (18.71%), it was on par with emamectin benzoate 5SG and fipronil 5SC which recorded foliar damage of 19.58 and 19.93 per cent, respectively. The order of efficacy with respect to per cent foliar damage of remaining treatments was diafenthiuron 50WP (20.73%), acetamiprid 20SP (21.02%), spinosad 45SC (22.24%) and chlorfenapyr 10SC (22.47%). The highest foliar damage of 38.44 per cent was recorded in the untreated control.

**Efficacy of treatments against thrips at 7 days after second spraying**
At seven days after spraying, eight insecticides out of eleven chemical treatments were found to be on par with each other with respect to per cent foliar damage by thrips *viz*., thiacloprid 21.7SC (12.21%), acetamiprid 20SP (12.25%), chlorfenapyr 10SC (13.50%), imidacloprid 200SL (13.65%), emamectin benzoate 5SG (14.48%), fipronil 5SC (14.57%), monocrotophos 36WSC (14.61%) and diafenthiuron 50WP (14.81%). The treatment spinosad 45SC recorded 15.83 per cent foliar damage and was on par with thiamethoxam 25WG (16.33%) followed by dimethoate 30EC (24.21%). Among all the treatments untreated control recorded the highest per cent foliar damage (28.59%) due to thrips.

**Efficacy of treatments against thrips at 14 days after second spraying**
At fourteen days after spraying thiacloprid 21.7SC remained superior by recording least per cent foliar damage (3.00%) over rest of the treatments and it was on par with imidacloprid 200SL (4.55%) and monocrotophos 36WSC (4.59%). The treatments chlorfenapyr 10SC (7.97%), fipronil 5SC (8.46%), thiamethoxam 25WG (8.49%), acetamiprid 20SP (8.85%), emamectin benzoate 5SG (9.62%) and spinosad 45SC (9.94%) were found to be on par with each other. The next effective treatment was diafenthiuron (10.59%) followed by dimethoate 30EC with 16.88 per cent foliar damage. Highest thrips damage was recorded in untreated control with 29.67 per cent foliar damage.
During *Kharif,* 2012, thiacloprid 21.7SC recorded least per cent foliar damage by thrips with 13.63, 15.19 and 12.21, 3.00 per cent foliar damage respectively, at 7 and 14 DAT in two sprayings and it was on par with imidacloprid 200SL and monocrotophos 36WSC. The present findings are in concordance with Albuquerque *et al*. (1999) [1] who reported that thiacloprid and imidacloprid were the most effective treatments in controlling thrips, *Frankliniella schultzei* on cotton up to 7 days after treatment. Per cent damage recorded

was 15.47 and 16.28 at first spraying and 13.65 and 4.55 per cent damage during second spraying at 7 and 14 DAT, respectively with imidacloprid 200SL. Whereas with monocrotophos 36WSC recorded 13.93 and 16.43 per cent damage at first spraying and 14.61 and 4.59 per cent damage during second spraying at 7 and 14 DAT, respectively. Mishra *et al*. (2005) [14] recorded that imidacloprid was most effective in reducing the thrips population followed by monocrotophos and acetamiprid. The remaining all insecticides were more or less on par with each other. The present results are in agreement with the findings of Ulaganathan and Gupta (2004) [28] who reported that acetamiprid, imidacloprid, betacyfluthrin, spinosad, indoxacarb were effective in reducing thrips and jassid populations. Shelton *et al*. (2008) [23] reported that acetamiprid, spinosad, imidacloprid and dimethoate performed better and found that acetamiprid reduced damage by 51 per cent by reducing the thrips incidence in cabbage. Khalid Ahmed and Prasad (2009) [11] documented the efficacy of emamectin benzoate in managing thrips incidence in chillies. All the insecticidal treatments showed superiority over untreated control with respect to per cent foliar damage by thrips.

**Cumulative efficacy of certain new insecticides as foliar spray against thrips in groundnut**

It was evident from the pooled data of the three seasons indicated that all the treatments were significantly superior over untreated control. It was understood that after first spraying, monocrotophos 36WSC was found to be effective at 7 and 14 days after spraying (11.82 and 11.93 per cent foliar damage, respectively) and it was at par with thiacloprid 21.7SC and imidacloprid 200SL with 12.35, 12.33 and 13.13, 12.42 per cent foliar damage, respectively. However after 2nd spray, thiacloprid 21.7SC was superior among all the treatments by recording lowest thrips incidence (4.07 per cent) followed by monocrotophos (4.83%) and imidacloprid 200SL (5.00%). The present findings are in concurrence with Sangar (1998) [21], Reddy (1982) [18], Kandasamy *et al*. (1990) [8] and Kennedy *et al*. (1992) [10] who reported that monocrotophos was very effective against thrips in different crops like groundnut, cotton, rose and chillies. This might be due to its effective systemic action by inhibiting the acetyl choline esterase at synapse. The next best treatment was thiamethoxam 25WG and at par with emamectin benzoate 5SG at 7DAS whereas vice versa at 14 DAS followed by acetamiprid 20SP, diafenthiuron 50WP, spinosad 45SC, chlorfenapyr 10SC, dimethoate 30EC and fipronil 5SC (Table 1, Fig 1). The efficacy of insecticides thiacloprid and acetamiprid might be due to ovicidal and larvicidal effects (Seidenglanz *et al*., 2011) [22].

After second spraying, thiacloprid 21.7SC was found to be effective at

7 and 14 days after spraying (7.88 and 4.07 per cent foliar damage, respectively) followed by imidacloprid 200SL and monocrotophos 36WSC with 9.40 and 9.61 per cent foliar damage, respectively at 7 DAS. The foliar damage at 14 DAS was 5.00 and 4.83 per cent by spraying monocrotophos and imidacloprid respectively.

Thiacloprid is highly active chloronicotinyl insecticide for foliar application with systemic action and broad spectrum efficacy against sucking and biting insects, selectively acts on insect nervous system as an agonist of nicotinic acetylcholine receptor (Jeschke *et al*., 2001) [7]. Premalatha *et al*. (2003) [17] also reported that thiacloprid was significantly superior to imidacloprid 200SL and oxydemeton-methyl 25EC. The results revealed that thiacloprid and imidacloprid were the most effective treatments in controlling the thrips on cotton (Albuquerque *et al*., 1999) [1]. The results indicated that imidacloprid effectively managed the thrips vector by reducing the number of thrips settling on leaves of groundnut. Similar results were reported by Riley (2007) [20] with leaf-choice test of thrips in groundnut. This might be due to imidacloprid had both antifeeding and repellency mode of action. Same trend with respect to mode of action was reported by Seidel and Matthiessen (1999) [13]. Anuj and Yogeeta (2008) [2] also revealed that two foliar sprays of imidacloprid 0.02% (during emergence and after 21 days), found to be effective in reducing the thrips population. The next best insecticides were acetamiprid 20SP with 13.05 and 9.87 per cent foliar damage at 28 and 35 days after sowing, respectively which was followed by emamectin benzoate 5SG, thiamethoxam 25WG, diafenthiuron 50WP, chlorfenapyr 10SC with 13.40 and 10.28, 14.25 and 10.22, 14.17 and 11.50, 14.35 and 10.32 per cent foliar damage at 28 and 35 days after sowing, respectively. Amongst the chemicals tested dimethoate 30EC and fipronil 5SC were less effective against the thrips in groundnut. However, Garzo *et al*. (2001) [4] reported that fipronil was not effective to suppress the *F.occidentalis* which transmitted TSWV on pepper.

Eventhough all the chemicals exhibited significant superiority over untreated control, the chemical treatments thiacloprid 21.7SC, imidacloprid 200SL and monocrotophos 36WSC showed superiority over rest of the treatments in both the sprayings and on par with each other. The mean efficacy of all the insecticides were high in second spray when compared to first spray in terms of per cent foliar damage by thrips. Shetgar *et al*. (1989) [24] also reported that two applications of monocrotophos would control the foliage pest like jassids, thrips etc. Hence, it could be concluded that spraying of thiacloprid 21.7SC, imidacloprid 200SL and monocrotophos 36WSC twice could be recommended to the farmers for effective management of the thrips and enhanced yields in groundnut.

**Yield in different foliar spray treatments during *Kharif*, 2012**

During *Kharif*, 2012 highest yield was recorded in thiacloprid 21.7SC (1885 kg $ha^{-1}$) and was on par with imidacloprid 200SL (1766 kg $ha^{-1}$), monocrotophos 36WSC (1744 kg $ha^{-1}$) and thiamethoxam 25WG (1714 kg $ha^{-1}$). The next best treatments were spinosad 45SC, emamectin benzoate 5SG, acetamiprid 20SP, chlorfenapyr 10SC and fipronil 5SC with 1523, 1435, 1366, 1336 and 1289 kg $ha^{-1}$, respectively. Among the chemical insecticide treatments lower yields were recorded in dimethoate 30EC (1234 kg $ha^{-1}$) and diafenthiuron 50WP (1204 kg $ha^{-1}$). Yield recorded in untreated control was 833 kg $ha^{-1}$

**Economics of Different Insecticides as foliar spray against thrips in groundnut**

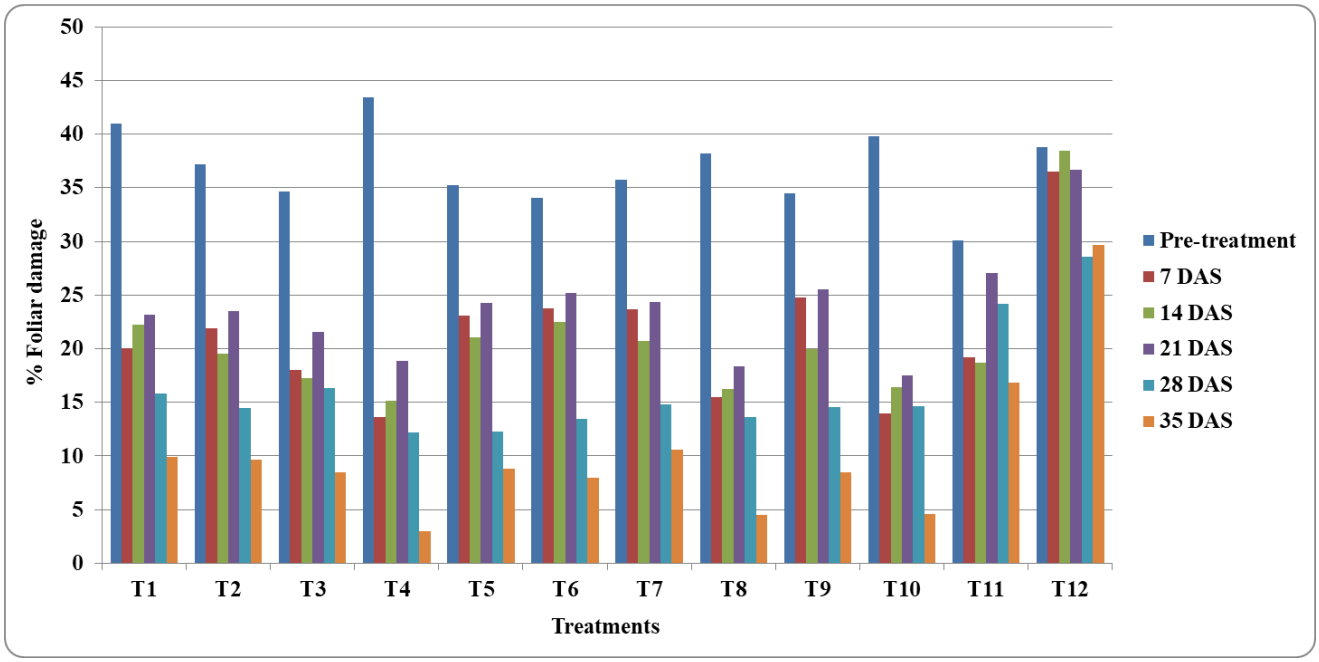
Data regarding per cent incidence of thrips in different foliar spray treatments, monetary returns through yield and cost of chemical application leading to computation of the cost benefit ratio of insecticidal application in protecting the crop against thrips infestation are presented in Tables 1.

During *Kharif*, 2012 the C:B ratio of different treatments ranged from 0.7 in untreated control to 2.9 in thiacloprid

21.7SC. Imidacloprid 200SL and monocrotophos 36WSC recorded the C:B ratio of 2.8 followed by thiamethoxam 25WG (2.5) and both fipronil 5SC and acetamiprid 20SP recorded 2.0. The next best treatment with respect to C:B ratio was emamectin benzoate 5SG followed by chlorfenapyr 10SC, spinosad 45SC and diafenthiuron 50WP with 1.9, 1.8, 1.6 and 1.5, respectively. The treatment dimethoate 30EC was found to be moderate with C:B ratio of 1.3.

**Table 1:** Evaluation of certain new insecticides against groundnut thrips by foliar application during *Kharif*, 2012

| Treatments | Dosage (ml or g/lt) | % Foliar damage by thrips | | | | | | Yield (Kg/ha) | C:B ratio |
|---|---|---|---|---|---|---|---|---|---|
| | | Pre treatment | After I Spray (Post treatment) | | Pre treatment | After II Spray (Post treatment ) | | | |
| | | | 7 DAT | 14 DAT | | 7DAT | 14 DAT | | |
| T1: Spinosad 45% SC | 0.30 ml | 41.01 | 20.04 (26.59)$^{bc}$ | 22.24 (28.12)$^{c}$ | 23.20 | 15.83 (23.42)$^{b}$ | 9.94 (18.36)$^{b}$ | 1523 | 2.0 |
| T2: Emamectin benzoate 5% SG | 0.10 g | 37.15 | 21.93 (27.91)$^{c}$ | 19.58 (26.26)$^{b}$ | 23.55 | 14.48 (22.34)$^{a}$ | 9.62 (18.05)$^{b}$ | 1435 | 2.0 |
| T3: Thiamethoxam 25 WG | 0.25 g | 34.69 | 18.02 (25.08)$^{b}$ | 17.25 (24.42)$^{ab}$ | 21.59 | 16.33 (23.82)$^{b}$ | 8.49 (16.90)$^{b}$ | 1714 | 2.6 |
| T4: Thiacloprid 21.7% SC | 0.25 ml | 43.46 | 13.63 (21.57)$^{a}$ | 15.19 (22.93)$^{a}$ | 18.85 | 12.21 (20.42)$^{a}$ | 3.00 (9.96)$^{a}$ | 1855 | 2.9 |
| T5: Acetamiprid 20% SP | 0.25 g | 35.23 | 23.05 (28.62)$^{c}$ | 21.02 (27.28)$^{c}$ | 24.28 | 12.25 (20.48)$^{a}$ | 8.85 (17.29)$^{b}$ | 1366 | 1.9 |
| T6: Chlorfenapyr 10% SC | 2.00 ml | 34.09 | 23.78 (29.18)$^{c}$ | 22.47 (28.26)$^{c}$ | 25.19 | 13.50 (21.55)$^{a}$ | 7.97 (16.39)$^{b}$ | 1336 | 1.7 |
| T7: Diafenthiuron 50% WP | 1.00 g | 35.77 | 23.65 (29.08)$^{c}$ | 20.73 (27.07)$^{c}$ | 24.35 | 14.81 (22.59)$^{ab}$ | 10.59 (18.98)$^{c}$ | 1204 | 1.4 |
| T8: Imidacloprid 200 SL | 0.25 ml | 38.21 | 15.47 (23.16)$^{ab}$ | 16.28 (23.79)$^{a}$ | 18.34 | 13.65 (21.67)$^{a}$ | 4.55 (12.31)$^{a}$ | 1766 | 2.7 |
| T9: Fipronil 5% SC | 2.00 ml | 34.51 | 24.79 (29.84)$^{c}$ | 19.93 (26.50)$^{bc}$ | 25.56 | 14.57 (22.40)$^{a}$ | 8.46 (16.88)$^{b}$ | 1289 | 1.6 |
| T10: Monocrotophos 36% WSC | 1.60 ml | 39.84 | 13.93 (21.90)$^{a}$ | 16.43 (23.90)$^{a}$ | 17.52 | 14.61 (22.40)$^{a}$ | 4.59 (12.36)$^{a}$ | 1744 | 2.7 |
| T11: Dimethoate 30 EC | 2.00 ml | 30.10 | 19.23 (25.89)$^{b}$ | 18.71 (25.62)$^{b}$ | 27.09 | 24.21 (29.39)$^{c}$ | 16.88 (24.25)$^{d}$ | 1234 | 1.6 |
| T12: Untreated Control | - | 38.81 | 36.50 (37.17)$^{d}$ | 38.44 (39.31)$^{d}$ | 36.69 | 28.59 (32.32)$^{d}$ | 29.67 (33.00)$^{e}$ | 833 | 0.8 |
| CD @ 0.05% | - | - | 3.43 | 2.61 | - | 2.75 | 1.74 | 155.6 | |
| SEm | - | - | 1.17 | 0.89 | - | 0.94 | 0.59 | 53.1 | |
| CV% | - | - | - | - | - | - | - | 6.38 | |




T1 : Spinosad 45% SC
T2 : Emamectin benzoate 5% SG
T3 : Thiamethoxam 25 WG
T4 : Thiacloprid 21.7% SC
T5 : Acetamiprid 20% SP
T6 : Chlorfenapyr 10% SC
T7 : Diafenthiuron 50% WP
T8 : Imidacloprid 200 SL
T9 : Fipronil 5% SC
T10 : Monocrotophos 36% WSC
T11 : Dimethoate 30 EC
T12 : Untreated Control

**Fig 1:** Evaluation of certain new insecticides against groundnut thrips for foliar spray during *Kharif*, 2012.

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