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# Bio-efficacy of different acaricides against broad mite, *Polyphagotarsonemus latus* (Banks) in *Kharif* sesame

**SB Bathani, ML Patel and NJ Hadiya**

**Abstract**
Investigation on the management of broad mite, *Polyphagotarsonemus latus* infesting sesame was carried out under field condition during the *kharif*- 2018 at Instructional Farm, Junagadh Agricultural University, Junagadh, India. For the management of mites, different acaricides *viz.*, hexythiazox 5.45 EC @ 0.008%, ethion 50 EC @ 0.05%, ethion + cypermethrin 45 EC @ 0.045%, fenpyroximate 5 SC @ 0.005%, etoxazole 10 SC @ 0.01%, abamectin 1.9 EC @ 0.0019%, diafenthiuron 50 WP @ 0.05%, fenazaquin 10 EC @ 0.01% and propargite 57 EC @ 0.057% were evaluated against the pest. Based on pooled over periods diafenthiuron 50 WP @ 0.05% was found most effective for the control of mites. However, treatments which were found next in order of efficacy were abamectin 1.9 EC @ 0.0019% and propargite 57 EC @ 0.057%. Ethion 50 EC @ 0.05% was found least effective against this pest. The highest (823 kg/ha) seed yield was gained from the plots treated with diafenthiuron 50 WP @ 0.05% followed by abamectin 1.9 EC @ 0.0019% (815 kg/ha) and propargite 57 EC @ 0.057% (794 kg/ha).

**Keywords:** Sesame, mites, *Polyphagotarsonemus latus*, chemical control

## Introduction
Sesame (*Sesame indicum*) known variously as sesamum, til, gingelly, simsim and gergelim is an important and very ancient oil yielding crop cultivated extensively in India, Burma, China and Japan. It is also cultivated in the hotter and drier parts of Africa and the Mediterranean region. In recent years, the cultivation of sesame has been receiving much attention in the USA, Mexico and in some of the Latin American Countries. Sesame is regarded as the oldest oil yielding plant known to human being. In India this crop grown in area of about 19.50 lakh ha with the production of about 8.5 lakh MT and productivity 436 kg per ha (Anon., 2016) [4]. The productivity of sesame is very low as compared to other oilseeds hence, it is necessary to raise the productivity and thereby total oilseeds production in order to meet edible oil requirement of the country. Sesame has played a major role in the rich and diverse health and cosmetic traditions of India. Sesame is highly nutritive (oil 50% and protein 25%) and its oil is an excellent vegetable oil because of its high contents of antioxidants such as sesamin, sesamol and sesamolin and its fatty acid composition (Suja *et al.*, 2004) [16]. The presence of antioxidants and about 85% unsaturated fatty acids make the oil stable and it has therefore a long shelf life. Seeds are rich source of linoleic acid, vitamin E, A, B1 and B2; minerals including Ca and P. After oil extraction, the remaining meal contains 35-50% protein, and is rich in tryptophan and methionine. Seed coats are rich in calcium (1.3%) and provide a valuable source of minerals. Sesame cake is nutritious feed for dairy cattle and it can also be used as fertilizer (Ashri, 1998) [5]. Among the different insect-pests of sesame, mites *Polyphagotarsonemus latus* (Banks) is more common and destructive pest of sesame. It also found infecting jute, cotton, zinnia, marigold, dahlia, datura, amaranthus, chilli, potato, brinjal, cucurbits, cowpea, cluster bean, sword bean, lablab, moth bean, horse gram, green gram, hollyhock, kidney bean, tea and thorn apple crops in state of Bihar, Karnataka, Maharashtra, Gujarat, Punjab, Uttar Pradesh and West Bengal in India (Gupta, 1985) [8]. Damage is usually confined to undersides of leaves, where areas between veins are reddish brown in colour and young leaves are capped downward and narrow than normal. Several chemical acaricides have been recommended for combating mites. However, problems like residues in seeds and environmental contamination are the result of injudicious use of these chemical acaricides. Such reliance on acaricides has created many problems such as very frequent application of acaricides, excessive residues in the produce, which are the concerns of general consumer health and the environment, acaricide resistance, trade implications, poisoning, hazards to non-target organisms and increased production costs etc. Among the several avenues to overcome

the acaricidal resistance problem. Therefore, there is a need to check the effects of different acaricides were one of the important considerations.

**Materials and Methods**

The experiment was laid out in a Randomized Block Design (RBD) with three replications keeping plot size of 4.5 m x 3.6 m during *kharif*-2018 at Instructional Farm, Junagadh Agricultural University, Junagadh. Sesame variety Gujarat Til - 2 was sown at a spacing of 45 cm x 15 cm in July, 2018. All agronomic practices were adopted as per the recommendation in vogue. The spraying was done using knapsack sprayer of nine different acaricides viz., hexythiazox 5.45 EC @ 0.008%, ethion 50 EC @ 0.05%, ethion + cypermethrin 45 EC @ 0.045%, fenpyroximate 5 SC @ 0.005%, etoxazole 10 SC @ 0.01%, abamectin 1.9 EC @ 0.0019%, diafenthiuron The data was converted into percent mortality by using following formula given by Abbott (1925) and modified by Henderson and Tilton (1955) [9].

$$\text{Percent mortality} = 100 \times \frac{(1 - Ta \times Cb)}{Tb \times Ca}$$

50 WP @ 0.05%, fenazaquin 10 EC @ 0.01% and propargite 57 EC @ 0.057% for the control of mites. As the population of mites was heavy starting after the flowering stage, the spray was carried out to check the population. Only one spray was given because the mite population could not be built after the acaricidal spray. The observations on mites were recorded visually from five randomly selected and tagged plants from its upper, middle and lower leaves from top 50 cm length of main shoot. Observations on mites population were recorded at pre-treatment counts a day before and post treatment counts at 1, 3 and 7 days after spray. With a view to evaluate the effect of different acaricides on the sesame yield, crop was harvested from each net plot. The harvested yield was weighted and converted on hectare basis. The percentage increase in yield over control was calculated by using the following formula.

$$\text{Percentage increase over control} = 100 \times \frac{T-C}{C}$$

Here,

Ta = No. of mites observed after treatment. Tb = No. of mites observed before treatment.

Ca = No. of mites observed from the untreated control after treatment.

Cb = No. of mites observed from the untreated control before treatment.

The data on corrected percent mortality was subjected to angular transformation before statistical analysis.

**Result and Discussion**

The data on mean percent mortality of mites after one application of acaricides pooled over spray were presented in Table-1. The periodical data showing the effects of acaricidal spray on infestation to sesame due to mites on one, three and seven days after spray (DAS) was also presented. The bio-efficacy of various acaricides had been adjudged based on pooled over spray.

Here,

T= Yield of respective treatment (kg/ha) C= Yield of control (kg/ha) The mean per cent mortality of mite (Table-1 and Figure-1) recorded at 24 hrs after application of different.

**Table 1:** Efficacy of different acaricides against broad mite, *P. latus* on *kharif* sesame during 2018

| | | | Mean per cent mortality at different interval after spraying | | | |
|---|---|---|---|---|---|---|
| **Sr. No.** | **Treatment** | **Concentration (per cent)** | **1 DAS** | **3 DAS** | **7 DAS** | **Pooled over period** |
| 1. | Hexythiazox 5.45 EC | 0.008 | 47.15 | 52.46 | 55.23 | 51.61 |
| | | | (53.76) | (62.87) | (67.47) | (61.37) |
| 2. | Ethion 50 EC | 0.05 | 41.28 | 47.95 | 51.38 | 46.87 |
| | | | (43.52) | (55.13) | (61.04) | (53.23) |
| 3. | Ethion + Cypermethrin | 0.045 | 58.68 | 64.42 | 67.44 | 63.51 |
| | 45 EC | | (72.98) | (81.36) | (85.28) | (79.87) |
| 4. | Fenpyroximate 5 SC | 0.005 | 66.82 | 71.76 | 74.10 | 70.89 |
| | | | (84.51) | (90.20) | (92.49) | (89.07) |
| 5. | Etoxazole 10 SC | 0.01 | 48.87 | 54.19 | 56.37 | 53.14 |
| | | | (56.73) | (65.77) | (69.33) | (63.94) |
| 6. | Abamectin 1.9 EC | 0.0019 | 68.48 | 74.81 | 77.61 | 73.63 |
| | | | (86.54) | (93.13) | (95.40) | (91.69) |
| 7. | Diafenthiuron 50 WP | 0.05 | 69.98 | 75.94 | 79.95 | 75.29 |
| | | | (88.28) | (94.10) | (96.96) | (93.11) |
| 8. | Fenazaquin 10 EC | 0.01 | 55.91 | 62.11 | 65.96 | 61.33 |
| | | | (68.58) | (78.12) | (83.40) | (76.70) |
| 9. | Propargite 57 EC | 0.057 | 67.24 | 74.51 | 76.45 | 72.73 |
| | | | (85.03) | (92.86) | (94.51) | (90.80) |
| | S.Em. ± | | 2.70 | 3.25 | 3.14 | 2.92 |
| | C. D. at 5% | | 8.09 | 9.75 | 9.42 | 8.77 |
| | C. V.% | | 8.02 | 8.77 | 8.11 | 8.04 |

**Notes:**

1. Figures in parentheses ( ) are retransformed values; those outside are arcsine transformed value.

DAS = Days after spraying

acaricides revealed that diafenthiuron 50 WP @ 0.05% was the most effective treatment and gave 88.28% mortality of the pest. However, it was at par with abamectin 1.9 EC @ 0.0019%, propargite 57 EC @ 0.057% and fenpyroximate 5 SC @ 0.005% as they registered 86.54, 85.03 and 84.51% mortality, respectively. The treatment with ethion + cypermethrin 45 EC @ 0.045% and fenazaquin 10 EC @ 0.01% were found next best treatments with 72.98 and

68.58% mortality of this pest, respectively. The remaining treatments *viz.,* etoxazole 10 SC @ 0.01% and hexythiazox 5.45 EC @ 0.008% were found moderately effective with 56.73 to 53.76% mortality. Ethion 50 EC @ 0.05% was found least effective as it exhibited 43.52% mortality of the pest.

The data on per cent mortality of mite (Table-1 and Figure-1) obtained at 72 hours after application of acaricides revealed that diafenthiuron 50 WP @ 0.05%, abamectin 1.9 EC @ 0.0019%, propargite 57 EC @ 0.057% and fenpyroximate 5 SC @ 0.005% found to be the most toxic and equally effective with 94.10, 93.13,

92.86 and 90.20% mortality of the pest, respectively. The treatment with ethion + cypermethrin 45 EC @ 0.045%, fenazaquin 10 EC @ 0.01%, etoxazole 10 SC @ 0.01% and hexythiazox 5.45 EC @ 0.008% were found moderately effective and registered 81.36, 78.12, 65.77 and 62.87% mortality of the mite, respectively. The treatment with ethion 50 EC @ 0.05% was found least toxic and registered only 55.13% mortality of the pest.

The experimental results on per cent mortality of mite (Table-1 and Figure-1) at 7 day after application of acaricides revealed that diafenthiuron 50 WP @ 0.05%, abamectin 1.9 EC @ 0.0019%, propargite 57 EC @

0.057% and fenpyroximate 5 SC @ 0.005% were found to be the most toxic and equally effective with 96.96, 95.40, 94.51 and 92.49% mortality of the pest, respectively. The treatment with ethion + cypermethrin 45 EC @ 0.045%, fenazaquin 10 EC @ 0.01%, etoxazole 10 SC @ 0.01% and hexythiazox 5.45 EC @ 0.008% were found moderately effective and registered 85.28, 83.40, 69.33 and 67.47% mortality of the mite, respectively. The treatment with ethion 50 EC @ 0.05% was found least effective and registered 61.04% mortality of the pest. The pooled data (pooled over period) presented in Table-1 and depicted in Figure-1 indicates that all the acaricides had significantly reduced the mite population in the range of 53.23 to 93.11%. The highest mortality of mite (93.11%) was observed from the plots treated with diafenthiuron 50 WP @ 0.05% and it was statistically at par with abamectin 1.9 EC @ 0.0019%, propargite 57 EC @ 0.057% and fenpyroximate 5 SC @ 0.005% which caused 91.69, 90.80 and 89.07% mortality, respectively. The treatment with ethion + cypermethrin 45 EC @ 0.045% and fenazaquin 10 EC @ 0.01% were found next in order of their efficacy against the pest as they recorded 79.87 and 76.70% mortality, respectively. The remaining treatments *viz.,* etoxazole 10 SC @ 0.01% and hexythiazox 5.45 EC @ 0.008% were found moderately effective by registered 63.94 and 61.37% mortality of the pest. The treatment with ethion 50 EC @ 0.05% was found least toxic and registered 53.23% mortality of the pest. In contrast, Ahmed *et al.* (2000) [2] recorded that ethion gave 65.93 % reduction of yellow mite at 7 DAS over control. Srinivasulu *et al.* (2002) [15] concluded that abamectin 0.05 % were found effective against yellow mite, *P. latus* on chilli with 85.19 % pest reductions. Biswas *et al.* (2009) [6] indicated that fenpyroximate 5 % SC @ 500 ml formulation per hectare was found to be effective among all other acaricides available in controlling chilli yellow mite. Varghese and Mathew (2013) [17] evaluated that propargite 57 EC at 570 g a.i./ha were found to be effective in reducing chilli mite population. Chakrabarti and Sarkar (2014) [7] experimented that among the different molecules used to manage *Polyphagotarsonemus latus* (Banks) diafenthiuron (300 g a.i./ha) showed the best efficacy against motile stages followed by milbemectin (3.5 g a.i./ha) and propargite (1000 g a.i./ha). Siddhapara and Virani (2015) [14] reported that the various acaricidal treatments, abamectin 0.0025 % was significant over rest of treatments by registered highest (91.47 %) mortality and fruit yield (8274 kg/ha) and it was at par with fenazaquin 0.01 % and propargite

0.05 %. Pokle and Shukla (2015) [13] reported that the diafenthiuron 50 WP was found most effective in reducing the eggs and mobile stages of *T. urticae.* Veerendra *et al.* (2015) [18] concluded that the new acaricides hexythiazox

5.45 EC (1.5 ml/l), abamectin 1.9 EC (0.5 ml/l) and propargite 57 EC (2.0 ml/l) appeared to be highly effective against grape mites. Kavya *et al*. (2015) [11] concluded that propargite (0.78 mites/leaf) reduced the overall mite population more significantly than other acaricide within three days of application and this will lead to corresponding increase in higher fruit yield. Ali *et al*. (2015) [3] concluded that fenpyroximate was proved the best among the tested ones for the control of two-spotted spider mite based on their LC50 values and percent mortality. Jadhav *et al.* (2016) [10] revealed that propargite @ 1500 ml a.i./ha proved to be the best treatment showing maximum reduction of mites in 6.25 cm2 leaf area per three leaves followed by fenazaquin which were also highly effective against mites indicating results at par with the best treatment in reducing mite population on okra. Pal and Karmakar (2017) [12] observed that application of diafenthiuron @ 800 g a.i./ha was very promising and gave the result for maintenance of low mite population with 99.96 % mortality followed by fenazaquin @ 100 g a.i./ha rendered 98.94 % mortality while the acaricide molecule ethion @ 1 ml/lit registered the least mortality (47.72 %).

The seed yield of sesame in different acaricidal treatments varied from 531 to 823 kg/ha. The highest seed yield (823 kg/ha) was recorded in the treatment of diafenthiuron 50 WP @ 0.05%. However, it was at par with abamectin 1.9 EC @ 0.0019% (815 kg/ha),

propargite 57 EC @ 0.057% (794 kg/ha) and fenpyroximate 5 SC @ 0.005% (751 kg/ha). The next best treatments were ethion + cypermethrin 45 EC @ 0.045%, fenazaquin 10 EC @ 0.01%, etoxazole 10 SC @ 0.01% and hexythiazox 5.45 EC @ 0.008% as they were equally effective by registering 710, 698, 667 and 646 kg/ha seed yield. The treatment of ethion 50 EC @ 0.05% recorded lower yield i.e. 593 kg/ha seed yield which could not significantly increased the yield over untreated control (531 kg/ha).

Considering the per cent increase in yield of sesame, it was found highest in diafenthiuron 50 WP @ 0.05% (54.99 %) followed by abamectin 1.9 EC @ 0.0019% (53.48 %), propargite 57 EC @ 0.057% (49.53 %) and fenpyroximate 5 SC @ 0.005% (41.43 %). The treatment found next in order in respect of the per cent increase in yield over control were ethion + cypermethrin 45 EC @ 0.045%, fenazaquin 10 EC @ 0.01%, etoxazole 10 SC @ %, hexythiazox 5.45 EC @ 0.008% and ethion 50 EC @ 0.05% as they registered 33.71, 31.45, 25.61, 21.66 and 11.68% increase in yield over control, respectively.

**Table 2:** Yield of *kharif* sesame in different acaricidal treatment during 2018

| Sr. No. | Treatment | Concentration (%) | Yield (kg/ha) | Per cent increase in yield over control |
|---|---|---|---|---|
| 1. | Hexythiazox 5.45 EC | 0.008 | 646 | 21.66 |
| 2. | Ethion 50 EC | 0.05 | 593 | 11.68 |
| 3. | Ethion + Cypermethrin 45 EC | 0.045 | 710 | 33.71 |
| 4. | Fenpyroximate 5 SC | 0.005 | 751 | 41.43 |
| 5. | Etoxazole 10 SC | 0.01 | 667 | 25.61 |
| 6. | Abamectin 1.9 EC | 0.0019 | 815 | 53.48 |
| 7. | Diafenthiuron 50 WP | 0.05 | 823 | 54.99 |
| 8. | Fenazaquin 10 EC | 0.01 | 698 | 31.45 |
| 9. | Propargite 57 EC | 0.057 | 794 | 49.53 |
| 10. | Control | - | 531 | - |
| | S.Em. ± | - | 37.59 | - |
| | C.D. at 5 % | - | 112 | - |
| | C.V. % | - | 9.26 | - |

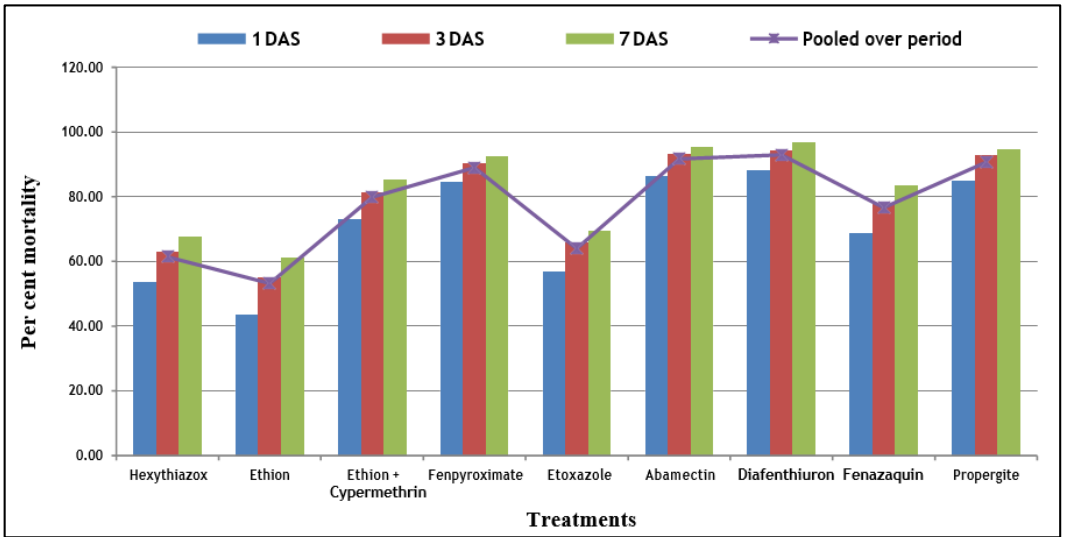


**Fig 1:** BATHANI *et al.*, Bio-efficacy of Different Acaricides Against Broad Mite, *Polyphagotarsonemus latus* (Banks) in *Kharif* Sesame

## References


1. Abbott WS. A method of computing effectiveness of an insecticide. Journal of Economic Entomology. 1925; 18(2): 265-267.
2. Ahmed GMK, Hanumanth RV, Rao NHP, Purnachandra RP. Evaluation of pesticides for management of yellow mite, *Polyphagotarsonemus latus* on chilli. Andhra Agricultural Journal. 2000; 47(1):67-70.
3. Ali A, Khan IA, Maula F, Yasmin B. Comparative efficacy of acaricides against two spotted spider mites, *Tetranychus urticae* Koch (Acari: Tetranychidae) on kidney bean plants under laboratory and field conditions. International Journal of Technical Research and Applications. 2015; 3(6):170- 175.
4. Anonymous. Directorate of Agriculture Gujarat State, Gandhinagar, 2016. Available at http://dag.gujarat.gov.in/Portal/News/474124th-Adv-ESt-2015-16.pdf accessed on 19 January, 2018.
5. Ashri A. Sesame breeding. Plant Breeding Research, 1998; 16:179-228.
6. Biswas K, Mallikarjunappa S, Koneripalli N, Goswami TN. Superiority of Fenpyroximate 5% SC (SEDNA) over other available acaricides against chilli yellow mite, *Polyphagotarsonemus latus* (Banks) (Acari: Tarsonemidae). Resistant Pest Management Newsletter. 2009; 19(1):21.
7. Chakrabarti S, Sarkar PK. Studies on efficacy of some acaricidal molecules for the management of *Polyphagotarsonemus latus* (Banks) (Acari: Tarsonemidae) infesting chilli **(***Capsicum annuum* L.) in West Bengal. *Current Biotica*, 2014; 70(4):299-305.
8. Gupta SK. Hand book Plant Mites of India. Shri Aurobindo Press. Kolkota, 1985, 292-294.
9. Henderson CF, Tilton EW. Tests with acaricides against brown wheat mite. Journal of Economic Entomology. 1955; 48(2):157-161.
10. Jadhav YT, Mane SR, Shinde DS. Bio- efficacy of newer pesticides against mite population on summer okra. International journal of Plant Protection. 2016; 9(2):439-444.
11. Kavya MK, Srinivasa N, Ravi GB, Vidyashree S. Relative toxicity of selected acaricides on two spotted spider mite (*Tetranychus urticae*) of brinjal. *International Quarterly Journal of Life Sciences*, 2015; 10(2):605-608.
12. Pal S, Karmakar K. Population dynamics and management of yellow mite, *Polyphagotarsonemus latus* (Banks) (Acari: Tarsonemidae) infesting gerbera under protected cultivation. Journal of Entomology and Zoology Studies. 2017; 5(5):795-799.
13. Pokle PP, Shukla A. Chemical control of two spotted spider mite, *Tetranychus urticae* Koch (Acari: Tetranychidae) on tomato under polyhouse conditions. Pest Management in Horticultural Ecosystems. 2015; 21(2):145-153.
14. Siddhapara MR, Virani VR. Biology, seasonal incidence and management of red spider mite, *Tetranychus urticae*

Koch in okra, Ph.D. Thesis (Unpublished), Junagadh Agricultural University, Junagadh, 2015.
15. Srinivasulu P, Naidu VG, Rao NV. Evaluation of different pesticides for the control of yellow mite, *Polyphagotarsonemus latus* (Banks) on chilli. Journal of Applied Zoological Research. 2002; 13(1):71-72.
16. Suja KP, Abraham JT, Thamizh SN, Jayalekshmy, Arumughan C. Antioxidant efficacy of sesame cake extract in vegetable oil protection. Food Chemistry. 2004; 84(3):393-400.
17. Varghese TS, Mathew TB. Bioefficacy and safety evaluation of newer insecticides and acaricides against chilli thrips and mites. Journal of Tropical Agriculture, 2013; 51(1, 2):111-115.
18. Veerendra AC, Udikeri SS, Karabhantanal SS. Bio-efficacy, yield loss and economics of two spotted spider mite, *Tetranychus urticae* Koch (Acarina: Tetranychidae) management through synthetic acaricides and biorationals in grape vineyards. International Journal of Current Research in Biosciences and Plant Biology. 2015; 2(5):130-140.