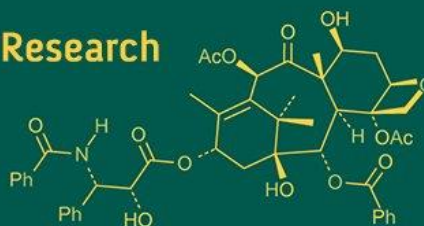


International Journal of Advanced Biochemistry Research



ISSN Print: 2617-4693
ISSN Online: 2617-4707
NAAS Rating (2026): 5.29
IJABR 2026; SP-10(7): 22-26
www.biochemjournal.com
Received: 16-04-2026
Accepted: 19-05-2026

Mohit

Faculty of Agriculture, Maharishi Markandeshwar (Deemed to be University), Mullana, Ambala, Haryana, India

Neha Negi

Faculty of Agriculture, Maharishi Markandeshwar (Deemed to be University), Mullana, Ambala, Haryana, India

Harwinder Singh Buttar

PAU-Krishi Vigyan Kendra, Jalandhar, Punjab, India

Kokab Askari

Faculty of Agriculture, Maharishi Markandeshwar (Deemed to be University), Mullana, Ambala, Haryana, India

Aastha Khatri

Faculty of Agriculture, Maharishi Markandeshwar (Deemed to be University), Mullana, Ambala, Haryana, India

Arushi Padiyal

Faculty of Agriculture, Maharishi Markandeshwar (Deemed to be University), Mullana, Ambala, Haryana, India

Ankit

Faculty of Agriculture, Maharishi Markandeshwar (Deemed to be University), Mullana, Ambala, Haryana, India

Kajal

Faculty of Agriculture, Maharishi Markandeshwar (Deemed to be University), Mullana, Ambala, Haryana, India

Parth Tanwar

Faculty of Agriculture, Maharishi Markandeshwar (Deemed to be University), Mullana, Ambala, Haryana, India

Corresponding Author:**Arushi Padiyal**

Faculty of Agriculture, Maharishi Markandeshwar (Deemed to be University), Mullana, Ambala, Haryana, India

Assessing the role of botanicals, biological and chemical approaches to manage two spotted spider mites (*Tetranychus urtica* Koch) of cucumber under polyhouse conditions

Mohit, Neha Negi, Harwinder Singh Buttar, Kokab Askari, Aastha Khatri, Arushi Padiyal, Ankit, Kajal and Parth Tanwar

DOI: <https://www.doi.org/10.33545/26174693.2026.v10.i7Sa.8921>

Abstract

A study was conducted during the spring season of 2025 under polyhouse conditions at the Research Farm, Faculty of Agriculture, Maharishi Markandeshwar (Deemed to be University), Mullana-Ambala, Haryana, to investigate the seasonal incidence of two-spotted spider mite, *Tetranychus urticae* Koch and evaluate the efficacy of botanical, biological and chemical treatments for its management in cucumber. The experiment was laid out in a Randomized Block Design (RBD) with nine treatments and three replications. The seasonal incidence study revealed that mite population initiated during the 13th Standard Meteorological Week (SMW) with 0.71 mites per inch² of leaf area and attained a peak population of 25.19 mites per inch² during the 22nd SMW. Correlation analysis showed that mite population was positively correlated with maximum temperature ($r = 0.62$), minimum temperature ($r = 0.72$) and average temperature ($r = 0.68$), whereas relative humidity showed a weak negative correlation ($r = -0.08$). Among the treatments evaluated spiromesifen 22.9% SC @ 0.8 ml/l proved most effective recording the lowest mean mite population of 1.30 mites per inch² and 70.67 percent reduction over control after the second spray. Spinosad 45% SC and thiamethoxam 25 WG were the next most effective treatments. Among eco-friendly options, *Beauveria bassiana* 1.5% LF recorded the highest efficacy, while neem leaf extract was the most effective botanical treatment. The study demonstrated that spiromesifen can effectively manage severe mite infestations, whereas *B. bassiana* and neem leaf extract may be incorporated into sustainable integrated mite management programmes under protected cultivation.

Keywords: *Tetranychus urticae*, cucumber, polyhouse, seasonal incidence, spiromesifen, *Beauveria bassiana*

1. Introduction

Protected cultivation structures such as greenhouses and polyhouses have emerged as an important technology for increasing vegetable production (Shukla *et al.*, 2024) [12]. These controlled environments enable farmers to cultivate crops throughout the year, irrespective of seasonal limitations, while achieving higher production and superior produce quality compared to open-field cultivation. The adoption of improved cultivation practices, efficient resource management techniques and high-yielding crop cultivars has significantly contributed to the success of protected farming systems. However, the favorable microclimatic conditions created inside these structures, such as optimal relative humidity and temperature reduced environmental stress (Singh *et al.*, 2018) [13]. It also facilitates the proliferation of several insect and non-insect pests, thereby posing challenges to sustainable crop production. Among the non-insect pests, the two-spotted spider mite, *Tetranychus urticae* Koch, is considered one of the most destructive and economically important species. Belonging to the family Tetranychidae, it is highly polyphagous. It has been reported to infest more than 1,200 plant species, including approximately 150 commercially important crops (Safaa *et al.*, 2021) [10]. Warm temperatures and dry environmental conditions commonly prevailing under protected cultivation favour rapid multiplication and establishment of this pest, leading to severe infestations. Consequently, *T. urticae* has become a major threat to both field-grown and protected horticultural crops.

Cucumber (*Cucumis sativus* L.) is a widely grown vegetable crop in tropical and subtropical regions and is extensively cultivated under protected conditions due to its high yield potential and market demand. It is valued for its nutritional content, being rich in water, vitamins and minerals (Mallick, 2022) [8]. Global cucumber production reached about 97 million metric tonnes in 2024, with China accounting for nearly 80% of the total output, while in India it is cultivated on about 1.48 lakh hectares with a production of 21.12 lakh tonnes. It is particularly vulnerable to spider mite infestations. The pest generally colonizes the lower surface of leaves and piercing plant tissues and extracting leaf cells (Singh *et al.*, 2016) [14]. Infested plants initially small yellow specks on leaves, which later merge into larger chlorotic patches due to the removal of chlorophyll contents. As infestations intensify, mites occupy both leaf surfaces and produce webbing, eventually migrating to plant tips and neighbouring plants, thereby facilitating rapid spread within protected cultivation systems. Its biological characteristics including a short developmental period, high reproductive capacity, rapid population growth and relatively long lifespan, enable it to establish damaging populations within a short period (Golizadeh *et al.*, 2017) [4]. Under favorable temperatures around 30 °C, the development from egg to adult may be completed in a week, further accelerating population buildup. Weather parameters play a vital role in influencing two spotted spider mite population development and seasonal incidence (Devi and Challa, 2019) [1]. Optimum temperature favours rapid development, shorter life cycles, increased fecundity and higher survival rates, leading to exponential population buildup, whereas temperatures beyond this range can suppress their activity. Relative humidity also affects two spotted spider mites' survival and reproduction with moderate levels being most favorable (Meena *et al.*, 2013) [9]. Light intensity and photoperiod further influence mites' behaviour and reproduction, with higher light intensity generally enhancing their activity and population growth. Therefore, understanding the relationship between weather parameters and mite incidence are essential for developing effective forecasting models and timely pest management strategies. Integrated pest management approaches, including cultural practices such as sanitation and removal of infested plant parts and application botanical, biological and chemical insecticides, play a significant role in minimizing yield losses and ensuring sustainable cucumber production under protected cultivation.

2. Materials and Methods

2.1 Experimental Site:

The field experiment was conducted during the cucumber spring season of 2025 (March to June) at the Research Farm, Faculty of Agriculture, Maharishi Markandeshwar (Deemed to be University), Mullana-Ambala, Haryana.

2.2 Procurement of seed, botanical extracts and chemicals

The seeds of parthenocarpic cucumber variety ADIVA (CBA-1736) were procured from Bhatia Seeds and Pesticides store, Shahabad. For the botanical extracts the leaves of different plants were collected from the local area and then botanical extracts of neem leaf, chilli and garlic fruit were prepared by using cold extraction method grinding fresh plant material with distilled water, followed

by filtration through muslin cloth to obtain crude extracts (Kumar *et al.* 2025) [6]. Moreover, the insecticides used in this study was procured from local market of Barara, Ambala.

2.3 Experimental details

The experiment was laid out in a Randomized Block Design (RBD) comprising nine treatments (Table 1) with three replications. Cucumber variety ADIVA (CBA-1736) was sown in March 2025 at a spacing of 60 × 60 cm on raised beds. All recommended agronomic practices were followed uniformly except for plant protection measures.

Table 1: Detail of treatments

Treatment	Doses
Neem leaf extract	50 ml/l
Chilli and garlic extract	100 ml/l
Cow urine and garlic extract	250 ml/l
Cow urine and garlic extract	500 ml/l
Spiromesifen 22.9% SC	0.8 ml/l
Thiomethoxam 25WG	0.2 ml/l
Spinosad 45% SC	0.3 ml/l
<i>Beauveria bassiana</i> 1.5% LF	4 ml/l
Control	-----

2.4 Application of treatments

All treatments were applied at the recommended concentrations using a knapsack sprayer when the two spotted spider mite population reached the economic threshold level (ETL), followed by a second application after 15 days.

2.5 Observations recorded

Observations on two spotted spider mite population per inch² of leaf area were recorded from five randomly selected and tagged plants in each plot at one day before treatment and at 1, 3, 7 and 14 days after each spray. The efficacy of treatments was evaluated by calculating the percent reduction in mite population using the Henderson and Tilton (1955) formula.

2.6 Data Analysis

The experimental data were subjected to analysis of variance (ANOVA) using OPSTAT software and treatment means were compared at the 5% level of significance.

3. Results

3.1 Seasonal incidence and correlation of two spotted spider mite with weather parameter

The seasonal incidence of two-spotted spider mite on cucumber is presented in Table 2. No mite population was observed from the 9th to 12th Standard Meteorological Week (SMW). The population initiated during the 13th SMW with 0.71 mites per inch² of leaf area and thereafter increased gradually with crop growth and favourable weather conditions. The population reached 10.17 mites per inch² during the 18th SMW and further increased to 19.46 mites per inch² during the 20th SMW. After a slight decline in the 21st SMW, the mite population achieved its peak of 25.19 mites per inch² in the 22nd SMW. Subsequently, the population declined and reached 2.45 mites per inch² of leaf area during the 24th SMW. Correlation analysis revealed that two-spotted spider mite population was positively correlated with maximum temperature ($r = 0.62$), minimum

temperature ($r = 0.72$) and average temperature ($r = 0.68$), whereas average relative humidity showed a weak negative correlation ($r = -0.08$) (Table 3).

Table 2: Seasonal incidence of two-spotted spider mite on cucumber under polyhouse conditions.

Standard Meteorological Week	Maximum temperature (°C)	Minimum temperature (°C)	Average temperature (°C)	Average relative humidity (%)	No. of mite/inch ² of leaf area
9	27.00	13.75	20.38	70.13	0.00
10	29.14	15.57	22.36	62.43	0.00
11	32.29	17.29	24.79	62.43	0.00
12	33.71	17.86	25.79	53.14	0.00
13	33.71	16.71	25.21	47.86	0.71
14	37.86	21.86	29.86	44.57	1.57
15	36.86	22.57	29.71	50.29	4.71
16	39.00	24.14	31.57	50.36	5.14
17	40.29	24.14	32.21	42.79	6.98
18	39.29	24.71	32.00	55.00	10.17
19	39.57	25.43	32.50	50.86	12.96
20	40.57	27.57	34.07	56.07	19.46
21	36.71	25.14	30.93	54.07	13.42
22	39.57	27.14	33.36	56.37	25.19
23	42.00	29.43	35.71	59.36	11.78
24	40.71	28.57	34.64	58.57	2.45

Table 3: Correlation of two-spotted spider mite population with weather parameters

	Maximum temperature	Minimum temperature	Average temperature	Average relative humidity
Two spotted spider mites	$r = 0.62$	$r = 0.72$	$r = 0.68$	$r = -0.08$

3.2 Bioefficacy of different treatments against two-spotted spider mite

3.2.1 First spray: All treatments significantly reduced the mite population over the untreated control. Among the chemical treatments, spiromesifen was the most effective recording mean mite population of 2.98 mites per inch² of leaf area with 67.78 percent reduction over control (Table 4). This was followed by spinosad and thiamethoxam treatments, recording 64.44 and 59.83 percent reduction over control respectively. In the biological treatment, *Beauveria bassiana* recorded 60.65 percent reduction over control. Among the botanical treatments, neem leaf extract was the most effective, recording 43.79 percent reduction over control.

3.2.2 Second spray: Spiromesifen again proved most

effective treatment, recording the lowest mean mite population of 1.30 mites per inch² of leaf area with 70.67 percent reduction over control (Table 5). In spinosad and thiamethoxam treatments recorded 59.20 and 58.85 percent reduction over control, respectively, whereas in *Beauveria bassiana* treatment recorded 50.85 percent reduction. Among the botanical treatments, neem leaf extract @ 50 ml/l remained superior, recording 44.09 percent reduction over control. Spiromesifen 22.9% SC @ 0.8 ml/l emerged as the most effective treatment against *T. urticae*, followed by spinosad 45% SC @ 0.3 ml/l and thiamethoxam 25 WG @ 0.2 ml/l. Among the eco-friendly treatments, *Beauveria bassiana* 1.5% LF performed better than the botanical treatments, while neem leaf extract @ 50 ml/l was the most effective botanical treatment under polyhouse conditions.

Table 4: Bioefficacy of different treatments against two spider mites in cucumber under polyhouse condition after first spray

Mite population per inch ²												
Treatments	Doses	PTC	1 DAS	PR	3 DAS	PR	7DAS	PR	14 DAS	PR	Mean	PR
Neem leaf extract	50 ml/l	5.90 (2.53)	5.61 (2.47)	8.20	4.48 (2.23)	34.08	3.67 (2.04)	57.43	4.50 (2.24)	58.92	4.57 (2.25)	43.79
Chilli and garlic extract	100 ml/l	6.69 (2.68)	6.31 (2.61)	8.94	5.68 (2.49)	26.29	4.84 (2.31)	50.49	5.61 (2.47)	54.84	5.61 (2.47)	39.08
Cow urine and garlic extract	250 ml/l	5.94 (2.54)	5.13 (2.37)	16.62	4.71 (2.28)	31.16	4.09 (2.14)	52.88	4.48 (2.23)	59.38	4.60 (2.26)	43.71
Cow urine and garlic extract	500 ml/l	6.58 (2.66)	6.17 (2.58)	9.47	5.12 (2.37)	32.45	4.17 (2.16)	56.63	4.98 (2.34)	59.24	5.11 (2.37)	43.58
Spiromesifen 22.9% SC	0.8 ml/l	6.72 (2.69)	3.38 (1.97)	51.44	2.86 (1.83)	63.05	2.10 (1.61)	78.62	3.58 (2.02)	71.31	2.98 (1.87)	67.78
Thiamethoxam 25WG	0.2 ml/l	6.71 (2.69)	5.22 (2.39)	24.90	3.80 (2.07)	50.83	2.15 (1.63)	78.07	3.67 (2.04)	70.54	3.71 (2.05)	59.83
Spinosad 45% SC	0.3 ml/l	6.90 (2.72)	3.64 (2.03)	49.07	3.24 (1.93)	59.23	2.73 (1.80)	72.92	3.90 (2.10)	69.56	3.38 (1.97)	64.44
<i>Beauveria bassiana</i> 1.5% LF	4 ml/l	6.78 (2.70)	4.39 (2.21)	37.49	3.15 (1.91)	59.67	3.38 (1.97)	65.89	3.77 (2.07)	70.05	3.67 (2.04)	60.65
Control		6.98 (2.73)	7.23 (2.78)		8.04 (2.92)		10.20 (3.27)		12.96 (3.67)		9.61 (3.18)	
C.D. ($p = 0.05$)		NS	0.18		0.18		0.19		0.16			

Table 5: Bio-efficacy of different treatments against two spider mites in cucumber under polyhouse condition after second spray

Mite population per inch ²												
Treatments	Doses	PTC	1 DAS	PR	3 DAS	PR	7DAS	PR	14 DAS	PR	Mean	PR
Neem leaf extract	50 ml/l	4.50 (2.24)	3.88 (2.09)	21.36	3.10 (1.90)	46.98	2.29 (1.67)	66.11	3.14 (1.91)	32.61	3.10 (1.90)	44.09
Chilli and garlic extract	100 ml/l	5.61 (2.47)	5.16 (2.38)	16.11	4.33 (2.20)	40.60	3.72 (2.05)	55.84	4.72 (2.28)	18.75	4.48 (2.23)	35.21
Cow urine and garlic extract	250 ml/l	4.48 (2.23)	4.31 (2.19)	12.26	3.77 (2.07)	35.24	3.48 (1.99)	48.27	4.47 (2.23)	3.64	4.01 (2.12)	27.46
Cow urine and garlic extract	500 ml/l	4.98 (2.34)	4.63 (2.26)	15.21	3.98 (2.12)	38.49	3.27 (1.94)	56.27	3.94 (2.11)	23.60	3.96 (2.11)	35.60
Spiromesifen 22.9% SC	0.8 ml/l	3.58 (2.02)	1.78 (1.51)	54.65	1.17 (1.29)	74.85	1.05 (1.24)	80.47	1.18 (1.30)	68.17	1.30 (1.34)	70.67
Thiamethoxam 25WG	0.2 ml/l	3.67 (2.04)	2.74 (1.80)	31.91	1.90 (1.55)	60.16	1.28 (1.33)	76.77	1.53 (1.42)	59.74	1.86 (1.54)	58.85
Spinosad 45% SC	0.3 ml/l	3.90 (2.10)	2.25 (1.66)	47.38	1.87 (1.54)	63.10	1.60 (1.45)	72.68	2.13 (1.62)	47.26	1.96 (1.57)	59.20
<i>Beauveria bassiana</i> 1.5% LF	4 ml/l	3.77 (2.07)	2.62 (1.77)	36.62	1.83 (1.53)	62.64	1.99 (1.58)	64.85	2.70 (1.79)	30.84	2.29 (1.67)	50.85
Control		12.96 (3.67)	14.21 (3.84)		16.84 (4.16)		19.46 (4.47)		13.42 (3.73)		15.98 (4.06)	
C.D. (p = 0.05)		0.16	0.16		0.13		0.11		0.10			

4. Discussion

The population of two-spotted spider mite increased with rising temperature and reached its peak during the 22nd SMW. The positive correlation with temperature and negative correlation with relative humidity indicate that warm and relatively dry conditions favoured mite multiplication. Similar findings were reported by Verma *et al.* (2025) [16] and Goudia *et al.* (2023) [5]. Among all the treatments, Spiromesifen 22.9% SC proved to be the most effective due to its translaminar movement and inhibition of lipid biosynthesis, which disrupts egg development and immature stages of mites, thereby reducing their population effectively. Similar findings were reported by Sood *et al.* (2015) [15] and Yaligar *et al.* (2015) [17]. Spinosad 45% SC was the second most effective treatment, possibly because of its action on the nervous system causing paralysis of mobile stages, although its lower ovicidal activity resulted in comparatively reduced efficacy. Among the biological treatments, *Beauveria bassiana* 1.5% LF effectively suppressed mite populations by penetrating the cuticle, proliferating inside the host and causing mortality through fungal infection, as reported by Seyed-Talebi *et al.* (2012) [11] and Gatarayiha *et al.* (2010) [2]. Among the botanicals, cow urine + garlic extract performed better due to the combined acaricidal and repellent effects of allicin and bioactive compounds present in cow urine, whereas chilli + garlic extract provided moderate suppression owing to the presence of capsaicin and allicin with repellent and antifeedant properties. Neem leaf extract was comparatively less effective because azadirachtin primarily acts as an antifeedant and growth regulator with shorter residual activity. The untreated control recorded the highest mite population, indicating that warm temperature and low relative humidity under protected conditions favoured rapid multiplication of mites, as also reported by Kumar *et al.* (2014) [7] and Ghongade and Sangha (2021) [3]. These findings suggest that spiromesifen is the most effective option for mite management, while *B. bassiana* and botanical treatments can be integrated into sustainable IPM programmes.

5. Conclusion

The present study demonstrated that the incidence of two-spotted spider mite, *Tetranychus urticae* Koch, on cucumber under polyhouse conditions was strongly influenced by weather parameters, with mite populations increasing under higher temperatures and lower relative humidity, reaching peak infestation during the 22nd Standard Meteorological Week. Among the treatments evaluated, Spiromesifen 22.9% SC @ 0.8 ml l⁻¹ proved to be the most effective in reducing mite population after both spray applications,

followed by Spinosad 45% SC and Thiamethoxam 25 WG. Among the eco-friendly treatments, *Beauveria bassiana* 1.5% LF showed superior efficacy, while neem leaf extract was the most effective botanical treatment. Although botanical formulations provided comparatively lower control than chemical acaricides, they offer environmentally safe alternatives and can be integrated into sustainable pest management strategies. The findings indicate that an integrated approach combining effective chemical acaricides with biological and botanical treatments can successfully manage spider mite infestations while reducing dependence on synthetic pesticides. Such an IPM-based strategy can improve cucumber productivity, minimize environmental risks and support sustainable protected cultivation.

References

1. Devi M, Challa N. Impact of weather parameters on seasonality of phytophagous mites. *J Entomol Zool Stud.* 2019;7(4):1095-1100.
2. Gatarayiha MC, Laing MD, Miller RM. Combining applications of potassium silicate and *Beauveria bassiana* to four crops to control two-spotted spider mite, *Tetranychus urticae* Koch. *Int J Pest Manag.* 2010;56(4):291-297.
3. Ghongade DS, Sangha KS. Population dynamics of two-spotted spider mite *Tetranychus urticae* Koch on parthenocarpic cucumber in net house. *Indian J Entomol.* 2021;83(4).
4. Golizadeh A, Ghavidel S, Razmjou J, Fathi SAA, Hassanpour M. Comparative life table analysis of *Tetranychus urticae* Koch (Acari: Tetranychidae) on ten rose cultivars. *Acarologia.* 2017;57(3):607-616.
5. Goudia N, Jena MK, Singh RR. Dynamics of pests, natural enemies and pollinators of *Lycopersicon esculentum* Mill. and correlation with weather parameters. *Int J Environ Clim Change.* 2023;13(6):128-142.
6. Kumar A, Singh SK. Integrated approaches for managing potato early blight: evaluating fungicides, botanicals, biocontrol agents, and resistance genotypes against *Alternaria solani*. *Vegetos.* 2025;38:1-8.
7. Kumar D, Raghuraman M, Singh RN, Santeswari, Singh J. Effect of environmental factors on the population of spider mite, *Tetranychus urticae* Koch on okra in Varanasi region. *J Environ Biol.* 2014;35(4):231-235.
8. Mallick PK. Evaluating potential importance of cucumber (*Cucumis sativus* L.; Cucurbitaceae): a brief review. *Int J Appl Sci Biotechnol.* 2022;10(1):12-15.
9. Meena NK, Rampal, Barman D, Medhi RP. Biology and seasonal abundance of the two-spotted spider mite,

- Tetranychus urticae*, on orchids and rose. *Phytoparasitica*. 2013;41(5):597-609.
10. Safaa MAR, Fathia IM, Hedaya AK, Manal AA. Predacious mites as a tool to manage spider mites *Tetranychus* spp. population on cotton cultivars.
 11. Seyed-Talebi FS, Kheradmand K, Talaei-Hassanlou R, Talebi-Jahromi K. Sublethal effects of *Beauveria bassiana* on life table parameters of two-spotted spider mite, *Tetranychus urticae* (Acari: Tetranychidae). *Biocontrol Sci Technol*. 2012;22(3):293-303.
 12. Shukla RM, Nazir NB, Pandey Y, Dadhich SM. Influence of protected cultivation structures on vegetable crops. *J Agric Ecol*. 2024;25:116-122.
 13. Singh MC, Singh JP, Pandey SK, Cutting NG, Sharma P, Shrivastav V, *et al*. A review of three commonly used techniques of controlling greenhouse microclimate. *Int J Curr Microbiol Appl Sci*. 2018;7(1):3491-3505.
 14. Singh P, Singh RN, Srivastava CP. Phytophagous mites of Indian fruit plants. In: *Insect Pests Management of Fruit Crops*. 2016. p. 621-649.
 15. Sood AK, Sood S, Singh V. Efficacy against red spider mite, *Tetranychus urticae* Koch, on parthenocarpic cucumber under protected environment. *Bioscan*. 2015;10(3):963-966.
 16. Verma SC, Sharma PL, Chandel VG, Chandel RS, Sharma N, Sharma P, *et al*. Management of *Tetranychus urticae* Koch (Acari: Tetranychidae) on cucumber using *Blaptostethus pallescens* Poppius (Hemiptera: Anthocoridae) and *Neoseiulus longispinosus* (Evans) (Acari: Phytoseiidae) under polyhouse conditions. *Int J Trop Insect Sci*. 2025;45:689-697.
 17. Yaligar R, Kalmath B, Kapasi M. Bio-efficacy of spiromesifen 240 SC against mite pests in cucumber. *Bioscan*. 2015;10(3):1079-1081.