# *Original Research Article*

# Integrated Assessment of Pesticide Efficacy Against *Aceria litchii* (Keifer) in Litchi Orchards of Bihar, India

# Abstract

This study evaluated the efficacy and toxicity of various pesticides against *Aceria litchii* (Keifer), a major pest threatening litchi production in Bihar, through integrated laboratory and field trials. Laboratory bioassays, based on a modified Voss–Dittrich method, determined LC₅₀ values and relative toxicity for nine pesticides, revealing that sulphur and dicofol exhibited superior efficacy with the lowest LC₅₀ values and highest relative toxicity, while tetradifon and malathion were less effective. Field evaluations conducted over two consecutive years on 10-year-old litchi trees corroborated laboratory findings, with sulphur (0.05%) and dicofol (0.05%) significantly reducing mite populations and leaf distortion compared to untreated controls. A modified algicidal trial further assessed commonly available algicides, demonstrating that wettable sulphur, sulphur combined with dicofol, and Bordeaux mixture effectively reduced both mite populations and subsequent leaf re-infestation. The findings underscore the potential of integrating sulphur and dicofol into pest management programs, while also highlighting the necessity for rotation strategies to prevent resistance. This comprehensive evaluation provides a valuable framework for sustainable control of *Aceria litchii*, ultimately contributing to improved litchi yield and quality.

**Keywords:** *Aceria litchii*, Litchi Orchards, Pesticide Efficacy, Litchi Erinose Mite, Sustainable Litchi Cultivation.

# Introduction

India is one of the largest litchi producers (*Litchi chinensis*), contributing significantly to global production. The fruit is primarily cultivated in the country's subtropical regions, with Bihar, West Bengal, Uttar Pradesh, and Jharkhand being the major litchi-growing states [1]. India produces approximately 500,000 metric tons of litchi annually, with Bihar accounting for over 40% of the total production [2, 3]. Bihar is the leading producer of litchi in India, with districts such as Muzaffarpur, Vaishali, and Samastipur being the major hubs. The favorable climatic conditions and fertile soil of the region make it ideal for litchi cultivation. Muzaffarpur, often referred to as the "Litchi Capital of India," is the largest producer of litchi in Bihar. The region contributes approximately 300,000 metric tons of litchi annually, accounting for nearly 80% of Bihar’s total litchi production [4]. The district has around 28,000 hectares of land under litchi cultivation, with the majority of farmers relying on this fruit for their livelihood. The prominent variety grown in Muzaffarpur is Shahi litchi, which is known for its superior quality, aroma, and sweetness. The district’s litchi is exported to international markets, including the Middle East and Europe, contributing significantly to the region's economy. Litchi production is severely threatened by *Aceria litchii* (Keifer), a microscopic eriophyid mite that causes considerable damage to litchi orchards [5]. Pest infestations, particularly caused by *Aceria litchii* (Keifer), pose a serious threat to litchi production in Muzaffarpur. Infestations can lead to a yield loss of 30–40% annually, depending on the severity of the attack [6]. In severe cases, the damage can escalate, resulting in up to 50% crop loss. *Aceria litchii*, the litchi mite, damages young leaves, flowers, and fruits, resulting in leaf curling, necrosis, flower abortion, and fruit malformation. Severe infestations can lead to significant economic losses by reducing both yield and fruit quality, thereby impacting farmers' livelihoods and the litchi industry as a whole causing malformation and reducing market value. Other pests, such as fruit borers and bark-eating caterpillars, also contribute to production losses. Economic losses due to pest infestations in Muzaffarpur have been estimated at around ₹150–200 crore annually, significantly affecting farmers’ incomes. In addition, the compromised quality of the produce impacts export potential, leading to further financial setbacks for the litchi industry. The economic impact of *A. litchii* infestations has prompted growers to rely on a variety of management strategies, including cultural practices and chemical control [29]. However, inconsistent field performance and concerns over resistance development underscore the need for precise evaluation of pesticide efficacy [7]. To combat this pest, chemical control using pesticides has been the most widely adopted approach due to its rapid action and effectiveness. However, the efficacy and toxicity of pesticides against *Aceria litchii* can vary under different conditions. Laboratory studies allow for controlled experiments to determine the contact toxicity of pesticides on adult mites, while field evaluations provide a practical understanding of pesticide performance in natural environments where factors such as weather, plant physiology, and other environmental variables play a role [8]. The integration of laboratory and field assessments is critical for obtaining comprehensive insights into pesticide performance. Laboratory tests help identify potential toxicants and their lethal doses, while field experiments validate these results under real-world conditions, ensuring that the selected pesticides maintain efficacy in practical applications. Moreover, evaluating the toxicity of pesticides is essential to assess their environmental impact [31, 32] and safety for beneficial organisms, thus contributing to the development of sustainable pest management strategies [9]. This study aims to combine laboratory and field evaluations to assess the toxicity and efficacy of various pesticides against adult *Aceria litchii*. By identifying the most effective pesticides that balance high efficacy with minimal environmental impact, the study seeks to provide valuable recommendations for integrated pest management (IPM) programs. The Study reflects a holistic view of rural development, where improving environmental factors can yield benefits across multiple sectors [10]. The goal is to develop a holistic and sustainable approach to managing *Aceria litchii* infestations, thereby ensuring improved production and safeguarding the ecological balance.

MATERIALS AND METHODS

Surveys were conducted in 8 districts of north Bihar, viz., Begusarai, Darbhanga, Madhubani, Motihari, Muzaffarpur, Samastipur, Sitamarhi, and Vaishali, during the year 2023-24. In each route several steps were made for data collection in litchi orchards. The percentage infestations were calculated using the following formulas:-

Percent tree infestation = [Sum of infested trees in district/Total no. of trees of district Observed] × 100

Percent leaf infestation = [Sum of infested leaf in a district / Total no. of leaves of the districts Observed]

× 100

List 1: Leaf infestation incidence index:

|  |  |
| --- | --- |
| **Grade** | **Range of leaf infestation** |
| No incidence | Less than 1% |
| Less incidence | 1 to 10 % |
| Moderate incidence | 11 to 30 % |
| Heavy incidence | 31% above |

While estimating the leaf infestation 10 twigs (6 cm long) containing approximately 20 leaves were plucked from both sides of a tree, i.e., 5 twigs facing towards the trunk and 5 twigs facing away from the trunk, at random, and the percentage leaf infestation was calculated. In solid planting, i.e., in larger orchards, such observations were recorded at every 6th tree. The total number of infested trees in an orchard revealed the percentage of tree infestation. For estimation population dynamics mite/2.5 cm² leaf surface, out of 200 leaves collected from an orchard, 5 leaves were chosen at random, brought to laboratory for recording mite/2.5 cm² under stereo zoom binocular microscope. For the study of the toxicity of different pesticides as contact poison to the adults of *Aceria litchii* (Keifer) under laboratory conditions, the method originated by Voss and improved by Dittrich was followed [11, 12]. The adults of the litchi mite were obtained from an untreated farmer’s field where no pesticidal treatment had been given for the last two years. The heavily infested old litchi leaves were brought to the laboratory and kept under an electric bulb 100 watt to crawl out the mite from perineum. Pesticidal emulsions were prepared from their commercial formations using distilled water. For the toxicity test, a microscopic slide was pasted with sticky material (egg albumen) and a known number of mites were released on it by sticking a piece of dried infested leaf with a small glass rod over the slide. The prepared slide was dipped in serial dilution of various pesticides for five seconds. They were drained by placing them on edge for 15 minutes at room temperature (26 ± 1ºC in slide holder). For the assessment of mortality, counts were made after 24 hours. Mites moving when disturbed with a fine brush were recorded. Each experiment was replicated four times. The mortality in control (Mites released on egg albumen) was also recorded. The mortality data thus obtained were subjected to probit analysis [13], and LC 50 values for each pesticide were calculated. Based on LC 50 values relative toxicity of different pesticides has been calculated by taking the LC 50 values of endosulfan as unity. For Study field evaluation of different pesticides against *Aceria litchii* (keifer), field trials were carried out during 2023 and 2024 on 10 year old litchi trees at NRCL farm using randomised block design with three replications [14]. The pesticides were evaluated for 2 years during January-April. Spraying was done in the mid-January with an HTP power sprayer. Approximately 10-15 liters of spray solution was required to cover the entire foliage of each tree. The check plants were sprayed with plain water. Newly infested mite colonies at different niches in different directions were earmarked. Pre and Post mite population counts of living mites per 2.5 cm² leaf surface were recorded at 2, 7 and 14 days after spraying. Predatory mites inhabiting the same niches were counted/100 leaves (entire leaf surface). Mortality counts were worked out by computing differences between Pre and post treatment population of mites by applying Abbots (1925) correction factor [15]. The data thus obtained were statistically analyzed after angular transformation [16] and presented in Table-2. Re-infestation in term of percentage leaf infestation 3 months after treatment was recorded based on damage to assess the re- infestation by the mite. For study of efficacy of some algicides against *Aceria litchii* (Keifer) and reappearance of symptom of leaf curling, A Field trial on the ‘Shahi’ variety was conducted during July 2024, just after pruning at NRCL, Mushahari, Muzaffarpur. Based on the unfavorable response of insecticide as well as acaricidal trials conducted during previous years. The treatments were replicated thrice using randomised block design. Spraying was done with an HTP power sprayer on 10-12 year old plants. Approximately 20 liters of spray solution were prepared to cover their entire foliage of the tree. The data were statistically analyses after angular transformation.

# Results and Discussion

# *Evaluation of pesticides Toxicity against adult Aceria litchii under laboratory conditions*

The relative toxicity of nine pesticides was evaluated as contact poisons against adult *Aceria litchii* (Keifer) under laboratory conditions. The results presented in Table-1, provide insights into the effectiveness and toxicity levels of the tested pesticides, as indicated by their LC₅₀ values and relative toxicity. The LC₅₀ values of the tested pesticides ranged from 0.0051 ppm (Sulphur) to 0.0953 ppm (Tetrodifon), indicating a wide variation in their effectiveness. Sulphur demonstrated the highest toxicity with the lowest LC₅₀ value of 0.0051 ppm, suggesting that it required the least concentration to achieve 50% mortality of adult *Aceria litchii*. Ramos et. al. use of the Bordeaux mixture and lime sulfur showed a significant effect in reducing the incidence of the same [17]. Sulphur and dicfol were the most efficacious insecticides in reducing the mite population as compared to other. This conforms to the findings of Patel (2020) and Siddhapara (2016) [18, 19]. In contrast, Tetrodifon exhibited the highest LC₅₀ value of 0.0953 ppm, making it the least effective among the tested pesticides. The relative toxicity values revealed significant differences in pesticide efficacy. Sulphur showed the highest relative toxicity (0.052), followed by Dicofol (0.151), indicating their superior effectiveness against *Aceria litchii*. On the other hand, Tetrodifon had the highest LC₅₀ value and the lowest relative toxicity (1.060), suggesting limited effectiveness. Among the organophosphate and organochlorine pesticides, Endosulfan (0.734), Phenthoate (0.682), Phosphamidon (0.828), and Ethion (0.850) demonstrated moderate toxicity. Malathion (0.892) and Phosalone (0.779) showed slightly lower toxicity compared to other pesticides in this group. The heterogeneity factor (χ²) values for all pesticides were non-significant at P < 0.05, indicating that the data obtained were consistent and reliable. This suggests that the dose-response relationships for all pesticides were homogeneous and fit the probit regression model. The findings underscore the importance of selecting appropriate pesticides to control *Aceria litchii*. Sulphur and Dicofol, with their high relative toxicity and lower LC₅₀ values, can be incorporated effectively into IPM programs. However, the prolonged use of these pesticides may lead to resistance development, necessitating the adoption of rotation strategies and integrated approaches involving biological and cultural control methods.

Table-2 showed the study during both the years of 2023 & 2024). All the insecticides / acaricides were significantly effective against the mite *Aceria litchii* as compared to the check. During 2023, amongst various pesticides, sulphur (0.05%) proved as the most efficacious over other insecticides following 2, 7, and 14 days after application. These insecticides provided maximum reduction (%) of the pest, i.e., 93.84, 97.17, and 71.07 at these durations, respectively. Dicofol (0.05%) was next in order of efficacy, followed by phenthoate, endosulfan, ethion, tetradifon, phosalone, and phosphamidon. The results obtained during the second consecutive year, i.e., 2024, were consistent with those of results obtained during 2023, as evident from Table-2. During 2024, also, the sulphur (0.05) and dicofol (0.05%) were the most efficacious insecticides in reducing the mite population as compared to others. This confirms the findings of Sharma and Rahman [20] and Lall and Rahman [21, 35]. They also found dicofol as very effective against this pest on litchi when treated at pre-bloom and post-bloom stages. In both the years (2023 and 2024), sulphur (0.05%), dicofol (0.05%), and endosulfan (0.05%) were most effective in reducing the symptom, i.e., distortion of litchi leaves (Table-2). However, the maximum effect was noticed with sulphur (0.05%), followed by dicofol and endosulphan. In these treatments, curling of litchi leaves was recorded less (17.43) as compared to the check (68.92); other pesticides failed to protect the foliage for a longer time.

# *Impact of pesticide treatment on the mortality of Aceria litchii under field conditions*

The population build-up of these mites starts in March and increases gradually till June, after which there is a decline in their population. The effects of conduct toxicity of eight insecticides/ acaricides to predatory mite of *Aceria litchii* are presented in Table-3. Among the pesticides tested, sulphur and dicofol each (0.05%) are found to be significantly less toxic and produced 0.66 to 1.33 percent mortality, respectively during 48 hours after spraying, whereas the toxicity of other pesticides. Such as endosulfan, phenthoate, phosphamidon, ethion, phosalone, and tetradefon have indicated 76.00 to 100 mortalities during 48 hours after spraying. The percent mortality of predatory mites obtained due to the persistence of pesticide residue is also indicated (Table-3). The residue of sulphur was not found to be totally innocuous whereas the residue of dicofol was found to be less toxic, causing 10 percent mortality to predatory mites when recorded 7 days after treatment. Eighty to hundred per cent mortality was recorded in residue of endosulfan, phenthoate, phosphamidon, ethion, phosalone and tetradifon on 7th day after treatment. Thus, based on the results obtained, sulphur and dicofol were found to least toxic to the predatory mites. The present finding supports the observations made by Overneer and Vanzon [22, 33] that the chemical endosulfan was found to be highly toxic to various predatory mite like Typhlodromus pyri, Amblyseius potentillae and Amblyseius bibenes but does not support the observation made by several authors [23, 30, 24]; and Hislop and Prokopy [24]; they that endosulfan was found to be non-toxic or less toxic to Amblyseius fallocis (German). The result of the present study indicated that the acaricides like sulphur and dicofol can be used safely against the *Aceria litchii* whose residue do not show any deleterious effect on predatory mites present in the same ecological niche in association with *Aceria litchii*. The other pesticides like endosulphan, phenthoate, phosphamidon, ethion, phosalone, and tetradifon could be recommended against *Aceria litchii*. In light of the results of the two years, a modified algicidal trail was conducted to determine the efficacy of some commonly available algicides against the *Aceria litchii*.

***Bio-efficacy of various insecticides against mite Aceria litchii***

The trail comprised to six treatments, including control, and each treatment was replicated thrice. Before spraying, the population density of mites per 2.5 cm² leaf surface was estimated. After the treatment, observations on the population reduction (%) were recorded at the intervals of 2, 7, and 14 days interval. After one month, the leaf infestation (%) was also recorded.

The results of the experiment are summarized in Table-4. In perusal of data, it is evident that in the 2 days after the application of the algicide, all the algicide was found to reduce the mite population significantly in comparison to the control. Wettable sulphur (50 WP) was found highly effective in reducing the mite population (90.25%). Sulphur followed by dicofol (0.3%) and boardeaux mixture (1%) were at par. After 7 days, 75.25 to 88.25 percent population reduction was recorded in treatments bordeaux mixture (1%) Sulphur + dicofol (0.2 + 0.3) and wettable sulphur. These algicides were found statistically superior over Bordeaux (0.5) and copper oxichloride (0.5%). At 14 days after treatment, the wettable sulphur was the only effective treatment, which gave the highest population reduction (79.25%). The percentage of new leaf re-infestation was also recorded in the next flushing season i.e. during July- August. It is clear from Table-4 that the minimum (3.88%) re-infestation was recorded on trees treated with wettable sulphur, followed by sulphur + dicofol (0.2 + 0.3 %) and the Bordeaux mixture (1%). Thus, for effective control of Aceria litchii, these three algicides viz. Sulphur (0.1%), sulphur + dicofol (0.2 + 0.3%), and bordeaux mixture (1%) could be recommended profitable. Kim (2010) recommended crude oil emulsion and lime sulphur against the mite at the time of new flush [25, 28]. Prasad and Singh (1981) reported that microwet sulphur or micro-999 @ 0.04 percent, consecutively for 2-3 years during June-July was found highly effective and economical. To date, authors recommended various insecticides/ acaricides viz., dimethoate, dicofol, endosalfan, Malathion, Phosphamidon, wettable sulphur against the mist [26]. None of the workers have emphasized the control of Cephaleurosvirescens, which harbor the mite *Aceria litchii* on litchi. Sood *et.al*. (1987) reported that spraying of lime sulphur at least thrice during autumn and spring season and burning of pruned infected twigs had reduced the infection by 94 percent [27].

# Conclusion

This study provides a comprehensive evaluation of pesticide efficacy against *Aceria litchii* in litchi orchards through both laboratory and field trials. The laboratory bioassays revealed that sulphur and dicofol were the most effective, exhibiting the lowest LC₅₀ values and highest relative toxicity against the mite, while tetrodifon and malathion were comparatively less effective. Field trials conducted over two consecutive years confirmed these findings, with sulphur (0.05%) and dicofol (0.05%) significantly reducing mite populations and mitigating leaf distortion. In addition, the modified algicidal trial demonstrated that wettable sulphur, sulphur combined with dicofol, and Bordeaux mixture substantially lowered mite populations and minimized re-infestation in the subsequent flushing season. Furthermore, the study highlights the importance of selecting pesticides that not only target *Aceria litchii* effectively but also exhibit minimal adverse effects on beneficial predatory mites. The integration of these findings into an Integrated Pest Management (IPM) framework, with rotation strategies to prevent resistance development, offers a promising approach for sustainable litchi production. Ultimately, this work contributes valuable insights for optimizing pest control measures, ensuring improved yield and quality in litchi orchards while safeguarding the ecological balance.

**Recommendation:**

It is recommended that litchi cultivation practices be optimized by implementing advanced irrigation techniques, pest management strategies, and improved post-harvest handling to enhance yield and quality. Furthermore, market accessibility should be strengthened through better supply chain management and farmer training programs to ensure economic sustainability. Investment in research and development, particularly in climate-resilient varieties, will also play a crucial role in the long-term success of litchi production

**Future scope of study:**

Future research on litchi cultivation can focus on developing climate-resilient litchi varieties to withstand changing environmental conditions and improve yield consistency. Exploring advanced irrigation techniques, soil health management, and organic farming practices can further enhance productivity and fruit quality. Additionally, studies on pest and disease resistance, along with the development of eco-friendly pest control methods, will contribute to sustainable cultivation. Research on post-harvest technologies, including storage, transportation, and packaging, can help reduce spoilage and extend shelf life. Market research and analysis of consumer preferences, both domestically and internationally, will provide valuable insights for improving market access and profitability. Finally, integrating modern technology such as precision agriculture and data-driven farming can revolutionize litchi cultivation and ensure long-term sustainability

Disclaimer (Artificial intelligence)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

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# Table-1: Relative toxicity of some pesticides as contact poison to *Aceria litchii* (Keifer) (Laboratory condition)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Pesticides** | **Heterogeneity** | **Regression equation** | **LC50**  **ppm** | **Fiducial limit (ppm)** | **Relative toxicity** |
| Sulphur | x²(3) = 0.242041 | Y = 0.0641x + 4.851 | 0.0051 | 0.00174499 –0.01466023 | 0.052 |
| Dicofol | x²(3) = 0.00409765 | Y = 1.0714x + 3.760 | 0.0144 | 0.00639072 –0.03251251 | 0.151 |
| Endosulfan | x²(3) = 0.02578780 | Y = 2.1828x + 0.990 | 0.0700 | 0.04671518 –0.10205989 | 0.734 |
| Phenthoate | x²(3) = 0.0053299 | Y = 1.870x + 1.612 | 0.0650 | 0.04565695 –0.09370306 | 0.682 |
| Phosphamidon | x²(3) = 0.0037871 | Y = 1.761x + 1.660 | 0.0790 | 0.05315249 –0.11752590 | 0.828 |
| Ethion | x²(3) = 0.00250051 | Y = 2.521x + 0.191 | 0.0810 | 0.06672403 –0.09852047 | 0.850 |
| Phosalone | x²(3) = 0.02414432 | Y = 1.5511x + 2.101 | 0.0743 | 0.04536777 –0.0779 | 0.779 |
| Tetrodifon | x²(3) = 0.0002160 | Y = 1.441x + 2.151 | 0.0953 | 0.05853330 –0.16274637 | 1.060 |
| Malathion | x²(3) =0.99970924 | Y = 2.200x +0.751 | 0.0851 | 0.06107311 –0.11861178 | 0.892 |

Y = Probit Kill; x = log (concentration × 10³); LC₅₀ = concentration calculated to give 50% kill. In none of the cases were the data found to be significantly heterogeneous at P < 0.05.

# Table-2 Bio-efficacy of various insecticides against mite *Aceria litchii* infesting litchi with respect to percent reduction.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Insecticides** | **Concentration**  **%** | **Percent Reduction (2023)** | | | **Percent Reduction (2024)** | | |
| **After 2 days** | **After 7 days** | **After 14 days** | **After 2 days** | **After 7 days** | **After 14 days** |
| Sulphur (Sulflex- 80WP) | 0.05 | 93.84  (78.33) | 97.17  (82.50) | 71.07  (57.96) | 100.00  (90.00) | 98.27  (83.99) | 89.25  (71.62) |
| Dicofol (Kelthane 18SEC) | 0.05 | 88.92  (97.05) | 84.33  (69.92) | 68.90  (56.26) | 88.20  (96.67) | 80.62  (65.86) | 78.50  (62.97) |
| Endosulfan (Thiodon 35EC) | 0.05 | 49.66  (44.81) | 47.39  (44.56) | 48.76  (44.28) | 79.27  (65.67) | 78.50  (65.67) | 58.50  (50.10) |
| Phenthoate (Elasan 50EC) | 0.05 | 83.42  (66.42) | 81.15  (68.37) | 51.33  (45.71) | 82.71  (66.69) | 76.61  (60.63) | 54.50  (47.62) |
| Phosphamidon (Dimecron 100 EC) | 0.05 | 38.56  (31.49) | 49.01  (43.27) | 47.80  (43.08) | 73.60  (59.34) | 64.50  (53.62) | 40.50  (39.45) |
| Ethion (Mitici 50EC) | 0.05 | 71.33  (58.92) | 68.92  (57.47) | 45.66  (42.49) | 82.50  (66.14) | 80.50  (47.95) | 35.50  (37.20) |
| Phosalone (Zolohe 35EC) | 0.05 | 64.62  (46.84) | 64.83  (53.73) | 44.00  (41.42) | 66.83  (54.52) | 63.47  (52.95) | 46.50  (42.95) |
| Tetrodifon (Tedion 18WP) | 0.05 | 76.24  (61.91) | 73.64  (56.11) | 43.30  (41.74) | 80.87  (65.71) | 80.70  (57.86) | 40.20  (39.44) |
| Check | - | 0.54  (31.13) | 0.32  (3.25) | 0.23  (2.75) | 0.43  (3.74) | 0.31  (3.11) | 0.30  (3.11) |
| S.Em (±) | - | 1.93 | 11.09 | 5.57 | 4.84 | 3.86 | 4.99 |
| C.D. (P=0.05) |  | 5.36 | 32.97 | 16.55 | 14.37 | 11.46 | 14.84 |

Note:

Each figure is an average of 3 replications. Figures in parentheses are angular values.

**Table-3 Residual effect of pesticide on reappearance of symptom and on mortality of adults (Predatory Mites).**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Treatments | % Damaged new leaf (2012) | % Damaged new leaf (2013) | % Mortality due to residues  (2 days p.t.) | % Mortality due to residues  (7 days p.t.) |
| Sulphur (0.05) | 17.76 (24.83) | 17.90 (25.10) | 0.66 (4.63) | 0.33 (1.91) |
| Dicofol (0.05) | 14.43 (24.67) | 19.45 (6.31) | 1.33 (6.31) | 1.00 (4.62) |
| Endosulfan (0.05) | 20.94 (28.17) | 17.19 (24.37) | 76.00 (61.11) | 60.16 (51.49) |
| Phenthoate (0.05) | 53.01 (46.75) | 58.75 (50.06) | 81.50 (64.63) | 72.00 (58.82) |
| Phosphamidon (0.05) | 64.40 (52.85) | 65.33 (54.01) | 75.83 (61.05) | 64.00 (53.29) |
| Ethion (0.05) | 66.56 (54.68) | 64.00 (53.34) | 35.83 (68.07) | 74.50 (6.79) |
| Phosalone (0.05) | 57.46 (50.98) | 58.93 (50.70) | 85.66 (50.19) | 79.00 (62.90) |
| Tetridifon (0.05) | 67.55 (55.34) | 56.06 (48.68) | 100.00 (90.10) | 100.00 (90.00) |
| Check | 68.92 (56.13) | 70.58 (57.23) | 3.00 (9.55) | 0.00 (0.00) |

Note: p.t. = Post treatment; Figures in parentheses are angular values

Statistical Parameters

|  |  |
| --- | --- |
| Parameter | Value |
| S.Em (±) | 1.93, 3.91 |
| C.D. (P=0.05) | 5.79, ---- |
| C.D. (P=0.05) between treatment | 4.70 |
| C.D. (P=0.01) | 7.98, 16.16 |
| C.D. (P=0.01) Period | 4.49 |
| Interaction between treatment and period | 13.48 |

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**Table-4 Percentage reduction of mite population *Aceria litchii* (Keifer) after combined application of Acaricides, insecticides, fungicide & algaecide (during 2024)**.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Treatment** | **Concentration**  **(%)** | **Mean pre- treatment mite population** | **Percentage reduction** | | | **Percentage re-infestation / mite** |
| **(After 2 days)** | **(After 7 days)** | **(After 14 days)** |
| T1 Wettable Sulphur | 0.1 | 264.00 | 90.72  (72.37) | 88.25  (69.85) | 79.25  (62.93) | 3.88  (9.12) |
| T2 Sulphur followed by dicofol | 0.2 + 3.0 | 273.00 | 85.75  (67.83) | 76.50  (61.00) | 64.50  (53.43) | 8.09  (13.21) |
| T3 Bordeaux Mixture | 1.0 | 284.00 | 85.50  (67.53) | 75.25  (60.17) | 62.00  (51.95) | 8.26  (15.29) |
| T4 Bordeaux Mixture | 0.5 | 292.00 | 83.00  (65.68) | 70.00  (56.80) | 44.50  (41.84) | 22.92  (28.41) |
| T5 Copper oxychloride | 0.5 | 294.00 | 82.50  (56.29) | 71.00  (57.43) | 40.62  (39.44) | 29.62  (32.98) |
| T6 Control | - | 264.00 | 0.74  (4.36) | 0.70  (4.80) | 0.41  (3.74) | 38.08  (37.89) |
| S.E. Mean (±) |  |  | 0.62 | 0.40 | 0.70 | 4.90 |
| C.D. at 5% |  |  | 1.84 | 1.19 | 2.08 | 15.09 |
| C.D. at 1% |  |  | 1.52 | 1.63 | 2.85 | 21.15 |

\*Figures in parentheses indicate the degree transformed value.