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# Seasonal incidence of leaf mite, *Oligonychus oryzae* Hirst. (Acari: Tetranychidae) in Rice

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**Abstract**
Leaf mite, *Oligonychus oryzae* (Acari: Tetranychidae) is assuming the major pest status of rice and cause considerable yield loss in the rice cultivated under rainfed and upland systems. The seasonal incidence of rice leaf mite was studied in the rice fields of Tamil Nadu Agricultural University, Coimbatore on the popular variety CO-51 during 2015-16. The results revealed that the leaf mite incidence was more during September - October with the population ranging from 7.36 to 8.57 mites /1x10 cm leaf length. Minimum population was recorded during November 2015 to February 2016 (standard week 44 of 2015 to standard week 5 of 2016). Again the population gradually increased and reached its peak during the month of April with 16.49 mites /1x10 cm leaf length (standard week 17 of 2016). Correlation studies between the mite population and weather factors revealed that there was a significant positive correlation with maximum and minimum temperature, negative correlation with morning and evening relative humidity. Rainfall also showed negative correlation with mite population. Regression analysis revealed that for every unit increase in maximum and minimum temperature there was an increase of 1.15 and 1.36 mites, whereas for every unit increase in morning relative humidity, evening relative humidity and rainfall, mite population decreased by 0.72, 0.27 and 0.53, respectively.

**Keywords:** Rice, leaf mite, *Oligonychus oryzae*, seasonal incidence, weather factors

## 1. Introduction

In India, rice is the major agricultural crop and it is the staple food in most of the states, however productivity is very low due to several abiotic and biotic stresses. Among the biotic stress insect pests are the major and ravage caused by these pest at different stages of crop growth leads to severe yield loss. The major insect pests are brown planthopper, stem borers, leaf folders and gall midge which cause economic yield loss to the farmers regularly. However, some of the minor pests like mites are becoming severe in rice due to changing climate, alteration in the cropping pattern and usage of synthetic chemicals. In recent times, leaf mite *Oligonychus oryzae* Hirst. (Acari: Tetranychidae) is gaining importance and are observed to cause appreciable damage level in the recent years [5]. Nayak [10] have observed higher level rice leaf mite occurrence in areas of incessant rain coupled with high temperature followed by indiscriminate use of agro inputs. Occurrence of the rice leaf mite has also been noticed in Tamil Nadu due to changes in rainfall pattern, prolonged drought which provides a congenial atmosphere for the multiplication of the mites. This mite infests rice leaves, leading to yellowing and drying [12, 13]. The nymphs and adults are seen on the undersurface of leaves and cause damage by sucking the sap of leaves and inflict damage on mesophyll cells of the interveinal tissues. This result in characteristic whitish patches on leaves, which later turn to ash colour leading to drying from tip to down-wards [8]. Besides rice, several weeds found in rice ecosystems *viz*., *Panicum coloratum* L., *P.crusgalli* L. [9], *Cyanodon dactylon* L. and *Echinochloa colona* L. [8] have been reported as alternate hosts for *O. oryzae*. Very limited reports are available on the seasonal incidence and damage potential of rice leaf mite, hence present study was carried out to study the seasonal occurrence of rice leaf mites and influence weather parameters on their incidence.

## 2. Materials and Methods

### 2.1. Seasonal incidence of leaf mite in rice

The seasonal occurrence of rice leaf mite was studied in var. CO-51 during September 2015 to April 2016 at Paddy Breeding Station, Tamil Nadu Agricultural University, Coimbatore, India. Twenty days old rice seedlings were transplanted in a staggered manner in the plot size of

4.8 x 5m with recommended agronomic practices under insecticide free conditions.

The observations on the nymphs and adult mites present on the leaves were recorded at weekly intervals commencing from 15 days after transplanting and upto the flowering stage of the crop. Five hills were selected at random and in each hill, three leaves were selected randomly on top, middle and bottom. Observations were recorded in an area of 1x10 cm leaf length for the motile stages of nymph and adults. In order to study the influence of abiotic factors on the buildup of rice leaf mite meterological data on maximum temperature, minimum temperature, morning relative humidity, evening humidity, rainfall were collected from Agro Climate Research Centre, Tamil Nadu Agricultural University, Coimbatore to work out the correlation coefficients on the population dynamics of rice leaf mite.

### 2.2. Statistical Analysis

The data collected were subjected to correlation, regression analyses with the prevailing weather parameters and the mite population using AGRES package.

## 3. Results and Discussion

### 3.1 Seasonal occurrence of *O. oryzae* in rice

The results of seasonal incidence of leaf mite showed variation during different standard weeks of observation. During the months of September and October the population ranged from 7.36 to 8.57 mites/1x10 cm leaf length after which there was a decrease in mite population of 0.76 to 3.57 mites/1x10 cm leaf length during November 2015 (standard week 44) to February 2016 (standard week 5) (Table 1). Thereafter a gradual increase in mite population was observed and reached to the peak of 16.49 mites/1x10 cm leaf length during April (standard week 17) (Fig. 1). The results are in close agreement with Misra and Israel [8] who reported a minimum population of rice leaf mites during December and January when the temperature and relative humidity was 20±2 °C and 91±2%, respectively. But, Rao and Kulshreshta [15] observed decline in rice leaf mite population when temperature went below 20 °C along with RH 90%.

Karmakar and Soma Dey [7] noticed rice leaf mite during the second fortnight of March (10 mites/10 $cm^2$) to the first fortnight of June (16.6 mites/10 $cm^2$) and reached the peak during the first fortnight of May (26.67 mites/10 $cm^2$), whereas lowest population was observed in the first fortnight of January (0.63 mites/10 $cm^2$) followed by the second fortnight of December (0.83 mites/10 $cm^2$). Bhagat and Singh [1] also reported that high temperature, low relative humidity and low rainfall favoured the population build-up of spider mites in brinjal during the summer months. Gulati *et al.* [4] and Chinniah *et al.* [2] reported a moderate population of red spider mites (7-10/ plant) from October to December months in brinjal, thereafter gradual increase of *T.urticae* was observed from January to April.

### 3.2 Correlation analysis with weather parameters

Correlation studies between the rice leaf mite population and weather factors revealed that there was a significant positive correlation with maximum temperature (0.85) and minimum temperature (0.66), negative correlation with morning relative humidity (-0.85) and evening relative humidity (-0.88). It was observed that rainfall was negatively correlated with mite population (Table 2). Regression analysis revealed that for every unit increase in maximum and minimum temperature there was an increase of 1.15 and 1.36 mites, whereas for every unit increase in morning relative humidity, evening relative humidity and rainfall, mite population decreased by 0.72, 0.27 and 0.53, respectively.

High temperature coupled with humidity favoured the development of leaf mite, *O. oryzae* and maximum numbers of mites were observed at 27±2 °C with RH 94±2% and minimum number of mites was observed in December and January when the temperature and relative humidity was 20±2 °C and 91±2%, respectively [7].

Nayak *et al.* [10] observed peak population of rice leaf mite during the last week of September to the second week of October in areas of incessant rain coupled with high temperature, whereas, Jhansi Lakshmi *et al.* [6] noticed the occurrence of leaf mite, *O. oryzae* during bright sunny weather with slight rainfall. Srimohanapriya *et al.* [17] studied the seasonal abundance of the rice leaf mite and recorded the lowest number of 0.43 eggs per leaf during February sowing and higher number of eggs in March, May and August sowings. The lowest number of 0.12 nymphs and 0.17 adults per leaf was observed during November and June sowing, respectively. Similar studies on brinjal with two spotted mite, *Tetranychus urticae* revealed that there was significant positive correlation with temperature and negative correlation with minimum temperature, evening relative humidity and morning relative humidity [3, 16]. Rao [14] worked out regression analysis with *T.urticae* on brinjal and the results indicated that temperature and relative humidity have significant influence of mite population, regression equation fitted as $Y = 108.32+1.89X_1- 2.39X_2-0.94X^3-0.27X_4-0.09X_5$ explain that for every unit increase in temperature there was an increase of 1.89 mites, whereas for every unit increases in morning relative humidity mite population decreased by 0.94. Heavy rainfall washed off all the stages on *T.urticae* [11] in brinjal. The above findings corroborated with the present study on the seasonal incidence of *O.oryzae* on rice.

**Table 1:** Seasonal incidence of leaf mite, *O. oryzae* in rice *var*. Co-51

| Standard week (2015-16) | No. of mites/1x10 cm* | Temperature (°C) | | Relative Humidity (%) | | Rainfall (mm) |
|---|---|---|---|---|---|---|
| | | Maximum | Minimum | Morning | Evening | |
| 38 | 7.36 | 32.73 | 24.50 | 78.39 | 36.85 | 0.00 |
| 39 | 7.93 | 33.80 | 24.31 | 78.10 | 35.00 | 0.00 |
| 40 | 8.79 | 31.66 | 23.10 | 77.71 | 31.00 | 0.00 |
| 41 | 8.17 | 31.20 | 22.97 | 78.05 | 34.89 | 0.00 |
| 42 | 8.21 | 31.83 | 21.36 | 78.00 | 33.86 | 0.00 |
| 43 | 8.57 | 31.91 | 21.34 | 77.90 | 33.00 | 0.00 |
| 44 | 3.36 | 30.27 | 23.01 | 83.57 | 49.29 | 0.03 |
| 45 | 3.37 | 30.33 | 22.47 | 83.50 | 49.57 | 0.00 |
| 46 | 1.36 | 26.36 | 22.79 | 89.00 | 63.43 | 5.77 |
| 47 | 1.37 | 28.66 | 22.76 | 88.78 | 62.71 | 5.60 |
| 48 | 0.76 | 27.74 | 23.24 | 94.39 | 77.86 | 15.94 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 49 | 0.97 | 28.37 | 22.84 | 90.71 | 71.29 | 15.14 |
| 50 | 1.29 | 29.43 | 21.91 | 90.00 | 67.57 | 8.53 |
| 51 | 1.31 | 29.63 | 19.96 | 89.14 | 64.14 | 7.84 |
| 52 | 2.61 | 30.03 | 17.14 | 84.00 | 50.57 | 0.17 |
| 1 | 1.79 | 29.79 | 19.31 | 88.43 | 58.71 | 2.94 |
| 2 | 1.93 | 29.96 | 17.93 | 86.86 | 55.43 | 0.97 |
| 3 | 2.36 | 30.10 | 22.87 | 84.14 | 52.19 | 0.60 |
| 4 | 3.57 | 32.60 | 20.10 | 82.00 | 45.12 | 0.00 |
| 5 | 3.43 | 32.50 | 21.10 | 83.00 | 48.30 | 0.00 |
| 6 | 4.57 | 33.30 | 21.80 | 81.54 | 42.80 | 0.00 |
| 7 | 4.95 | 34.70 | 22.80 | 79.54 | 39.54 | 0.00 |
| 8 | 4.76 | 33.40 | 23.30 | 81.00 | 40.15 | 0.00 |
| 9 | 5.13 | 34.70 | 23.30 | 79.00 | 38.00 | 0.00 |
| 10 | 6.79 | 36.40 | 24.60 | 78.64 | 37.00 | 0.00 |
| 11 | 7.93 | 37.20 | 24.60 | 78.11 | 35.00 | 0.00 |
| 12 | 12.03 | 36.20 | 24.40 | 76.85 | 30.84 | 0.00 |
| 13 | 12.13 | 36.54 | 24.68 | 76.73 | 30.18 | 0.00 |
| 14 | 12.21 | 36.93 | 24.73 | 76.55 | 29.46 | 0.00 |
| 15 | 12.50 | 36.63 | 24.74 | 76.43 | 29.00 | 0.00 |
| 16 | 13.39 | 37.34 | 25.93 | 76.27 | 28.63 | 0.00 |
| 17 | 16.49 | 37.84 | 25.97 | 77.89 | 28.00 | 0.00 |

*Mean of three replications

**Table 2:** Influence of weather parameters on mite population

| Weather parameters | Correlation Coefficient | Regression | |
|---|---|---|---|
| | | Regression Equation | $R^2$ Value |
| Maximum temperature (°C) | 0.8449* | Y= 1.15X – 31.29 | 0.71 |
| Minimum temperature (°C) | 0.6581* | Y= 1.36X – 24.76 | 0.43 |
| Morning relative humidity (%) | -0.8522* | Y= -0.72X + 64.93 | 0.73 |
| Evening relative humidity (%) | -0.8789* | Y= -0.27X +18.03 | 0.78 |
| Rainfall (mm) | -0.5345* | Y= -0.53X + 7.06 | 0.29 |

* Significant at 5 % level

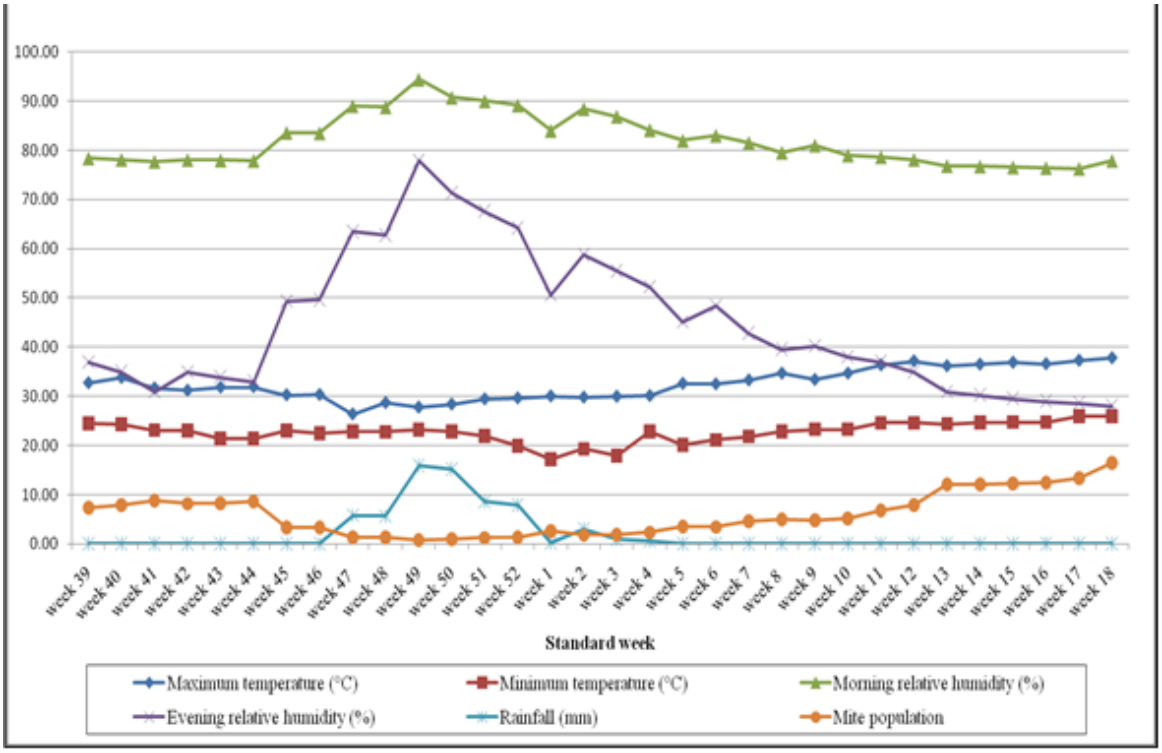


**Fig 1:** Seasonal occurrence of *Oligonychus oryzae* in relation to weather parameters

## 4. Conclusion

The leaf mite, *O.oryzae* reached its maximum population in two peaks during the study period. The first peak was recorded during September and October and second peak during April. Correlation studies between the mite population and weather factors revealed that there was a significant positive correlation with maximum temperature, negative correlation with morning and evening relative humidity. Based on the seasonal abundance and peak activity of leaf mite suitable control measures has to be taken to obtain better yield in rice crop.

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## 6. References


1. Bhagat KC, Singh W. Some observations on the biology and behaviour of carmine spider mite, *Tetranychus cinnabarinus* (Boisduval) (Acarina: Tetranychidae) a pest of brinjal vegetable. Journal of Advanced Zoology. 1999; 20:28-31.
2. Chinniah C, Balaji S, Kanimozhi Maragatham K, Muthiah C. Influence of weather parameters on the population dynamics of red spider mite *Tetranychus urticae* on okra *Abelmoschus esculentus* (L.) Moench. Journal of Acarology. 2007; 16:45-46.
3. Chinnaiah C, Vinoth Kumar D, Muthiah C, Rajavel DS. Population dynamics of two spotted spider mite, *Tetranychus urticae* Koch in brinjal ecosystem. Karnataka Journal of Agricultural Science. 2009; 22(3):734-735.
4. Gulati R. Incidence of *Tetranychus cinnabarinus* (Boisd.) infestation in different varieties of *Abelmoschus esculentus* (L.). Annals of Plant Protection Sciences. 2004; 12:45-47.
5. Gupta SK. Handbook on Injurious and beneficial mites infesting agri horticultural crops in India and their management. Nature Books India, New Delhi. 2012, 362.
6. Jhansi Lakshmi V, Krishnaiah NV, Pasalu IC, Katti G. 2008. Bio-ecology and management of rice mites - A Review. Agricultural Review. 2008; 29(1**)**:31-39.
7. Karmakar K, Soma Dey. Relative susceptibility of banana cultivars to spider mite, *Oligonychus oryzae* (Hirst) (Acari: Tetranychidae). Proceedings of National Seminar on "Banana Industry – Present Scenario Strategies, 11th to 13th, June, BCKV, Kalyani, West Bengal, 2004.
8. Misra BC, Israel P. Studies on the bionomics of the paddy mite, *Oligonychus oryzae* Hirst. (Acarina: Tetranychidae). Oryza. 1968; 5:32-37.
9. Nagarajan KR. A short note on *Paratetranychus oryzae* Hirst. the paddy mite. Madras Agricultural Journal. 1957; 44:480.
10. Nayak HG, Rajashekharappa K, Channakeshava R, Mahabaleshwar Hegde, Hugar PS. Incidence of paddy leaf mite, *Oligonychus oryzae* (Hirst) (Acari: Tetranychidae) on paddy in Tungabhadra project area of Karnataka. Journal of Acarology. 2007; 16(1, 2):57-59.
11. Puttaswamy M, Channabasavanna GP. Influence of weather factors and predators on the population of spider mite Tetranychus *ludeni* (Acari: Tetranychidae). Indian Journal of Acarology. 1981; 5:69-79.
12. Rao J, Prakash A, Dhanasekharan S, Ghosh SK. Observation on tarsonemid mite, white tip nematode and sheath rot fungus interactions deteriorating grain quality in the paddy fields. Journal of Applied Zoological Research. 1993; 4:89-90.
13. Rao J, Prakash A. Bio-deterioration of paddy seed quality due to insects and mites its control using botanicals. Final Report of ICAR Ad-hoc Scheme (1992-1995), CRRI, Cuttack (India), 1995, 76.
14. Rao KS. Biology and predatory potential of *Neoseiulus longispinosus* (Evans) against *Tetranychus urticae* Koch. M.Sc. thesis, Tamil Nadu Agricultural University, Coimbatore, India, 2015, 91.
15. Rao YS, Kulshreshtha JP. Insect Pests of Rice. In: Rice Research in India, (ed Padmanabhan, SY). Indian Council of Agricultural Research, New Delhi, 1985, 550-290.
16. Singh P, Singh RN. Introduction of environmental factors with *Tetranychus neocaledonicus* Andre and its predatory mite in brinjal ecosystem. Annals of Plant Protection Sciences. 2014; 23(1):23-26.
17. Srimohanapriya, V, Kandibane M, Natarajan L. Bioefficacy of Insecticides against rice leaf mite, *Oligonychus oryzae* Hirst. Madras Agricultural Journal. 2009; 97(1-3):81-83.