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Studies on Population Dynamics of Broad Mite, *Polyphagotarsonemus latus* During Different Seasons on Mulberry

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Abstract

An investigation has been undertaken to know the impact of seasons on the occurrence of various stages (eggs, nymphs and adults) of broad mite, *Polyphagotarsonemus latus* at different fortnightly intervals on mulberry. Further, population of broad mite was correlated with weather parameters namely minimum temperature, maximum temperature, relative humidity and rainfall. The occurrence of broad mite persists throughout the year on mulberry with variation in their population. However, different stages of broad mite namely eggs, nymphs and adults were more during summer (March to June) followed by winter (November to February) and rainy (July to October) seasons. The weather parameters namely maximum temperature, minimum temperature, relative humidity and rainfall showed marginal positive relationship with the population of broad mite in different seasons. On the other hand, fecundity showed negligible negative correlation with maximum temperature, minimum temperature and relative humidity, while it was positive negligible correlation with rainfall. The nymphal stage showed slight negative correlation with all the weather parameters. However, adult population exhibited moderately negative relationship with maximum temperature and relative humidity, while it showed lower positive correlation with minimum temperature and rainfall.

***Key words*:** Broad mite, Leaf area, Population, Seasonal occurrence, Weather parameters

Sericulture is a highly lucrative agro-based industry of significant importance worldwide. More than 40 countries in the world are practicing sericulture, of which 14 are situated in Asia. The world's silk production is dominated by Asian region, accounting for 90 per cent of the total output [1]. Mulberry [*Morus* spp.] leaf, the sole food for the silkworm, *Bombyx mori* L., is a deep rooted, perennial and fast-growing plant. Yield and quality of mulberry leaf has direct impact on silkworm rearing influencing the cocoon quality and productivity and hence its cultivation with quality production of leaf is an essential part of sericulture. The two important farm-based activities namely mulberry and silkworm are the victim of various pests and pathogens throughout the year, which affects the cocoon quality and productivity resulting in economic loss to the farmers and sericulture industry. In the recent past, the non-insect pest broad mite *Polyphagotarsonemus latus* [Banks] and commonly called as yellow mite or broad mite causing serious threat to mulberry in Karnataka. Fifteen species of mites belonging to Tetranychidae and Eriophyidae are reported to cause considerable damage to mulberry in India to the tune of 5 to 10% [2]. Broad mite passes through egg, larva, nymph and adult stages in their life cycle. Mite may complete its generation in one week under optimal conditions [25ºC and high RH] and deposit 40 eggs/female on the underneath of leaf surface [3]. The broad mite occurrence in the mulberry growing areas has been reported by the field officers of state department of sericulture in certain districts of Karnataka. Crop loss due to infestation of broad mite is in the range of 20–70%, which in turn has adversely affected the average supply of silkworm cocoons to government markets [4]. Owing to scanty information regarding the invasion and damage caused by broad mite on mulberry, this study has been undertaken to investigate the influence of weather parameters and seasonal occurrence of broad mites specifically on the susceptible V-1 mulberry variety.

MATERIALS AND METHODS

Study area

The study was conducted in field and laboratory of Insect Pathology and Pest Management Section, Karnataka State Sericulture Research and Development Institute [KSSRDI], located at Thalaghattapura, Bengaluru District in Karnataka. KSSRDI is located at a latitude of 12º51'15" N, longitude of 77º31'24" E and altitude of 866 meters above the mean sea level [MSL].

Survey data collected

The fixed plot survey was carried out to document the occurrence of broad mite in the experimental mulberry garden at fortnightly intervals across all the seasons [rainy, winter and summer] over a span of three years from June-2019 to May-2022. Ten plants were randomly selected and labeled for the purpose of observing broad mite occurrences. Three shoots were selected from each labeled mulberry plants, and three apical leaves were collected from each shoot in polythene

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covers and brought to the laboratory. The number of eggs, nymphs and adult population in 2 cm^2 area of mulberry leaves were observed under stereo-zoom binocular microscope and the observations were recorded. Weather parameters viz., minimum temperature, maximum temperature, relative humidity and rainfall were recorded during the period of investigation. Further, the population of broad mite was correlated with the weather parameters.

Data analysis

The data pertaining to field and laboratory investigations were analyzed adopting ONE-WAY Analysis of Variance [ANOVA] using SPSS statistical package [Ver. 21.0] [5].

RESULTS AND DISCUSSION

Occurrence of broad mite on mulberry at fortnightly intervals during different seasons

Fecundity

Rainy season: Fecundity of broad mite did not vary statistically [F-value=1.905^{NS}] at different fortnightly intervals. Fecundity was more [6.322 ± 0.163/$2cm^2$ leaf] during second fortnight of July, followed by second fortnight of October [6.078 ± 0.080/$2cm^2$ leaf], second fortnight of August [6.033 ± 0.144/$2cm^2$ leaf], first fortnight of September [5.904 ± 0.198/$2cm^2$ leaf], first fortnight of August [5.866 ± 0.113/$2cm^2$leaf], second fortnight of September [5.833 ± 0.188/$2cm^2$ leaf] and first fortnight of July [5.705 ± 0.180/$2cm^2$ leaf]. On the other hand, least number of eggs was recorded during first fortnight of October [5.663 ± 0.111/$2cm^2$ leaf].

Winter season: Non-significant [F-value=1.499^{NS}] variation was observed in respect of fecundity of broad mite at different fortnight intervals. More number of eggs [6.268 ± 0.271/$2cm^2$ leaf] was recorded during the second fortnight of November, followed by first fortnight of November [6.067 ± 0.137/$2cm^2$ leaf], second fortnight of February [6.005 ± 0.107/$2cm^2$ leaf]. Next in the order were first fortnight of January [5.935 ± 0.210/$2cm^2$ leaf], first fortnight of December [5.916 ± 0.097/$2cm^2$ leaf], second fortnight of December [5.932 ± 0.166/$2cm^2$ leaf] and first fortnight of February [5.813 ± 0.082/$2cm^2$ leaf]. However, less number of eggs was found with second fortnight of January [5.532 ± 0.188/$2cm^2$leaf].

Summer season: Significant difference [F-value=2.854**] was observed with respect to fecundity of mite at different fortnight intervals. Fecundity was more [8.920 ± 0.179/$2cm^2$ leaf] during the second fortnight in the month of May, followed by second fortnight of March [8.133 ± 0.223/$2cm^2$ leaf], second fortnight of June [7.899 ± 0.294/$2cm^2$ leaf]. Subsequently, next in the rank were first fortnight of June [7.865 ± 0.359/$2cm^2$ leaf], second fortnight of April [7.833 ± 0.187/$2cm^2$ leaf], first fortnight of April [7.798 ± 0.249/$2cm^2$leaf] and first fortnight of May [7.733 ± 0.184/$2cm^2$ leaf]. Notably, least number of eggs was recorded during the first fortnight of March [7.679 ± 0.111/$2cm^2$ leaf] (Table 1).

Table 1 Fecundity of broad mite on mulberry at fortnightly intervals during different seasons

Rainy season		Winter season		Summer season	
Fortnight	No. of eggs /2 cm^2 leaf	Fortnight	No. of eggs /2 cm^2 leaf	Fortnight	No. of eggs /2 cm^2 leaf
July- I	5.705 ± 0.180	November-I	6.067 ± 0.137	March-I	7.679 ± 0.111
July-II	6.322 ± 0.163	November-II	6.268 ± 0.271	March-II	8.133 ± 0.223
August-I	5.866 ± 0.113	December-I	5.916 ± 0.097	April-I	7.798 ± 0.249
August-II	6.033 ± 0.144	December-II	5.932 ± 0.166	April-II	7.833 ± 0.187
September-I	5.904 ± 0.198	January-I	5.935 ± 0.210	May-I	7.733 ± 0.184
September-II	5.833 ± 0.188	January-II	5.532 ± 0.188	May-II	8.920 ± 0.179
October-I	5.663 ± 0.111	February-I	5.813 ± 0.082	June-I	7.865 ± 0.359
October-II	6.078 ± 0.080	February-II	6.005 ± 0.107	June-II	7.899 ± 0.294
Mean	5.928 ± 0.065		5.933 ± 0.081		7.983 ± 0.080
F-value	1.905^{NS}		1.499^{NS}		2.854**

I: First fortnight, II: Second fortnight, ± values: Standard error **$p \leq 0.01$, NS: Non-significant

Nymphal population

Rainy season: Non-significant [F-value=0.590^{NS}] variations was observed in the nymphs population of broad mite at different fortnight intervals. The more number of nymphs [5.934 ± 0.252/$2cm^2$] was recorded during the first fortnight, followed by second fortnight in month of July [5.864 ± 0.180/$2cm^2$], first fortnight of October [5.721 ± 0.292/$2cm^2$leaf], second fortnight of October [5.721 ± 0.292/$2cm^2$leaf], second fortnight in month of September [5.272 ± 0.322/$2cm^2$leaf], first fortnight of August [5.319 ± 0.465/$2cm^2$leaf], and second fortnight of August [5.319 ± 0.465/$2cm^2$ leaf]. On the other hand, least number of nymph populations was observed during the second fortnight in the month of September [5.272 ± 0.322/$2cm^2$ leaf].

Winter season: The nymph population of broad mite during different fortnight intervals was shown non-significant [F-value=0.934^{NS}] variations. More number of nymphs [5.968 ± 0.159/$2cm^2$ leaf] was observed during the second fortnight of January, followed by first fortnight of November [5.798/$2cm^2$ ± 0.164/$2cm^2$ leaf], first fortnight of December [5.779 ± 0.149/$2cm^2$ leaf], second fortnight of February [5.734 ± 0.151/$2cm^2$ leaf], second fortnight of November [5.732 ± 0.257/$2cm^2$ leaf], second fortnight of December [5.779 ± 0.149/$2cm^2$ leaf] and first fortnight of February [5.612 ± 0.165/$2cm^2$ leaf]. On the other hand, less number of nymphal population was observed during the first fortnight of January [5.245 ± 0.305/$2cm^2$ leaf] (Table 2).

Summer season: Statistically, Significant [F-value=4.002**] variation was observed in the nymphs populations during different fortnight intervals. More number of nymph populations [7.767 ± 0.249/$2cm^2$ leaf] was observed during the first fortnight of March, followed by second fortnight of May [7.633 ± 0.230/$2cm^2$ leaf] and second fortnight of June [7.633 ± 0.188/$2cm^2$ leaf]. Subsequently, next in the rank were first fortnight of May [7.533 ± 0.218/$2cm^2$ leaf], first fortnight of June [7.432 ± 0.267/$2cm^2$ leaf], and first fortnight of April [7.034 ± 0.225/$2cm^2$ leaf]. Notably, least number of nymphs was recorded during the second fortnight of March [6.501 ± 0.159/$2cm^2$ leaf] (Table 2).

Table 2 Nymphal population of broad mite on mulberry at fortnightly intervals during different seasons

Rainy season		Winter season		Summer season	
Fortnight	No. of nymphs /2 cm^2 leaf	Fortnight	No. of nymphs /2 cm^2 leaf	Fortnight	No. of nymphs /2 cm^2 leaf
July- I	5.934 ± 0.252	November-I	5.798 ± 0.164	March-I	7.767 ± 0.249
July-II	5.864 ± 0.180	November-II	5.732 ± 0.257	March-II	6.501 ± 0.159
August-I	5.319 ± 0.465	December-I	5.779 ± 0.149	April-I	7.034 ± 0.225
August-II	5.319 ± 0.403	December-II	5.707 ± 0.280	April-II	6.996 ± 0.136
September-I	5.378 ± 0.335	January-I	5.245 ± 0.305	May-I	7.533 ± 0.218
September-II	5.272 ± 0.322	January-II	5.968 ± 0.159	May-II	7.633 ± 0.230
October-I	5.721 ± 0.292	February-I	5.612 ± 0.165	June-I	7.432 ± 0.267
October-II	5.396 ± 0.370	February-II	5.734 ± 0.151	June-II	7.633 ± 0.188
Mean	5.526 ± 0.237		5.698 ± 0.076		7.317 ± 0.070
F-value	0.590^{NS}		0.934^{NS}		4.002**

I: First fortnight, II: Second fortnight, SE: Standard error ***p≤0.01*

Adult's population

Rainy season: Adults of broad mite population did not vary statistically [F-value=0.660^{NS}] at different fortnightly intervals. Number of adults was more [6.933 ± 0.313/2cm^2 leaf] during second fortnight of October, followed by second fortnight of October [6.842 ± 0.058/2cm^2 leaf], second fortnight of September [6.777 ± 0.117/2cm^2 leaf], first fortnight of August [6.701 ± 0.320/2cm^2 leaf], second fortnight of August [6.666 ± 0.341/2cm^2leaf], first fortnight of July [6.582 ± 0.078/2cm^2 leaf] and first fortnight of September [56.558 ± 0.071/2cm^2 leaf]. On the other hand, least number of adults was recorded during second fortnight of July [6.334 ± 0.253/2cm^2 leaf].

Winter season: Significant [F-value=2.184*] variation was observed in respect of adult population of broad mite at different fortnight intervals. More number of adults [6.967 ± 0.246/2cm^2 leaf] was recorded during the second fortnight of November, followed by second fortnight of February [6.964 ± 0.058/2cm^2 leaf], first fortnight of November [6.639 ± 0.104/2cm^2 leaf]. Next in the order were second fortnight of December [6.519 ± 0.073/2cm^2 leaf], first fortnight of December [6.477 ± 0.388/2cm^2 leaf], second fortnight of January [6.317 ± 0.143/2cm^2 leaf] and first fortnight of February [6.294 ± 0.067/2cm^2 leaf]. However, less number of adult populations was found with first fortnight of January [6.188 ± 0.236/2cm^2 leaf].

Summer season: Significant difference [F-value=4.155**] was observed with respect to adult population of mite at different fortnight intervals. The adult population was more [9.373 ± 0.161/2cm^2 leaf] during the first fortnight in the month of May, followed by second fortnight of May [9.241 ± 0.154/2cm^2 leaf], second fortnight of June [9.229 ± 0.148/2cm^2 leaf]. Subsequently, next in the rank were first fortnight of April [9.153 ± 0.322/2cm^2 leaf], second fortnight of March [8.976 ± 0.170/2cm^2 leaf], first fortnight of June [8.943 ± 0.166/2cm^2 leaf] and second fortnight of April [8.676 ± 0.169/2cm^2 leaf]. Notably, least population of adults was recorded during the first fortnight of March [8.033 ± 0.300/2cm^2 leaf].

In respect of average fecundity of broad mite, irrespective of the fortnight among the different seasons of the year, summer registered more number of eggs [7.983 ± 0.080/2cm^2 leaf] when compared to winter [5.933 ± 0.081/2cm^2 leaf] and rainy seasons [5.928 ± 0.065/2cm^2 leaf] 9Table 1). Average nymph populations of broad mite, irrespective of the fortnight among the different seasons of the year, summer registered more number of nymphs [7.317 ± 0.070/2cm^2 leaf] when compared to winter [5.698 ± 0.076/2cm^2 leaf] and rainy seasons [5.526 ± 0.237/2cm^2 leaf] (Table 2). In respect of average number of broad mite population, irrespective of the fortnight among the different seasons of the year, summer registered more number of adults [8.954 ± 0.036/2cm^2 leaf] when compared to rainy [6.674 ± 0.085/2cm^2 leaf] and winter seasons [6.546 ± 0.056/2cm^2 leaf] (Table 3).

Table 3 Adult population of broad mite on mulberry at fortnightly intervals during different seasons

Rainy season		Winter season		Summer season	
Fortnight	No. of adults /2 cm^2 leaf	Fortnight	No. of adults /2 cm^2 leaf	Fortnight	No. of adults
July- I	6.582 ± 0.078	November-I	6.639 ± 0.104	March-I	8.033 ± 0.300
July-II	6.334 ± 0.253	November-II	6.967 ± 0.246	March-II	8.976 ± 0.170
August-I	6.701 ± 0.320	December-I	6.477± 0.388	April-I	9.153 ± 0.322
August-II	6.666 ± 0.341	December-II	6.519 ± 0.073	April-II	8.676 ± 0.169
September-I	6.558 ± 0.071	January-I	6.188 ± 0.236	May-I	9.373 ± 0.161
September-II	6.777 ± 0.117	January-II	6.317± 0.143	May-II	9.241 ± 0.154
October-I	6.933 ± 0.313	February-I	6.294 ± 0.067	June-I	8.943 ± 0.166
October-II	6.842 ± 0.058	February-II	6.964 ± 0.058	June-II	9.229 ± 0.148
Mean	6.674 ± 0.085		6.546 ± 0.056		8.954 ± 0.036
F-value	0.660^{NS}		2.184*		4.155**

I: First fortnight, II: Second fortnight, SE: Standard error **p≤0.05, **p≤0.01,* NS: Non-significant

The present results are in line with the findings of author Gupta [7], who reported that the occurrence of mites in India was more on mulberry during March-April and May-June and the population decreases during August and which remained up to January-February. Further, the sudden decrease in mite population from August onwards was mainly attributed to the heavy rainfall [14]. As per Karmakar *et al*. [8], average population of mite, *P. ulmi* reaches its peak with 19.74 mites/leaf, during the second half of March in mulberry gardens at West Bengal.

According to Chauhan *et al.* [4], the infestation of *P. latus* was occurred on January and gradually increased until April. In May, there was decline in infestation, followed by a rise from June onwards, reaching its peak during October and November that lead to significant damage to mulberry crop. The infestation has gradually slowdown in December. Ramakant and Vineetkumar [17] studied the influence of climatic conditions on the infestation of major pests of mulberry in Doon valley, as per the study, mite infestation observed to commence from July to October. The highest incidence was documented in September with notable occurrence also noticed in July, October and August. Conversely, there was absence of mite infestation during January, February, April, May, June, November and December. Rajalakshmi *et al*. [16] in their study reported that the population and infestation of yellow mite showed a clear-cut seasonal variation and are well adapted to climatic conditions. The mite incidence was started by summer (May/June) with an average of 6 eggs and 14 mites/plant with an infestation of 9.36%. It reached the peak during July-September with 189-215 eggs, 20-40 mites/plant and an infestation percentage of 16.58 to 27.84.

Correlation between weather parameters and life stages of broad mite in mulberry

Weather parameters vs. fecundity of broad mite: During rainy season, there was weak negative correlation existed between fecundity and maximum temperature [r=-0.360^{NS}] as well as relative humidity [r=-0.359^{NS}], while negligible negative correlation observed with minimum temperature [r=-0.111^{NS}] and rainfall [r=-0.175^{NS}]. During winter season, between fecundity showed low negative correlation with maximum temperature [r=-0.387^{NS}] and relative humidity [r=-0.354^{NS}], whereas minimum temperature and the rainfall exhibit negligible positive [0.008^{NS}] and negative [-0.206^{NS}] correlation with fecundity. During summer season, low negative correlation observed between fecundity with maximum temperature [r=-0.419^{NS}] and moderately negative correlation with relative humidity [r=-0.586^{NS}]. However, minimum temperature and rainfall exhibit negligible positive [0.116^{NS}] and negative [-0.286^{NS}] correlation with fecundity, respectively (Table 4).

Table 4 Correlation between weather parameters and fecundity of broad mite on mulberry

Weather parameter	Fecundity of broad mite		
	Rainy	Winter	Summer
Min. Temp [°C]	-0.111^{NS}	-0.206^{NS}	0.116^{NS}
Max. Temp[°C]	-0.360^{NS}	-0.387^{NS}	-0.419^{NS}
RH [%]	-0.359^{NS}	-0.354^{NS}	-0.586^{NS}
Rain Fall [mm]	-0.175^{NS}	0.008^{NS}	-0.286^{NS}

NS: Non-Significant

Weather parameters vs. nymphal population of broad mite: During rainy season, there was a slight negative correlation found between the nymphal population of broad mite with maximum temperature [r=-0.367^{NS}] and relative humidity [r=-0.355^{NS}], while nymphal population showed minimal negative correlation between minimum temperature[r=-0.108^{NS}] as well as rainfall [r=-0.174^{NS}]. During winter season, maximum temperature [r=-0.389^{NS}] and relative humidity [r=-0.356^{NS}] showed moderately negative correlation with nymphal population, whereas negative and positive correlation exhibited with minimum temperature and the rainfall with nymph population [r=-0.212^{NS} and r=0.012^{NS}], respectively. During the summer season, lower negative correlation was observed between nymphal population with maximum temperature [r=-0.428^{NS}] and moderately negative correlation was observed with relative humidity [r=-0.585^{NS}]. However, nymphal population showed negligible correlation with minimum temperature[r=-0.131^{NS}] and rainfall [r=-0.288^{NS}] (Table 5).

Table 5 Correlation between weather parameters and nymphs of broad mite on mulberry

Weather parameter	Nymphs of broad mite		
	Rainy	Winter	Summer
Min. Temp [°C]	-0.108^{NS}	-0.212^{NS}	0.131^{NS}
Max. Temp[°C]	-0.367^{NS}	-0.389^{NS}	-0.428^{NS}
RH [%]	-0.355^{NS}	-0.356^{NS}	-0.585^{NS}
Rain Fall [mm]	-0.174^{NS}	0.012^{NS}	-0.288^{NS}

NS: Non-Significant

Weather parameters vs. adults of broad mite: During rainy season, there was an unfavorable relationship between adult of broad mite population with maximum temperature [r=-0.353^{NS}] and relative humidity [r=-0.350^{NS}]. Further, adult population showed non-significant lower negative correlation for minimum temperature [r=-0.120^{NS}] and rainfall [r=-0.183^{NS}]. During winter season, adult population exhibit negative correlation with maximum temperature [r=-0.380^{NS}] and relative humidity [r=-0.348^{NS}], while minimum temperature and rainfall had negligible negative and positive correlation with adult of broad mite population [r=0.219^{NS} and r=-0.002^{NS}], respectively. During summer season, moderately negative correlation observed between the adult of broad mite population with maximum temperature r=-0.400^{NS}] and relative humidity[r=-0.578^{NS}], while minimum temperature and rainfall showed lower positive [r=0.112^{NS}] and negative [r=-0.294^{NS}] correlation with adult population (Table 6).

Table 6 Correlation between weather parameters and adults of broad mite on mulberry

Weather parameter	Adults of broad mite		
	Rainy	Winter	Summer
Min. Temp [°C]	-0.120^{NS}	-0.219^{NS}	0.112^{NS}
Max. Temp[°C]	-0.353^{NS}	-0.380^{NS}	-0.400^{NS}
RH [%]	-0.350^{NS}	-0.348^{NS}	-0.578^{NS}
Rain Fall [mm]	-0.183^{NS}	0.002^{NS}	-0.294^{NS}

NS: Non-Significant

Omesa Hamid *et al*. [13] recorded the eggs of mite in different mulberry varieties. The study inferred that highest mite egg population was recorder in Goeshoerami [91.3] followed by KNG [55.9] and Tr-10 [46.6] per branch in bush type of mulberry. In the tree type also, Goshoerami recorded highest mites [31.8] and Tr-10 with lowest mites [13.2] per branch.

Dar *et al*. [11] also reported that, the *T. turkestani* was present on all the four varieties of mulberry and incidence was more on Ichinose [3.37mites/25cm*2*] followed by KNG [3.13], Goshoerami [2.97] and was least on Tr-10 [1.56] throughout the seasons [May-October]. Devi *et al*. [2017] studied the seasonal incidence of different *Aceria* sp. in mulberry. They were reported that mulberry bud mite was recorded during first and second fortnight of June [15.8 and 16.4]. Dar *et al*. [10], noted that, the incidence and severity of *T. turkestani* were lesser during May month and reached maximum during 2nd fortnight of July and 1st fortnight of August from there it declined to reach a lower level during 2nd fortnight of October with the onset of leaf fall.

Dar [9] observed that, the summer season with an average temperature of 25.72^{o} C in Kashmir valley is ideal for

increasing the population of mite, *P. ulmi* in mulberry. Temperature affects the developmental time and fecundity of female mites. Present observations are comparable to the findings of Arun Kumar and Srinivasa [3], who studied the spatial distribution of yellow mite on mulberry. The number of eggs per leaf varied with more numbers observed on fourth and fifth leaves from the tip and the least number of eggs were found on tenth to fifteenth leaves. In terms of density of mite population per cm^2 leaf area, the number of mite eggs/cm^2 leaf area varied from 0.00 to 72.98. The mite population reached peak during the month of August, and a lower population during the month of December.

Arun Kumar and Srinivasa [3] studied the spatial distribution of yellow mite on mulberry. They were reported that, the number of motile/active stages which includes larvae, nymphs and adults from 0.05 to 775.80. More number of eggs observed on fourth and fifth leaf from the tip and the least number of eggs were found on tenth to fifteenth leaf from the tip. In terms of density of mite population per cm^2 leaf area, the number of mite eggs/cm^2 leaf area varied from 0.00 to 72.98. The mite population reached peak during the month of August, 2020 and a lower population during the month of December 2020. According to Elumalai [5], the broad mite or yellow mite and red spider mite was noticed in the in the mulberry gardens at Coonoor in all the seasons, spreading very fast from one plant to other plant and observed that in an individual leaf contains more than 1000 numbers of different stages of mite population. According to Sharath [18], the number of eggs/$2cm^2$ mulberry leaf area was found highest in March and gradually increased towards May-July and reached peak during August-November.

CONCLUSION

The study inferred that the population of broad mite varied considerably among different seasons with highest being observed during summer over rainy and winter seasons. Further, weather parameters too play a decisive role in the population of different stages of broad mite. It's essential to consider multiple factors when developing strategies for broad mite management in mulberry.

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