Incidence and Severity of Blister Mite (*Eriophyes erinea* Nalepa) on Walnut (*Juglans regia* L.) under Temperate Conditions of Kashmir Valley

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Mini Research Article

ABSTRACT

Walnut is an important crop that is widely grown for its edible nuts, timber, and other commercial uses. Walnut pests can cause significant damage to the trees and reduce the quality and quantity of the crop. Walnut blister beetles can cause significant damage to walnut trees, especially during the early stages of fruit development. The data generated on incidence and severity revealed that the incidence of *E. erinea* commenced from 13th standard meteorological week (SMW) with mean

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incidence of 1.2 blister per leaf observed in this SMW, reached to its peak (22.7 per leaf) during 30th SMW and then decreased and reached to 0.8 blisters per leaf during 43rd SMW. The mean number of blister was found highest (18.64±1.62) in the month of July and lowest (1.25±0.2) in the month of October. Low severity (4.0%) of *E. erinea* was recorded in April, which reached to its peak (28.5%) in the month of July, thereafter, the severity decreased and reached to 1.5 per cent in the month of October.

1. INTRODUCTION

Walnut (*Juglans regia* L.) is the most widespread tree nut in the world. It belongs to genus *Juglans* and family Juglandaceae [1]. There are numerous insect pests associated with walnuts that have been reported from all over the world, inflicting severe harm to walnut trees and walnut products. Although there are various insect pests reported on walnut in Kashmir valley but among them walnut weevil, stem borer, hairy caterpillar, walnut aphid, dusky-veined aphid, leaf roller, gypsy moth, bark beetle, walnut blister mite and tortrix moth present a severe threat and cause considerable economic damage to the plant and their attack thus reduce quality as well as quantity of walnuts [2]. Like in traditionally cultivated giant and isolated walnut trees, there are also apprehensions of pests and other diseases which may destroy the plant under regular orchard conditions. Though some work has been carried out in Kashmir regarding studies on pests affecting traditional walnut trees but no such work has been carried out in regular/compact walnut orchards having short sized grafted trees.

2. MATERIALS AND METHODS

The investigations on "Incidence and severity of blister mite (*Eriophyes erinea* Nalepa) on Walnut (*Juglans regia* L.) under temperate conditions of Kashmir Valley" were carried out at Faculty of Agriculture, SKUAST-K Wadura, situated at an altitude of 1,610 meters above mean sea level between 34°20 North Latitude and 74°24 East Longitude on nine year old established walnut orchard during cropping season 2020. The detail of materials and methodologies followed during the course of investigation is as under:

2.1 Seasonal Incidence of Blister Mites

Incidence of blister mites was carried out by counting the number of blisters from 20 randomly selected leaves per plant at three different heights in all the four directions. The average of the data generated from 20 leaves was considered as number of blisters per leaf.

2.2 Severity Index

Severity was recorded by observing the number of blisters/leaf from the same plants and leaves for which incidence was computed. The categorization for severity was done on the basis of score/grade system per leaf per plant developed by McKinny, [3].

Scale 1. Severity index

Description	Score assigned / Grade
No blisters	0
1-4 blisters	1
5-8 blisters	2
9-12 blisters	3
.> 12 blisters	4

2.3 Per cent Severity Index (PSI)

$$PSI = \frac{\text{Sum of numerical ratings}}{\text{Max. Grades Value} \times \text{Total No. of leaves observed}} \times 100$$

Sum of numerical ratings = 1N+2N+3N+4N

Where 1,2,3,4 are grades
N Is the number of leaves showing respective grades or scores

3. RESULTS AND DISCUSSION

3.1 Incidence of Blister Mite on Walnut

The data on incidence of blister mite (*Eriophyes erinea* Nalepa) on walnut is illustrated by Fig. 1. The perusal of data revealed that activity of blister mite commenced from 13th standard meteorological week (SMW) with mean incidence (1.2 blisters per leaf) was observed in this meteorological week. Thereafter, there was gradual increase in the pest incidence which
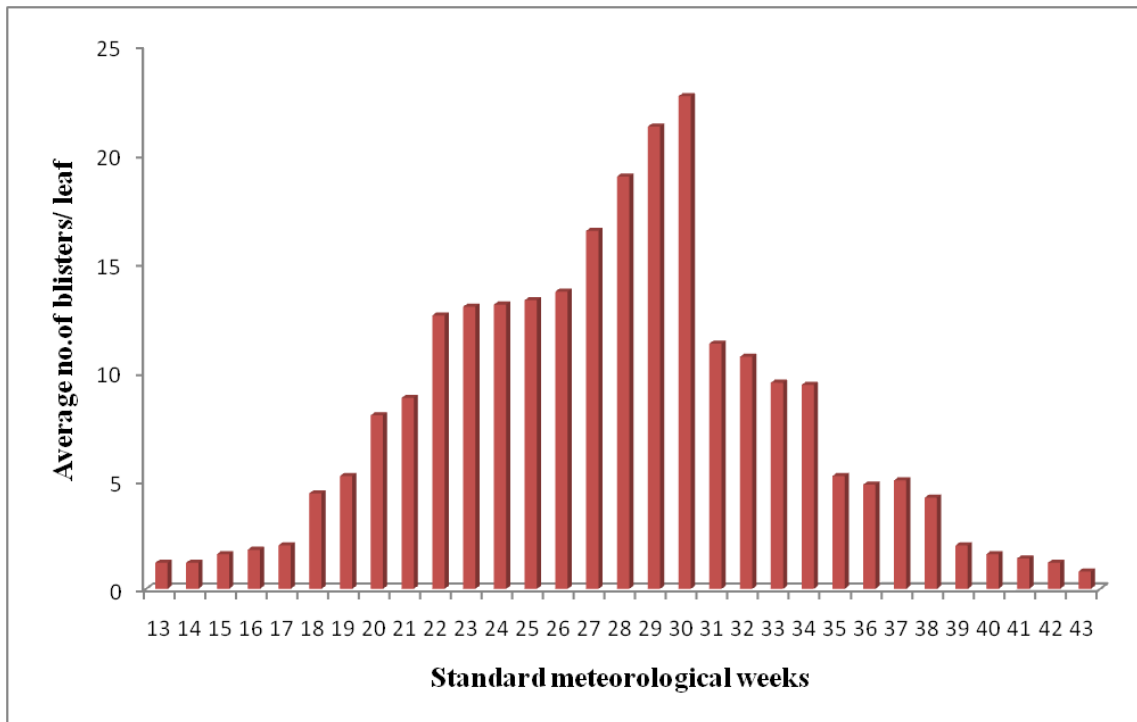
Fig. 1. Incidence of blister mites (*Eriophyes erinea* Nalepa) on walnut

reached to its peak (22.7 blisters per leaf) in 30th SMW from where it started declining and reached to minimum (0.8 blister per leaf) in 43rd SMW. The mean number of blister/ leaf was found highest (18.64±1.62) in the month of July and lowest (1.25±0.2) in the month of October. Coefficient of variance (CV) was recorded highest (40%) in the month of October and lowest (2.26%) in the month of June. The present findings are also supported by the studies of Devi et al. [4] who also reported that incidence of mango bud mite, *Aceria mangiferae* (gall mite) in mango showed increasing trend in May (33.30 per leaf) and June (37.5 per leaf). The present findings are also supported by the findings of Sauro et al. [5] who reported that the apple rust mite, *Aculus schlechtendali* first appeared in mid-summer and mite populations were low in May, started to increase in June, and peaked in July as reported in our study. The present findings revealed that blister mites cause blisters (galls) on the upper surface of foliage. Weber [6] also reported that the velvet gall mite, *Eriophyes cauliseifer* causes a noticeable velvety red growth up to an inch long on the leaf stem in orchards of black walnut in the Eastern United States, forcing the leaf to curl or twist over on it. The results of Rather [7] who conducted survey and found that walnut blister mite, *Eriophyes erinea* (Nelepa) occurs in epidemic form in all

agro climatic zones of Jammu & Kashmir and prevails as a major acarine pest of walnut due to which affected leaves showed galls on upper surface of leaves are in consonance with our results.

3.2 Correlation and Regression Studies of Blister mite with Important Weather Parameters

The data on correlation of blister mite (*Eriophyes erinea* Nalepa) on walnut with temperature (°C), Relative humidity (%) and rainfall (mm) from 13th to 43th standard meteorological week under field conditions revealed that among the different weather parameters, maximum temperature had a significant and positive correlation (r=0.787) with blister mite, and negative and significant correlation (r=- 0.397) with rainfall and morning and evening relative humidity (r=-0.332 and -0.330). Minimum temperature had a non-significant and positive correlation (r=0.681) with it. The data presented in Table 1 indicated the regression between populations of blister mite with the weather parameters. The regression analysis showed that the weather parameters have a significant effect on the population density of blister mite. From the regression equation, R^2 value (0.73) suggested that all the weather parameters jointly contributed 73 per cent

Table 1. Regression between incidence of blister mite (*Eriophyes erinea* Nalepa) with weather parameters on walnut (*Juglans regia* L.)

Weather parameters	*Eriophyes erinea*			
	Coefficients	**Standard Error**	**"t" value**	**"p" value**
Intercept	-18.939	12.616	-1.501	0.146
Max temperature (^{o}C)	0.581	0.281	2.06	0.01
Min temperature (^{o}C)	0.435	0.267	1.63	0.90
Rainfall (mm)	-0.190	0.185	-1.09	0.02
Relative humidity (Morning)	-0.144	0.118	-1.12	0.04
Relative humidity (Evening)	-0.099	0.055	-1.79	0.05
Coefficient of Determination (R^2)	**0.738**			
Regression Equation	**Y =- 18.939 + 0.58x_1 + 0.43x_2 - 0.19x_3 + 0.14x_4 + 0.099x_5**			

Table 2. Percent severity index of blister mite (*Eriophyes erinea*) on walnut

Month	SMW	Mean severity index (%)	*Grade
	13th	4.00	1
	14th	4.00	1
April	15th	4.50	1
	16th	7.00	2
	17th	9.00	3
	Mean	**5.70**	
	18th	11.00	3
May	19th	12.50	4
	20th	14.00	4
	21st	14.70	4
	Mean	**13.05**	
	22nd	16.20	4
June	23rd	17.40	4
	24th	18.50	4
	25th	19.00	4
	Mean	**17.77**	
	26th	21.00	4
July	27th	23.00	4
	28th	25.00	4
	29th	26.70	4
	30th	28.50	4
	Mean	**24.84**	
	3Ist	24.00	4
August	32nd	22.00	4
	33rd	21.50	4
	34th	18.00	4
	Mean	**21.37**	
	35th	15.50	4
September	36th	12.40	4
	37th	11.20	3
	38th	11.00	3
	39th	7.00	2
	Mean	**11.42**	
	40th	5.50	2
October	4Ist	1.50	1
	42nd	1.50	1
	43rd	1.50	1
	Mean	**2.50**	

SMW= Standard meteorological week,
*Grade 0 = No blisters, Grade 1= 1-4 blisters, Grade 2= 5-8 blisters, Grade 3= 9-5 blisters
Grade 4 = > 12 blisters

variation in population indicating higher dependence of population on weather parameters. The present study is in conformity with the findings of Balaji and Hariprasad [8] who reported a positive correlation between the population of coconut mite, *Aceria guerreronis* in the coconut palm with maximum temperature and negative correlation with relative humidity, rainfall, and sunshine hours. Devi et al. [4] also reported a positive correlation of population of mango bud mite, *Aceria mangiferae* in mango with maximum temperature and minimum temperature and negative correlation with rainfall and relative humidity. Sauro et al. [5] also found that the apple rust mite showed a significant and positive correlation with maximum temperature and a highly negative and significant correlation with rainfall.

3.3 Severity of Blister Mite on Walnut

The data on mean per cent severity of blister mite/leaf presented in Table 2 revealed that blister formation on leaves is directly related to the pest population. A scale (1-4) was used to determine the mean pest severity. The data presented in the Table 2 showed increased trend of severity from 13th standard meteorological week (SMW) till 43rd SMW. The maximum severity (28.5%) was observed in 30th SMW from where it started declining and reached to minimum (1.5%) in 43rd SMW.The mean per cent severity was recorded highest (24.84%) in the month of July and lowest (2.50 %) in the month of October.

4. CONCLUSION

The incidence was found lowest number is in the month of October in all these pests. Blister mites have a significant and positive correlation with maximum temperature, a significant and negative correlation with rainfall, and a positive and non-significant correlation with minimum temperature.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Ogunmoyole T, Kade IJ, Korodele B. In vitro antioxidant properties of aqueous and ethanolic extracts of walnut (*Juglans regia*). Journal of Medicinal Plants Research. 2011;5(31):6839-6848.
2. UCIPM. Pest management guidelines: Walnut. University of California; 2011.
3. Mckinney HH. Influence of soil temperature and moisture on infection of wheat seedlings by *Helminthosporium sativum*. Journal of Agricultural Research. 1923; 26:195-217.
4. Devi M, Niranjan RF, Umapathy H. Seasonal incidence of different Aceria sp. correlated with weather parameters. Journal of Entomology and Zoology Studies. 2017;5(3):39-43.
5. Sauro S, Gino A, Mario B, Carlo D. Effects of *Aculus schlechendali* (Acari: Eriophyidae) population densities on Golden Delicious apple production. Open Science in Acarology. 2018;58:134-144.
6. Weber BC. How to diagnose black walnut damage. North Central Forest Experiment Station Service. Department of Agriculture. 1980;3(1):56-73.
7. Rather AQ. Studies on mites (acari) associated with stone fruits in subtropical temperate and cold-arid zones of Jammu and Kashmir. Progress in Acarology. 1989;183.
8. Balaji K, Hariprasad Y. Correlation studies on incidence of eriophyid mite population *Aceria guerreronis* with weather parameters. International Journal of Plant Protection. 2016;9(1):268-271.