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Research article

Population dynamics and feeding potentiality of a new species *Hypoaspis xylocarpi* collected from sundarban biosphere reserve

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Abstract

Population dynamics of a newly described species is given in this present study. During the field study, one new species of genus *Hypoaspis* was reported by the author from Sajnekhali Tiger Reserve, within Sundarban Biosphere Reserve, 24-Paraganas (south). The species was collected from *Xylocarpus granatum*. The species was belonging to Laelapidae family. It was found that the highest population of this mite was shown during May-June, 2016 and minimum population was during July-August, 2016.

Introduction

Previous studies reported that a good number of plant mites are injurious pests of agricultural and horticultural crops causing considerable yield loss (Gupta. 2003)[1]. The bark of the of *Xylocarpus granatum* is rich in tannin and is used for tanning heavy hides into sole leather and other heavy leather, and for toughening and preserving fishing nets. It is sometimes used to dye cloth brownish or reddish. It is used in boat building, and for nails, house-posts, wood carvings, tool handles and furniture. In India the wood is found suitable for second grade pencils. The oil extracted from seeds has been used as an illuminant and as hair oil. The astringent bark has some medicinal uses. It is used to treat dysentery, diarrhoea and other abdominal troubles, and as a febrifuge. The fruit is used in India to treat swellings of the breast and elephantiasis. Since *Hypoaspis xylocarpi* is a newly described predatory species reported from *Xylocarpus granatum* in Sundarbans Biosphere Reserve and no study was made on the population fluctuation of this predatory mite on this plants, it was thought desirable to conduct a study on the population dynamics of this mite. It will provide information about the time of abundance of this species. This will help farmers in biological control of this mite.

Experimental

Materials and Methods

Collection is made directly from the infested leaves by examining those under a 20X magnification glass in the field. The mites were collected with fine sable hairbrush moistened with 70% ethanol. Collected samples were kept in small glass vials (3x1cm) in 70% ethanol. Specimens were collected under a dissecting microscope with a fine brush and were put in a drop of lactic acid on a glass slide and then they were covered with a broken piece of cover glass to minimize the weight of the glass on the specimens.

Ten *Xylocarpus granatum* trees of almost the same age were sampled and all those were tagged. From each tree, ten leaves of the same size and age were randomly collected. An area of 6.25 cm^2 on the ventral surface of each leaf was examined for mites using a 20 x hand lens. Sampling was repeated at a three-week interval. The relevant meteorological data on temperature, relative humidity and rainfall were collected for the entire study period by a digital device (Digital thermo-hygrometer by Citizen biotech). The data were subjected to a Pearson correlation analysis to determine the degree of association between simple correlation coefficients. (Statistical Package used: SPSS, ver-12)

Results and Discussion

Results

In *Xylocarpus granatum* the mite population size was average i.e., 17.9 ± 0.33 mites / 6.25 cm^2 to 15.4 ± 0.43 mites / 6.25 cm^2 during November, 2015 – January, 2016. A population size peak was observed during May, 2016 (32.8 ± 0.28 mites / 6.25 cm^2, mean ± sd is calculated) when mean temperature, RH and rainfall were 31.28 ± 1.21 ^{0}c, 72.62 ± 4.56% and 1.05 ± 0.87 mm, (mean ± SD is calculated respectively**.**

The population declined thereafter reaching the minimum in August, 2016 (4.5 ± 0.51 mites / 6.25 cm^2) when the mean temperature, RH and rainfall were 28.91± 2.22 ^{0}c, 84.50 ± 3.42 %, and 15.53 ± 6.21 mm respectively (table-1).

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Increased precipitation in June and July, 2016, probably acted adversely on the mite population. From September 2016 onwards the population again started to increase.

The correlation coefficient of the mite density with temperature was positive while, with relative humidity and rainfall it was found to be negative. Correlation with rainfall was found to be significant but it was non-significant in the other two cases.

Discussion

Several general studies on seasonal occurrence of phytophagous mites are available. For *raoiella indica* hirst on coconut, population density was positively correlated with temperature and negatively correlated with RH and rainfall. Nageschandra and Channabasavanna [2], which is contrary to the present findings where it was positively correlated with temperature, RH and negatively correlated with rainfall. Gupta *et al.,* [3] reported negative correlation with temperature and positive correlation with RH and rainfall for *Tetranychus telarius* on castor. Nageschandra and Channabasavanna [2] reported a peak of population density of *Raoiella indica* in february on guava and in other months for other crops. Contrary to this, Dhooria and Butani [4] reported peak population of *Eutetranychus orientalis* on *citrus* during May-June as well as in September while Lal [5] reported peak population during January-April. The present study shows similarities with the studies made by Ghoshal *et. al.*, [6]. According to him, hot dry wind favored its population growth and the same was also reported by Dean [7], Lal and Mukherji [8], Puttaswamy and Channabasavanna [9], Lal [5], and Sugeetha and Shrinivasa [10]. Dhooria and Gupta [11] and Kumari and Sadana [12] reported peak population of B*revipalpus phoenicis* on guava during November - December. Therefore, the present report does not totally agree with published data.

The present results showed a peak in population density in may, 2016 which is similar to results of Dhooria and Butani [4]. These authors show two peaks in May-June as well in September. Our results, however, disagree with those of Dhooria and Gupta [12] who reported a peak in December. Most of the previous studies reported that mite population was reduced drastically with low temperature and rainfall (Oatman and Mcmurtry [13], Dhooria and Butani [4]). The peak population of different mites on *psidium guajava* was reported during February and the minimum was reported in July (Ghoshal, Gupta and Mukherjee [6]). They also reported that temperature, RH positively correlated while rainfall negatively correlated with the mite population.

Table1.Population size of *Hypoaspis xylocarpi* on *Xylocarpus granatum* per 6.25 cm² leaf area recorded form Nov. 2015 to Oct. 2016. (Data are given as mean ± SD)

Months	Mites (n=100)	Average temp (^{0}c)	Average Humidity (%)	Average rainfall (mm)
Nov 2015	17.9 ± 0.33	25.41 ± 2.10	75.00 ± 5.12	0.71 ± 0.08
Dec 2015	13.5 ± 0.56	21.10 ± 1.33	69.51 ± 6.35	0 ± 0.0
Jan 2016	15.4 ± 0.43	20.32 ± 2.33	72.97 ± 8.29	0.64 ± 0.22
Feb 2016	19.3 ± 0.65	23.50 ± 2.00	65.99 ± 5.36	0 ± 0.0
Mar 2016	29.9 ± 0.87	28.56 ± 2.07	62.33 ± 4.87	0.033 ± 0.01
Apr 2016	26.2 ± 0.28	29.5 ± 2.66	67.58 ± 3.99	2.54 ± 0.93
May2016	32.6 ± 0.93	31.28 ± 1.21	72.62 ± 4.56	1.05 ± 0.87
Jun 2016	30.8 ± 0.48	29.00 ± 1.34	83.50 ± 4.77	0.15 ± 0.22
July2016	5.10± 0.72	30.6 ± 2.37	78.29 ± 7.01	12.92 ± 3.45
Aug 2016	4.5 ± 0.51	28.91 ± 2.22	84.5 ± 3.42	15.53 ± 6.21
Sep2016	15.8 ± 0.48	27.10 ± 2.11	82.76 ± 3.22	10.49 ± 4.87
Oct2016	13.8 ± 0.28	27.69 ± 2.14	72.79 ± 5.01	2.28 ± 1.11

Table 2. Correlation between the mite density and three environmental variables

	Temperature	Relative humidity	Rainfall
Mite population	0.357	-0.208	- 0.636 *

* = significant, according to the J.P. Guilford's product moment coefficient of correlation table.

Conclusion

From the present study it was revealed that the highest population of *Hypoaspis xylocarpi* was found during May-June, 2016 and minimum population was during July-August, 2016. Therefore, this result shows that maximum availability of this mite was found during May- June of the year. During this time we can collect the mite and mass culture it and apply in the field for the purpose of predatory mite against any potent phytophagous mite population. This mite could be used as potential biocontrol agent against harmful phytophagous mites during May-June.

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