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POPULATION FLUCTUATION OF SHEATH MITE, *STENEOTARSONEMUS SPINKI* SMILEY INFESTING RICE CULTIVAR IET- 4786 AND ITS MANAGEMENT BY USING ORGANIC AMENDMENT UNDER WEST BENGAL CONDITION

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Abstract: India is the leading rice growing country in the world, with the production of 91.5 million t in 43.7 million ha. In few years, the rice sheath mite, *Steneotarsonemus spinki* Smiley, has been found most destructive mite pests of this crop in West Bengal province of India, especially in the kharif season. The mite population start to increase progressively after September and their peak population attained during the period of 22.9.14 to 27.10.14 at dough to ripening stage of the crop. Maximum temperature and maximum relative humidity had a negative influence on mite population. As temperature and RH gradually decreases a negative response is found. Rainfall had also a negative influence on mite population. The maximum mite population (850 mite/sheath) was observed in chemical fertilizer treated plot with appearance of 58.33% damage symptoms followed by untreated control plots and the lowest infestation was recorded in mustard cake (14.33%) treated plot. Application of mustard cake and cowdung manure are very promising for maintenance of low mite population and securing higher seed yield.

Keywords: Incidence, sheath mite, mustard cake, cowdung manure, organic farming.

Introduction

Rice, the most important food of near about half of the humanity is mainly grown and consumed in Asian countries. India is the leading rice growing country in the world, with the production of 91.5 million t in 43.7 million ha. In India, West Bengal is one of the main rice gwowing states, where about 14 million t are produced in 6.2 million ha (Anonymous, 2014). In few years, the rice sheath mite, *Steneotarsonemus spinki* Smiley, has been found most destructive mite pests of this crop in the West Bengal, especially in the kharif season. Rice sheath mite, *S. spinki* is a regular mite pest occurs in kharif rice under Gangetic Plains of West Bengal causing 15 to 60% yield loss in susceptible rice cultivars depending on the time of transplanting (Karmakar, 2008). It colonizes inside leaf sheath, producing chaffy and sterile grains and characteristic brownish patches on the affected plant parts. Continuously feeding by mites on reproductive parts of rice flowers, results in sterility of grain (Rao &

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Prakash, 1992). These mites have also been reported as vector/carrier of pathogenic fungi like *Acrocylindrium* (*Sarocladium*) *oryzae*, *Fusarium moniliformae,* and *Helminthosporium oryzae* (Rao *et al*., 2000). The rice sheath mite, *Steneotarsonemus spinki* Smiley, which belongs to the family Tarsonemidae, has been reported from Taiwan (Chen *et al.,* 1979), Cuba (Ramos and Rodriguez, 1998), Philippines (Sogawa, 1977) and Madagascar (Gutierrez, 1967). In India, it has been reported from Orissa (Rao and Das 1997), East and West Godavari districts of Andhra Pradesh (Rao *et al*., 2000). The extent of crop loss has been reported as 30–90% in China (Xu *et al*., 2001) and 30–70% in Cuba (Ramos & Rodriguez, 2000).

The rice panicle mite or sheath mite, (*Stenotarsonemus spinki)* alone and in association with sheath rot fungus, (*Acrocylindrium oryzae)* causes grain discoloration, ill-filled, chaffy grains and often cause heavy losses. It has been reported that this mite caused yield losses ranging from 4.9% to 23.7% (Natalie *et al*., 2009).

Most of the mite population is found on lower 2 and 3 leaf sheaths (Ramos and Rodriguez, 2000 and 2001). Sheath mite population is generally higher during wet season compared to dry season (Rao and Prakash, 1992and 1995). Damage by *S. spinki* is more in short duration varieties compared to medium and long duration ones (Rao and Prakash, 1996). Population size of S. *spinki* increases with rice planting density (Lo and Ho, 1979). Mite infestation increased gradually from 80 DAT and reached a peak between 100 to 120 DAT during *kharif* and summer under field conditions in Karnataka, India. However, the mite population was more abundant during summer than *kharif* (Prabhakara, 2002).

Materials and Methods

The experiments were conducted in kharif rice on sheath mite at field condition by using standard rice cultivars IET-4786 (Satabdi) at 'AB' Block Farm, Bidhan Chandra Krishi Viswavidyalaya, Kalyani during two consecutive year 2014-15. To study the population dynamics of sheath mite and to evaluate the impact of organic nutrients on occurrence sheath mite, *Steneotarsonemus spinki* on rice. Twenty five days old Seedlings were transplanted in the main field at spacing 25cm x 15cm on 20th of July, 2014-15. Standard agronomic practices were followed for general cultivation of rice. Population data of mite was recorded in forty days after transplanting at regular 10 days interval. Ten hills were selected from each treatment and each replication and one sheath was taken from each selected hills along the diagonal line of the plot for counting the mean mite population. Mite population was counted from each of the leaf sheaths taking leaf-sheath pieces of one square centimeter length from

three places along the leaf-sheath and was washed in alcohol vials separately and thus mean (of 30 observations) mite population/cm^2 was considered for presenting data in the table-1. To find out the relationship of mite population that occurred in the susceptible rice cultivar IET-4786 was correlated with the corresponding mean weather parameters viz., maximum and minimum temperature, maximum and minimum relative humidity and total rainfall.

The different treatments contains the organic matters viz. cowdung manure @ 5 ton/ha, mustard cake @ 2.5 t/ha, neem cake 2.5 t/ha, Glyricidia leaf manure @ 5 t/ha and recommended dose of chemical fertilizer (100:50:50) and an untreated control were considered. For recording data on mite population and % of symptom caused by *S. spinki* from each of the plots were considered. The treatments were replicated five times in a Randomized Block Design.

Results and Discussion

From the data it was revealed that at the early tillering stage of the crop in the month of August no mite population was observed and very low mite population was noticed in the 1st week of September (Table 1). Thereafter, the mite population start to increase progressively and their peak population attained during the period of 22.9.14 to 27.10.14 at dough to ripening stage of the crop. The highest population of mite observed at ripening stage of the crop. From the experiment it was clearly observed that the occurrence of the mite population was highly correlated with the host phenology and the prevailing weather parameter. Maximum temperature and maximum relative humidity had a negative influence on mite population. As temperature and RH gradually decreases a negative response is found. Rainfall had also a negative influence on mite population (table 1).

Table 1: Population fluctuation of rice sheath mite on rice cultivars IET-4786 during Kharif, 2014-15 in West Bengal.

Date of observation	No. of mite/cm	Temperature		Relative humidity		Total Rainfall (mm)
		Max Temp (^oC)	Min Temp (^oC)	Max. RH (%)	Min RH (%)	
13.8.15	0 (0.50)	35	27	95	70	8.00
20.8.15	0.02 (0.64)	33.5	25.2	97	77	35.00
27.8.15	0.09 (0.8)	33.8	27.5	95	69	0.00
04.9.15	1.10 (1.54)	35	26.5	95	70	00
11.9.15	15.5	33	26.5	95	70	0.00

	(4.43)					
18.9.15	19.32 (4.89)	36	27	95	74	0.00
25.9.15	21.05 (5.08)	34.6	26.5	98	62	0.00
02.9.15	31.08 (6.07)	35.5	24.5	98	69	23.7
09.10.15	44.42 (7.16)	33.4	24.8	98	73	7.0
16.10.15	50.52 (7.60)	32	24	96	75	1.00
23.10.15	64.12 (8.50)	34.5	25.0	93	58	0.00
30.10.15	41.75 (6.96)	29.8	21.5	91	71	0.00
6.11.15	14.25 (4.27)	32.12	20.21	94	63.12	0.00
13.11.15	5.22 (2.78)	33.0	18.9	94	52	0.0
Pearson's *r*	---	-.252	-.160	-.113	-.033	-0.185

The different treatments contains the organic nutrients viz. cowdung manure @ 5 ton/ha, mustard cake @ 2.5 t/ha, neem cake 2.5 t/ha, Glyricidia leaf manure @ 5 t/ha and recommended dose of chemical fertilizer (100:50:50) and an untreated control were considered. For recording data on mite population and % of symptom caused by S. spinki from each of the plots were considered. No mite infestation was observed at the early

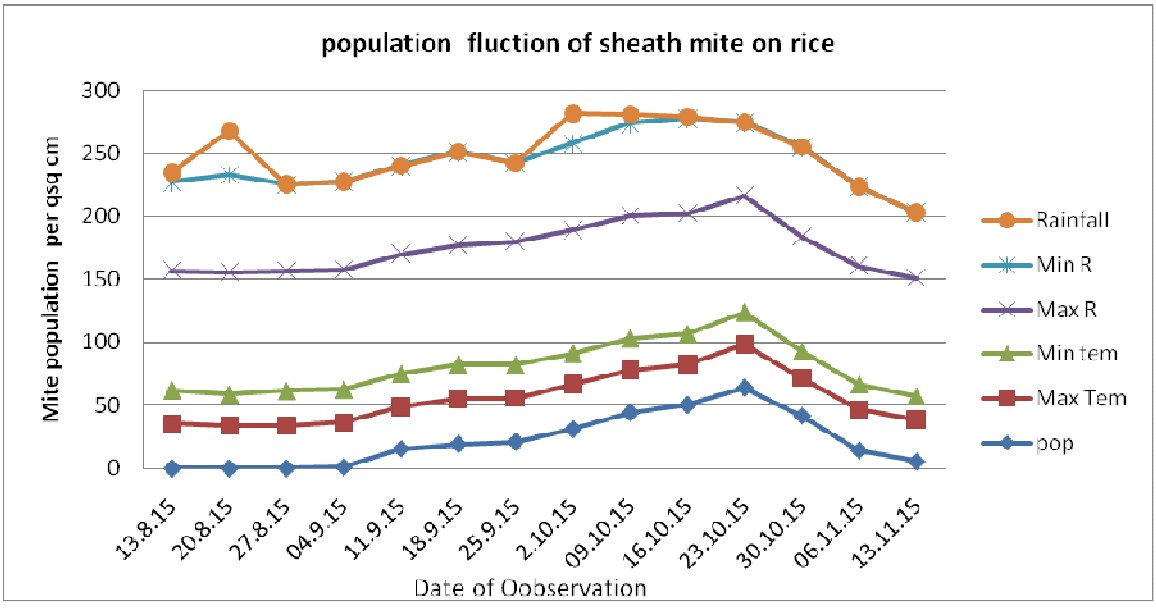

Fig: 1 Population fluctuation of rice sheath mite on rice (cv- IET-4786) relation with ambient weather parameters.

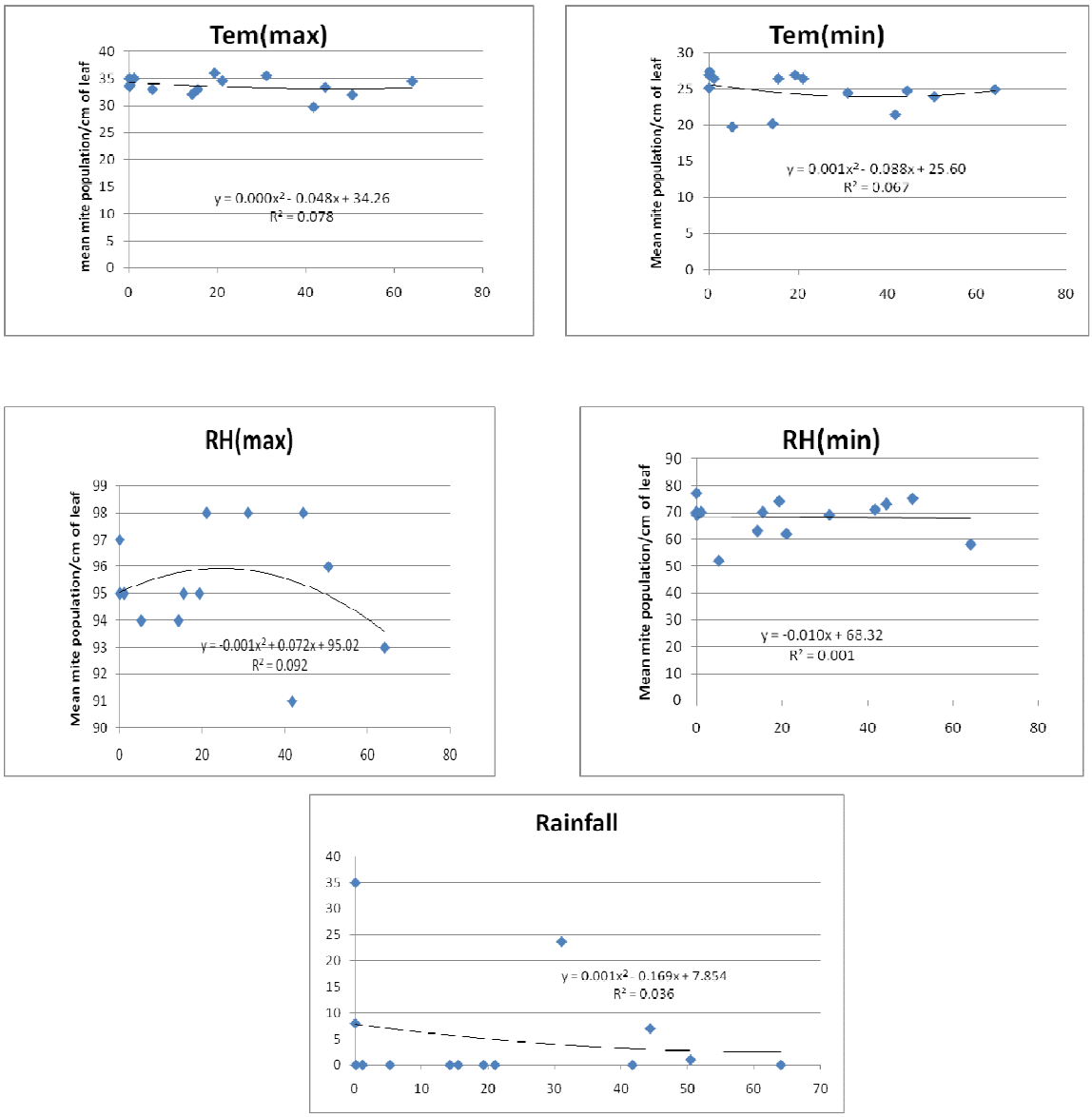

Table: 2: Correlation and regression coefficient of sheath mite on rice with weather factor during 2015-16.

Weather factor	Correlation (r)	Regression coefficient by (x)
Maximum Temperature (^{o}C)	-0.27	-0.05
Minimum Temperature (^{o}C)	-0.25	-0.09
Maximum Relative humidity (%)	0.30	0.07
Minimum Relative humidity (%)	-0.03	-0.69
Total Rainfall(cm)	-0.18	-0.17

vegetative stage of the crop, however, they began to start their population development during booting stage and gradually attained a peak during end of September and ripening

stage of the crop. The maximum mite population (850 mite/sheath) was observed in chemical fertilizer treated plot with appearance of 58.33% damage symptoms followed by untreated control plots with (395 mites/sheath and 50% plant with damage symptoms) and the lowest infestation was recorded in mustard cake (14.33%) treated plot. Application of mustard cake and cowdung manure are very promising for maintenance of low mite population and securing satisfactory seed yield.(7.55 t/ha and 6.45 t/ha respectively) table-3.

Table 3: Impact of organic nutrients on the occurrence of sheath mite on rice cultivar, IET-4786 during 2014-15.

Treatments	Doses	No of mite/sheath	% tillers with damage symptom	Yield in ton/ha.
Cowdung Manure	5 t/ha	205	20.0c (26.81) *	6.45b (2.63) **
Mustard cake	2.5 t/ha	170	14.33c (22.52)	7.55a (2.84)
Neem cake	2.5 t/ha	290	30.0b (34.34)	5.0c (2.34)
Glyricidial leaf manure	5 t/ha	152	31.67b (33.47)	5.5c (2.45)
Chemical Fertilizer	100:50:50	850	58.33a (50.13)	5.6c (2.47)
Untreated Control	------	395	50.0a (45.29)	3.5d (1.87)

Similar alphabets represents the homogeneous means group due to Duncan's Multiple Test range, * Values in the parentheses are angular transformed,** Values in the parentheses are square root transformed

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