POPULATION DYNAMICS OF LADY BIRD BEETLE AND SPIDERS IN RELATION TO WEATHER FACTORS IN TOMATO (LYCOPERSICON ESCULENTUM L.)

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Abstract: The incidence pattern of spider and ladybird beetle was studied during 2011-2013. Maximum population of spider (1.07-1.83/plant) and lady bird (0.33-1.00/plant is observe on 3rd week of February to 2nd week of March and on 3rd week November to 1st week of January respectively. Minimum population of spider (0.10/plant) is recorded on 3rd week of September and 4th week of May. Similarly minimum population number of lady bird (0.00 to 2..23/plant) on 3rd week of September to 3rd week of November, 2nd week of January to last week of February and 4th week of May to last week of May. Correlation co-efficient studies reaveled that activity spider population decrease with the rise of temperature, relative humidity and heavy rainfall. But in case of ladybird beetle, population decrease with the rise of temperature, relative humidity and rainfall.

Key words*:* Incidence, ladybird beetle, spider, tomato, weather factors.

Introduction: Lady beetle and spiders are two well known groups of insect predators and consume more than one prey during their life. All spiders are predacious. They usually kill their prey by injecting venom. Spiders are highly beneficial; they feed on insects and other small arthropods.The garden spider uses its webs to capture insects. Both larva and adult of lady beetle arre predacious, feeding mainly on soft bodied insect like mealybugs, aphids , scale insets and eggs [1]. It also play an important role in killing eggs and small larvae of most of the lepidopteran species which is widely used in biological control [2]. Different types of pests are found in nature affecting life and yield of natural and cultivated crops. They hamper and destroy standing and stored foods reserves in every part of world [3]. Chemical Control Method (CCM) is frequently applied as it is easy and prompt way to directly kill or repel the pests from crops and fruit tree [4]. But it is reported in many experiments that chemical pesticides has not only hazardous effects on human life by increasing pollution but also it has indirect impact by disturbing ecosystems. Recently, it is reported that Biological Control Method is better technique to control the pest of different types [5]. In many studies it is known that *Coccinella septempunctata* L. commonly called Lady bird beetle is a capable predator and can be used for the biological control of *T. tabaci* and *T. vaporariorum* in a greenhouse [6]. *Coccinella septempunctata* L. is considered to be an important bio-control agent for soft-bodied insects such as aphids, white flies, jassids and small lepidopterous larvae which were among the first to be used in this fashion [7] and fields preying on aphids and scale insects[8]. The use of predators, as biocontrol agents, is an important alternative to the chemical insecticides. Keeping in view, the objective of this study was to investigate the seasonal abundance of ladybird beetle and spiders. This information allows judicious application of pesticides with minimum hazards to natural enemies.

Materials and methods: Field experiments were conducted in Instructional Farm of Uttar Banga Krishi Viswavidyalaya at Pundibari, Coochbehar, West Bengal, India for two years (2011-13). The experimental area is situated in the sub-himalayan region of north-east India. This so called terai zone is situated between 25°57' and 27° N latitude and 88°25' and 89°54' E longitude. To study seasonal incidence ladybird beetle and spider with relation to prevailing weather conditions on the, Pusa Ruby variety was grown round the year except rainy season when tomato cultivation is not possible in open field in this area. The crops were raised following standard agronomic practices of irrigation, weeding, and fertilization. However, no pesticides were used throughout the cropping season. The seasonal incidence of pest and important weather parameter (temperature, relative humidity and rainfall) was recorded to find out influence of weather on population fluctuation. The data were recorded at seven days interval from five plants which was randomly selected and tagged from each replicated plots for each observation. The natural enemies were counted number per leaf basis.

Result and discussion: Analysis of the two years (2011-12 and 2012-13), it was found that the pattern spider incidence more or less similar type on tomato plant. From the beginning the population started to increase continuously with little fluctuation in number of population up to 11th standard week of 1st March. After that it started to decrease with fluctuation in number of population up to end of the season. Higher population is maintained on 8th to 11th standard week that is during 3rd week of February to 2nd week of March (1.07-1.83/plant) when average temperature, average relative humidity, weekly total rainfall were 20.10-22.96ºC, 52.86-73.50% and 0.00-4.00mm respectively. The lowest population is

recorded on 38th and 22nd standard week that is during 3rd week of September and 4th week of May with the population number *i.e.,* 0.10/plant when the average temperature, average relative humidity and weekly total rainfall were 27.42-27.73ºC, 79.50-92.46% and 65.86-240.00mm respectively. Correlation studies (Table 1) between spider population and environmental parameter revealed that spider population had a significant positive correlation with temperature difference while significant negative correlation with temperature (minimum and average), relative humidity (minimum and average) and weekly total rainfall. On the other hand non-significant negative correlation found between spider population and relative humidity (maximum, minimum and average) and non significant negative correlation between spider and maximum temperature. This indicates that activity of spider population decrease with the rise of temperature, relative humidity and heavy rainfall.

Ladybird beetle is important biological agent of tomato pests assisting to reduce the damage of insect infestation appeared in both the years [2011-12 and 2012-13]. Its occurrence and degree of infestation not only varied with seasons but also over the years [Fig 1].

The pooled data on lady bird beetle incidence for the two years (2011-12 and 2012-13), showed that low level of population (0.00 to 2..23/plant) was recorded on 38th to 47th standard week that is during 3rd week of September to 3rd week of November, 2nd to 9th standard week that is during 2nd week of January to last week of February and 21st to 22nd standard week of 4th week of May to last week of May when average temperature, relative humidity and weekly rainfall ranged from 14.28-27.73°C, 54.35-92.46% and 0.00-240.00mm respectively. Higher level of population (0.33-1.00/plant was maintained on 47th standard week to 1st standard week that is during 3rd week November to 1st week of January when average temperature, relative humidity and weekly rainfall ranged from 16.46-27.58°C, 47.85-92.39% and 0.00-63.40mm respectively. Correlation studies (Table 4.14) between ladybird beetle population and environmental parameter revealed that ladybird beetle population had a non-significant positive correlation with temperature difference while non-significant negative correlation with temperature (maximum, minimum and average), relative humidity (maximum, minimum and average) and weekly total rainfall. This indicates that activity of ladybird population decrease with the rise of temperature, relative humidity and rainfall.

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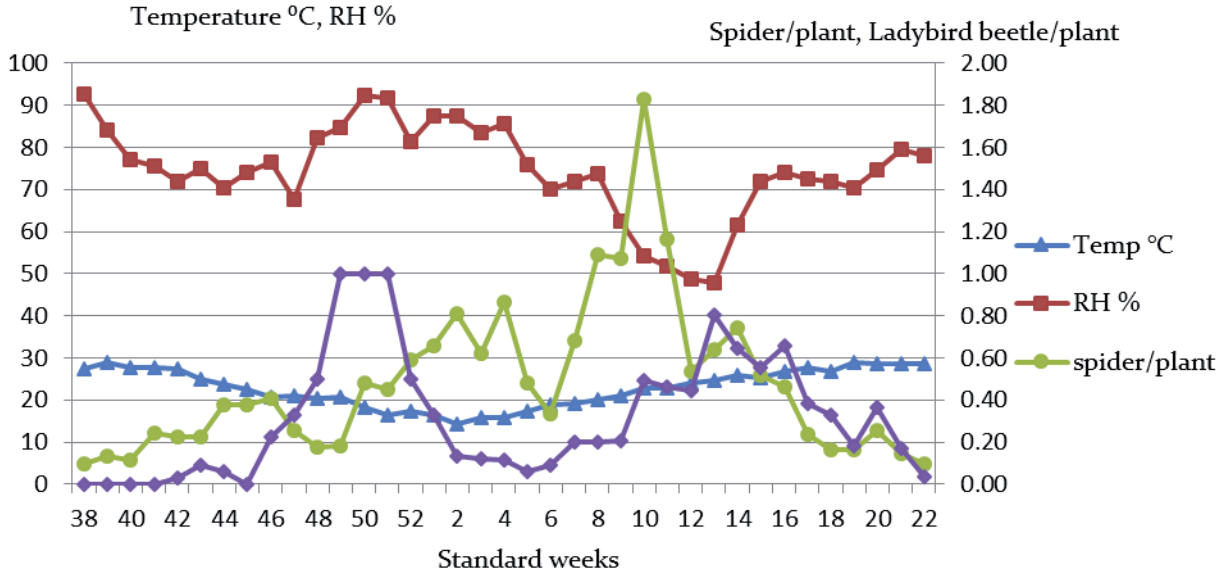

Fig. 1: Incidence of spider and ladybird beetle as influence by temperature and RH

Table 1

Environmental parameter		Correlation co-efficient (r)		Co-efficient of determination (R^2)		Regression equation	
		Spider	Lady Bird beetle	Spider	Lady bird beetle	Spider	Lady bird beetle
Temp. ^oC	Maximum	-0.309	-0.167	0.095	0.028	Y= -3.078X+30.840	Y= -2.096X+30.031
	Minimum	-0.502**	-0.205	0.252	0.042	Y= -7.477X+19.916	Y= -3.838X+17.532
	Difference	0.559**	0.175	0.312	0.030	Y= 4.381X+10.947	Y= 1.720X+12.510
	Average	-0.439**	-0.198	0.193	0.039	Y= -5.321X+25.410	Y= -3.006X+23.806
RH (%)	Maximum	-0.195	-0.049	0.382	0.002	Y= -5.110X+83.720	Y= -1.608X+81.122
	Minimum	-0.554**	-0.082	0.307	0.006	Y= -20.623X+78.185	Y= -3.834X+69.473
	Average	-0.423**	-0.071	0.179	0.005	Y= -12.866X+80.628	Y= -2.272X+75.279
Rainfall(mm)	Weekly total	-0.400*	-0.261	0.160	0.068	Y= -46.726X+42.409	Y= -38.298X+32.510

Reference:

1. J. M. Ryan,"Michigan state university extension. biocontrol of insects." 1996, Extension bulletin E-2453.
2. *Gaurang Trivedi, I. R. Gadhvi,* Survey of Sea Turtle on Piram Island; Life Sciences international Research Journal , ISSN 2347-8691, Volume 2 Issue 1 (2015), Pg 445-447
3. M. A. Altieri, "Agroecology: The Science of Sustainable Agriculture," Westview Press, Boulder, CO, USA. 1995.
4. J. J. O. T. J. Kring, "Predaceous Coccinellidae in Biological Control," Annual Review of Entomology, 1998, 43:295-321.
5. I. Katsarou, J. T. Margaritopoulos, J. A. Tsitsipis, D. C. Perdikis and K. D. Zarpas, "Effect of temperature on development, growth and feeding of *Coccinella septempunctata* and *Hippodamia convergens* reared on the tobacco aphid, Myzus persicae nicotianae." *BioControl,* 2005, 50 (.4): 565-588.
6. D. H. Habeck, F. D. Bennett, and J. .H. Frank,. Classical Biological Control in the Southern United States." Southern Cooperative Series Bulletin No. 355, IFAS Editorial, University of Florida, Gainesville, 1990, FL. pp 197.
7. M. E. Solomon, "The natural control of animal populations. Journal of Animal Ecology." 1949, 18: 1-35.
8. Chand Basha ,V.Subhashini, An Overview on the Assessment of Air Pollution By SK; Life Sciences International Research Journal , ISSN 2347-8691, Volume 1 Issue 1 (2014): Pg 170-173
9. N. K. Victor, "Lady Beetles of the Russian Far East. Center For Systematic Entomology." Memoir 1997. 1: 4-5.
10. M. F. Potter, R. Bessin, and T. Lee,. "Uncooperative Extension Service. Asian Lady Beetle Infestation Of Structures" 2005. ENTFACT-416
11. *S.Arunkumar,* Evaluation of Surface Reactivity Patterns Between Ovine Nematodes By Immunoperoxidase Assay; Life Sciences International Research Journal , ISSN 2347-8691, Volume 2 Issue 2 (2015): Pg 73-75

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