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Short Communication

Weather based forewarning of root mealy bug, *Paraputo sp.* (Pseudococcidae : Hemiptera) in mulberry of Kalimpong hills

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Kalimpong hills in Darjeeling district endowed with sub-tropical climate, is congenial for rearing of bivoltine silkworm superior in quality in comparison to hybrids reared in plains of West Bengal. Bivoltine silkworms can be successfully reared during March-October when adequate rainfall and prevailing temperature facilitates production of adequate mulberry foliage. Incidence of pest is a serious predicament for the production of mulberry which ultimately affects the silk production.

Mulberry plantations in hill are being infested by root mealy bug, *Paraputo* sp. (Pseudococcidae: Homoptera) causing considerable damage. It remains in the root-zone and adjacent to stump portion below the soil surface up to 20 cm deep, suck sap and secrets honey dew; thus inviting the occurrence of several fungi on the plants. Due to sucking root becomes stunted, normal growth ceases; leaves become yellow and appear to be wilting (8). Several alternate hosts were recorded for the pest and highest density of it was recorded at the depth of 7.5 to 15cm (2). Its biology has been studied and chemical control was recommended (1). Use of synthetic insecticides in hills is not permissible due to pollution of surface water source and its application is warranted due to its toxicity to silkworm in a fixed cropping schedule.

For specific agro eco system information on the abundance and distribution of pest population in relation to weather parameters is a basic requirement to develop weather based forewarning or prediction system by monitoring or predicting the pest population (10). It is being widely used in the agricultural production system now-a-days as a tool for lesser damage to natural enemy complex and also limits environmental pollution by way of reduced pesticide application on requirement basis and apply when necessary strategy. The influence of climate greatly impacts the population dynamics of insect pests. Significant influence of weather has been demonstrated in the population dynamics of several insect pest in different crops and developed weather based models (3, 4, 5, 6, 9, 11). Considering this, an attempt was made to predict the root mealy bug population through weather based forewarning models to intimate the seri-farmers of Kalimpong area about its incidence to remain in preparedness and to reduce the use of chemicals.

The incidence of root mealy bug were recorded from four locations viz, Regional Sericultural Research Station (RSRS) Kalimpong (910 m), Barbat farm (950 m), Hill Nursery (970 m) and Foreign race seed station (FRSS, 980m) randomly from five plants in every standard international week during April 2005 to March 2008. The soil in basal regions of plants was carefully removed up to 15 cm depth and population (nymphs/adults) was recorded and soil was replaced. In every week data collection was made at separate site in the same plot as removal of soil from the basal region of same plant may affect adversely. Meteorological data

i.e., maximum temp. (MaxT), minimum temp.(MinT), maximum RH% (MaxR), minimum RH (MinR) and rainfall was recorded at RSRS observatory during the study period. Root mealy bug incidence data was correlated with the meteorological factors through different type of regression analysis to find the best suitability.

The incidence pattern shows a very definite pattern, population was found almost negligible during January and February after which it started growing and attended maximum sometimes during June and October. During 2005 maximum population was observed in July while in 2006 it was in September and in October during 2007. Minimum population was recorded during the month of January as 0.98/plant, 0.50/palnt and 1.35/plant during 2006, 2007 and 2008, respectively (Fig.1).

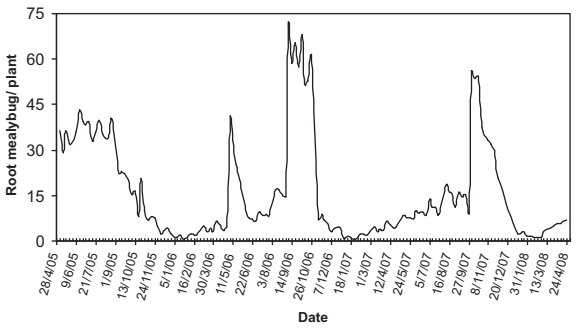

Fig.1 Root mealy bug population (mean)/plant.

While developing a prediction model for the pest based on the meteorological factors the most precise multiple regression equation (R^2 = 0.394) was found to be Y = -46.201 + 1.000x1 + 0.929x2 + 0.102x3 + 0.211x4 + 0.103x5, where x1, x2, x3, x4, x5 are the above five meteorological factors averaged over a period of 19 - 22 days, 24 - 29 days, 19 - 25 days and 29 - 31 days respectively prior to the day of incidence. The same level of prediction can also be made (R^2 = 0.365) from the minimum temperature averaged over the same period using regression equation Y = - 21.130 + 2.320x2. During 2006 predicted values were found to be nearer to the observed values and during 2007 predicted values have shown some differences during the month of May and during 2008 observed values were closer to predicted values (Fig.2).

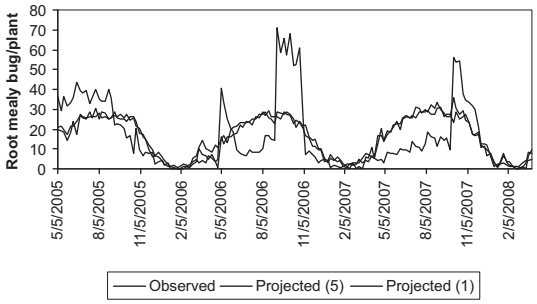

Fig. 2 Showing root mealy bug incidence/plant. [Projected (5) indicates based on five met factors and projected (1) indicates based on min. temp.]

In the present study rainfall was observed as one of the factor influencing root mealy bug population corroborated with the findings of Madden *et al*. (7) where rainfall was identified as the critical factor for occurrence of *Helicoverpa armigera.* Khaliq & Yousaf (5) reported that minimum temperature plays significant role in the population build up of *Amrasca devastanus* on cotton in Pakistan is in agreement with the finding as minimum temperature showed a relationship (R^2=0.365) with population build-up of root mealy bug. Wu & Shen (12) have developed a prediction model for *Helicoverpa armigera* in cotton in the coastal areas of Jiangsu, China, in which monthly mean temperature positively impacted on the oviposition rate is in conformity with the present findings.

In this study, a definite incidence pattern of the pest was recorded. A prediction model for incidence from the meteorological factors was developed and multiple regression equations (R^2 = 0.394, R^2 = 0.365) were found to be significant based the five meteorological and minimum temperature over a certain period of time. The observation paves the way to develop the full proof prediction model for root mealy bug in Kalimpong hills.

Literature Cited

1. Biswas S Das D Chattopadhyay S Das SK and Mondal K. 2002 *Sericologia* **42**: 39-48.
2. Das D Biswas S Sarkar S Das SK Chakrabarti S. 2004 *Sericologia* **44**: 95-100.
3. Hasan W and Singh C P. 2010 *The Journal of Plant Protection Sciences* **2**: 71-76.
4. Huffaker CB Berryman AA Laing JE. 1984 In *Ecological Entomology.* CB Huffaker and RL Labb (Eds.) pp. 359-98 Wiley, New York.
5. Khaliq A Yousaf M. 1986 *Journal of Agricultural Research,* Lahore, **24**: 313-19.
6. Kravchenko VD. 1990 *Zashchita-Rastenii-Moskva* **2**:26-27.
7. Madden A D Haggis M J Holt J. 1993 *Crop Protection* **12**: 51-54.
8. Misra AK Das BK Ahasan MM. 1996 *Sericologia* **36**: 369-71.
9. Mukhopadhyay SK Bandyopadhyay UK Santha Kumar MV and Das SK. 2005 In *Proceedings of Congress of International Sericultural Commission* held at Bangalore, India on 15-18 Dec, 2005, pp. 87-90.
10. Steenwyk W. 1983 *Journal of Economic Entomology* **76**: 57-60.
11. Trivedi TP Khurana P Puri SM Bhar SN, Mehta LM Jain SC Singh RC Choudhury G Mohasin MSM Dhandapani A. 2002 *Indian Journal of Agricultural Science* **40**: 75-82.
12. Wu MD Shen JS. 1994 *Plant Protection* **20**: 25-27.