Journal of Agrometeorology 21 (2) : 230-232 (June 2019)

Short Communication

Seasonal population build-up of leaf folder (*Cnaphalocrocis medinalis* Guenee)in paddy in response to meteorological parameters

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India is the second largest producer of rice in the world after China, producing about 105.48 million tonnes from an area of 44.11 million hectares during 2014-15 (Annon., 2016). Assam has its climatic and physiographic features favourable for rice cultivation and the crop is grown in a wide range of agro-ecological situations. *Sali* or winter rice is dominant crop of the state covering 19 lakh hectares (75 % of rice area) followed by *boro* rice of 4 lakh hectares (16 %) and *ahu* rice of 2 lakh hectares (9 %) (Annon., 2014).

Though diverse agro climatic zones of Assam offers a great potential for cultivation of rice but, its production is severely affected by various biotic stresses.Rice ecosystem acts as a habitat for different pests which drastically diminishes the economic harvest of the crop (Dhaliwal *et al*., 2010). Nearly, 300 species of insect pests attack paddy at various stages of the crop growth and among them 23 species causes notable damage (Pasalu and Katti, 2006). *Cnaphalocrocis medinalis*, rice leaf folder, which was considered a minor and sporadic insect pest of rice in several Asian countries, has become a major threat to rice production in tropical and subtropical Asia (Heinrichs *et al.*,1985). *C. medinalis* infestation influences photosynthesis of the crop and may lead to as high as 60-70 per cent leaf damage inflicting yield loss up to 80 per cent (Saikia and Saikia, 1999). Hence, need was felt for thorough understanding of the seasonal incidence of leaf folder and its relationship with the meteorological parameters so as to predict and plan for effective forewarnings and efficient protection measures.

The present study was conducted at farmers' field near Regional Agricultural Research Station, Titabor, Jorhat,(Lat: 26°60' N, Long: 94°20' E andAlt:90 m)during *kharif* season of 2013 and 2014. 'Ranjit' variety of rice was chosen for the present experiment as it is widely grown in Assam and standard agronomic practices were followed with zero pesticide application.The seedlings were transplanted to main plots on 19thJuly, during both the years, 2013 and 2014. Plant inspection method was used to record leaf folder for which 20 plants were randomly selected and folds were opened to record the pest population.Observations were started 15 days after transplanting (DAT) and continued at fortnightly interval till harvesting to estimate their fluctuation during various phases of the crop.

For assessing the association of leaf folder with weather, fortnightly average meteorological data *viz.,* mean temperature (Tmean), total rainfall (RF), mean relative humidity (RH), and bright sunshine hours (BSSH), preceding each sampling date were collected from RARS, Titabor for the whole cropping season and the data on seasonal incidence of leaf folder was obtained from the field. Two year pooled data were used for working out Karl Pearson's correlation and t-test was used to understand its statistical significance. An attempt was made to develop a multiple regression equation for identifying the weather parameter playing major role in determining occurrence of leaf folder using fortnightly averaged pooled meteorological data preceding each sampling date as the independent variable and pooled leaf folder population at fortnightly interval as the dependent variable. The best fit regression equation was obtained using XLSTAT software and was selected on the basis of adjusted coefficient of determination (Adjusted R^2) and root mean square error (RMSE).

Seasonal incidence of C.medinalis in kharif paddy under field condition

The activity of leaf folder started soon after establishment of the crop in the main field (Fig. 1). The occurrence of the pest was observed from the first sampling date *i.e*., 15 DAT to 105 DAT. The population was initially low with a population level of 1.6 larvae/20 plants at 15 DAT. It increased gradually and the peak population (8.2 larvae/ 20 plants) was recorded at 60 DAT *i.e.,* during mid of September. Maximum population at 60 DAT might be due to highest foliage cover resulting in higher leaf area index during that phase (Ko *et al.,* 2017) in combination with favourable weather factors such as reduced rainfall coupled with high humidity, high temperature and diminished

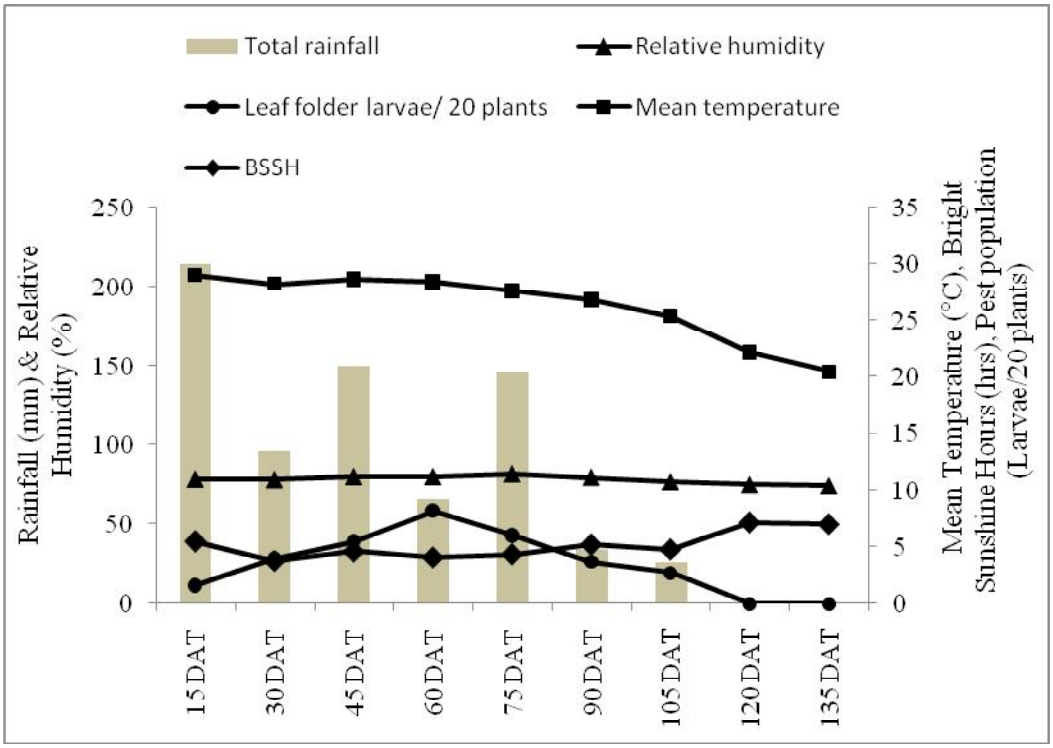

Fig. 1: Pooled weather scenario corresponding to pest population during the crop growing period of *Kharif* 2013 and 2014.

Table 1: Correlation of population of leaf folder per 20 plants of rice with meteorological parameters

Weather parameter	Correlated coefficient
Mean temperature (Tmean)	0.728*
Relative humidity (RH)	0.853**
Rainfall (RF)	0.348
Bright sunshine hour (BSSH)	-0.844**

*shows significance at $p = 0.05$, **shows significance at $p = 0.01$

sunshine hours. Subsequently, the population gradually declined and such downswing can be attributed most possibly due to the reduction in number of young leaves as the crop entered reproductive stage as well as due to the presence of rich fauna of spider and dragonfly which were regarded as potential predator of the pest.

Correlation and regression analysis

Incidence of leaf folder established a significant (p = 0.05) positive correlation (r = 0.728) with average temperature (Table 1).Pest incidence, was however, not associated with rainfall. Leaf folder depicted highly significant (p = 0.01) positive correlation (r = 0.853) with average relative humidity. The results were in conformity with that of Kalita *et al.* (2015) who stated that relative humidity (maximum and minimum) had positive influence on all insects and natural enemies with significant effect on the population of leaf folder in rice. The association with bright sunshine hours revealed a highly significant negative correlation (r = -0.844) and the results were similar to that of Chakraborty and Deb (2011) who reported negative impact of the same on the pest population.

The multiple linear regression technique applied to develop prediction equation for leaf folder population as given below

Leaf folder larvae/ 20 plants = -53.83805 + 0.81083 × RH - 0.01146 × RF - 1.01104 × BSSH

With ($R^2 = 0$) 87** it is observed that mean relative humidity, total rainfall and bright sunshine hours were the major weather parameters which affected the incidence of leaf folder. These three weather parameters explained 87.0 per cent of the total variation in the leaf folder population occurring during the crop growth period. Such results were corroborated with the findings of Shekhar *et al.* (2018) who obtained a value of coefficient of determination of 76 per cent when the pest population was regressed against relative humidity, sunshine hours, temperature and wind speed.Moreover, the mean square error (MSE) and root mean square error (RMSE) was 1.50 and 1.20 respectively for this line of regression.

The results revealed that the mean temperature, mean relative humidity and bright sunshine hours exhibited significant relation with the occurrence of the pest. The regression equation developed can be used for prediction the population of on C. *medinalis* in Titabor, Jorhat region of Assam.

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Received : January 2018; Accepted: May 2019