PREDICTING THE OUTBREAK OF GREEN JASSID (*NEPHOLETHIX VIRESCENS*) USING DIFFERENT WEATHER INDICES AT PATTAMBI, KERALA

1.   Rice is grown throughout the year at Pattambi (10° 48′ N, 76° 12′ E), Kerala. But the yield in all the seasons is much below the potential yield due to several reasons. One of the most important reasons is the pest and diseases attack which causes considerable damage to the crop. Globally nearly 20 to 35% rice yield is lost due to insect pests attack (Heinrichs, 1994). Among these pests green jassid is a major constraint to higher rice yield (Heinrichs, 1994). Kharif rice is mainly infested by green jassid year after year (Samui *et al.*, 2002) but the intensity of attack depends on favourable meteorological conditions, natural enemies, predators, parasites etc. in the crop growing seasons. Damage due to green jassid is much higher in southern states where the pest multiplies throughout the year and shifts from one crop to next (Samui *et al.*, 2004). On an average about 10% damage has been reported due to green jassid attack at Pattambi (Kartikeyan, 2002).   It is reported that proper plant protection measures at appropriate time can save the loss in yield of rice even upto 50% (Rangaswammy, 1988). With this in view, an attempt has been made to explore the feasibility to develop forewarning on the basis of three ratios namely afternoon relative humidity to maximum temperature ratio (HTR), afternoon relative humidity to bright sunshine ratio (HBSSH) and afternoon relative humidity to rainfall ratio (HRF). This study would be useful in evolving a pest management scheme based on optimum weather requirement and present and forecast weather at and around Pattambi, Kerala.

2.   Chinsurch type light trap was installed in the rice field at Regional Agricultural Research Station (RARS), Pattambi for trapping various rice pests. The daily observations of green jassid catches were recorded by the Entomologist, RARS and meteorological data by the Meteorological Office at Pattambi respectively. The data recorded from 1987-2001 for 15 years were utilized for this study.

Correlation coefficients between green jassid population and individual meteorological parameters for the corresponding week have been worked out. The C.C. which was found significant at 1% or 5% level was used for further study. The C.C.s. at week no. 33, 37 and 39 were found highly significant. The meteorological parameters significant at these weeks were used for calculating the HTR, HBSSH and HRF ratios. The afternoon relative humidity at 33rd, 37th and 39th week in all the years divided by maximum temperature for the corresponding week respectively give humidity thermal ratio (HTR). The afternoon relative humidity at 33rd, 37th and 39th week in all the years divided by bright sunshine hours (BSSH), for corresponding week respectively give HBSSH ratio. Similarly afternoon relative humidity at 33rd, 37th and 39th week in all the years divided by rainfall (RF), for the corresponding week respectively give HRF ratio. These ratios were correlated with light trap catches of green jassid. The best fit equations for 3 ratios were developed for operational use.

3.   *Humidity-Temperature Ratio and Green Jassid Relationship (HTR-GJ-Relationship)* - Relation between the afternoon relative humidity to maximum temperature ratio and light trap catches of green jassid is presented in Fig. 1. The lowest and highest values of green jassid catches are 115.9 and 754 respectively during the peak infestation period. The HTR ratios observed were 1.71 and 2.91 respectively for the lowest and highest values of green jassid population.   However, the HTR values between 2.75 to 2.83 had profound effect for the sudden outbreak of green jassid attack. This correspondence to the afternoon relative humidity range between 78 to 82% and maximum temperature range between 28 to 29° C. The Cauchy type equation $Y = 1 / [-0.0075*(X-1.922)^2 + 0.084]$ was found to give best fit equation for HTR ratios and light trap catches of green jassid with R^2 value 0.85 (significant at 1% level).
Where,

Y =   light trap catches of green jassid

X =   HTR ratios

The equation accounted for 85% of variation of green jassid population. It may be seen from the graph that the green jassid population increased with the increase in HTR ratios gradually when HTR ratio reaches about 2.5 then it increases exponentially. The outbreak of green jassid infestation takes place as the afternoon relative humidity increases and maximum temperature decreases. It may be seen from the Fig. 1 that the Cauchy equation predicated green jassid population fairly well.

4.   *Humidity-Bright Sunshine Hours Ratio and Green Jassid Relationship (HBSSH-GJ-relationship)* - Relation between the afternoon relative humidity to sunshine hour ratio and green jassid population is presented in Fig. 2. The lowest and highest RH-II/BSSH ratio were observed 7.27 and 32.4 corresponding to light
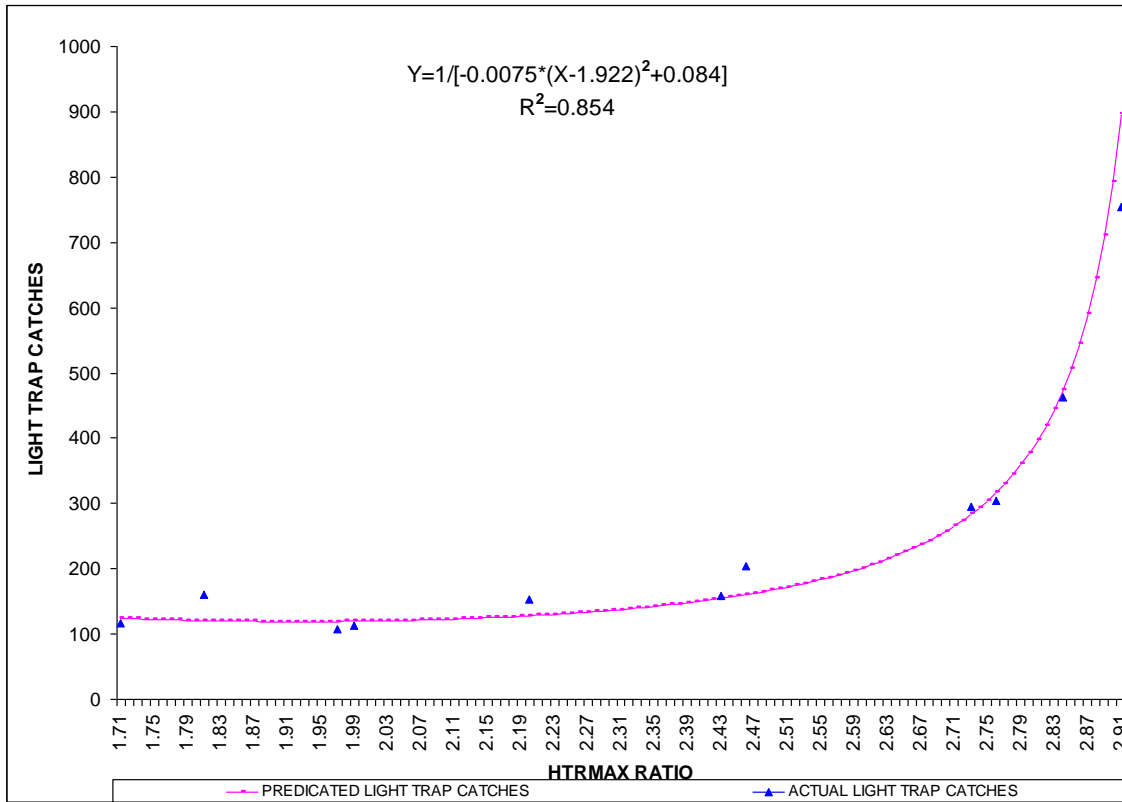
$$Y=1/[-0.0075*(X-1.922)^2+0.084]$$
$$R^2=0.854$$

Fig. 1. Relationship between light trap catches of green jassid and HTRMAX ratio

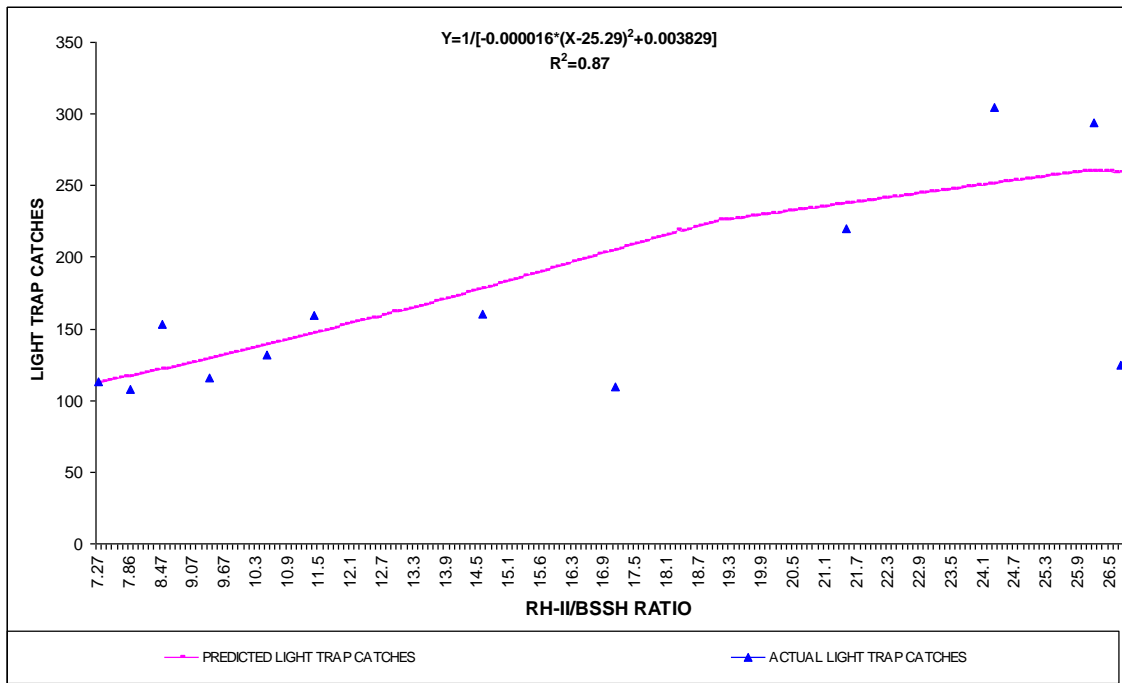$$Y=1/[-0.000016*(X-25.29)^2+0.003829]$$
$$R^2=0.87$$

Fig. 2. Relationship between light trap catches of green jassid and RH-II/BSSH ratio
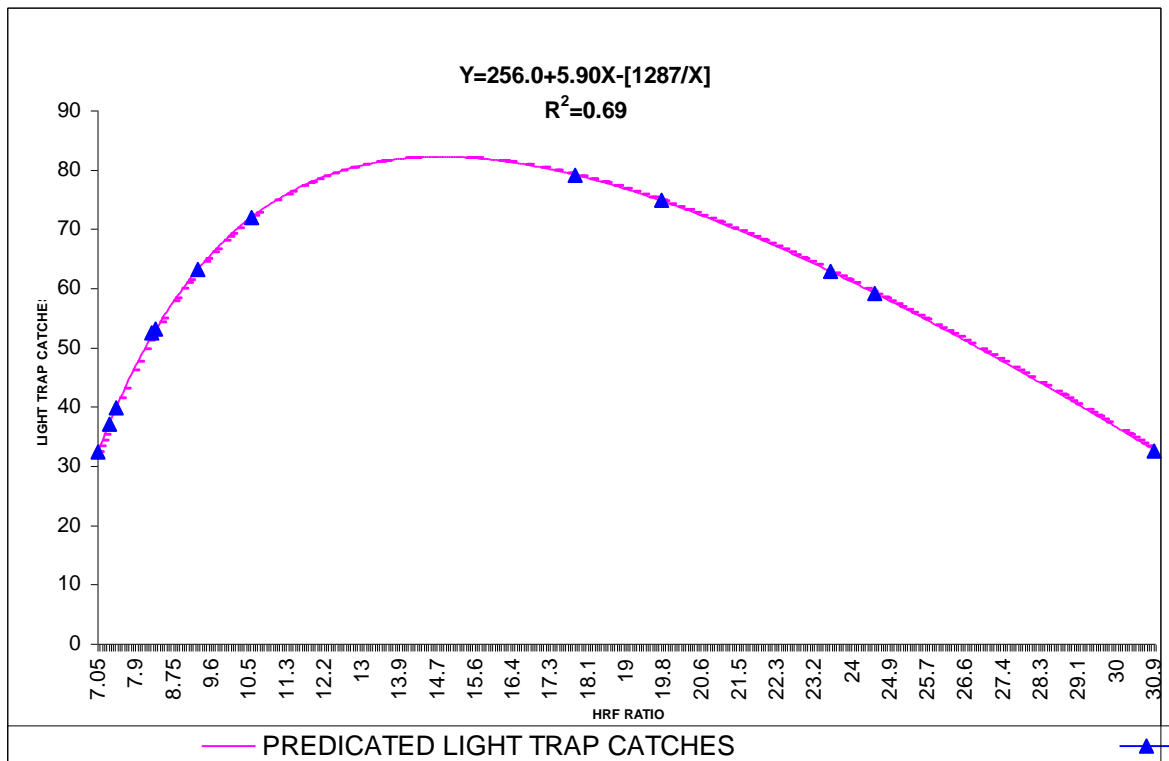
Fig. 3. Relationship between light trap catches of green jassid and HRF ratio

trap catches of green jassid 113.1 and 203.1 respectively. The cauchy equation

$$Y = 1 / [-0.000016*(X-25.29)^2 + 0.003829]$$

Where,

Y = Light trap catches of green jassid

X = HBSSH ratio

was found the best fit equation for HBSSH ratio and light trap catches of green jassid. It gives R^2 value 0.87 significant at 1% level. The equation accounted for 87% variation of green jassid population. It may be seen from Fig. 2 that green jassid population increased with the increases in HBSSH ratio. The population is concentrated mainly in the range 7.27 and 32.4 HBSSH ratio. The peak infestation is observed when the HBSSH ratio ranged 25.67 to 26.67 corresponding to the afternoon relative humidity between 72 & 82% and BSSH between 2.7 & 3.1 hours. The actual and predicated values of green jassid clearly indicated that when the ratio of HBSSH was high the intensity of green jassid population increased almost linearly (Fig. 2).

5. *Humidity-Rainfall Ratio and Green Jassid Relationship (HRF-GJ-Relationship)* - Relation between the afternoon relative humidity-rainfall ratio and light trap catches of green jassid is presented in Fig. 3. The lowest and highest values of green jassid catches were 13.4 and 77.6 corresponding to HRF ratios of 7.05 and 17.8 respectively. The green jassid population increased with the increase in HRF ratios upto 16.7 and then it decreased gradually. The reciprocal equation $Y = 256.0 + 5.90X - 1287/X$ was found to be the best fit equation for HRF and light trap catches of green jassid. The R^2 value is 0.69 significant at 1% level.

Where,

Y = Light trap catches of green jassid

X = HRF ratio

The equation accounted for 69% variation of green jassid population. The population was found mainly concentrated in the HRF ratios of 10.5 to 15.7. The actual and predicated values of green jassid population indicate

that the green jassid population increases with increase in HRF upto 17.8. It may also seen from Fig. 3 that the reciprocal equation predicted green jassid population fairly well.

6.   (*i*) HTR values between 2.75 & 2.83, HBSSH values between 25.67 & 26.67 and HRF values ranges 10.5 to 15.7 were found favourable for the incidence of green jassid attack.

(*ii*) Predicated and observed values show that forewarning of green jassid attack could be issued based on HTR, HBSSH and HRF ratios.

Acknowledgements

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