Indian Journal of Entomology 83(2021) Online published Ref. No. e20146 DoI No.: 10.5958/0974-8172.2020.00211.4

DISTRIBUTION PATTERN AND SEQUENTIAL SAMPLING PLAN FOR RICE CASEWORM *NYMPHULA DEPUNCTALIS* (GUENEE)

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ABSTRACT

Rice caseworm *Nymphula depunctalis*is (Guenee) is one of the major insect pests that attack rice. Due to its leaf cases, and without taking into account their spatial distribution pattern it is difficult to evolve an IPM strategy against this. Present study is on this and was assessed with field experiments during rainy seasons of 2015, 2016 and 2017. The results obtained with Taylor's power law (TPL) and Iwao's mean crowding (IMC) regression show that *N. depunctalis* followed an aggregation pattern in rice field as revealed by the TPL parameters - Sampling parameter (a) = - 0.023, aggregation parameter (b) = 1.226, R^2= 0.851; and IMC parameters- Index of basic contagion (α) = 0.089, and density contagiousness coefficient (β) = 1.204, R^2= 0.960). Optimum sample size was estimated with Taylor's regression coefficients with two precision levels fixed at 0.10 and 0.20, and these revealed that the size increased with TPL parameters with an increased precision level. Sequential sampling decision lines (d = 1n ± 0.38 n) were also determined based on the TPL parameters.

Key words: Rice, Nymphula depunctalis, sampling, spatial distribution, Taylor's power law, parameters, Iwao's mean crowding, regression, optimum sample size

Rice *Oryza sativa* is the major food source and it fulfills the nutrient requirement of 2500 million people. Few dozens of insect species had been reported to damage rice crop but in lowland rice only around twenty observed regularly and found as major importance (Jena et al., 2018). Rice production in India, experiences 25% yield loss in every season due to insect pests attack (Dhaliwal et al., 2010) and it also increases under changing climatic condition (Dhaliwal., 2006; Pandi et al., 2016; 2018). Insect pest status has undergone a drastic change after green revolution in the rice ecosystem (Chander et al., 2003; Jena et al., 2018). Caseworm *Nymphula depunctalis* (Guenee) had been reported in different rice cultivating regions of the world and severe attack takes place in water logged condition (Shroff, 1919; Sisson, 1938; Alum, 1967; Grist, 1969; Chi, 1995; Vromant, 1998). This sporadic pest was earlier believed to cause < 20% yield loss (Dale, 1994). However, since the beginning of this century this pest has attained major status in eastern and north eastern parts of India. Larvae remain inside finely cut leaf cases, which can float on the water surface. Larval protection case and semiaquatic habitat make them less susceptible to insecticide/ natural enemies.

The IPM relies on the use of insecticides only when insect population attains economic threshold level (ETL) and to assess whether the population has reached ETL, an efficient sampling plan is needed. Formulation of reliable sampling plan in turn, requires spatial distribution information of the insect, which in fact are the most distinguishing ecological properties of species (Taylor's 1984; Li et al., 2017). Kogan and Haezog (1980) stated that conventional methods of sampling for insect pests depend on a fixed number of sampling units; hence there is a need of faster and reliable sampling method required. Fernandes et al. (2003) suggested that sequential sampling plan solves the above raised concerns and could be an alternative in which the sample size is not fixed and the counts acquired are grouped between density classes to differentiate the population level (Kao, 1984; Faleiro and Kumar, 2008). In comparison to other sampling technique, the saving in time and labour usually exceeds 50% (Chander and Singh, 2003). Although caseworm significantly affects rice production, critical information about its spatial distribution pattern and suitable sampling plan are lacking. The present study analyses the spatial distribution pattern of case worm to develop suitable sampling method for assessing its damage in lowland rice.