Entry No. IRRC-0005

Category	: International Rice Research Conference
Select Theme	: Climate change and environmental sustainability
Endorsement email	:
Keyword 1	: Adaptation to climate change
Keyword 2	: Climate smart agriculture
Keyword 3	: Mitigation of climate change
Title of Entry	: Bioclimatic Thresholds and Thermal Constants for the development of the Indian Population of Rice Brown Planthopper, Nilaparvata lugens (Stål) (Hemiptera: Delphacidae)
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Select only one type of presentation	: 15 minute oral presentation
Abstract	: In India, Brown planthopper(BPH), outbreaks become common in rice growing states. Due to unpredictable nature of infestation, impact, BPH is regarded as national pest. BPH causes severe yield losses by direct by feeding(hopperburn) and as virus vector. Temperature is most important influencing insect development, survival, reproduction, generation-time, growth-rate. Developmental rate increases linearly with increasing temperature over range of favourable temperatures but becomes nonlinear at temperature extremes. Temperatures below lower and above upper thresholds, adversely affect development. Reports on non-linear relationship between development and high temperature used to estimate optimum and upper threshold temperatures are lacking. Pest forecasting is important IPM component and pest phonology models help managing pest attacks, crop losses. In present study, effect of constant temperatures on BPH development, survival was studied. Two linear, three non-linear models were applied to estimate thermal constants, bioclimatic thresholds and to develop phenology models to predict pest population growth-potential, seasonal-dynamics. Temperature driven development of BPH was examined at seven constant temperatures (15, 18, 20, 25, 30, 32, 35°C). Complete development from egg to adult was observed between 15 to 32°C. Total immature developmental duration ranged from 22.4 days at 30°C to 74.4 days at 15°C. Linear and non-linear models fitted to describe developmental rates of life stages as a function of temperature, gave estimates of thermal constants and bioclimatic thresholds (lower, optimum, upper temperature thresholds). Estimated thermal constants for egg, nymph and cumulative immature development to adult were, 198.8, 275.5 and 473.9 degree days, respectively. The Lactin 2 non-linear model is highly recommended for the description of temperature-dependent development. The intrinsic optimum temperature and upper threshold temperatures (TH) for the development of egg, nymph and total immature form were estimated at 23.4, 23.2, 23.4□C and 32.6, 31.4, 31.8□C, respectively. The estimated thermal constants and bioclimatic thresholds were used to

develop temperature dependent phenology models. Timing of BPH life stages in the field were predicted by computing accumulated degree days(ADD) starting from first date of appearance of macropterous adult female(biofix date). Thus, prediction of BPH development in the second generation was accurately done during wet season, 2015 for its timely and effective management.

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