Co-occurence Relationships Between Insect Pest and Disease from Farmer's Field Survey Data Revealed by Network Analysis

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Pests are the blocks in the big wall of yield losses that agronomists have to deal with because of the need to increase crop productivity. Survey data from farmers' fields are useful sources of data to help us to determine the importance of pests and understand the complex interactions of the agroecosystem. Co-occurrence patterns are used for explore potential interactions between elements within group of studies. Spearman's rank correlation-based network analysis was used to identify the co-occurrence correlations of the incidence of insect pests and diseases from survey data collected in 450 farmers' fields in irrigated lowland rice growing areas in five countries, India, Indonesia, Thailand and Vietnam from 2007 to 2010. Network models revealed interactions between insect pests and diseases, which show strongly both positive and negative relationships within entities of network models. The network illustrated that the important insect pests and disease in South and South East Asia are brown plant hopper, whorl maggots, bacterial leaf streak and brown spot determined by degree of connectivity. Moreover, I found that network structure changed with different seasons (wet and dry seasons). In wet season, incidence of bacterial leaf streak, damage by whorl maggots, incidence of silver shoot and the number of brown plant hoppers showed strong co-occurrence. While the incidence of narrow brown spot, number of brown plant hoppers, and white backed plant hoppers showed strong co-occurrence in dry season. The strong co-occurrence of selected pests potentially indicate the key pests to control.