

Co-occurrence 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 plant protection specialists must scale due to the need to increase crop productivity. Surveys of farmers' fields are useful sources of data to help us determine the importance of pests and understand complex relationships within agroecosystems. Co-occurrence patterns, in the form of network analysis, can be used to explore potential relationships between elements. Spearman's rank correlation-based network analysis was used to identify relationships between the incidence of insect pests and diseases from survey data collected in 450 farmers' fields in irrigated lowland rice growing areas in five Asian countries. Network models revealed relationships between incidences and severities of damages by insect pests and diseases, which showed both positive and negative relationships. The model illustrated that the important pests and diseases are brown planthopper, whorl maggot, bacterial leaf streak and brown spot. Moreover, network structures changed with different seasons (wet or dry season). In wet season, incidence of bacterial leaf streak, whorl maggot damage, silver shoot and the number of brown plant hoppers showed strong co-occurrence. While the incidence of narrow brown spot, number of brown planthopper, and white backed planthopper showed strong co-occurrence in dry season. This study provides a substantiated approach to guide plant protection specialists in the construction and interpretation of co-occurrence networks from crop health survey datasets.