Gene Regulation of Agricultural Pests by Environmental Stress

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All organisms are faced with the challenge of coping with environmental change on scales ranging from hours to years. One important mechanism to eliminate or mitigate environmental stress is a physiological adaptation. Environmental stress changes the activity (or expression) of various gene products. However, the ability to use this mechanism may vary both within and between species. Stress tolerance is though to influence the distribution of species and the fitness of individuals within various habitats as a consequence of evolutionary change. We have been examining the mechanisms of physiological adaptation on environmental stress at the molecular level.

Gene expressions of both heat-shock protein (hsp) and immune protein, hemolin, were analysed from the populations of indianmeal moth, *Plodia interpunctella* and two-spotted spider mite, *Tetranychus urticae*. During development of the moth the level of hsc70 gene is constitutive from egg to pupal stages but increased at adult stage. The hemolin gene transcript was mostly detected from feeding fifth instars. When fifth instarswere challenged by the injection of bacteria, hsc70 mRNA was increased after 12 hours, but hemolin mRNA was increased from 6 hours after treatments. When fifth instars were challenged by the restriction of foods for 2 days the level of hsc70 mRNA was lower than that of constantly fed ones. We also analysed the level of hsp70 mRNA from mites. When mites were challenged by the food restriction for 2 days its level was lower than that of fed mites. We have shown that the activities of genes that related with environmental stress are greatly influenced by those changes and variable in different species. Furthermore, we are examining gene activities by other environmental challenges, such as temperature, desiccation and pesticides. Integrated information on the analysis of these environmental stress supports to determine physiological roles of those genes and could be applicable to the control of agricultural pests.