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## Host- Plant, Insect- Pest Compensations, and Microclimate as Drivers for Healthy and a Sustainable Agro-ecosystem

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### Abstract

Host-plants and insect-pests' compensational relationships are known to enable plants and insects to survive and adopt to changing environmental conditions. In the mount Elgon region of Uganda there exists a mosaical pattern of different coffee farming systems with increasing altitudes, and their combinations create differing microclimates, which influence the host-plant and pest behaviours. The objective of this study was to determine the host-plant and *Toxoptera aurantii* (Hemiptera: Aphididae) compensations with microclimate in Arabica coffee under conditions of different altitudes and farming systems. A two-year study on the coffee leaf biomass, *T. aurantii* numbers on the leaf surface, and damage intensity of *T. aurantii*, was conducted using 72 Arabica coffee farms with mixed coffee polycultures (farming systems). Two independent factors were considered: altitude as a major factor and the farming system as the second factor. There was evidence of significant host-plant and insect-pest compensations; host-plant/microclimates; and insect-pest /microclimates. Linear regression analysis revealed a - relationship (number of leaves /branch / *T. aurantii* numbers). A + relationship (number of leaves / branch infested by *T. aurantii*/*T. aurantii* abundance). Also *T. aurantii* abundance had a + relationship / RH or/ambient temperature). The Arabica coffee leaves/ branch had a - relationship (ambient temperature or/ RH). While the *T. aurantii* infested leaves /branch only had a + relationship with RH. Regarding the soil variables it was only soil temperature which had a + relationship with the number of leaves /branch. The *T. aurantii* infested leaves /branch had a + relationship (soil temperature or/soil moisture). An understanding of the key relationships of host-plant and insect-pest compensations; host-plant/microclimates; and insect-pest /microclimates enables control decisions for a healthy and sustainable future in Agriculture.

**Keywords:** Leaf-biomass, microclimate, relative-humidity, temperature