Influence of climate change on insects and natural pest in horticulture

CHRISTINE TÖLLE-NOLTING, RAINER MEYHÖFER, HANS-MICHAEL POEHLING

Institute of Plant Diseases and Plant Protection, Gottfried Wilhelm Leibniz Universität Hannover, Herrenhäuser Str. 2, D-30419 Hannover, Germany

The climate will continue to change within the next years as it did in the last century. Important changes are related to the amount of greenhouse gases in the atmosphere and current enrichments are followed by increasing temperatures (warmer winters and nights) and more extreme changes in short term periods of heat and precipitations (heavy rains and dry spells). Besides several direct and indirect large scale impacts on ecosystems it is likely that horticultural pest and their natural enemies are affected.

The most important factors for insect development are temperature and precipitation. It has been supposed that under a warmer climate species will move to more northern areas and that species, which can't migrate, will diminish their area but increase their abundance. At higher temperatures insects develop faster and more generations of pest are expected. The warmer winters will decrease winter mortality and the pests will reach the plants in a more vulnerable stadium. But very hot temperatures will increase the mortality of insects. A change in the temperature can also lead to an asynchrony between prey and predator/parasitoid, if they are triggered by different abiotic factors, e.g. photoperiod and temperature. The development of the dark-coloured caterpillar *Melitaea cinxia* for example is depending on the sunlight, while it's light-coloured specialist parasitoid *Cotesia melitaearum* is mainly influenced by air temperature (Van Nouhuys & Lei 2004). Precipitation is another important factor for insects. Rain can prevent the development of insects and heavy rains can wash the insects off the leaves and increase mortality. In return drought can make the plants more vulnerable for herbivores due to a decreased nutrient uptake and a decreased level of secondary compounds. But the different feeding guilds react in a different way to drought. Gall formers are likely to react negatively, chewing insects doesn't react to moderate drought and sucking insects seem to react positively. Parasitoids seem to deal better with dryness, but all respond negatively to heavy droughts.

Hence we need more information about variation in pest/natural enemy interaction pattern under different temperature/humidity scenarios and under realistic experimental conditions before reliable predictions can be performed. It is the aim of the KLIFF-Network (KLImaFolgenForschung in Niedersachsen) to study the influence of climate change on agriculture, forestry and water management and develop adaptation strategies. In particular we will focus in our sub-project on the reaction of some of the coming pest species in horticultural crops and interactions with natural enemies under changing temperatures and precipitation.

References:

Van Nouhuys, S. & Lei, G.C. (2004). Parasitoid-host metapopulation dynamics: the causes and consequences of phonological asynchrony. *Journal of Animal Ecology*, 73, 526–535.