



Annex 4. Abstracts of workshop presentations of impacts of climate change on the potential range expansion and abundance of pests in selected crops

Potato and vegetable pests

Potato tuber moth, *Phthorimaea operculella* (Zeller)

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The potato tuber moth *Phthorimaea operculella* (Lepidoptera: Gelechiidae) is considered one of the most serious pests worldwide. Potato is the main host but other Solanaceae are also attacked. It is originated in the tropical mountainous regions of South America and is reported more than 90 countries. The moth occurs in almost all tropical and subtropical potato production systems in Africa and Asia, as well as in North, Central, and South America and it's adapted to wide range of different climates and agroecologies. Losses can reach up to 40% in the field and 100% in storage. *P. operculella* attacks all vegetative plant parts of potato, typical symptoms of leaf damage are mines caused by larvae feeding in the mesophyll. Tuber infestation caused by first instar larvae can be hardly noticed and characteristic piles of feces indicate infestation. Inside tubers, larvae bore irregular galleries which may run into the interior of the tubers or remain directly under the skin in field and storage conditions. Adults are brownish gray, with fraying on the posterior edge of the forewings and on both posterior and inner edges of the hindwings. The wings are folded to form a roof-like shape with a wingspan of 12-16 mm. They are nocturnal and all activity occurs in the evening. The future distribution and abundance of this pest will be affected by climate change by changes in temperature. Using the Insect Life Insect Modeling (ILCYM) software we applied three risk indices (establishment [ERI], generation [GI] and activity [AI] index) in a geographic information system (GIS) to map and quantify changes. Under the climate of the year 2000, an ERI>0.6 represents very well the current global distribution of *P. operculella*: Africa, Oceania, South America, and Asia. Under the year 2050 temperature scenario, the boundaries for *P. operculella* are indicated to shift further north in the northern hemisphere. The number of generations indicates pest abundance and is closely related to losses. In regions where potato tuber moth is established and losses occur, a minimum of >4 generations are developed; between 12-15 generations are developed in tropical production systems. For future scenario (2050), changes in a number of generations per year of >4 will be highest in Europe and Asia. In potato production areas of Africa, Asia and South America, *P. operculella* abundance and infestation is expected to become more severe, reflected in an increase of the area with >7 generations per year. The AI indicates the potential population growth throughout a year; an increase by 1 indicates a 10-fold higher increase rate. For 2050, an increase by a factor 5-10 is predicted for most potato growing regions worldwide especially in those regions where temperatures have not reached the upper temperature threshold. For Africa, establishment of *P. operculella* will potentially increase as well as number of generations (2-5 generations/year). There are only few regions that might become too warm for potato tuber moth and more likely also for potato production. Infestations in other Solanaceae crops such as tomato might increase. The activity will generally increase; only in regions where temperature may reach values of maximum temperature threshold for development, the population growth will be gradually reduced due to increasingly high temperature-induced mortality and reduced reproduction per female. *P. operculella* is already a cosmopolitan pest but climate change will support its further spread and abundance. Phytosanitary measures and inspections are important in those countries where the pest has not yet established.

Guatemalan potato tuber moth, *Tecia solanivora* (Povolny)

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The Guatemalan potato tuber moth *Tecia solanivora* (Lepidoptera: Gelechiidae) is considered to be one of the most serious potato pests in Central and South America. It is a monophagous insect pest feeding