Title: The relationship between plant lipophilic barrier composition and two-spotted spider mites activity

Plants came ashore about 480–450 million years ago. Their survival on land was primarily facilitated by the development of a lipophilic barrier composed of cuticle, cuticular waxes, and suberin, which protected them from water loss and UV radiation. Throughout evolution, the lipophilic barrier also enabled plants to defend against biotic stresses, such as attacks from pathogenic microorganisms and pests. Additionally, as immobile organisms, plants developed various anatomical, biochemical, and molecular adaptive and defensive mechanisms against unfavorable environmental conditions, with the lipophilic barrier becoming a crucial element.

The two-spotted spider mite (*Tetranychus urticae* Koch) is one of the most common plant pests. It is a phytophage of over 1,100 plant species found on almost every continent. A characteristic feature of this pest is its short life cycle (7-18 days) and the ability of females to lay over 200 eggs during their lifetime. High fecundity helps spider mites develop resistance to various chemical compounds, including pesticides, which, along with their low nutritional requirements, makes them one of the most dangerous agricultural pests. Despite this, little is still known about how plants defend themselves against this pest.

The proposed research aims **to analyze the possible correlation between the structure and chemical composition of the lipophilic barrier in tomato and *Arabidopsis* and their resistance to the two-spotted spider mite.**

To achieve this goal, ecotypes of *Arabidopsis* and varieties of tomato with differing susceptibility to the spider mite, as well as mutants of genes related to wax biosynthesis in both species, will be studied. Microscopy, supported by a self-developed AI-based computer program, will be used to assess susceptibility to the pest. The tightness and integrity of the lipophilic barrier will be evaluated using toluidine blue staining and chlorophyll assay tests. The efficiency of the molecular machinery involved in wax biosynthesis will be studied by analyzing selected genes before and after spider mite attack, and the composition of cuticular waxes will be assessed using mass spectrometry (Fig. 1). The results of this project should contribute to the development of more effective pest control strategies in crops.

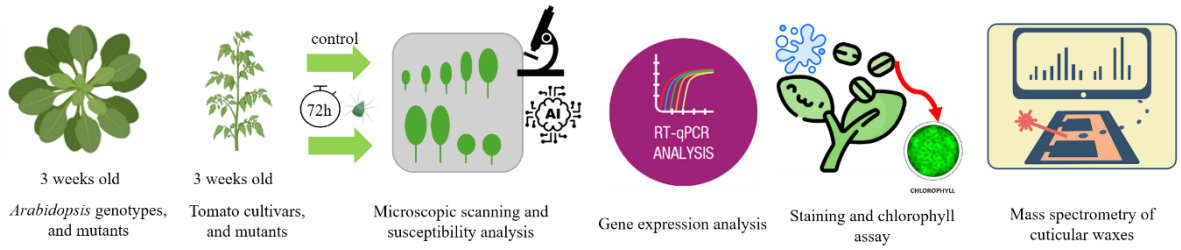

Fig.1 Task schedule for project implementation