

Etiology and epidemiology of phytoplasma-associated diseases of stone fruits and grapevine in Jordan

Phytoplasmas, unculturable insect-transmitted phloem-limited bacteria, are dangerous for European and Mediterranean countries. Almond witches'-broom (AlmWB) is a severe disease which affects almond, peach and nectarine trees in Lebanon, and almond, peach and apricot trees in Iran. '*Candidatus Phytoplasma phoenicium*' (CaPphoe, taxonomic subgroup 16SrIX-B) and related strains (16SrIX-C) are the AlmWB etiological agents. Multiple gene typing analyses allowed the identification of genetically distinct CaPphoe and related strains in different insect and plant hosts from distinct geographic areas. Available evidences highlighted that CaPphoe (IX-B) was never identified outside Middle East. On the other hand, CaPphoe-related strains (IX-C) are associated with important diseases of other crops (e.g. sesame and lettuce phyllody in Turkey and Iran, respectively) and were reported in other geographic areas in vegetables and wild plants. The phytoplasma/host plant(s)/insect vector(s) pathosystems, involved in CaPphoe and related strains spreading, are still poorly understood making quite difficult an effective disease management and control.

The main aims of the present PhD project will be to: (i) survey the presence of AlmWB in almond, peach, nectarine, apricot and other stone fruit trees in Jordan by symptoms observation and molecular identification of CaPphoe and related strains; (ii) identify putative insect vector(s) and non-crop plant host(s) of CaPphoe and related strains and provide a map of their distribution; (iii) identify genetic markers useful for taxonomic distinction and typing of CaPphoe and related strains; (iv) determine the ecology of CaPphoe and related strains using a molecular epidemiology approach.

Field surveys and total nucleic acids extraction from plants and insects will be conducted in Jordan; molecular biology analyses and data interpretation will be conducted in Italy. It will be crucial the involvement of Jordan scientists with great expertise in entomology (insect collection, recognition, transmission trials) and botany (recognition of non-crop plants).

The scientific approach used to study AlmWB will be employed also to investigate the presence of phytoplasma diseases affecting other important crops in Jordan (apple, pear, cherry, grapevine).

The knowledge acquired on the ecology and epidemiology of CaPphoe and other phytoplasmas in Jordan will allow prevention of further spreading of the associated diseases, their rapid containment/eradication in case of accidental introductions, and planning control strategies against the pathogens and the insect vectors for a sustainable fruit production in order to minimize environmental pollution and preserve the health of growers and of final consumers of agriculture products.