6.5 Rapid screening tests for the assignment of *X. fastidiosa* genotypes to a subspecies cluster

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Abstract: Until now, different molecular tests can be used to assign novel *X. fastidiosa* isolates to subspecies clusters, among which MLST/MLSA represents the most common method. *X. fastidiosa* outbreaks in EU motivated the search for accurate and faster approaches to differentiate the *X. fastidiosa* isolates. Because MLST/MLSA requires PCR reactions and sequencing analyses, 2 independent approaches were recently developed and implemented for rapid taxonomic assignment of uncharacterized isolates: (1) single-nucleotide primer extension (SNuPE) method that allows to differentiate all subspecies and three genotypes within *X. fastidiosa* subsp. *pauca* including the type-isolate infecting olive in Italy and (2) high-resolution melting (HRM) analysis of the amplicon recovered from the gene encoding the conserved HL protein. Both assays were validated on a larger panel of isolates and proved to clearly differentiate *X. fastidiosa* isolates currently known to occur in the Italian, France and Spain outbreaks. These rapid approaches could represent a useful tool for pre-screening of infected samples to be further analyzed by MLST or whole genome sequencing. In addition alternative genomic regions of *X. fastidiosa* are going to be analyzed to implement approaches aimed to assign genotypes to a subspecies cluster, with the purpose to support a rapid identification of genotypes/subspecies at interception places or when new findings occur in a pest free area

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6.6 Ground penetrating radar as a tool for an early diagnosis of olive quick decline syndrome

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Abstract: *X. fastidiosa* subsp. *pauca* is responsible for a devastating disease of olive trees in Apulia (south-eastern Italy), characterized by a quick decline syndrome, wilting, and death of the plants. In order to develop a possible indicator that can provide information for an early diagnosis of the disease, a multi-source (manned and unmanned aerial platforms, on-field spectroradiometry, on-field radar platforms, visual agronomic assessment) data integration method is being tested. As first experimental test, trunks and main branches of healthy and diseased olive trees were examined by using the Ground Penetrating Radar (GPR). The conceptual hypothesis underlying the test with the GPR is that this method, based on relative dielectric permittivity (εr), is very sensitive to water level in the medium. Since *X. fastidiosa* clog the xylem vessels, it is reasonable to suppose that sap movement in the affected trees may be anti-related to the severity of the disease. Therefore, an εr value as lower as greater the disease severity should be expected. In addition, a sap deficiency would cause a simultaneous increase in electrical resistivity. Such circumstances would cause both a higher velocity and lower attenuation of the radar waves. Measurements on olive tree's trunks were conducted, both longitudinally and transversally, using different devices (PulsEkko1000, with a 1200 Mhz antenna, and Noggin 500 MHz). Preliminary results seem promising and consistent with the starting hypothesis.

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