Phytoplasma-associated diseases: biological and epidemiological features

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In the last twenty years the study of phytoplasmas was mainly devoted toward their classification based on molecular dissecting of their ribosomal DNA and of other conserved genes. The availability of a robust and quite exhaustive classification system allowed recently to also developing barcodes capable to identify them. From five full genomes sequencing information about putative biochemical pathways showed that phytoplasmas are very special microorganisms because they lack a lot for relevant features: cell wall, mobility, key enzymes and pathways. What they have is a small efficient chromosome and tricky metabolisms, allowing them to a trans kingdom life of interaction that often increase activity of their hosts enhancing insect fitness, plant shoot production, changing shape and colour of flowers. For some of them it looks also that they are preparing to become relevant permanent cell hosts. However they are still far from loosing independence and freedom as they can also act as very dangerous pathogens for many relevant agricultural crops. In the frame of epidemiology transovarial and seed transmission were reported for several binomial insect/phytoplasma and phytoplasma/plant respectively. Epidemiological studies of phytoplasma-associated diseases with economically relevant agricultural species such as grapevine, cassava, oil palm and corn *allow confirming the possibility to molecularly identify* strains that have the most important roles in disease outbreaks. One of the first examples is the quarantine phytoplasmas associated with "flavescence dorée" disease of grapevine in Europe that has differential geographic distribution and aggressiveness. Very recently the axenic growth of a number of phytoplasmas was also achieved either from strains maintained in micropropagated collection of periwinkle shoots as well as from field infected plants of grapevine, apple and plum. Biology represents still the "unknown" for phytoplasmas and this small step, even if it is just a beginning should allow the confirmation of the huge amount of molecular information gained in the last twenty years of research. Only the knowledge of their biology will help in defining feasible solutions to reduce phytoplasma impact on worldwide agriculture and will help in devising the best management strategies.