Phloem-restricted parasites of Palms. Focus on the coconut palm

Speaker: Michel Dollet.

There is a category of palm diseases that raises many investigation problems: lethal diseases caused by phloem-restricted parasites and transmitted by vector insects. The difficulties encountered lie in the impossibility – or at least great difficulty – of growing the pathogen *in vitro,* and difficulties in identifying the vector. These obstacles to aetiological definition and an understanding of the disease cycle hold back the identification of resistant species or varieties. Since the 1970s, CIRAD has endeavoured to solve some enigmas surrounding these diseases classed "of unknown origin" on two major oil crop species for tropical countries: coconut (*Cocos nucifera* L.) and oil palm (*Elaeis guineensis* Jacq.).
In the 1970s, use of the electron microscope for aetiological research on diseases of unknown origin became the norm and it resulted in numerous advances. It led to the discovery of the specific association of MLOs (Mycoplasma-Like-Organisms) and lethal yellowing like syndromes of coconut (CLY). MLOs are small wall-less bacteria. They are only located in the phloem (in the sap). The electron microscope also led to the discovery of flagellate protozoa – Trypanosomatidae - associated with wilt diseases in coconut ("Hartrot") and oil palm ("Marchitez sorpresiva") in Latin America. The Hartrot syndrome is similar to the CLY syndrome and the trypanosomes responsible for it are located, like MLOs, in the sap. This decisive aetiological advance was not followed by immediate effects as these two types of microorganisms could not be grown *in vitro*. That is still the case for all MLOs, known today as "phytoplasmas". But the rapid progress made in molecular biology in the 1990s revealed that there did not exist just one CLY, but several CLYs caused by different phytoplasmas.
However, at CIRAD, we have succeeded in culturing trypanosomatids associated with Hartrot or Marchitez. That success has led to major scientific advances on these microorganisms.
Vector identification has had mixed fortunes. The vectors of phytoplasma diseases belong exclusively to three groups of insects: Fulgoromorpha, Cicadellidae and Psyllidae. For CLYs, it took twenty years of research in Florida to detect the vector of CLY in Florida: *Haplaxius crudus;* Cixiidae (Fulgoromorpha). However, it has not been possible to demonstrate the role of that insect in CLY in Jamaica or Mexico. *H. crudus* does not exist in Africa, where the vector(s) remain(s) unknown. The vectors have been found for Hartrot and Marchitez. They are bugs - Pentatomidae - of the genus *Lincus.* The insects of this genus, only known in Latin America, seem to live off native palms. For example, they have been found on palms of the genus *Astrocaryum* in Peru.
In the Caribbean, no source of resistance to CLY and/or Hartrot has been identified. Given the other diseases of known or unknown origin, coconut is a highly threatened species in that region.

Keywords: *Cocos nucifera*, *Elaeis guineensis*, Phytoplasma, Trypanosomatidae, Latin America, Caribbean, Africa, vector insect, phloem.