Modelling the temporal evolution of cacao (*Theobroma cacao*) black pod rot caused by *Phytophthora megakarya*

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The fight against plant disease epidemics is a central issue in agriculture. Cocoa is an important cash crop in Africa, yet productivity is severely impacted by pests and diseases. Cocoa black pod rot is the main cocoa disease in Africa and is responsible for yield losses up to 50-80% in the absence of control measures. In Cameroon, Cacao black pod rot due to *Phytophthora megakarya* can be responsible for losses up to 80-90% [1,2]. Understanding disease epidemics allows the identification of means to slow or even stop disease spread by means of adequate management strategies. This is why it's important to understand black pod epidemics, in order to establish efficient management strategies to ensure sustainable cocoa production. One way to improve the understanding of epidemics and factors governing their spatio-temporal dynamics is mathematical modelling.

We have developed a mathematical model [3], based on knowledge gained on the temporal development of black pod rot epidemics in order to simulate, predict and anticipate the spread of the disease in cocoa plots and thus to be able to identify control strategies and sustainable management of an epidemic. The general aim of this modelling study is to identify actions levers on which we could act to establish tactical control and management strategies of black pod rot epidemics. To achieve this, we analyse the epidemiological model to derive the dynamic evolution of primary and secondary infections in a cocoa plot taking into account growth stages of susceptible fruits. We also present numerical simulations, discuss the results and their implications in terms of control.

References

[1] D. Guest, 2007. *Black pod: Diverse pathogens with a global impact on cocoa yield*, Phytopathology **97** 1650-1653.

[2] S. Nyassé, M.I.B. Efombagn, B.I. Kebe, M. Tahi, D. Despreaux, and C. Cilas, 2007. *Integrated management of Phytophthora diseases on cocoa (Theobroma cacao L): Impact of plant breeding on pod rot incidence*, Crop Protection **26** 40-45

[3] C. Nembot, P. Takam Soh, G.M. Ten Hoopen, and Y. Dumont. Modelling Cocoa black pod rot. Mathematical analysis and Simulations. Submitted.