Impact of lime application on soilborne pests and diseases in acidic soils of coffee plantations in the Central Highlands in Vietnam

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Rationale:
Vietnam is the number one producer of Robusta coffee globally and there are approximately 650,000 ha of plantations concentrated in the Central Highlands. The expansion of coffee cultivation in recent years has been poorly managed in many cases and resulted in declining plant health, soil fertility (high soil acidification) and soil health, and increased pest and pathogen pressures. These factors are having detrimental impacts on coffee productivity and are potentially limiting access to high value markets. Around 300,000 ha of coffee plantations must be renewed and to date, 40% of the replanting operations failed due to the pressure of acidic soils and various soilborne pests and diseases (SBPDs) such as nematodes and *Fusarium* spp.

Methods:
Farm trials were conducted in Giai Lai Province on ten productive Robusta coffee plantations with two treatments (2.5 t ha-1 dolomite lime and a control with no lime) from September 2021 to September 2022. Soil pH was monitored on the monthly basis for each farm and after one year; soil physiochemical and biological properties and SBPDs were observed after one year lime application.

Results:
Lime applications increased soil pH by an average of 0.49 unit compared to control (70% of the farms responded positively to lime application). Additionally, lime application significantly enhanced ($P<0.05$) OM%, exchangeable K, Ca2+, Mg2+ by 16.70%, 26.48%, 100% and 243% respectively and decreased exchangeable Al3+ by 30.88% compared to control. On the other hand, no significant differences between both treatments were observed for available NH4+, NO3-, P and exchangeable Fe3+. AMF frequency and intensity were significantly enhanced by lime application compared to control (91.90% and 23.86% respectively for the limed plots and 79.40% and 18.42% for the control). Despite this, our results did not show any significant influence of liming on the populations of *Fusarium* spp., *Rhizoctonia* spp. and plant parasitic nematodes. Under controlled conditions, we determined that for an increase of one unit of pH in an acidic soil requires 25 tons of lime ha-1 which is not feasible for farmers.

Conclusions & Perspectives:
Other practices/alternatives must be investigated such as utilization of commercial bioinoculants containing beneficial microorganisms' antagonist of SBPDs or/and combined with agroecological practices based on the utilization of nematicide legumes such as *Crotalaria pallida* which in addition of being capable to symbiotically fix atmospheric N, also releases nematicide metabolites (Pyrrolizidine alkaloids and monocrotaline) reducing the populations of plant parasitic nematodes.

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