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Contrasted agronomical and physiological responses of five *Coffea arabica* genotypes under soil water deficit in the field in Northwest of Vietnam

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Rationale:
Several models predicted that climate change will increase drought stress on coffee cultivation and decrease its growth and yield worldwide. As a potential adaptation solution against these adverse environmental conditions, breeding programs have developed high-yielding new *Coffea arabica* F1-hybrids adapted to agroforestry systems. However, the response to drought of these F-1 hybrids has never been assessed.

Methods:
The study was carried out at NOMAFSI research station in Son La province (annual average temperature ± 21°C, annual rainfall ±1500 mm) of Northwest Vietnam at an elevation of 780 m.a.s.l at the edge of the coffee belt. Growth, yield and physiological responses of five *C. arabica* genotypes (2 fixed lines: Catimor [C] and Marsellesa [M] and 3 hybrids: Starmaya [HS], Centroamericano [H1] and Mundo Maya [H16]), shaded by the leguminous shade tree species *Leucaena leucocephala*, were assessed under a rain-fed (Cont) and a rain-suppressed treatment (WS) which reduced soil water content by 14% over 2 successive years of production.

Results:
In Cont, production of H16, H1 were higher than HS, M or C due in part to their capacity to maintain high photosynthesis. Under water deficit (WS treatment), the yield of C, M, HS, H1 and H16 genotypes decreased respectively by 25, 16, 54, 75 and 20% compared to rain fed. Hybrids are more vigorous and produce more than the local Catimor under rain-fed agroforestry conditions. However, tolerance to water deficit is not systematically associated with hybrid vigor. Indeed, only the F1 hybrid H16 was the best performing genotype in both rain-fed and rain-suppressed conditions and displayed a high photosynthesis at times of high evaporative demand (11AM, 2PM), as well as a high yield and high fine root production in conditions of soil water deficit. Fixed lines (C and M) had a low yield but were not significantly affected by drought unlike HS and H1 whose high yield strongly decreased under water stress.

Conclusions & Perspectives:
Our better understanding of the physiological and agronomical response of these genotypes to soil water deficit will enhance coffee breeding and genotype selection for drought tolerance as a climate smart solution for resilient coffee agroecosystems. This work shows the potential of breeding productive and drought tolerant genotypes among the highly F1 Arabica hybrids for agroforestry systems.

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