

Effect of genotype and climate on the agronomic performance of 3 genotypes of *Coffea Arabica*

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Rationale:

Coffee provides a livelihood for over 12 million households in tropical countries such as Brazil, Vietnam, Colombia and Indonesia. Climate change leads to increased average temperatures and changes in rain patterns across the globe, which influences plant productivity. As for many crops, *Coffea arabica*, is sensitive to environmental changes caused by climate change. Coffee plant breeding programs have produced vigorous coffee genotypes with higher yield however, the effect of climate change on these genotypes have never been investigated.

Methods:

The effects of genotype and climate on the agronomical performance of *Coffea arabica* were studied using nine trials covering an altitudinal gradient [600–1100 m above sea level (m.a.s.l.)] with three genotypes of *Coffea arabica* in the northwest mountainous region of Vietnam. The impacts of the climatic conditions on agronomical traits were assessed.

Results:

Genotype had a significant effect on height, branch length, diameter, nodes per branch. Catimor was less vigorous than F1-hybrids and have lower height, branch length, trunk diameter and number of nodes. The environment effect was significant for the fruit bean ratio, height, diameter, orthonodes and cumulated yield. Height, diameter was significantly affected by temperature but not by soil water content. Cumulated yield and fruit bean ratio were significantly affected by temperature and soil water content. Due of a very low application of NPK, fertilization rate did not affect agronomic performance.

Conclusions & Perspectives:

This study of the agronomic performance of 3 genotypes of *Coffea arabica* in Northwest of Vietnam highlights the higher vigor of the new varieties compared to the Catimor. Yield was significantly affected by temperature and soil water content, forecasting future struggles of *C. arabica* with climate change in the region.

References:

1. Marie L, Abdallah C, Campa C, Courtel P, Bordeaux M, Navarini L, et al. G × E interactions on yield and quality in *Coffea arabica*: new F1 hybrids outperform American cultivars. *Euphytica* 216(5):78 (2020).
2. Rahn E, Vaast P, Läderach P, van Asten P, Jassogne L, Ghazoul J. Exploring adaptation strategies of coffee production to climate change using a process-based model. *Ecol Model* 371:7689 (2018).
3. Bertrand B, Alpizar E, Lara L, SantaCreo R, Hidalgo M, Quijano JM, et al. Performance of *Coffea arabica* F1 hybrids in agroforestry and full-sun cropping systems in comparison with American pure line cultivars. *Euphytica* 181(2):14758 (2011).