Inducing water stress in new Robusta coffee varieties to enhance drought tolerance

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INTRODUCTION

Coffee stands as one of the pivotal commodities in international agricultural trade. The predominant cultivated species encompass Coffea arabica L and Coffea canephora P. Over time, coffee production in Côte d'Ivoire has witnessed a decline from 285,164 tonnes in 1990 to 134,700 tonnes in 2021[1]. This decline can be attributed to a range of factors, including the conversion of coffee plantations to more lucrative perennial crops, escalating temperatures, and shifts in precipitation patterns[2]. These multifarious elements have collectively impacted the plant's metabolic processes, culminating in heightened water stress[3]. Our proposed initiative revolves around assessing the threshold of tolerance in novel Robusta hybrids subsequent to exposure to water scarcity. This undertaking aims to unveil and delineate parameters that determine the resilience of coffee plants to water stress.

MATERIAL AND METHODS

- **Material**

The plant material consisted of 12 six-month-old coffee hybrids derived from crosses between Guinean and Congolese clones.

- **Trial conduct**

The experimentation took place within a controlled glass environment. Over the initial four week period, all plants received regular watering to sustain soil water content at a level approximating field capacity (FC). Subsequently, the plants were subjected to three distinct water regimes: 100 %, 50 % and 0 % FC. These regimes were applied sequentially, followed by a subsequent 21-day recovery phase.

- **Agronomic and physiological measurements**

The study encompassed the meticulous evaluation of pivotal factors that are the drought sensitivity, vegetative vigour, total chlorophyll content, dry matter distribution and survival rate.

- **Data analysis**

The collected data underwent processing through EXCEL spreadsheets and R 3.63 software for comprehensive analysis.

RESULTS

Following the water stress period, distinct genotypes emerged as noteworthy, influenced by the specific watering regimen, particularly among plants subjected to water deprivation. Notably, genotype 7082 exhibited an elevated overall chlorophyll content (**Figure 2**). Moreover, Genotype 7093 displayed the most robust survival rate post-recovery (100%), trailed by Genotypes 7082 and 7092 (**Figure 3**).

Figure 1. Differents genotypes after the water stress period

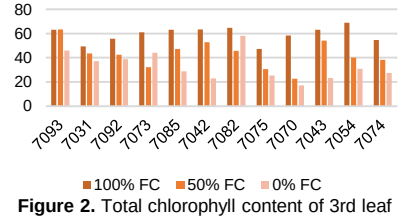

Figure 2. Total chlorophyll content of 3rd leaf from apex

Figure 3. Plant recovery period after water stress

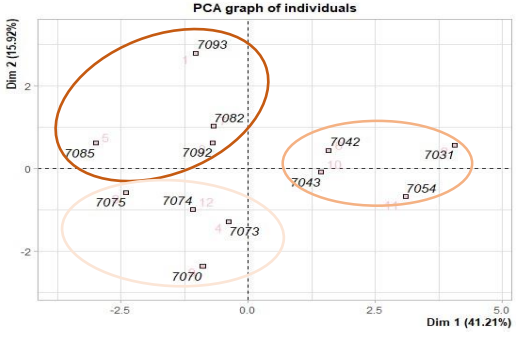

Figure 4. Distribution of genotypes by variables

CONCLUSION

Among the examined genotypes, 7082, 7092, 7093, and 7085 exhibit the highest levels of tolerance following exposure to water stress.

ACKNOWLEDMENTS

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