ROYAUME DU MAROC
UNIVERSITE ABDELMALEK ESSAADI
FACULTE DES SCIENCES ET TECHNIQUES
TANGER

المملكة المغربية
جامعة عبد المالك السعدي
كلية العلوم والتقنيات
طنجة

CED : « Engineering Sciences and Techniques »

THESIS DEFENSE

«YOUSSEF BOUARGALNE»

CANDIDATE FOR DOCTOR SCIENCES AND TECHNIQUES

« Genetic Diversity and Nitrogen Supply Response of Moroccan Sorghum Ecotypes »

Date :	**Friday 23 june 2023**
Time :	**10 am**
Location :	**Conference Hall, Building F, FST - Tangier**

Committe Members		
Pr. Abdelaziz SMOUNI	FS - Rabat	Chair & Reviewer
Pr. Zine El Abidine TRIQUI	FS - Rabat	Reviewer
Pr. Mouna FAHR	FS - Rabat	Reviewer
Pr. Naima GHAILANI NOUROUTI	FST - Tangier	Examiner
Pr. Naima NHIRI	CNRS - France	Guest
Pr. Reda BEN MRID	ISSB-P – Ben Guerir	Guest
Pr. Redouane EL OMARI	EST - Sidi Bennour	Co-Supervisor
Pr. Mohamed NHIRI	FST- Tangier	Thesis Director

ABSTRACT

Sorghum bicolor (L. Monech) is ranked the 5th most important cereal crop in the world and used for a variety of different purposes. This spring cereal is known for its ability to survive severe environmental conditions throughout the world. Its yield varies according to the sorghum varieties, agroclimatic conditions and fertilization under which this crop is cultivated. In crop production, nitrogen (N) is the nutrient that is most limited and the nitrogenous fertilizers are the major factors that improve the yield and biomass. Inadequate and imbalanced application of fertilization to crops not only leads to alter plant growth and metabolic processes but also cause environmental problems. Investigations on the performance of sorghum ecotype in relation N fertilization have not been conducted. Therefore, the main objective of this PhD thesis was to evaluate the N stress (deficiency and excess) response of Moroccan sorghum ecotypes. We first collected 10 sorghum ecotypes from northwestern regions of Morocco and its agromorphological traits were investigated. Our results showed that the Moroccan sorghum has retained great biodiversity and genetic resource. We also concluded that 4P11 ecotype has high-performance of key agronomic traits and can be used for breeding programs. In order to examine the differential response to N among the Moroccan sorghum, two contrasted ecotypes, 3P4 (sensitive) and 4P11 (resistant), were selected and cultivated under different N treatments. The results showed that 4P11 has higher photosynthetic pigment, amino acid and protein contents with less proline accumulation suggesting a higher tolerance to N stress for this ecotype compared to the 3P4. We also demonstrated that the levels and sources of inorganic N affect activities of antioxidant, proline and glyoxalase enzymes. The ammonium excess and N deficiency increase the malondialdehyde content, proline accumulation and enzymatic activities of detoxification systems, indicating the sorghum's ability to alleviate the effect of N stress. Considering its high-performance of key agronomic traits and its higher capacity to cope with N stress, 4P11 ecotype could be a resourceful option for farmers and can be recommended for commercial cultivation. Taken together, these results constitute a necessary step that can be exploited in the programs of sorghum breeding, improvement and valorization of this marginalized species.

Keywords: Sorghum bicolor, biodiversity, ecotype, ammonium, nitrate, nitrogen stress, enzyme, antioxidants system, glyoxalase system, proline metabolism.