



ATSAF Academy
Academy for International Agricultural Research for Development

Junior Scientists Tandems

Final Report

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Title: Characterizing salinity hormesis of sweetpotato biomass

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Arrival in Germany

In close coordination with the Hans-Ruthenberg Institute, I arrived in Germany on July 15th to attend the lectures in the Ecophysiology module delivered by Professor Dr. Folkard Asch and Dr. Alejandro Pieters. I vividly recall every moment of my arrival at Stuttgart Airport on that significant day, as it marked a memorable and meaningful milestone in my life. Johanna Volk, a PhD researcher from the University of Hohenheim, kindly picked me up from the airport at 17:50. Following this, we dined at a restaurant near my accommodation, which she had thoughtfully arranged in advance. This warm and thoughtful welcome made my first international trip an incredibly rewarding experience.

Social Interactions Abroad

The following day, I visited the Hans-Ruthenberg Institute at the University of Hohenheim for the first time. The team warmly welcomed me, and I quickly integrated with the students of the Ecophysiology module, who were kind and supportive in assisting me with the course content and practical activities. I also benefited greatly from the insightful lectures by Professor Dr. Folkard Asch, which profoundly enriched my knowledge and complemented the experiences I had gained during my international graduate program.

I had the opportunity to explore the Fairytale Garden in Ludwigsburg with colleagues from the Institute. During this visit, we observed various bird and tree species and enjoyed activities such as boating. The event was delightful, with fantastic food and games, and I thoroughly enjoyed bonding with my peers from the Institute.

ATSAF Networking Event and Tropentag Conference

These significant events were held at the University of Natural Resources and Life Sciences (BOKU) in Vienna, Austria. Participating in these events was remarkable for me, as it was my first experience in an international academic environment. The itinerary began with the ATSAF Networking event, organized by the ATSAF team. This event was a fantastic opportunity to connect with scholars from diverse cultural backgrounds, each offering unique perspectives on networking and collaboration.

The next day marked the opening of the Tropentag Conference, which was particularly inspiring. I was moved by the recognition of female researchers during the awards ceremony and their outstanding presentations. Throughout the week, I attended poster presentations on various fascinating topics and participated in seminars that allowed me to delve deeply into these subjects. The infrastructure of BOKU impressed me greatly, with well-organized spaces making it easy to navigate the event's venues. Additionally, the city's cultural beauty, characterized by elegant baroque architecture, added to the overall experience, providing a sense of peace and relaxation.



Laboratory Work

I had the rewarding opportunity to contribute to Johanna Volk's PhD research, where I shared my expertise while gaining new skills. The laboratory work involved managing samples from experiments conducted in 2022 and 2023 in Maputo, Mozambique. My tasks included drying samples overnight in an oven, weighing them using an analytical balance, and storing the remaining content in desiccator bells for subsequent ball-milling procedures. I prepared samples for processing using ceramic bowls or metal balls and operated both the FastPrep and ball mill machines with confidence after receiving prior training.

Further, I assisted in the filtration process, ensuring accurate identification of samples to avoid errors. I also used a flame photometer to measure sodium and potassium content in the samples. This involved preparing buffer solutions for each element. This laboratory experience was incredibly enriching, allowing me to contribute practically while learning advanced analytical techniques.

Experiment in the Greenhouse

The experiment, titled "**Characterizing Salinity Hormesis of Sweet Potato Biomass,**" commenced in October. The soil preparation involved mixing 70% clumpy soil and 30% substrate, which was then evenly distributed into 72 pots. Following this step, irrigation components, including pipes and droppers, were installed in each pot. The drip irrigation system was carefully tested and calibrated to ensure that each dropper delivered 8 ml of water per minute. The system was confirmed to be in optimal working condition.

A **completely randomized design** was implemented, consisting of 72 pots serving as experimental units, with two replicates and two treatments. The treatments involved two sweet potato varieties, **CIP 1989151.8** and **CIP 188002.1**, sourced from the International Potato Center in Mozambique. Two fertilizers, potassium nitrate (**KNO₃**) and dipotassium phosphate (**K₂HPO₄**), were used to study the interaction between variety and fertilizer. The primary objective was to evaluate the efficient uptake and retention of potassium in sweet potato tissues under salinity conditions, with the plants subjected to **70 mM NaCl**.

- *Field Capacity Measurement*

To determine field capacity, three pots were used. Each pot was weighed before adding water to establish a dry weight. Water was then added to achieve 70% field capacity, equivalent to a humid weight of 5.8 kg. This target weight guided irrigation scheduling based on the plants' water requirements. During this process, the pots were covered with aluminum to minimize water loss. After saturation, the water weight was recorded, and the covers were removed. A **TDR sensor** (Time Domain Reflectometry) was used to monitor soil moisture levels in the root zone, expressed as percentages. Daily TDR readings were taken until the lowest value was observed.



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These values were later used to develop a regression equation to estimate daily irrigation requirements.

- *Challenges and Adjustments*

The experiment encountered setbacks with the initial vines due to aphid damage. Once planted, significant growth disparities were observed between the two varieties, with **CIP 1989151.8** showing slower growth. To address this, the experiment was restarted using new vines derived from the first planting. These vines were water-treated to enhance germination rates. Despite efforts, uniform growth between the varieties was not achieved, possibly due to differences in vine cutting methods. However, replacing dried vines with fresh ones eventually helped standardize growth levels, enabling the evaluation of the research parameters.

- *Soil Sampling*

Soil samples were collected from six randomly selected pots. A soil sampler was inserted 3 cm away from the plant, extending to the bottom of the pot (15–16 cm). Each sample was divided into three sections: **Upper (U), Middle (M), and Lower (L)**. The samples were then dried under lights for further analysis.

- *Conclusion*

This experiment serves as a foundational step for future research in hydroponic systems with additional sweet potato varieties. The anticipated outcomes include improved plant yield and salinity resistance, supported by the physiological advantage of enhanced potassium retention and uptake in the presence of NaCl.

Acknowledgment

I am profoundly grateful to the ATSAF JST team for their financial support and for providing me the opportunity to participate in this program. Collaborating with an international research team was a transformative experience that fostered both personal and professional growth. Interacting with diverse cultures broadened my perspectives and encouraged innovative thinking.

I am especially thankful for the chance to connect with experts from various research fields during university-organized seminars and symposiums. These interactions were pivotal in shaping my research focus and decision-making, contributing significantly to my personal and professional development.

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