



ATSAF - CGIAR++ Junior Scientists Program

Final Report

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Country : Mozambique

Supervisor at IARC: Dr. Isabel Maria Andrade

Start and end date of stay at IARC: 01 Apr 2023 - 30 Sept 2023

Title: Evaluation of side branch morphology and physiology of sweet potato grown under salinity

Funded by the German Federal Ministry for Economic Cooperation and Development (BMZ)



Implemented by
giz Deutsche Gesellschaft
für Internationale
Zusammenarbeit (GIZ) GmbH



Project description

I did my internship & master's thesis within the ongoing research project of PhD candidate Johanna Volk on "Model supported identification of phenotypic traits and development of a field-based screening tool for salinity tolerant sweet potato clones", under the supervision of Prof. Dr. Folkard Asch and Dr. Isabel Maria Andrade. I was engaged with the International Potato Center (CIP), which is CGIAR center, located in Maputo, Mozambique.

My internship and thesis last for 6 months. During that period I successfully participated in multiple activities including organizing of things for the field trial, soil sample analysis, establishing of experimental layout and fixing the irrigation lines, collection and analysis of the data, *etc.* The field trial was located in the Nwalate research station, which is in Boane province. The research station is about 35-40 km from Maputo city. We were using a car to travel to the field, as we were living in the Maputo city. The aim of the project is to investigate the performance different sweet potato varieties in salinity conditions, and also to study the physiological mechanisms for the tolerance of the plant against salt stress. The team consisted of two M.Sc. students, and one PhD candidate.

The main field trial comprises two different trial (screening trial and physiology trial). A randomized block design (RBD) was used with three replications, three different treatments (control, saline water, and saline water + fertilizer application), and contrasting genotypes. In the physiology trial, each main plot consist of one variety treatment combination and is subdivided into 15 sampling units from which one plant was removed per sampling event. At every sampling event, morphological characteristics such as vine length, number of leaves and leaf area was determined along with a destructive sampling to analyze salt uptake and distribution of the different plant parts. The screening trial is also structured into main plots of one variety-treatment combination but was mainly sampled destructively once at the end of the growing period to determine the above and belowground biomass. In both trials, soil samples and moisture measurements was taken in regular intervals to track salinization and soil water content. For irrigation, fresh water was pumped from the Umbuluzi river stored in respective tanks. Salt and fertilizer were added as per the requirement of the treatments. The drip irrigation system was used to irrigate the plants.

Since it was the second year trial, we were quite familiar with the local situations. Although, we faced multiple issues with the water pumps, and fixing of the drip irrigation lines. We started with the layout of the experiment, and later women made ridges manually to plant sweet potato. During the months of April, and May we were working to prepare the field for planting. As due to multiple damages in the irrigation pipes, and technical problems in the water pumps it took a long time to fix them. Also, simultaneously we were working in a soil lab to analyze soil samples of the last year. We were also measuring dry weight (DW) of the plant samples of the last year trial. Finally we planted sweet potato cuttings in the end of June month, and left them to grow before we started sampling.

For the destructive and non-destructive sampling we had a team support from CIP including technical assistants and students. For the saline water we mixed fine salt in a fresh water to irrigate. To avoid the clogging of the holes we flush the saline water irrigation pipes with fresh water at the end of the every irrigation event. The irrigation event were scheduled for twice a week, and also depend on the frequency of the rainfall.



Fig. 1 & 2 : Preparation of experimental layout



Fig. 3 & 4 : Planting of sweet potato cuttings



Data collection and sampling

For the data collection and sampling, we divided in two parts, destructive and non-destructive sampling. The interval of the each sampling event was ten days. For the non-destructive sampling, we marked one plant from each plot and every ten days we measured the different parameters like length and number of vines, number of side branches, number of leaves, *etc.* Also, we marked the vine on every sampling event to record the growth of the plant. The non-destructive sampling was scheduled for one day per each sampling. In destructive sampling we took out the plant, and separated the different parts (stem, petioles, leaves, flowers, tubers, *etc.*) with the scissors and put them in different paper bags with label for further lab analysis. Further, the plant samples dried at 60°C for 2-3 days to remove moisture, and subjected to lab analysis to measure DW and determination of salt accumulation. The non-destructive sampling was scheduled for three to four days per each sampling event. Soil samples were also collected simultaneously on the same day of destructive sampling to determine the soil EC. Soil samples were collected with soil sampler up to 90 cm of soil depth. Further, they were divided in three parts upper (0-30 cm), middle (30-60 cm), and lower (60-90 cm). Further, the soil samples were air dried at room temperature, and subjected to lab analysis. For moisture determination also soil samples were collected and dried in oven at 110°C to remove the moisture. In events of destructive and non-destructive sampling, as well as soil sampling we had a great support from the CIP team.



(Fig.5 : Introduction/training lecture for destructive and non-destructive sampling)



(Fig.6 : Destructive sampling)



(Fig.7 : Vine marking)



(Fig.8 : Non-destructive sampling)

Interaction with CIP team

During my internship I had a great chance to interact with the scientific, technical and administrative team of CIP. We were warmly welcomed by CIP team on our arrival, and at last they celebrated goodbye with cake and celebration. We had multiple learning sessions with Dr. Andrade, which really helped me to expand my knowledge on production practices of sweet potato. I had also chance to meet station secretary Dr. Ligia and her team. They helped us a lot to organize the things. It was a pleasure to working with technical staff of CIP and IIAM. As we spent majority of our time in the field I also had a great opportunity to working with the students who are doing bachelor's in agriculture, as well as technical team from CIP (Mr. Gonzaga, and Mr. Covele) and IIAM (Mr. Arlindo). Working with them really helped me to gain my practical skill. I would like to say special thanks to Mr. Gonzaga, and Mr. Covele for helping me out all the time during field trial. It was a pleasure to working with them.



Fig. 9 : CIP office team



Fig. 10 : Field assistant and students

Conclusions

It was a really great experience to working in the country like Mozambique with the international people. Also, working with a scientific team from the CGIAR research center helped me a lot to develop my knowledge and practical skills. The Mozambican people are very kind and helpful, also the weather of the country was calm and fresh that made my stay smooth. I had a really great time in Maputo, and I would like to visit it again in future. The only things I felt it was a bit expensive in case rent, travelling and food. I express my hearty thanks to ATSAF team to give me this opportunity that really helped me a lot to build my knowledge, technical skills and personality.