The Effect of Flooding Water From Kindai Lake

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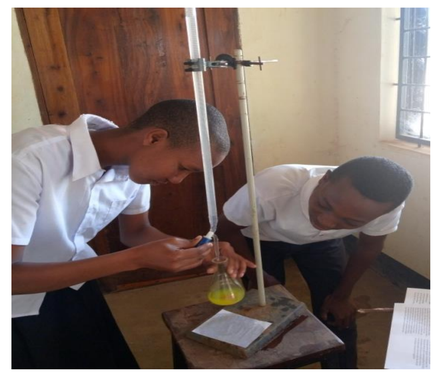
Introduction

In Singida Urban there are two lakes, Kindai and Singidani. Due to heavy rainfall of 2020, these two lakes overflow water to the residence area and farming area. The water from these lakes have salts (NaCl) and other minerals. Affected area was very important to cultivation of maize, sorghum, millet and sunflower.

Soil salinization is one of the major factors of soil degradation. Salinity inhibition of plant growth is the results of osmotic and ionic effects and the different plant species have developed different mechanisms to cope with these effects. Reduction in osmotic potential in salt stressed plant can be a result of inorganic ion (Na+, Cl- and K+) and complete organic solute (soluble carbohydrates, amino acids etc.) accumulations. Although the relationship between osmotic regulation and salt tolerance is not clear, there is evidence that the osmotic adjustment appears, at least partially, to be involved in the salt tolerance of certain plant genotypes (NETO et al., 2004).



Plant species vary in how well they tolerate salt-affected soils. Some plants will tolerate high levels of salinity while others can tolerate little or no salinity. The relative growth of plants in the presence of salinity is termed their salt tolerance. A high salt level interferes with the germination of seeds. Salinity acts like drought on plants, preventing roots from performing their osmotic activity where water and nutrients move from an area of high concentration. Therefore, because of the salt levels in the soil, water and nutrients cannot move into the plant roots

This project aim to use a bioassay to determine if a concentration of salt (NaCl) in lake Kindai is toxic for seed germination or not.

Method

Three steps was involved.

1**. Selection of viable seeds, plot preparation and laboratory experiment set up**.

(a) 125 Seeds of Sunflower, 125 maize, 125 sorghum and 125 millet were collected from Agricultural shop and were used as plant material.

25 seeds were put in each Petri dish and covered with cotton wool to ensure seeds remain moist at all time.

2. Determination of Sodium chloride Concentration by Titration

(a) This method determines the chloride ion concentration of a solution by titration with silver nitrate. As the silver nitrate solution is slowly added, a precipitate of silver chloride forms.

$Ag^+(aq) + Cl^-(aq) \rightarrow AgCl(s)$

The end point of the titration occurs when all the chloride ions are precipitated. Then additional chloride ions react with the chromate ions of the indicator, potassium chromate, to form a red-brown precipitate of silver chromate.

We prepared half a liter of solutions for each concentrations to be used in laboratory set up experiment and five liters each concentration for plot set up. No Nutrient solution was applied in each plot and petri dishes.

(b) Each plot and petri dishes was irrigated using their respective solutions to ensure no drought interfere our results.

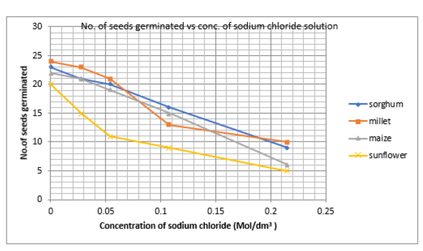
The number of seeds that were germinated was recorded at 24 hours intervals for 7 days in petri dish set up while in plot set up the data was recorded every 2 days for 14 days.

After 7 days and 14 days for laboratory set up and plot set up respectively of growth, germination percentage, germination index and germination speed were recorded

Results

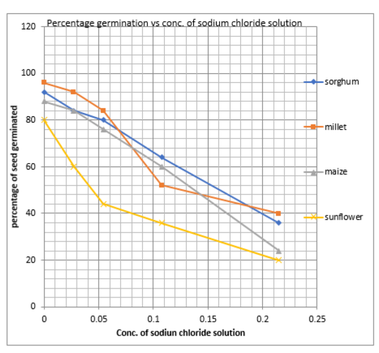
Number of seeds germinated

Concentrations (Mol/dm^{-3})	25 total seeds in each petri dish			
	sorghum	millet	maize	sunflower
0	23	24	22	20
0.027	21	23	21	15
0.054	20	21	19	11
0.1075	16	13	15	9
0.215	9	10	6	5



Percentage of seeds germinated

Concentrations (Mol/dm^{-3})	25 total seeds in each petri dish			
	sorghum	millet	maize	sunflower
0	92	96	88	80
0.027	84	92	84	60
0.054	80	84	76	44
0.1075	64	52	60	36
0.215	36	40	24	20



Germination rate (mean)

Concentrations (Mol/dm^{-3})	25 total seeds in each petri dish			
	sorghum	millet	maize	sunflower
0	92	96	88	80
0.027	84	92	84	60
0.054	80	84	76	44
0.1075	64	52	60	36
0.215	36	40	24	20

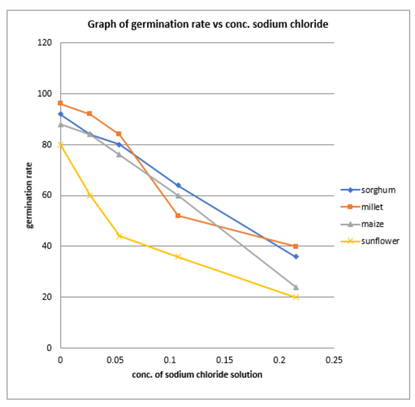
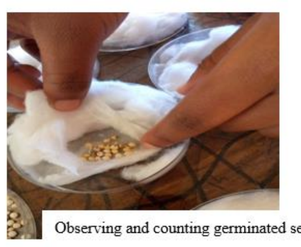


Fig. Observing if there is any germination

Fig. Observing if there is any germination in laboratory setup.



Observing and counting germinated seeds in the petri dishes.

Conclusions

The germination index (GI), germination percentage and germination rate was significantly decreased as the NaCl levels were increased. Germination percentage of a crop is considered as the most important criteria for a successful crop establishment under stress conditions because under saline conditions germination is the first stage of a crop exposed to salinity. Usually a crop with high germination percentage, germination rate and germination index performs well under saline conditions than with low.

Presumably the osmotic effect due to salinity on inhibition of seeds was the main cause for the reduction of germination percentage, rate and varieties differences for Germination index.

Our preliminary results showed that seeds of Maize, sunflowers, Sorghum and Millet germinated at low concentrations of NaCl (0.0215M), while at higher concentrations (0.215M) seeds of maize, sunflower, sorghum and millet were inhibited (low germination). Although all seeds germinated well at a moderately elevated salt concentration except sunflower which is seen to be more affected.

Kindai area the crops will take more time to germinate compared to the time before flood. Though this effect will be reduced as more rainfall because the concentration of sodium chloride will be lowered, as we see when concentration of sodium chloride is decreasing the percentage of germination increase and germination index increases too, also germination rate increases. It is known that the effect of salts on plants leads to physiological drought. It can be concluded that salt reduces the water potential of soil solution, which prevents the supply of water by plants.

Acknowledgments

Special thanks to our head of school (Mariam Mpimbi), teacher mentor (Nadhiru Bwikizo) and Regional , teachers of English department Dr Salmin Amour secondary school and all students of form three for their kindly support that helped us to accomplish our project. Also thanks to Amipour, M with his work which gives us more ideas on the effects of sodium chloride solution on germinating seeds..