Germination & Early Seedling Growth of Seven Varieties of Pearl Millet Under Saline Conditions

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INTRODUCTION

Primary soil concern in the Senegalese "Peanut Basin" (figure 1)

- Loss of arable lands and the decrease of crop yields due to soil salinity
  - Upward flux of salts from the soil solution and shallow groundwater,
  - Inundation by saline water from creeks and rivers
  - Aeolian deposition of salts
- Soils in Senegal are typically highly acidic.

Main crops: peanut, corn, sorghum and millet (Figure 2).

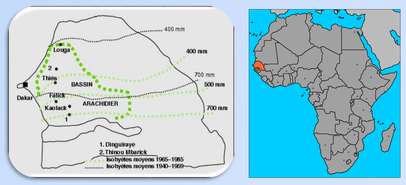

Figure 1. Peanut Basin of Senegal (bold green squares)

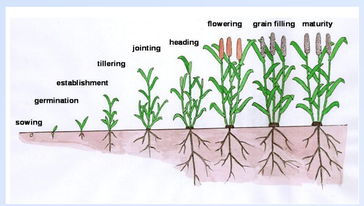

Figure 2. Pearl millet development stages

OBJECTIVES

To identify pearl millet cultivars tolerant to salinity based on their germination performance and early seedling growth characteristics.

MATERIALS AND METHODS

A factorial study conducted in a greenhouse at Virginia Tech.

- Electrical conductivity/NaCl concentration and pH/lime calibration curves
- Pots filled with 600 g of Orangeburg loamy sand
- Pots watered once with NaCl solutions corresponding to 0.3, 2.1, 4.2, 5.2, 6.3 dS/m
- Deionized water used for the rest of the experiment (10 days).
- 2 pH levels (4.9 and 6.0)
- Seven varieties (IBMV 8402, IKMV 8201, ICMV-IS 88102, IKMP1, IKMP2, Gawane, and SOSAT C88)
- 4 replicates.

RESULTS AND DISCUSSION

1. Seed Germination

- ✓ Seven days after sowing, the salinity and pH had no effects on seed germination.
- ✓ Greater germination percentage (Figure 3) for cultivars IBMV 8402 and SOSAT C88 (93 and 85%, respectively) compared to those of cultivars ICMV-IS 88102 (75%), IKMP2 (73%), IKMP1 (71%) and Gawane (61%). Such differences may be explained by some intrinsic characteristics.

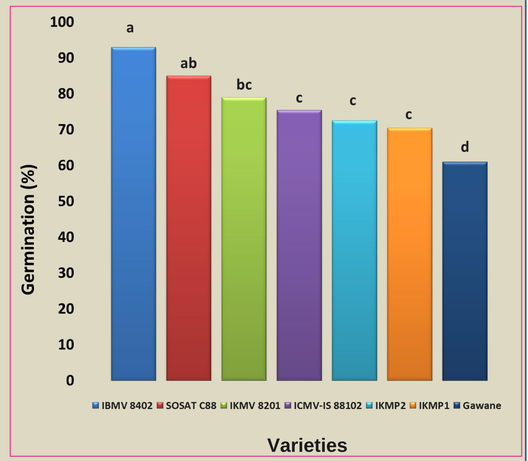

Figure 3. Germination percentage of 7 millet cultivars seven days after sowing

2. Early Seedling Growth

Ten days after sowing,

- ✓ pH had no effects on root growth; on the other hand, rising pH increased shoot length (Figures 4, 5 & 6)
- ✓ Unlike pH, rising salinity decreased both shoots and roots: more depressive effects on shoots (Figure 8)
- ✓ Millet target pH (6.2), which would improve water and nutrient uptake while high salinity would reduce this effect due to an increase of osmotic pressure
- ✓ SOSAT C88 and IBMV 8402 had the longest shoots whereas Gawane and SOSAT C88 had the longest roots (Figure 7).
- ✓ Number of leaves negatively correlated with salinity(Figure 9)

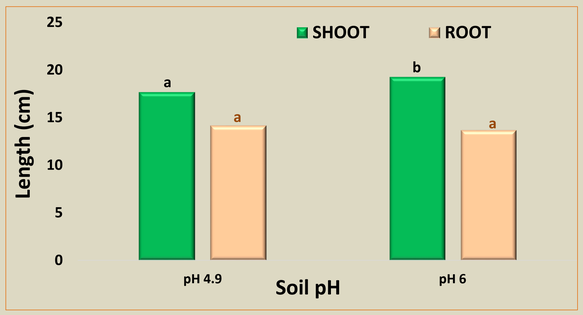

Figure 4. pH effects on ten-day-seedling length

Figure 5. Millet ten-day-seedlings in pots

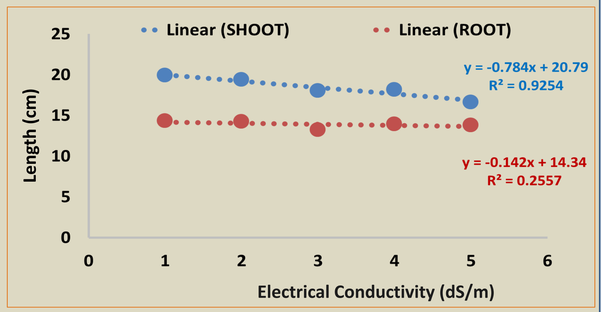

Figure 8. Depressive effect of EC on the number of leaves

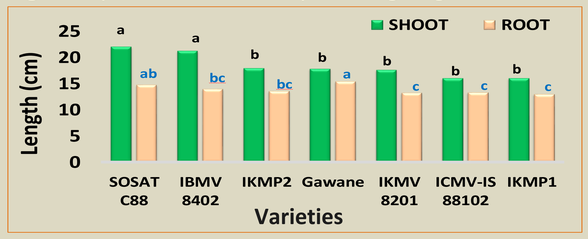

Figure 7. Difference in length between cultivars ten days after sowing

Figure 6. Millet ten-day-seedlings

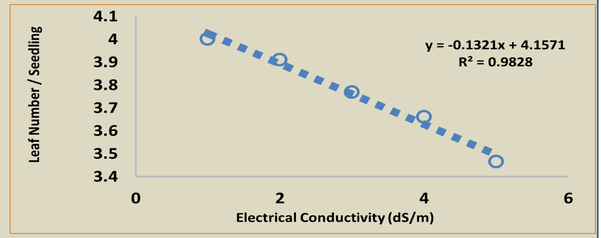

Figure 9. Depressive effect of EC on the number of leaves

CONCLUSIONS

- ➢ Salinity and pH had no effects on seed germination and root length;
- ➢ Number of leaves, and shoot length were inversely proportional to salinity;
- ➢ Cultivars IBMV 8402 & SOSAT C88 would be recommended in salt-affected soil.

UID: 93835
2015 Annual Meeting November 15-18 2015, Minneapolis, MN

Acknowledgements: We thank the USAID Education and Research in Agriculture project in Senegal for funding.