



# **Effect of different salinity levels on *In vitro* and Ex vitro growth of potato**

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- Potato is a major food crop in Palestine . The annual consumption is about 100 thousands tons. Thus, a large amount of tubers is imported for this purpose.

# Abstract

- *Solanum tuberosum* cv. Sponta explants grown in vitro on MS media, , were subjected to 4 NaCl treatments. Meanwhile potato plants of two weeks age were subjected to the same levels of NaCl in the green house, growth and development of the plants and explants were analyzed. Plants were highly sensitive to salt treatment, both biomass and tuber production were influenced significantly.

Salinity is one of the major abiotic constraints that severely affect the productivity of agricultural crops in arid and semiarid regions

Salt stress limits yield of crops by

1. affecting the metabolism of plants and causes important modification in different biochemical and molecular processes ([Allakhverdiev et al., 2000](#)).
2. It can activate certain photosynthetic enzymes activity causing decomposition of membrane structures ([Meloni et al., 2003](#)).
3. Rate of photosynthesis and respiration in crop plants is severely interfered causing reduced plant growth and low productivity at high salts ([Silva et al., 2001](#); [Zhang et al., 2005](#); [Fidalgo, 2004](#)).

4. Higher level of salinity disrupts plant roots making water deficiency, nutrients imbalance by altering uptake and transport, ionic stress by higher  $\text{Na}^+$  and  $\text{Cl}^-$  accumulation, ([Munns, 2002](#)).
5. Severe yield reduction in many crops has also been reported by [Zhu \(2007\)](#). FAO suggested that approximately 6% of the world's total arable and 20% of irrigated land is affected by high salinity ([FAO, 2008](#)).

- Extensive breeding and selection in potato for traits other than abiotic stress tolerance have resulted in cultivars that are considered moderately salt tolerant (FAO, 2010).

The study of plant salt tolerance through •  
tissue culture to identify crop sensitivity  
seems to be a fruitful and short time approach  
([Zhu, 2007](#))

# Objectives

- Objective
- The objective of this project is to study the effect of different salt levels on the growth of potato plants through both *in vitro* and *ex vitro technique*



# Methodology

- I. *In vitro* experiment
- A. Potato incubation for sprouting under the room temperature with 16 hrs light and 8 hrs dark
- B Sprouting
- C. Sprout disinfestation using 10% chlorox and tween 20 (1 drop) then washing three times in sterile distilled water
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# Growing sprouts



# Establishment

- Disinfestation



# Media

- MS basal medium was prepared supplied with 30 gm per liter sucrose and 8 gm Defco Bacto agar, the media was dispensed in test tubes, the media was divided into four portion
- 1. MS control medium
- 2. MS + 50 mM NaCl
- 3. MS + 100 mM NaCl
- 4. MS + 200 mM NaCl

# In vitro culture

- Sprouts were sterilized and cultured on media supplied with different levels of NaCl
- The culture were incubated in a growth chamber at  $23 \pm 2^{\circ}\text{C}$  for 16 hrs light

# Culturing under aseptic condition



# Growth chamber



# Green house experiment

- Potato tubers were planted in 10 liters pots filled with sand in the green house
- 32 pots were planted
- The pots were irrigated for two weeks with fresh water
- After 2 weeks, 16 pots of homogenous growth were selected, the four treatment ( NaCl levels) (0, 50, 100, 200) were randomly assigned each in four pots (4 replicates), each pot was irrigated with the corresponding salt level.







# Results

- *In vitro* Experiment



## Effect of salinity on the average shoot length and number of potato plants *in vitro*

Salt level (mM)	Av. shoot length (cm)	Av. Shoot number
0	3.10 a	4.1*
50	3.10 a	3.1
100	1.70 b	3.8
150	1.40 b	3.6 NS



# Before treatment





# Cultural practices





Labeling one shoot per plant





# Initial stage





# Treatment application





## Control treatment



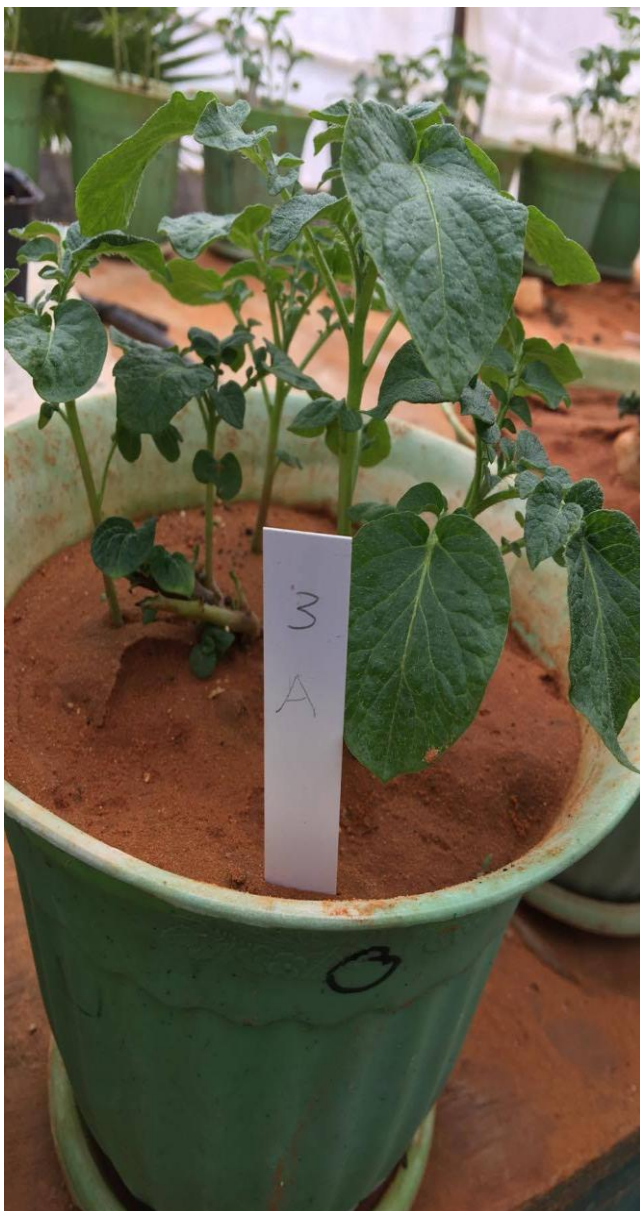


## General effect of salinity





# Stress development





# High salinity effect



## Effect of salinity on the average weight and number of tuber per plant

Salt level (mM)	Weight tuber/plant(g m)	Average number of tuber per plant
<b>0</b>	<b>43.70 a</b>	<b>5.8*</b>
<b>50</b>	<b>25.50 b</b>	<b>6.3</b>
<b>100</b>	<b>25.30 b</b>	<b>4.3</b>
<b>150</b>	<b>18.50 b</b>	<b>5.5</b> <b>NS</b>

## Effect of salinity on the average biomass of potato plants

Salt level (mM)	Total biomass (gm)
<b>0</b>	<b>88.33 a</b>
<b>50</b>	<b>59.7 b</b>
<b>100</b>	<b>59.5 b</b>
<b>150</b>	<b>46.7 b</b>

# Conclusion

- 1. Potato Sponta cultivar is sensitive to salinity
- 2. The effect was more exhibited in green house trail
- 3. Growth and tuber production was highly affected with salinity treatment
- 4. Other cultivars should be investigated and screened for salt tolerance