EFFECT OF SALT STRESS AGAINST CELL WALL

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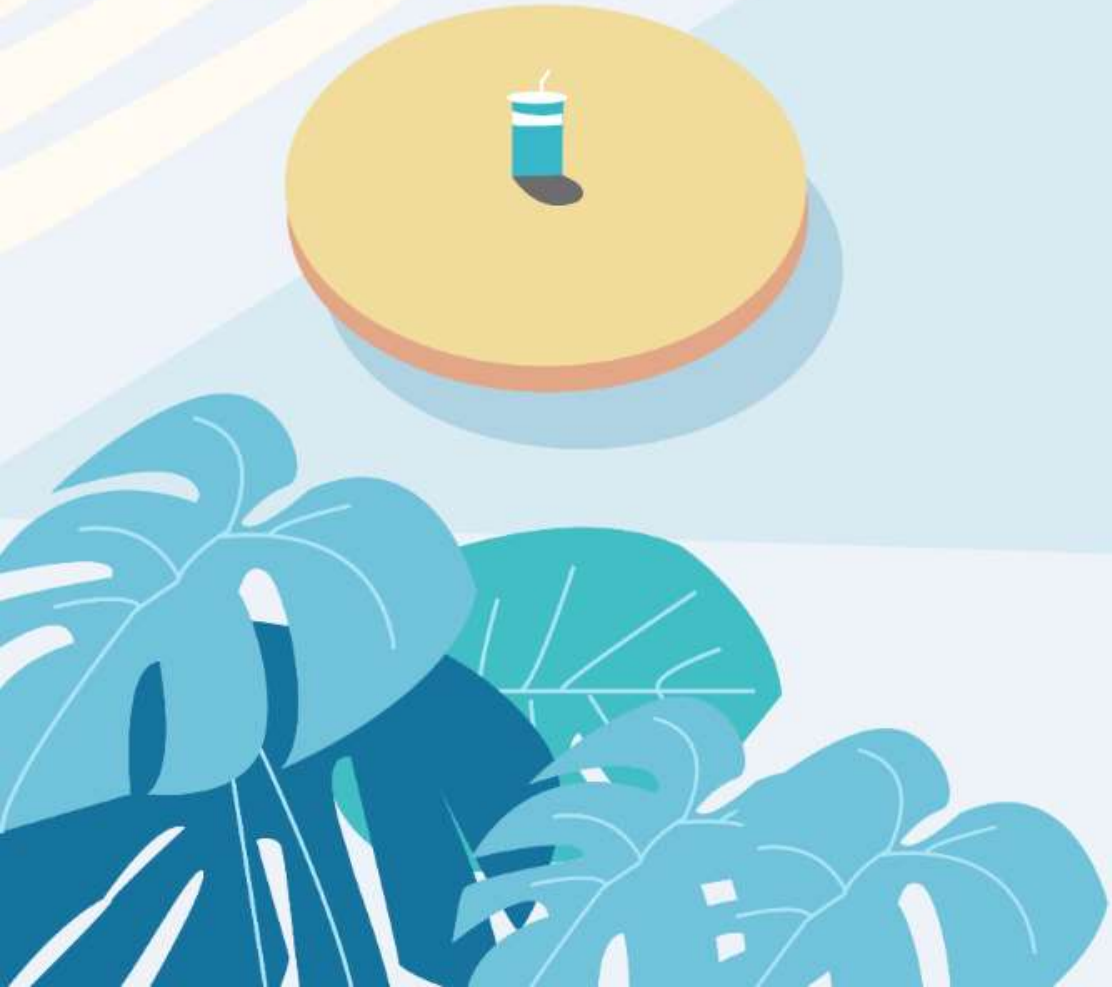


CONTENTS

INTRODUCTION

- Salt stress is one of the abiotic factors caused by environmental factors that can affect the growth, development, yield and quality of plant seeds.
- Salt stress in plants causes various physiological and metabolic changes such as nutritional imbalance, inhibition of water uptake, seed germination, photosynthesis and decrease in growth.
- Besides that, salt stress in plant can be seen by a slowing of shoot and root growth, reduced photosynthesis and the reallocation of respiration from growth to maintenance.
- In this experiment, effect of salt stress on the seed especially on the cell wall is found out.

PROCEDURES

1. 60 green beans are soaked overnight in water to ease gemination
2. Sea water solution is prepared by mixing sea water with warm water based on the table below.

Beaker	Sea water (mL)	Warm water (mL)
1	0	100
2	10	90
3	30	70
4	50	50
5	100	0

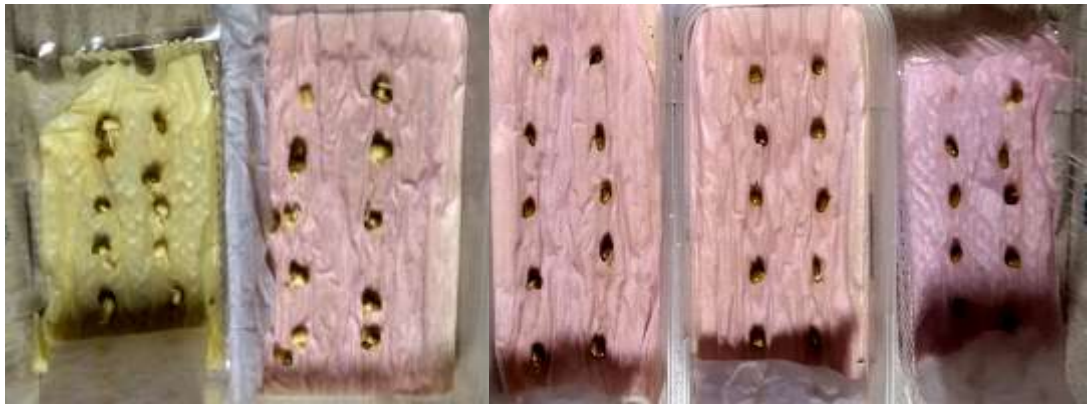
3. 5 containers are prepared by placing tissues and 10 green beans were placed in each of the containers.

4. The seeds are watered from day 1 to day 10 according to the table below.

Container	Amount of water added
A	5 teaspoons from Beaker 1
B	5 teaspoons from Beaker 2
C	5 teaspoons from Beaker 3
D	5 teaspoons from Beaker 4
E	5 teaspoons from Beaker 5

RESULTS AND OBSERVATION

Day 1



A B C D E

- All seeds started to germinate except seeds in Container E

Day 4

A B C D E

- Container B showed a few seeds with the growth of shoots
- Container A showed the overall seeds with the growth of shoots

Day 7

A B C D E

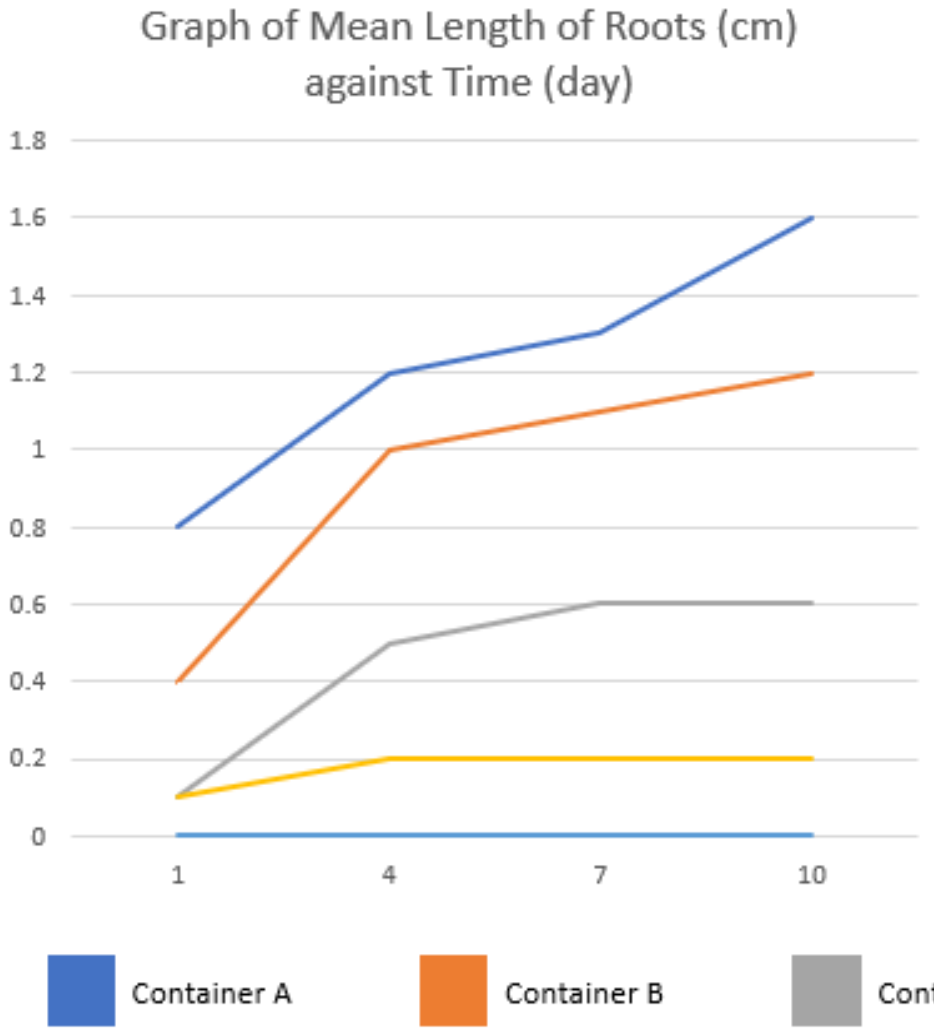
- The growth of shoots and roots were actively germinated in Container A and B

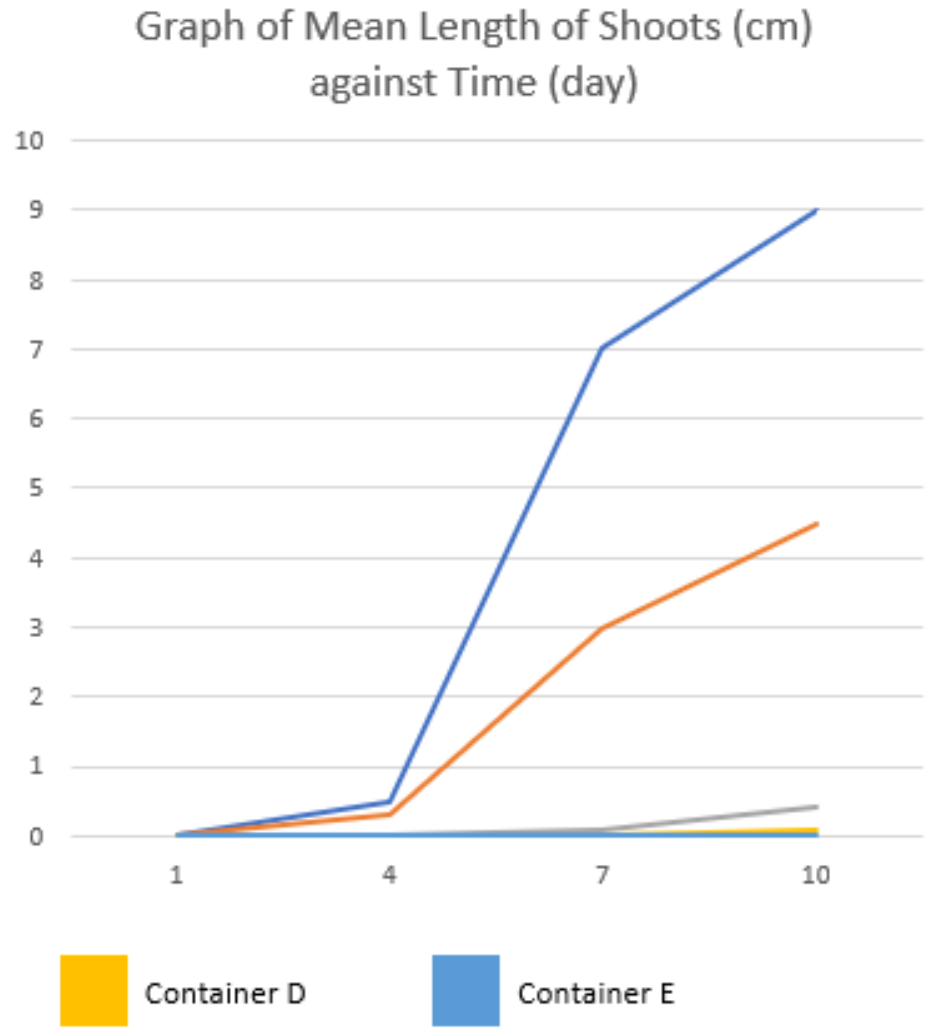
Day 10

A B C D E

- The growth of shoots and roots for Container C and D maintained
- Seeds in Container E occurred no germination at all

GRAPHS


Graph of Mean Length of Roots (cm) against Time (day)
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
1
4
7
10
Container A
Container B
Container C
Container D
Container E


Graph of Mean Length of Shoots (cm) against Time (day)
10
9
8
7
6
5
4
3
2
1
0
1
4
7
10

SALT STRESS AFFECT CELL WALL METABOLISM

- The major effect of salt stress is the decrease in available soil water due to the reduction in osmotic potential as it leads to water deficit-related plant growth impairment. Plant display shoot growth inhibition during the first phase of salt stress due to loss of cell wall extensibility.
- Green beans are glycophytes plant, which means they are sensitive to salinity. In glycophytes, the proteins and polysaccharides are modified in the primary cell wall. The celulose and hemicellulose show a steady state level in soybean genotype. The sugar content in cell wall also decrease with about 70% in the abundance of pectin.

COMPONENT OF CELL WALL AFFECTED

- A few components of the cell wall would be effected by salinity which is the cellulose, pectin and lignin
- Cellulose content will be reduced
- Cross linking contained in the pectin will be disrupted
- Lignin will be accumulated

COMPONENTS THAT CHANGE IN CELL WALL AS A MEAN OF PROTECTION

CELLULOSE AND HEMICELLULOSE

- Plants with a lack of function of the CESA1 and CESA6 genes have reduced root elongation and severe tip swelling during salt stress, and their cellulose content is reduced. The CSC reassembled at the plasma membrane during the growth recovery phase to synthesise new cellulose in order to continue root and hypocotyl development under salt stress.
- Salt stress response in plants is aided by the enzyme xyloglucan endotransglucosylase/hydrolases found in hemicellulose. When exposed to salt, XTHs are dramatically increased. Increased salt tolerance is associated with the loss of function of the XTH30 gene, which may be due to a slower decrease in crystalline cellulose content.

PECTIN AND LIGNIN

- A high salinity triggers the demethyl-esterification of loosely bound pectins to inhibit cell swelling. At high [Na+], the ratio of sodium ions in the apoplasts increase and replace calcium ion to bind pectins and disturb the cross-linking of pectins, leading to reduced cell elongation.
- Lignin is important for secondary cell wall formation and responses to a variety of environmental stresses. A high salinity causes the accumulation of lignin content and cell wall thickening through the activation of lignin biosynthesis pathway.

APPLICATION IN OUR DAILY LIFE

- We should make sure our land for plantation further away from high salt content areas such as by the sea water.
- We need to control the use of fertilizers which contain high concentration of sodium chloride, NaCl
- We have to increase drainage for better flushing to remove salts from ground surface

CONCLUSION

- It is proven that salinity is one of the major abiotic factor which effects plant growth
- It can also be seen that salt stress greatly influenced the secondary metabolism of green beans
- Green bean as a glycophyte is intolerant to salt or salinity as there was no germination at all from Day 1 to Day 10
- Many components in the cell wall of plant/seed is disturbed, causing difference in the root and shoot length

REFERENCES

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THANK YOU