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A Study on the Effect of NaCl Stress on Vigna radiata (L.) Wilczek. Var Co-6

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Abstract: - Salt stress is a condition where, excessive soil solution causes inhibition of plant growth and leading to plant death. Soil salinization is one of the major factors of soil degradation. It has reached 19.5% of the irrigated land and 21% of the dry land agriculture. The effect of NaCl salinity on morphological parameters of Vigna radiata (L.) Wilczek, var.Co-6 was studied. The morphological characters such as shoot length, leaf number, fresh weight, dry weight, leaf area decreased with increasing concentrations. As the scarcity for the fresh water gets increasing, the need for salinity resistant plant emergence become inevitable. The work done here may not provide sufficient information to raise a model crop for salt resistant. So further research process can be conducted in molecular and genetic level to produce a model salt resistant transgenic plant.

Keywords
leaf area, dry and fresh weight, NaCl stress, shoot length.

1. INTRODUCTION

Salt stress is a condition where excessive salts in soil solution cause inhibition of plant growth or plant death. On the world scale, no toxic substance restricts plant growth more than saline stress. Salt stress presents an increasing threat to plant agriculture. Jacob Levitt (1972), suggested that biological stress is any change in environmental conditions that might reduce or adversely change a plant's growth or development. We also defined salinity as "when the salt concentration is high enough to lower the water potential from 0.5 to 1.5 bar the stress will be called as Salt Stress." Salinity may also affect the germination of seeds by creating an externa; osmotic potential that prevents water uptake or due the toxic effects of Na+ and cl- ions on the germinating seed. (Hosseini et al., 2003).Vigna is an important legume grown in India. It is also known as Mung Bean, green gram. It is the native plant species of Pakistan and India. Mung beans are tropical crops and require warm temperatures.

Vigna radiata is mainly cultivated for its edible seeds. In India it is widely grown throughout the tropics, ascending from sea level to 1850m in the northwest Himalayan regions. In the present study, Vigna radiata (L) Wilczek var Co6 is subjected to saline stress and the following parameters have been studied to establish the physiological effects of salinity on this crop plant. In the present study it is propose to investigate the growth parameters of Vigna radiata (L) Wilczek.

II. MATERIALS AND METHODS

The certified seeds of Vigna radiata (L) Wilczek var co6 were collected from Killikulam Agriculture College, Killikulam. The experiment was conducted in the Green House garden in St. Xavier's College (Autonomous), Palayamkottai. Eighteen Pots were selected which is divided into three series of six pots each.

SALT CONCENTRATION:

Certified seeds of uniform size were surface sterilized with 0.1% Mercuric chloride for two minutes and rinsed thoroughly with distilled water. Various concentration of Sodium chloride solutions (50mM, 100mM, 150mM, 200mM, 300mM) were prepared.

The selected pots were filled with soil and organic manures. About 25 seeds were sown in each pot. The pots were watered with 100ml of well water in alternated days. Salt treatment was started from the 15th day after sowing. The plants were treated with NaCl salt using the following concentrations 50mM, 100mM, 150mM, 200mM,300mM once in three days for 35 days. The control pot was watered with well water.

PHYSICAL PARAMETERS:

The effects of salinity were studied using Vigna radiata var co6. It is an annual legume. The plants were collected at the stages of 15th, 25th, 35th days for growth measurements such as shoot length, leaf area, number of leaves, dry weight and fresh weight.

GROWTH DETERMINATION:

Shoot Length:

The shoot length was measured in five seedlings of each treatment by measuring the length of the shoot above the ground level to the tip of the shoot and the average was taken.

Number of Leaves:

Five plants were collected and the number of leaves in each plant was calculated and the average was taken.

Leaf Area:

Leaves from each plant was collected and their outline was drawn in graph sheets to calculate the leaf area and expressed in mm3.

Fresh Weight of Shoot:

The plants were collected from each pots and their fresh weight were measured in grams using chemical balance.

Dry Weight of Shoot:

Freshly weighed plants were kept in an oven at regulated temperature (65oC) for three days. The plants were taken after proper drying and weighed.

III. RESULT AND DISCUSSION

The result of the effects of NaCl stress on the growth parameter of Vigna radiata was presented in Table – 1-3

Table-1 Effect of NaCl stress on Shoot length and Number of leaves in Vigna radiata

Samples	Shoot length (cm)			Number of leaves		
	15th day	25th day	35th day	15th day	25th day	35th day
Control	19.4	20.6	22.9	6.0	6.8	7.9
50mM	18.5	21.2	21.6	5.2	6.3	7.7
100mM	18.2	20.1	20.4	4.8	5.7	7.4
150mM	17.7	18.6	19.8	4.6	5.2	6.6
200mM	16.6	18.4	19.2	4.3	4.8	6.4
300mM	15.4	18.0	18.2	3.6	4.1	6.3

Shoot Length:

Shoot length of Vigna radiata was very severly affected with increasing salt concentration. The minimum shoot length was observed in 300mM. This has been shown in Table – 1. Similar results were obtained in Basil by Mahmut and Gulsum, 2017

Number of leaves:

The number of leaves of Vignaradiata was also severely affected with increasing salt concentration. The minimum number of leaves were observed in 300mM. This has been shown in Table – 1. Similar results were obtained in Capsicum annuum L. Cultivars, Mathias, 2017

Table – 2 Effect of NaCl stress on fresh and dry weight of Vigna radiate

Samples	Fresh weight (mg)			Dry weight (mg)		
	15th day	25th day	35th day	15th day	25th day	35th day
Control	0.461	0.636	0.777	0.055	0.079	0.080
50mM	0.329	0.546	0.740	0.047	0.069	0.071
100mM	0.312	0.497	0.709	0.045	0.064	0.063
150mM	0.297	0.473	0.657	0.038	0.038	0.058
200mM	0.290	0.425	0.564	0.032	0.034	0.055
300mM	0.246	0.405	0.447	0.025	0.024	0.049

Fresh and Dry weight:

Fresh and dry weight of Vigna radiata were decreased with increasing salt concentration as shown in Table- 2 Reduction in dry weight depended upon the decrease in the lengths of shoot and root (Salim, 1991) Similar results were obtained in the sorghum plant by Saberi et al., 2015

Table – 3 Effect of NaCl stress on leaf area of Vigna radiata

Samples Leaf area (mm3)

Samples	Leaf area (mm3)		
	15th day	25th day	35th day
Control	579.2	595.7	675.2
50mM	493.6	491.7	582.2
100mM	326.2	483.9	505.9
150mM	293.2	400.8	400.3
200mM	269.2	388.9	375.1
300mM	202.8	356.1	335.7

Leaf area:

Leaf area of Vigna radiate was reduced with increasing salt concentration. This has been shown in Table – 3. In Glycine max and Talinium triangulare, the leaf area decreases with increasing salt concentration as reported by Essa, 2000 and Bamidele et al., 2007

III. CONCLUSION

Salt stress is often referred to as “Silent Killer” of natural production since it usually kills plants and soil organisms in the affected areas. From the present study the salinity stress is adversely affect the growth parameters of Vigna radiata. This is mainly due to the accumulation of Na2+ and Cl- ions

in the plant cells. Since the parameters analysed here was primitive level test, there is a scope of further research in the molecular level to produce new salt resistant plant.

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