EFFECT OF THE SALINITY STRESS ON THE TWO POPULAR VARIETY OF *PISUM SATIVUM* L. ON DIFFERENT GROWTH ATTRIBUTES

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ABSTRACT:

The growth analysis is employed to investigate the dependence of the growth capacity of a plant genotype on internal factors and the interaction between plant growth and its environment. Plant growth analysis is an explanatory, holistic and integrative approach of interpreting plant form and function. It uses simple primary data, such as weights and contents of plant components to investigate processes within and involving the whole plant. Growth analysis also plays an important role in the comparison of genotypes often as part of breeding programme. In this paper we summarized the said plant attribute under morphological, physiological categories.

Keywords: *salt stress, garden pea growth , legume*

INTRODUCTION

With the changing environment the individual plants exhibit the phenotypic plasticity (1) and also this is one of the solutions to the problem of adaptation to heterogeneous environment (2). The phenotypic plasticity enables a plant to change its growth patterns as it encounters different environment condition (3). The interaction between the individual species and its heterogeneous environment brings the phenotypic plasticity (3,4) as it plays an important role in the ecology and evolution of the most plant species. The evolutionary biologist and ecologist take a great interest in plasticity (5). The architectural plasticity and their relation with the salt stress are less studied (6). The plasticity itself evolves under selection (7) and under genetical control (5). It allows species to adjust in a new environment (8), resulting from dispersal of individual, disturbances and seasonal influences (9).

Growth attributes

Growth has been described generally in terms of increase in size which includes fresh weight, dry weight, leaf area, etc. (8). Dry weight determination gives a reasonable estimation of the carbon content in the plant material (7). Fresh weight measurements cannot be used like dry weight measurements because of salt status of the plant which has a complicated relationship between dry weight and fresh weight (14). The dry weight increase in plant over a period of time indicates the overall growth of the plant. (Lam 1991). Different factors, including the cultivation types, certain plant development aspect, environmental factors affect the plant growth (15). Many researchers reported the effect of salt stress in myriad of plants such as chick peas, cow peas and many other pea varity(11), Barley (12), Okra (16), safflower (18). The identification of physiological components causing varietal differences of yield in plants improves the understanding of desirable plant type; such differences can also be found in different clones of a species (17). Most species respond to different conditions by changing their ratio between below-ground and above-ground biomass (R/S ratio). The responses to changing conditions observed as differences in the R/S ratio may reflect the general ecological characteristics of the current species (5). In general fast growing species have low R/S ratios and slow growing species have high RS ratios (Lambers and Poorter 1992).

Leaf growth is one of the first to be affected by the salt stress (4,5), and leaf expansion (leaf area) is sensitive to the tissue salt stress, because leaf expansion depends mostly on cell expansion (4). The principles that underlie the two processes are similar (9). The cell growth relates to the turgor pressure, as the leaf expansion corresponds to the cell growth and both are turgor driven processes which are extremely sensitive to Salt.

The stress factors along with various molecular, biochemical and physiological phenomena affect the plant growth and development (11). Plants develop a wide variety of morphological (14) and physiological Salt tolerance mechanisms for further survival (17). One of the mechanisms involved in the adaptation of plants to salt is the change in root to shoot dry mass ratio (18). Salt stress reduces both root and shoots growth, but root growth seems to be less affected (12) noted that studies on partitioning of dry mass between different plant organs are scarce.

Study plant:

Pisum sativum known as garden peas were the most likely edible plant mostly grown in winter season and used as a source of protein minerals and salts and antioxidants. It is economically grown as fresh and fry grains. However the increased salinity of the soil becomes a major drawback of its economical production as this plant reported as sensitive to salt stress. How ever many varieties has been launched after excessive studies on its salt stress. Here were chosen two different variety easily available in markets and widele used and commercial purposes.

Experimental setup:

The two variety of pea seeds were selected and soaked for germination after that seed were implanted in pots to germinate under control and three salinily criteria 50, 100 and 150 mM NaCl. The germination percentage were recorded .

Germination speed = number of seeds germinated /total number of seeds sown. The number of germinated seeds was recorded every day from sowing, and lasted for 10 days, and was used to calculate germination speed.

Germination speed = n1/d1 + n2/d2+n3/d3+n4/d4+………….n10/d10

Where n1 is no of seeds sown and d1 is no of days from the day of sowing. After that Mean daily germination was calculated by

Mean daily germination = total number of germinated seeds + total number of days taken for final germination

The lengths of the roots and shoots were taken by the graphical scale and their fresh weight was measured by the electronic balance.

Fresh weight: The leaves were detached from the shoot carefully and every plant parts were weighed separately. The fresh weight estimated were determined the fresh biomass of the plant.

Dry weight: All the plant part was then dried overnight in the hot air oven at 70°C for the estimation of the dry weight calculation. Precaution was taken that during weighing the plant parts did not absorb the moisture.

Leaf area: The leaf area was measured by the leaf area meter. Further the mean of each ratio over a harvest interval may also be estimated.

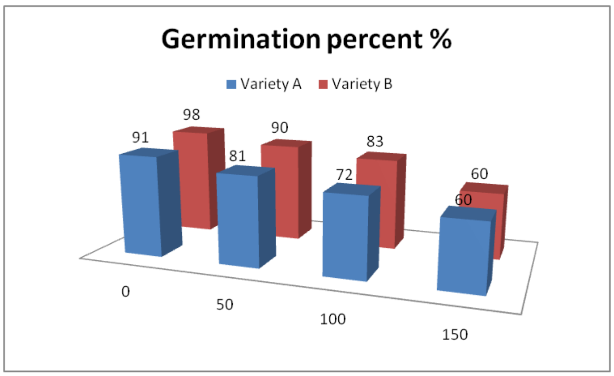
% Moisture content (g g^{-1}) = $\frac{\text{(Plant fresh weight} - \text{Plant dry weight)}}{\text{Total plant fresh weight}} \times 100$

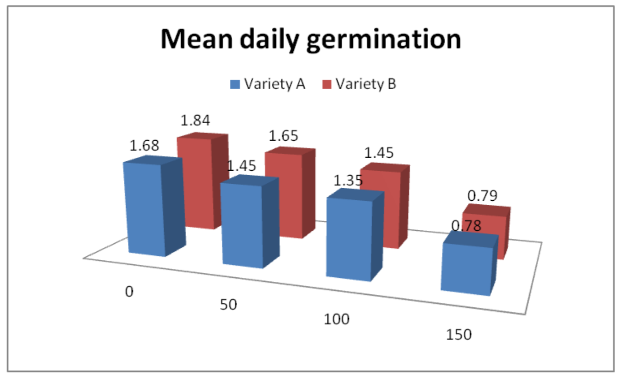
Result and data interpretation:

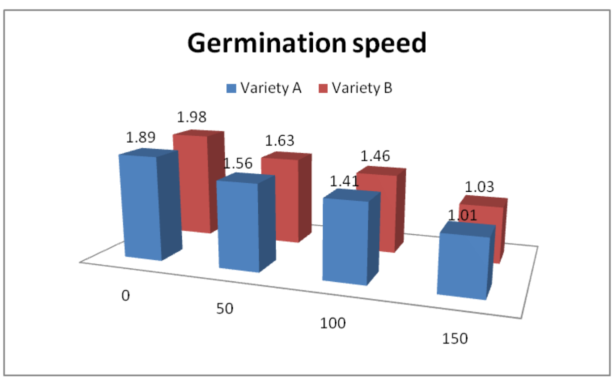
After 10 days of the salinity stress the plants were recorded by the different morphological and physiological traits.

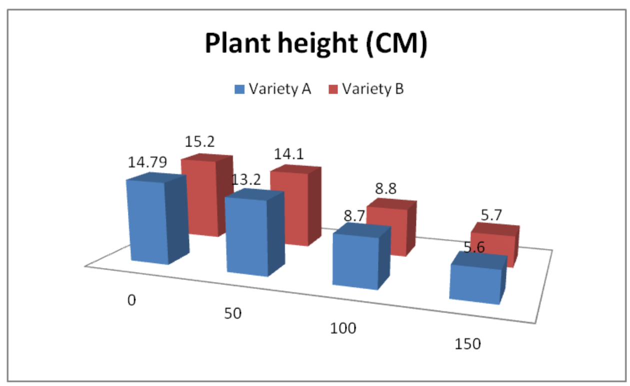
Effect on morphological traits:

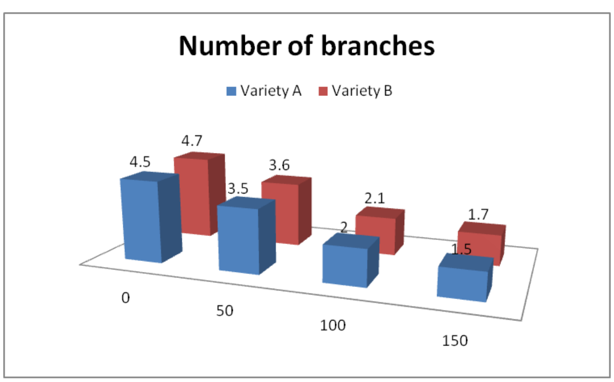
	Variety A				Variety B			
morphological traits	**0**	**50**	**100**	**150**	**0**	**50**	**100**	**150**
Germination percent %	91	81	72	60	98	90	83	60
Mean daily germination	1.68	1.45	1.35	0.78	1.84	1.65	1.45	0.79
Germination speed	1.89	1.56	1.41	1.01	1.98	1.63	1.46	1.03
Plant height (CM)	14.79	13.2	8.7	5.6	15.2	14.1	8.8	5.7
Number of branches	4.5	3.5	2	1.5	4.7	3.6	2.1	1.7
Number of leaves	10.5	8.4	5.7	3.6	10.7	8.7	5.8	3.7

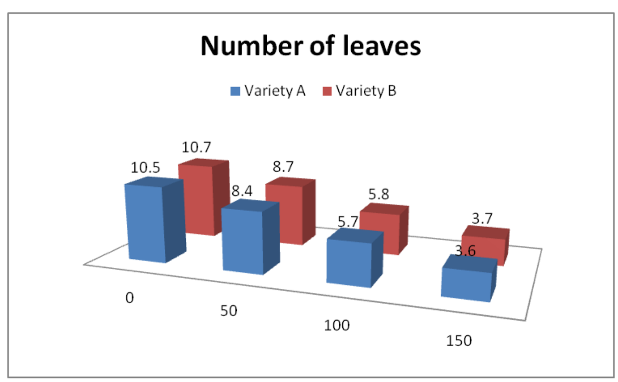












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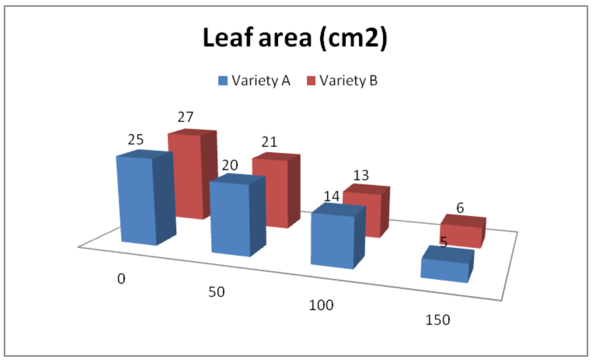
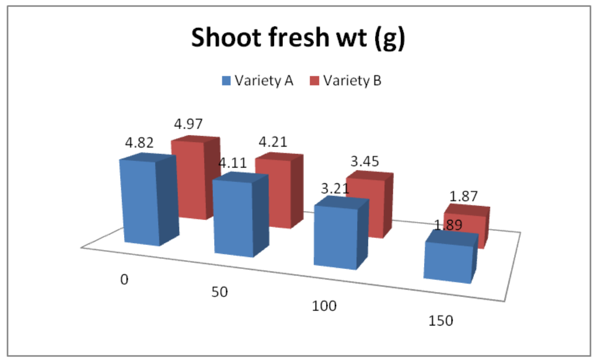
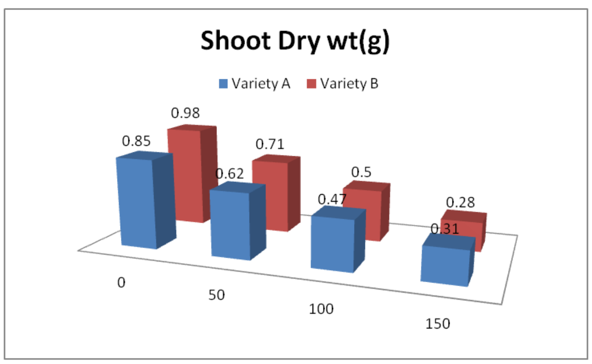
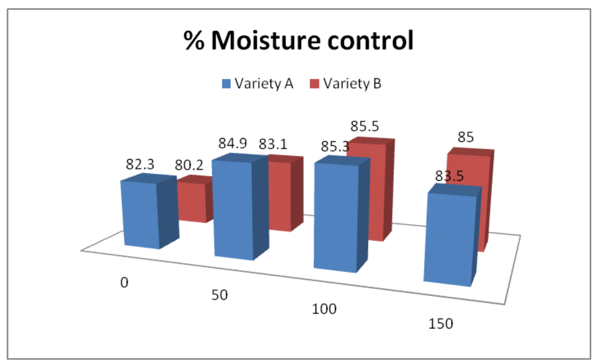
Effect on physiological traits:

	Variety A				Variety B			
physiological traits	**0**	**50**	**100**	**150**	**0**	**50**	**100**	**150**
Leaf area (cm2)	25	20	14	5	27	21	13	6
Shoot fresh wt (g)	4.82	4.11	3.21	1.89	4.97	4.21	3.45	1.87
Shoot Dry wt(g)	0.85	0.62	0.47	0.31	0.98	0.71	0.50	0.28
% Moisture control	82.3	84.9	85.3	83.5	80.2	83.1	85.5	85.0









The data in table and chart showed that the salt stress has the negative impact on all the growth attributes but the variety B has a better performance than variety A. the 50 m L NaCl has the minimum effect on the pea growth parameter while with increase NaCl concentration plants growth were suppressed and consecutively decreased the yield of the pea.

DISCUSSION

In the present study, the adverse effect of salinity decreased germination and growth of pea plants as shown in Table 2. Germination and seedling stages are critical life stages for plant survival and appropriate seedling establishment, particularly under stress conditions. The findings of this study indicated that seeds germination and establishment of pea seedlings were inhibited gradually by increasing salinity stress. At a high salinity level of 150mM NaCl, seed germination was completely inhibited. In this respect, many studies reported that increasing salinity level decreased germination percentage and germination speed in field pea.

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