IOSR Journal Of Pharmacy And Biological Sciences (IOSR-JPBS)
e-ISSN:2278-3008, p-ISSN:2319-7676. Volume 13, Issue 5 Ver. I (Sep. –Oct. 2018), PP 89-93
www.Iosrjournals.Org

Comparative Effect Of The different concentration of NACl Stress On The Popular Variety Of *Abelmoscus Esculantus* and *Pisum Sativum* L. On Different Growth Attributes

Dr. G. C. Yadav
Associate Professor, Chemistry Department, C. L. Jain College, Firozabad

Abstract:
The study on the comparative effect of different concentrations of NaCl stress on growth attributes of vegetables is an important research topic that can shed light on the impact of salt stress on plant growth and development. Salt stress is a major environmental stress that affects plant growth and yield, especially in arid and semi-arid regions where soil salinity is a common problem. In this study, different concentrations of NaCl can be applied to vegetable plants to create salt stress conditions. The growth attributes of the plants such as plant height, stem diameter, leaf area, biomass production, and yield can be measured and compared across the different NaCl concentrations. The effects of salt stress on physiological and biochemical parameters such as chlorophyll content, proline content, antioxidant activity, and ion homeostasis can also be analyzed.
The study can provide valuable insights into the mechanism of plant adaptation to salt stress and the potential of different vegetable crops to tolerate salt stress. The findings of the study can be used to develop new strategies for enhancing the salt tolerance of vegetable crops, such as the selection and breeding of salt-tolerant cultivars or the application of exogenous substances to alleviate the negative effects of salt stress.
Keywords: *salt stress, garden pea growth , legume*

I. INTRODUCTION

The study on the comparative effect of different concentrations of NaCl stress on the popular variety of Abelmoschus esculentus and Pisum sativum L. on different growth attributes is an important research topic that can shed light on the impact of salt stress on the growth and development of these vegetable crops[1,5].

In this study, the two popular varieties can be subjected to different concentrations of NaCl to create salt stress conditions. The growth attributes of the plants, such as plant height, stem diameter, leaf area, biomass production, and yield can be measured and compared across the different NaCl concentrations. The effects of salt stress on physiological and biochemical parameters such as chlorophyll content, proline content, antioxidant activity, and ion homeostasis can also be analyzed[2-4].

The study can provide valuable insights into the potential of these vegetable crops to tolerate salt stress and their adaptation mechanism. The findings of the study can be used to develop new strategies for enhancing the salt tolerance of these crops, such as the selection and breeding of salt-tolerant cultivars or the application of exogenous substances to alleviate the negative effects of salt stress[6,7].

Furthermore, the study can provide a comparative analysis of the response of different vegetable crops to salt stress, which can help in identifying the crops that are more tolerant to salt stress and can be grown in saline soils or arid and semi-arid regions. The comparative analysis can also provide insights into the genetic and physiological mechanisms underlying the salt tolerance of these crops[5,8].

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[9-11]. In this paper we summarized the said plant attribute under morphological, physiological categories.

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. (12). 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 (11).

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. However many varieties has been launched after excessive studies on its salt stress. Here were chosen two different varieties easily available in markets and widely used and commercial purposes.

Abelmoschus esculentus, commonly known as okra or lady's finger, is a vegetable crop that is susceptible to salt stress. Salt stress is a major environmental stress that affects plant growth and development, and is a common problem in arid and semi-arid regions where soil salinity is high. When exposed to salt stress, Abelmoschus esculentus may show a range of negative effects, including reduced growth, biomass production, and yield, as well as decreased chlorophyll content and photosynthetic rate. In addition, salt stress may also affect the accumulation of osmoprotectants such as proline and soluble sugars, which are important for plant adaptation to stress conditions. However, some studies have also reported that Abelmoschus esculentus has a certain level of salt tolerance, which can be enhanced by the application of exogenous substances such as plant growth regulators, organic fertilizers, and osmoprotectants. For example, the application of seaweed extracts has been shown to improve the growth and yield of Abelmoschus esculentus under salt stress conditions.

Experimental setup:

The two most consumable vegetable okra and 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.

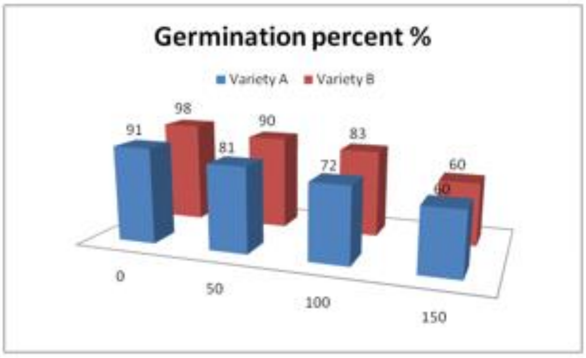
% Moisture content (g g^{-1}) = $\frac{\text{(Plant fresh weight} - \text{Plant dry weight)}}{\text{Total plant fresh weight}} \times 100$

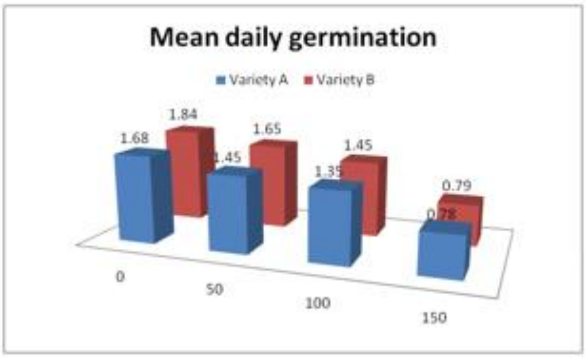
Result and data interpretation:

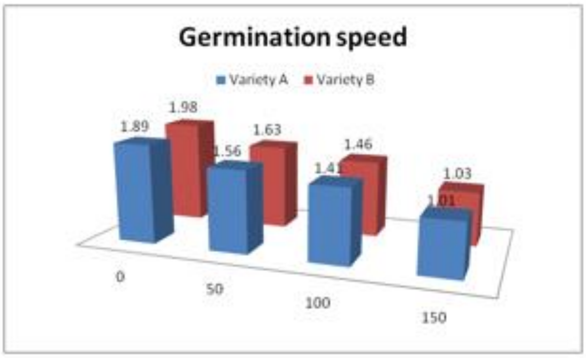
After 10 days of the salinity stress the plants were recorded by the different morphological and physiological traits.

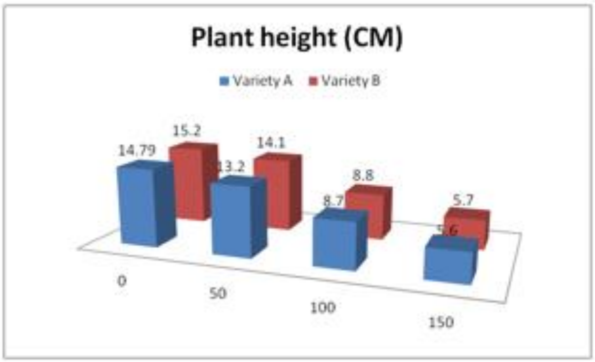
Effect on morphological traits:

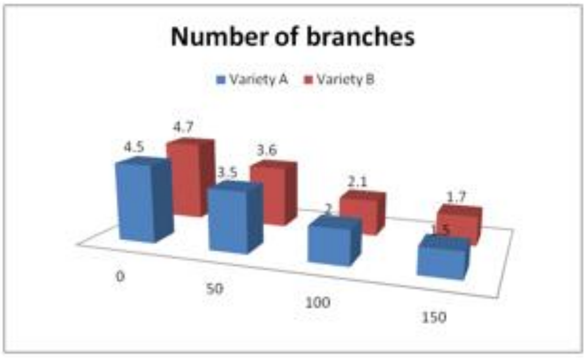
	Pea plant				Okra Plant			
morphological traits	**0**	**50**	**100**	**150**	**0**	**50**	**100**	**150**
Germination percent %	91	81	72	60	98	90	83	60
Mean daily germination	1.68	1.45	1.35	0.78	1.84	1.65	1.45	0.79
Germination speed	1.89	1.56	1.41	1.01	1.98	1.63	1.46	1.03
Plant height (CM)	14.79	13.2	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

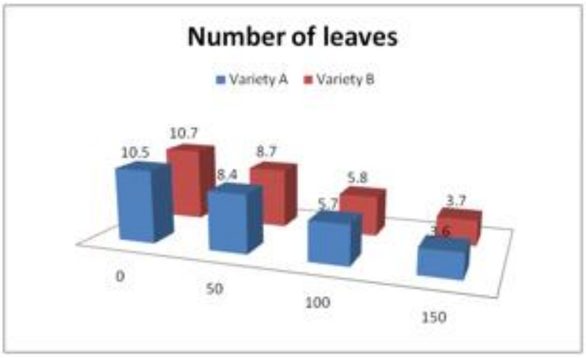






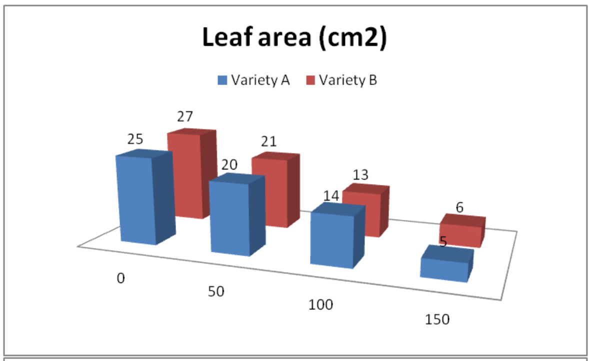


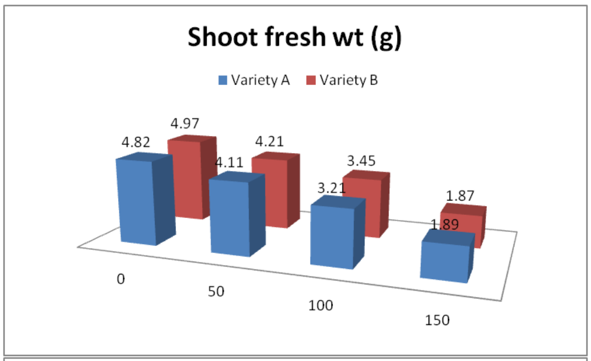


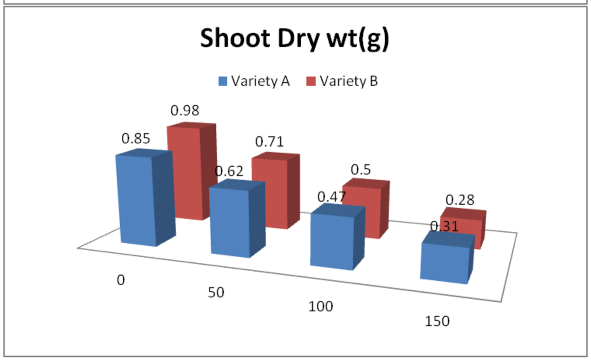


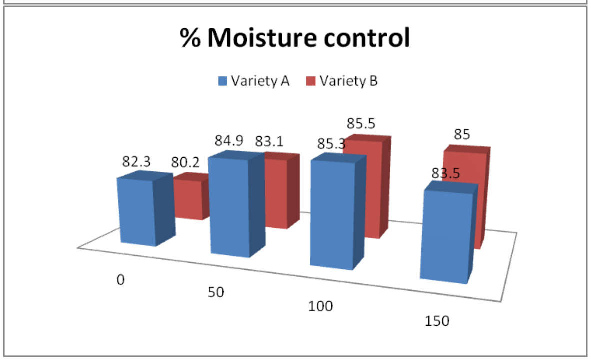
Effect on physiological traits:

	Pea plant				Okra plant			
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 blue graph represents the pea plant while the red bar represents the okra plant. The data in table and chart showed that the salt stress has the negative impact on all the growth attributes but the okra has a better performance than pea towards salt stress. 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.

II. 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.

The response of Abelmoschus esculentus to salt stress is complex and depends on a range of factors, including the severity and duration of salt stress, the growth stage of the plant, and the genetic background of the cultivar. Understanding the mechanisms underlying the salt tolerance of Abelmoschus esculentus and developing strategies to enhance its salt tolerance can help in improving the productivity and sustainability of this important vegetable crop.

References

[1]. Zahran, H. H. (1999). Rhizobium-legume symbiosis and nitrogen fixation under severe conditions and in an arid climate. Microbiol. Mol. Biol. Rev., 63(4), 968-989.
[2]. Grozeva, S., Kalapchieva, S., & Tringovska, I. (2019). Evaluation of garden pea cultivars to salt stress tolerance. Mechanization in agriculture & Conserving of the resources, 65(4), 150-152.
[3]. Ibrahim, E. A. (2016). Seed priming to alleviate salinity stress in germinating seeds. Journal of Plant Physiology, 192, 38-46.
[4]. Cordovilla, M. D. P., Ligero, F., & Lluch, C. (1999). Effect of salinity on growth, nodulation and nitrogen assimilation in nodules of faba bean (Vicia faba L.). Applied Soil Ecology, 11(1), 1-7.
[5]. Husen, A., Iqbal, M., & Aref, I. M. (2016). IAA-induced alteration in growth and photosynthesis of pea (L.) plants grown under salt stress Pisum sativum. Journal of Environmental Biology, 37, 421-429.
[6]. Kaya, M. D., Ç İ Ftci, C. Y., & Kaya, M. (2002). Bakteri Aşılaması ve Azot Dozlarının Bezelye (Pisum sativum L.)'de Verim ve Verim Öğelerine Etkileri.A.O. Ziraat. Fakültesi Tarım Bilimleri Dergisi 8(4): 300-305.
[7]. López-Aguilar, R., Orduño-Cruz, A., Lucero-Arce, A., Murillo-Amador, B., & Troyo-Diéguez, E. (2003). Response to salinity of three grain legumes for potential cultivation in arid areas. Soil science and plant nutrition, 49(3), 329-336.
[8]. Schatz, B., & Endres, G. (1999). Field pea production.
[9]. Nasri, N., Kaddour, R., Rabhi, M., Plassard, C., & Lachaal, M. (2011). Effect of salinity on germination, phytase activity and phytate content in lettuce seedling. Acta physiologiae plantarum, 33(3), 935-942.
[10]. Munns, R., & Tester, M. (2008). Mechanisms of salinity tolerance. Annu. Rev. Plant Biol., 59, 651-681.

[11]. Wang, Y., & Nii, N. (2000). Changes in chlorophyll, ribulose bisphosphate carboxylase-oxygenase, glycine betaine content, photosynthesis and transpiration in Amaranthus tricolor leaves during salt stress. The Journal of Horticultural Science and Biotechnology, 75(6), 623-627.

[12]. Mahajan, S., & Tuteja, N. (2005). Cold, salinity and drought stresses: an overview. Archives of biochemistry and biophysics, 444(2), 139-158.

[13]. Khan, H. A., Siddique, K. H., Munir, R., & Colmer, T. D. (2015). Salt sensitivity in chickpea: growth, photosynthesis, seed yield components and tissue ion regulation in contrasting genotypes. Journal of plant physiology, 182, 1-12.

[14]. Majid, A., Mohsen, S., Mandana, A., Saeid, J. H., Ezatollah, E., & Fariborz, S. (2013). The effects of different levels of salinity and indole-3-acetic acid (IAA) on early growth and germination of wheat seedling. Journal of Stress Physiology & Biochemistry, 9(4).

[15]. Desoky, E. M., Merwad, A. M., & Elrys, A. S. (2017). Response of pea plants to natural bio-stimulants under soil salinity stress. Am. J. Plant Physiol, 12, 28-37.

[16]. Hasegawa, P. M., Bressan, R. A., Zhu, J. K., & Bohnert, H. J. (2000). Plant cellular and molecular responses to high salinity. Annual review of plant biology, 51(1), 463-499.

[17]. Piwowarczyk, B., Tokarz, K., & Kamińska, I. (2016). Responses of grass pea seedlings to salinity stress in in vitro culture conditions. Plant Cell, Tissue and Organ Culture (PCTOC), 124(2), 227-240.

[18]. Rubio-Casal, A. E., Castillo, J. M., Luque, C. J., & Figueroa, M. E. (2003). Influence of salinity on germination and seeds viability of two primary colonizers of Mediterranean salt pans. Journal of Arid Environments, 53(2), 145-154.