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Review Article

Effect of salinity (Na₂SO₄) on stomata, and yield parameters of Indian mustard (*Brassica juncea L*) var. Goldi

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Abstract

Here, our research on effect of increasing different concentrations (0, 4Mm hos/cm, 8Mm hos/cm and 12Mm hos/cm) of salt (Na₂SO₄) on plant growth, and yield parameters of *Brassica juncea* (var. Goldi). After plant growth with salt treatment, identify the number of leaf with untreated plant. Here our experiment was completely randomized design with three replicates. After randomly selected plants start the process of observation of number of stomata in mature leaves on both sides (abaxial and adaxial) at 65 & 75 (DAS). Here, in our experiment determine the number of stomata due to different concentrations of salt (Na₂SO₄) as compared to control. However, at the maximum concentrations i.e (8Mm hos/cm and 12Mm hos/cm) of salt, stomata become close as compared with control and low level treatment (4Mm hos/cm). On the other hand after the plant growth, next step of our experiment observation of the yield parameters of *Brassica juncea* (var. Goldi) at 120 DAS. The strongest reduction of yield parameters was observed in the 12Mm hos/cm treatment. Our result suggested that, due to salinity level stomata become destroy without show any damage on physiological characters.

Introduction

Salinity causes high effects on higher plants, both (halophytes and non-halophytes) [1]. The reduction in growth is consequence of several physiological responses including modifications of ions balance, water status. Mineral nutrients, stomatal conductances, and photosynthetic efficiency [1,2]. However, literature on the stomatal differentiation in plants cultivars under saline conditions is scanty. The effects of salinity on growth, stomatal conductance, photosynthetic capacity, plants were grown at different Na₂SO₄ concentrations. Plant growth and leaf area development were strongly reduced by salinity. Stomatal conductance also was reduced by salinity, indicating that stomatal limitation of photosynthesis was increased. This correlation was not clear in bean plants. When plants are grown at high salinity, stomatal closure is induced by the presence of sodium ions in the apoplast surrounding the guard cells. Salt stress affected both stomatal and mesophyll conductances, and photosynthetic efficiency of both species. The fresh water/salt water comparison show that

the photosynthetic capacity is directly reduced. Reduction in photosynthetic rates under increased salt stress are not only due to limitation of CO₂ diffusion. Exposure to salt stress involves complex changes in plant morphology, physiology, and metabolism, and a large number of studies have focus on salt-stressed, which effect on plant growth, leaf photosynthetic rates, CO₂ fixation capacity, and leaf stomatal conductance [3,4]. High salinity, is a common abiotic stress factor that seriously effects on the crop production in arid and semi-arid regions. This type of stress are reducing the crop yield [5]. High salt concentrations in root effects the plant growth, and yield. Salinity may reduce the crop yield by upsetting water and not proper nutritional balance of the plants [6].

Materials and method

All the experiments were conducted in the research laboratory of Department of Botany, Sir Syed Faculty of Science, Mohammad Ali Jauhar University, Rampur (U.P.) India. Seeds of Indian mustard (var. Goldi) were used in this study. Collection

of mustard seeds, from authentic seed source in Rampur. Here, in our work identify the effect of different concentrations (0, 4Mm hos/cm, 8Mm hos/cm and 12Mm hos/cm) of salt (Na_2SO_4) on the number of stomata in the mature leaf of mustard (*Brassica juncea* L. var. Goldi) at 65 & 75 days after sowing (DAS). Stomatal density was study using the method of Teare, et al. [7]. Using the nail polish is a traditional method to measure stomatal density. In this process a thin layer of nail polish was apply on the both side (abaxial and adaxial) on the middle of the leaf. A small strip of clear sellotape was gently pressed over the nail polish part of the leaf. After few minutes, the stomata of leaves attached on the tape, and the sellotape pest on the clean slide. The number of stomata was count under the light microscope, on such leaf surface impression of both

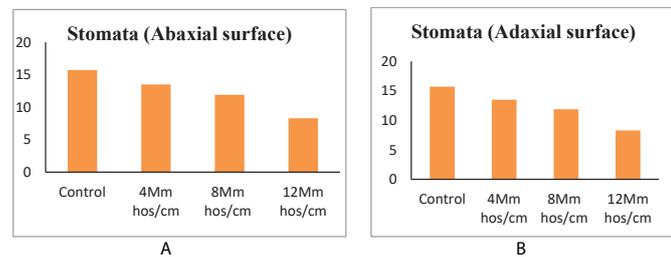


Figure 1a,b: It is showing a decreasing effect of Sodium sulfate on number of stomata of *Brassica juncea* (var. Goldi) at 65 DAS.

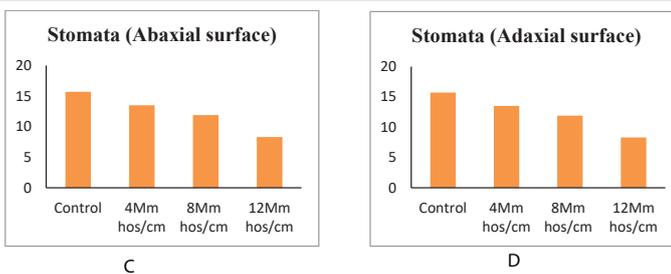


Figure 1c,d: They are also showing a decreasing effect of Sodium sulfate on number of stomata of *Brassica juncea* (var. Goldi) at 75 DAS.

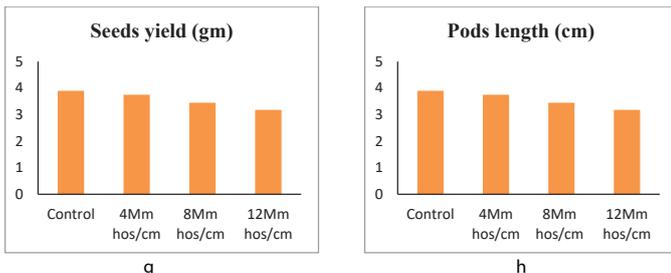
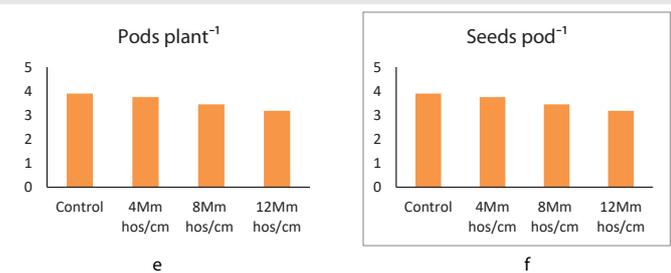
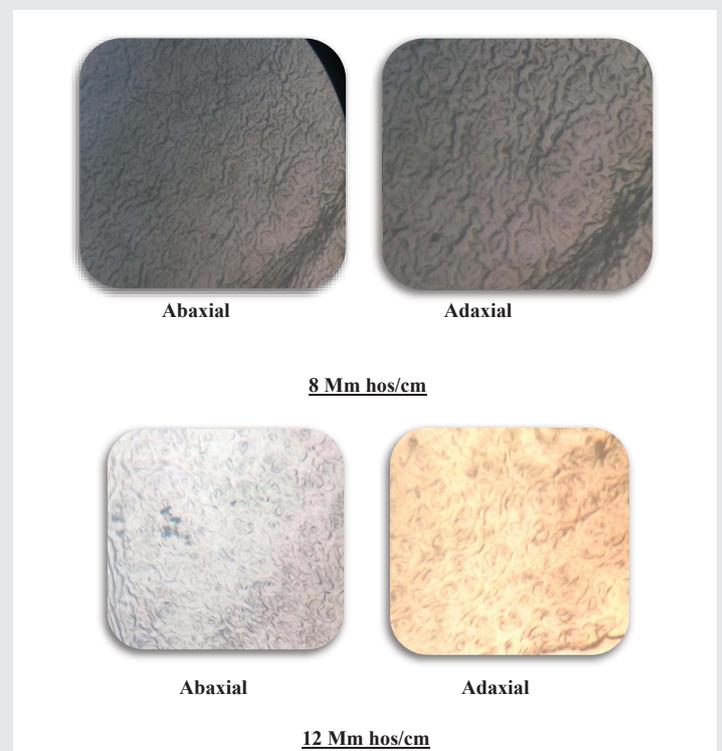
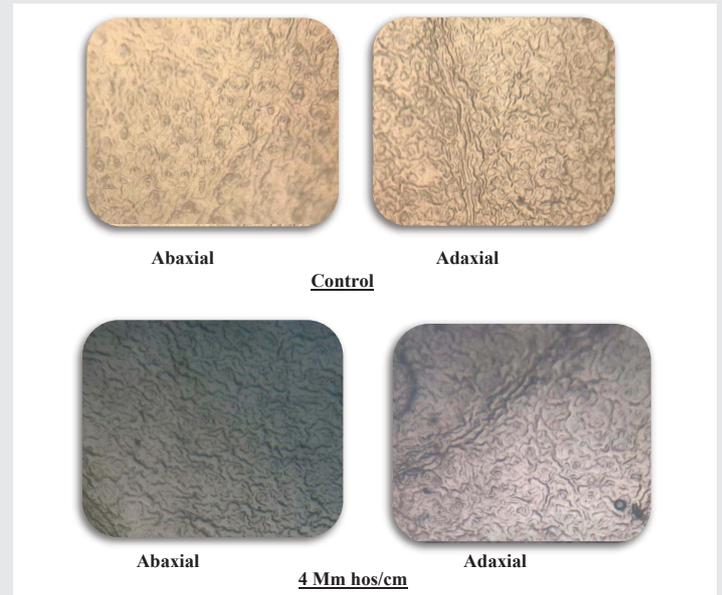


Figure 1e-h: Effect of different concentrations (0, 4Mm hos/cm, 8Mm hos/cm and 12Mm hos/cm) of Na_2SO_4 on yield parameters of *Brassica juncea* (var. Goldi) at 120 DAS.



All pictures showing the effect of salt (Na_2SO_4) on the number of stomata (Abaxial & Adaxial surface) of *Brassica juncea* (var. Goldi).



Here, a picture showing the effect of different level of salt on the yield parameter (Pods length (cm), of *Brassica juncea* (var. Goldi).



sides (abaxial and adaxial), in a cm² area of eye piece (= 0.41 mm² of leaf surface). Our other experiment are based on the method of yield parameters from each treatment at 120 DAS. Ten pods was randomly selected and counted, and weighed to calculate the seed yield per plant and measured on a meter scale for average a pod length.

Results and Discussions

This result is reveal that in saline condition. The number of stomata are always decline with increasing salt concentrations (0, 4Mm hos/cm, 8Mm hos/cm and 12Mm hos/cm). In Figures (a, b, c, & d) high effect of salinity show on the adaxial surface of the leaf as compare to the abaxial surface at both stages (65 DAS & 75 DAS). The highest reduction of stomata was observe at the 8Mm hos/cm and 12Mm hos/cm treatments levels than 4Mm hos/cm, and control plants. High salinity strongly reduced plant growth. Salt stress damages the photosynthetic activities at multiple levels, such as pigments biosynthesis, stomatal functioning and gaseous exchange, structure and function of thylakoid membrane, electron transport and enzyme activities (Sudhir and Murthy 2004) [8]. At the stage of maturity, plants were harvest. In our experiment, the number of pods per plant, the number of seeds per pod, seeds yield and pods length was recorded at 120 DAS. In figures (e, f, g, & h), all the yield parameters (pods plant⁻¹, Numer of seeds pod⁻¹, Seeds yield, and Pods length), show reduction at different treatment levels (0, 4Mm hos/cm, 8Mm hos/cm and 12Mm hos/cm). Similarly, studies Islam, et al. [9] and Mahmoodzadeh [10], it was report that due to increasing salinity levels, yield and yield associated traits were reduced.

Conclusion

However, it is possible that the reduction of physiological parameter and yield parameters is caused by salinity. Our experiment was conduct to investigate the effects of different concentrations (0, 4Mm hos/cm, 8Mm hos/cm and 12Mm hos/cm) of salt (Na₂SO₄) on morphological and yield parameters of *Brassica juncea* (var. Goldi), along with non-treated plants in measurement periods (65, 75 and 120 DAS). More than half a billion hectares of land are not being properly used for crop production. This result clearly demonstrate that the effect of salt on stomata and yield are harmful, stomata become closure and reduce the process of gas exchanges.

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