



The impact of salinity stress on germination, proline content, and lipid peroxidation of Sunn hemp (*Crotalaria Juncea*) seeds

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Abstract: Global climate change has increased salinity, challenging seed establishment, and agricultural production. To ensure food security, cultivating resilient plants like Sunn hemp (*Crotalaria juncea*) is crucial. We studied the impact of salinity on Sunn hemp germination at stress levels of 0, -0.4, -0.8, and -1.2 MPa using sodium chloride. Results indicated that salinity significantly impacted germination, seedling growth, lipid peroxidation, and proline content ($P < 0.01$), with notable reductions at higher salinity levels. These findings highlight the need to improve germination, especially at -0.8 and -1.2 MPa.

Keywords: *Fabaceae*, Osmotic potential, Seedling, Sodium chloride, and Van't Hoff equation

Introduction: Salinity stress is a significant environmental challenge that hinders seed establishment and growth, leading to reduced agricultural production. Sunn hemp (*Crotalaria juncea*) is a plant from the *Fabaceae* family with high nutritional and medicinal value (Samuel & Sornakumar, 2020). Sunn hemp is a non-native plant in Iran. In recent years, it has been used as a cover crop to control weeds, and improve the yield of agricultural products (Ahmadnia et al., 2023). Iran's agricultural lands are mainly located in arid and semi-arid areas, where environmental stresses, including salinity, affect crop growth and yield.

Materials and methods: The effect of salinity stress on the germination of Sunn hemp (*Crotalaria juncea*) seeds was assessed at various levels of salinity stress (0, -0.4, -0.8, and -1.2 MPa) using sodium chloride salt. The Van't Hoff equation (1) was used to calculate and apply salinity stress levels, while equation (2) was employed to determine germination percentage.

Equation(1) $\pi = -MiRT$ Equation (2) $GP = \frac{S}{T} \times 100$

Results and Discussion: The results indicate that salinity stress had a significant impact on seed germination, radicle length, plumule length, lipid peroxidation, and proline content in Sunn hemp seedlings ($P < 0.01$, Table 1). The intensification of salinity stress resulted in a decrease in seed germination, radicle, and plumule length of Sunn hemp (Figure 1a-d).

Table 1. The effect of salinity stress on germination parameters, proline content, and lipid peroxidation of Sunn hemp

S.O.V.	Df	Germination percentage	Radicle length	Plumule length	Lipid peroxidation	Proline content
Salinity stress	3	1838.88	26.24	65.3	0.0011	10.36
Error	8	45.72	0.16	0.0001	0.0001	0.0019
CV (%)	-	9.01	17.81	13.40	5.79	0.56

** is significantly differences at 1%

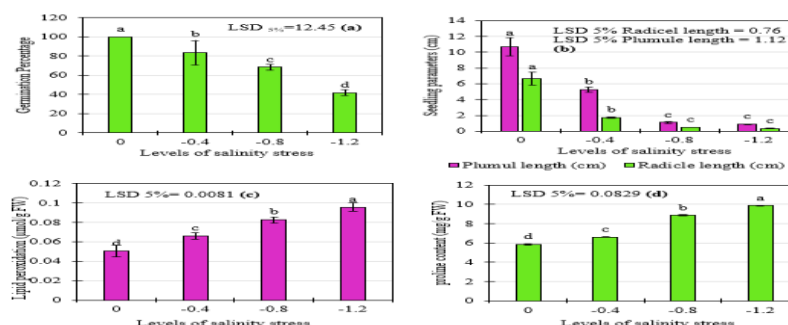


Figure 1. The effect of salinity stress on germination parameters, proline content, and lipid peroxidation of Sunn hemp (*Crotalaria juncea*)

Conclusion: We studied how salinity stress affects Sunn hemp seed germination, seedling growth, proline content, and lipid peroxidation. Our results showed a reduction in germination, seedling growth, and enhanced lipid peroxidation and proline content. Additionally, the findings highlight the importance of investigating methods to enhance the germination of Sunn hemp seeds, particularly at osmotic potentials of -0.8 and -1.2 MPa.

References

- [1] Samuel, P.N.K.J. & Sornakumar, R.S.A. (2020). Antioxidant, antimicrobial, haemolytic, germination and growth promoting properties of *Crotalaria juncea* L., *Plant Science Today*, vol. 7(2) pp. 201-205. <https://doi.org/10.14719/pst.2020.7.2.653>
- [2] Ahmadnia, F., Ebadi, A., Hashemi, M., Ghavidel, A. & Alebrahim, M.T. (2023). Investigating the effect of aqueous extracts of Sunn hemp (*Crotalaria juncea*) and Oats (*Avena sativa* L.) on the germination of wild mustard weed (*Sinapis arvensis*), *Iranian Journal of Seed Science and Research*, vol. 10(2), pp. 1-19. DOI: 10.22124/jms.2023.7605