

Establishment and Efficient Protocol to Develop and Regenerate of Salt-Tolerant *Helianthus annuus* L.

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ABSTRACT

Introduction: Sunflower (*Helianthus annuus* L.) is becoming an important oilseed crop in Pakistan due to its capacity to withstand harsh environment. Specially drought and salinity tolerance, as there are two significant challenges faced by agriculture. The crop promotes soil restoration and climate- resilient farming while providing a long-term remedy for the growing edible oil shortage and for the reduction of economy losses; establish tissue culture technique to enhance the production of sunflower. It is a good substitute in salty like southern Punjab, Sindh, and regions of Balochistan because of its adaptability to marginal soils and comparatively low water requirements.

Objectives: Main goal of this study is callus formation and callus proliferation with different combinations of auxins and cytokinin NaCl stress test on Calli.

Methodology: This research deals with the isolation and establish the salt tolerant varieties of Sunflower via tissue culture technology. Explants were regenerated employing various treatments of IBA, IAA, BAP, kinetin, and 2,4-D. Beside we worked on increased salt tolerant of plants. For this purpose, three Sunflower varieties Golden-1, Agsun, and S-278 were analysed at their callus stage to figure out their susceptibilities against salinity stress by employing various percentages of NaCl such as 0, 50, 100, 150, and 200.

Key Findings: Result suggested that callus was obtained from the initiation stage. Excised pieces of callus were cultured on MS medium that contained full-strength MS medium supplemented with 30 g/l sucrose, and 5 g/l agar at pH 5.7 and contained a different combination of auxins and cytokinins. Golden-1 tolerates the salt stress gives 68.12% at 150 salt concentration in the medium Murashige and Skoog with different hormonal supplements as BAP-2.0 and IAA-0.1. These results make it ideal variety to grown on 25% saline soil of Pakistan.

Conclusion: The goal of the research is to identifying the Sunflower (*Halienthus aunnuus* L.) changes in several morphological traits in response to salinity stress and various hormone therapies. There have been 14 different combinations of plant growth regulators. Successful in vitro cultivation and obtaining *Halienthus aunnuus* L. callus that is steadily developed. Effect of NaCl was also declared that Golden -1 tolerate the salt stress at 150 mM so this variety can be preferred for cultivating through plant tissue culture technique on saline soil in Pakistan that is 1.5 Mha.

Keywords: Sunflower, In Vitro Culture, Plant Regeneration, *Helianthus annuus* L., Salt Stress..

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