BIOTECHNOLOGICAL STUDIES ON TOMATOES IMPROVEMENT FOR SALT STRESS TOLERANCE THROUGH TISSUE CULTURE AND GAMMA RADIATION TECHNIQUES

By

OSAMA ABD EL- HAMEED HELMY

B.Sc., Agric. Sc. (Biotechnology), Al-Azhar University, 2010

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ABSTRACT

Osama Abd-El hameed Helmy: Biotechnological Studies on Tomatoes Improvement for Salt Stress Tolerance through Tissue Culture and Gamma Radiation Techniques. Unpublished Master Thesis, Department of Genetics, Faculty of Agriculture, Ain Shams University, 2019.

Tomato (*Lycopersicon esculentum* Mill) are considered major and important globally vegetable crops in Egypt in particular. Tissue culture techniques have facilitated the use of mutation methods in crop improvement. The mutation induction in vegetative crops through tissue culture and ɣ-irradiation may be the optimal method to improve this crop. Tomato explants Idkawy (Egyptian cultivar) was cultured *in vitro* on MS medium supplemented with 0.2 mg/l BAP. The resulted plantlet was treated with different gamma radiation doses (50, 100, 150, 200 and 250 Gy). The growth rate, survival and mean of shoot length decreased with increased gamma radiation doses. The survival percentages of irradiated plantlets ranged from 78.75% with 50 Gy and 18.75% with 250 Gy. Whereas, the shoot length decreased by a rate of 2.71 cm for the dose 50 Gy and 1.2 cm for dose 250 Gy. Plantlets were grown at different salinity concentrations of 50, 100, 150 and 200 mM NaCl. Salinity impacts on plant survivals decreased with increased NaCl concentration until it reached 5% at a concentration of 200 mM. Likewise, mean shoot length was affected negatively with salt concentrations where they decrease with increase of NaCl. Salt-tolerant (50 and 100 mM NaCl) plants were obtained from irradiated plants at dose 100 Gy. The mean of shoot length also had a negative effect, as it decreased as the combined effect increased. Ten SCoT primers applied with irradiated, salinity and the combined effect between gamma radiation and salinity to determine the banding patterns and moleculer markers. Total genomic DNA from four irradiated tomato leaves with different gamma radiation doses 50, 100, 150 and 200 Gy were used as templates for SCoT – PCR analysis. Ten SCoT primers amplified a total 114 amplicons with a range of 4 to 18

bands per primer. The polymorphism varied from 20 % to 90 % with an average polymorphism of 66.3%. These 10 markers were present as a total. Total genomic DNA from tomato grew on different NaCl concentration 50, 100, 150 and 200 mM NaCl was used as templates for SCoT- PCR analysis. A total of 120 amplicons bands were detected using the ten SCoT primers, of which 75 were polymorphic. The polymorphism varied from 10 % to 92.8%. This means that 21 markers were present as a total. Total genomic DNA from irradiated tomato with doses 100, 150 and 200 Gy and grew on 50 and 100 mM NaCl was used as templates for SCoT- PCR analysis. A total of 115 amplified bands were detected using the ten SCoT primers, of which 33 were polymorphic. The polymorphism varied from 0 % to 53.8 %. Five SCoT markers for salt tolerance were present.

Keywords: Tomato (*Lycopersicon esculentum* Mill), Tissue culture, Gamma irradiation, salinity, SCoT markers, DNA polymorphism.

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