EFFECTS OF LASER AND GAMMA IRRADIATIONS ON SOME LENTIL GENOTYPES, AND THE SELECTION IN SEGREGATING POPULATIONS

By

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ABSTRACT

Five lentil cultivars were used in this study. Three of which belonged to microsperma seed types (Giza 9, Giza 29 and Giza 370) and two ones are considered as macrosperma (Sinai 1 and Giza 51). Dry seeds of five Egyptian lentil cultivars (M_0) were irradiated by two Helium neon laser types and gamma irradiation (Cobalt 60) with three exposure periods in addition to untreated corresponding seeds. The exposure periods were 5, 10 and 15 min of both laser types, whereas gamma rays were applied on 2, 4 and 6 min which equal 3, 6 and 9 kr.

The M_1 plants along to untreated corresponding checks were evaluated under pot condition during 2014/2015 season using 30 cm plastic pots, each sown with five healthy seed and represent one replicate. The performance of M_2 and M_3 high yielding selected individuals and bulk represent lasers and gamma exposure period combinations with control checks were investigated under pot trial during 2015/2016 and 2016/2017 seasons, respectively.

Morphology, yield and its components of segregated mutations compared to untreated checks M_2 seeds were studied using protein profiling (SDS-PAGE). The M_3 pot grown plants of higher doses and exposure periods were sampled for molecular characterization. RAPD and ISSR techniques were used for molecular studied.

Each lentil cultivar is affected differently by various irradiation types, their doses and their interactions. The investigated lentil cultivars over doses of applied irradiation differed significantly for most of recorded traits. Moreover, the magnitudes of estimated variances due to CVs differed among studied radiations and traits. The five studied varieties showed widely migration and dividing into different groups (and ungrouped) depending on irradiation types and exposure period used. It was also observed conversation of varieties from microsperma to macrosperma and vice versa. This is due to irradiation influence which varied from variety to another and also differed due to the selected investigated traits.

RAPD profile revealed lesser polymorphism (67.13 %) than ISSR profile (94 %). The M_3 lines exhibited encouraging variation differed from group variety to another. The PCR and SDS-page will characterize the potentiality of M_4 lines in lentil breeding. Various molecular markers show a different efficiency for evaluating DNA polymorphism in lentil and indicate that the patterns of variation are clearly influenced by the genetic marker used. Comparatively, by Phenotyping dendrograms show various responses of lentil cultivars under different treatments of laser and gamma irradiations.

Key words: Lentil, *Lens culinaris*, Laser irradiation, M_1 performance, M_2 families, M_3 selections, SDS-PAGE, RAPD, ISSR.

DEDICATION

I dedicate this work and express my immense gratitude to my Family; my lovely parents, my husband and my sweetie children, my two brothers and sister for their continuous support and valuable advices they lovely offered during my graduate studies and for their encouragements during hard moments.

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