ABSTRACT

PLANT REGENERATION OF SUGARCANE (*Saccharum officinarum* L.) FROM CALLUS IRRADIATED AND UNIRRADIATED WITH GAMMA RAY

By

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This research aimed to study in vitro plant regeneration of sugarcane from callus which was not irradiated and unirradiated with gamma rays. This study was divided into two studies. They were plant regeneration of sugarcane (*Saccharum officinarum* L.), from callus irradiated and unirradiated with the gamma-ray. The first study consisted of three experiments, i.e., (1) The effect of 2,4-D concentrations on callus proliferation, (2) the response of sugarcane clones to callus induction media, (3) The effect of IBA concentrations on rooting of sugarcane shoots and plantlet survival during acclimatization. The second study consisted of two experiments, i.e., (4) The response of sugarcane clones to gamma-ray irradiation, and (5) Regeneration of sugarcane shoots from callus irradiated with gamma rays. The research was conducted at the Plant Science Laboratory and a Greenhouse, Crop Science Department, Faculty of Agriculture, University of Lampung. Gamma irradiation was done at the Centre for Research and Development of Isotop and Radiation Technology, BATAN, Jakarta. The first experiment was conducted using 5 concentrations of 2,4-D i.e. 1, 2, 3, 4, and 5 mg/l. The data were subjected to analysis of variance. The difference of two values was tested with Least Significant Difference (LSD) at 5% level. The second experiment was conducted with the 4 different clones i.e Ragnar, X3, GM19, and GP11 as treatments. The third experiment was conducted using 5 concentrations of IBA i.e 0, 2.5, 5, 7.5, and 10 mg/l. The fourth experiment was conducted using 10 levels of gamma-ray i.e 0, 5, 10, 15, 20, 25, 30, 40, 50, and 60 Gy. The fifth experiment was conducted with 3 different clones i.e Ragnar, GM21, dan GM25 as treatments.
The results showed that the addition of 1—3 mg/l 2,4-D to callus induction medium was effective to induce embryogenic callus as indicated by the highest callus weight and diameter. Clone X3 was found to be the most responsive to callus induction medium containing 3 mg/l 2,4-D as indicated by callus and shoot formation. The addition of 5 and 7,5 mg/l of IBA on root induction medium was effective to stimulate rooting as indicated by the highest number of roots per shoot that is (4,1 ± 0,5) and (3,9 ± 0,3) respectively as well as showed the highest survival rate when acclimatized with 68,4 % and 66,3 % of by survival rate, respectively. The doses of gamma ray irradiation that produced LD50 for sugarcane callus was 30 Gy, and clone (Ragnar, GM21, and GM25) did not give different response to 30 Gy of gamma irradiation in term of the formation of shoots and roots.

Keywords: Sugarcane in vitro, callus proliferation, mutation breeding, gamma irradiation, acclimatization, 2,4-D, and IBA