

Growth promoting effects of Pluronic F-68 on callus proliferation of recalcitrant rice cultivar

ABSTRACT

This study was undertaken to evaluate growth-promoting effects of Pluronic F-68 (PF-68) on recalcitrant MR 219 rice callus. Our study shows that calli grown on Murashige and Skoog medium supplemented with 0.04% PF-68 significantly increased callus proliferation by 58.80% (fresh weight) and 23.98% (dry weight) while root formation from callus was enhanced by 28.57%. Enhanced callus proliferation was supported by biochemical analysis, whereby highest amount of soluble sugar (1.77 mg/mL) and protein (0.17 mg/mL) contents were recorded in calli grown on 0.04% PF-68. Furthermore, enhanced expression of sucrose synthase (2.65-folds) and NADH-dependent glutamate synthase (1.86-folds) genes in calli grown on 0.04% PF-68 also correlates with enhanced callus proliferation. In contrast, high concentration of PF-68 (0.10%) recorded highest amount of phenolic (0.74 mg/mL), flavonoid (0.08 mg/mL), and hydrogen peroxide content (0.06 mg/mL) as compared to other treatment groups indicates activation of plant defence mechanism towards stress. Similarly, high expression of 4-coumarate:CoA ligase 3 (1.28-folds), chalcone-flavonone isomerase (1.65-folds) and ascorbate peroxidase (1.61-folds) genes were observed in calli grown on 0.10% PF-68 further supports increasing stress caused by the high concentration of PF-68. Taken together, our study revealed that optimum concentration of PF-68 could improve recalcitrant rice callus proliferation via enhanced sugar metabolism and amino acid biosynthesis which are crucial towards plant growth and development. However, at high concentration, PF-68 induces stress in plant which enhance the production of secondary metabolite to maintain cellular homeostasis.

Keyword: Callus growth; Pluronic F-68; Recalcitrant indica cv. MR 219; Stress response