

Stimulation of Stevioside Accumulation on *Stevia rebaudiana* (Bertoni) Shoot Culture Induced with Red LED Light in TIS RITA® Bioreactor System

Authors : Vincent Alexander, Rizkita Esyanti

Abstract : Leaves of *Stevia rebaudiana* contain steviol glycoside which mainly comprise of stevioside, a natural sweetener compound that is 100-300 times sweeter than sucrose. Current cultivation method of *Stevia rebaudiana* in Indonesia has yet to reach its optimum efficiency and productivity to produce stevioside as a safe sugar substitute sweetener for people with diabetes. An alternative method that is not limited by environmental factor is *in vitro* temporary immersion system (TIS) culture method using recipient for automated immersion (RITA®) bioreactor. The aim of this research was to evaluate the effect of red LED light induction towards shoot growth and stevioside accumulation in TIS RITA® bioreactor system, as an endeavour to increase the secondary metabolite synthesis. The result showed that the stevioside accumulation in TIS RITA® bioreactor system induced with red LED light for one hour during night was higher than that in TIS RITA® bioreactor system without red LED light induction, i.e. $71.04 \pm 5.36 \mu\text{g/g}$ and $42.92 \pm 5.40 \mu\text{g/g}$ respectively. Biomass growth rate reached as high as $0.072 \pm 0.015/\text{day}$ for red LED light induced TIS RITA® bioreactor system, whereas TIS RITA® bioreactor system without induction was only $0.046 \pm 0.003/\text{day}$. Productivity of *Stevia rebaudiana* shoots induced with red LED light was $0.065 \text{ g/L medium/day}$, whilst shoots without any induction was $0.041 \text{ g/L medium/day}$. Sucrose, salt, and inorganic consumption in both bioreactor media increased as biomass increased. It can be concluded that *Stevia rebaudiana* shoot in TIS RITA® bioreactor induced with red LED light produces biomass and accumulates higher stevioside concentration, in comparison to bioreactor without any light induction.

Keywords : LED, *Stevia rebaudiana*, Stevioside, TIS RITA

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