

Comparison of Growth Medium Efficiency into Stevia (*Stevia rebaudiana* Bertoni) Shoot Biomass and Stevioside Content in Thin-Layer System, TIS RITA® Bioreactor, and Bubble Column Bioreactor

Authors : Nurhayati Br Tarigan, Rizkita Rachmi Esyanti

Abstract : Stevia (*Stevia rebaudiana* Bertoni) has a great potential to be used as a natural sweetener because it contains steviol glycoside, which is approximately 100 - 300 times sweeter than sucrose, yet low calories. Vegetative and generative propagation of *S. rebaudiana* is inefficient to produce stevia biomass and stevioside. One of alternative for stevia propagation is in vitro shoot culture. This research was conducted to optimize the best medium for shoot growth and to compare the bioconversion efficiency and stevioside production of *S. rebaudiana* shoot culture cultivated in thin layer culture (TLC), recipient for automated temporary immersion system (TIS RITA®) bioreactor, and bubble column bioreactor. The result showed that 1 ppm of Kinetin produced a healthy shoot and the highest number of leaves compared to BAP. Shoots were then cultivated in TLC, TIS RITA® bioreactor, and bubble column bioreactor. Growth medium efficiency was determined by yield and productivity. TLC produced the highest growth medium efficiency of *S. rebaudiana*, the yield was 0.471 ± 0.117 gbiomass.gsubstrate-1, and the productivity was 0.599 ± 0.122 gbiomass.Lmedium-1.day-1. While TIS RITA® bioreactor produced the lowest yield and productivity, 0.182 ± 0.024 gbiomass.gsubstrate-1 and 0.041 ± 0.0002 gbiomass.Lmedium-1.day-1 respectively. The yield of bubble column bioreactor was 0.354 ± 0.204 gbiomass.gsubstrate-1 and the productivity was $0,099 \pm 0,009$ gbiomass.Lmedium-1.day-1. The stevioside content from the highest to the lowest was obtained from stevia shoot which was cultivated on TLC, TIS RITA® bioreactor, and bubble column bioreactor; the content was 93,44 $\mu\text{g/g}$, 42,57 $\mu\text{g/g}$, and 23,03 $\mu\text{g/g}$ respectively. All three systems could be used to produce stevia shoot biomass, but optimization on the number of nutrition and oxygen intake was required in each system.

Keywords : bubble column, growth medium efficiency, *Stevia rebaudiana*, stevioside, TIS RITA®, TLC

Conference Title : ICBE 2016 : International Conference on Bioengineering

Conference Location : Kuala Lumpur, Malaysia

Conference Dates : August 18-19, 2016