

Research Article

Production of Adventitious Root and Saponin of *Talinum paniculatum* (Jacq.) Gaertn. in Temporary Immersion Bioreactor

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Abstract: This research is conducted to identify the effects of immersion length and interval on *Talinum paniculatum* (Jacq.) Gaertn. adventitious roots' biomass and saponin content in temporary immersion bioreactor. Immersion intervals used in this research are 3, 6, and 12 hours with immersion lengths 1, 3, 5, and 7 minutes. Adventitious roots were induced from leaf explants grown on MS medium added by IBA 2 mg/L. Two grams adventitious root are cultured in temporary immersion bioreactor with each treatment and kept for 28 days. Results of this research indicated different biomass and saponin content caused by each treatment. The best combination was found on immersion length of 5 minutes and 12 hours interval which resulting 3.67 g fresh weight, growth speed 0.027 g/day, spot area of saponin 12.56 mm²/0.01 g dry-weight, and spot area thickness scale 4+.

Keywords: adventitious roots, saponin, temporary immersion bioreactor, *Talinum paniculatum* (Jacq.) Gaertn

INTRODUCTION

Talinum paniculatum (Jacq.) Gaertn. is a herb with many medicinal properties. In Indonesia *T. paniculatum* known as ginseng Jawa and its roots contain β -sitosterol- β -D-glicosida known as pharmaceutical products ingredient [1].

T. paniculatum adventitious root induction was successfully done using leaf explants on MS medium added by growth regulator substance IBA 2 mg/L. The disadvantage of using solid medium is that explants only absorb nutrition on the lower side which have direct contact with the medium, so that the result is less optimal compared to using liquid medium [2].

The use of liquid medium on plant tissue culture has some advantages. Liquid medium can provide homogenous culture condition, having faster growth rate, and relatively easy for sterilization [3-4]. However, there are several disadvantages of liquid medium mainly some technical issues such as hyperhydricity, cellular damage caused by propeller rotation when using bioreactor with churning system and oxygen deficiency [5]. Therefore, better methods to regulate aeration on the medium are needed. One of them is using temporary immersion applied to bioreactor known as Temporary Immersion Bioreactor (TIB) [6].

TIB is bioreactor which regulates nutrition and oxygen absorptions of the culture. In this condition, explants are not immersed in the medium all the time.

There are several periods when the explants are not immersed [6]. When the explants are not immersed, they are free to absorb oxygen because of low oxygen solubility on immersed condition. Oxygen is needed by culture to unload energy provided by medium in form of sucrose. TIB immersion lengths and intervals can help explants growth [7]. One to fifteen-minute immersion length with 2-12 hours of immersion frequency also affects explants growth of perennial plants [3].

When culture is on immersed condition as a result of one-minute immersion length and 1, 12, 24-hour of immersion intervals on TIB, may cause stress on *Hevea brasiliensis* calluses identified by superoxide dismutase (SOD) [8]. Immersion length and interval in culture could cause abiotic stresses. Abiotic stresses may affect production of secondary metabolite contents [9]. Secondary metabolite synthesis, including saponin is a response to abiotic stress [10]. For example water stress treatment on *T. paniculatum* plant increase its saponin content on water 40% availability [11].

This research is conducted to identify the effects of immersion length and interval on biomass and saponin contents of *T. paniculatum* adventitious roots on liquid medium using *temporary immersion system* method on bioreactor.