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Effect of Aeration and Inoculum Density on Biomass and Saponin Content of *Talinum Paniculatum* Gaertn. Hairy Roots in Balloon-Type Bubble Bioreactor

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ABSTRACT

Hairy roots have same or greater biosynthetic capacity for secondary metabolite production compare to their mother plants. *Agrobacterium rhizogenes* strain LB 510 has been known its ability to induce hairy roots of *Talinum paniculatum* from leaf explants. Cultivation of *T. paniculatum* hairy roots on MS medium in balloon-type bubble bioreactor(BTBB) under various aeration rates and inoculum densities were investigated in this research. Hairy root cultures on various aeration rates 0,25; 0,5; and 0,75 vvm had same inoculums density (2.5 g/L) and cultivated for 28 days. Biomass and saponin content at the end day of cultivation increased and higher than control (culture had no aeration). Saponin content in this research were represented by wide of saponin spot/0,1 g dry weight sample. Maximum biomass 0,93 g (dry weight) and saponin content 1,37 cm^2/0,1 g were obtained by culture at aeration rate 0,25 vvm. At hairy root cultures on various inoculums densities1.25; 2.5; 3.75 dan 5 g/L had same aeration rate (0,25 vvm) shown increasing of biomass and saponin content. The maximum biomass (1,91 g) and saponin content was achievedat inoculums density 5 g/L. Culture at inoculums density 1.25 g/L had maximum growth rate (0,057 g/day) and the other had relatively same (0,021-0,023 g/day). This result indicates that inoculums density at 5 g/L and aeration rate at 2 vvm were the best condition than others for biomass and saponin content.

KEY WORDS*:* aeration rate, inoculums density, *Talinum paniculatum*, hairy root, balloon-type bubble bioreactor

INTRODUCTION

Most of the pharmaceutical compound from plants are secondary metabolite that nonessential on the growth plant, produced in a small amount, and almost was accumulated in the special tissue, like tricome. Secondary metabolites usually have a complex structure, so organic synthesis was not effective, especially in cost. Extraction from a part of plant has become a main method for production of secondary metabolite until this era [1][2].

Hairy root culture haspotency as an alternative method to produce pharmaceutical compound in large scale. One of the advantages of hairy root culture is it has biosynthetic capacity same as or more than production of secondary metabolite from mother plant [3][4]. Cultivation of hairy root in large scale still need improved in various aspects [5].

Aeration in liquid culture has function as an oxygen supply. Oxygen transfer usually limited the work of biological system, because the limited dissolved oxygen in water. If the oxygen limited, cell growth and production of secondary metabolite will be influenced[6]. Inoculums density is a necessary parameter that influence on performance of cell culture. When the inoculums density is low, cell growth also low [5].It was known that when the inoculums density is high, culture has no lag phase period and cell growth became higher [7], and increasing of secondary metabolite also can get by increasing the inoculums density or using certain medium[8].

In Indonesia, especially in Java, java ginseng was used as a traditional medicine for diarrhea, antisepsis, aphrodisiac and improve vitality. Phytochemistry analysis of java ginseng showed that it contain saponin, triterpen or steroid, polifenol and essential oil [9]. Root extract of java ginseng can improve mice libido higher than root extract of Korean ginseng in the condition of low testosterone [10]. The aims of this research are to know the effect of aeration and inoculum density on the biomass and saponin content in hairy root culture of java ginseng (*Talinum paniculatum* Gaertn.) in balloon-type bubble bioreactor (BTBB).

MATERIALS AND METHODS

Hairy Root Culture

Agrobacterium rhizogenes LB510 was gotten from Research Center of Biotechnology Indonesia. Bacteri was cultivated in Luria Bertani (LB) medium in the rotary shaker incubator at 28^{o}C, 110 rpm for 2 days. Leaf explants of*T. paniculatum*were sterilized with 10% Clorox for 5 minutes, then the explants were submerged in

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