Nadia Anisah Tahani. 2019. Pengaruh Metil Jasmonat dan Densitas Inokulum terhadap Biomassa dan Kadar Flavonoid Akar Adventif Sambung Nyawa (*Gynura procumbens* (Lour.) Merr.) dalam Bioreaktor Bergelembung Tipe Balon.

Tesis ini di bawah bimbingan Prof. Dr. Yosephine Sri Wulan Manuhara, M.Si.[1] dan Dr. Edy Setiti Wida Utami, MS.[1], [1]Departemen Biologi, Fakultas Sains dan Teknologi, Universitas Airlangga, Surabaya

ABSTRAK

Sambung nyawa (*Gynura procumbens* (Lour.) Merr.) merupakan tanaman obat yang memiliki senyawa bioaktif, yaitu flavonoid. Produksi biomassa dan flavonoid perlu ditingkatkan untuk dapat memenuhi kebutuhan industri farmasi. Peningkatan produksi dapat dilakukan melalui kultur *in vitro* akar adventif dalam bioreaktor bergelembung tipe balon (BBTB) dengan pemberian metil jasmonat (elisitor abiotik) dan densitas inokulum. Penelitian ini bertujuan untuk mengetahui pengaruh metil jasmonat dan densitas inokulum terhadap biomassa dan kadar flavonoid pada kultur akar adventif sambung nyawa. Penelitian dilakukan secara eksperimental di Laboratorium. Setiap 2 gram akar adventif dikultur pada BBTB skala 1 L berisi 600 mL media MS yang ditambah IBA 5 mg/L dan sukrosa 30 g/L. Pada usia 28 hari kultivasi, akar adventif diberi perlakuan konsentrasi metil jasmonat (0 μM, 50 μM, 100 μM, dan 200 μM) dengan 2 kali ulangan. Pada hari ke-35, pengamatan biomassa segar, kering, dan kadar flavonoid dilakukan. Sebanyak 5 g/L dan 10 g/L inokulum digunakan sebagai variabel untuk variasi densitas inokulum di dalam BBTB kapasitas 3 L yang berisi 2 liter media ½ MS yang ditambah IBA 5 mg/L dan sukrosa 30 g/L. Pada hari ke-35 dilakukan pengamatan biomassa segar, biomassa kering, dan indeks pertumbuhan. Perhitungan kadar flavonoid total dilakukan menggunakan spektrofotometer. Hasil penelitian menunjukkan, rerata biomassa segar dan kering tertinggi pada perlakuan metil jasmonat diperoleh pada konsentrasi 50 μM, yaitu 35,7±11,4 gram berat segar dan 2,4±1,0 gram berat kering. Indeks pertumbuhan tertinggi yaitu 10,8 diperoleh pada densitas inokulum 5 g/L dengan 118 gram berat segar dan 2,7 gram berat kering. Biomassa segar meningkat 11,8 kali lipat pada perlakuan 5 g/L. Kadar flavonoid total tertinggi diperoleh pada perlakuan 100 μM metil jasmonat, yaitu kuersetin 40.808,3 mg/L dan kaempferol 137.861,1 mg/L dan pada perlakuan dan 5 g/L densitas inokulum, yaitu kuersetin 2.483,3 mg/L dan kaempferol 10.111,1 mg/L. Metil jasmonat konsentrasi tinggi menghambat pertumbuhan akar adventif namun dapat menginduksi pembentukan flavonoid lebih tinggi sebagai bentuk pertahanan diri terhadap kondisi cekaman abiotik. Densitas inokulum yang optimal mendukung penyerapan nutrisi secara efektif oleh akar adventif selama kultivasi.

Kata kunci: *Gynura procumbens* (Lour.) Merr, bioreaktor bergelembung tipe balon, metil jasmonat, densitas inokulum, flavonoid.

Nadia Anisah Tahani. 2019. Effect of Methyl Jasmonate and Inoculum Density to Biomass and Flavonoid Content of Sambung Nyawa (*Gynura procumbens* (Lour.) Merr.) Adventitious Root in Balloon Type Bubble Bioreactor.
This thesis is supervisored by Prof. Dr. Yosephine Sri Wulan Manuhara, M.Si.[1] and Dr. Edy Setiti Wida Utami, MS.[1], [1]Biology Department, Science and Technology Faculty, Airlangga University, Surabaya.

ABSTRACT

Gynura procumbens (Lour.) Merr. is a medicine plant that has flavonoids as its bioactive compounds. Biomass and flavonoid production must be increased to complete the needs of pharmaceutical industry. The enhancement can be done by adventitious root in vitro culture in balloon type bubble bioreactor (BTBB) with methyl jasmonate or MeJa (abiotic elicitor) and inoculum density (ID) treatments. This research have purpose to determine the effect of MeJa different concentrations and ID on biomass and flavonoid content of *G. procumbens* adventitious root culture. This research is done experimentally in laboratory. Two grams of adventitious roots were cultivated in BTBB 1 L scale contained 600 mL MS medium supplemented with 5 mg/L IBA 30 g/L sucrose. In 28 days, adventitious root was treated with different concentrations of MeJa treatment (0 µM, 50 µM, 100 µM, and 200 µM) with 2 replications. In 35 days, adventitious roots were harvested. Fresh weight, dry weight, and flavonoid content were observed. 5 g/L and 10 g/L inoculums were used as variables for ID variation in ½ MS media supplemented with 5 mg/L IBA and 30 g/L sucrose in larger scale (3 L) of BTBB. In 35 days, adventitious roots were harvested. Fresh biomass, dry biomass, and growth index (GI) were observed. Total flavonoid levels were calculated by spectrophotometer UV-VIS. The results showed, the highest average of fresh and dry weight were obtained in 50 µM MeJa (35,7±11,4 and 2,4±1,0 g). The highest GI in inoculum density treatment was obtained in 5 g/L (10,8) with 118 g fresh weight and 2,7 dry weight. Fresh weight in 5 g/L treatment increased 11,8 fold and in 10 g/L than first inoculum. The highest total flavonoid content was obtained in 100 µM MeJa, quercetin 40.808,3 mg/L and kaempferol 137.861,1 mg/L and in 5 g/L ID, quercetin 2.483,3 mg/L and kaempferol 10.111,1 mg/L. Too high MeJa concentration caused decreased adventitious root growth but it can induced higher flavonoid synthesis as a term of self defence from abiotic stress. An optimum inoculum density supported an effective absortion of nutrition that needed by adventitious root during cultivation.

Keywords: *Gynura procumbens* (Lour.) Merr, balloon type bubble bioreactor, methyl jasmonate (MeJa), inoculum density, flavonoid.