ISOLASI DAN KARAKTERISASI SENYAWA METABOLIT SEKUNDER DARI JAMUR *Penicillium simplicissimum* Ch06 YANG DIKULTIVASI DENGAN PENAMBAHAN MONOSODIUM GLUTAMAT 3,5 % PADA MEDIA BERAS DAN UJI AKTIVITAS ANTIBAKTERI

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ABSTRAK

Penelitian ini bertujuan untuk mengisolasi, mengkarakterisasi dan menentukan aktivitas antibakteri senyawa metabolit sekunder dari jamur *Penicillium simplicissimum* Ch06 asal spon laut *Chelonaplysilla* sp. Jamur *P. simplicissimum* Ch06 dikultivasi dengan pendekatan *one strain many compound* (OSMAC) menggunakan induktor garam monosodium glutamate (MSG) dan sodium nitrat ($NaNO_3$.) sebanyak 3,5 % masing-masing dan dibandingkan dengan jamur yang tumbuh pada media beras (standar). Isolat jamur dikultivasi pada tiga media tersebut sampai tumbuh maksimal selama ± 4 minggu. Selanjutnya media dan jamur diekstraksi dengan etil asetat, dan diperoleh tiga ekstrak: MSG, $NaNO_3$ dan standar. Semua ekstrak etil asetat diuji aktivitas antibakterinya dengan metode difusi Agar dan kandungan metabolit sekundernya dianalisis menggunakan LCMS/MS. Hasil penelitian menunjukkan bahwa ekstrak etil asetat dari media yang diinduksi MSG menunjukkan adanya peningkatan aktivitas sebanyak 51,79 % dibandingkan dengan media standar. Profil kromatogram LCMS ekstrak MSG dan $NaNO_3$ memperlihatkan 12 senyawa yang memiliki intensitas % area yang meningkat dibandingkan ekstrak media standar. Ekstrak MSG selanjutnya diisolasi kandungan metabolit sekundernya menggunakan metode kromatografi dan diperoleh 2 senyawa antibakteri. Senyawa D1 (22.5 mg) berbentuk kristalin bening dan larut dengan pelarut etil asetat, kloroform dan metanol. Nilai KHM D1 terhadap *E. coli ATCC 25922* dan *S. aureus* ATCC 25923 12,5 µg/mL; 25 µg/mL terhadap MRSA, dan 6,25 µg/mL pada *P. aeruginosa* ATCC 27853. Senyawa D2 (24,4 mg) berbentuk kristalin kuning pucat, larut dengan aseton dan metanol. Nilai KHM D2 yaitu 12,5 µg/mL pada *E. coli* ATCC 25922; 25 µg/mL pada *S. aureus* ATCC 25923; 50 µg/mL pada MRSA, dan *P. aeruginosa* ATCC 27853. Berdasarkan hasil karakterisasi fisikokimia, senyawa D1 indentik dengan 5,8-Epidioxyergosta-6,9(11),22-trien-3-ol ($C_{28}H_{42}O_3$). Sedangkan senyawa D2 diperkirakan termasuk senyawa golongan terpenoid. Kultivasi jamur *P. simplicissimum* Ch06 dengan metode OSMAC sangat berpotensi menghasilkan senyawa antibakteri.

KATA KUNCI : *Penicillium simplicissimum,* OSMAC, Antibakteri, 5,8-Epidioxyergosta-6,9(11),22-trien-3-ol, $C_{18}H_{16}O_7$

ISOLATION AND CHARACTERIZATION OF SECONDARY METABOLITE COMPOUNDS FROM THE FUNGUS Penicillium simplicissimum Ch06 CULTIVATED WITH THE ADDITION OF 3.5 % MONOSODIUM GLUTAMATE IN RICE MEDIA AND ANTIBACTERIAL ACTIVITY

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ABSTRACT

This study aims to isolate, characterize and determine the antibacterial activity of secondary metabolites from the fungus Penicillium simplicissimum Ch06 from the marine sponge Chelonaplysilla sp. A new approach to obtaining new metabolic products with various structures is "One Strain Many Compounds" (OSMAC). Through this research, the secondary metabolites of P. simplicissimum Ch06 in a solid rice medium were compared to the same medium with the addition of 3.5 % MSG and 3.5 % NaNO3 cultivated for a maximum of 4 weeks. Then the media and fungus were extracted with ethyl acetate, and three extracts were obtained: MSG, $NaNO_3$ and standards. The fungal metabolite profiles analyzed by liquid chromatography (LC) - mass spectrometry (MS) showed a clear difference of several peaks in the LC profile following the same trend with the variation of the antibacterial activity of the fungal extracts. The results showed that the ethyl acetate extract from MSG-induced media showed an increase in activity of 51.79 % compared to standard media. LCMS chromatogram profiles of MSG and $NaNO_3$ extracts showed that 12 compounds had an increased % area intensity compared to standard media extracts. The MSG extract was then isolated for its secondary metabolite content using the chromatography method and 2 antibacterial compounds were obtained. Compound D1 (22.5 mg) is clear crystalline and soluble in ethyl acetate, chloroform and methanol. MIC D1 value for E. coli ATCC 25922 and S. aureus ATCC 25923 12.5 µg/mL; 25 µg/mL for MRSA, and 6.25 µg/mL for P. aeruginosa ATCC 27853. Compound D2 (24.4 mg) is pale yellow crystalline, miscible with acetone and methanol. The MIC value of D2 was 12.5 µg/mL for E. coli ATCC 25922; 25 µg/mL on S. aureus ATCC 25923; 50 µg/mL on MRSA, and P. aeruginosa ATCC 27853. Based on the physicochemical characterization results, compound D1 is identical to 5,8-Epidioxyergosta-6,9(11),22-trien-3-ol (C28H42O3). While compound D2 is thought to be a terpenoid compound. Cultivation of P. simplicissimum Ch06 using the OSMAC method has the potential to produce antibacterial compounds.

KEY WORD **:** *Penicillium simplicissimum,* OSMAC, *Antibacterial*, 5,8-Epidi oxyergosta-6,9(11),22-trien-3-ol, $C_{18}H_{16}O_7$