SINTESIS 1-MONOMIRISTIN DARI ASAM MIRISTAT SERTA UJI AKTIVITASNYA SEBAGAI ANTIJAMUR DAN ANTIBAKTERI

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INTISARI

Telah dilakukan sintesis gliserol terproteksi, yaitu 2,2-dimetil-1,3-dioxolan-4-metanol (**senyawa 1**), etil miristat (**senyawa 2**), 2,2-dimetil-1,3-dioxolan-4-metilmiristat (**senyawa 3**), 1-monomiristin (**senyawa 4**), serta uji aktivitas antijamur dan antibakteri dari **senyawa 4** secara *in vitro*.

Senyawa 1 disintesis melalui reaksi ketalisasi gliserol dengan aseton menggunakan katalis asam *p*-toluensulfonat (*p*TSA) dan pemurnian dengan distilasi vakum. **Senyawa 2** disintesis dari reaksi asam miristat dan etanol yang dikatalisis asam sulfat pekat dengan bantuan radiasi ultrasonik (sonokimia). **Senyawa 3** disintesis melalui reaksi antara **senyawa 1** dan **senyawa 2** dengan bantuan variasi katalis basa, yaitu $NaHCO_3$ **(A)**, $KHCO_3$ **(B)**, dan K_2CO_3 **(C),** sehingga diperoleh **senyawa 3A, 3B,** dan **3C**. Sintesis **senyawa 4** dilakukan dengan cara mereaksikan **senyawa 3A, 3B,** dan **3C** dengan etanol dan dibantu katalis asam resin penukar ion–*wet* Amberlyst 15, sehingga diperoleh **senyawa 4A, 4B,** dan **4C**. Produk sintesis dianalisis menggunakan spektrofotometer FTIR, GC–MS, LC–MS, ^{1}H–, dan ^{13}C–NMR. Uji aktivitas antijamur dan antibakteri dilakukan pada **senyawa 4** menggunakan metode difusi sumuran dengan bahan uji, antara lain jamur *Candida albicans*, bakteri Gram positif *(Staphylococcus aureus* dan *Bacillus subtilis)*, bakteri Gram negatif *(Escherechia coli* dan *Aggregatibacter Actinomycetemcomitans)*, polietilen glikol 400 20% sebagai kontrol negatif, dan 4-isopropil-3-metilfenol 1% sebagai kontrol positif.

Semua hasil penelitian menghasilkan produk yang diinginkan dengan persen hasil sebagai berikut, **senyawa 1** sebesar 33,70%, **senyawa 2** sebesar 98,43%, **senyawa 3A, 3B,** dan **3C** masing-masing sebesar 30,66; 43,80; dan 32,12%, serta **senyawa 4A, 4B,** dan **4C** masing-masing 70,79; 100; dan 100%. **Senyawa 4** menunjukkan adanya aktivitas antijamur dan antibakteri pada semua bakteri uji (Gram positif dan Gram negatif). Aktivitas tertinggi ditunjukkan pada konsentrasi 15% untuk jamur *Candida albicans*, bakteri Gram positif *(Staphylococcus aureus* dan *Bacillus subtilis)*, dan bakteri Gram negatif *(Escherechia coli dan Aggregatibacter Actinomycetemcomitans).*

Kata kunci : 1-monomiristin, aktivitas, antibakteri, antijamur, transesterifikasi

SYNTHESIS OF 1-MONOMYRISTIN FROM MYRISTIC ACID AND ITS ACTIVITY ASSAY AS ANTIFUNGI AND ANTIBACTERIA

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ABSTRACT

Synthesis of a protected glycerol, i.e. 2,2-dimethyl-1,3-dioxolan-4-methanol (**compound 1)**, ethyl myristate (**compound 2)**, 2,2-dimethyl-1,3-dioxolan-4-methylmyristate **(compound 3)**, 1-monomyristin **(compound 4)**, and testing the capabilities of antifungal and antibacterial activity of **compound 4** in vitro have been carried out.

Compound 1 was synthesized through the ketalization reaction of glycerol with acetone using *p*-toluenesulfonic acid (*p*TSA) catalyst and purification by vacuum distillation. **Compound 2** was obtained by reacting myristic acid and ethanol with concentrated sulfuric acid catalyst with the aid of ultrasonic radiation (sonochemical). **Compound 3** was prepared by reacting 2,2-dimethyl-1,3-dioxolan-4-methanol and ethyl myristate with the presence of some alkaline catalysts, such as $NaHCO_3$ **(A)**, $KHCO_3$ **(B)**, and K_2CO_3 **(C)**, thus obtained **compound 3A**, **3B**, and **3C**. Synthesis of **compound 4** was done by reacting **compound 3A**, **3B**, and **3C** with ethanol in the presence of acid catalyst ion exchange resin–wet Amberlyst 15 to obtain **compound 4A**, **4B**, and **4C**. The products of the synthesis were analyzed using FTIR, GC–MS, LC–MS, ^{1}H– and ^{13}C–NMR spectrophotometer. Antifungal and antibacterial activity test was done at **compound 4** using the wells diffusion method towards *Candida albicans* fungus, Gram-positive bacteria (*Staphylococcus aureus* and *Bacillus subtilis*), Gram-negative bacteria (*Escherechia coli* and *Aggregatibacter Actinomycetemcomitans*), polyethylene glycol 400 20% as a negative control, and 4-isopropyl-3-methylphenol 1% as a positive control.

All synthesis experiments afforded the expected products in the percent yield as the following: **compound 1** was 33.70%, **compound 2** was 98.43%, **compound 3A, 3B, and 3C** were 30.66; 43.80; and 32.12% respectively, and **compound 4A**, **4B**, and **4C** were 70.79; 100; and 100% respectively. **Compound 4** showed antifungal and antibacterial activity to all tested bacteria (Gram-positive and Gram-negative). The highest activity was shown at concentration of 15% for the fungus *Candida albicans*, Gram-positive bacteria (*Staphylococcus aureus* and *Bacillus subtilis*), and Gram-negative bacteria (*Escherechia coli* and *Aggregatibacter Actinomycetemcomitans*).

Keywords : 1-monomyristin, activity, antibacteria, antifungi, transesterification