



## INTISARI

Stres oksidatif merupakan akar dari berbagai macam penyakit yang menyerang sistem kardiovaskuler, ginjal, saraf, paru-paru, serta salah satu penyebab utama timbulnya kanker. Pengembangan senyawa antioksidan dalam usaha penanganan fenomena stres oksidatif yang disebabkan oleh spesies oksigen reaktif (ROS) dilakukan salah satunya melalui pengembangan analog senyawa kurkumin. Tujuan penelitian ini adalah melakukan sintesis dan uji aktivitas antioksidan senyawa analog kurkumin 2,6-bis-(2'-kloro-6'-fluorobenziliden)-sikloheksanon.

Sintesis analog kurkumin 2,6-bis-(2'-kloro-6'-fluorobenziliden)-sikloheksanon dilakukan melalui mekanisme kondensasi aldol menggunakan *starting material* 2-kloro-6-fluorobenzaldehid dan sikloheksanon. Reaksi diperantarai oleh katalis basa NaOH tanpa pelarut. Mekanisme uji kemurnian yang digunakan adalah uji kromatografi lapis tipis, uji jarak lebur, serta analisis struktur senyawa menggunakan spektrometri massa, spektrometri resonansi magnetik inti ( $^1\text{H-NMR}$  dan  $^{13}\text{C-NMR}$ ), serta spektrofotometri inframerah. Uji aktivitas antioksidan dilakukan menggunakan metode penangkapan radikal bebas DPPH dan metode reduksi ion ferri. Data dianalisis menggunakan perangkat lunak SPSS untuk melihat signifikansi % aktivitas antioksidan (FRAP) serta  $\text{IC}_{50}$  senyawa uji.

Hasil penelitian diperoleh senyawa 2,6-bis-(2'-kloro-6'-fluorobenziliden)-sikloheksanon dalam bentuk kristal berwarna kuning dengan jarak lebur 124-125°C. Pelarut rekristalisasi yang digunakan adalah etanol. Rendemen hasil sintesis sebesar 70,00%. Berdasarkan uji aktivitas antioksidan, senyawa 2,6-bis-(2'-kloro-6'-fluorobenziliden)-sikloheksanon tidak memiliki aktivitas antioksidan pada metode penangkapan radikal bebas DPPH dan aktivitas antioksidan yang lebih rendah dibandingkan dengan Vitamin-E pada metode reduksi ion ferri dengan harga  $\text{IC}_{50}$  48.230  $\mu\text{M}$  dan Vitamin E 256,7  $\mu\text{M}$ .

**Kata kunci:** stres oksidatif, analog kurkumin, 2,6-bis-(2'-kloro-6'-fluorobenziliden)-sikloheksanon, halogen, klor, fluor, antioksidan, ROS, DPPH, reduksi ion ferri



## ABSTRACT

Oxidative stress is one of the potent causes of diseases attacking the cardiovascular system, kidney, nervous systems, lungs and is one of the main triggers for cancer. The development of antioxidant compound in the form of curcumin analogues is carried out to inhibit oxidative stress progression caused by Reactive Oxygen Species (ROS). The purpose of this study is to synthesize the curcumin analogue, 2,6-bis-(2'-chloro-6'-fluorobenzylidene)-cyclohexanone, followed by the determination of its antioxidant activity.

The curcumin analogue, 2,6-bis-(2'-chloro-6'-fluorobenzylidene)-cyclohexanone, was synthesized through aldol condensation mechanism using 2-chloro-6-fluorobenzaldehyde and cyclohexanone as starting materials. The reaction was catalyzed using sodium hydroxide without a solvent. The purity of the product was determined through melting point range and thin layer chromatography. Compound structure was elucidated through mass spectrometry, nuclear magnetic resonance spectrometry ( $^1\text{H-NMR}$  and  $^{13}\text{C-NMR}$ ), and infrared spectrometry. Antioxidant activity was assessed through DPPH radical scavenging potential and the reduction of ferric ions potential. The data was analyzed using SPSS software to determine the % significance of Ferric Reducing Antioxidant Power (%FRAP) and  $\text{IC}_{50}$ .

The synthesized 2,6-bis-(2'-chloro-6'-fluorobenzylidene)-cyclohexanone was formed with a yield of 70,00% in yellow crystals with melting point range between 124-125°C. Ethanol was used as recrystallization solvent. The compound did not show antioxidant activity through DDPH radical scavenging potential analysis whereas it's antioxidant activity was smaller than vitamin E in the reduction of ferric ions potential analysis with  $\text{IC}_{50}$  of the compound and vitamin E being 48.230  $\mu\text{M}$  and 256,7  $\mu\text{M}$  respectively.

**Keywords:** oxidative stress, curcumin analogue, 2,6-bis-(2'-chloro-6'-fluorobenzylidene)-cyclohexanon, halogen, chlorine, fluorine, antioxidant, ROS, DPPH, reduction of ferric ions