AKTIVITAS ANTIINFLAMASI DAN POTENSI ANTIKANKER FORMULASI NANOKRISTAL EKSTRAK DAUN KELOR DAN CIPLUKAN SECARA *IN VITRO*

SKRIPSI

Diajukan sebagai salah satu syarat untuk memperoleh gelar Sarjana Sains
Progam Studi Biologi

Disusun oleh:

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PROGRAM STUDI BIOLOGI

FAKULTAS PENDIDIKAN MATEMATIKA DAN ILMU PENGETAHUAN ALAM

UNIVERSITAS PENDIDIKAN INDONESIA

2025

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Oleh:

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Universitas Pendidikan Indonesia

Agustus 2025

LEMBAR PENGESAHAN

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AKTIVITAS ANTIINFLAMASI DAN POTENSI ANTIKANKER FORMULASI NANOKRISTAL EKSTRAK DAUN KELOR DAN CIPLUKAN SECARA *IN VITRO*

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LEMBAR PERNYATAAN

Dengan ini saya menyatakan bahwa skripsi dengan judul "Aktivitas Antiinflamasi dan Potensi Antikanker Formulasi Nanokristal Ekstrak Daun Kelor dan Ciplukan secara *In Vitro*" ini beserta seluruh isinya adalah benar-benar karya saya sendiri. Saya tidak melakukan penjiplakan atau pengutipan dengan cara-cara yang tidak sesuai dengan etika ilmu yang berlaku dalam masyarakat keilmuan. Atas pernyataan ini, saya siap menanggung risiko/sanksi apabila dikemudian hari ditemukan adanya pelanggaran etika keilmuan atau ada klaim dari pihak lain terhadap keaslian karya saya ini.

Bandung, Agustus 2025

Yang membuat pernyataan

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KATA PENGANTAR

Puji syukur penulis panjatkan ke hadirat Allah SWT karena berkat rahmat dan karunia-Nya, penulis dapat menyelesaikan penyusunan skripsi ini dengan judul "Aktivitas Antiinflamasi dan Potensi Antikanker Formulasi Nanokristal Ekstrak Daun Kelor dan Ciplukan secara *In Vitro*". Skripsi ini disusun sebagai salah satu syarat untuk memperoleh gelar Sarjana pada Program Studi Biologi, Fakultas Pendidikan Matematika dan Ilmu Pengetahuan Alam, Universitas Pendidikan Indonesia.

Penulis menyadari bahwa dalam proses penyusunan ini masih terdapat banyak kekurangan, baik dalam hal isi maupun penyajian. Oleh karena itu, penulis membuka diri terhadap masukan, kritik, dan saran yang membangun demi kesempurnaan karya ini di kemudian hari. Akhir kata, semoga skripsi ini dapat memberikan manfaat khususnya bagi penuliss dan umumnya bagi pembaca serta menjadi sumbangsih kecil dalam pengembangan ilmu pengetahuan di bidang biomedik.

Bandung, Agustus 2025

Penulis

UCAPAN TERIMA KASIH

Selama proses penyusunan skripsi ini, penulis banyak mendapatkan dukungan, bimbingan, serta bantuan dari berbagai pihak, sehingga memberikan motivasi kepada penulis untuk menyelesaikan skripsi ini dengan baik. Oleh karena itu, penulis mengucapkan banyak terima kasih kepada:

1. Bapak Prof. Dr. Didik Priyandoko, M.Si., selaku dosen pembimbing I yang telah meluangkan waktu, pikiran, dan tenaga untuk memberikan bimbingan, arahan, saran, dukungan, serta ilmu yang sangat bermanfaat sehingga penulis dapat menyelesaikan penelitian tugas akhir dan laporan akhir.
2. Ibu Dr. R. Kusdianti, M.Si., selaku dosen pembimbing II yang telah meluangkan waktu, pikiran, dan tenaga untuk memberikan bimbingan, arahan, dan saran dalam menyelesaikan penelitian tugas akhir dan laporan akhir.
3. Bapak Dr. Wahyu Surakusumah, M.T., selaku ketua Program Studi Biologi, FPMIPA UPI yang terlah memberikan arahan dan dukungan administratif selama masa studi.
4. Ibu Dr. Hernawati, S. Pt., M.Si., selaku Dosen Pembimbing Akademik yang telah memberikan dukungan dan bantuan selama masa perkuliahan.
5. Ibu Dr. Peristiwati, M. Kes., selaku Dosen Reviewer Skripsi atas kontribusinya dalam kesempurnaan naskah skripsi ini.
6. Seluruh Bapak dan Ibu dosen Program Studi Biologi FPMIPA UPI yang telah memberikan ilmu dan pengalaman berharga kepada penulis selama perkuliahan.
7. Seluruh staf Program Studi Biologi FPMIPA UPI yang telah membantu dalam penyelesaian administrasi selama perkuliahan.
8. Kepada PT Fathonah Amanah Shidiq Tabligh (PT. FAST), PT Nanotech Global Indonesia (Tbk), PPNN Institut Teknologi Bandung, Laboratorium Sentral Universitas Padjajaran, dan Laboratorium Riset Translasional Farmasi Universitas Padjajaran atas dukungan, fasilitas, serta bantuan yang diberikan dalam pembuatan, karakterisasi, pengujian, dan analisis yang memungkinkan penelitian ini terlaksana dengan baik.
9. Keluarga terutama ayah (alm.), ibu, dan kakak penulis atas segala doa, dukungan, serta pengorbanan yang telah diberikan sepanjang perjalanan studi ini. Segala bentuk kasih sayang mereka menjadi sumber semangat terbesar bagi

penulis dalam menyelesaikan pendidikan ini dengan sebaik-baiknya. Semoga skripsi ini dapat menjadi persembahan kecil bagi kebahagiaan mereka.

10. Teman-teman Biologi C 2021 yang telah menjadi keluarga terbaik selama masa perkuliahan.
11. Rekan-rekan satu bimbingan Nuha Fathinah Shalihah dan Lisna Wahyu Nurani yang telah berbagi suka duka dan menjadi penguat satu sama lain selama penelitian dan penyusunan skripsi. Terima kasih telah bertahan dan berjuang bersama untuk menyelesaikan tugas akhir ini.
12. Rekan seperjuangan skripsi Hilda Nur Azizah Rahardi dan Dendu Noutera Pramayuditya Harnieyane, yang selalu ada selama masa perkuliahan dan memotivasi penulis untuk menyelesaikan tugas akhir dengan tepat waktu.
13. Teman-teman yang membantu di Laboratorium Riset Bioteknologi FPMIPA B, Vinno Bayu Christhofan dan Salma Setia Nurhaliza.
14. Teman-teman terdekat penulis Shania Gisela Dwicanakya Sapay, Syifa Kania Oktaviani, Syakira Alaida Zaeni, Raffasya Sharma, dan Assyifa Nurfadilah yang telah memberikan dukungan dan membersamai penulis selama masa-masa skripsi.
15. Fajri Khoirul Rizki yang telah menjadi bagian hidup penulis, secara konsisten hadir memberi dorongan, pendapat, tenaga, dan sandaran dalam proses penyusunan skripsi, serta turut berperan besar dalam menyemangati dan membantu penulis melalui berbagai fase. Terima kasih atas kesabaran, waktu, dan usaha yang tak sedikit.
16. Seluruh pihak yang tidak dapat disebutkan satu persatu atas bantuan dan dukungannya.

Bandung, Juli 2025

Penulis

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ABSTRAK

Stres oksidatif memicu inflamasi kronis yang dapat menyebabkan kerusakan DNA dan perkembangan kanker. Pengobatan konvensional sering menimbulkan efek samping seperti gangguan pencernaan, resistensi obat, dan toksisitas sistemik. Penelitian ini bertujuan mengevaluasi potensi kombinasi nanokristal ekstrak daun kelor dan ciplukan (NKEKC) sebagai agen antioksidan, antiinflamasi, dan antikanker secara *in vitro*. Nanokristal dibuat dari ekstrak serbuk kelor dan ciplukan, kemudian dikarakterisasi PSA dan ZPA. Hasil menunjukkan ukuran partikel NKEK dan NKEC masing-masing 323 nm dan 671 nm, dengan zeta potensial -40.5 mV dan -52.3 mV. Uji DPPH menunjukkan NKEKC mampu menghambat radikal bebas hingga 55,06% pada konsentrasi 4 mg/mL. Pada uji denaturasi protein, NKEKC menghambat denaturasi hingga 98,39% pada konsentrasi 1 mg/mL. Uji sitotoksisitas pada sel MCF-7 menunjukkan viabilitas sel 87,48% pada konsentrasi 1 mg/mL, namun belum mencapai IC50. Selain itu, NKEKC mampu menginduksi penuaan sel (*senescence*) pada sel MCF-7 sebesar 53,47% pada konsentrasi 0,25 mg/mL dan meningkat hingga 87,78% pada 4 mg/mL. Analisis siklus sel NKEKC terhadap sel MCF-7 menunjukkan bahwa NKEKC dapat menginduksi penghentian siklus sel pada fase G0 dan S. Berdasarkan hasil tersebut, dapat disimpulkan bahwa ekstrak kelor dan ekstrak ciplukan tergolong partikel nano yang memiliki aktivitas antioksidan dan antiinflamasi yang baik. NKEKC berpotensi sebagai agen antikanker melalui mekanisme induksi penuaan sel.

Kata kunci: stres oksidatif, inflamasi, kanker, kelor, ciplukan, nanokristal

ABSTRACT

Oxidative stres triggers chronic inflammation, which can lead to DNA damage and cancer development. Conventional treatments often cause side effects such as digestive disorders, drug resistance, and systemic toxicity. This study aims to evaluate the potential of a combination of nanocrystals from Moringa oleifera and Physalis angulata leaf extracts (NKEKC) as antioxidant, anti-inflammatory, and anticancer agents in vitro. Nanocrystals were prepared from powdered extracts of Moringa and Physalis and characterized using particle size analysis and zeta potential analysis. The results showed that the particle sizes of NKEK and NKEC were 323 nm and 671 nm, respectively, with zeta potentials of -40.5 mV and -52.3 mV. NKEKC showed a particle size of 1115 nm and a zeta potential of -22.2 mV. The DPPH assay indicated that NKEKC could inhibit free radicals up to 55.06% at a concentration of 4 mg/mL. In the protein denaturation assay, NKEKC inhibited protein denaturation by 98.39% at 1 mg/mL. Cytotoxicity testing on MCF-7 cells showed a cell viability of 87.48% at 1 mg/mL, indicating that NKEKC has not yet reached the IC50 value. Moreover, NKEKC induced cellular senescence in MCF-7 cells by 53.47% at 0.25 mg/mL, increasing to 87.78% at 4 mg/mL. NKEKC cell cycle analysis of MCF-7 cells showed that NKEKC can induce cell cycle arrest in the G0 and S phases. Based on these results, it can be concluded that Moringa and Physalis extract are classified as nanocrystals with good antioxidant and anti-inflammatory activity. NKEKC also has potential as an anticancer agent through the induction of cellular senescence.

Keywords: oxidative stres, inflammation, cancer, kelor, ciplukan, nanocrystal

DAFTAR ISI

DAFTAR TABEL

DAFTAR GAMBAR

DAFTAR LAMPIRAN

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