

**STUDY OF PHYTOCHEMICAL COMPOUND CONTENT AND ANALGESIC
ACTIVITY OF ETHANOL EXTRAK OF CELERY LEAF (*Apium graveolens* L.)
WRITHING TEST METHOD**

**Rosa Juwita Hesturini^{1*}, Fathul Hidayatul Hasanah¹, Dwi Wahyuni¹, Briandini
Dwi Astuti¹, Anis Anggrayni¹**

¹ Institut Ilmu Kesehatan Bhakti Wiyata, Kediri, Indonesia

*Corresponding Author: rosa.hesturini@iik.ac.id

DOI : <https://doi.org/10.56710/jpb.v611.173>

ABSTRACT

Article Information

Article History :

*Submitted: 29 April
2026*

*Accepted: 26 May
2026*

*Publish Online: 30
May 2026*

Keywords:

Phytochemical
Compounds,
Analgesic Test,
Celery (*Apium
graveolens* L.)

Background: The celery plant (*Apium graveolens* L.) belongs to the Apiaceae family and is one of the vegetable commodities that is widely used for flavoring and decorating dishes with various health benefits. **Objective:** This study aims to determine the content of phytochemical compounds and analgesic activity of celery leaves. Through a systematic review article. **Method:** The research method with systematic literature review was carried out by searching for articles or journals related to phytochemical compound content and analgesic activities of celery. which had been published in journals. Literature search was conducted in April-May 2021 through Google Scholar, then journals were selected based on exclusion and inclusion criteria. **Conclusions:** The inclusion criteria, namely journals published last 5 years, the journal discusses the content of phytochemical compounds and analgesic activity of ethanol extract of celery leaves using the writhing test method. And as for the exclusion criteria, the data in the journal is incomplete and the journal does not discuss the celery plant. Based on the results of a systematic literature review of 5 published journals indicate that celery plant contains phytochemicals flavonoid compounds, tannins, saponins flavoglucoside (apiin), apigenin and have analgesic activity.

ABSTRAK

Latar Belakang: Tanaman Seledri (*Apium graveolens* L.) termasuk dalam famili apiaceae dan merupakan salah satu komoditas sayuran yang banyak digunakan untuk penyedap dan penghias hidangan dengan berbagai manfaat bagi kesehatan. **Tujuan:** penelitian ini adalah untuk mengetahui kandungan senyawa fitokimia dan aktivitas analgesik dari daun seledri. melalui artikel review sistematik. **Metode:** penelitian dengan *systematic literature review* dilakukan dengan mencari artikel atau jurnal yang terkait dengan kandungan senyawa fitokimia dan aktivitas analgesik dari daun seledri yang sudah di publikasikan dalam jurnal. Penelusuran literatur dilakukan melalui *Google scholar*, kemudian jurnal diseleksi berdasarkan kriteria eksklusi dan inklusi. Adapun kriteria-kriteria inklusi yaitu jurnal dipublikasikan 5 tahun terakhir, jurnal membahas tentang kandungan senyawa fitokimia dan aktivitas analgetik ekstrak etanol

daun seledri dengan metode *writhing test*. Dan adapun kriteria eksklusi yaitu data pada jurnal tidak lengkap dan jurnal tidak membahas tentang tanaman seledri. **Hasil dan kesimpulan** penelitian menunjukkan bahwa berdasarkan hasil dari *systematic literature review* terhadap 5 jurnal yang telah dipublikasikan menunjukkan bahwa daun seledri memiliki kandungan senyawa fitokimia flavonoid, tanin, saponin, flavor-glukosida (apiin), apigenin dan mempunyai aktivitas analgesik.

INTRODUCTION

Traditional medicine consists of materials or concoctions derived from plants that have been traditionally used for treatment based on ancestral knowledge or experience. The high price of synthetic drugs and the presence of health-detrimental side effects prompt the community to use traditional medicine as a treatment alternative that is considered safer and more affordable. Due to these various side effects, treatment using herbal medicine or jamu remains a treatment alternative expected to have fewer side effects. The use of herbal medicine or jamu in the community to overcome and reduce symptoms caused by pain and inflammation requires further assessment (Hesturini et al., 2022).

Indonesia, with its plant biodiversity, offers many choices of medicinal plants that can be enhanced for use as potent medicinal ingredients. Many plants have been reported to have therapeutic effects for various diseases, but knowledge about the benefits and safety of these natural medicines is only empirical and has not been scientifically tested. One such plant is celery. This plant, also known by its scientific name *Apium graveolens* L., uses its leaves and stalks as a culinary complement.

celery plants (*Apium graveolens* L.) are often found only as raw vegetables or as additional ingredients in cooking, but besides that, celery is known to have activities that increase the production of digestive enzymes or act as an appetite stimulant, lower blood pressure, facilitate urination, reduce pain in rheumatism, and are also used as anti-convulsants. Celery leaves are also known as analgesics because they contain bioflavonoid substances that have various bioactivities (Haryoto, 2019). The working mechanism of these flavonoid substances is to inhibit the cyclooxygenase (COX) enzyme, which can decrease prostaglandin synthesis, thereby reducing blood vessel vasodilation and local blood flow, so that the migration of inflammatory cells in the inflamed area will decrease. Furthermore, in addition to having benefits as traditional medicine, celery plants are also beneficial as scientific medicine. These scientific treatments have been proven by several researchers (Tjay dan Rahardja, 2015).

METHOD

This research uses a Systematic Literature Review (SLR) design, which aims at reviewing several previous studies related to the topic to be observed and investigated.

Population And Sample

The population used consists of journals discussing the phytochemical compound content and analgesic activity of the ethanol extract of celery leaves (*Apium graveolens* L.). The samples used in this study are journals regarding the phytochemical compound content and analgesic activity of celery leaves (*Apium graveolens* L.) that meet the inclusion criteria, namely journals that explain the phytochemical compound content of celery leaves and the analgesic activity of celery leaves, provided that the species name of the plant must be *Apium graveolens* L. Meanwhile, the exclusion criteria include journals with incomplete data, data that is not qualitative, journals discussing other plant species, and journal content that does not discuss the phytochemical content and analgesic activity of celery leaves (*Apium graveolens* L.).

Sampling Technique

The sampling technique used is purposive non-random sampling, or a sampling technique based on the research objectives. The sampling technique in this study is to determine the phytochemical compound content and analgesic activity found in celery leaves (*Apium graveolens* L.).

Unit Of Analysis

The unit of analysis is the level of data unity collected during the subsequent data analysis stage (Hardiansyah, 2012). The unit of analysis is the source of information regarding the variables to be processed in the research. The unit of analysis in this study is the phytochemical compound content and analgesic activity of celery leaves (*Apium graveolens* L.).

RESULT

In the three journals, the solvent used was 70% ethanol, celery leaves containing chemical compounds such as flavonoids, tannins, saponins, flavor-glucosides (apiin), and apigenin were tested using the writhing test method. Flavonoid, saponin, and tannin compounds are known to have various pharmacological activities, including inhibiting the alpha-glucosidase enzyme in breaking down carbohydrates into simple sugars, flavonoids can inhibit prostaglandin synthesis which prevents the release of pain mediators, and act as antioxidants that reduce oxidative stress levels in diabetes mellitus patients. Flavonoids are plant derivative compounds easily found in several fruits and vegetables and consumed in the daily food intake. Flavonoids vary in terms of classes, and while structurally unique, they share a basic structure formed by three rings, known as the flavan nucleus. Structural differences can be found in the pattern of substitution in one of these rings. The hydroxyl group (–OH) position in one of the rings determines the mechanisms of action of the flavonoids and reveals a complex multifunctional activity. Flavonoids have been widely used for their antioxidant, analgesic, and anti-inflammatory effects along with safe preclinical and clinical profiles. In this review, we

discuss the preclinical and clinical evidence on the analgesic and anti-inflammatory proprieties of flavonoids (Ferraz et al., 2020).

Flavonoid compounds also contain active compounds apigenin and apiin which have anti-inflammatory agent activity. Celery contains a large amount of the bioflavonoid apigenin, which acts as a strong COX-2 inhibitor, capable of stopping inflammation and having comparable efficacy to other anti-inflammatory drugs. Apigenin also functions like a beta blocker, which can slow down the heart rate and reduce the strength of heart contractions, resulting in less pumped blood flow and decreased blood pressure. Additionally, the presence of apiin is known to have diuretic activity, helping the kidneys excrete excess fluid and salt from the body, thus reducing fluid in the blood and lowering blood pressure. From this, it can be understood that these three journals demonstrate good pharmacological effects.

In the research conducted by Anom Parmadi et al., the analgesic activity test using the writhing test method utilized dose variations of 50 mg/kgBW, 100 mg/kgBW, and 200 mg/kgBW. The analgesic capability was indicated by the % analgesic power of the celery leaf ethanol extract at a dose of 200 mg/kgBW, which was 22.36%, while the % analgesic power of the positive control (Acetosal) reached 33.65%. When this % analgesic power is compared to the 50 mg and 100 mg doses, which were 14.73% and 2.30%, it indicates that the 200 mg/kgBW dose has a higher analgesic effect than the 50 mg/kgBW and 100 mg/kgBW doses. This is presumed to be because the 200 mg/kgBW dose contains more active substances compared to the other doses, thereby providing a higher therapeutic effect.

In a study conducted by Rizki Febriyanti et al., the analgesic activity test used a dose of 500 mg/kgBW. The pharmacological activity measured as the percentage of analgesic power was 64.21%. This analgesic test used the writhing test method. In a study conducted by Dellal et al. in 2018 using the writhing test analgesic method, the percentage of analgesic power using celery leaf extract (*Apium graveolens* L.) at a dose of 200 mg/kgBW showed an analgesic power of 80.17%, while at a dose of 300 mg/kgBW it showed an analgesic power of 86.50%. At the highest dose of 500 mg/kgBW, the analgesic power was 89.66%. Thus, in this study, the effective dose of celery leaf extract for reducing pain was 500 mg/kgBW.

Based on the three journals, the analgesic activity showed good percentage of analgesic effect at a dose of 200mg/kgBW with 22.36% analgesic effect, at a dose of 500mg/kgBW with 64.21% analgesic effect, and in the third journal at a dose of 500mg/kgBW with a higher analgesic effect of 89.66%.

Author's name	Article's	Plant part	Phytochemical Identification Results	Pharmacology activity
Anom Parmadi, Anisa Nadiarti	Analgesic activity test of celery leaf ethanol extract (<i>Apium graveolens</i>)	celery leaf	The solvent used was 70% ethanol, and the phytochemical	Analgesic activity test of 70% ethanol extract using the writhing test method. Analgesic activity at a dose

	L.) in Swiss strain mice using the chemical stimulation method.		screening test results showed the presence of flavonoid compounds.	of 200 mg/kg BW produced an analgesic effect of 22.36%.
Rizki Febriyanti, Anny Victor Purba, Partomuan Simanjutak	Analgesic activity test of the combination of wuluh star fruit (<i>Averrhoa bilimbi</i> L.) extract and celery leaf (<i>Apium graveolens</i> L.) extract in male white mice (<i>Mus musculus</i>) using the writhing method.	celery leaf	The solvent used was 70% ethanol, and the phytochemical screening test results indicated the presence of flavonoid, saponin, tannin, flavor-glucoside (apiin), and apigenin compounds.	Analgesic activity test of 70% ethanol extract using the writhing test method. The analgesic activity at a dose of 500 mg/kg BW showed a % analgesic power of 64.21%.
A. Dellal, F.ToumlBenall, M.M.Dif, S.Bouazza, S. Brikhou. N.Mekhfi.	Antiinflammatory, Analgesic and Antioxidant Activities of the Hydroalcoholic Extrak from celery (<i>Apium graveolens</i>) Leaves	celery leaf	The solvent used, 70% ethanol, yielded phytochemical screening results containing flavonoid and tannin compounds.	Analgesic activity test of 70% ethanol extract using the writhing test method. It showed analgesic activity at a dose of 500 mg/kg BW with an analgesic power percentage of 89.66%.

Based on research conducted by Anom Parmadi and Anisa Nadiarti, testing the analgesic activity of celery leaf extract. The celery leaves were extracted using 70% ethanol solvent, then phytochemical screening was carried out to determine the chemical substances contained in the celery leaves. The results of the phytochemical screening showed that the ethanol extract of celery leaves positively contained flavonoids. The method used for testing analgesic activity was the writhing test method. The writhing test method is a chemical method used to test the analgesic activity of a compound. The working principle of this method is to observe the writhing response caused by pain stimulation from an irritant.

Flavonoid compounds can inhibit prostaglandin synthesis, resulting in the prevention of pain mediator release. In this study, dose variations of 50 mg/kgBW, 100 mg/kgBW, and 200 mg/kgBW were used. The percentage of analgesic activity for the ethanol extract of celery leaves at a dose of 200 mg was 22.36%, which is close to the positive control (Acetosal) at 33.65%, compared to the doses of 50 mg/kgBW and 100 mg/kgBW, which were 14.73% and 20.30% respectively; this indicates that the 200 mg/kgBW dose has a greater analgesic effect than the 50 mg/kgBW and 100 mg/kgBW doses. This is because the 200 mg dose contains more active substances compared to the 50 mg/kgBW and 100 mg/kgBW doses, thereby providing a greater therapeutic effect.

Based on research conducted by Rizki Febriyanti, Anny Victor Purba, and Partomuan Simanjuntak on the phytochemical screening and activity test of celery leaves used as an analgesic. The solvent used to make the extract was 70% ethanol, which is known as a universal solvent capable of attracting compounds ranging from polar, semi-polar to non-polar substances. Subsequently, the ethanol extract of celery leaves underwent phytochemical screening, and the results showed that the ethanol extract of celery leaves positively contained flavonoid, tannin, saponin, apiin, and apigenin compounds. For instance, flavonoid, saponin, and tannin compounds have a mechanism that inhibits the alpha-glucosidase enzyme from breaking down carbohydrates into simple sugars. Flavonoids can inhibit prostaglandin synthesis, preventing the release of pain mediators, and act as antioxidants that reduce oxidative stress levels in diabetes mellitus patients (Ferraz et al., 2020). Flavonoid compounds contain the active compounds apigenin and apiin. These two compounds are said to be beneficial for use as anti-inflammatory agents. Celery is said to contain a large amount of the bioflavonoid apigenin, which is a strong COX-2 inhibitor, capable of stopping inflammation as effectively as other anti-inflammatory drugs. Apigenin functions like a beta blocker, slowing down the heart rate and reducing the force of heart contractions, resulting in less pumped blood flow and reduced blood pressure. Apiin has a diuretic effect, helping the kidneys remove excess fluids and salts from the body, so the reduced fluid in the blood lowers blood pressure. From this, it can be seen that all three journals have good pharmacological effects.

Based on research conducted by A. Dellal, F. tourml benall, M.M. Dif, S. Bouazza, S. Brikhrou, and N. Mekhfi, celery leaves were used for analgesic activity testing as a material for patients with pain. This journal uses 70% ethanol solvent, known as a universal solvent, so it can extract compounds ranging from polar, semi-polar, to non-polar compounds. Furthermore, the ethanol extract of celery leaves underwent phytochemical screening, and the results showed that the ethanol extract of celery leaves positively contained flavonoid and tannin compounds. Flavonoids and tannins have a mechanism that inhibits the action of the alpha-glucosidase enzyme in breaking down carbohydrates into simple sugars. Flavonoids can inhibit the synthesis of prostaglandins, resulting in the prevention of the release of pain mediators, and act as antioxidants that lower the level of oxidative stress in patients with diabetes mellitus. Hesperidin inhibits neuroinflammation in mice as observed by decreased levels of GFAP (an astrocyte activation marker), NF- κ B, iNOS, and COX-2 in the coronal brain induced by an intracerebroventricular infusion of streptozotocin (STZ). Treatment with hesperidin also ameliorates mechanical hyperalgesia in STZ-induced diabetic rats and CCI experimental model of neuropathic pain. Therefore, both hesperidin and naringenin show neuroprotective and antioxidant properties that contribute to their analgesic effects (Ferraz et al., 2020). Using the writhing test method, the percentage of analgesic activity of celery leaf extract (*Apium graveolens* L.) at a dose of 200 mg/kgBW was 80.17%, at 300 mg/kgBW was 86.50%, and at 500 mg/kgBW was 89.66%. Celery leaf (*Apium*

graveolens L.) extract has an analgesic effect, with the effective dose for reducing pain being 500 mg/kgBW.

CONCLUSION

Based on the results of a literature study conducted on the analgesic activity of celery leaf extract (*Apium graveolens* L.) using the writhing test method, it can be concluded that celery leaf extract contains phytochemical compounds such as flavonoids, tannins, saponins, flavorglucosides (apiin), apigenin, and has good analgesic activity.

REFERENCES

- Achmad. 2013. *Kimia Organik Bahan Alam*. Jakarta: Penerbit Karunika.
- Ahmad. 2015. *Ekstrak dan Stabilitas Betasianin Daun Darah (Alternanthera dentata) (Kajian Perbandingan Pelarut Air: Etanol dan Suhu Ekstraksi)*. Malang: Fakultas Teknologi Pertanian Universitas Brawijaya.
- Anggraini, N. C. 2016. *Penerapan Myofascial Release Technique Sama Baik dengan Ischemic Compression Technique dalam Menurunkan Nyeri pada Sindroma Miofasial Otot Upper Trapezius*. Denpasar: Universitas Udayana.
- Dipiro J.T., Wells B.G., Schwinghammer T.L. and DiPiro C. V., 2015, *Pharmacotherapy Handbook*, Ninth Edit., McGrawHill Education Companies, Inggris.
- Depkes RI. 2000. *Parameter Standar Umum Ekstraksi Tumbuhan Obat Cetakan Pertama*. Jakarta: Depkes RI.
- Camila R Ferraz, Thacyana T Carvalho, Marília F Manchope, Nayara A Artero, Fernanda S Rasquel-Oliveira, Victor Fattori, Rubia Casagrande, Waldiceu A Verri Jr. Therapeutic Potential of Flavonoids in Pain and Inflammation: Mechanisms of Action, Pre-Clinical and Clinical Data, and Pharmaceutical Development. *MDPI Molecules*. 2020 Feb 10;25(3):762. doi: 10.3390/molecules25030762
- Endarini, Hanni, Lully. (2016). *Farmakognosi dan Fitokimia*. 2019, Oktober 11. PDF bppsdmk.kemkes.go.id.
- Harborne, J. B. 2000. *Metode Fitokimia: Penuntun Cara Modern Menganalisis Tumbuhan*. Bandung: ITB.
- Kementrian Kesehatan RI. 2018. *Profil Kesehatan Indonesia 2018*. Jakarta: Kemenkes RI.
- Hesturini, R. J., Herowati, R., & Widodo, G. P. (n.d.). (2022). *Daun Gandarussa (Justicia gendarussa Burm. F) Pada Tikus Putih Anti-Inflammatory Activity Of Etanolic Extract Fractions Of Gandarussa (Justicia gendarussa Burm. F) Leaves In Rats*.
- Kristanti, A.N., dkk. 2008. *Buku Ajar Fitokimia*. Surabaya: Airlangga. University Press.
- Lenny, S. 2006. *Senyawa Flavonoida, Fenil Propanoida dan Alkaloida*. Karya Ilmiah. MIPA Universitas Sumatera Utara.

- Narra Venkatesh, Kopuri Gayathri Devi, dan Akula Murali Sri Sudakhar. 2019. Evaluation Of In Vitro Anticancer Activity of Ethanol Extract Of Albizia Saman Flowers.
- Notoatmodjo S., 2012. *Metode Penelitian Kesehatan*. Jakarta: Rineka Cipta
- Novia, et al. 2015. *Pengaruh Konsentrasi Natrium Hidroksida Saat Pretreatment dan Waktu Fermentasi Terhadap Kadar Bioetanol dari Daun Nanas*. Sumatra Selatan: Jurusan Teknik Kimia Fakultas Teknik Universitas Sriwijaya.
- M.J. Pelczar, W.C.S. Chan, N.R. Krieg, *Microbiology*, Tata McGrawHill, 1998
- Sasongko, Heru. Setyawan, Ahmad Dwi. Sugiyarto. Farida, Yeni. Efendi, Nur Rohman. Pratiwi, Diah. 2016. *Analgesic Activity of Ethanolic Extracts of Karika Leaves (Carica pubescens) In Vivo*. Journal of Pharmaceutical Science and Clinical Research. 01.
- Sekeon CG, Wuisan J, Juliatri. 2015. Efektifitas antibakteri ekstrak daun pacar air (*Impatiens balsamina L.*) terhadap pertumbuhan *Streptococcus mutans* secara in vitro. *Dentire Journal Jurnal Kedokteran Gigi*; 4(1): h.8.
- Staples, George W. and Elevitch, Craig R. 2006. *Samanea saman (rain tree)*. Permanent Agriculture Resources.
- Wardana, Andika Pramudya. Tukiran. 2016. *Skринing Fitokimia dan Aktivitas Antioksidan Ekstrak Kloroform Tumbuhan Gowok (Syzygium polycephalum)*. Prosiding Seminar Nasional Kimia dan Pembelajarannya.
- Yulia. 2016. *Studi Etnofarmasi Penggunaan Tumbuhan Obat Suku Tengger di Kabupaten Lumajang Dan Malang*, Jawa Timur. Pharmacy Vol 13 No. 01. Halaman 10-20.