ANALGESIC POWER OF DICHLOROMETHANA EXTRACT OF SWEET POTATO LEAVES (IPOMOEA BATATAS L) IN MICE

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ABSTRACT

Sweet potato (Ipomoea batatas L) contains flavonoids, polyphenols and saponins. Sweet potato leaves have been empirically used as a medicine for boils, wounds and as a medicine for reducing fever. This study aims to determine the analgesic power of dichloromethane extract of sweet potato leaves in mice induced by chemical stimuli. Simplicia extraction was carried out by maceration with dichloromethane. The test groups were group I (Acetosal 65 mg/kgBW), group II (coconut oil as negative control), groups III, IV and V (dichloromethane extract of sweet potato leaves at doses of 100, 200 and 400 mg/ kgBB). Each group was given the test preparation orally, then immediately injected 1% acetic acid intraperitoneally. The mice's movements were recorded every five minutes for one hour. The number of writhes is used to calculate the percentage of analgesic power. The results of the percentage of analgesic power of the test preparations at doses of 100, 200 and 400 mg/kgBW were (13.48 ± 2.00)%, (49.33 ± 1.59)% and (57.92 ± 1.63)%, while acetosal has an anagetic power percentage of (59.99 ± 0.04)%. The results of the one way Anova test show a significance value of 0.000, meaning there was a significant difference. However, in the post hoc test, the test treatments showed significant differences except between the test dosage preparation of 400 mg/kgBW and acetosal. Sweet potato leaves have the potential to be used as a new analgesic medicine.

KEYWORDS

Keywords: sweet potato, Ipomoea batatas, analgesic, in vivo

INTRODUCTION

Pain is a painful condition caused by unpleasant sensory and emotional effects resulting from tissue damage. Psychological states can cause intense pain sensations, but can also cause avoidance of painful stimuli. The pain threshold is a subjective feeling and varies from person to person. The temperature threshold for pain is constant, at 44-45°C (Tjay and Rahardja, 2022).

Indonesians strive to maintain a healthy lifestyle in various ways. One such effort is the use of traditional medicines passed down from their ancestors to maintain health. Currently, the use of traditional medicines is widespread due to concerns about the side effects of chemical drugs. The use of plants for disease prevention is due to their relatively low cost, easy availability, and safety, as long as they are used in moderation.

Many medicinal plants have not been studied and tested preclinically to determine their efficacy. Many types of plants and plant parts are empirically known to have therapeutic effects for various diseases, but this knowledge is limited through scientific research. Today, a person's health is affected by various diseases caused by germs, bacteria, viruses, fungi, or toxic chemicals. Unhealthy lifestyle habits can also affect a person's health. The increasing use of drugs has spurred the development of research into natural medicines.

The sweet potato plant (Ipomoea batatas L.) is a climbing plant that thrives in tropical regions like Indonesia. Its leaves are often used as a vegetable due to their high nutritional value. Sweet potato leaves have been empirically used as a remedy for boils, wounds, and fever.

This plant is a climbing monocot characterized by round leaves with palmate veins. The leaves are green with yellowish-white tubers. Sweet potato leaves have pharmacological effects and can be used as an analgesic for swollen joints. Results of phytochemical screening of sweet potato leaves indicate they contain saponins, flavonoid alkaloids, tannins, quinones, steroidal triterpenoids, and polyphenols. Research on flavonoids from several plants has shown pharmacological effects as anti-inflammatory and antioxidants.

Sweet potato leaves contain many active compounds, as evidenced by the deep green color of the aqueous extract. This plant has pharmacological effects and immunomodulatory activity and can be used as an analgesic for sprained joints. Sweet potato leaves contain saponins, flavonoids and polyphenols (Balitbangkes, 2000)

Previous research indicates that the ethanol extract of purple sweet potato leaves has an anti-inflammatory effect on rats when applied topically (Setiawati, Fitriani, and Masruhim 2016). The ethanol extract of purple sweet potato leaves also exhibits in vivo anti-inflammatory effects on male Wistar rats (Riansyah, Malque, and Coesrina 2015). Red sweet potato gel has analgesic and anti-inflammatory effects on male Wistar white rats, with a 60% concentration showing good efficacy (Pujiastuti and Anasthasia 2022).

According to (Prasetyaningsih et al. 2019), their study showed that an infusion of purple sweet potato leaves can increase platelet counts in white rats, suggesting its potential use as a treatment for dengue hemorrhagic fever. Research by (Fatimah and Prasetyaningsih 2018) demonstrated that the ethanol extract of sweet potato leaves can reduce LDL cholesterol levels in rats within 14 days, indicating its potential as a cholesterol-lowering agent.

The ethyl acetate fraction gel preparation from the ethanol extract of sweet potato leaves has been shown to reduce burn wounds in white rats, suggesting its potential as a burn treatment (H. F. Rahmadani, Pratimasari, and Amin 2021). Meanwhile, a study by (Armadani 2021) showed that a mouthwash preparation from the ethanol extract of purple

sweet potato leaves can inhibit the growth of *Staphylococcus aureus* bacteria, indicating the potential of sweet potato leaves as an antibacterial agent.

Based on the literature review, no studies have investigated the analgesic activity of sweet potato leaf fractions. Therefore, this study will evaluate the analgesic activity of sweet potato leaf fractions in mice induced with chemical stimuli using acetic acid.

RESEARCH METHOD

This analgesic activity study was conducted to evaluate the ability of the n-hexane insoluble fraction of the ethanol extract of sweet potato leaves in male Swiss strain mice. The research stages included simplicia preparation, extraction, fractionation, and in vivo pharmacological testing.

Simplicia Preparation

Sweet potato leaves were harvested in Sukoharjo, Central Java. The fresh leaves were sorted and washed with running water. The leaves were then dried in an oven at 50°C for 24 hours and subsequently ground into powder.

Simplicia Extraction

The simplicia extraction was performed using the maceration method with dichloromethane as the solvent. Maceration involved soaking the simplicia in the solvent at a ratio of 1:5, followed by stirring for 6 hours and letting it stand for 18 hours (Kemenkes RI, 2017). The result was a dichloromethane extract of sweet potato leaves (EDDU), which was used as the test preparation.

Pharmacological Testing

The pharmacological test for analgesic activity was conducted on male Swiss strain mice aged 30–120 days with a body weight of 20–30 grams. A total of 25 mice were divided into five treatment groups:

- Group I (positive control) received acetylsalicylic acid (aspirin) at 65 mg/kg body weight.
- Group II (negative control) received coconut oil at 0.5 ml/20 grams.
- Group III received EDDU at a dose of 100 mg/kg body weight.
- Group IV received EDDU at a dose of 200 mg/kg body weight.
- Group V received EDDU at a dose of 400 mg/kg body weight.

All test preparations were administered orally. Immediately after administration, the mice were induced with 1% acetic acid intraperitoneally. The writhing response of the mice was observed every 5 minutes for 60 minutes, and the cumulative number of writhes was recorded.

Data Analysis

The observed data on the number of writhes were used to calculate the percentage of analgesic activity (%DAI) using the formula:

$$\%DAI = 100 - (P/K \times 100)$$

Where:

P = Cumulative number of writhes in the test preparation group

K = Cumulative number of writhes in the negative control group

The percentage of analgesic activity for all treatments was statistically analyzed to determine significance. The statistical analysis began with tests for normality and

homogeneity. If the data were normal and homogeneous (p-value), the analysis proceeded with ANOVA at a significance level of 0.05. Significance between treatments was determined using a post hoc test. The hypotheses were:

- H_0: There is no significant difference in %DAI results among the EDDU treatment groups.
- H_1: There is a significant difference in %DAI results among the EDDU treatment groups.

Multivariate analysis was performed using ANOVA (Pratama, 2019).

The research method used in the problem experiment includes analytical methods. Contains the type of method, time, place and tools of research materials. Picture captions are placed as part of the picture title (figure caption) not part of the picture. The methods used in completing the research are listed in this section.

RESULT AND DISCUSSION

The maceration extraction using dichloromethane as the solvent yielded a rendemen of 12.12% w/w, with organoleptic properties characterized as a thick extract, greenish-black in color, aromatic in odor, and bitter in taste. The fractionation of the ethanol extract of sweet potato leaves using n-hexane as the solvent produced the n-hexane insoluble fraction of the ethanol extract of sweet potato leaves (EDDU), with organoleptic properties including a powdery form, dark green color, odorless, and bitter taste.

Table 1 presents the cumulative writhing data and the percentage of analgesic activity of the test preparations. The positive control (acetylsalicylic acid) achieved an average analgesic activity percentage (%DAI) of (59.99 ± 0.04)%. The EDDU test preparations at doses of 100, 200, and 400 mg/kg body weight yielded average analgesic activity percentages (%DAI) of (13.48 ± 2.00)%, (49.33 ± 1.69)%, and (57.92 ± 1.63)%, respectively.

Statistical Test Results

The normality test using the One-Sample Kolmogorov-Smirnov Test for the percentage of analgesic activity (%DAI) showed a significance value (p) of 0.200 for each treatment group. Based on the established criteria, this indicates that the data from all treatment groups are normally distributed, as they have a p-value > 0.05. The homogeneity test yielded a significance value (p) of 0.206, indicating that the data are homogeneous, as the p-value > 0.05.

The parametric One-Way ANOVA test showed a significant difference between the treatment groups ($p = 0.001$). The analysis proceeded with a post hoc test using the Least Significant Difference (LSD) method to identify differences between individual treatment groups. Based on the LSD test, the five treatment groups—positive control (acetylsalicylic acid) (a), EDDU 100 mg/kg body weight (b), EDDU 200 mg/kg body weight (c), and EDDU 400 mg/kg body weight (d)—showed significant differences between the treatment pairs (a-b), (b-c), and (b-d) with p-values of 0.001, 0.001, and 0.001, respectively ($p < 0.05$). However, there was no significant difference between the treatment pair (a-d), with a p-value of 0.317, which is greater than 0.05.

Table 1. Mean Writhing Values and Percentage of Analgesic Activity (%DAI) of EDDU**

Test preparation	Writing (Mean ± SEM)%	% DAI (Mean±SEM)%
Coconut oil 25 ml/kgBB	97,00 ± 1,49	-
EDDU dosage 100 mg/kgBB	86,00 ± 1,51	13,48 ± 2,00
EDDU dosage 200 mg/kgBB	43,61 ± 1,60	49,33 ± 1,59
EDDU dosage 400 mg/kgBB	41,45 ± 1,06	57,52 ± 1,63
Asetosal 65mg/kgBB	38,28 ± 1,11	59,99 ± 0,04

This experimental study evaluates the analgesic activity of the dichloromethane extract of sweet potato leaves (*Ipomoea batatas* L.) in mice induced with acetic acid. Prior research indicates that sweet potato leaves contain flavonoids with potential analgesic and anti-inflammatory effects. The study involved simplicia preparation (harvesting, sorting, washing, drying, and pulverizing dark green leaves), maceration extraction with dichloromethane, and fractionation with n-hexane to produce the test preparation (EDDU). In vivo testing used male Swiss mice (20–30 grams, ~5 weeks old) due to their stable physiology and similarity to humans. Mice were acclimatized for one week, fasted for 18 hours, and treated with EDDU at varying doses or controls. Analgesic activity was assessed by observing writhing responses post-acetic acid induction. Results showed an inverse relationship between writhing and analgesic activity, with the highest EDDU dose (100 mg/kg) showing no significant difference from acetylsalicylic acid. The study supports prior findings on the analgesic and anti-inflammatory properties of sweet potato leaf extracts, attributed to flavonoids inhibiting cyclooxygenase and protecting phospholipid membranes. EDDU shows potential as a new herbal analgesic.

CONCLUSION

The dichloromethane extract of sweet potato leaves has potential as a new analgesic drug due to its analgesic activity in mice at doses of 100, 200, and 400 mg/kg body weight, with percentages of (13.48 ± 2.00)%, (49.33 ± 1.69)%, and (57.92 ± 1.63)%, respectively. In comparison, acetylsalicylic acid at 65 mg/kg body weight yielded (59.99 ± 0.04)%. There is a significant difference between all test preparation treatments, except between acetylsalicylic acid and the sweet potato leaf extract at a dose of 400 mg/kg body weight.

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