# ANTIPYRETIC ACTIVITY OF ETHANOL EXTRACT *Ipomoea batatas* L. ON SWISS WEBSTER MICE INDUCED 5% PEPTONE

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**Abstract.** Antipyretics are drugs that can reduce high body temperature. This study aims to prove the antipyretic effect of the ethanol extract of *Ipomoea batatas* L. in Swiss Webster strain male mice induced by 5% peptone. The research design was Post-test Only Control Group Design. This study used a sample of 25 male Swiss Webster mice which were divided into 5 groups. Each consists of 5 tails. Negative control (K1) was given CMC Na 0.5%. The positive control (K2) was given 1.3 mg paracetamol. (K3) *Ipomoea batatas* L group. dose of 100 mg/kg BW. (K4) *Ipomoea batatas* L. group 200 mg/kg BW. (K5) *Ipomoea batatas* L. group 300 mg/kg BW. Mice that had been adapted for 1 week were fasted for 8 hours and then the initial rectal temperature of the mice was measured (T0). Mice were induced subcutaneously with 5% peptone and then the rectal temperature was measured using a digital thermometer (T1). Rectal temperature measurements were performed at 30, 60, 90, 120, 150, and 180 minutes. (Tn). The results of the percentage decrease in temperature in the group (K5) *Ipomoea batatas* L. at a dose of 300 mg/kg BW were not statistically significantly different from the positive control (Paracetamol), with a p-value of 0.667. In conclusion, the ethanol extract of Ipomoea batatas L. positively contains chemical compounds of flavonoids, alkaloids, and terpenoids which have antipyretic activity.

**Keywords**: [Antipyretic, Ethanol Extract of Ipomea batatas L., Peptone 5%]

## INTRODUCTION

Fever is one of the body's manifestations of inflammation. The condition of increasing body temperature over 37°C. Current fever case. This is increasing, based on data from the World Health Organization (WHO) estimates that the number of fever cases worldwide is 16 –33 million with 500 – 600 thousand deaths each year (Setyowati, 2013). Fever is the mechanism body's defense against infection. Infection is the entry of bacteria, viruses, fungi, and parasites. Biochemically the occurrence of fever is caused by the activity of the cyclooxygenase-2 enzyme (Cox-2) (McNamara et al., 2021). Fever can be treated with the antipyretic paracetamol, however, thus paracetamol has side effects or liver damage hepatotoxic when used in the long term (BPOM RI, 2015), by therefore efforts to treat a fever with herbal medicines are needed because the side effects are smaller when used properly. The herbal plant which is suspected to have an antipyretic effect is *Ipomoea batatas* L contains anthocyanin organic compounds in the form of flavonoids, terpenoids, and alkaloids (Hutagalung et al., 2020). *Ipomoea batatas* L. is known as a functional food ingredient that can be used for the prevention and treatment of chronic diseases through its ability as an antioxidant, anti-inflammatory, immunomodulating, anti-cancer/anti-tumor, antibacterial, and anti-ulcer (Ayeleso & Ramachela, 2016). This research is expected to make *Ipomoea batatas* L.limit a candidate for antipyretic drugs.

## MATERIALS AND METHODS

### Materials

The materials used in this study were sweet potato (*Ipomoea batatas* L.), paracetamol (PT.Kimia Farma), peptone (Merck), and CMC. Na, Na.CL 0,9% (PT.Otsuka), the reagent will starter, bate smith, NaOH. The main instruments used in this study were a digital thermometer (Omron), and an injection syringe (Terumo). The software used for data analysis was IBM SPSS Statistics ®23.0.

## METHODS

### Extraction Process

The simplicia sample of Ipomoea batatas L powder was weighed as much as 500 grams then put into the maceration container and added 2 liters of 70% ethanol until the simplicia was completely

submerged. The extraction process was carried out for 3×24 hours, the extract solution was then filtered to separate the macerate from the residue. Then the soaking process was repeated until the color of the solvent remained clear. The macerate is then put into a rotary evaporator to evaporate the solvent and a thick extract is obtained.

**Preparation of test animals**

The test animals used were male Swiss websters/ mice weighing 20-30 g, which has been acclimatized for a week. All test animals were given drink and standard feed ad libitum. Mice that had been adapted for 1 week were fasted for 8 hours and then the initial rectal temperature of the mice was measured.

**Extract Preparation**

The thick extract that has been weighed according to the dose is suspended with 0.5% Na CMC. The extract suspension was then put into a 10mL volumetric flask and distilled water was added up to the mark. The results obtained doses of Ipomoea batatas L. extract of 100 mg/kg, 200 mg/kg, and 300 mg/kg

**Peptone Induction 5%**

Before induction, the rat's body temperature was recorded. Induction was carried out by injecting 5% peptone in a normal saline solution subcutaneously. The body temperature of the mice was measured and recorded again after 180 minutes. The body temperature of mice that experienced a minimum increase of 0.3 °C from the initial temperature before induction was used as a test.

**Examination of phytochemical screening**

1. **Identification of flavonoids**
   Identification of flavonoids can be done by the Wilstater test, bate-smith test, and 10% NaOH test. Identification of flavonoids with the Wilstater test showed positive results which were indicated by the formation of an orange color, while the Bate-Smith test showed positive results which were indicated by the formation of a red color.
2. **Identification of alkaloids**
   Identification of alkaloids can be done by adding H2SO4 and Dragendorff reagent to the extract after being tested positive for containing alkaloid compounds because it produces a red-orange color change.

**Examination of the temperature drop**

The extract suspension was given orally according to the weight of the test rats. The negative control can be given the same amount of Na.CMC orally, while the positive control can be given paracetamol suspension orally. The body temperature of the mice after treatment was measured in several time intervals (30, 60, 90, and 120 minutes). The results of reducing the body temperature of mice obtained were then compared between the test group and the positive control. Mice were fasted and the initial temperature (T0) was measured and then induced by 5% peptone subcutaneously Mice were measured rectal temperature (T1), and mice with fever were characterized by fever above 37 $^0$C. Mice were given treatment K1, K2, K3, K4, and K5. Rectal temperature measurements were carried out at 30, 60, 90, 120, 150, and 180 minutes. The percentage decrease in rectal temperature was calculated.

Calculated using the formula:

$$\% \text{ Percentage of temperature drop} = (T1 - Tn) \,/\, T1 \times 100\%$$

Information:
T1: temperature of mice after induced peptone 5%
Tn: temperature of mice at the 30th, 60th, 90th, 120th, 150thand 180th minute

**Research design**

This study used a laboratory experimental quantitative approach with a post-test-only control group design in antipyretic activity mice in vivo. The test group was divided into five groups: Negative control (K1) was given CMC Na 0.5%. The positive control (K2) was given 1.3 mg paracetamol. (K3) Ipomoea

batatas L group. dose of 100 mg/kg BW. (K4) the 200 mg/kg BW group. (K5) the 300 mg/kg BW group.

The research design schematic was shown in Figure 1

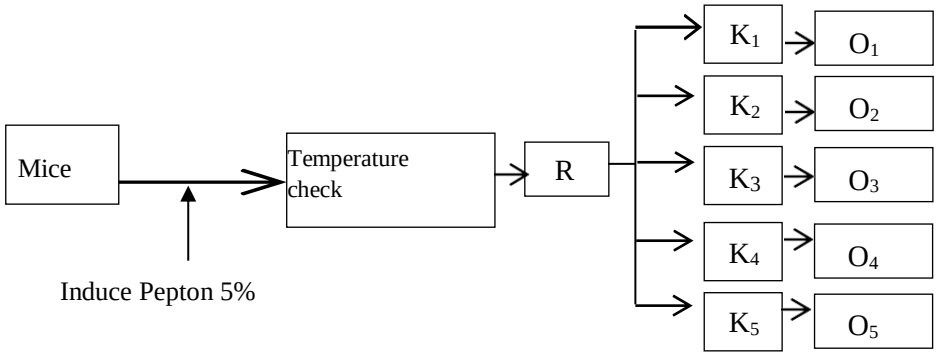


**Figure 1.** Research design

Information:
R: Randomization
K1 : Negative control (Na. CMC)
K2 : Positive control (Paracetamol)
K3 : Ipomoea batatas L. dose 100mg/kgBW
K4 : Ipomoea batatas L. dose 200mg/kgBW
K5 : Ipomoea batatas L. dose 300mg/kgBW
O1 – O5 = Observe for decreased body temperature

## Ethical considerations

This research was conducted after obtaining approval from the Commission on Ethics for Health Research, University of Muhammadiyah Purwokerto. Ethical clearance with registration number KEPK/UMP/84/III/2022

## RESULTS AND DISCUSSION

The results of the phytochemical screening on Ipomoea batatas L. were positive for secondary metabolites, namely flavonoids, and alkaloids, Flavonoids have an antipyretic effect and act as cyclooxygenase (COX) inhibitors which act as triggers for the formation of prostaglandins (Oktapianti et al., 2016). Alkaloids have an antipyretic effect by inhibiting the cyclooxygenase enzyme, preventing the formation of prostaglandins as mediators in response to an increase in body temperature (Sedu et al., 2020). Fever is the body's response to infection and foreign molecules in the body. It is characterized by an increase in prostaglandins in certain areas of the brain, increasing body temperature. Prostaglandins play an important role in the febrile process. The mechanism of fever occurs when the blood vessels surrounding the hypothalamus are exposed to certain exogenous pyrogens, causing the metabolite arachidonic acid to be released from the endothelial cells into the vascular tissue. Metabolites such as prostaglandins cross the blood-brain barrier and diffuse into the temperature control center of the hypothalamus. The release of prostaglandins alters the hypothalamic thermoregulatory center by increasing its set point. At some level, the hypothalamus sends sympathetic signals to the peripheral vessels. Peripheral blood vessels respond by vasoconstriction, which reduces heat loss through the skin. This further increases body temperature as prostaglandins are continuously released in the hypothalamus.

**Result examination of phytochemical screening**

**Table 1.** Result of phytochemical screening

| No. | Group of chemical compounds | Reagent | Interprestasion | Result |
|---|---|---|---|---|
| 1. | Flavonoid Wilstater | | | |
| | | Mg + HCl | Orange Dark red | + |
| | BateSmith | | Black Green | |
| | | Concentrated HCl is heated | | + |
| | NaOH 10% | | | |
| | | NaOH 10% | | + |
| 2. | Alkaloid | H2SO4 + Dragendorff | Orange Red Precipitate | + |

**Result examination of temperature drop**

**Antipyretic Activity Test**

In this study, the decrease in rectal temperature was measured from 30, 60, 90, 120, 150, and 180 minutes using a digital thermometer. The average results of decreasing rectal temperature are presented in Table 2.

**Table 2.** Result of lowering the temperature

| Groups | Themperature Measurement | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | T0 | T1 | 30' | 60' | 90' | 120' | 150' | 180' |
| K1 | 35,9 | 37,7 | 36,6 | 36,2 | 36,1 | 36,2 | 35,6 | 35,7 |
| K2 | 35,7 | 37,8 | 34,8 | 35,2 | 35,6 | 35 | 34,8 | 33,8 |
| K3 | 36,2 | 38,0 | 37,2 | 37,4 | 36,1 | 36,3 | 35,8 | 35,7 |
| K4 | 36,5 | 38,0 | 37,3 | 36,8 | 37,0 | 36,5 | 35,8 | 35,0 |
| K5 | 35,7 | 38,0 | 35,8 | 35,2 | 34,9 | 34,9 | 34,4 | 34,1 |

Information:
T0: temperature of mice before induce pepton 5%
T1: temperature of mice after induced peptone 5%

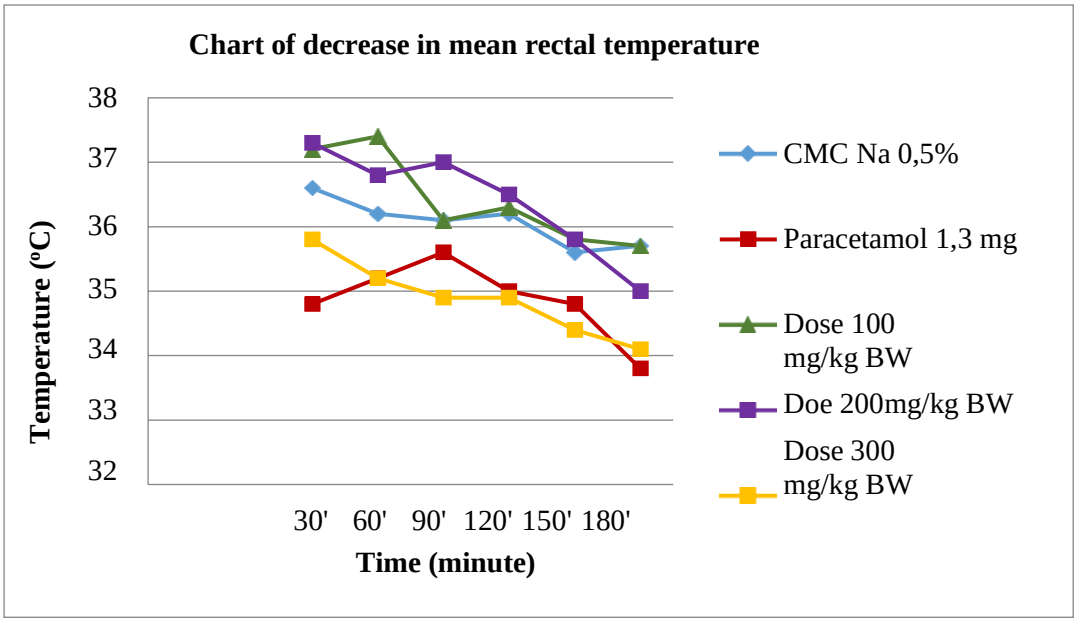


**Figure 2.** Chart of decrease in mean rectal temperature

The results showed a decrease in rectal temperature in all treatment groups the positive control group

which was given a dose of 1.3 mg paracetamol in the 180th minute from a fever temperature of 37.8 $^{o}$C down to a temperature of 33.8$^{o}$ C was the fastest decrease in temperature when compared to all treatment groups. The research results of Hastuti & Endrawati, (2018) that paracetamol works by inhibiting the cyclooxygenase enzyme. This results in the hypothalamic point cells being lowered back to normal so that the order to produce heat above normal and the reduction in heat expenditure no longer exists.

### Percentage drop in temperature

**Table 3.** Percentage of Decrease in Average Rectal Temperature

| Groups | Percentage of Decrease in Average Rectal Temperature (%) minute | | | | | |
|---|---|---|---|---|---|---|
| | 30 | 60 | 90 | 120 | 150 | 180 |
| K1 | 2,97 | 4,11 | 4,18 | 3,78 | 5,70 | 5,24 |
| K2 | 7,75 | 6,91 | 5,78 | 7,27 | 7,82 | 10,53 |
| K3 | 2,22 | 1,58 | 5,18 | 4,66 | 5,92 | 6,18 |
| K4 | 1,89 | 3 | 2,63 | 3,85 | 5,65 | 7,75 |
| K5 | 5,83 | 7,21 | 7,99 | 8,23 | 9,52 | 10,17 |

Information:
K1: Na.CMC
K2: Paracetamol
K3: dose 100mg/kgBW,
K4: dose 200mg/kgBW,
K5: dose 300mg/kbBW

### Analysis of normality and homogeneity of the percentage of temperature drop.

The data normality test for the percentage of temperature drop performed with Shapiro-Wilk, with p-value> 0.05, indicates that the data is normally distributed presented in Table 4. As for data homogeneity, post hoc test results were obtained with a p-value >0.05.

**Table 4.** *Normality of data with Shapiro-Wilk test*

| Groups | Variable |
|---|---|
| | Percentage of temperature drop |
| K1 | 0,936 |
| K2 | 0,246 |
| K3 | 0,367 |
| K4 | 0,524 |
| K5 | 0,725 |

Information:
K1: Na.CMC
K2: Paracetamol
K3: dose 100mg/kgBW
K4: dose 200mg/kgBW,
K5: dose 300mg/kbBW

Indicating that the data obtained for the percentage of temperature drop is homogeneous, as shown in Table 5

**Table 5.** Data homogeneity by post hoc test

| Parameter | Variable |
|---|---|
| | percentage of temperature drop |
| p-value | 0.210 |

After the one-way ANOVA test was carried out, it was continued with the Post Hoc Test with LSD

(Least Square Difference) at a significant level <0.05 which aims to determine significant group differences between treatment groups, as shown in Table 6.

**Table 6.** Results of post hoc Test With data analysis with LSD (Least Square Difference)

| Groups | K2 | K3 | K4 | K5 |
|---|---|---|---|---|
| K1 | 0,000* | 0,337 | 0,008* | 0,000* |
| K2 | | 0,000* | 0,004* | 0,667 |
| K3 | | | 0,057 | 0,000* |
| K4 | | | | 0,010* |

K1: Na.CMC
K2: Paracetamol
K3: dose 100mg/kgBW
K4: dose 200mg/kgBW,
K5: dose 300mg/kbBW

## CONCLUSION

*Ipomoea batatas* L. extract is proven to contain secondary metabolites of flavonoids, alkaloids which have antipyretic activity. The dose of 300 mg proved to be statistically not significantly different from the positive control given Paracetamol 1.3 mg

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## AUTHORS' CONTRIBUTION

Dian Arsanti Palupi: conceptualization, supervision, methodology, data curation, data analysis, validation,writing-original draft & editing. Anis Retnosari: conceptualization, supervision, data analysis, writing-review & editing. Rifda Naufa Lina: conceptualization, methodology, data curation, data analysis, writing-review & editing. Hasty Martha Wijaya: conceptualization, methodology, data curation, data analysis, writing-review & editing. Anis Retnosari: project administration, data curation, data analysis, writing-review & editing. Heni Setyoningsih: project administration, data curation, data analysis, writing-review & editing.