

THE ANTHELMINTIC EFFECTS OF ETHANOL EXTRACT OF *CURANGA FEL-TERRAE* LEAVES ON *ASCARIDIA GALLI*

POPI PATILAYA^{1*}, DADANG IRFAN HUSORI², IMAM BAGUS SUMANTRI¹

¹Department of Pharmaceutical Biology, Faculty of Pharmacy, Universitas Sumatera Utara, Medan, Indonesia. ²Department of Pharmacology, Faculty of Pharmacy, Universitas Sumatera Utara, Medan, Indonesia. Email: popi.patilaya.usu.ac.id

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ABSTRACT

Objective: This study was to investigate the anthelmintic effects of ethanol extract of *Curanga fel-terrae* leaves on *Ascaridia galli*.

Methods: Extract of *C. fel-terrae* was prepared by percolating the dried powder of the plant leaves. To observe anthelmintic effects, *A. galli* was exposed to the plant extract solutions in different concentrations at room temperature for 72 hrs. Sodium chloride 0.9%, sodium carboxymethyl cellulose 0.5%, and albendazole 0.1% were served as negative control, solvent control, and positive control, respectively. The anthelmintic effects were determined by observing the time taken for paralysis and the time taken for death of *A. galli* during experiment.

Results: The results demonstrated that there were no different effects between negative and solvent controls. However, the ethanol extract of *C. fel-terrae* leaves exhibited significantly paralysis and death effects toward *A. galli*. The plant extracts at the concentration of 100 mg/ml showed similar anthelmintic effects with albendazole 0.1%. This study also indicated that the paralysis and death effects of plant extract were shorter when the worms exposed with the concentration above of 100 mg/ml.

Conclusion: This study indicated that the ethanol extract of *C. fel-terrae* leaves has potential anthelmintic effects on *A. galli*.

Keywords: *Curanga fel-terrae*, *Ascaridia galli*, Anthelmintic, Helminthiasis, Ascariasis.

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INTRODUCTION

The World Health Organization reported that ascariasis is commonly parasitic infection disease of human with highest cases occur in tropical and subtropical countries. It is estimated around 60,000 people deaths by severe ascariasis infections, mainly in children [1]. Ascariasis also remains a health problem in Indonesia with the frequency cases about 75%. Because of chronic ascariasis, children experience impaired growth and development due to decreased food intake [2]. Arizono *et al.* have studied that human ascariasis is a result of infection with pig-derived ascaris such as *Ascaris lumbricoides*, *Ascaris suum*, and *Ascaridia galli* [3].

The emergence of helminthes resistance to currently available anthelmintic agents leads to an increasing of natural anthelmintic demand [4].

Curanga fel-terrae (Lour.) Merr. which is known as *Pugun tanoh* or *poguntano* by Indonesian people belongs to family Linderniaceae [5,6]. The leaf of plant is traditionally used for helminthiasis treatment [7]. Preliminary study indicated that the leaf ethanol extract of *C. fel-terrae* has potential anthelmintic activity against an earthworm, *Pheretima phostuma*. This effect may due to the presence of phytochemical compounds such as flavonoids, saponins, tannins, glycosides, and dan steroids [8]. However, anthelmintic effects of the leaf ethanol extract of Indonesian *C. fel-terrae* on human parasitic worms have not been studied.

This work was to study the anthelmintic effects of the leaf ethanol extract of *C. fel-terrae* against *A. galli*. Although *A. galli* is the common helminth parasites in fowls [9], but this worm has similarity with *A. lumbricoides* in morphological and physiological properties [10]. Because of this reason, *A. galli* is used as animal model in our experiment.

MATERIALS AND METHODS

Plant materials

Leaves of *C. fel-terrae* were collected from Dairi District, North Sumatra Province, Indonesia. The species was authenticated and deposited by the Herbarium Department of Indonesian Institute of Sciences.

Chemicals

Chemical used in this study namely 96% ethanol, saline, and sodium carboxymethyl cellulose (Na-CMC) were purchased from Merck, UK. Standard albendazole was obtained from Indofarma Pharmaceutical Industry, Indonesia.

Preparation of plant extract

The cleaned leaves of *C. fel-terrae* were dried on oven with air circulation at 40°C and then powdered with electrical grinder. The dried leaf powder was extracted by percolating with 96% ethanol at room temperature. Filtrate was then concentrated in a rotary evaporator at 40°C to obtain the crude extract of plant leaves.

Phytochemical screening

Phytochemical screening method from Tiwari *et al.* was adopted to identify chemical compounds of the ethanol extract of *C. fel-terrae* leaves, such as alkaloids, flavonoids, glycosides, saponins, tannins, and terpenoids/steroids [11].

Evaluation of anthelmintic effects

A. galli were obtained from a local slaughterhouse in Medan, Indonesia. The worms were identified by the Zoology Department of Universitas Sumatera Utara. Before experiment, *A. galli* were acclimated in saline at room temperature for 1 hr. To investigate anthelmintic effects, the worms were divided into six groups in which each group contain three worms. Group I was exposed to saline (negative control), Group II was

Table 1: Anthelmintic effects of the ethanol extract of *C. fel-terrae* leaves on *A. galli*

Treatment	Time taken for paralysis (hr) ± SD	Time taken for death (hr) ± SD
Saline	30.78±1.59*	38.03±0.33*
Na-CMC 0.5%	30.74±0.53*	38.08±0.18*
Ethanol extract (100 mg/ml)	5.08±0.87	10.47±0.32
Ethanol extract (200 mg/ml)	3.96±0.28	8.39±0.84*
Ethanol extract (300 mg/ml)	2.49±0.09*	6.93±0.57*
Albendazol 0.1%	4.61±0.47	10.26±1.01

All data are presented as the average value of three replicates (n=3). *p<0.05 compared with albendazole 0.1%, SD: Standard deviation, *C. fel-terrae*: *Curanga fel-terrae*, *A. galli*: *Ascaridia galli*

exposed to Na-CMC 0.5% in saline (solvent control), and Group III was exposed to albendazole 0.1% (positive control). Groups IV-VI were separately exposed to the ethanol extract of *C. fel-terrae* leaves at the different doses (100, 200, and 300 mg/ml). The anthelmintic effects were evaluated by observing the time taken for paralysis, and the time taken for death of the worms at room temperature for 72 hrs.

Statistical analysis

All data were expressed as mean±SD. The data of each group were statistically analyzed using analysis of variance followed by *post hoc* test Tukey honest significant difference multiple comparison tests. Values were classified as significantly different if p<0.05.

RESULTS

Phytochemical compounds

The results of phytochemical test indicated that the leaf ethanol extract of *C. fel-terrae* contain flavonoids, glycosides, saponins, tannins, and steroids.

Anthelmintic effects

As shown in Table 1, there were no different effects on *A. galli* between saline (negative control) and Na-CMC 0.5% (solvent control). During observation, the ethanol extract of *C. fel-terrae* leaves significantly produced paralysis and death effects toward *A. galli* compared with these controls. The plant extract at the concentration of 100 mg/ml have similar anthelmintic effects with albendazole 0.1%. In addition, the paralysis and death times were shorter when on *A. galli* exposed to the plant extract at concentrations of 200 mg/ml and 300 mg/ml. The results also indicated that the time taken for paralysis and the time taken for death on the worms declined with the increasing concentrations of the plant extract.

DISCUSSION

This study identified the presence of flavonoids, glycosides, saponins, tannins, and steroids in the leaf ethanol extract of *C. fel-terrae*. Few compounds of this plant leaves such as flavonoid glucuronides [12], dehydrobryogenin glycoside, cucurbitacin [13,14], triterpenoid saponins [15], and β-sitosterol [16] also isolated by other researchers. The *C. fel-terrae* also contain acid compounds mainly heptadecanoic acid, butanedioic acid, docosanoic acid, and hydroxycinnamic acid [17]. Those compounds may contribute to anthelmintic effects of the plant extract on human parasitic worms [18,19].

Our study also noted that *A. galli* paralyzed and finally death, when exposed to the ethanol extract of *C. fel-terrae* leaves in the experimental condition. These effects are specific for substances which have anthelmintic activity [20]. Thereby, it indicates that *C. fel-terrae* leaves very potential as anthelmintic source. Other plant species also reported to have anthelmintic effects on *A. galli*. Subash *et al.* found at that 100 mg/ml of ethanol extracts of *Eupatorium triplinerve* and *Alpinia galanga* exhibited anthelmintic effect on *A. galli* with the death time of 2.54 hrs and above 3.00 hrs, respectively [21]. Leaf methanol extract of Chinese violet (*Asystasia gangeticum*) at the experimental concentration of 100 mg/ml led to paralysis and death effects on *A. galli* at 0.27 hrs and 0.55 hrs, respectively [22]. *A. galli* was paralyzed at 1.75 hrs and death at 3.09 hrs, when exposed to 100 mg/ml of the leaf ethanol

extract of Indonesian *Allium fistulosum* [23]. According to Kumar *et al.*, methanol extracts of *Cicer arietinum* seeds (100 mg/ml) able to paralyze and kill *A. galli* at 0.14 hrs and 0.64 hrs, respectively [24]. While 100 mg/ml of hydroalcoholic extract of *Valeriana jatamansi* leaves showed anthelmintic effects with the time of paralysis was 0.20 hrs and the time of death was 0.45 hrs [25]. In this case, although the anthelmintic effects of ethanol extract of *C. fel-terrae* on *A. galli* are weaker than the such plant extracts, but further studies are still needed to discovery its bioactive compounds.

The presence of phytochemical compounds such as polyphenols, tannins, saponins, and glycosides may contribute to anthelmintic activity of plant extracts [26-28]. Anthelmintic activity of other Linderniaceae species, such as *Lindernia ruellioides* (Closm.) Pennel., also reported by Goel *et al.* (2002) [29]. Potential anthelmintic activity of plant extracts may due to the presence of tannins content in high concentration [30]. Tannins is able to disturb the metabolism of ascaris species through oxidative phosphorylation reaction [31]. In addition, tannins can also bind to free protein nutrition which leads to larval starvation [32]. Flavonoids can interact with the free proteins of gastrointestinal host or glycoproteins on the worm's cuticula and blocking tubulin polymerization causing the worm death [33]. Saponins cause vacuolization and disintegration of the tegumental worm through changing of their cell membrane permeability [34]. Glycosides and steroids are antioxidant agents that decrease nitrate production, it leads to the inhibition of worm development [35]. The action mechanism of natural anthelmintic agents also involves inhibition of glucose up take system that causing the lost energy of worm [36]. Breaking of mucopolysaccharide membrane structure of helminths will restrict their movement which may cause paralysis and finally the worms death [37]. According to Kundu *et al.* (2015) and Swargiary and Roy (2012), phytochemicals are also involved in blocking of attachment of the parasitic worm to host by damaging of worm's tegumental surface [38]. The effects also involve the change of phosphatase enzymes in the tegument of parasites [39]. However, so far, action of mechanism of the ethanol extract of *C. fel-terrae* leave is unknown.

CONCLUSION

This study indicates the potential anthelmintic effects of leaf ethanol extract of *C. fel-terrae* on *A. galli*.

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