ISSN: 2322 - 0902 (P)
ISSN: 2322 - 0910 (O)

International Journal of Ayurveda and Pharma Research

Research Article

THE ANTHELMINTICS EFFECT OF *MOMORDICA CHARANTIA* L. LEAVES AND *ANDROGRAPHIS PANICULATA* NESS. FROM INDONESIA

Canny Nur Chastity[1]*, Karsa Lugi Yuwono[1], Ummi Utami[1], Prala Ayu AP[1], Wildan Priscillah[1], Em Sutrisna[2]

*[1]Medical student of Faculty of Medicine of Universitas Muhammadiyah Surakarta, Indonesia.

[2]Senior lecturer of Department of Pharmacology of Faculty of Medicine of Universitas Muhammadiyah Surakarta, Indonesia.

Received on: 20/05/2015 Revised on: 10/06/2015 Accepted on: 21/06/2015

ABSTRACT

Momordica charantia L. leaves and *Andrographis paniculata* Ness*.* leaves were traditionally used as anthelmintic in Indonesia.

Objective: This study aims at examining the anthelmintic effects of 70% ethanolic extract of *Momordica charantia L.* leaves and *Andrographis paniculata* Ness. leaves.

Material and Method: This research was an experimental research with only post test controlled group design. The samples were 72 Ascaris suum worms, divided into 8 groups. The first group was treated by NaCl 0.9% solution as negative control, the second group was treated by pyrantel pamoate as positive control in 0.236 % concentration. The third, fourth and fifth group were treated by 70% ethanolic extract of *Momordica charantia* L. in 20%, 40%, 80% concentrations respectively. The sixth, seventh and eighth groups were treated by 70% ethanolic extract of *Androgaphis paniculata Ness*. in 20%, 40% 80% concentrations respectively. Data were collected by observation of total mortality time of *Ascaris suum* worm every 1 hour. The anthelmintic effects test analysis is performed by Kruskal Wallis test and followed by Mann Whitney test with significancy level at p <0.05.

Result: There are is significant difference between the 70% ethanolic extract of *Momordica charantia L* (20%, 40%, 80%) and *Andrographis paniculata Ness.* (20%,40%,80%) with control negative with P value <0.05 by Mann whitney test.

Conclusion: The 70% ethanolic extract of *Momordica charantia L.* and *Andrographis paniculata* Ness. leaves have potential as anthelmintic.

KEYWORDS: *Momordica charantia* L.*, Andrographis paniculata* Ness.*,* Ascaris suum, anthelmintic effect.

INTRODUCTION

Helminthic infection is one of health problems in the world. The most common helminthic infection is Ascariasis, which is caused by Ascaris worm. This is estimated to infect about 0.8-1.22 billion people, with an estimated prevalence of 25%[1]. The prevalence of ascariasis is highest in children aged 2-10 years, with the highest intensity of infection occurring in children aged 5-15 years who have simultaneous infections with other soil-transmitted helminths such as *Trichuris trichiura* and hookworm[2]. Usually present with no specific symptom, ascariasis mostly occurs in children of tropical and developing countries, where they are perpetuated by contamination of soil by human feces or use of untreated feces as fertilizer[3]. Symptoms that show on ascariasis include growth retardation, pneumonitis, intestinal obstruction, or hepatobiliary and pancreatic injury. Ascariasis may exist as a zoonotic infection corelated with pigs and use of hog manure[4]. Children with a marginal diet may be susceptible to protein, caloric, or vitamin A deficiency, resulting in retarded growth and increased susceptibility to infectious diseases such as malaria[5]. Even though if estimates of disability-adjusted years of life due

to ascariasis have fallen because of development and management programs during the 1990s, especially in Asia, but still constitute a significant burden in some countries and might be equivalent to malaria or tuberculosis worldwide[2]. Large and tangled worms may cause intestinal (usually ileum), common duct, pancreatic, or appendiceal obstruction. Mean worm burden varies from more than 16 to 4 and appears related to host factors, particularly age, geophagy[6], and immunity. Worms do not multiply their quantity in the host body. An infection case that persists more than the 2-year maximum lifespan of the worms, is predicted caused by re-exposure. Some children look very severely infested, it may caused by multiple cumulative exposures over time and/or relative immunodeficiency[7].

Ascaris suum, a swine nematode, has been suspected responsible for zoonotic infection. It is difficult to differentiate between *A. lumbricoides* and *A. suum* is difficult, because the difference between them are only 6 (1.3%) nucleotides in the first internal transcribed spacer (ITS-1) and by 3%-4% in the mitochondrial genome sequence[7]. A suum appears to cause nearly in all ascariasis cases in well-developed countries with excellent sanitation (e.g., Denmark[8], United States[4], UK[9]). In the cases like this, those who are infected will only have a low worm burden and may present with not too severe manifestation, such as cough, acute eosinophilia, or eosinophilic liver lesions visible on CT scans. However, a molecular genetic study from China casts doubt that infections in pigs are the cause of most human infection[10].

Momordica charantia L. (family: Cucurbitaceae) is a tropical and subtropical plant distributed in Asia, Africa, South America, Caribbean countries and commonly known as Pare in Indonesia. The plant is harvested for its bitter fruits, which usually used as a vegetable. Since ancient times, different parts of M. charantia are used in traditional medical management of diverse human diseases[11]. Fruit, leaf, seeds of the plant used as anthelmintic in different traditional medicinal systems[12,13,14]. Previous biological studies of *M. charantia* occured that the plant parts possess anti-oxidant[15,16], anti-diabetic[17,18], anti-obesity[19], anti-viral[20], anti-bacterial[21], insecticidal[22], anti-cancer[23], anti-tumor[24], anti-depressant and anxiolytic[25], anti-fertility[26], wound healing[27], analgesic and anti-pyretic[28] activity. M. charantia contains many potential pharmacologically active substances such as charantine, goyaglycoside, mormodicoside, mormodicoside 3β, 25-dihydroxy-5β, 19-epoxycucurbita-6, (23E)-diene, momordicine-I, karavilagenin, karavilagenin C, karaviloside, karaviloside, kuguacin, kuguacin A, kuguacin B, kuguacin E[13,29], 3,7,23-trihydroxy-cucurbita-5,24-diene-19-al[29], 3,7,25-trihydroxy-cucurbita-5, 23-diene-19-al[29], 3,7-dihydroxy-25-methoxycucurbita-5, 23-diene-19-al[29]. Ethanol extract of *Momordica charantia L.* has investigated for in vitro anthelmintic effect against Ascaris suum[30]. Another study reported that plant extract has better anthelmintic effect against A. galli than piperazine hexahydrate[31].

Andrographis paniculata Nees, ussually known as the "king of bitters," is an herbaceous plant belonging to the Acanthaceae and is found throughout tropical and subtropical Asia, Southeast Asia, and India. The predominant chemical substances exist in A. paniculata are andrographolide, andrographin, panicolin, andrographolide, deterpene glucoside-neoandrographolide, andrographidihnes, neoandrographolide, chlorogenic, myristic acide, homoandrographolide, andrographiside andropanoside, etc. A. paniculata are also available in the market to cure various diseases. This plant has antimalarial[32], anti-inflammatory, antioxidant[33], antihepatitic[34], antihyperglycemic[35], anthelmintic[36], antibacterial[37], antipyretic[38], and anticancer activity[39]. Antihelminthic effect of the extract may be attributed to the phytochemical substances such as sterols and terpenes, polyphenols, flavonoids, tannins saponins, and alkaloids. These compounds would be having strong activity due to the phytochemicals and could explain the antihelminthic activity of the plant. However, more detailed phytochemical analysis and experiments are required to isolate and characterize each active compound which is responsible for the antihelminthic activity and to know the exact mechanisms of action of this antihelminthic activity[40].

In tropical developing countries helminthic infections causes a serious health problem for human. Even though gastrointestinal helminthic infections are not responsible for significant morbidity and mortality but they may cause a rather severe effects, for example malabsorption diarrhea, anemia and other states of poor health[41,42]. Although there are already a number of synthetic medicines for human, but it still do not distribute worldwide evenly, especially

in remote areas people still cannot afford it. Another key problem is drug resistance that often happens in case of managing parasite infections. In this context, use of medicinal plants tender a foremost and accessible source of health care to people[41,42,43].

MATERIAL AND METHOD

Material

The plants used in this research were *Momordica charantia* L. and *Andrographis paniculata* Ness. were harvested from Karanganyar, Central Java, Indonesia in January 2015. The animal test were Ascaris suum obtained from butchery of hogs "Radjakaja" Surakarta.

Preparation of extract

The *Momordica charantia* L. and Andrographis paniculata Ness leaves covered by black flannel cloth were dried under the sun. Once dried, the *Momordica charantia* L. and *Andrographis paniculata* Ness. leaves were blended to obtain the powder. The powder was macerated by 70% ethanolic extract for 4 days. The filtrates were aerated in the vacuum evaporator until thick extract was obtained. Extraction process was done in laboratory of Pharmacology of Faculty of Medicine of University Muhammadiyah Surakarta.

A total of 72 Ascaris suum were divided into 8 groups. Each group consists of 9 worms. All worms treated by extract / control appropriated test group, namely:

1.	Negative control	:	NaCl 0.9% 12.5 ml
2.	Positive control	:	Pyrantel Pamoate 0.236%
3.	Group III	:	The 70% ethanolic extract of Momordica charantia in 20% concentrations
4.	Group IV	:	The 70% ethanolic extract of *Momordica charantia* in 40% concentrations
5.	Group V	:	The 70% ethanolic extract of Momordica charantia in 80% concentrations
6.	Group VI	:	The 70% ethanolic extract of Andrographis paniculata Ness. in 20% concentrations.
7.	Group VII	:	The 70% ethanolic extract of Andrographis paniculata Ness. in 40% concentrations
8.	Group VIII	:	Ethanolic extract of Andrographis paniculata Ness. in 80% concentrations

Anthelmintic test

Worms treated according to group giving all treatments carried out for 24 hours. To see if the worm has died after being put in the liquid extract, the worms are disturbed by stir bar every hour. The worm is said to still be alive if they move on and for the non-moving worm, the worm is immersed in distilled water 50° C, otherwise paralysis if after soaked and then stirred back worms will move and declared dead when once disturbed, remain there for the movement of the worms.

Data were collected by recording the number of worms that die when do the treatment. Recording is done every hour by counting the number of worms that die every hour.

Statistical analysis

The data of anthelmintic test were expressed by ± SD and anthelmintic test was analyzed by Kruskal Wallis followed by Mann Whitney test.

RESULTS AND DISCUSSION

Result

In the process of maceration of *Momordica charantia L* with 70% ethanol in get 450 grams of liquid extract of 1.8 kg of dried leaves and to *Andrographis paniculata* Ness. with 70% ethanol in get 580 grams of liquid extract of 2 kg dry leaves.

The 70% ethanolic extract of *Momordica charantia* L. leaves and *Andrographis paniculata* Ness. leaves can be seen in figure 1.

Figure 1: The 70% ethanolic extract of *Momordica charantia* L. leaves and *Andrographis paniculata* Ness. leaves

Anthelmintics effect of *Momordica charantia* L. leaf and *Andrographis paniculata* Ness. leaf can be seen in figure 2 and Table 1.

Figure 2: Ascaris suum worm

Table 1 : The time of death of worms after the treatment

Groups	Mean ± SD of time of death worm (hours)	* P values (vs. negative control)
Negative control	24 ± 0	
Positive control (pyrantel pamoate)	3.67 ± 2.45	0.000
The 70 % ethanol extract of *Momordica charantia* L. 20 %	16.44 ± 9.57	0.012
The 70 % ethanol extract of *Momordica charantia* L. 40 %	12 ± 9.81	0.002
The 70 % ethanol extract of *Momordica charantia* L. 80 %	9.89 ± 7.85	0.000
The 70% ethanol extract of *Andrographis paniculata* Ness. 20 %	15.22 ± 9.32	0.001
The 70% ethanol extract of *Andrographis paniculata* Ness. 40 %	10.89 ± 8.88	0.000
The 70% ethanol extract of *Andrographis paniculata* Ness. 80 %	5.89 ± 5.84	0.000

* P value of the test Man Whitney

From the Kruskal Wallis test, it is showed a significant with a P value of 0.000 ($P < 0.05$). Based on Table 1 obtained significant difference between groups 70 % ethanol extract of *Momordica charantia* L. and 70% ethanol extract group *Andrographis paniculata* Ness. to the negative control ($P < 0.05$).

It can be concluded that the 70% ethanol extract of *Momordica charantia L* group and the group *Andrographis paniculata* Ness. can be used as anthelmintics.

DISCUSSION

The result of anthelmintic effect test of 70% ethanol extract of *Momordica charantia* L. and *Andrographis paniculata* Ness. leaves of this

research is linear with previous study. The result shows that extract of *Momordica charantia* L. and *Andrographis paniculata Ness* leaves can influence the speed of the worm mortality compared with negative controls. So that extracts of *Momordica charantia* L. and *Andrographis paniculata* Ness. leaves have the anthelmintic effects.

The anthelmintic effect of this research is linear with previous research among others: Androghapis paniculata Ness. leaves known to contain saponins, tannins, and andrografolid. Saponins can be potentially act as anthelmintics for work by inhibiting the enzyme acetylcholinesterase, so the worm will become muscle paralysis and lead to death. Alkaloids tannin has the effect of anthelmintics by means of the worm body protein agglomerate. This activity can interfere with the metabolism and homeostasis in the body worm, so the worms will die. While andrografolid which is a bitter substance on bitter herbs can kill worms to cause alkaline conditions of the intestine, causing conditions uncomfortable for the life of worms. Besides, andrografolid also act as immunomodulators and antioxidants.

Momordica charantia L. leaves contain compounds that are anthelmintic such as saponins, tannins, flavonoids and triterpene glycoside[45]. Saponins may irritate the mucous membrane channel gastrointestinal worms that interfere with the absorption of food[46]. While the tannins can free protein binding in the intestinal tract that can lead to the death of worms. Flavonoid compounds may lead to the degeneration of neurons in the worm's body resulting in the death of worms anyway[47]. Triterpene glycosides in bitter melon leaves also can cause inhibition of spontaneous motility in the worms[48]. All this will eventually cause the worm into paralysis or death.

CONCLUSION

70% ethanol extract of *Momordica charantia* L. and *Andrographis paniculata Ness* leaves has the effect of anthelmintics.

ACKNOWLEDGEMENTS

We would like to thank to Indonesian Directorate General of Higher Education as funders of our research.

REFERENCE

1. Bethony J, Brooker S, Albonico M, Geiger SM, Loukas A, Diemert D, et al. Soil-transmitted helminth infections: ascariasis, trichuriasis, and hookworm. Lancet. May 6 2006;367(9521):1521-32.
2. Olds GR. Deworming the world. Trans Am Clin Climatol Assoc. 2013;124:265-74.
3. Walker M, Hall A, Basáñez MG. Individual predisposition, household clustering and risk factors for human infection with Ascaris lumbricoides: new epidemiological insights. PLoS Negl Trop Dis. Apr 26 2011;5(4):e1047.
4. Notes from the field: ascariasis associated with pig farming - Maine, 2010-2013. MMWR Morb Mortal Wkly Rep. May 24 2013;62(20):413.
5. Le Hesran JY, Akiana J, Ndiaye el HM, et al. Severe malaria attack is associated with high prevalence of Ascaris lumbricoides infection among children in rural Senegal. Trans R Soc Trop Med Hyg. Jul 2004;98(7):397-9.
6. Geissler PW, Mwaniki D, Thiong F, et al. Geophagy as a risk factor for geohelminth infections: a longitudinal study of Kenyan primary schoolchildren. Trans R Soc Trop Med Hyg. Jan-Feb 1998;92(1):7-11.
7. Dold C, Holland CV. Ascaris and ascariasis. Microbes Infect. Jul 2011;13(7):632-7.
8. Nejsum P, Parker ED, Frydenberg J, et al. Ascariasis is a zoonosis in denmark. J Clin Microbiol. Mar 2005;43(3):1142-8.
9. Bendall RP, Barlow M, Betson M, Stothard JR, Nejsum P. Zoonotic ascariasis, United kingdom. Emerg Infect Dis. Oct 2011;17(10):1964-6.
10. Peng W, Yuan K, Hu M, et al. Recent insights into the epidemiology and genetics of Ascaris in China using molecular tools. Parasitology. Mar 2007;134:325-30.
11. Momordica charantia (bitter melon). Monograph. Altern Med Rev 2007;12:360-3.
12. Paul A, Raychaudhuri SS. Medicinal uses and molecular identification of two Momordica charantia varieties – a review. Electron J Biol 2010;6:43-51.
13. Kumar KP, Bhowmik D. Traditional medicinal uses and therapeutic benefits of Momordica charantia Linn. Int J Pharm Sci Rev Res 2010;4:23-8.

14. Kumar DS, Sharathnath KV, Yogeswaran P, Harani A, Sudhakar K, Sudha P, et al. A medicinal potency of Momordica charantia. Int J Pharm Sci Rev Res 2010;1:95-100.
15. Thenmozhi AJ, Subramanian P. Antioxidant Potential of Momordica charantia in Ammonium Chloride-induced Hyperammonemic Rats. Evid Based Complement Alternat Med 2010.
16. Hamissou M, Smith AC, Carter RE Jr, Triplett JK 2nd. Antioxidative properties of bitter gourd (Momordica charantia) and zucchini (Cucurbita pepo). Emir J Food Agric 2013;25:641-7.
17. Virdi J, Sivakami S, Shahani S, Suthar AC, Banavalikar MM, Biyani MK. Antihyperglycemic effects of three extracts from Momordica charantia. J Ethnopharmacol 2003; 88:107-11.
18. Shetty AK, Kumar GS, Sambaiah K, Salimath PV. Effect of bitter gourd (Momordica charantia) on glycaemic status in streptozotocin induced diabetic rats. Plant Foods Hum Nutr 2005;60:109-12.
19. Chan LL, Chen Q, Go AG, Lam EK, Li ET. Reduced adiposity in bitter melon (Momordica charantia)-fed rats is associated with increased lipid oxidative enzyme activities and uncoupling protein expression. J Nutr 2005;135:2517-23.
20. Pongthanapisith V, Ikuta K, Puthavathana P, Leelamanit W. Antiviral Protein of Momordica charantia L. Inhibits Different Subtypes of Influenza A. Evid Based Complement Alternat Med 2013;2013:729081.
21. Mwambete KD. The in vitro antimicrobial activity of fruit and leaf crude extracts of Momordica charantia: A Tanzania medicinal plant. Afr Health Sci 2009;9:34-9.
22. Subramaniam J, Murugan K, Kovendan K. Larvicidal and pupcidal efficacy of Momordica charantia leaf extract and bacterial insecticide, Bacillus thuringiensis against malarial vector, Anopheles stephensi Liston. (Diptera: Culicidae). J Biopesticides 2012;5 Suppl: 163-9.
23. Hussain S, Sharma V, Saxena AK. Fruit part of Momordica charantia possesses remarkable in vitro anticancer efficiency against eight human cancer cells. Int J Plant Sci 2013;8:140-3.
24. Jilka C, Strifler B, Fortner GW, Hays EF, Takemoto DJ. In vivo antitumor activity of the bitter melon (Momordica charantia). Cancer Res 1983;43:5151-5.
25. Ishola IO, Akinyede AA, Sholarin AM. Antidepressant and anxiolytic properties of the methanolic extract of Momordica charantia Linn (Cucurbitaceae) and its mechanism of action. Drug Res (Stuttg) 2014;64:368-76.
26. Adewale OO, Oduyemi OI, Ayokunle O. Oral administration of leaf extracts of Momordica charantia affect reproductive hormones of adult female Wistar rats. Asian Pac J Trop Biomed 2014;4:S521-4.
27. Prashanthi R, Mohan N, Siva GV. Wound healing property of aqueous extract of seed and outer layer of Momordica charantia L. on albino rats. Indian J Sci Technol 2012;5:1936-40.
28. Patel R, Mahobia N, Upwar N, Waseem N, Talaviya H, Patel Z. Analgesic and antipyretic activities of Momordica charantia Linn. fruits. J Adv Pharm Technol Res 2010;1:415-8.
29. Sharma S, Tandon S, Semwal B, Singh K. Momordica charantia Linn: A comprehensive review on bitter remedy. J Pharm Res Opin 2011;1:42-7.
30. Tjokropranoto R, Nathania MY. Anthelmintic effect of ethanol extract of pare leaf (Momordica charantia L.) against female Ascaris suum worm in vitro. J Med Planta 2011;1:33-9.
31. Lal J, Chandra S, Raviprakash V, Sabir M. In vitro anthelmintic action of some indigenous medicinal plants on Ascardia galli worms. Indian J Physiol Pharmacol 1976;20:64-8.
32. Mishra K, Dash AP, Swain BK, Dey N. Anti-malarial activities of Andrographis paniculata and Hedyotis corymbosa extracts and their combination with curcumin. [available at http://www.malariajournal.com/content/8/1/26] Malar J 2009;8:26.
33. Andrographis paniculata and Hedyotis corymbosa extracts and their combination with curcumin. [available at

http://www.malariajournal.com/content/8/1/26] Malar J 2009;8:26.

34. Nees K, Sheeja PK, Shihab GK. Antioxidant and anti-inflammatory activities of the plant Andrographis paniculata. Immuno-pharmacol Immunotoxicol 2006; 28:129-40.
35. Singh RP, Banerjee S, Rao AR. Modulatory influence of Andrographis paniculata on mouse hepatic and extrahepatic carcinogen metabolizing enzymes and antioxidant status. Phytother Res 2001;15:382-90.
36. Zhang XF, Tan BK. Antihyperglycaemic and anti-oxidant properties of Andrographis paniculata in normal and diabetic rats. Clin Exp Pharmacol Physiol 2000;27:358-63.
37. Singh S, Mehta A, John J, Mehta P. Anthelmintic potential of Andrographis paniculata, cajanus cajan and silybum marianum. Pharmacog J. 2009;1(4):71-73
38. Burm F, Kumar OA, Naidu LM, Rao KG. In vitro antibacterial activity in the extracts of Andrographis paniculata. International Journal of Pharm Tech Research 2010;2:1383-5.
39. Chandra R, Kumarappan CT, Kumar J, Mandal SC. Antipyretic activity of JURU-01 - a polyherbal formulation. Global J. Pharmacol. 2010;4 (1):45-47.
40. Murali J, Maheswari R, Syed Muzammil M, Asogan G. Anthelmintic Activity Of Leaves Extract Of Andrographis Paniculata Nees. International Journal of Pharmacognosy. 2014;1 (6): 404-408.
41. Tandon V, Yadav AK, Roy B, Das B. Phytochemicals as cure of worm infections in traditional medicine systems. In: Srivastava UC, Kumar S, editors. Emerging Trends in Zoology. Delhi: Narendra Publishing House; 2011. p. 351-78.
42. Helmby H. Helminths and our immune system: Friend or foe Parasitol Int 2009;58:121-7.
43. Hotez PJ, Brindley PJ, Bethony JM, King CH, Pearce EJ, Jacobson J. Helminth infections: The great neglected tropical diseases. J Clin Invest 2008;118:1311-21.
44. Gunawan D, Sudarsono, Wahyuono S, Donatus IA, Purnomo. Plant Medicine 2: Results, Attributes and Usage. Yogyakarta: PPOT UGM. 2001. p. 119-121.
45. Mills S., Bone K. Principles and Practice of Phytotherapy Modern Herbal Medicine. 2000. Edinburgh, England: Churchill Livingstone. p. 45
46. Meng Xiaoyun, Munishkina Larissa A, Fink Anthony L, Uversky Vladimir N. Effects of various flavonoids on the α-synuclein fibrillation process. Parkinson's Disease. Cairo, Egypt: Hindawi Publishing Corporation. 2010.
47. Rasmaliah. Ascariasis as a worm disease that needs to be recalled. Public Health Info. ISSN: 1410-6434. 2007; 11 (1). Terrain: The University of North Sumatra. p. 82-85.

Cite this article as:
The Canny Nur Chastity, Karsa Lugi Yuwono, Ummi Utami, Prala Ayu AP, Wildan Priscillah, Em Sutrisna. The Anthelmintics Effect of Momordica Charantia L. Leaves and Andrographis Paniculata Ness. from Indonesia. International Journal of Ayurveda and Pharma Research. 2015;3(6):33-39.
Source of support: Nil, Conflict of interest: None Declared

***Address for correspondence**
Canny Nur Chastity
Medical student
Faculty of Medicine of Universitas Muhammadiyah Surakarta
Indonesia.
Email: ini.email.canny@gmail.com