World Journal of
Pharmacognosy & Phytochemistry

IDAAM Publications

World J Pharmacog Phytochem 2023; 1(1): 14-18

RESERCH ARTICLE

Anthelmintic activity of *Lawsonia inermis* leaf extracts against *Pheretima posthuma* and *Ascardia galli*

AKSHAY R YADAV *, SWAPNALI A THORAT

Department of Pharmaceutical Chemistry, Rajarambapu College of Pharmacy, Kasegaon, Maharashtra, India-415404

***Author for Correspondence:** *Email:* akshayyadav24197@gmail.com

ARTICLE DETAILS

Article history:
Received on 2 March 2021
Modified on 25 March 2021
Accepted on 29 March 2021

Keywords:
Lawsonia inermis Linn,
Anthelmintic Activity,
Ascardia Galli,
Pheretima Posthuma.

ABSTRACT

Plants play an important role on the earth, and humans depend on them for their medicinal properties. Medicinal plants are commonly used in the health-care delivery system, either as a single drug or in combination. Helminthes infections are among the most common infections in humans, affecting a significant portion of the global population. Although the majority of helminth infections are confined to tropical areas, they pose a significant health risk and lead to the prevalence of malnutrition, anaemia, eosinophilia, and pneumonia. Parasitic diseases cause a high incidence of morbidity in people living in endemic areas. The antihelmintic activity of ethyl acetate and ethanolic extracts of *Lawsonia inermis* Linn leaves against *Pheretima posthuma* and *Ascardia galli* is currently being investigated. In the bioassay, various concentrations were used, and the worms were paralysed and died after a certain period of time. Both extracts were found to have significant antihelmintic activity.

INTRODUCTION

In India, mehndi is usually applied to the hands and feet [1]. Because of its cooling effect in the hot Indian summers, it became popular in India [2, 3]. *Lawsonia inermis* Linn (Family: Lythraceae), also known as henna, is a plant that grows mostly in subtropical and tropical climates and is used all over the world [4-8]. It has been used as a beauty dye for over 9000 years. Carbohydrates, phenolics, flavanoids, saponins, proteins, alkaloids, terpenoids, quinones, coumarins, xanthones, fat, resin, and tannins were contained in *Lawsonia inermis* phytochemical study. 2-hydroxy-1,4-naphthoquinone was also present [9-13]. *Lawsonia inermis* was used to isolate a number of alkaloids, napthoquinone derivatives, phenolics, and flavonoids. Antibacterial, antifungal, antiparasitic, molluscicidal, antioxidant, hepatoprotective, central nervous, analgesic, anti-inflammatory, antipyretic, wound and burn healing, immunomodulatory, antiurolithiatic, antidiabetic, hypolipidemic, antiulcer, antidiarrhoeal, diuretic, anticancer, and many other pharmacological effects were found in *Lawsonia inermis* [14-19].

Traditional medicine uses henna leaves, flowers, seeds, stem bark, and roots to treat a number of illnesses, including rheumatoid arthritis, headaches, ulcers, diarrheoa, leprosy, fever, diabetes, heart disease, hepatoprotective, and colouring agent. Henna leaf has an orange-red dye and leaf paste or powder is widely used for decorating hands, nails and feet with patterns. It's also used to hair dye [20-27]. In India, mehndi is usually applied to the hands and feet. The sodium content of 25 populations of *Lawsonia inermis* collected from the coastal oases of Gabès in Tunisia ranged from 0.08 to 0.69 % in leaves and 0.08 to 0.46 % in stems, according to mineral analysis. Potassium levels in the leaves ranged from 0.16 to 0.47 %, while potassium levels in the stems ranged from 0.15 to 0.81 %. Calcium levels in the leaves ranged from 0.2 to 0.41 %, while calcium levels in the stems ranged from 0.11 to 0.47 % [28].

The magnesium content in the leaves ranges from 0.09 to 0.23 %, while the magnesium content in the stems ranges from 0.03 to 0.11 %. The leaves have a phosphorus content of 2.57 to 6.29 %, while the stems have a phosphorus content of 2.73 to 9.84 percent. The copper content in the leaves ranges from 0.06 to 1.87 %, while the copper content in the stems ranges from traces to 11.27 % [29-32].

Zinc levels in the leaves ranged from 0.47 to 2.92 %, while zinc levels in the stems ranged from 0.2 to 7.39 %. The iron content in the leaves ranges from 4.03 to 28.77 %, while the iron content in the stems ranges from 1.17 to 15.85 %. The manganese content in the leaves ranges from 0.27 to 1.28 %, while the stems have a manganese content of 0.14 to 0.95 %. The nitrogen content of the leaves ranged from 0.14 to 4.72 percent, and the stems from 0.17 to 0.56 %. Henna is a symbol of fertility. Because of its cooling effect in the hot Indian summers, it became popular in India [33-38].

Rheumatoid arthritis, headaches, ulcers, diarrhoea, leprosy, fever, leucorrhoea, diabetes, heart disease, hepatoprotective, and colouring agent are all handled with henna leaves, flowers, seeds, stem bark, and roots in traditional medicine. Henna leaves produce an orange-red dye, and the paste or powder is commonly used to make designs on the hands, nails, and feet. It's also used to dye hair. The microwave extraction method has proven to be more accurate and reliable than the soxhlet extraction method. A typical technique is soxhlet extraction, which is a continuous solvent extraction process. Soil, sediments, sludge, polymers and plastics, pulp and paper, biological tissues, textiles, and food samples are all collected using extraction systems [39].

Microwaves, in contrast to soxhlet extraction, use a smaller amount of solvent and analyse and extract at a much faster rate, according to studies [40]. An outbreak of coronavirus disease (COVID-19) triggered by the novel severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) poses an unparalleled challenge in the development of effective medicines for prevention and treatment. The oral cavity has been suggested as a possible reservoir for COVID-19 transmission due to the close proximity to the patient during dental treatment, the high generation of aerosols, and the detection of SARS-CoV-2 in saliva. Someday, you might be able to make your own medicines at home. This is due to the fact that researchers have developed a 3D printer using clear, readily available medicinal active agents fed into a drug delivery system [41]. The main mode of gastrointestinal parasite control today is commercial anthelmintic. However, widespread anthelmintic resistance, scarcity, and high costs, particularly for low-income farmers in developing countries, necessitated the creation of alternative helminth control methods [42]. Traditional herbal dewormers, as well as other alternative approaches, are gaining popularity. The study's aim is to determine *Lawsonia inermis* Linn's anthelmintic potential [43].

MATERIALS AND METHODS

Collection of Plant Material

Lawsonia inermis Linn was obtained from Karad, Maharashtra, India. The plant was identified and authenticated by Department of botony, Yashwantrao Chavan College of Science, Karad.

Preparation of Plant Extract

Shade drying was done for almost a month as to avoid chemical degradation due to sunlight. Grinding of the dried material was done, with the aid of a grinder and converted into coarse powder. Extraction of *Lawsonia inermis* Linn was done by microwave extraction method further filtered and excess solvent present was evaporated and dried extract were collected and subjected for activity studies.

Animals

Indian adult earthworms (*Pheretima posthuma*) were collected from water logged areas and *Ascardia galli* (nematode) worm were obtained from freshly slaughtered fowls (Gallus gallus).

Evaluation of Anthelmintic Activity

The anthelmintic assay was carried as per method of Ajaiyeoba et al., with minor modifications. The anthelmintic activity was evaluated on adult Indian earthworm *Pheretima posthuma* worm due to its anatomical and physiological resemblance with the intestinal round worm parasites of human beings. *Ascardia galli* (nematode) worms are easily available in slaughtered fowls and it can be used as a screening model for anthelminthic drugs as advocated earlier. Three different concentrations, each of crude methanolic and ethyl acetate extract (10, 50, 100 mg/mL in distilled water) were and six worms (same type) were placed in it. This was done for both type of

worms. Observations were made for the time taken to cause paralysis and death of the individual. Mean time for the paralysis (P) in min was noted when no movement of any sort could be observed, except when the worm was shaken vigorously; time of death (D) in min was recorded after ascertaining the worms neither moved when shaken vigorously nor when dipped in warm water (50°C). Albendazole (10 mg/mL) was included as reference compound [40, 44].

RESULTS AND DISCUSSION

As shown in Table 1, ethyl acetate and ethanolic extract exhibited anthelmintic activity in dose-dependent manner giving shortest time of paralysis (P) and death (D) with 100 mg/mL concentration. The ethyl acetate extract of *Lawsonia inermis* Linn caused paralysis of 9 min. and time of death of 25 min. While ethanolic revealed paralysis of 8 and 21 min. respectively against the earthworm *Pheretima posthuma*. The reference drug Albendazole showed the same at 20 and 55 minutes, respectively. *Ascardia galli* worms also showed sensitivity to the extract of *Lawsonia inermis* Linn. The ethanolic extract caused paralysis in 11 min, death in 20 min and the ethyl acetate extract displayed P and D in 10 and 17 min, respectively. Albendazole did the same at 16 and 38 min.

Table 1: Anthelmintic activity of methanolic and ethyl acetate extract of *Lawsonia inermis* Linn

Test subs	Concentrations (mg/mL)	Time taken for paralysis (P) and death(D) of worms in min			
		P. posthuma		A. galli	
		P	D	P	D
Control	-	-	-	-	-
Ethyl acetate extract	10	25.09 ± 0.34	79.0 ± 0.31	28.43 ± 0.66	51.34 ± 0.72
	50	18.12 ± 0.43	41.08 ± 0.15	15.92 ± 0.41	31.39 ± 0.55
	100	09.41 ± 0.20	25.4 ± 0.18	11.30 ± 0.10	20.87 ± 0.71
Ethanolic extract	10	29.92 ± 0.56	60.71 ±0.10	41.45 ± 0.12	60.18 ± 0.92
	50	25.59 ± 0.02	44.78 ±0.92	30.96 ± 0.11	55.12 ± 0.85
	100	08.34 ± 0.21	21.98 ±0.67	10.12 ± 0.25	17.81 ± 0.44
Standard (Albendazole)		20.44 ± 0.55	55.12 ±0.82	16.48 ± 0.91	38.61 ± 0.71

CONCLUSION

In comparison to the reference drug albendazole, leaf extract of *Lawsonia inermis* Linn. not only demonstrated paralysis, but also induced worm death in a shorter period at higher concentrations of 100 mg/mL. The extracts included alkaloids, saponins, flavonoids, triterpenes, tannins, and steroids, according to phytochemical analysis. Tannins have been shown to have antihelmintic properties. Polyphenolic compounds are what tannins are chemically. It's probable that tannins present in *Lawsonia inermis* Linn., extracts have a similar effect. Tannins are said to have an anthelmintic effect since they may attach to free proteins in the gastrointestinal tract of the host animal or glycoprotein on the parasite's cuticle, causing death. Further research is underway to classify the phytoconstituents that may be responsible for anthelmintic activity.

REFERENCES

[1] Abdulmoneim MA. Evaluation of *Lawsonia inermis* Linn (Sudanese Henna) leaf extract as an antimicrobial agent. Res J Biol Sci. 2007; 2: 417-423.

[2] Baba-Moussa F, Nacoulma O, Ouattara A, Nguyen HP, Akpagana K and Bouchet P. Antibacterial activity of total aqueous extracts of *Combretum micranthum Lawsonia inermis* and *Waltheria indica* plants from west African pharmacopoeia. Revue de Medecines et Pharmacopees Africaines 1997; 11 (12):197-203.

[3] Singla S, Gupta R, Puri A, Singh V, Roy S. Comparison of anticandidal activity of *Punica granatum* (pomegranate) and *Lawsonia inermis* (henna leaves): an *in vitro* study. Int J Dental Res 2013;1:8-13.

[4] Ismail KA, Ibrahim AN, Ahmed MA, Hetta MH. Comparison between the effect of *Lawsonia inermis* and flubendazole on Strongyloides species using scanning electron microscopy. J Parasit Dis 2016; 40:415-22.

[5] Singh DK, Cheema HS, Saxena A, Jyotshana Singh S, Darokar MP, Bawankule DU, et al.

Fraxetin and ethyl acetate extract from *Lawsonia inermis* L ameliorate oxidative stress in P. berghei infected mice by augmenting antioxidant defence system. Phytomedicine 2017; 36:262-72.

[6] Al-Ogaili N. Synergistic effect of *Lawsonia inermis* and *Peganum harmala* aqueous extracts on *in vitro* growth of Leishmania tropica promastigotes comparison to sodium stibogluconate. Al-Qadisiyah Med J 2016; 12:76-83.

[7] Motazedian MH, Mikaeili F, Mohebali M, Miri R, Habibi P, Kamarloie S. The antileishmanial effects of *Lawsonia inermis* and *Cedrus libani* on Leishmania major promastigotes: an *in vitro* study. J Parasit Dis 2017; 41:375-9.

[8] Serakta M, Djerrou Z, Mansour Djaalab H, Kahlouche Riachi F, Hamimed S, Trifa W, et al. Antileishmanial activity of some plants growing in Algeria: *Juglans regia*, *Lawsonia inermis* and *Salvia officinalis*. Afr J Tradit Complement Altern Med 2013; 10:427-30.

[9] Anna T, Harikrishnan TJ, Meenakshisundaram A, Arunachalam K, Suriya K, Narendran RR. Anticoccidial effects of *Lawsonia inermis* against caecal coccidiosis in broilers. 2016;2:246.

[10] Wurochekke AU, Chechet G, Nok AJ. *In vitro* and *in vivo* anti trypanosomal activity of the leaf of *Lawsonia inermis* against Trypanosoma brucei infection in mice. J Medical Sci 2004; 4:236-9.

[11] Tauheed AM, Shittu SH, Suleiman MM, Habibu B, Kawu MU, Kobo PI, et al. *In vivo* ameliorative effects of methanol leaf extract of *Lawsonia inermis* Linn on experimental Trypanosoma congolense infection in wistar rats. Int J Vet Sci Med 2016; 4:33- 40.

[12] Marimuthu S, Rahuman AA, Santhoshkumar T, Jayaseelan C, Kirthi AV, Bagavan A, et al. Lousicidal activity of synthesized silver nanoparticles using *Lawsonia inermis* leaf aqueous extract against pediculus humanus capitis and bovicola ovis. Parasitol Res 2012; 111:2023-33.

[13] Hossain MA. *In vitro* determination of antioxidant capacity for methanolic extract of *Eichhornia crassipes*, *Lawsonia inermis* L and *Cissus quadrangularis* L By DPPH (1,1-diphenyl-2- picrylhydrazyl) free radical scavenging assay. Bachelor thesis, East West University, Dhaka; 2008.

[14] Hasan KM, Yesmin S, Akhter SF, Paul S, Sarker S, Islam A, et al. Hepatoprotective potentiality of various fractions of ethanolic extracts of *Lawsonia inermis* (henna) leaves against chemicalinduced hepatitis in rats. Biochem Mol Biol 2016; 1:17-22.

[15] Philip Jacob P, Madhumitha G, Mary Saral A. Free radical scavenging and reducing power of *Lawsonia inermis* L seeds. Asian Pac J Trop Med 2011;4:457-61.

[16] Kumar M, Kaur P, Chandel M, Singh AP, Jain A, Kaur S. Antioxidant and hepatoprotective potential of *Lawsonia inermis* L leaves against 2-acetyl amino fluorene induced hepatic damage in male wistar rats. BMC Complement Altern Med 2017; 17:56.

[17] Mohamed MA, Eldin IM, Mohammed AE, Hassan HM. Effects of *Lawsonia inermis* L. (henna) leaves' methanolic extract on carbon tetrachloride-induced hepatotoxicity in rats. J Intercult Ethnopharmacol 2015;5:22-6.

[18] Darvin SS, Esakkimuthu S, Toppo E, Balakrishna K, Paulraj MG, Pandikumar P, et al. Hepatoprotective effect of lawsone on rifampicin-isoniazid induced hepatotoxicity in *in vitro* and *in vivo* models. Environ Toxicol Pharmacol 2018; 61:87-94.

[19] Latha PG, Suja SR, Shyamala S, Rajasekharan S. Some hepatoprotective garden plants. Nat Prod Radiance 2005;4:278-9.

[20] Anand KK, Singh B, Chand D, Chandan BK. An evaluation of *Lawsonia alba* extract as hepatoprotective agent. Planta Med 1992; 58:22-5.

[21] Hsouna AB, Mongi S, Culioli G, Blache Y, Ghlissi Z, Chaabane R, et al. Protective effects of ethyl acetate fraction of *Lawsonia inermis* fruits extract against carbon tetrachloride-induced oxidative damage in rat liver. Toxicol Ind Health 2016; 32:694- 706.

[22] Ahmed S, Saeed A, Asadullah M. Effectiveness of *Lawsonia inermis* for psychopharmacological activity on staircase in NMRI mice. Med Forum 2016; 27:2-4.

[23] Ahmed S, Iqbal J. Aniolytic effect of *Lawsonia inermis* (henna) on light dark boxactivity. World J Pharm Pharm Sci 2014;3:1334-9.

[24] Pal SC, Kasture VS, Kasture SB. Effect of *Lawsonia inermis* on memory and behavior mediated via monoamine neurotransmitters. Indian J Pharmacol 1998; 30:181-5.

[25] Ali BH, Bashir AK, Tanira MO. Anti-inflammatory, antipyretic, and analgesic effects of *Lawsonia inermis* L (henna) in rats. Pharmacology 1995; 51:356-63.

[26] Imam H, Mahbub NU, Khan MF, Hana HK, Sarker MM. Alpha amylase enzyme inhibitory and anti-inflammatory effect of *Lawsonia inermis*. Pak J Biol Sci 2013; 16:1796-800.

[27] Ramya A, Vijayakumar N, Renuka M. Antiarthritic effect of *Lawsonia inermis* L an *in vitro* study. Int J Modn Res Revs 205;3:744-7.

[28] Ziaei A, Sahranavard S, Gharagozlou MJ, Faizi M. Preliminary investigation of the effects of topical mixture of *Lawsonia inermis* L and *Ricinus communis* L leaves extract in treatment of osteoarthritis using MIA model in rats. Daru 2016; 24:12.

[29] Manivannan R, Aeganathan R. Analgesic activity of *Lawsonia inermis* leaves extract in Swiss albino mice. Pharm Biol Evaluations 2016; 3:360-5.

[30] P, Singh N, Kumar D. Synergistic analgesic activity of chloroform extracts of *Lawsonia inermis* Linn and Chlorophytum borivilianum sant. J Pharm Phytochem 2015; 3:35-8.

[31] Sultana S, Khosru KH. Analgesic and antidiarrhoeal activity of *Lawsonia inermis*. Int J Pharma Sci Res 2011; 2:3183-8. 119. Nayak BS, Isitor G, Davis EM, Pillai GK. The evidence based wound healing activity of *Lawsonia inermis* Linn. Phytother Res 2007; 21:827-31.

[32] Bakhshi H, Abai MR, Amin G, Zolfi R, Pirmohammadi M, Bakhshi A, et al. Larvicidal properties of botanical extracts of *Lawsonia inermis* against Anopheles stephensi. Adv Infect Dis 2014; 4:178-85.

[33] Khanavi M, Vatandoost H, Khosravi Dehaghi N, Sanei Dehkordi A, Sedaghat MM, Hadjiakhoondi A, et al. Larvicidal activities of some Iranian native plants against the main malaria vector, Anopheles stephensi. Acta Med Iran 2013; 51:141-7.

[34] Singh A, Singh DK. Molluscicidal activity of *Lawsonia inermis* and its binary and tertiary combinations with other plant derived molluscicides. Indian J Exp Biol 2001; 39:263-8.

[35] Aguwa CN. Toxic Effects of the Methanolic Extract of *Lawsonia inermis* Roots. Pharm Biol. 1987; 25: 241-245.

[36] Ajaiyeoba EO Onocha PA Olarenwaju OI. *Invitro* Anthelmintic properties of *Buchhozia coriacea* and *Gynandropsis gynadra*. J Pharmaceut Biol (in press) Pharmacology. 2007; 51: 356-363.

[37] Ali NAA, Julich WD, Kusnick C and Lindequist U. Screening of Yemeni medicinal plants for antibacterial and cytotoxic activities. J Ethnopharmacol. 2001; 74(2): 173-179.

[38] Arayne MS, Sultana N, Mirza AZ, Zuberi MH and Siddiqui FA. *Invitro* hypoglycemic activity of methanolic extract of some indigenous plants. Pak J Pharm Sci. 2007; 20 (4):268-273.

[39] Yadav AR, Mohite SK. Antioxidant activity of *Malvastrum coromandelianum* leaf extracts. Research Journal of Topical and Cosmetic Sciences. 2020; 11(2):59-61.

[40] Yadav A, Mohite S. A Brief Review: Microwave Chemistry and its Applications. Res. J. Pharma. Dosage Forms and Tech. 2020; 12(3): 191-197.

[41] Yadav A, Mohite S. Anthelmintic and Antibacterial Activity of *Psidium Guajava* Leaf Extracts. Int J Sci Res Chemi. 2020; 5(6): 06-11.

[42] Yadav A, Mohite S. Toxicological Evaluation of *Psidium guajava* Leaf Extracts using Brine Shrimp (*Artemia salina* L.) Model. Res. J. Pharma. Dosage Forms and Tech. 2020; 12 (4): 198-120.

[43] Yadav A, Mohite S. Screening of *In-vitro* anti-inflammatory and Antibacterial assay of *Malvastrum Coromandelianum*. International Journal of Pharma Sciences and Research. 2020; 11(4): 68-70.

[44] Yadav A, Gavali K, Rajput M, Pathade K, Patil S, Dharanguttikar V, Mohite S. Anthelmintic Activity of *Malvastrum Coromandelianum* Leaf Extracts against *Pheretima Posthuma* and *Ascardia Galli*. Int J Sci Res Chemi. 2020; 5(6): 18-24.