Research Article

ANTHELMINTIC POTENTIAL OF PODS AND STEM BARK EXTRACTS OF *CASSIA FISTULA* L.

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ABSTRACT

Aqueous, ethanolic, Benzene extracts from different developmental growth stages of pod and stem bark of *C. fistula* were investigated for their anthelmintic activity against the earthworm *Pheretima posthuma*. Different concentrations of extracts were used to determine the anthelmintic activity, which involves time of paralysis and time of death of the worm. Ethanolic young bark and aqueous old bark extracts showed very good anthelmintic activity with respect to paralysis and death time, as compared to control and standard Albendazole (2mg ml⁻¹) and Piperazine Citrate (1.5 mg ml⁻¹). Hence, extracts of bark and pod might be applied against the chronic infection caused by parasitic worms.

Keywords: *Cassia fistula*, Anthelmintic activity.

INTRODUCTION

Cassia fistula (family- Caesalpinaceae) grows wild as well as a roadside tree in India. The stem bark of *C. fistula* is laxative, antitubercular, anthelmintic, emetic, febrifuge, diuretic, constipation, fever, diabetic and used against cardiac problem¹. This plant is widely used by tribal people to treat various ailment including ringworm and other fungal skin infections². Bark of *C. fistula* contains tannins, flavonoids, glycosides, phenolic compounds, carbohydrates, steroids and triterpenoids³. Stem bark of *C. fistula* is potential source of lupeol, β -sitosterol and hexacosanol⁴. Two new furanoflavones A and B with 3,4'-dimethoxy-5-hydroxy-7,8 (2''-(2-hydroxyethyl)furan)-flavones, 3,4'-dimethoxy-5-hydroxy-7,8-(2''-ethyl furan) flavone, furano-(2'',3'':7,6)-4'-hydroxyflavanone, pachycarin D, 5-hydroxy-2''-isopropenyl 3-methoxyfurano-(2'',3'':7,8)-flavone and 5-hydroxy-2''-(1-hydroxy-1-methylethyl)-3-methoxy-furano (2'',3'':7,8)-flavone was identified in 70% aqueous acetone extract of stem of *C. fistula*⁵

Chronic infection caused by parasitic helminthes (Worms) children often becomes infected with one or more species. In some cases these infection results mainly in discomforts and does not cause substantial ill health, but others such as schistosomiasis and hookworm disease, can produce very serious morbidity^{6,7}. The helminthes parasites mainly subsist in human body in intestinal tract⁸. Worm infestations are more common in the developing countries, it is seen in people with porhygiene. Anthelmintics has two properties either vermifuge which kill the worm or vermifuse which promotes expulsion of worms^{9,10}. A person may infect with a worm either eating contaminated food, or drinking contaminated water¹¹. Many pharmaceuticals are extremely toxic, if taken in improper dosages they can be dangerous to humans as well as lethal to parasites¹². Hence, it was thought worth while to evaluate anthelmintic activity of

different extract of pod and bark of *Cassia fistula* at different developmental growth stages.

MATERIAL AND METHOD

The pod and stem bark were selected at different developmental growth stages from Akluj and nearby locality, Maharashtra, India. The samples were washed in tap water, blotted to dryness, cut in to small pieces, oven dried at 60°C, finely powdered and stored in air tight containers. Oven dried 10g of powdered samples of pod and stem bark were weighed accurately and soaked in 100 ml of different solvents i.e. distilled water, ethanol, benzene for 72 hours on shaker then filtered through whatman No. 1 filter paper and filtrate was condensed on water bath. Aqueous, ethanolic and Benzene extracts 20mg/ml were prepared using weighted residue in DMF (5% Di Methyl Formamide in normal saline) and then volume was made to 10 ml with normal saline solution. This gives concentration of the extracts as 20 mg/ml. Indian adult earthworms (*Pheretima posthuma*) were collected from Agricultural College, Kolhapur and washed with normal saline water to remove all fecal matter. The earthworms of 3-7 $\pm$ 1 cm in length and 0.1-0.3 cm in width were used for evaluation of anthelmintic activity^{13,14}. The anthelmintic activity was evaluated on adult Indian earthworms, *Pheretima posthuma* according to the method of Ghosh *et al.*, (2005)¹⁵. Eighteen groups of approximately equal sized (3-7cm) Indian earthworms consisting six earthworms in each group were selected. All selected worms were washed thoroughly first with running water and then with normal saline and released six worms in to 10 ml of desired formulation in each Petri dish at room temperature. The extracts of different developmental stages of pod and stem bark of *C. fistula* plant were screened for the activity at 20mg/ml concentration using 5% DMF in normal saline as control while Albendazole (2 mg/ml) and Piperazine Citrate (1.5 mg/ml) were used as standard drugs. Extracts showing promising activity were further screened for minimum

effective concentration. Results were compared with control and standard. The time taken to complete paralysis (stoppage of movement by pin test) and death (fading of color or no movement in hot water at 50°C) were recorded.

RESULTS AND DISCUSSION

The mean paralysis and mean lethal time for each group is reported in Table No.1. The ethanolic extract of young bark and aqueous extract of old bark have shown very good anthelmintic activity with respect to paralysis and death time as compared to control and standards. The aqueous extract of one month pod, aqueous extract of young bark and benzene extract of one month pod have shown good anthelmintic activity while benzene extract of 4 month pod, benzene extract of young bark, ethanolic extract of one month pod, ethanolic extract of 4 month pod and ethanolic extract of old bark have exhibited very weak activity. Other extracts tested such as aqueous extract of 4 month pod, aqueous extract of pulp, benzene extract of pulp, benzene extract of old bark and ethanolic extract of pulp have shown no anthelmintic activity even after 2h of treatment. Anthelmintic activity in ethyl acetate extract of *Cassia tora* leaves is the most potent one and requires less time to the paralysis and death of the worm as compared to the methanolic extract. Both extracts showed a concentration dependant anthelmintic property¹⁶

Paralysis and death time of worms in a less as compared to Piperazine Citrate at higher concentration of 100 mg/ml in alcoholic seed extract of *Cassia tora*¹⁷. *Cassia tora* had strong

anthelmintic activity than *Zingiber officinale* and showed dose dependent anthelmintic activity¹⁸. Anthelmintic activity in petroleum ether, methanol and chloroform extract of *Cassia auriculata* leaves showed dose dependent anthelmintic activity¹⁹. Methanolic extract *Luffa cylindrica* leaves, was more effective anthelmintic activity than other extract²⁰. Anthelmintic activity in methanolic extracts of *cassia occidentalis* (EC=4.23mg/ml) was more effective than *Guiera Senegalensis* (EC=0.11mg/ml) against the larvae of *H. contortus* and both extracts inhibited hatching of eggs and larval development of *Haemonchus contortus* in a concentration-dependent manner²¹. Methanolic extract of seed and pulp of *Cassia fistula* showed dose-dependent anthelmintic activity. Pulp showed more dependent activity at all concentration. In this co-relation coefficient between paralysis and death of *Pheretima postuma* by seeds and pulp were 0.9986 and 0.9976²². Methanolic pod extract of *C. fistula* showed dose dependent significant anthelmintic activity comparing with standard drug Albendazole and control distilled water and the effect of anthelmintic activity was directly proportional to the concentration of pod extract and paralysis and death time decreases as per increasing dose concentration²³. In the present study most promising anthelmintic activity was observed in case of ethanolic extract of young bark (19.32 ± 0.65 , 26.44 ± 0.78) followed by aqueous extract of old bark (29.18 ± 0.55 , 39.22 ± 0.63) and was also found significant ($p < 0.01$) compared to control and the standard Albendazole and Piperazine Citrate. Other extracts tested showed weak or no anthelmintic activity.

Table 1: Anthelmintic activity of different extracts of *Cassia fistula*.

Treatment	Standard		Aqueous		Benzene		Ethanolic	
	Time taken for paralysis and time taken for death in min.							
	paralysis	Death	Paralysis	Death	Paralysis	Death	Paralysis	Death
Control			-	-	-	-	-	-
Piperazine citrate 1.5mg/ml	20.50 ± 0.35	54.25 ± 0.38	-	-	-	-	-	-
Albedazole 2.0mg/ml	19.28 ± 0.70	31.42 ± 0.72	-	-	-	-	-	-
1 Mon.pod	-	-	40.34 ± 0.25	48.16 ± 0.39	58.20 ± 0.31	66. 58 ± 0.73	100. 31 ± 0.46	139.11 ± 0.23
4 Mon.pod	-	-	—	—	74.26 ± 0.65	79.09 ± 0.39	109.57 ± 0.62	119.17 ± 0.18
Pod pulp	-	-	—	—	—	—	-	-
Young bark	-	-	57.03 ± 0.18	63.52 ± 0.35	88. 05 ± 0.22	131.28 ± 0.53	19.32 ± 0.65**	26.44 ± 0.78**
old bark	-	-	29.18 ± 0.55**	39.22 ± 0.63**	—	—	71.12 ± 0.37	79.37 ± 0.39

* Average of six determinations ± SEM, -- No results even after 2h.

** Significant at $p < 0.01$ compare to control and standard.

CONCLUSION

It can be concluded from the result that the ethanolic young bark and aqueous old bark have shown very good anthelmintic activity with respect to paralysis and death time as compared to control and standards used at tested concentrations. Thus the extracts of bark and pods might be applied against the chronic infection caused by parasitic worm.

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REFERENCES

1. Kirtikar KR, Basu BD, Basal M. Indian Medicinal plants. Allahabad, 1933; 1:856- 860.
2. Rajan S, Baburaj DS, Sethuraman M, and Parimala S. Stem and stem bark used medicinally by the Tribals Irulas and Paniyas of Nilgiri District, Tamil Nadu. Journals of Natural Remedies, 2001; 1(1): 49-54.
3. Malpani SN, Manjunath KP, Hasanpasha S, Savadi RV, Akkikumar S, Darade SS. Antidiabetic activity of *Cassia fistula* Linn. bark in Alloxan induced diabetic rats. International Journal of Pharmaceutical Sciences, 2010; 2:382-85.
4. Bahorun T, Luximon RA, Crozier A, Aruoma OI. Total phenol, flavonoid proanthocyanidins and vitamin C levels and antioxidant activities of Mauritian vegetables. Journal

- of the Science of Food and Agriculture, 2004; 84:1553-1561.
5. Li GP, Gao XM, Shen YQ, Huang XZ, Yang LY, Shu LD, Hu QF. 2''-ethyl- furanoflavone derivatives from the stems of *Cassia fistula* and their cytotoxicity. Journal of the Brazilian Chemical Society, 2013; 24(4): 685-689.
6. Agarwal R, Kharya MD, Shrivastava R. Antimicrobial and anthelmintic activities of the essential oil of *Nigella sativa*. Indian Journal of experimental biology, 1979; 17:1264-1275
7. Akhtar MS, Rifat S. Field trial of *Saussured lappa* roots against nematodes, and *Nigella sativa* seeds against cestodes in children. Journal of Pakistan Medical Association, 1991; 41:185-187.
8. Tripathi KP. Essentials of medicinal pharmacology. 5th ed. Jaypee Brothers Medical publishers (P) LTD, New Delhi; 2003:759.
9. Bonnefont- Rousselot D, Bastard JP, Jaudon MC Delattre J. Consequences of the diabetic status on the oxidant/ antioxidant balance, U.S. National library of medicine, National institutes of Health, 2000; 26(3): 163-176.
10. Burits M, Bucar F. Antioxidant activity of *Nigella sativa* essential oil. Phytotherapy Research, 2000; 14 (5): 323-328.
11. Chung L.Y. The antioxidant properties of garlic compounds: allyl cysteine, alliin, allicin and allyl disulfide. Journal of Medicinal Food, 2006; 9:205-213.
12. El-Sokkary GH, Omar HM, Hassanein AF Cuzzocrea S, and Reiter RJ. Melatonin reduces oxidative damage and increase survival of mice infected with *Schistosoma mansoni*. Free radical Biology Medicine, 2002; 32:319-332.
13. Thorn GW, Adams RD, Braunwald E, Isselbacher KJ, and Petersdorf RG. Harrison's Principle of internal Medicine. Mcgraw Hill Company, New York; 1977. p.1088.
14. Vigar Z. Atlas of Medical Parasitology, 2nd ed. P. G. Publishing House, Singapore; 1984. p. 216.
15. Ghosh T, Maity TK, Bose A, and Dash GK. Anthelmintic activity of *Bacopa monnieri*. Indian Journal of Natural Products, 2005; 21: 16-19.
16. John J, Mehta A, Shukla S, and Mehta PA. Report on anthelmintic activity of *Cassia tora* leaves. Songklanakarin Journal of Science and Technology, 2009; 31(3): 269-271.
17. Deore SL, Khadadadi SS, Kamdi KS, and Ingale VP. In vitro anthelmintic activity of *Cassia tora*. International Journal of ChemTech Research, 2009; 1(2): 177-179.
18. Dubey RD, Verma S, Rane D, Wani VK, Pandey AK, and Paroha S. Comparative studies of Anthelmintic activity of *Zingiber officinale* and *Cassia tora*. International Journal of chemical and pharmaceutical sciences, 2010; 1(1).
19. Chaudhary S, and Kumar A. (2014). Phytochemical analysis and assessment of in-vitro anthelmintic activity of *Cassia auriculata* Linn. leaves. American Journal of phytomedicine and clinical Therapeutics, 2014; 2(2):161-167.
20. Pratap S, Kumar S, Kumar A, Sharma NK and Jha KK. In vitro anthelmintic activity of *Luffa cylindrical* leaves in Indian adult earthworm. Journal of pharmacognosy and phytochemistry, (2012); 1(2):27.
21. Mohammed MS, Mammen M, Sidiama A, Igboja EJ, Tauheed M, and Talba M. Evaluation of anthelmintic activity of Nigerian ethnoveterinary plants; *Cassia occidentals* and *Guiera senegalensis*. veterinary world organisation, 2014; 7:536-541.
22. Irshad MM, Singh and Rizvi MMA. Assessment of anthelmintic activity of *Cassia fistula* L. Middle East Journal of Science and Research, 2010; 5:346-349.
23. Sumi S, and Saj OP. Antibacterial, anthelmintic and phytochemical investigation on the pod extracts of *Cassia fistula* L. International Journal of Medical and pharmaceutical Sciences, 2012; 2 (1).

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