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Evaluation of anti-helminthic activity of *Ferula foetida* “Hing— A natural Indian spice” aqueous extract

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PEER REVIEW

ABSTRACT

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Comments

This paper is an impressive way of presentation. The chemical constituents useful in acting against the intestinal microbes have been listed and proved by this very study. The paper has enormous findings in the field of microbiology. The paper on the whole is an excellent overview of action of antimicrobial. This particular research can be improved by in depth survey of chemical constituents and their isolations.

(Details on Page 191)

Objective: To evaluate the anti-helminthic activity of *Ferula foetida* “Hing” against helminthic (*Pheretima postuma*). **Methods:** Aqueous extracts from the *Ferula foetida* resin was investigated for its anthelmintic activity against *Pheretima postuma*. Three concentrations (25, 50 and 100 mg/mL) of extract were studied in activity, which involved the determination of time of paralysis and time of death of the worm. **Results:** The extract has exhibited significant anti-helminthic activity at the highest concentration of 100 mg/mL. Infact, the extract has shown better significant activity than the standard drug. Piperazine citrate in the same concentration as that of extracts was included as standard reference and distilled water as control. **Conclusions:** It was concluded from the present study that the plant revealed significant anthelmintic activity.

KEYWORDS

Anti-helminthic, *Ferula foetida*, Piperazine citrate, Resin

1. Introduction

Anti-helminthic drug is an agent that destroys or causes the expulsion of parasitic intestinal worm. They may also be called vermifuges (stunning) or vermicides (killing). Asafoetida is the dried latex (gum oleoresin) exuded from the living underground rhizome or tap root of several species of *Ferula* (three of which grow in India), which is a perennial herb (1 to 1.5 m high). Asafoetida is extensively used for flavouring curries, sauces, and pickles. It is also used in medicines because of its antibiotic properties.

Ferula foetida (*F. foetida*), commonly known as “Hing”, have shown promising therapeutic value due to the presence of various therapeutic phytoconstituents such as terpenoids, sulfide derivatives, volatile oil, phenols, and minerals.

The various pharmacological actions such as antioxidant, antimicrobial, antifungal, anticancer, antidiabetic and other various activities have been studied^[1].

This activity was initially assessed by numerous proofs. In generally, various chemical constituents such as tannins, poly-phenolic compounds, tannins (they can bind to free proteins in the gastro intestinal tract of host animals), essential oils, flavanoids, and terpenoids are responsible for anti-helminthic activity. And fortunately, these compounds are found in asafoetida.

The resins of this plant consists of sesquiterpenecoumarins present in asafoetida are assafoetidol A and assafoetidol B which are found to have antimicrobial properties^[2]. Galbanic acid is also one of the widely present sesquiterpene in resin portion of the drug^[3]. *Ferula* species are found to have a

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major chemical constituent called as “Galbanic acid” which is found to have high antimicrobial and antibiotic properties^[4]. Sesqui-terpenoids are another group of constituents which are found to have anti-helminthic properties and are found in this plant^[5]. Various essential oils, flavanoids and terpenoids are found in this plant. Poly-phenolic compounds which act as the major envy of helminths are found in this plant.

2. Materials and methods

2.1. Collection of plant materials

The pure form of asafoetida resin powder was procured from S. Muthiah & Sons, Tamil Nadu, India.

2.2. Extraction process

Extracts were prepared by the method of Clarkson and Bibby^[6]. Water extracts were made by extracting 5 g of ground spice in 100 mL distilled water in a Soxhlet extraction apparatus for 4 h at 100 °C. The filtrate was then adjusted and taken^[7].

2.3. Experimental animals

Healthy adult Indian earthworms, *Pheretima postuma* (*P. postuma*), due to its anatomical and physiological resemblance with the intestinal roundworm parasites of human beings were used in the present study. All the earthworms were of approximately equal size (15 cm)^[8–10].

2.4. Drugs

Piperazine citrate was purchased from GSK Pvt. Ltd. The solvents and other chemicals of analytical grade were used during experimental protocol.

2.5. Experimental design

Aqueous extracts from the *F. foetida* were investigated for their anthelmintic activity against *P. postuma*. Six groups of six earthworms were released in to 50 mL solutions of three different concentrations (25, 50 and 100 mg/mL each) of piperazine citrate, and aqueous extracts of *F. foetida* in distilled water^[11]. Piperazine citrate in the same concentration as that of extracts was included as standard reference and distilled water as control. Observations were made for the time taken to paralysis and death of individual worms. Time for paralysis was noted when no movement of any sort could be observed except when the worms were shaken vigorously. Death was concluded when the worms neither moved when shaken vigorously nor when dipped in warm (50 °C) followed with fading away of their body colors^[12].

3. Results

Figure 1 clearly shows the mechanism of action of *F. foetida*

against *P. postuma*. The mechanism of paralyzing and death of the worm was clearly stated.

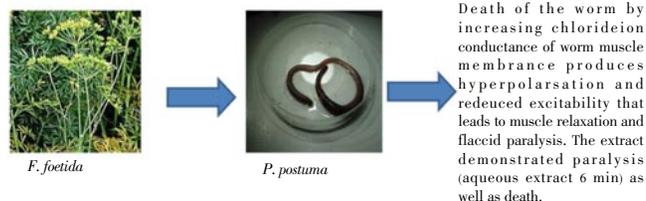


Figure 1. Successful mechanism of *F. foetida* on helminthic organism.

Table 1 is shown significant results. There was a successful effect on the helminthic by the effect of the plant extract 100 mg/kg. The 3rd extract was found to show more significant activity than 100 mg/kg of piperazine citrate. It took 6 min to paralyze the worm in the case of the drug extract 100 mg/kg, 8 min for the standard drug (piperazine) 100 mg/kg.

It was clearly evident that the more concentration of extracts was (the highest concentration 100 mg/kg), the better effect would have and the less time would take to kill the worm.

Table 1

In vitro evaluation of anti-helminthic activity of *F. foetida* resin extract.

Treatments	Concentrations (mg/mL)	<i>Pheretima</i> paralysis time (min)	<i>Pheretima</i> death time (min)
Aqueous extract	25	24.00±0.14	56.00±0.17
	50	17.00±0.13	39.00±0.15
	100	6.00±0.10	18.00±0.04
Piperazine citrate	25	22.00±0.08	53.00±0.13
	50	15.00±0.15	37.00±0.18
	100	8.00±0.06	20.00±0.02

Values are mean±SEM from six observations. **P*<0.05 vs. standard group.

4. Discussion

The resin extracts of *F. foetida* displayed a significant anthelmintic activity (*P*<0.05) in dose dependent manner. The anthelmintic activity of the aqueous extract was comparable with that of standard drug at 100 mg/mL. The predominant effect of piperazine citrate on the worm is to cause a flaccid paralysis that result in expulsion of the worm by peristalsis. Piperazine citrate by increasing chloride ion conductance of worm muscle membrane produces hyperpolarisation and reduced excitability that leads to muscle relaxation and flaccid paralysis. The extract demonstrated paralysis (aqueous extract 6 min) as well as death (aqueous extract 18 min) of worms at a time comparable to piperazine citrate (paralysis 8 min and death 20 min) especially at higher concentration. Here, the extract has shown more significance than the standard drug. Phytochemical screening of the crude extracts revealed the presence of flavonoids and polyphenolic compound as one of the major chemical constituents. Polyphenolic compounds show anthelmintic activity; chemically tannins are polyphenolic compounds^[13]. Some synthetic phenolic anthelmintics, e.g. niclosamide, oxclozanide and bithionol are shown to interfere with energy generation in helminth parasites by uncoupling oxidative

phosphorylation^[14]. It is possible that tannins contained in the extracts of *F. foetida* produced similar effects. Another possible anthelmintic effect of tannins is that they can bind to free protein in the gastrointestinal tract of host animal or glycoprotein on the cuticle of the parasite and cause death^[15].

It is concluded that based on the findings of the present study, the *F. foetida* resin possesses varying degree of anthelmintic activities. However, dose and the form used require standardization. Moreover, phytochemical studies and mechanism are also needed to lay down recommendation on scientific grounds. This pragmatic study was initially assessed by the phyto-chemical screening and later confirmed by the activity on the *P. postuma*. Thus it is concluded that *F. foetida* possesses strong and significant anti-helminthic activity.

Conflict of interest statement

We declare that we have no conflict of interest.

Acknowledgements

I want to convey my deep gratitude to my God, My parents and my colleges who made me go through my journey of doing my research. I performed this research in respect to the current problems and disorders of the gastro intestinal tract.

Comments

Background

Helminthic infections are rising in the society due to various reasons like food contamination *etc.* If avoided, these helminthic worms can cause serious damage in the human gastro intestinal tract. The aim of this study is to act against these helminthic worms with the help of a traditional Indian spice.

Research frontiers

The poly-phenolics present in the herb are the active warriors against the helminthics. These compounds can bind to the free proteins in the gastro intestinal tract of host animals, thus paralyzing and then killing the animals.

Related reports

Shahverdi *et al.* reported the activity of Galbanic acid and its potential in acting against microbes. The resins of this plant consists of sesquiterpenecoumarins present in asafoetida are assafoetidnol A and assafoetidnol B which are found to have antimicrobial properties and which were early reported. These related reports were the preface to the study.

Innovations & breakthroughs

We have found a new horizon of research from a natural Indian spice which was used as a traditional therapy against disorders of the stomach. Usage of the chemical constituents of this particular plant extract.

Applications

The research paper is an amazing contribution to the field of microbiology and antimicrobial agents. This study can be used as a foundation for further articulation of research in the active chemical constituents useful in the treatment of intestinal disorders caused by helminthics.

Peer review

This paper is an impressive way of presentation. The chemical constituents useful in acting against the intestinal microbes have been listed and proved by this very study. This paper has enormous findings in the field of microbiology. The paper on the whole is an excellent overview of action of antimicrobial. This particular research can be improved by in depth survey of chemical constituents and their isolations.

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