

Evaluation of Anthelmintic activity of zea mays Leaves on Pheretima Posthuma

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Abstract- Intestinal worms are a common issue in rural India, particularly in developing countries with poor personnel and environmental hygiene. Helminthiasis is a major cause of ill health, and anthelmintics are drugs used to kill infecting helminths. Synthetic drugs are available but have side effects, making them less effective but safer. Zea mays, a monoecious plant, is a natural anthelmintic that produces its leaves through seed. This study evaluated the in-vitro anthelmintic activity of methanolic extract of leaves from Zea mays, using adult earthworm (*Pheretima posthuma*) as a control. The extract showed better anthelmintic activity than the standard drug, indicating the plant's potential as an anthelmintic. The study highlights the potential of zea mays as a potential anthelmintic.

Index Terms - Anthelmintic activity, Pheretima Posthuma, zea mays Leaves

I. INTRODUCTION

Helminthiasis is also known as sponge worm disease. It is a macroscopic parasitic disease of man and beast, in which part of the body is infected by parasites (called helminths). Parasites are probably the most common cause of in developing countries, responsible for a global disease burden that exceeds well-known diseases, infections than helminths in developed countries, but gastrointestinal infections cause serious Single-celled protozoan sponges can reproduce in the human body.

TYPE OF HELMINTHES SPECIESL:

Flukes (trematodes).

Tapeworms (Cestodes)

Roundworms (Nematodes).

Major Problems Caused Due to Serious Helminthiasis:

Most helminth infections, if left untreated, cause many years of inflammatory disease, leading to complications and delays in those who suffer. In addition to the obvious and cause of blindness and elephantiasis in people with onchocerciasis and LF, respectively. It is now accepted that chronic helminth infection is also associated with chronic health problems such as diabetes, growth retardation, protein-calorie malnutrition, fatigue and mental growth. Vasantidevi Patil Institute of Pharmacy, Kodoli. 7 Initially, in childhood the presence and severity of helminth infection determines the risk of developing the disease. Indeed, most tissue damage in adults can become painful and the disease persists even long after the disease has cleared. Ascariasis is an intestinal disease. Roundworms are the cause of ascariasis, the most common disease in humans. They are a type of roundworm. Ascariasis may be asymptomatic, causing only malnutrition and growth retardation, or may present with abdominal pain, nausea, vomiting, bloating, and diarrhea. Taeniasis is an intestinal infection caused by tapeworms. Three bacteria cause taeniasis in humans: *Taenia solium*, *Taenia sanginata* and *Taenia asiatica*. Only a pig can cause severe pain. Also known as cystic disease. Human cysticercosis can seriously affect people's health. Larvae can develop in the muscles, skin, eyes, and central nervous system (CNS).

Antihelmintic Drugs:

Anthelmintic drugs can be classified into following three types:

1. Drug used for treatment of trematodes.
2. Drug used for treatment of cestodes.
3. Drug used for treatment of nematodes

Aim:

Anthelmintic activity of methanolic extract of zea mays leaves

Objective:

- a. Our recent work has focused on the discovery of novel anthelmintic activity against worms as well as other parasitic nematodes important for future development.
- b. Understand the demand and market for herbal anthelmintics.
- c. Comparison of the effectiveness of herbal medicines with commercial anthelmintics.
- d. Prevention of intestinal parasitic helminth infections.
- e. There is anthelmintic resistance due to use of synthetic anthelmintics so have to prefer evaluation of herbal plants as other anthelmintic sources.
- f. In vitro experiments were performed to determine the possible anthelmintic effect of the crude methanolic extract.

Rationale of Study:

There are many commercially available anthelmintic drugs with significant anthelmintic activity; Many of the antibiotics available can cause side effects such as stomach pain, loss of appetite, nausea, vomiting, headache, and diarrhea. Many available anthelmintics show anti-inflammatory and anti-inflammatory properties for this activity. Powerful herbs have many medicinal functions. Among them, plants with anthelmintic effects have attracted attention because of the ability of plants and their compounds to treat diseases that seriously harm livestock and reduce livestock. The disease is fatal as anthelmintic resistance develops in the body and has a significant impact on other uncontrollable problems. Although many synthetic drugs are produced, they have side effects rather than treatment. Therefore, there is interest in researching the needs of plants for medicinal use, so the demand for anthelmintics increases, many studies have been conducted to evaluate the anthelmintic activity of different components of different plants. Some plants are more resistant than commercially available chemicals. Experiments were conducted on various plants such as Trichosanthes, Holy Basil, Neem, Moha, Mimisops elengi linn., Pomegranate, calotropis

procera (Ait) R. Br., capparidaceae Edgew, Butea Monosperma (lam.) Kuntze, Allium sativum, Prosopis juliflora, Zingiber officinale, Eucalyptus globulus, castor beans and many other plants have been shown to have potential anthelmintic activity, among other activities. This herb has proven to be more effective than existing antibiotics. A medicinal plant that is also used in various treatments and combinations in Indian systems, maize displays many medicinal functions and also contains phytochemicals essential for anthelmintic activity.

PLANT PROFILE:

Zea mays:



Fig4.Zea mays

Table : Plant profile of zea mays

Botanical Name	Zea mays
Synonym	Maize
English	Corn
Hindi	Bhutta
Marathi	Makka
Family	Poaceae
Genus	Zea
Species	Zea mays (Maize) Zea Diploperenonis
Part	Leaves
Geographical Sources	The commercial Producer of zea mays are central America and Mexico, Brazil, China, Romania

Health Benefits of Zea Mays:

1. Prevents hemorrhoids:
2. Promotes growth
3. Helps you gain weight:
4. Provides Minerals:
5. Prevents Cancer
6. Protects Your Heart:
7. Prevents anemia:
8. Good for eyes and skin:
9. Control Diabetes:
10. Cosmetic Uses:

MATERIAL AND METHODS

Experimental Animals: Indian adult earthworms *Pheretima posthuma* collected from moist soil from local areas and washed with normal saline to remove all the fecal matters were used for the anthelmintic study. The Earthworms of 6-8 cm in length and 0.2-0.3cm in width were used for all the experimental protocol.

Collection and Authentication of plant material: The selection and the collection of plant material are important in making efficient phytochemical constituent isolation. The disease free and healthy plants only selected for the plant extraction which is protected from weeds and insect and the numerous factors involved in the collection of the plant materials. The leaves of zeamays were collected from local area surrounding from Talsande Dist.- Kolhapur (Maharashtra) and Plants was authenticated by, Dr. K. Gouri Sankar In herbarium of Vasantidevi Patil Institute of Pharmacy, Kodoli.

Pre-extraction Processes:

Extraction, as the term is used pharmaceutically, involves the separation of medicinally active portions of plant from the inactive or inert components by using selective solvents in standard extraction procedures. The products so obtained from plants are relatively impure liquids, semisolids or powders intended only for oral or external use. For the extraction of Zea mays leaves, we can follow following steps,

Drying:

From collected leaves of Zea mays plant, the unwanted part i.e., stem and branches as well as dust

and soil particle were removed. Allow them to dry in shadow place (Shadow dry method), because in sunlight have possibilities to spoil the leaves or reducing of main phytochemical constituents. Hence it can be dried in shadow place for 1 month until the leaves are totally dried i.e., moisture content become zero and which are able to make powder in mortar.

Powder making:

The dried leaves material was pulverized into a coarse powder by using a dry blender. Leaves are beaten up to produce fine powder. The powder is then sieved through sieve no. 85 for getting uniform size of particles. Then collected powder can used for further experiment, extraction and phytochemical screening and evaluation test.

Mixing:

50 g Fine powder of zeamays plants was taken and mix them properly with continuous stirring.

Selection of solvent for Soxhlet extraction:

The selection of solvents was based on the selectivity ratio, which was expressed as the ratio of the methanol distribution coefficient to the water distribution coefficient. The selection of the solvent is crucial for solvent extraction. Selectivity, solubility, cost and safety should be considered in selection of solvents. Based on the law of similarity and inter-miscibility (like dissolves like), solvents with a polarity value near to the polarity of the solute are likely to perform better and vice versa. Alcohols (Ethanol and Methanol) are universal solvents in solvent extraction for phytochemical investigation.

Method of Extraction:

Extraction is the first step to separate the desired natural products from the raw materials. Extraction methods include solvent extraction, distillation method, pressing and sublimation according to the extraction principle. Solvent extraction is the most widely used method. The extraction of natural products progresses through the following stages:

- > The solvent penetrates into the solid matrix
- > The solute dissolves in the solvents
- > The solute is diffused out of the solid matrix
- > The extracted solutes are collected. Any

factor enhancing the diffusivity and solubility in the above steps will facilitate the extraction.

The properties of the extraction solvent, the particle size of the raw materials, the solvent-to-solid ration, the extraction temperature and the extraction duration will affect the extraction efficiency.

Extraction is the separation of medicinally active portions of plant using selective solvents through standard procedures. The purpose of all extraction is to separate the soluble plant metabolites, leaving behind the insoluble cellular marc (residue). The initial crude extracts using these methods contain complex mixture of many plant metabolites, such as alkaloids, glycosides, phenolics, terpenoids and flavonoid.

Procedure for Methanolic extraction of powder of dried leaves of Zea mays are as follows:

1. First of all, rinse all the glass apparatus by Alcohol and dry it in the oven at 102°C and after removing it keep in the desiccator.
2. Weigh 50 gram of grounded and dried sample of leaves Zea mays and place it in the thimble.
3. Place the thimble in the Soxhlet extractor.
4. Take a 250 ml round bottom flask and clean it and fill the flask with 300 ml methanol.
5. Place the whole setting on a heating mantle and allow the methanol to boil.
6. Continue the extraction process for several hours, almost 24 hours.
7. Remove the condensing unit from extraction unit and allow the sample to cool down. Finally, it removes all the lipid.
8. Collect almost all the solvent after distillation.
9. Place the sample in the oven and after removing it place in the desiccators.
10. Take the weight of the sample.
11. As a result, we get a defat sample.

Experimental setup:

Preparation of Standard:

Albendazole 25mg/ml is used as standard drug for anthelmintic activity.

2. Preparation of Control solution:

Normal water with equal amount of maximum concentration of the methanol used in the extract for anthelmintic activity.

3. Preparation of Sample solutions:

The Zea mays leaves extract diluted with distilled water to obtain 25 mg/ml, 50 mg/ml and 100mg/ml concentrations for checking the effect of drug on *Pheretima Posthuma* in various concentration.

5. Procedure for Anthelmintic Activity: Earthworms were divided into three groups: -

- Control: Normal saline water
- Standard: Albendazole
- EPJ: 25, 50, 100 mg/ml.

1. Methanolic extracts from Zea mays were examined for their anthelmintic activity using *Pheretima posthuma*.
2. Three concentrations of each extract were tested on the bioassay, using two parameters i.e., time of paralysis and time of the death of the worms. Here Albendazole was used as standard reference and saline water as control.
3. Took 5 Petri plates and cleaned them thoroughly.
4. The first Petri plate is filled with control solution.
5. The second Petri plate is filled with standard drug solution.
6. In other three Petri plates 25ml of the three different concentrations (20mg/ml, 50mg/ml, 100mg/ml) of extract was poured.
7. In each Petri plate a test animal is placed and is observed for the anthelmintic activity.
8. The observations were made as time required for the paralysis and time required for the death of test animals.
9. Time for paralysis was noted when no movement of any sort could be observed except when the worm shaken vigorously.
10. Death indicated the worms lost their motility followed with fading away of their body colors. Also, when worms were placed into hot water there was no movement observed.





Fig. Anthelmintic activity of extract of Zea Mays
Observations:

Observation Tables:

Table: Phytochemical screening of extract of zea mays.

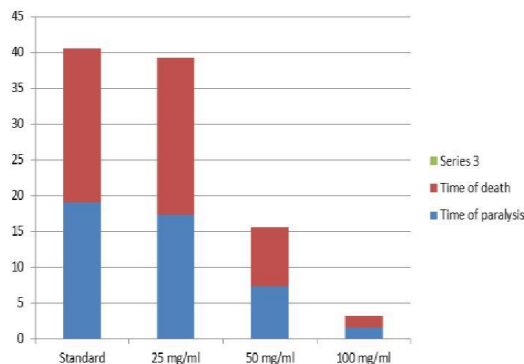
Sr. No	Phytochemicals	Name of Test	Inference
1	Alkaloids	Mayer's	+
		Hager's	+
		Wager's	+
		Dragendorff's	+
2	Carbohydrates	Molisch's	+
		Barfoed's	+
3	Glycosides	Keller Killiani Test	+
		Brontrager's Test	-
		Sample + Lead Acetate Sol ⁿ	+
		Shinoda Test	+
4	Tannins and Phenol	5% FeCl ₃	+
		Dilute Iodine	+
		10% Lead acetate	+
5	Saponin	Foam test	+
6	Amino acid	Ninhydrin	+
7	Protein	Biuret test	+
8	Volatile Oil	Hydrodistillation method	-
9	Terpenoids	Salkowski's test	+

Table: Anthelmintic activity of extract of Zea mays.

Sr No.	Solution	Time of Paralysis (min)	Time of Death (min)
1	Standard	19.01±0.10	40.51±0.20
2	Control	-	-
3	25 mg/ml extract	17.25±0.23	39.25±0.30
4	50 mg/ml extract	07.23±0.10	15.48±0.40
5	100 mg/ml extract	01.47±0.20	03.20±0.15

RESULT AND DISCUSSION

The phytochemical screening of the extract of the plant zea mays showed the presence of various phytochemical constituents and, the presence of the tannins shows the possible anthelmintic activity of the extract. Phytochemical Screening of leaf extract zea mays presence of flavonoids, tannins, saponins, alkaloids and amino acids. The presence of tannins and flavonoids are responsible for Anthelmintic activity. The methanol extracts of zea mays on the pheretima posthuma having potential antihelmintic activity at 50 and 75 mg/ml dose. Tannins in their mechanism of anthelmintic action are known to interfere with energy generation by uncoupling oxidative phosphorylation or they may interfere with glycoprotein of cell surface. The result of preliminary phytochemical tests study revealed that Zea mays leaves possess secondary metabolites having ±OH functional group such as tannins and phenolic compound were detected in used solvent extract. The current investigation indicates that amount of extract of Zea mays this methanolic extract most potent and require less time to paralysis and death of the worms. The function of the anthelmintic drugs, like Albendazole is known to cause paralysis of the worms, so that they are expelled in the faces of man and animals. The extract not only demonstrated this properly, but they also kill the worms. Methanolic extract in the concentration of 25 mg/ml has taken less time to cause paralysis and little more time to cause death of earthworms as compared with reference drug.



CONCLUSION

From the phytochemical analysis of zeamays it was concluded that the active ingredients for anthelmintic activity were found in the methanolic extract of maize. From the data, it was concluded that the protective properties were due to the presence of tannins in the extract. As the concentration of the extract changes, the anthelmintic activity also changes, and as the concentration of the extract increases, the anthelmintic activity increases and vice versa. This study showed that zeamays plants exhibited significant anthelmintic activity against worms at lower concentrations.

REFERENCE

- Henry J. Mensorley and Rick M. Maizels Helminth Infections and Host Immune Regulation, Clinical morphology reviews PMID: PMC 3485755; PMID: 23034321. doi: 10.1128/CMR.05040-11.
- Peter J. Hotez, Paul J. Brindley, et al. Helminth infections: the great neglected tropical diseases PMID: PMC2276811; PMID: 18382743, doi: 10.1172/JCI34261.
- Human Intestinal Parasites Rashidul Haque, Scientist and Head of Parasitology Laboratory.
- Human Intestinal Parasites Rashidul Haque, Scientist and Head of Parasitology Laboratory.
- Gilbert A. Castro. Helminths: Structure, Classification, Growth, and Development, Medical Microbiology. 4th edition.

- Pradeep kumar singh, Ram Lakhan singh et al Chapter 2 ± Food hazards: Physical, Chemical, and Biological. DOI:10.1016/B978-0-12-816333-7.00002-3.
- Gilbert A. Castro. Helminths: Structure, Classification, Growth, and Development, Medical Microbiology. 4th edition.
- 7 RP i AL6FERQ L RP riL.)FE~r~LD iN~i AL2 TRs Tapeworms as pathogens of fish: A review. First published: 16 September 2021 <https://doi.org/10.1111/jfd.13526>.
- Gilbert A. Castro. Helminths: Structure, Classification, Growth, and Development, Medical Microbiology. 4th edition.
- Nematodes Roundworms Authored by Dr Roger Henderson, Reviewed by Dr Adrian Bonsall| Last edited 11 Nov 2014 | Meets Patient’s editorial guidelines.
- Peter J Hotez et al. J Clin Invest. 2008 Apr;118(4):1311-21 Helminth infections: the great neglected tropical diseases. doi: 10.1172/JCI34261.
- Daniela F. de Lima Corvino et al. Ascariasis In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2022 Jan. 2021 Oct 28. PMID: 28613547 Bookshelf ID: NBK430796
- Taeniasis word health organization review. Wikipedia.
- Piyush Yadav, Rupali Singh, A Review on Anthelmintic Drugs and Their Future Scope International Journal of Pharmacy and Pharmaceutical Sciences ISSN- 0975-1491 Vol 3, Issue 3, 2011.
- Jong-Yil Chai 2013 Mar;45(1):32-43. Praziquantel treatment in trematode and cestode infections: an update. doi: 10.3947/ic.2013.45.1.32. Epub 2013 Mar 29.
- Wei Chen, Robert A. Mook Jr., Richard T. Premont, Jiangbo Wang Review on Niclosamide: Beyond an anthelmintic drug <https://doi.org/10.1016/j.cellsig.2017.04.001>.
- Handa SS, Khanuja SPS, Longo G, Rakesh DD (2008) Extraction Technologies for Medicinal and Aromatic Plants, (Istedn), no. 66. Italy: United Nations Industrial Development Organization and the International Centre for Science and High Technology.
- <https://discoverfoodtech.com/soxhlet-extraction-method/amp/>
- Khandelwal K. R., Practical Book of pharmacognosy, Nirali Prakashan, Page No. 149-154.

20. Dike, P. Ijeoma; Ibojo, O. Olaseike, Daramola F.Y. Omonhinmin A. Conrad*research on Phytochemical and proximate analysis of foliage and seeds of Bixa Orellana Linn ISSN 0976-044X