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Research Article

Experimental Evaluation of Anthelmintic effect of Gallic Acid

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ABSTRACT

Background: Helminth infestation is most prevalent infestations by parasites, which affects large part of world's population. It is one of the leading causes of malnutrition among children. Gallic acid (3,4,5 trihydroxybenzoic acid), a plant polyphenol, is a naturally abundant gallotannin, which is found in vegetables, fruits, legumes and beverages. The present study was undertaken to explore anthelmintic activity of gallic acid. **Materials and Methods:** Five concentrations (25, 50 and 100 mg/ml) of gallic acid were studied in the anthelmintic bioassay to determine the paralysis time and death time in the worm Pheretima posthuma. Piperazine citrate was used as standard in the study. The results are expressed as mean ± standard error of mean. Experiments were always performed in triplicates. **Results:** Gallic acid exposure to worms caused a dose dependent paralysis and death. At lower concentration, (10 mg/ml) paralysis time was 29.27 ± 1.62 min and time for death was 52.11 ± 1.92 min. Increase in concentration of gallic acid (100 mg/ml) caused paralysis within 20 min (20.97 ± 1.93) and death was observed within first 30 min (30.11 ± 1.63) **Conclusion:** The study confirms the significant anthelmintic activities of gallic acid. However further studies on tape worms and other worms is needed to be undertaken.

Key words: Anthelmintic, Gallic acid, Piperazine citrate.

INTRODUCTION

Helminth infestation is most prevalentinfestations by parasites, which affects large part of world's population. It is amongst the leading cause of prevalence of malnutrition, anemia, eosinophilia, and pneumonia in developing countries. A number of anthelmintic agents are available that kill or expel infesting helminths from body.[1] However, due to their poor tolerability and development of resistance, it seems to be necessary to search for novel anthelmintic agents of natural origin.[2]

Gallic acid (3,4,5-trihydroxybenzoic acid), a plant polyphenol, is a naturally abundant gallotannin, which is found in vegetables, fruits, legumes and beverages.[3] Recent studies have demonstrated that nearly thirty Ayurvedic formulations contained high amount of gallic acid, and such formulations are extensively used for treatment of numerous diseases in India.[4] A variety of studies have established gallic acid as antioxidant, antiobseity, antiasthmatic, hepatoprotective and anticancer agent.[5-9]

A number of plants rich in polyphenols content like *Pistacia lentiscus*, *Phillyrea latifolia*, *Camellia sinensis*, *Caesalpinia pyramidalis*, *Arachis pintoi*, *Gliricidia sepium*, *Cratylia argentea* have demonstrated anthelmintic potential against various test organisms.[10-14] Thus, polyphenols could be effectively used against helminth infection. However, experimental substantiation in support of anthelmintic effect of gallic acid is missing. Hence, the present work was aimed to determine Anthelmintic activity of gallic acid.

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MATERIALS AND METHODS

Chemicals

Gallic acid was purchased from Central Drug House, India. Piperazine citrate (10 mg/ml) was used as a ref-

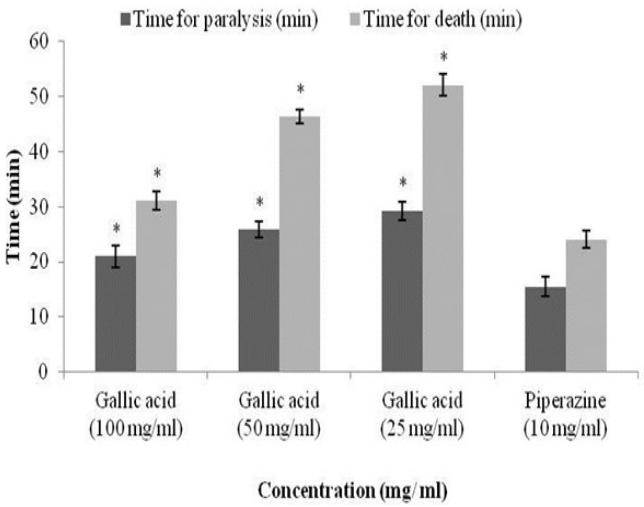

Figure 1: Anthelmintic effect of Gallic acid. The results are expressed as mean ± standard error of mean. Statistical comparison was performed using analysis of variance (ANOVA) followed by Bonferroni's test (*$p < 0.001$)

erence standard (Argon Remedies, India). All the other chemicals used during the study were of analytical grade. Triple distilled water was used during the experiment.

Anthelmintic assay

Anthelmintic assay was carried.[15] Earthworms (*Pheretima phostuma*) were collected from garden and same type of worms with average weight of 1-2 grams. Formulations (4 ml) containing different concentrations of gallic acid (10, 50, and 100 mg/ml in distilled water) were prepared, and three worms (same type) were placed in it. Time for paralysis was noted as when no movement of any sort could be observed, except when the worms were shaken vigorously. Time for death of worms were recorded after ascertaining that worms neither moved when shaken vigorously or when dipped in warm water (50°C).

Statistical analysis

The results are expressed as mean ± standard error of mean. Experiments were always performed in triplicates. Statistical comparison was performed using analysis of variance (ANOVA) followed by Bonferroni's test (*$P < 0.05$).

RESULTS

In the present study, following a short stimulant effect on motility, earthworms lost movements, became paralyzed and finally died on exposure to the gallic acid. Formulation containing 25, 50,100 mg/ ml of gallic acid caused dose dependent paralysis, causing loss of motility to loss of response to external stimuli, which ultimately progressed to death. Gallic acid exposure to worms caused a dose dependent paralysis and death. At lower concentration, (10 mg/ml) paralysis time was 29.27 ± 1.62 min and time for death was 52.11 ± 1.92 min. Increase in concentration of gallic acid (100 mg/ml) caused paralysis within 20 min (20.97 ± 1.93) and death was observed within first 30 min (30.11 ± 1.63) (Figure 1)

DISCUSSION

Helminth infestation of the gastrointestinal tract of humans badly influences the health standards of people worldwide. For the investigation of compounds possessing anthelmintic activity, various substances have been screened using different species of worms, for example, earthworms, *Ascaris, Nippostrongylus* and *Heterakis*. Amongst these species, earthworms have been used extensively for the early evaluation of anthelmintic compounds *in vitro* because they show likeness to intestinal "worms" in their response to anthelmintics and are easily available (Sheikh, 2007). It has been demonstrated that all anthelmintics are fatal to earthworms, and agent's toxic to earthworms is praiseworthy for study as potential anthelmintic.

In this study, gallic acid, a polyphenols was used to determine its effect on lethality of earthworm. Some of the synthetic polyphenolic agents like oxyclozanide, bithionol, niclosamide act as Anthelmintic by impeding energy generation in helminth parasites by disentanglement of 'oxidative phosphorylation'. An additional Anthelmintic mechanism associated with polyphenols could be binding to free proteins in the gastrointestinal tract of host animal, thereby causing its death.[16-17]

In summary, it can be concluded that gallic acid demonstrated significant anthelmintic activity compared to the standard drug piperazine. However, further studies are necessary to access the exact mechanism responsible for it.

CONCLUSION

In nutshell, it can be regarded the anthelmintic effect of gallic acid on worms might be due to its binding to free proteins in the gastrointestinal tract that leaded to mortality of animals. This study can be regarded as stepping stone towards research focused on anthelmintic effect of polyphenols.

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