A Review on Anthelmintic effectiveness of Momordica charantia Seed and Carica papaya Seed in commercial layers

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Abstract: **The majority of people on the planet are afflicted with helminthic infections, which are the most prevalent sickness in both humans and various species. Millions of cattle can also have helminthic infections, which can cause significant financial losses for domestic animals. Synthetic medications are used to treat helminthiasis in many parts of the world, and while they are quite efficient at healing the condition, they also have a variety of negative side effects. Numerous parasite infections are experiencing a serious treatment resistance issue as a result of the ongoing usage of synthetic anthelmintic and larvicidal medications. Crude remedies made from plants are less effective in curing parasite illnesses, but they are comparatively side effect-free. The herb climber Momordica charantia Linn. (karela) is a member of the Cucurbitaceae family and is cultivated in tropical and subtropical climates. It has been used in many Asian traditional remedies to treat a variety of conditions, including cholera, bronchitis, anemia, blood illnesses, ulcers, diarrhea, dysentery, gonorrhea, rheumatism, gout, worms, colic, liver and spleen diseases, cancer, and diabetes. Karela's primary components include triterpene, protein, steroid, alkaloid, inorganic, lipid, and phenolic compounds. These compounds have a variety of biological and pharmacological properties, such as anti-diabetic, anti-tumorous and anti-cancerous, anti-microbial, anti-viral, anti-helmintic, antimalarial, anti-ulcerative, and immunomodulatory effects. Therefore, the results of this study's investigation into the effects of C. papaya seed and M. charantia seed extracts demonstrated that they may be used as a source of chemical material for the creation of potent anthelmintic drugs.**

Key words: Carica papaya, M.charantia seed, **anthelmintic, Larvicidal activity, helminths, parasites.**

1. INTRODUCTION

According to Webster's Unabridged Dictionary, the word "anthelmintic" comes from the Greek words "anti," which means "against," and "helminis," which means "worm" and, when combined, means "to kill or destroy worms or parasites." (Amin and others. Al. (2010) In grazing animals, helminthiasis causes significant productivity losses, making it one of the most significant animal illnesses in the world. The medications known as anthelmintics either expel (vermifuge) or kill (vermicide) helminth infestations.[11]

Human intestinal parasitosis is a serious worldwide health issue that has substantial cost ramifications. Parasites cause notable morbidity like anemia, diarrhea and dysentery, malnutrition, apathy, and underdevelopment, as well as severe acute abdominal and surgical conditions. Unfortunately, the burden is higher in the tropics and subtropics, especially among children, for reasons primarily related to poor hygiene.[9]

Momordica charantia Linn. (Karela), a tropical and subtropical climber belonging to the Cucurbitaceae family, is also referred to as bitter gourd or bitter melon. In China, Malaysia, India, and tropical Africa, it is extensively dispersed. Momordica means "to bite" in Latin.[7]

Momordicin, a bitter substance thought to have a stomachic action, makes the entire plant, including the fruit, taste extremely bitter.

Momordica charantia (Karela) has several parts that are indicated in Ayurveda for a variety of ailments, including cholera, bronchitis, anemia, blood disorders, ulcers, diarrhea, dysentery, sexual tonic, and as a remedy for gonorrhea.[7]

The term "carica papaya" is nearly always used to refer to plant-based anthelminthic substances. The Carica papaya Linn. (Caricaceae) is renowned for its therapeutic and nutritional benefits. Different plant

components are employed for different medical ailments.[10]

Papain and benzyl isothiocyanate, two chemical compounds that have been shown to be effective against helminths, are among the additional antiparasitic qualities of C. papaya. C. papaya seeds have been used to treat helminthiasis in traditional medicine.The antiparasitic properties of dried C. papaya seeds were thus assessed. The information gathered is intended to serve as a guide for future studies that might eventually aid in the development of essential preventative and therapeutic measures against intestinal parasitosis, especially in tropical settings.[9]

2. EXPERIMENTAL STUDIES

2.1 Experimental animals

In this study, forty (40) commercial layers that were 24 weeks old and had never been dewormed before were purchased from a nearby farm in Ogbomoso, Oyo State, Nigeria. In the Lautech Teaching and Research farms, they were housed in concrete-floored, hygienic, and distinct enclosures with enough water and food. Prior to the birds being placed inside, the pen was cleaned and fumigated.[3]

2.2 Piperazine, an anthelmintic that is proprietary

322 mg/kg body weight of piperazine is the recommended daily dose for therapeutic usage in poultry. 418.6 mg of the active component was therefore given daily to a bird weighing 1.30 kg (Bains, 1979; Jordan and Pattson, 1996).[3]

2.3 Analysis of hematology and parasitology

Using flotation methods, a fecal sample from each bird was collected in sterile universal bottles with labels to identify the type of helminth eggs present. Additionally, blood samples were taken from every animal and placed in EDTA vials with labels for hematology. The first stabilization period of two weeks was followed by the baseline haematological and coprological assessments.

To identify the helminth eggs in the fecal samples, the flotation method—which used salted (NaCl) water—was employed. For nematode counts, the modified McMaster egg-counting approach was employed. The same modified McMaster egg-counting method used for nematode counts was utilized to determine the fluke count.

Using 25-gauge needles and 5-ml syringes, blood samples were drawn from each bird's jugular vein and placed into EDTA bottles with the proper labels. Using Sahli's approach, the concentration of hemoglobin (Hb) was estimated. Neubau'shemocytometer was used to manually count the erythrocytes and leucocytes. Leucocyte differential counts and packed cell volume (PCV) were calculated using the traditional approach, which is the microhaematocrit method (Mitruka and Rawsley, 1977; Jain, 1986).[3]

2.4 Phytochemical study

Petroleum ether, chloroform, and ethanol extracts of M. charantia were tested for the presence of several phytochemical elements, as explained by Harborne (1973). The following reagents were used: the Shinoda test for flavonoids, the Keller-Kiliani test for glycosides, the Libermann-Buchard reagent for steroids, Dragendroff's reagent for alkaloids, and the ferric chloride reagent for phenolics.[15]

2.5 Collection of earthworms

Earthworms (Phertimaposthuma) weighing 0.8–3.04 g and measuring 3–5 cm in length and 0.1–0.2 cm in width were gathered from damp soil on the Chittagong University campus. Saline water was used to completely wash them.[6]

3. PATHOPHYSIOLOGY OF HELMINTHIC INFECTIONS

Humans can contract helminthic infections by consuming the eggs, larvae, or infected vectors of parasitic worms, or helminths. Depending on the type of parasite, these worms can live in the intestines, liver, lungs, or blood vessels and cause both acute and long-term symptoms. The pathogenesis and course of the disease are significantly influenced by the host's immunological response as well as the particular parasite's capacity to elude it.

In this context, Momordica charantia and Carica papaya seed extracts have shown potential anti-helminthic effects through multiple mechanisms. Below, we explore both the pathophysiology of helminthic infections and the specific ways in which bitter melon and papaya seed extracts may counteract this process.

❖ Arrival of Helminths:

- Direct contact with infected vectors (such as mosquitoes) or contaminated food or water can

allow helminths to enter the human body. Once within the body, they develop and move to different organs, depending on the species, such as the liver, blood arteries, or intestines.

- In the intestinal system, where they cause irritation, blood loss, and mechanical damage, the eggs, larvae, or adult worms (such as Ascaris species and hookworms) usually live.

❖ The Immune Response:

- When helminths are detected, the immune system sets off a series of reactions that are intended to drive the parasites out. IgE antibody generation, mast cell activation, and eosinophil activation are examples of Th2-mediated immune responses that are triggered by this.
- Eosinophils are essential for the destruction of helminths because they emit harmful proteins that harm the parasites, such as major basic protein (MBP) and eosinophil cationic protein (ECP).
- Clusters of immune cells called granulomas, which develop around the parasite and cause inflammation and tissue damage, are another effect of helminth infection.

❖ Tissue Inflammation and Damage:

- In organs like the liver, lungs, and intestines, persistent helminthic infections can result in tissue damage, fibrosis, and scarring.
- In schistosomiasis, for example, the adult worms become lodged in the blood vessels and release eggs that trigger strong immunological responses. This leads to splenic and liver fibrosis, which can result in consequences such cirrhosis, portal hypertension, and hepatomegaly.
- The migrant larvae in Ascariasis have the potential to harm the lungs, resulting in "asthma-like" symptoms (eosinophilic pneumonia

- Immune evasion and chronicity:
- Several helminths have developed defense strategies against the human immune response, such as encysting in tissues to prevent identification or secreting immunomodulatory chemicals that weaken host defenses.
- Chronic helminthic infections can cause intestinal blockage, organ fibrosis, metabolic abnormalities, anemia, and chronic inflammation.

3.1 Mechanisms of Action of Papaya and Bitter Melon Seed Extracts
Together:
The combined modes of action of Momordica charantia and Carica papaya seeds may result in a stronger anti-helminthic effect:

- Anthelmintic Action Synergistically:

Both papaya seeds and bitter melon use distinct strategies to combat helminths, such as direct toxicity, immunological stimulation, neuromuscular paralysis, and digestive assistance. The helminths may find it more difficult to live and procreate as a result of this multi-target strategy.

- Boosting the Immune System:

The immunomodulatory properties of these plants help the body produce a strong immunological response. A quicker and more effective removal of parasite infections could result from the combined impact.

- Minimizing Tissue Damage and Inflammation:

Tissue damage and persistent inflammation are frequent outcomes of helminthic infections. Tissue damage, fibrosis, and long-term consequences may be reduced by papaya seeds and bitter melon's anti-inflammatory qualities.

- Better Digestive Health:

Papaya seeds and bitter melon both support gastrointestinal health and function, which may aid in the removal of parasites from the intestines and increase the effectiveness of intestinal helminth treatment.

4. STUDY OF*IN VITRO* AND *IN VIVO* ANTHELMINTIC / LARVICIDAL ACTIVITY

Carica papaya

The aqueous extract of Carica papaya (Carbicaeceae) seeds has also been shown to have anthelmintic properties against Ascaris lumbricoides and Ascaridia galli.[18]According to Satrija et al., C. papaya latex is highly effective against experimental Heligmosomoidespolygyrus infections.[19]Benzyl isothiocyanate, which was extracted from C. papaya seeds, has anthelmintic properties against Caenorhabditiselegans.[20]According to Hounzangbe-Adote et al.[21], extracts of the leaves of Morinda lucida, Newbouldia, and Zanthoxylum zanthoxyloides, as well as C. papaya seeds gathered

in Western Africa, shown anthelmintic efficacy against various stages of H. contortus. Z. zanthoxyloides, M. lucida, N. laevis, and C. papaya extracts were shown to elicit a dose-dependent suppression of T. colubriformis egg hatching in another investigation. These plant extracts demonstrated their efficacy against T. colubriformis's infectious larvae as well. The effects, however, were only statistically significant for N. laevis and C. papaya in adult worms.[22]The seeds of C. papaya are inexpensive, natural, safe, and easily accessible as a monotherapy and preventative measure against intestinal parasitosis, according to Okeniyi et al.[23]

Mice infected with adult Trichuris muris, a rat gastrointestinal nematode, have shown evidence of the anthelminticeffectiveness of plant cysteine proteinases of C. papaya[24]. Stepek et al.[25]documented the anthelmintic properties of C. papaya cysteine proteinasesagainst Protospiruramuricola in a rodent model in a different investigation.

Momordica Charantia

At the laboratory of Veterinary Helmintology, Department of Parasitology, Federal University of Minas Gerais, Brazil, the trematode has been maintained by serially infecting Lymnaea columella and Santa Inês sheep. The F. hepatica used in the experiments was isolated from the feces of cattle (Bos taurus) by Lima et al. (2009) from farms in the municipality of Itajubá, state of Minas Gerais, Brazil. eggs that were separated from the F. hepatica-Itajubáfecal bolus in accordance with Girão and Ueno (1985). The embryonic dynamics of eggs extracted from the fecal bolus of F. hepatica-Itajubá were studied when the eggs were put in a 96-well cell culture plate and cultured for 12 days at 23° C with dechlorinated water. Using an inverted optical microscope, the pattern of miracidium development was tallied daily during which blastomerized eggs, morulated eggs, embryos, and fully formed miracidium were all observed. The proportion of eggs that exhibited such patterns during a 12-day incubation period with M. charantia extracts was then calculated using the extracts. 50 eggs were added to each well of a 96-well Corning-Costar cell culture plate with a flat bottom and 10 µl of unchlorinated water. The precise number of eggs in each well was counted using an inverted optical microscope just before the treatment began (Pereira et al., 2008). After that, 125 µl of CE and M. charantia subfractions were added to each well, and then unchlorinated water was added to each well until the total volume was 250 µl. For a total of 20 trials per extract, each was evaluated in five wells and in quadruplicate. As negative and positive controls, we utilized unchlorinated water, 0.03% DMSO, and 100 µg/mL albendazole sulphoxide (ABZ(SO)), respectively, with the DMSO control quantity determined according to Butterweck and Nahrstedt (2012). For 12 days at 23 °C, the plates with the eggs were incubated with the controls and the various amounts of M. charantia extracts. To evaluate the growth of miracidia under the various treatments, an Olympus BX41N microscope connected to an Olympus DP12 digital camera was used. The Federal University of Minas Gerais's (CEUA/UFMG) Ethics Committee on the Use of Farm Animals gave its approval to the experiment under protocol number 18/2016.[26]

FUTURE PROSPECTS

Future possibilities for using the seeds of Carica papaya (papaya) and Momordica charantia (bitter melon) as anthelmintic agents seem bright, especially for commercial poultry and perhaps other animal or human uses. These plants provide an affordable, natural substitute for synthetic anthelmintic medications, which are frequently linked to problems including resistance, adverse effects, and environmental concerns.

1. Creation of Natural Anthelmintic Medication

- Extraction and formulation: The bioactive substances found in the seeds of M. charantia and C. papaya, including papain, benzyl isothiocyanate, alkaloids, and phenolic compounds, may be further separated, refined, and standardized to create more potent medication formulations. The creation of commercial herbal or phytomedical products may fall under this category.
- In combination, therapy: Incorporating these plant-based medicines with traditional anthelmintics may improve effectiveness, lessen adverse effects, and postpone the development of parasite drug resistance.

2. Helminth Resistance: A Solution

Natural alternatives like M. charantia and C. papaya are becoming more and more significant due to the persistent worldwide issue of helminth resistance to synthetic medications. These plants may lessen the

need for chemical anthelmintics, which, if used frequently, may lead to resistance.
These plant extracts' effectiveness in controlling helminth resistance may be confirmed by more clinical trials and field research, strengthening its incorporation into integrated pest management plans.

3. Improving the Health and Output of Poultry
The welfare, productivity, and general health of chickens might all be enhanced by the use of natural anthelmintics. Better feed conversion rates, increased egg production, and decreased mortality might result from fewer parasiteinfections.
Additionally, these natural compounds offer a non-chemical method of controlling parasites and may be included into low-input or organic farming systems.

4. Additional Uses for Human Health
Beyond veterinary applications, human intestinal parasitosis may benefit from the anti-helminthic qualities of M. charantia and C. papaya seeds. Particularly in places with limited access to conventional medications, these natural therapies may be used in place of or in addition to synthetic anthelmintics.
Further clinical studies on their safety and efficacy in humans are necessary to understand proper dosing and therapeutic benefits.

5. Investigating Bioactivity and Phytochemicals
There is a lot of promise for bioactivity screening because to the rich phytochemical profile of both M. charantia and C. papaya seeds. The isolation of novel compounds with targeted efficacy against different phases of parasite diseases can be aided by additional investigation into the precise molecular mechanisms of action.

Examining the synergistic effects of various plant components may also help identify new therapeutic combinations for the treatment of complicated helminth infections.

6. Worldwide Awareness and Research
A greater need for evidence-based research confirming the efficacy of M. charantia and C. papaya seeds as anthelmintics is anticipated as interest in herbal medicine and alternative remedies rises across the world. International relationships and a broader use of these plants in livestock and public health programs might be fostered by cooperative research across nations.

CONCLUSION

The anthelmintic properties of Momordica charantia (bitter melon) and Carica papaya (papaya) seeds demonstrate significant potential as natural remedies for parasitic infections, particularly in commercial poultry. Both plants have shown efficacy in combating helminth infestations, with Momordica charantia exhibiting broad-spectrum activity against various helminths and Carica papaya demonstrating a specific effectiveness against nematodes, such as *Ascaris lumbricoides* and *Ascaridia galli*, through the presence of bioactive compounds like papain and benzyl isothiocyanate.

The methods used in this study, including the extraction and application of the seed powders, have proven to be effective in reducing parasitic loads and improving overall poultry health. The use of these seeds provides a promising alternative to conventional synthetic anthelmintics, which often come with concerns over resistance, environmental impact, and cost.

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