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Efficacy of Ginger and Neem Plant Extracts against Nematode Parasites in Local Chickens: A Comparative Study

Evaluasi Khasiat Ekstrak Tanaman Jahe dan Mimba terhadap Parasit Nematoda pada Ayam Lokal: Studi Perbandingan

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Abstract

This research, conducted from May 2022 to February 2023, aimed to assess the effectiveness of alcoholic and aqueous extracts from *Zingiber officinale* (ginger) and *Azadirachta indica* (neem) plants against nematode parasites in local chickens within Salah al-Din, Iraq. A total of 360 chicken fecal samples were collected from various areas and examined using light microscopy, identifying *Tichostrongylus tenius* and *Subulura brumpti* as the prevalent nematode species. The study revealed that the 100% concentration of alcoholic neem extract exhibited the highest efficacy, eliminating worms within hours compared to the control group. Ginger extracts also demonstrated effectiveness, with the 100% concentration displaying rapid worm elimination. The results suggest the potential use of these plant extracts as natural remedies for nematode infestations in poultry, addressing critical health and economic concerns in the industry.

Highlights :

- Alcoholic neem extract at 100% concentration showed rapid efficacy against nematode parasites.
- Ginger extracts also demonstrated effectiveness in eliminating parasites.
- Potential for using plant extracts as natural remedies in poultry farming.

Keywords : Nematode parasites, Ginger extract, Neem extract, Poultry health, Natural remedies

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Introduction

Chickens occupy an important economic position in our country race, as they are bred for the purpose of producing human food (meat and eggs), and domestic birds are usually housed in limited areas with the presence of many types of animals and are therefore exposed to a variety of digestive parasites[1], as they are exposed to a variety of intestinal parasites such as primary, worms and It continues to be responsible for severe health and economic concerns in poultry farms and other animals worldwide[2]. Common internal parasitic infections occur in oral poultry and include nematodes, Cestodes and primary protozoa, which may cause significant damage and significant economic loss to poultry due to malnutrition, weight loss, low egg production and the death of young chicks[3]. Nematodes are known Also in the name of roundworms is a large group of worms with different shapes, hosts and life cycles and may exist in tissues and intestines, and is characterized by its cylindrical body covered with a complete acellular layer called cuticle, and has a developed digestive channel, and be separate races, and most of them have a direct life cycle, but some of them need a middle host [4]. The nematode parasitic is widely prevalent in poultry, such as *Ascaridia galli* and *Heterakis*, for example, *Heterakis gallinarum* and the species of *Capillaria* spp, these types are the most widespread nematodes and cause diseases in poultry and peacocks[5]. Identification of nematode species is based on morphometric and perennial parten characteristics[6]. Soil samples were taken to a depth of 0-20 cm. Nematodes extraction were conducted using Whitehead and Hemming method. Nematodes were killed by hot formaline. Permanent slides were prepared using Seinhorst (1962) method[7][8].

The ginger plant (*Zingiber officinale*) of the Zingiberaceae family is an important medicinal plant and its roots contain polyphenols (gingerol and shogaols.) which has a high antioxidant activity, where the suggestion of the antioxidant property of ginger as one of the main possible mechanisms for the protective effects of the plant against various diseases[9] and from the medicinal plants the Neem plant *Bead tree*, which belongs to the genus *Melia*, which is one of the genera of the Al-Sabbah family. The mahogany family[10] pointed out that plants belonging to the family Al-Sabhae possess chemical compounds relatively similar in their effect as pesticides and have a toxic and repellent effect on some pathogenic organisms[11].

Methods

Collection and preparation of plants

Neem leaves were obtained from a herbal shop in Tikrit and ginger rhizomes were collected from local markets. The aforementioned plants were classified by a specialist in plant taxonomy in the Department of Life Sciences / College of Education for Pure Sciences / University of Tikrit. The parts of the plants used in the experiment were washed with distilled water, then dried well and ground with an electric grinding device to become a fine powder and kept in clean and dry cans until the extraction process.

Alcoholic decoction

The alcoholic extract of plants was obtained using the suxhlet device, where the [12] method was followed as follows: Put 250 g of plant powder in a roll of Watman no.1 filter paper in the extraction column of the device using a 70% ethanol solvent, then install the condenser. After several cycles of 4-5 hours, the extracted material was collected and left to dry at a temperature The room was kept in glass bottles until use.

Hydro extraction

Aquatic extraction of plants was carried out following the [12] method as follows:

Mix 250 g of plant powders with 500 ml of distilled water by the electric mixer and then keep in the refrigerator for a full day (24 hours) filter the mixture using several layers of gauze to get rid of any stuck, then put in the centrifuge 3000 rpm and for 10 minutes where the filter was taken and the sediment was disposed of. Dry the filtrate by cryophilia and under rarefied pressure using a lyophilizer. The dry matter was obtained and kept in airtight glass bottles until use.

Preparation of the required concentrations for plants

Different concentrations of aqueous and alcoholic extracts of the plants under study were prepared (25, 50, 75, 100%), where (25, 50, 75, 100) mg of dry extract were added per 100 ml of distilled water/70% ethanol alcohol [13].

Results and Discussion

Effect of alcoholic and aqueous extract of ginger and neem plants on the nematode *Tichostrongylus tenius*

The results of Table (1) showed that the effect of neem plant extracts on the *Tichostrongylus* worm was more effective than the effect of ginger plant extracts from the first hours until the death of worms gradually, where the alcoholic ginger plant extract at a concentration of 100% recorded the least duration in the elimination of worms by 4.3 hours, while the longest period for worms to remain in the alcoholic extract with a concentration of 25% for 18.7 hours, as is the case of aqueous ginger extract

The shortest duration of the worms was 100% concentrated and reached 5.7 hours, and the longest duration in concentration of 25% with a duration of 21.7 hours, which differs significantly from the control of 23.2 hours.

In the neem plant, the concentration of 100% of alcoholic and aqueous extracts was more effective in eliminating worms for 2.7 and 3.7 hours respectively, and the concentration of 25% recorded the longest duration of worms living at 12.3 and 15.3 hours respectively, and this differs significantly from the control group of 23.2 hours. The results of Kiambom (2020) showed that the components of ginger have lethal effects on *Tichostrongylus tenius* worms in the laboratory as it can be used as insecticidal agents because of its effective compounds capable of killing parasites.

| Plant type | Abstract Type | Focus% | | | | | Average extract type | takeover |
|--------------|-----------------------------------|-----------|-----------|-----------|----------|-----------|----------------------|----------|
| | | 25% | 50% | 75% | 100% | | | |
| Ginger plant | Average time for alcoholic ginger | 18.7 b | 14.7 c | 11.9 D | 4.3 e | 12.4 B | 23.2 a | |
| | Average time for water ginger | 21.7 b | 15.7 c | 13.0 d | 5.7 e | 14.0 A | | |
| Neem plant | Average time Alcoholic Neem | 12.3 b | 10.3 c | 6.3 D | 2.7 e | 7.9 D | | |
| | Average time Water Neem | 15.3 b | 12.0 c | 8.0 D | 3.7 e | 9.7 C | | |

Figure 1. Effect of alcoholic and aqueous extract of neem and ginger plants on death Nematode *Tichostrongylus tenius*

Small letters that are similar horizontally mean that there are no significant differences between them

Capacitive letters that are similar vertically mean that there are no significant differences between them

Effect of alcoholic and aqueous extract of ginger and neem plants on the nematode *Subulura brumpti*

The results of Table (2) show that the effect of ginger extracts and alcoholic and aqueous neem extracts was more effective in killing *Subulurabrumpti* worms compared to the rest of the nematodes above, as the effect of alcoholic and aqueous neem plant extracts at a concentration of 100% amounted to 0.8 and 1.0 hours, which is higher than the ginger extract, which amounted to 1.3 and 2.0 hours respectively. The least effect was ginger and neem extract at a concentration of 25%, with results of 13.9 and 15.5 hours for ginger and 13.5 and 15 hours for neem respectively. Due to the lack of studies on these worms in chickens, we compare the results with the findings of the researcher [14][15] who conducted his study on nematodes, including *Subulurabrumpti* worms. In pigs, hot and cold ginger extract was shown to have an effective effect in killing worms and its effect was similar to albendazole.

| Plant type | Abstract Type | Focus% | | | | | Average extract type | takeover |
|--------------|-----------------------------------|-----------|-----------|----------|----------|----------|----------------------|----------|
| | | 25% | 50% | 75% | 100% | | | |
| Ginger plant | Average time for alcoholic ginger | 13.9 b | 10.6 c | 4.3 d | 1.3 e | 7.5 C | 17.8 a | |
| | Average time for water ginger | 15.5 b | 11.0 c | 5.3 d | 2.0 e | 8.4 A | | |
| Neem plant | Average time Alcoholic Neem | 13.5 b | 10.4 c | 1.5 d | 0.8 e | 6.5 D | | |
| | Average time Water Neem | 15 b | 13 c | 2.2 d | 1.0 e | 7.8 B | | |

Figure 2. Effect of alcoholic and aqueous extract of neem and ginger plants on death Nematode *Subulura brumpti*

Small letters that are similar horizontally mean that there are no significant differences between them

Capacitive letters that are similar vertically mean that there are no significant differences between them

Conclusions

1. Effectiveness of Neem and Ginger Plant Extracts: The study found that both alcoholic and aqueous extracts of neem and ginger plants showed promising effectiveness against nematode parasites in local chickens. These plant extracts, particularly at higher concentrations, significantly reduced the survival time of the parasites compared to the control group.
2. Differential Efficacy on Nematode Species: The research highlighted that the efficacy of the plant extracts varied depending on the nematode species. Neem extracts, in particular, demonstrated higher effectiveness against *Tichostrongylus tenius*, while *Subulura brumpti* was also susceptible to both neem and ginger extracts.
3. Optimal Concentration: The 100% concentration of alcoholic neem extract and the 100% concentration of aqueous ginger extract exhibited the highest efficacy in eliminating nematode worms rapidly. This suggests that using these plant extracts at full strength may be the most effective approach.
4. Potential for Natural Remedies: The study suggests that neem and ginger plant extracts have the potential to serve as natural remedies for nematode infections in poultry. This finding is significant for the poultry industry as it provides an alternative to synthetic anthelmintic drugs.
5. Implications for Chicken Farming: The research outcomes have important implications for the health and economic well-being of chickens in the poultry industry. Nematode infections can lead to malnutrition, weight loss, reduced egg production, and mortality in chickens. The use of plant extracts may help mitigate these issues and improve overall poultry health.
6. Need for Further Research: While the study provides promising results, further research is needed to explore the safety and long-term effectiveness of these plant extracts in real-world poultry farming conditions. Additionally, investigations into the mechanisms by which these extracts exert their antiparasitic effects would be valuable.

In summary, this research suggests that neem and ginger plant extracts have potential as natural solutions for controlling nematode parasites in chickens, offering a safer and more sustainable alternative to conventional

treatments. However, practical applications and long-term effects require further investigation.

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