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Identification and management of gastro-intestinal parasites of ibaka native chicken using different anthelmintic herbal plants

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Abstract

Many farmers are challenged in the infestations of various parasites in chicken production. Thus, they use chemically produced drugs for its management. This study was conducted to evaluate the efficacy of different anthelmintic herbal plants against gastrointestinal parasites on improved native chicken. Twenty-four chickens were used in in vivo and sixty adult roundworms in the in vitro study divided into four treatments replicated thrice. Results showed that species of parasites identified were *Ascaridia galli* and *Capillaria* spp. In terms of Fecal Egg Count Reduction (FECR), Treatment 2 (Ipil-ipil) recorded the highest percentage of 84.30 higher than the control treatment with 81. 30%, Treatment 4 (Betel Nut) with 70.25% and Treatment 3 (Papaya) with 56.82%. On the other hand, significant result on the motility assay of adult roundworms was detected. Ipil-ipil aqueous extract (Treatment 2) is highly effective in killing adult worms with a motility score of 0.94 comparable to the control treatment (Commercial dewormer) with 1.00. The other treatments are not effective. Lastly, birds in all treatments showed an increased in their body weights that ranges from 121 g – 235.50 g after 28 days of administering the dewormers. It is therefore concluded that Ipil-ipil aqueous extract is the most effective in reducing EPG of parasites and highly effective in killing adult roundworms as compared with other treatments. In terms of gain in weights, as the EPG decreases, weight gain of the birds increases.

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Introduction

According to Philippine Statistics Authority, the growth in chicken demand has been faster than other meats due to its affordability, lower fat content, and the absence of cultural religious hindrances. In 2022, the total chicken production was estimated at 1.87 million metric tons, live weight, indicating an annual growth rate of 7.0 percent from the previous year's output of 1.74 million metric tons. This opportunity opens a wide way to backyard and commercial poultry producers in the country. However, keeping the flocks healthy and safe is not easy; in particular with native chicken which nature has been pastured or free range. Nutrition is a vital key in the success of the production and there are several factors that hinder the chicken productivity, one is parasitism (PSA, 2022).

Parasitism continues to be a cause of major concern in several parts of the world that upsets the livestock and poultry raisers causing troubles to the flock because it is hidden within their giblets. Since native chickens are normally free ranged, they are more likely prone to parasites in the ground scratching for food and water. The wide variation used of several drugs in eliminating chicken parasites alarms the farmers and consumers over food safety, health issues, veterinary expenses, problem of anthelmintic resistance is progressive, and its availability on rural areas. For this reason, farmers and poultry raisers compelled to use herbs as an alternative medication. Aside from being natural, it is also abundant and available in the environment. It is easy to prepare and relatively free from effects when consumed (Shayma, 2015).

Plant- based medicines has been a traditional custom among Filipinos particularly in the countryside in treating illnesses. It is also an economically alternative for animal nutrition. Several researchers reported that the use of medicinal plant species as an alternative anthelmintic drug to manage gastrointestinal parasites in poultry and livestock are safe, sustainable and environmentally acceptable globally (Shen, 2010).

The discovery of natural anthelmintic is essential to animals and humans. They are benefited with economic availability and health safety. Researchers found that many herbal plants we usually stumbled in our surroundings. Some of these herbal plants to treat parasitism on internal parasites of chicken are Ipil- ipil seeds, papaya seeds (Goku *et al.*, 2020), and betel nut (Ozaraga and Ozaraga, 2017). The mentioned plants are just few of the listed anthelmintic herbal plants which can be used to manage internal parasites of native chicken. Besides, it is affordable and available within the locality. Therefore, this study was conducted.

Generally, the study was conducted to evaluate the efficacy of different anthelmintic herbal plants in in vivo and in vitro test against gastro-intestinal parasites of improved native chicken (*Gallus gallus domesticus*) raised by the IBAKA (Ilocano, Ibanag, Agta, and Kalinga) in the downstream part of Cagayan Province.

Specifically, the study was conducted to determine:

a. the chemicals present in the herbal plants through phytochemical analysis,
b. the species of parasites present before and after treatment,
c. fecal egg count and its degree of infection,
d. Fecal Egg Count Reduction (FECR),
e. gain in weights of the birds; and
f. motility assay of adult worms.

Conceptual framework

This Fig. 1 presents a flowchart of the process involving anthelmintic herbal plant extracts for improving native chickens. It outlines the Input (native chickens, herbal extracts, and equipment), Process (extraction, screening, and in vivo testing), and Output (chemical profile, test results, and parasite identification). The final Outcome highlights the potential of herbal extracts as an alternative to commercial dewormers, promoting healthier, parasite-free chickens for human consumption.

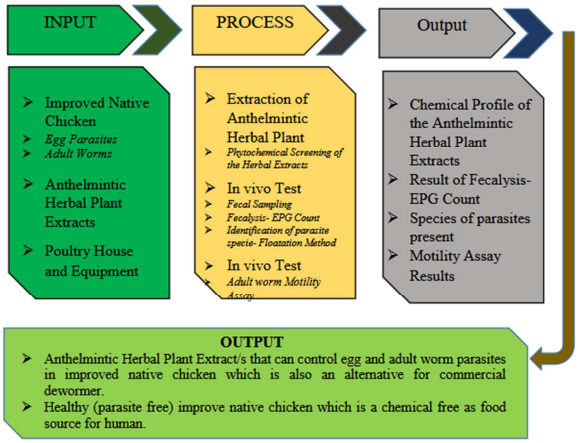

Fig. 1. Conceptual framework

Materials and methods

Materials

The supplies, materials and equipment used in the study were the following: twenty-four (24) heads of native chicken, surgical gloves, face mask, blender, muslin cloth, stirring rod, funnel, measuring cup, plastic containers, disposable syringe, disposable sauce cups, microscope, incubator, record book, pen, cooler and the different anthelmintic aqueous extracts (Ipil-ipil, Papaya and Betel Nut) seed extracts.

Experimental design and treatments

For *in vivo*, the experimental animals were equally divided into four (4) treatments replicated thrice having two (2) birds per replicate. For *in vitro,* sixty adult worms were collected and suspended to petri dish equally divided into four (4) treatments replicated thrice with five (5) worms per treatment. The study was laid out using the Completely Randomized Design (CRD).

The treatments used were as follows:

T_1- Commercial dewormer (control)

T_2- Ipil-ipil (*Leucaena leucocephala* Linn.)

T_3- Papaya (*Carica papaya*)

T_4- Betel Nut (*Areca catechu*)

Experimental animal

Twenty-four (24) of about four (4) to six (6) months old improved native chicken were raised in free range and were secured within the community as the experimental birds. These birds were subjected for fecalysis to ensure that they are infested with internal parasites.

Collection and preparation of materials for aqueous extraction

Seeds of the different plants were collected and gathered from different sources. The collected seeds were dried for three (3) days and powdered using blender and stored in a sealed plastic container prior to extraction.

Preparation of aqueous extracts

Aqueous extraction was done following the method of Cabardo and Portugaliza (2017) with a little modification. The collected seeds were dried, and powderized using blender and extracted using distilled water (Wilkins). Following the ratio of Delgado *et al.* (2012), the powdered seeds were soaked in water at a ratio of 2.5 g/ 100 ml (weight/volume) and allowed to stand protected from light for 48 hours. The extracts were sieved and filtered using a muslin cloth. The extracts were concentrated at 60° C in an induction cooker to obtain the plant seed aqueous extracts (PSAE), this method was adopted from the protocol of Fernandez *et al.* (2009).

In vivo application

The collected samples were brought to the laboratory and were subjected to fecalysis to determine the infestation of parasites. Treatments were administered on the 7^{th}, 14^{th}, 21^{st}, and 28^{th} day post-treatment, through mixing a 7 ml of extract to a 200 ml of water every day. The fecalysis were done on pre-treatment and post- treatment to determine the effectiveness of the test agents.

Data gathered

Phytochemical analysis

The different extracts of the anthelmintic herbal plants were submitted to Central Analytical Laboratory at Cagayan State University Andrews campus, Caritan, Tuguegarao City and subjected for phytochemical screening.

For the *in vivo* method, the following data were gathered:

Initial Weight (g/bird): The initial weight of experimental birds was gathered before the commencement of the study.

Parasite species present in the feces: The parasite species present were tested by Mc Master Floatation Method.

Fecal egg count and its degree of infection: The number of eggs counted on Mc Master chambers were multiplied by 50 to obtain the EPG.

Fecal egg count reduction (FECR): The fecal egg count reduction was calculated using the formula, FECR (Fecal Egg Count Reduction) = EPG pre-treatment- EPG post-treatment/EPG pre-treatment × 100.

Final Weight (g/bird): The final weight of the experimental birds was gathered after the end of the study.

Total weight gain (g/bird): The total gain weight was taken by subtracting the initial weight from the final weight.

Egg count per gram (EPG) for the parasites

Egg Count per Gram of the parasites was determined by using the Mc Master Technique of fecalysis. Two grams of feces were mixed with Sheather's solution. Samples were sieved and placed into a tube for atleast two (2) minutes in order for the eggs to float to the surface. After which, samples were transferred into the two (2) chambers, placed under the microscope and counted the eggs present. EPG was obtained by using the formula: Chamber 1+ Chamber 2* 50.

In vitro application

For in vitro, the study of Lagu and Kayanja (2013) were modified. Chickens which were positively infected with parasite were slaughtered prior to worm counting. The chicken intestines were carefully examined. Gastrointestinal parasites were collected from the intestines and placed into a Petri dish containing five (5) ml of nutrient broth and seven (7) ml each of the different extracts. The nutrient broth and the different aqueous extracts were heated until 37 degree Celsius. Sixty gastrointestinal parasite individuals were soaked and suspended to petri dish equally divided into four (4) treatments replicated thrice with five (5) worms per treatment to test the efficacy of the different plant extracts with the same concentrations of the AAE for 24 hours into an incubator with 37 degree Celsius. The number of deceased gastrointestinal parasites was recorded by ascertaining whether they had ceased movement.

Data gathered for the in vitro test

Parasite motility assay

This was taken after the worms were removed from the intestine. Observation and recording were taken after post-incubation.

Table 1. Motility scale

Motility scale	Interpretation
1	Live and Actively Motile
2	Live Non-Motile
3	Dead

The Costa *et al.* (2008) motility scale and the interpretation method was adopted and used in recording the motility of worms (Table 1). The mean motility scale score was analyzed and interpreted using descriptive analysis as shown in the Table 2.

Table 2. Motility score and interpretation of the effect of the different anthelmintic extracts

Mean score	Interpretation
>0.78	Highly Effective
0.72-0.78	Effective
<0.72	Not effective

Data analysis

The data gathered were statistically analyzed using the Analysis of Variance (ANOVA) in Randomized Complete Block Design.

Results and discussion

Phytochemical analysis of the anthelmintic herbal plants

The different herbal plants that were used as an anthelmintic against gastro-intestinal parasites of

improved native chicken were subjected for phytochemical screening. Shown in Table 3 is the result of the analysis. Ipil-ipil extract have flavonoids, phenols, steroids, and tannins but it does not have anthocyanin. For the Papaya extract, it contains flavonoid, steroids and tannins. Lastly, Betel nut extract contains anthocyanin, flavonoids, phenols, steroids and tannins.

Species of parasites present during pre-treatment and post-treatment

Two parasites, *Ascaridia galli* and *Capillaria* spp., were identified through fecalysis conducted before treatment and at the 1st, 2nd, 3rd, and 4th fecalysis after treatment (Table 4). Their presence was consistently detected during the examinations, indicating the extent of parasitic infection and response to treatment.

Table 3. Phytochemical screening of different herbal plant extracts, Cagayan State University, Lal-lo, Cagayan. December 2022- January 2023

	Parameter	Ipil-ipil AAE	Papaya AAE	Betel Nut AAE
Phytochemical screening	Anthocyanin	(-)	(-)	(+)
	Flavonoids	(+)	(+)	(+)
	Phenols	(+)	(-)	(+)
	Steroids	(+)	(+)	(+)
	Tannins	(+)	(+)	(+)

Table 4. Identified species of gastro-intestinal parasites of improved native chickens during pre-treatment and post-treatments of different anthelmintic herbal plants, Cagayan State University, Lal-lo, Cagayan, December 2022- January 2023

Treatments	Pre-treatment	Post-treatment (Day)			
		7^{th}	14^{th}	21^{st}	28^{th}
T_1- Control	1, 2	1, 2	1, 2	1, 2	1, 2
T_2- Ipil Ipil (*Leucaena leucocephala*)	1, 2	1, 2	1, 2	1, 2	1, 2
T_3- Papaya (*Carica papaya*)	1, 2	1, 2	1, 2	1, 2	1, 2
T_4- Betel Nut (*Areca catechu*)	1, 2	1, 2	1, 2	1, 2	1, 2

* 1= *Ascaridia galli*; 2= *Capillaria* spp.

Table 5. Fecal egg count of improve native chicken and its degree of infection during pre-treatment and post-treatment of different anthelmintic herbal plants, Cagayan State University, Lal-lo, Cagayan, December 2022-January 2023

Treatments	Pre-treatment	DI	Post-treatment							
			7^{th} Day	DI	14^{th} Day	DI	21^{st} Day	DI	28^{th} Day	DI
T_1- Control	683	M	250	L	158	L	217	L	92	L
T_2- Ipil Ipil (*Leucaena leucocephala*)	733	M	58	L	125	L	142	L	117	L
T_3- Papaya (*Carica papaya*)	725	M	357	L	392	L	367	L	283	L
T_4- Betel Nut (*Areca catechu*)	675	M	267	L	67	L	375	L	217	L

*Degree of Infection: L-Low, M-Medium, H-High

Fecal egg count and its degree of infection (DI)

The fecal egg count of improved native chicken and its degree of infection during pre-treatment and post-treatment at 7^{th}, 14^{th}, 21^{st}, and 28^{th} day is shown in Table 5. It shows that the initial Egg Count Per Gram of the different treatment ranges from 725-675 in which its degree of infection is medium. As the different dewormers were administered to the birds, continuous reduction of the EPG from 7^{th} day to 28^{th} day was obtained and the figure indicates a low degree of infection. A manifestation that the different anthelmintic were able to reduce the EPG of the chicken's parasites.

Fecal egg count reduction

The Fecal Egg Count Reduction of improved native chicken when treated with different anthelmintic herbal plants is shown in Table 6. The result shows that the highest percent reduction was recorded in Treatment 2 (Ipil-Ipil) with 84.30% better than the

control treatment with 81.30%. The least percent reduction was obtained by Treatment 3 (Papaya) with 56.82%. The figures in the table simply shows that among all the treatments, the most effective in expelling egg parasites of chicken is Treatment 2 (Ipil-Ipil).

Table 6. Fecal egg count reduction of improved native chicken as affected by different anthelmintic herbal plants, Cagayan State University, Lal-lo, Cagayan, December 2022- January 2023

Treatments	% Reduction
T_1- Control	81.30
T_2- Ipil Ipil (*Leucaena leucocephala*)	84.30
T_3- Papaya (*Carica papaya*)	56.82
T_4- Betel nut (*Areca catechu*)	70.25

Gain in weights of the birds

Shown in Table 7 are the weights of the birds taken before and after administration of the dewormers. The initial weights were almost the same that ranges from 2,084 grams to 2,157 grams. In terms of final weight and total weight gain, Treatment 4 recorded the highest weight of 2,386 grams and 235.50 grams. Nevertheless, the body weights of the birds in all treatments as manifested on the figures in the table increases when number of egg parasites decreases by allowing increased absorption of nutrients into the chickens' body. Furthermore, result of Analysis of Variance showed no significant difference in all weights of the birds.

Motility assay of adult worms of improved native chicken (%)

The Motility Assay of adult worms of improved native chicken is shown in Table 8. The adult worms were monitored under microscopic view to identify their motility. Result of the assay test showed that worms under Treatment 1 (Control) had already a hundred percent complete loss of motility on the first three hour which means a hundred percent mortality. Among the herbal plant extracts in the different treatments, Treatment 2 (Ipil-Ipil) is the most effective in killing adult worms that takes 21 hours only. This was followed by Treatment 3 (Papaya) at 24 hours duration and lastly, Treatment 4 (Betel Nut) at 28 hours.

Table 7. Mean initial weight, final weight, and total weight gain of improved native chickens before and after treatment of different anthelmintic herbal plants, Cagayan State University, Lal-lo, Cagayan, December 2022- January 2023

Treatments	Initial weight	Final weight	Total weight gain
T_1- Control	2157.50	2365.00	207.50
T_2- Ipil Ipil (*Leucaena leucocephala*)	2084.50	2205.50	121.00
T_3- Papaya (*Carica papaya*)	2075.50	2289.50	214.00
T_4- Betel nut (*Areca catechu*)	2150.50	2386.00	235.50
Statistical Inference	ns	ns	ns

Table 8. Hours to complete loss of motility and motility score of adult worms of improved native chicken treated with different herbal plants, Cagayan State University, Lal-lo, Cagayan, December 2022- January 2023

Treatments	Complete loss of motility	Motility score	Interpretation
T_1- Control	3 hours	1.00 a	Highly effective
T_2- Ipil Ipil (*Leucaena leucocephala*)	21 hours	0.94 a	Highly effective
T_3- Papaya (*Carica papaya*)	24 hours	0.62 b	Not effective
T_4- Betel nut (*Areca catechu*)	28 hours	0.56 b	Not effective
Statistical inference		Significant	

Motility score of worms in all treatments were also determined. The Analysis of Variance showed that Treatment 2 (Ipil-Ipil) gave highly significant difference compared to the control treatment while Treatment 3 (Papaya) and Treatment 4 (Betel Nut) did not cause any significant difference. The result of this study which papaya extract is highly effective in killing adult worms is consistent with the findings of Sen (2020) that aqueous extract of papaya is effective in reducing the total worm count by 83.66% and Ozaraga and Ozaraga (2017) that Ipil-ipil contains mimosine glycoside content that gradually kills the parasites

Conclusion

Based on the result of the study, it is concluded that the Ipil-ipil aqueous extract is the most effective in reducing the egg count of parasites and highly effective in killing adult worms of improved native chicken as compared with other anthelmintic herbal plants used in the study. In terms of gain in weights, as the number of the egg parasites decreases, the weight gain of the birds increases.

Recommendations

Based on the findings of the study, in order to manage internal parasites of chicken, Ipil-ipil aqueous extract is recommended as manifested by its high egg count reduction percentage and its motility score in adult worms which is highly effective that is comparable to commercial dewormers. However, for more conclusive results, it is recommended that similar studies must be conducted using the same treatments to verify the results.

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