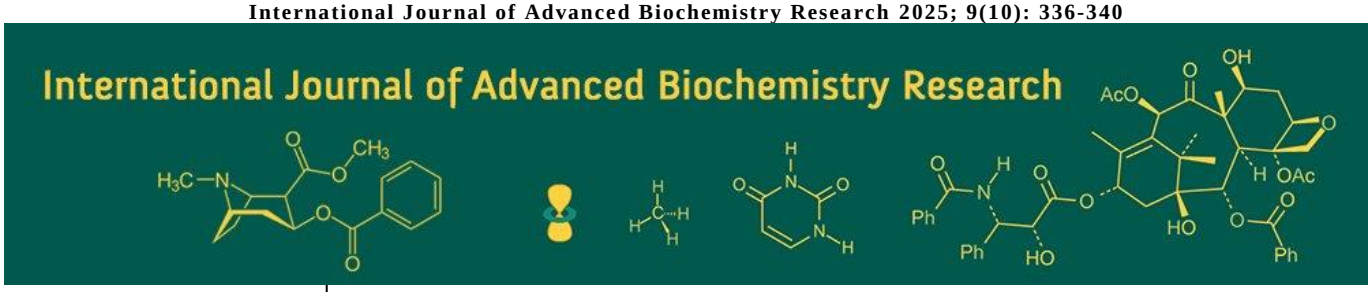

ISSN Print: 2617-4693
ISSN Online: 2617-4707
NAAS Rating (2025): 5.29
IJABR 2025; 9(10): 336-340
www.biochemjournal.com
Received: 10-08-2025
Accepted: 13-09-2025

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Comparative efficacy of certain herbal formulations against natural ascaridiosis in backyard poultry

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DOI: https://www.doi.org/10.33545/26174693.2025.v9.i10e.6028

Abstract
The present study was carried out to determine the comparative efficacy of certain herbal formulations against Ascaridiosis in naturally infected backyard poultry reared in U.S. Nagar district of Uttarakhand. The efficacy trial was of 28 days. Efficacy trial was conducted on 75 backyard chickens, randomly divided into 5 groups, each group comprising of 15 birds naturally infected with ascaridiosis. Group I was kept as control and untreated. Group II birds were treated with Piperazine @ 80 mg/kg body wt orally, Group III was treated with a combination of Neem, Papaya, Vaividang and Bathua powder (25% each) @ 2 gm/kg body wt. Group IV was treated with a combination of Bathua and Vaividang powder (50% each) @ 2 gm/kg body wt and Group V was treated with Bathua powder 2 gm/kg body wt. All the treatments were given for 3 consecutive days. Body weight and eggs per gram (EPG) was recorded at 0^{th}, 7^{th}, 14^{th}, 21^{st} and 28^{th} days post treatment (DPT). Results revealed that *Ascaridia galli* infection caused significant decrease in the body weights of chickens. Group II was found to be most effective in which weight gain was increased 9.79% compared to 0 DPT body weight. This was followed by group III, IV and V with an increase in body weight gain of 7.41, 6.51 and 6.02% compared to 0 DPT body weight. However, EPG count were found significantly decreased ($p<0.05$) in all treated groups and significantly ($p<0.05$) increased in control group at the end of experiment i.e. 28^{th} DPT. At 28^{th} DPT, Group II was found to be most effective (100%) followed by groups V, IV and III, respectively with a percent reduction in EPG of 83.04, 82.11 and 77.89, respectively. Group I had a negative reduction of 14.10 in the EPG. It is concluded from the present study that herbs in combinations and individually, had a moderate anthelminthic activity against *Ascaridia galli* parasites in backyard poultry and can be used as an alternative of chemical drugs in controlling ascaridiosis in poultry.

Keywords: Ascaridiosis, backyard poultry, efficacy, herbal formulations, natural infection

Introduction
Poultry farming is the most developed, rapid growing, intensively reared and profitable animal production venture in the world (Obiora, 1992 and Safari *et al*., 2004) [19, 25]. In the developing countries, like India, it has become pre-eminence and lucrative enterprises over all other livestock businesses of agriculture sector having a growth rate of 8% per annum and ranking third with respect to egg production and fifth in broiler meat production. Poultry sector plays a decisive role in improving the socio-economic condition in rural masses with a population of 729.21 million (Livestock Census, 2012) [14] which contributes nearly 1% whereas livestock contributes 4.8% and agriculture and the allied sector contributes 17.5% to the national GDP (NDDB Annual Report, 2017) [18]. Poultry is reared as backyard and commercial poultry in various parts of world. In India, backyard or village production system of poultry farming is as old as its civilization (Randhwa, 1946) [23] and contributes nearly 30.0% to total egg production (Singh *et al*., 2009) [27]. The organized sector of the poultry industry contributes 70% and other 30% is contributed by the unorganized sector to its total outputs. However, to hold productiveness of poultry it is far vital that they stay free from viral, bacterial and parasitic diseases. Though the impact of parasitic diseases in farm birds reared on cage system have diminished due to of improved housing, hygiene and managemental practices. Incidence of parasitic diseases in backyard free range system still under risk of parasitic infections via muddle droppings and scavenging habits. Most common parasitic roundworm of poultry is *Ascaridia galli* (Soulsby, 1982; Permin and Hansen, 1998) [29, 21]. It has a cosmopolitan occurrence.

Ascaridia galli infection causes retardation, loss in weight, reduced nutrients absorption and death. It may spread fatal bacterial infections, consequently results in financial losses to the poultry producer. For the control of parasites mostly hygiene and chemotherapeutic measures are followed. However use of chemotherapeutic control practices results in development of resistance to various anthelmintics rendering helminth infections rampant as ever (Chartier *et al*., 2001; Leathwick *et al*., 2001 and Stear, 2007) [8, 13, 30] together with the problem of residues and toxicity. Therefore herbs and herbal products provide a way to reduce the toxic effects of chemicals, high cost of drugs and development of resistance. Plants have been used as traditional medicine since long. The efficacies of herbs and herbal products for both endoparasitic and ectoparasitic diseases have been reported by earlier researchers (Meloney, 1982) [16]. Keeping these points in mind, the present study was planned to compare the efficacy of certain herbal formulations in naturally infected backyard chickens with ascaridiosis.

Materials and Methods

Present study was conducted in the District Udham Singh Nagar of Uttarakhand. Plants viz. Vaividang (*Embelia ribes*), Papaya (*Carica papaya*), Bathua (*Chenopodium album*) and Neem (*Azadirachta indica*) were collected locally from natural habitat within and surroundings of the campus of GB Pant University of Agriculture & Technology, Pantnagar. They were identified and authenticated by Department of Biological Sciences, College of Basic Science and Humanity, GB Pant University of Agriculture & Technology, Pantnagar. Table 1 shows the various plants and their parts used in the present study.

Table 1: Different plants and their parts used in efficacy trial

Sl. No	Plant Species	Part used	Common name
1.	*Azadirachta indica*	leaves	Neem
2.	*Carica papaya*	leaves	Papaya
3.	*Embelia ribes*	seed	Vaividang
4.	*Chenopodium album*	leaves	Bathua

After collection, leaves were separated from the plants and washed thoroughly in running tap water. The leaves were dried in the shade at room temperature and then they were dried in the oven at 55-60 °C. The dried leaves were cut into small pieces and pulverized with a grinder. A 25 mm mesh diameter sieve was used to obtain the fine powder, after that, the powder was preserved in an airtight plastic container till further use.

Experimental design

Backyard chickens naturally infected with ascarid eggs were randomly divided into 5 groups as (I, II, III, IV, V), each group containing 15 chickens. The experimental design is shown in Table 2. Group I was kept as control and untreated. Group II was treated with Piperazine @ 80mg/kg body weight orally. Group III was treated with a combination of Neem, Papaya, Vaividang and Bathua powder (25% each) @ 2 gm/kg body wt. Group IV was treated with a combination of Bathua and Vaividang powder (50% each) @ 2 gm/kg body wt while Group V was treated with Bathua powder only 2 gm/kg body wt. All the treatments were given for 3 consecutive days.

Table 2: Various treatments and their dose of administration

Groups	Drug used for trial	Dose	Period and Mode of administration
I	Control (Untreated)	Nil	Nil
II	Piperazine	80 mg/kg b.wt	Orally, 3 days
III	Neem: Papaya: Vaividang: Bathua (25:25:25:25)	2 gm/kg b.wt	Orally, 3 days
IV	Bathua: Vaividang (50:50)	2 gm/kg b.wt	Orally, 3 days
V	Bathua	2 gm/kg b.wt	Orally, 3days

Body weight of all the birds in each group was recorded at 0th, 7th, 14th, 21st, and 28th DPT and the mean body weight gain was calculated. Fecal egg count reduction test (FECRT) was performed by using faecal egg counts per gram of faeces (EPG) for all the birds when the chickens show positivity for *Ascaridia galli* eggs by modified McMaster technique (Soulsby 1982) [29] at 0th, 7th, 14th, 21st, and 28th DPT. Percent Fecal Egg Count Reduction Test (FECRT) was calculated using the following formula:

$$\text{FECRT (\%)} = \frac{\text{(Pre - treatment EPG - Post - treatment EPG}}{\text{Pre - treatment EPG}} \times 100$$

The data generated during the course of experiment was analyzed using two way ANOVA (Snedecor and Cochran, 1994) [28].

Results and Discussion

Body weight (BW)

The effect of various herbal formulations on mean body weight (g) and mean body weight gain (g) at different intervals in backyard chickens naturally infected with *Ascaridia galli* is presented in Table 3. In group I, the mean body weights of the birds were 774.46±2.83, 772.78±5.86, 770.21±1.71, 768.30±2.27 and 761.88±1.07 at 0th, 7th, 14th, 21st and 28th DPT, respectively. In group II, these values were 767.15±4.81, 781.34±5.39, 800.72±1.28, 820.58±0.95 and 842.22±6.36, respectively, at the above said intervals. In group III, at these intervals, the mean body weights of the birds were 773.33±4.09, 781.00±3.05, 796.66±4.05, 811.00±1.00 and 830.66±0.87, respectively. In group IV, these values were 773.00±6.65, 779.08±5.84, 791.08±2.56, 806.90±1.87 and 823.33±0.89, respectively. In group V, the mean body weights of birds were 771.53±12.33, 778.22±11.90, 790.43±12.63, 802.52±12.85 and 817.97±11.99, respectively.

At 0 DPT, birds of all the groups had statistically similar body weights. While at 14th DPT, maximum and significantly higher body weight was noted in birds of group II while all the other groups had significantly similar body weights. At 21st and 28th DPT, minimum and significantly lower body weight was noted in birds of control group while maximum and significantly higher body weight was observed in birds of group II. Birds of groups III, IV and V had non-significant difference in the body weight. For overall period, there was reduction of 1.62% body weight in the control group while there was body weight gain of 9.79, 7.41, 6.51 and 6.02% in birds of groups II, III, IV and V, respectively. The body weight of chicken increased significantly in treated group compared to control are in accordance with the reports of Hoque *et al*. (2006) [10] and Begum *et al*. (2010) [6]. Improved body weight at 21st and 28th DPT in chickens of groups II, III, IV and V might be

due to proper absorption and metabolism of feed nutrients as also evident by the EPG count of the chickens of groups II, III, IV and V for *Ascaridia galli*. This result supports the observations of previous researchers (Ralston *et al*., 2001; Githiori *et al*., 2004; Rayes *et al*., 2004; Martin *et al*., 2005; Wrigley *et al*., 2006) [22, 9, 24, 15, 31].

Efficacy trial

Comparative anthelmintic efficacy of various herbal formulations against natural infestation of *Ascaridia galli* in backyard poultry is presented in **Table 4.** In group I, the mean EPG of the birds were 286±26.50, 294.66±27.38, 303.33±28.26, 311.66±28.9 and 326.3±30.34 at 0th, 7th, 14th, 21st and 28th DPT, respectively. In group II, these values were 287.33±26.18 and 52±4.72 at 0th and 7th DPT. At 14th, 21st and 28th DPT the EPG in this group was 0. In group III, at these intervals, the mean EPG of the birds were 256.33±18.85, 223±16.34, 138.66±10.17, 90±6.50 and 56.66±4.17, respectively. In group IV, these values were 259±21.03, 207.33±16.85, 116.33±9.35, 88±7.02 and 46.33±3.84, respectively. In group V, the mean EPG of birds were 291±23.62, 229.66±18.65, 128±10.40, 95.66±7.68 and 49.33±3.84, respectively.

At 7th and 21st DPT, treatment in group II was found most effective and significantly reduced EPG count compared to all other groups. Treatment in groups III, IV and V were less effective compared to be but had similar effects among themselves. Group I had highest EPG at 7th DPT. At 14th and 28th DPT, there was significantly (p<0.05) higher and maximum i.e. 100% reduction in EPG was noted in birds of group II followed by group IV which was statistically similar to EPG reduction in birds of group V. In groups III and V, statistically similar reduction in EPG was noted. Birds of control group had significantly higher and maximum EPG at 14th and 28th DPT also. The probable results might be due to paralysing action of piperazine which was due to a curare-like effect on the neuromuscular junctions. These findings are in consonance with the study carried out by Hoque *et al*. (2006) [10] and Begum *et al*. (2010) [6]. However, chickens of group V were observed effective with 83.04% reduction of EPG on 28th DPT. It could be due to the anthelmintic properties of Bathua which is due to the presence of glycosides in aerial parts of *C. album* (Akhtar *et al*., 2000) [3]. In contrary to current study, Sarker *et al*. (2009) [26] reported least efficacy of Bathua in comparison with neem. Previous researches on goat shows that the powdered mixture containing equal parts of *Veronia anthelmintica* (seeds) and *Embelia ribes* (fruit) is effective for the treatment of goats suffering from mixed gastrointestinal nematode infection. While in separate study it was observed that individually these plant drugs viz., *V. anthelmintica* and *E. fiber* did not exert a significant antinematodal activity at even higher doses in goats (Javed and Akhtar, 1990) [4].

Group III was found to be least effective among treated groups with 77.89% reduction in EPG count of droppings. Similar reports were recorded by Adu *et al*. (2009) [2] who used extraction from latex of papaya and reported 77.7% decrease in EPG of *A. galli* in the feces of chicken. The effective control of *A. galli* in chicken with neem extract was recorded in present study and the same was also reported by Alam *et al*. (2014) [5]. Neem is being used as medicinal plant since long time. Earlier studies shown the effectiveness of neem leaves extract to control the *A. galli* infection in poultry (Khokan *et al*., 2014) [12] and it also acts as growth promoter (Adeyemo and Akanmu, 2012; Kamal *et al*., 2015) [1, 11], antifungal (Moslem and El-Kholie, 2009; Ospina-Salazár *et al*., 2015) [17, 20]. Similar findings were also observed by Chandrawathani *et al*. (2000) [7] who found that *ad libitum* feeding of fresh neem leaves produced 82% reduction in worm eggs of animals.

Table 3: Mean (Mean±SE) body weight (g) and mean (Mean±SE) body weight gain (g) of backyard poultry naturally infected with *Ascaridia galli*.

Groups	Pre-treatment (Mean±SE)	Post-treatment (Mean±SE)				Mean body weight Gain%
	0 DPT	7 DPT	14 DPT	21 DPT	28 DPT	
I	774.46±2.83^{a}	772.78±5.86^{a}	770.21±1.71^{b}	768.30±2.27^{c}	761.88±1.07^{c}	-1.62
II	767.15±4.81^{a}	781.34±5.39^{a}	800.72±1.28^{a}	820.58±0.95^{a}	842.22±6.36^{a}	9.79
III	773.33±4.09^{a}	781.00±3.05^{a}	796.66±4.05^{b}	811.00±1.00^{b}	830.66±0.87^{b}	7.41
IV	773.00±6.65^{a}	779.08±5.84^{a}	791.08±2.56^{b}	806.90±1.87^{b}	823.33±0.89^{b}	6.51
V	771.53±12.33^{a}	778.22±11.90^{a}	790.43±12.63^{b}	802.52±12.85^{b}	817.97±11.99^{b}	6.02
C.D. at 5%	N/A	N/A	N/A	19.75	21.945	
S.E.(m)	7.459	6.934	6.683	5.964	6.626	

Different small alphabetic letters (a and b) indicate significant (p<0.05) difference between groups at a particular DPT (DPT= Days post treatment).

Table 4: Mean (Mean±SE) Egg Per Gram count and fecal egg count reduction test (%) in various groups of naturally *Ascaridia galli* infected backyard poultry treated with different herbal formulations

Groups	EPG (Mean±SE)					(%) Fecal egg count reduction test (FECRT)			
	Pre-treatment	Post-treatment							
	0 day	7 DPT	14 DPT	21 DPT	28 DPT	7 DPT	14 DPT	21 DPT	28 DPT
I	286±26.50^{a}	294.66±27.38^{a}	303.33±28.26^{a}	311.66±28.9^{a}	326.3±30.34^{a}	-3.03	-6.06	-8.97	-14.10
II	287.33±26.18a	52±4.72^{c}	0^{d}	0^{c}	0^{d}	81.9	100	100	100
III	256.33±18.85^{a}	223±16.34^{b}	138.66±10.17^{b}	90±6.50^{b}	56.66±4.17^{b}	12.87	45.90	4.88	77.89
IV	259.00±21.03^{a}	207.33±16.85^{b}	116.33±9.35^{c}	88±7.02^{b}	46.33±3.84^{c}	19.94	55.08	66.02	82.11
V	291.00±23.62^{a}	229.66±18.65^{b}	128±10.40^{bc}	95.66±7.68^{b}	49.33±3.84^{bc}	21.07	56.01	67.12	83.04
C.D.	N/A	47.045	42.634	42.102	43.895				
SE(m)	16.102	14.205	12.874	12.713	13.254				

Different small alphabetic letters (a and b) indicate significant (p<0.05) difference between groups at a particular DPT (DPT= Days post treatment).

Conclusion

It is concluded from the present study that herbs in combinations and individually, had a moderate anthelminthic activity against *Ascaridia galli* parasites in backyard poultry and can be used as an alternative of chemical drugs in controlling ascaridiosis in poultry.

Acknowledgement

The authors are thankful to Dean, College of Veterinary and Animal Sciences, GB Pant University of Agriculture and Technology, Pantnagar for providing financial help to carry out this research work.

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