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## RESEARCH ARTICLE

# ASCARIASIS IN BACKYARD CHICKEN – PREVALENCE, PATHOLOGY AND CONTROL

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### ABSTRACT

Four hundred seventy eight (478) guts of local backyard chickens slaughtered in markets of ten different villages of Kashmir valley were collected and examined for *Ascaridia galli* infection. Formol-ether concentration technique was used to concentrate the gut content and analysis carried out. Prevalence of the nematode, age wise, season wise and sex wise infection rate was recorded. The infected tissues were subjected to histological studies by conventional Microtomy and finally the efficacy of extract of local herb *Mentha longifolia* to limit the nematode infection in chicken was also studied.

The overall prevalence of *Ascaridia galli* was found to be 35.35% with highest number of infected birds in September. Parasitic load was found to be highest during summer with mean intensity  $05 \pm 1.9$ . Females harbored more parasites than males. The histological studies of the infected tissue revealed degeneration of lining epithelium and even sloughing of mucosa. Mucous degeneration with vacuolation of lining epithelial cells was a consistent feature. Cellular reaction was mild and was characterized mainly by mononuclear cells and a few polymorphonuclear cells including eosinophils. Comparative efficacy study showed that treatment with *Mentha* leaves extract and piperazine caused significantly decreased egg per gram (EPG) in chickens. *Mentha* leaves extract started to decrease EPG from day 7 post-treatment and most effective at 21<sup>st</sup> day of post-treatment. On the other hand, piperazine (Piper-vet®) showed 100% efficacy on 7<sup>th</sup> day post-treatment.

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## INTRODUCTION

The domestic chicken feeds on a wide variety of food substances ranging from grains, fruits to insects which may harbour infective stages of parasites thereby predisposing them to parasitic infection particularly gastro-intestinal parasites (Oniye, *et al.*, 2001; Frantovo, 2000). Although, somewhat reduction in bird's parasitic infection has been achieved in commercial production system mostly due to improved housing, hygiene and management practices the prevalence of gastrointestinal parasites is still very rampant (Pandey, *et al.*, 1992)

The traditional poultry production system has a great importance as prime supplier of eggs and meat, and as source of income, especially, to the rural women (Asefaw, 2000). Nematodes are the most important group of helminth parasites of poultry. *Ascaridia galli* is the most common worm found especially in free ranging birds causing great economic losses in modern poultry. These live in central portion of the small intestine of domestic fowl and other birds (Markchadfield, 2001). Young age, coccidiosis and feed deficient in vitamin A and protein are the most important predisposing factors (Gordon, *et al.*; 1982). Despite being economically important parasite, little work has been carried out on the pathology caused by *Ascaridia galli*. Hence the present study was

designed to have hands on information about prevalence of this nematode and the pathological changes brought about in the intestinal tissue by this nematode. Control of *Ascaridia galli* is mainly based on regular anthelmintic treatment which being costly can not be afforded by our farmer. Furthermore, frequent use of these anthelmintics increased the resistant population of nematodes (Waller, 1987). In this context, investigations on indigenous medicinal herbs like *Mentha longifolia* might contribute to the development of effective but low-cost herbal anthelmintics.

## MATERIALS AND METHODS

The study was carried out at the Department of Zoology, A.S. College, Srinagar for a period of two years from January 2011 to December 2012 on a sample size of 478.

### Prevalence of Ascariasis

A total number of 478 guts of village backyard fowl were examined ranging from 2 months to 1 year of age from different villages of Kashmir valley. Prevalence was recorded on the basis of (a) Incidence rate (b) Mean intensity (c) Season-wise infection (d) Age-wise infection rate (e) Sex-wise infection rate.

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To study the prevalence, fecal samples were collected from the chicken in sample vials (containing formalin as preservatives) early in the morning. Collected samples were brought to the Department of Zoology for laboratory examination. Direct smear and improved McMaster method were used for fecal examination.

For counting the number of parasites (*Ascaridia galli*), the alimentary canal was opened from the esophagus down to the rectum (Fatihu, *et al.*, 1991) and all worms visible to the naked eye were collected using a pair of forceps. Recovered nematodes were preserved in 70% alcohol. Scrapings from the intestinal mucosa from the upper, middle and lower linings of the intestine and caecum were concentrated using the formol-ether concentration technique (Cheesbrough, 1998). All adult worms were identified directly under the microscope. The identification keys of Soulsby (1982) and Khali, *et al.*, (1994) were adopted.

Prevalence was calculated as a percentage of the host population infected at a point in time (Thrusfield, 1995). Mean intensity was calculated as number of parasites per infested bird.

#### Pathological studies

For histopathological studies the infected intestinal tissues were fixed and preserved in 10% formalin, processed through conventional technique (Behmer *et al.*, 1976) for paraffin embedding and then sectioned at 4-5 microns in thickness. The sections were then stained with Haematoxyline and Eosin and then studied under microscope.

#### Preparation of leaf extract of *Mentha longifolia*

*Mentha longifolia* leaves were collected from the plants growing wildly in the backyard of villages of Kashmir Valley. To obtain 10% aqueous extract, 20 gm of leaves were thoroughly washed in tap water. The leaves were cut into small pieces with the help of knife and then mixed with the help of mortar and pastels. The extract was made up to 20 ml by adding distilled water and filtered through a piece of clean silk cloth.

#### Comparative efficacy of *Mentha longifolia* leaf extract with Piperazine

For studying the efficacy of *Mentha longifolia*, 30 infected chicken were selected after their faecal examination and were randomly divided into three groups, comprising of ten chickens in each and marked as groups A (normal control no treatment was given), B (each chicken of this group was treated with *Mentha* leaves extract @ 1 gm/kg body weight orally by dropper for consecutive seven days), and C (each chicken of this group was treated Piper-vet @ (Piperazine) 200mg/kg body weight).

#### Statistical analysis

The data was analyzed statistically between control and treated groups of chicken by *Student's t' test*.

## RESULTS AND DISCUSSION

### Prevalence

Annual prevalence of 36.05% (84/233) and 34.69% (85/245) for *Ascaridia galli* was recorded during the 1<sup>st</sup> and 2<sup>nd</sup> year of study giving an overall prevalence rate of 35.35% (169/478). Overall Mean intensity of infection of *Ascaridia galli* was found to be  $05 \pm 1.9$ . Parasitic load was found to be highest in Summer with total of 312 parasites recovered from 56 infected birds (Table 1). Highest rate of infection was recorded in the September (Figure 1). Juveniles were found to be more infected as compared to adults. The rate of infection was 56.2% in 2-4 months of age, 29.1% in 4-8 months of age and 21.2% in 8-12 months of age of village poultry. Females were found to be more infected than the males and harbored more parasites than the males (Table 2).

The results of the present study on backyard fowl are in line with the observations of (Pandit *et al.* 1991) who while working on the prevalence of helminth parasites in desi fowls of Kashmir got almost similar percentage prevalence of the helminthes. Our observations are also clearly in line with the observations of (Fotedar and Khateeb, 1986) who also recorded the highest incidence of helminth infection in the month of September and lowest in the months of December and January and a decrease in the incidence and mean worm burden with decreasing temperature and rainfall. The reason behind the heavy infection during the warm and wet months may be high mean temperature and high relative humidity which lowers the resistance of birds and favours heavy infection (Hawkins, 1945) and lower rate of infection during winter season might be attributed to low temperature which also may help in arrested development of parasites in host and environment (Ogunsui and Eyskey, 1979). The increased availability of intermediate hosts in the rainy seasons for the completion of life cycles of parasites may also be one important factor responsible for high rate of infection during summer months.

In abroad more or less similar prevalence of gastro-intestinal nematodiasis in fowls have also been recorded which was supported by Birova volasinovicova V (1963), Wakeline (1964), Norton (1964), Durrani and Chauhan (1965), Kaushik and Deorani (1968), Busa and Hernandez (1970), Korchagin (1974), Ssenyonga (1982). Minor differences in the results of the present study could be explained on the basis of seasonal, managemental, climatic variations and also due to variation in parasitic population of different localities where the birds were exposed. Nemeseri (1968) reported that about 40 millions chickens were infected with *Ascaridia galli* in Hungary, causing an annual economic losses equivalent to six millions U.S. dollars approximately. From the above study it was evident that management and age factors played an important role in Ascariasis in poultry. This is why control program should be given priority. Proportional incidence of ascariasis in village poultry of various age groups of 60 days to 1 year is shown in Table-2. The range of infection rate was 21 to 56%. The highest rate of infection was found in 2-4 months of age group. Similar findings have been reported by Romanenko *et al.* (1985) and Haider *et al.* (1980). Higher infection rates in young chicks can be attributed to their less

resistance to infection because of less developed immune system.

**Pathology**

*Ascaridia galli* were found to inhabit lumen of the intestine. The worms were of varying sizes. Gross changes observed depended on the parasite load. In most of the cases, low load of worms was observed and was not associated with any grossly observable lesions. Moderate infection was associated with mucous enteritis. The intestinal wall appeared to be thickened with mucosa giving a velvety appearance. Lumen contained thick white pasty mucous. Histopathological sections of the parasites were found in the lumen (Figure 4). The histopathological lesions varied from degeneration of lining epithelium to sloughing of mucosa. Mucous degeneration with vacuolation of lining epithelial cells was a consistent feature. Cellular reaction was mild and was characterized mainly by mononuclear cells and a few polymorphonuclear cells including eosinophils. At places local mononuclear infiltration was observed in muscle layer (Figure 5). Histological studies of infected tissue revealed similar results as obtained by other workers while working on Ascariasis caused by *Ascaridia galli* in domestic fowl (Mishra *et al.*, 1980; Verma *et al.*, 1993; Dahl *et al.*, 2002; Permin *et al.*, 2006). As observed in the present study, the parasites are mostly recovered from the lumen of small intestine without causing much gross pathology. However, heavy infections have been reported to cause severe changes. The pathomorphological changes are in agreement with the earlier observations with comparable parasite load (Matta, S.C., 1980; Padhi *et al.*, 1987; Arunachalam *et al.*, 2003).

**Control**

Five chickens from each group (A, B and C) were slaughtered at the pretreatment and post treatment to count number of *Ascaridia galli* (table 3). Reduction of parasite count was found on 14th and 21st day in group B and C. Mentha leaves extract and piperazine decrease the number of parasites in chicken on day 14th and 21st.

The highest decrease in number of parasites was recorded on 21st day post treatment. Various internal organs of chicken group B and C were examined carefully. But there was not found any pathological changes. Whereas marked pathological changes in intestinal mucosa of chicken was observed in control group A. Similar finding has been reported by Verma *et al.* (1991) and Islam *et al.* (2008). Efficacy of Mentha leaf extracts as anthelmintic in chicken of Kashmir valley was also elucidated by Javid Ahmad, *et al.* (2013) after *in vitro* studies on anthelmintic activity of *Mentha longifolia* (L) and their results are also in line with this study.

In this study, *Mentha* leaf extracts were used for comparative study with patent compound piperazine. The data demonstrated the promising effect of Mentha leaf extract against *Ascaridia galli* in vivo. However, further extensive research works should be carried out to explore the possible therapeutic use of this commonly growing medicinal herb of Kashmir against ascariasis in chicken.

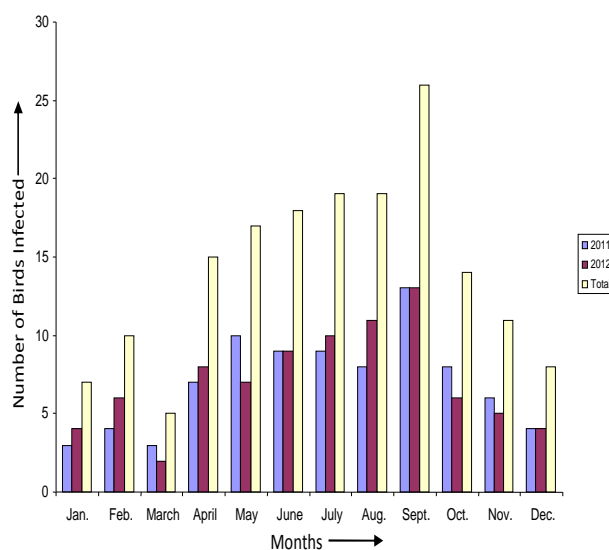


Fig. 1 Month wise prevalence of *Ascaridia galli*.

**Table 1** Season wise parasitic load on domestic fowl

| Name of parasitic species recovered | Spring       |      |                | Summer       |      |                | Autumn       |      |                | Winter       |      |                | Total        |      |                |
|-------------------------------------|--------------|------|----------------|--------------|------|----------------|--------------|------|----------------|--------------|------|----------------|--------------|------|----------------|
|                                     | No. Infested | Load | Mean intensity | No. Infested | Load | Mean intensity | No. Infested | Load | Mean intensity | No. Infested | Load | Mean intensity | No. Infested | Load | Mean intensity |
| <i>Ascaridia galli</i>              | 37           | 145  | 04 ± 2.2       | 56           | 312  | 05 ± 1.9       | 51           | 294  | 05 ± 1.6       | 25           | 109  | 04 ± 2.4       | 169          | 860  | 05 ± 1.9       |

**Table 2** Age wise and sex wise proportional incidence of Ascariasis in village poultry

| Point of consideration                | Category-1 (2-4 months) | Category-2 (4-8 months) | Category-3 (8-12 months) |
|---------------------------------------|-------------------------|-------------------------|--------------------------|
| No. of guts examined (Males/Females)  | 160 (80/80)             | 158 (79/79)             | 160 (80/80)              |
| No. of infected guts (Males /Females) | 90 (39/51)              | 46 (20/26)              | 34 (16/18)               |
| Infection rate (%) (Males/Females)    | 56.2 (48.7/63.7)        | 29.1 (25.3/32.9)        | 21.2 (20/22.5)           |

**Table 3** Effects of Mentha leaves and Piper-vet on number of parasites in chickens

| Group of Chicken | Drug and dose                       | Pre- treatment (Mean ± SD) | Post-treatment (Mean ± SD) |                      |                      |
|------------------|-------------------------------------|----------------------------|----------------------------|----------------------|----------------------|
|                  |                                     |                            | 7 <sup>th</sup> day        | 14 <sup>th</sup> day | 21 <sup>st</sup> day |
| A                | Control                             | 23±0.40                    | 21±0.45                    | 24±0.50              | 28±0.95              |
| B                | Mentha leaves fresh extract @ 1g/kg | 12±0.45                    | 6±0.21                     | 3±0.22               | 0.00                 |
| C                | Piper-vet @ 200mg/kg                | 9±0.45                     | 0±0.32                     | 0±0.40               | 0.00                 |





Figure 2 Whole parasites collected in a petridish.

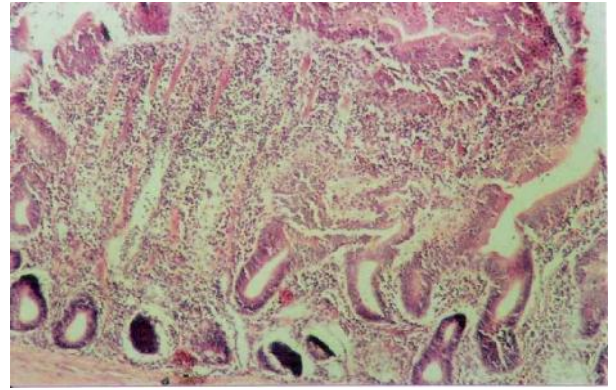


Figure 5 Photomicrograph of intestine from the domestic fowl infected with *Ascaridia galli* revealing club shaped broad villi and mononuclear cell infiltration. H&E 40X.

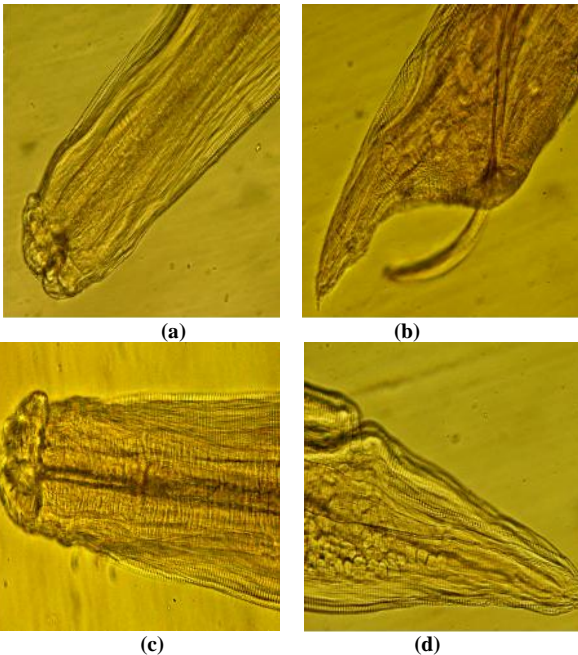


Figure 3 *Ascaridia galli* collected from domestic fowl (*Gallus gallus domesticus*)

1. Anterior end of male showing three pairs of lips.
2. Posterior end of male revealing a long spicule.
3. Anterior end of female revealing three pairs of lips.
4. Posterior end of female showing vulva and eggs.



Figure 4 Photomicrograph of sections of *Ascaridia galli* in the lumen of intestine of domestic fowl. H&E 40X.

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