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Prevalence of Endoparasites in Backyard Poultry in North Indian Region: A Performance Based Assessment Study

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ABSTRACT

Backyard poultry rearing is an important venture and integral part of mixed farming in most of the developing countries of world. Very scarce reports regarding the effects of parasites on free ranging birds are available from India. The present study was designed to investigate the prevalence of helminth parasites in the backyard poultry farming in the northern, humid and subtropical region of India. A total of 120 gut specimens and 600 faecal samples of backyard poultry were collected from different villages and analysed for parasitic worm loads and different egg/ova types. Furthermore, a random field trial on 40 birds reared in backyard poultry system was carried out to determine the effect of fenbendazole treatment on the parasitic load and production performance. On gut examination, the most common nematodes found were, *Ascaridia galli* (20%), *Heterakis gallinarum* (10.83%), *Capillaria* spp. (5%) and *Cheilospirura hamulosa* (1.67%) while the cestodes were *Raillietina tetragona* (9.16%), *R. echinbothrida* (5%), *Hymenolepis* spp. (5%), *Cotugnia digonopora* (3.33%) and *R. cesticillus* (2.5%). The faecal examination showed higher incidence of *A. galli* (19.16%), *H. gallinarum* (9.5%), *Capillaria* spp. (3.5%), *Trichostrongylus tenuis* (2.5%), *Raillietina* spp. (16.16%), *Eimeria* spp. (5.33%) and mixed infections (6.67%). Treatment with fenbendazole was found to reduce mortality (15%) as compared to untreated (30%) groups. Moreover, fenbendazole treated birds gained significantly steadily weights (r = -0.35) as compared to untreated group (r = -0.019). The study is first in its nature in providing the valuable information regarding prevalence of endoparasites based on faecal examination in backyard poultry from the Jammu region. This information will essentially be helpful for the researchers and local veterinarians to develop strategies for both treatment and control of these endoparasites affecting poultry.

Key words: Poultry, backyard rearing, endoparasites, prevalence, production losses

INTRODUCTION

The poultry industry occupies an important role in the provision of animal protein (meat and eggs) to man. It is one of the fastest growing segments of the agricultural sector in the most of the developing economies of world. India ranks third in egg production and sixth in broiler meat production (USDA, 2011). However, due to unorganized agriculture sector, larger number of marginal farmers and landless laborers follow the traditional methods of live stock rearing. Also, due to the common practice of mixed farming in India, a large number of poultry are reared under backyard poultry system. Backyard poultry farming, is a low or no input venture and is characterized by indigenous night shelter made of locally available material, a free range scavenging system during day time with occasional supplementary feeding and natural hatching of chicks (Zoungrana and Slenders, 1992; Saha, 2003). Backyard poultry farming is possible only due to hardy nature of the fowl as characterised by its marked physiological adaptability to wide and different agro-climatic environments (Goi, 1976). In India, poultry farming under backyard system is as old as its civilization (Randhawa, 1946).

Backyard poultry contributes to nearly 30% of Indian egg production (Singh *et al.*, 2009). At the same time, it provides excellent opportunity for gainful employment to idle or unemployed members of rural communities. Further, the meat and eggs of backyard poultry are more highly valued than that of industrially produced birds due of its comparatively superior taste and texture. It is considered equivalent to 'organic' chicken in Western Europe, as characterised by its low fat content than commercial bird meat. However, poultry reared under backyard system have poor productivity and have low economic returns due to inefficient local marketing and inappropriate health care practices (Singh and Pani, 1986; Dana, 1998; Saha, 2003). Furthermore, poultry reared under this system face high mortality due to cross diseases infection transmission, predators and poor management and nutrition (Conroy *et al.*, 2005). Among all the factors, parasites play important role in both in disease induction and economic losses. Although the impact of parasites in farm birds reared on cage systems and deep litter system have diminished due to modernization in poultry farming and biosecurity measures, backyard free ranging birds still remain highly susceptible to parasitic infection via litter droppings and due to their scavenging habits. The worm infections cause considerable damage and great economic losses to the poultry industry which include decreased feed conversion ratio and live weight gain, lowered egg production and death in young birds (Puttalakshmamma *et al.*, 2008). Helminthosis is considered as one of the significant constraints in poultry in humid tropical climatic conditions of India which are favourable for faster propagation and development of the larval stages of helminth parasites (Kulkarni *et al.*, 2001).

India is a developing country with diverse geographical regions, ecology and socio-cultures in its Himalayan region, Northern- fertile plains, western arid and semi-arid region, central plateau and Eastern and Western Ghat. These diverse geographical regions are highly suitable for a diverse range of vectors and pathogens of veterinary importance. The state of Jammu and Kashmir has three agro climatic zones viz., low altitude subtropical zone, middle agro-climatic zone and high altitude temperate zone. Among the total of 45.73 crore population poultry in India, 53.25 lac are reared as backyard poultry in Jammu and Kashmir alone. The humid subtropical climate of the Jammu is ideal for the faster propagation, development to infective stage and perpetuation of helminth parasites. Very limited information is available regarding the impact of endoparasites on backward poultry system from this region of globe (Salam *et al.*, 2009; Katoch *et al.*, 2012). There is no report on prevalence of endoparasites in backyard poultry based on field faecal examination from northern region of India. Therefore, the present study was designed to investigate the prevalence of endoparasites based on faecal examination and gut necropsy as well as to determine the impact of parasitic load on the health status of poultry by examining the effect on live body weight gain.

MATERIALS AND METHODS

Sample collection: The study was conducted in Jammu region of northern India having average temperature and humidity as 28.68°C and 76.34% in monsoon, 21.57°C and 65.75% in post-monsoon, 12.2°C and 76.83% in winter and 25.98°C and 55% in pre-monsoon, respectively. Faecal samples from backyard poultry were collected during the period extending from October 2010 to September 2011, in five selective villages of Jammu district which were found be true representative of the region. In total, 600 pooled faecal samples (10 from each village per month) of backyard poultry were examined. Besides, necropsy examinations of 120 of gastrointestinal (GI) tracts (10 per month) was carried out for the presence of different gastrointestinal helminths.

Faecal sample examination: All the pooled faecal samples were examined by routine sedimentation and floatation techniques for the identification of various parasites as per the standard methods (Soulsby, 1982).

Necropsy examination of gut: After opening the bird with the help of scalpel blade, gastrointestinal tract of each bird was placed in clean dissecting tray and intestine was freed from the mesentery. Before cutting each intestinal portion it was tied with twine on either ends to prevent the mixing of contents with other parts. Segments of oesophagus, gizzard, duodenum, small intestine and large intestine were separately cut and placed in separate in dissecting trays washed with clean tap water. The washed intestinal tract was scraped gently to remove any worm embedded in the intestinal mucosa. The intestinal contents were washed several times till the clear sediment was visible. The parasites visible to the naked eye were picked up by clean hair brush and transferred to a petri dish containing normal saline (NSS) solution. The keratinized layer of the gizzard was peeled to look for the nematodes embedded in the muscular layer. Helminths from each segment of the gastrointestinal tract were collected in separate petri dishes, fixed in hot formalin (10%), preserved and identified. The collected nematodes were kept in glycerine alcohol (10 glycerol: 90 alcohol) solution for clearing; whereas the cestodes were pressed gently between the two glass slides and fixed in hot formalin and stained with aqueous borax carmine and mounted for identification as per standard methods (Soulsby, 1982).

Impact of parasites on production traits (body weight gain): Forty days old birds (N = 40) vaccinated against common viral diseases like NewCastle disease, Infectious Bursal disease and Marek's disease, were purchased from Government Poultry Farm, Belicharana, Jammu and were distributed amongst four different families (ten birds each) at village Karotana, R.S. Pura, Jammu. These birds were kept in small poultry houses (size varies from 4×3' to 6.5×5') made of indigenous material (bamboo, mud, brick, straw and wooden) and rice husk was used as litter. The birds were housed during night and were allowed to roam freely in families backyards during the day time. The birds were randomly divided into two groups of birds (20 birds each) before the treatment. One group was treated with fenbendazole (Panacur, Intervet India Pvt. Ltd.) at 7.5 mg kg^{-1} b.wt. in drinking water at monthly intervals and while other group was kept as untreated control. To nullify the effect of ectoparasites, all the birds in both the groups were dusted with carbaryl (Fleetek powder, Vesper Pharmaceuticals Pvt. Ltd.) at 1% at regular intervals. To negate the effect of coccidiosis, the birds in both the groups were treated with amprolium (Virbac Pharmaceuticals Pvt. Ltd.) at a dose rate of 0.012% in the drinking water for 5-7 days. Prophylactic antibiotic treatment was also provided with tetracycline hydrochloride

(Intervet India Pvt. Ltd.) at 500 mg L^{-1} of water. The birds were weighed at monthly intervals. At the end of the field trial, all the survived chickens were brought to the laboratory, euthanized, necropsied and *in situ* worm population was recorded.

RESULTS

Prevalence of endoparasites based on gut examination: A total of 120 gut specimens of backyard poultry of five selected villages were examined among which 82 (68.33%) were found infected with different types of helminthes. Intestines of the highly infected birds were engorged with the lumen completely filled while in mild cases the intestines were of normal contour. The most common nematodes found were *A. galli* (20%), *H. gallinarum* (10.83%), *Capillaria* spp. (5%) and *Cheilospirura hamulosa* (1.67%). The prevalence of cestodes was found to be less compared to nematodes and the common types were *Raillietina tetragona* (9.16%), *R. echinbothrida* (5%), *Hymenolepis* spp. (5%), *Cotugnia digonopora* (3.33%) and *R. cesticillus* (2.5%). Mixed infections were detected in 6.67% of cases (Table 1).

Prevalence of endoparasitic eggs or ova based on faecal examination: For determining the prevalence based on faecal sample examination, a total of 600 faecal samples of backyard poultry were examined. During the study, 382 (63.67%) were found positive for egg/ova/segment of different parasites. The commonly recorded ova were of *A. galli* (19.16%), *H. gallinarum* (9.5%), *Capillaria* spp. (3.5%), *Trichostrongylus tenuis* (2.5%), *Raillietina* spp. (16.16%) and mixed infection of 6.67%. *Eimeria* spp. was detected in 5.33% of cases. Among nematodes, highest prevalence was recorded for *A. galli* (19.16%) and lowest for *Trichostrongylus tenuis* (2.5%) while prevalence of *Raillietina* was highest (16.16%) among cestodes (Table 2).

Season wise prevalence of endoparasites: Data was analysed to determine the season wise prevalence of parasites. Significant differences were observed in the prevalence rates among monsoon and post monsoon period ($p<0.05$). Based on gut examination, the infection was highest in monsoon (83.33%) and lowest in post monsoon (50%). Similarly, prevalence of endoparasitic eggs/ova was highest in monsoon (72%) and lowest in post monsoon in the faecal samples (56%) (Fig. 1).

Impact of endoparasites on live body weight: The mean body weight of the birds in untreated and treated groups was 204.75±2.419 and 200±3.627 g, respectively, at the start of the experiment. A total of 30% mortality was observed in untreated group while as only lower mortality (15%) was observed in fenbendazole treated group. At the end of the trial, 12 birds from each group were examined. The total worm count in untreated group was 1422 (mean 118.5±1.11) which was significantly higher ($p<0.05$) than the total worm count of 280 (mean 23.33±4.94) in the fenbendazole treated group. Further, fenbendazole treated birds gained weight steadily till the end of the field trail as compared to untreated group. The difference in body weight gain between the groups was significant ($p<0.05$) from 30 day after treatment. The untreated gained only 1925±0.788 g live weight (10.7 g day^{-1}), whereas treated birds gained 2525±9.215 g live weight (14.03 g day^{-1}) at the end of the 120 days period of the field trail. A strong negative correlation ($r = -0.355$) was observed between the weight gain and the total worm count in untreated group, where as a weak negative correlation ($r = -0.0188$) was noticed in treated group (Fig. 2).

Table 1: Seasonal prevalence of endoparasites of backyard poultry based on gastrointestinal tract examination

Season	No. of gut examined	Positivity (%) cases	*Ascaridia galli*	*Heterakis gallinarum*	*Capillaria* spp.	*Raillietina tetragona*	*Raillietina echinobothrida*	*Raillietina cesticellus*	*Cotugnia digonopora*	*Hymenolepis* spp.	*Cheilospirura hamulosa*	Mixed
Monsoon	30	25 (83.33)†	8 (26.67)	5 (16.67)	2 (6.67)	4 (13.33)	2 (6.67)	1 (3.33)	-	-	1 (3.33)	2 (6.67)
Post-monsoon	20	10 (50)	3 (15)	2 (10)	1 (5)	2 (10)	1 (5)	-	1 (5)	-	-	-
Winter	30	18 (60)	4 (13.33)	2 (6.67)	1 (3.33)	2 (6.67)	1 (3.33)	1 (3.33)	1 (3.33)	3 (10)	-	3 (10)
Summer	40	29 (72.5)	9 (22.5)	4 (10)	2 (5)	3 (7.5)	2 (5)	1 (2.5)	2 (5)	3 (7.5)	1 (1.5)	3 (7.5)

† Values in the brackets indicate percent infectivity (prevalence rate)

Table 2: Seasonal prevalence of endoparasites of backyard poultry based on faecal examination

Season	No. of fecal samples examined (N)	Positive (%)	*Ascaridia galli*	*Heterakis gallinarum*	*Capillaria* spp.	*Trichostrongylus tenuis*	*Eimeria* spp.	*Raillietina* spp.	Mixed
Monsoon	150	108 (72)†	33 (22)	16 (10.67)	6 (4)	4 (2.67)	10 (6.67)	27 (18)	7 (4.67)
Post-monsoon	100	56 (56)	18 (18)	9 (9)	3 (3)	1 (1)	4 (4)	15 (15)	6 (6)
Winter	150	88 (58.67)	24 (16)	12 (8)	5 (3.33)	5 (3.33)	9 (6)	22 (14.67)	11 (7.33)
Pre-monsoon	200	130 (65)	40 (20)	20 (10)	7 (3.5)	5 (2.5)	9 (4.5)	33 (16.5)	16 (8)
Total	600	383 (63.67)	115 (19.16)	57 (9.5)	21 (3.5)	15 (2.5)	32 (5.33)	97 (16.16)	40 (6.67)

† Values in the brackets indicate percent infectivity (prevalence rate)

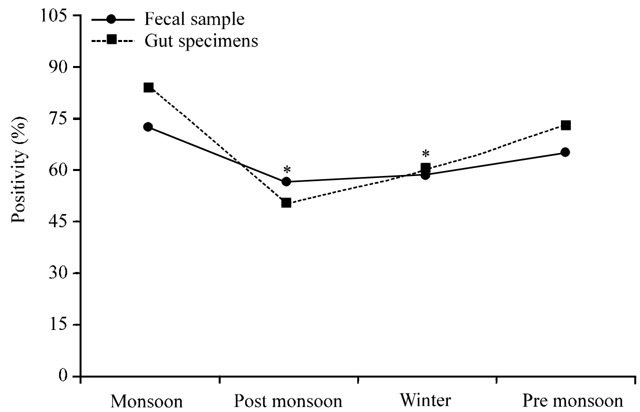

Fig. 1: Prevalence of endoparasites in the poultry flocks raised under backyard conditions. The fecal samples were pooled from each house hold and considered as a single sample while as gut specimens were analyzed individually, *p<0.05

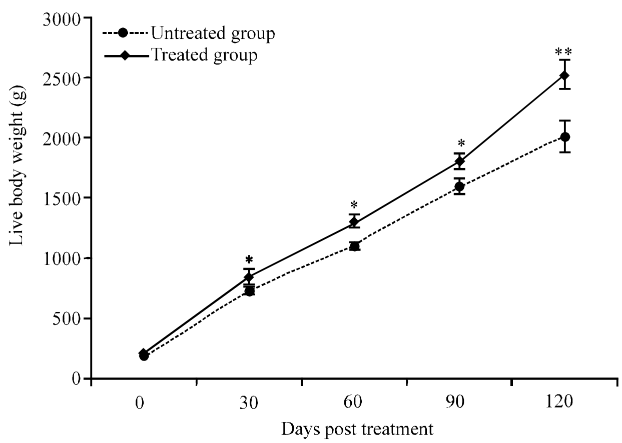

Fig. 2: Effect of fenbendazole on the live body weight of the chicks reared under backyard conditions. Body weights were taken monthly of all the birds, *p<0.05, **p<0.01

DISCUSSION

Endoparasitic infections are of great importance in poultry industry especially in backyard poultry worldwide. Many reports regarding the prevalence of endoparasites in backyard poultry from different parts of world are available (Raote *et al.*, 1991; Tasawar *et al.*, 1999; Mungube *et al.*, 2008; Mukaratirwa and Hove, 2009; Orunc and Bicek, 2009; Hussen *et al.*, 2012). However, limited reposts are available regarding the prevalence of endoparasites from different geographical regions of India (Bali and Kalra, 1975; Matta and Ahluwalia, 1981; Katoch *et al.*, 2012). Furthermore, there is no report available regarding the prevalence of endoparasites in backyard poultry based on faecal examination from Jammu, the extreme north western regions of India. In this study, the prevalence based on gut and faecal examination as well as impact of endoparasites in backyard poultry was determined. Examination of gut for endoparasites revealed an overall prevalence of 68.33% where as faecal examination revealed an overall percentage of 63.67% indicating high prevalence of various endoparasites in the free ranging poultry birds. These results were in agreement with the finding of other workers from different parts of India as well as other countries (Raote *et al.*, 1991; Islam *et al.*, 2004; Hange *et al.*, 2007; Abdelqader *et al.*, 2008; Katoch *et al.*, 2012). There are also reports indicating much higher incidence (80-100%) of endoparasites in backyard poultry (Nadakal *et al.*, 1972; Hedge *et al.*, 1973).

Among the individual parasite types, the most common nematodes found were *Ascaridia galli* (20%), *Heterakis gallinarum* (10.83%) while cestodes as *Raillietina tetragona* (9.16%), *R. echinbothrida* (5%), based on gut examination. Faecal examination also revealed almost similar pattern of prevalence rates of nematodes; however prevalence of cestodes indicated higher incidences of *Raillietina* spp. (16.16%). *Eimeria* spp. was observed during faecal examination with an incidence of in 5.33% cases. Overall prevalence of cestodes recorded in the present study was 25% with different species as *Raillietina tetragona* (9.16%), *Raillietina echinbothridia* (5%), *Hymenolepis* spp. (5%), *Cotugnia digonopora* (3.33%) and *Raillietina cesticillus* (2.5%). Moreover, the present findings indicated higher prevalence of *Raillietina tetragona* followed by *Raillietina echinobothridia* and these findings were similar to Mukaratirwa and Hove (2009) from Zimbabwe. However, the present results were low in comparison to the findings of Nadakal *et al.* (1972) who reported an overall prevalence of 97.3% of cestodes in backyard poultry in Kerala. Also, Hedge *et al.* (1973) reported high prevalence of cestodes (77.1%) in backyard poultry from Karnataka. The reason could be the different agro climatic conditions, availability of intermediate hosts, individual host resistance and ecological parameters in the respective study areas. The major area under the present study was canal irrigated with hot and humid climate like northern fertile plains with average maximum and minimum temperature and rainfall as 28.97 and 15.98°C and 103.07 mm, respectively. It is well proven that temperature and rainfall are important factors for the development, hatching and survival of pre-parasitic stages of nematodes (Katoch, 1998; Abdul Basit *et al.*, 2010). More than 90% of total parasitic population exists outside the host as eggs or larvae in the faeces or soil. Only small proportion of the eggs in faeces (1-17%) reaches the infective larvae stages on the soil and this depends mainly on temperature, rainfall and different seasons of the year (Swarnkar *et al.*, 2008).

Season wise analysis of the data revealed highest prevalence during monsoon (83.33%), followed by pre-monsoon (72.5%), winter (60%) and post-monsoon (50%). Similarly, month wise data analysis indicated highest prevalence of endoparasites (74%) during August and lowest (52%) in the month of January. The reason for such variations could be attributed to favourable ambient temperature (28.6°C), humidity (78.5%) and rainfall (457.6 mm) that helps in the development and propagation of the parasites as well as the intermediate host. High rainfall during rainy season helps in providing suitable molarity of salts in soil which is an important factor for ecdysis (Soulsby, 1966). The low prevalence in January could be due to harsh climatic conditions like low temperature, low humidity and the low rainfall that inhibit the development and propagation of parasites. These findings were in line with the reports of Mungube *et al.* (2008) from Kenya, who recorded highest prevalence of endoparasites during wet season and lowest during dry season. However, Hange *et al.* (2007) from Parbhani region of Maharashtra, reported highest prevalence during winter (66.67%), followed by rainy season (63.07%) and summer (58.73%). From Uttar Pradesh, Matta and Ahluwalia (1981) reported highest prevalence during autumn (87.80%) and lowest during summer (53%). Raote *et al.* (1991) from Maharashtra have recorded highest incidence during winter (93.65%), followed by rainy season (75.29%) and lowest during summer (39.34%). The difference in findings could be due to different environmental conditions and availability of intermediate hosts in the study area.

In comparison to most of the bacterial and viral disease of acute nature, nematode and cestode parasitic infections are chronic with regard to disease induction. Chronic poultry diseases are generally associated with significant production losses. Endoparasites consume the digested food material from the gut and cause deficiency disease, weight loss, decrease in egg production and associated mortality due to diarrhoea, gut impaction and others. In the present study it was found that the parasite infected birds gained only 1925±0.788 g live weight (10.7 g day^{-1}) whereas birds treated with endoparasitic drug fenbendizole gained 2525±9.215 g live weight (14.03 g day^{-1}) at the end of the 120 days period of the field trail. A strong negative correlation ($r = -0.355$) was observed between the weight gain and the total worm count in untreated group, whereas a weak negative correlation ($r = -0.0188$) was noticed in treated group. The total worm count in untreated group was 1422 (mean 118.5±1.107) which was significantly higher ($p<0.05$) than the total worm count of 280 (mean 23.33±4.942) in the treated group. Similar findings have been recorded by many workers (Malhotra, 1983; Negesse, 1991; Phiri *et al*., 2007; Katoch *et al*., 2012). Systemic treatment of the poultry birds is therefore essential to prevent cross infection and production losses in the backyard poultry.

CONCLUSION

In conclusion, the present study demonstrated for the first time the prevalence of various endoparasites both on gut and faecal examination in Jammu region. Among nematodes, high incidence of *A. galli*, *H. gallinarum*, *Capillaria* spp. while among the cestodes high incidence of *Raillietina* spp., *Hymenolepis* spp. and *Cotugnia digonopora* was observed. Also faecal examination indicated prevalence of *Eimeria* spp. in the free ranging birds. Treatment with fenbendazole not only helped in preventing the overall mortality of birds but the treated birds gained significantly higher body weights than the untreated birds. The study provides valuable information regarding prevalence of endoparasites and will essentially be helpful for both researchers and local veterinarians to develop strategies for both treatment and control of theses parasites of poultry.

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