

STUDIES ON *EIMERIA* SPECIES IN GOATS OF MATHURA REGION, UTTAR PRADESH, INDIA

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Received: 07.09.2019; Accepted: 20.01.2020

SUMMARY

The study was conducted to determine the distribution and identification of different *Eimeria* species in goats in the Central Institute for Research on Goats (CIRG), Makhdoom, Farah, Mathura, Uttar Pradesh, India. The results revealed the presence of multiple *Eimeria* species in 141 of 155 analyzed faecal samples (90.96%). Sixty four from kids (100%) and 77 from adult goats (84.61%) were positive as "Five different species identified were *Eimeria arlongi*, *E. ninakohlyakimovae*, *E. hirci*, *E. christenseni* and *E. caprina* with infection of 42%, 26.5%, 17.0%, 9.75% and 4.75%, respectively in kids and 46.25%, 28.75%, 14.0%, 7.5% and 3.5%, respectively in adults". The data indicate that the infection was relatively common among kids as well as adult goats and they had multiple infection. The results of the present study has implications for the control of coccidiosis in goat production of semi-arid region, India.

Keywords: Coccidiosis, *Eimeria*, Goats, Prevalence, Species

The total goat population in India is estimated at about 148.88 million (Livestock census, 2019). Docile nature and small body size of goat with its low requirement makes it most acceptable animal. Coccidiosis is one of the most economically important infections that causes mortality in the goat population (Wang *et al.*, 2010; Cavalcante *et al.*, 2012). Coccidiosis of goat is an intestinal protozoan parasite caused by multiple species of the genus *Eimeria*. It invades and destroys the small and large intestinal cells, causes anaemia, loss of electrolyte fluids and poor nutrients absorption. The most obvious clinical sign of infection is diarrhoea and affected animal shows reduced weight gain, weakness and rough hair coat (Bhatia *et al.*, 2010; Wang *et al.*, 2010). The high oocysts excretion may involve poor hygiene, high stocking rates in premises, breeding intensification and causes of physiological and nutritional stress (Chartier and Paraud, 2012). The aim of the present study was to investigate the possible factors affecting the prevalence and oocyst load of coccidia in goat herd. Moreover, results obtained would be quite useful to design appropriate effective control strategies and prophylactic programs for the coccidiosis in goat production of Mathura region, Uttar Pradesh, India.

Studies were carried out at the Central Institute for Research on Goats, Makhdoom, Farah, Mathura, Uttar Pradesh, India. The climate is tropical semi-arid and the monsoon season starts from June to September with 433.4 mm annual mean rainfall, 24.7 °C mean temperature and 60.15% relative humidity. Total 155 (64 kids and 91 adult) goats were selected randomly for study purpose.

Fresh faecal samples were collected directly from the rectum of goats. All the samples were placed into

plastic bags with proper labeling and were divided in two categories as kids (<6 months) and adults (>6 months). Faecal examinations were performed using floatation method in saturated salt solution. The positive samples were filtered through sieves (150 µm) and centrifuged at 2000 rpm for 10 minutes. The filtered materials were placed into Petri dishes with 2.5% potassium dichromate (K₂Cr₂O₇) solution for sporulation of oocyst at laboratory temperature (28 °C). After completion of sporulation, oocysts were recovered by centrifugation in saturated salt solution at 2000 rpm for 5 minutes followed by washing with distilled water. Concentrations of sporulated oocysts were performed by centrifugation and stored in K₂Cr₂O₇ solution at 4 °C for further study.

For the identification of sporulated oocyst, hundred oocysts from each sample were counted by using binocular microscope (Labomed, Germany) and ocular micrometer (Ajay, India). The species were determined based on the morphology of oocysts (color, form index, shape, presence or absence of residual as well as oocystic mass, presence or absence of micropyle and its cap, polar and stieda bodies) and sporulation time (Eckert *et al.*, 1995).

Total 155 faecal samples examined out of which, 141 (90.96%) were positive for *Eimeria* oocysts. Sixty four were from kids (100%) and 77 from adult goats (84.61%). "Five different species identified were *Eimeria arlongi*, *E. ninakohlyakimovae*, *E. hirci*, *E. christenseni* and *E. caprina* with infection of 42%, 26.5%, 17.0%, 9.75% and 4.75%, respectively in kids and 46.25%, 28.75%, 14.0%, 7.5% and 3.5%, respectively in adults".

Till date, 13 *Eimeria* species have been documented from goat species (Pellerdy, 1974; Levine, 1985; Platzer *et al.*, 2005). Several parameters can be used for the

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diagnosis of *Eimeria* species and new methods have been developed by Morris and Gasser (2006). Although, traditional morphological identification is still useful. The identification was performed by the comparison with original parasites and somewhat variations in size of oocysts (length and width) might be found, and this variation was considered as a common issue by previous studies (Hassum and Menezes, 2005; Bhatia *et al.*, 2010). Additionally, morphometric variations might be related to several factors such as host and parasite metabolism (Long and Joyner, 1984).

The *Eimeria* species were widespread in the studied herd. From thirteen *Eimeria* species known to found in goats, only five were identified in samples from CIRG, Mathura.

The lower infection frequency observed ($P>0.05$) in adult goats might be due to more developed immunity as compared to kids. These results are in good agreement with those earlier reported by Bhatia *et al.* (2010); Chartier and Paraud (2012) and Singh *et al.* (2014). On contrary, Kimbita *et al.* (2009) observed that the majority of infection (67.3%) was in adult goats. However, in both the cases adult goats might be considered as source of infection for the kids.

The most prevalent species were *Eimeria arloingi*, *E. ninakohlyakimovae* and *E. hirci* in both cases. The *E. ninakohlyakimovae* has been recognized to be more pathogenic in goat population (Chartier and Paraud, 2012), *Eimeria arloingi* causes focal mucosal hyperplasia and polyp formation, *Eimeria caprina* causes mucosal destruction in both (small and large) intestines and *Eimeria christenseni* and *Eimeria hirci* are also possibly pathogenic (Andrews, 2013). *E. ninakohlyakimovae*, *Eimeria arloingi* and *E. christenseni* produced abdominal pain, inappetance, bloody diarrhoea and papilloma like lesions in the intestine of young kids (Yvone *et al.*, 1980). As per most of the earlier reports, healthy goats may resist *Eimeria* infections duly well without establishment of clinical signs but stressors might be breaking the host parasite relationship leading to economic losses. Although, development of a positive relationship between parasites which is in tandem with the role of contamination in the acquirement as seen with coccidial as well as helminthes parasites (Kanyari, 1993).

In conclusion, the present results revealed that the incidence of coccidiosis was high in goats. This information indicates that the regular monitoring of *Eimeria* infection in goat is necessary.

ACKNOWLEDGMENTS

The authors are highly thankful to the Director and incharge, goat unit CIRG, Makhdoom, Farah, Mathura, for providing the facilities required for conducting research

work.

Ethical statement

The experiment was approved by the Institutional Animal Ethics Committee (IAEC) constituted as per the article number 13 of the CPCSEA–rules, laid down by Government of India.

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