



INDICATIONS OF HYPOBIOSIS OF *HAEMONCHUS CONTORTUS* IN GOATS OF DECCAN PLATEAU IN MAHARASHTRA

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Hypobiosis is the phenomenon of temporary suspension of development in the fourth (L_4) stage of a gastrointestinal nematode parasite inside the host when environmental conditions are not conducive for the completion of the life cycle of the parasite (Soulsby, 1982; Swarnkar et al., 2008). Hypobiotic larvae remain metabolically inactive in the abomasal mucosa without causing any clinical symptoms. When the environmental conditions become favourable, the hypobiotic larvae resume their development and grow into normal adults in the host (Hepworth et al., 2006). This study reports observations which indicate the probable occurrence of hypobiosis in *Haemonchus contortus* in naturally infected Osmanabadi male goats.

Nimbkar Agricultural Research Institute (NARI), Phaltan (Maharashtra), has a field unit for Osmanabadi goats under the All India Co-ordinated Research Project on Goat improvement (Indian Council of Agricultural Research). As a part of project activities, elite Osmanabadi bucks are sent to project villages for breeding with village goat keepers' goats. Accordingly, five selected Osmanabadi bucks were sent in August and December 2013, respectively, to Sakat village in Jamkhed taluka of Ahmednagar district and one to Kamone village in Karmala taluka of Solapur district of Maharashtra. At that time, the bucks sent to Sakat were dewormed with oral Ivermectin while the one buck sent to Kamone was not dewormed as it did not have a high worm faecal egg count (FEC). The bucks were maintained by goat keepers in their

grazing goat flocks. On completion of breeding, they were brought back to NARI's farm in Phaltan in April 2014 and their FECs were measured using the Modified McMaster technique (Soulsby, 1982). FECs were measured again in August 2014.

The mean FEC in April 2014 was 117.0 ± 40.1 eggs per gram (epg) of faeces and hence no anthelmintic was administered. The bucks were stall-fed in one pen on the farm. The mean FEC in August 2014 was 3217.0 ± 938.9 epg with a range of 1000–7000 epg (Table 1). Coproculture (MAFF, 1986) indicated the predominance of *Haemonchus contortus* (90%) followed by *Trichostrongylus* and *Oesophagostomum* species (7% and 3%, respectively).

Table 1. Faecal worm egg counts (epg) of Osmanabadi bucks in April and August 2014

Buck number	April 2014	August 2014
K288	100	7000
K310	100	3100
A687	0	1000
OB890	100	2600
OB891	300	1000
OB1126	100	4600
Mean \pm SE	117.0 \pm 40.1	3217.0 \pm 938.9

As the bucks were stall-fed from April 2014 when they had low or nil FECs, and there were little chances of their being exposed to worm eggs after that, the 10-70 fold rise in their FECs detected in August 2014 could probably be attributed to resumption of larval development from a state of hypobiosis. This is

because there was no rain in Maharashtra from December 2013 until April 2014 and from May the environment gradually became more conducive to gastrointestinal nematodes. The first rain of the season was in May 2014 (29 mm), followed by 54 mm, 48 mm and 202 mm in June, July and August, respectively. There was also a rise in average humidity from 51% in April to 59% in May, 66% in June, 79% in July and 84% in August. The average maximum temperature was 40.8°C in April and reduced gradually to 39.3°C in May, 36.7°C in June, 31.1°C in July and 30.8°C in August. It is therefore likely that hypobiotic larvae in the bucks responded to these weather changes in a pre-programmed pattern and resumed development (Gatongi et al., 1998).

Hypobiosis of *H. contortus* in sheep and goats has been reported as a probable reason of clinical haemonchosis at the end of the dry season and rapid dominance of *Haemonchus* larvae on pasture in favourable environmental conditions (Githigia, 2000). Gatongi et al. (1998) reported hypobiosis to be important in the survival of *Haemonchus* during the dry season in the tropics. Singh and Swarnkar (2013) have reported a rising trend in FECs in shepherds' sheep in Rajasthan from June due to hypobiotic larvae coming out of dormancy owing to nutritional stress to the host in extreme summer rather than climatic factors. Hypobiosis of *H. contortus* larvae due to low temperature in the autumn and winter in sub-temperate Kodaikanal (Tamil Nadu) has been reported by Sanyal (1989). Hypobiosis was, however, reported to be absent in the Northern Plains region of India (Bukhari and Sanyal, 2011). It can therefore be concluded that worm burdens of goats should be assessed after the weather changes at the end of the dry season on the Deccan plateau as they are likely to rise due to hypobiotic larvae coming out of dormancy.

SUMMARY

Probable hypobiosis in *Haemonchus contortus* in the dry season in naturally infected and later stall-fed Osmanabadi male goats is reported here. The average FECs of these bucks increased from a mean of 117.0±40.1 epg in April 2014 to 3217.0±938.9 epg in August 2014 in the absence of any exposure to worms and *H. contortus* was the

predominant larval species. It therefore appears that there were fourth stage hypobiotic *H. contortus* larvae in these bucks in April which came out of dormancy due to the higher humidity and rainfall from May onwards and started producing eggs. It can therefore be concluded that worm burdens of goats should be assessed at the end of the dry season on the Deccan plateau as they are likely to rise due to hypobiotic larvae coming out of dormancy.

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