

Case Report

**AFTER TROPICAL CYCLONE DINEO, AN INCREASED MORTALITY
IN SHEEP AND GOATS FROM *HAEMONCHUS CONTORTUS* AT
BOTSWANA UNIVERSITY OF AGRICULTURE AND NATURAL
RESOURCES (BUAN) FARM**

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ABSTRACT

An investigation was carried out to determine the cause of increased mortality in sheep and goats at BUAN farm in March 2017. At the time of reporting sheep and goat deaths had occurred daily for over a week. Clinical signs included weakness, dullness, poor body condition, recumbence followed by death. The investigation consisted of physical examination of sick animals and post mortem examinations. Also abomasal worm counts were carried out on two adult animals and a kid. Additionally, 32 randomly selected goats were tested for gastrointestinal nematodes using faecal egg count (FEC). Another group of animals consisting 12 sheep (6 adults and 6 lambs) and 12 goats (6 adults and 6 kids) were monitored for FEC for six weeks to compare sheep with goats and adults with young animals. A review of meteorological data preceding the case was carried out. Examined animals were diagnosed with *Haemonchus contortus* characterised by poor body condition, weakness, pale mucous membranes and the so-called bottle jaw. Abomasal worm counts ranged from 400 in the kid to 1900 in an adult. A cohort of 32 goats had FEC of 6544 ± 1081 (Mean \pm SEM) eggs per gram (EPG) and 95% confidence interval: 4,339 - 8,748 EPG. FEC of both sheep and goats increased over a six week period with the increase in sheep exceeding that in goats. The pattern of FEC increase was similar between adults and young animals. Meteorological data indicated above average rainfall with percentage departure from normal rainfall at 100% for the affected area. Tropical cyclone Dineo brought an unusually high amount of rain in mid-February 2017 preceding the case. It is concluded that an above average rainy season precipitated a *Haemonchus contortus* outbreak in sheep and goats at BUAN farm.

Keywords: *Haemonchus contortus*, sheep, goats, Faecal egg count

INTRODUCTION

Consistently over the years round worms have been shown to be a major cause of mortality and reduced productivity in sheep and goats in Botswana. Ramabu, 2015 (unpublished,) found that roundworms & coccidia were the most common condition of sheep and goats constituting 45% and 36% respectively of the cases reported to Botswana National Veterinary laboratory (BNVL) in the period 2008 – 2009. Earlier, Segwagwe & Ramabu, 1999 reported that roundworms and coccidia were the most common causes of mortality in sheep (44%) and goats (40%) based on BNVL data for the year 1994. Kibirige-Sebunya and Diteko, 1994 also observed that helminthosis & coccidiosis were the predominant diseases of small ruminants in a retrospective study spanning 10 years from 1983-1992. In March 2017, increased mortality was observed in sheep and goats at Botswana University of Agriculture and Natural Resources (BUAN) farm.

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CASE

An investigation was carried out in late March 2017 to determine the cause of mortality in sheep and goats at BUAN farm. The farm's Global Position System (GPS) coordinates are -24.580874 South and 25.966465 East. The investigation was prompted by reports that sheep and goats of all ages were dying in increased numbers on a daily basis for over a week. Sheep in particular displayed weakness, dullness, loss of weight and recumbence followed by death. Sick animals were physically examined. Dead animals were subjected to post mortem examination. Abomasal worm counts were carried out on two adult animals and a kid using a procedure that was previously described (Ramabu *et al.*, 2015).

During the outbreak period, two investigations for round worms were carried out in the flock. In one investigation 32 randomly selected goats were tested for faecal egg output. The mean faecal egg count was determined. In the second investigation 12 sheep (6 adults & 6 lambs) & 12 goats (6 adults & 6 kids) were monitored for FEC for six weeks to compare sheep with goats and adults with young animals. A review of meteorological data was carried out for the period preceding increased mortality attributable to *Haemonchus contortus*.

Clinical observations

Sick animals were weak, in poor condition and in some cases recumbent. Sheep in particular exhibited the so-called bottle jaw as shown in figure 1. Mucous membranes were pale as shown in figure 2.



Figure 1: A sheep showing submandibular oedema (bottle jaw) typical of animals dying from *Haemonchus contortus* in the farm.



Figure 2A & 2B: A sheep showing pale ocular mucous membranes, a sign of severe anaemia characteristic of severe *Haemonchosis*

Post mortem findings

At post mortem there was ascites and wireworms were visible in the wall of the abomasum and its contents (Figure 3, 4 & 5).

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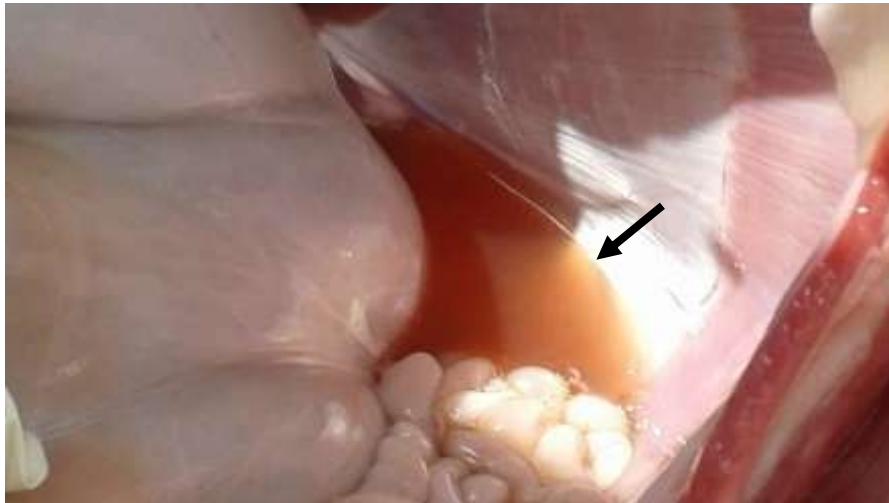


Figure 3: Ascites in a sheep that died from Haemonchosis



Figure 4: An abomasum from a sheep that died from Haemonchosis



Figure 5: Wireworms in abomasal contents from a sheep that died from Haemonchosis

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Abomasal worm counts

Of the two adult animals tested, one had 1900 worms and the other 400 worms in the abomasum. The one kid tested had 400 abomasal worms. The abomasal worms were morphologically identified as *Haemonchus contortus*

Faecal egg counts (FEC)

A sample of 32 randomly selected goats had a FEC of 6544 ± 1081 (Mean \pm SEM) eggs per gram (EPG) and 95% confidence interval: 4,339 - 8,748 EPG. Concurrent with increased mortality, FEC of both sheep and goats increased over a six week period with the increase in sheep exceeding that in goats (Figure 6). A similar pattern of FEC increase was found in adults compared to young animals (Figure 7).

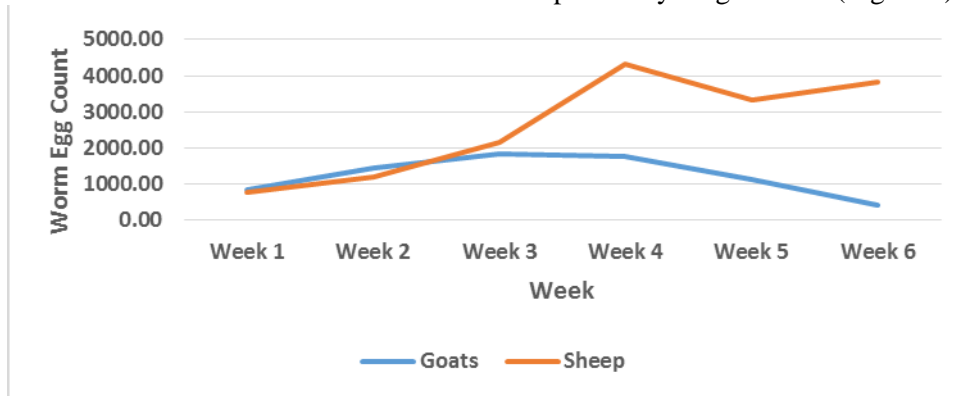


Figure 6: Worm egg count (EPG) increases in sheep and goats during increased mortality from *Haemonchus contortus*

Twelve (12) animals consisting 6 adult sheep, 6 lambs, 6 adult goats, and 6 kids were tested weekly for nematode eggs for six weeks during an outbreak of Haemonchosis at Botswana University of Agriculture and Natural Resources farm.

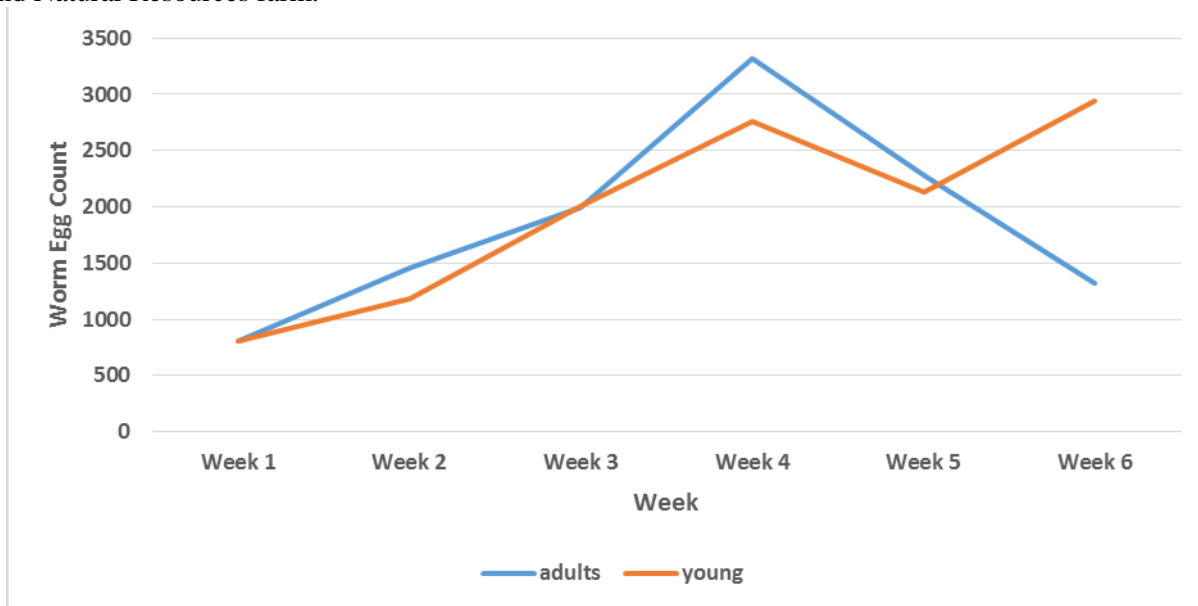


Figure 7: Worm egg count (EPG) increases similarly in adults compared to young animals during increased mortality from *Haemonchus contortus*

Twelve (12) animals consisting 6 adult sheep, 6 lambs, 6 adult goats, and 6 kids were tested weekly for nematode eggs for six weeks during an outbreak of Haemonchosis at Botswana University of Agriculture and Natural Resources farm.

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Meteorological data

Meteorological data preceding increased mortality attributable to *Haemonchus contortus* indicated above average rainfall with percentage departure from normal rainfall at 100% for BUAN farm and surrounding areas (Figure 8). Tropical cyclone Dineo brought an unusually high amount of rain in mid-February 2017 preceding increased mortality (Figure 9).

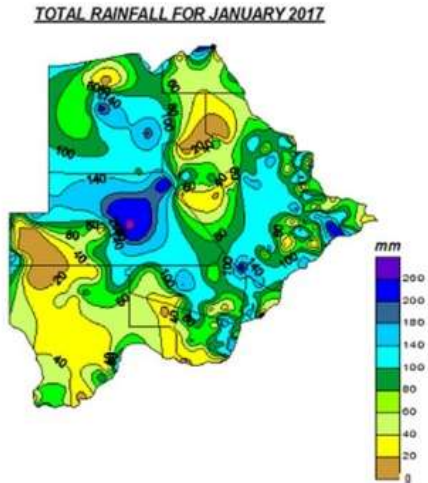


Fig 2: Cumulative rainfall for January 2017

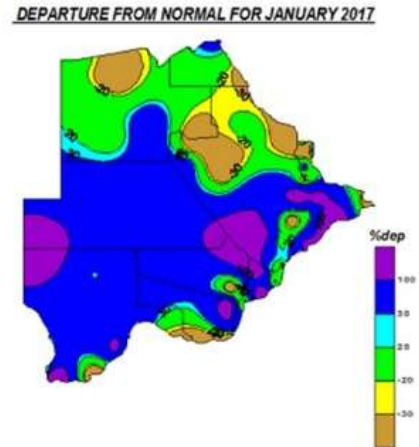


Fig 3: % departure from normal for January 2017

Figure 8: Cumulative rainfall for January 2017 on the left and percentage departure from normal rainfall for January 2017 on the right



Figure 9: Tropical cyclone Dineo made landfall in southern Africa including Botswana in Mid-February resulting in above average rainfall.

Subsequently increased mortality from *Haemonchus contortus* was realised in sheep and goats at BUAN farm.

DISCUSSION

The diagnosis of roundworm infection relies on clinical and physical examination as well as laboratory determination of faecal egg output. In most cases sheep and goats are sub clinically infected with

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roundworms. In the case reported here both sheep and goats had an unusually high mortality. A clinical syndrome including weakness, poor body condition, bottle jaw, recumbence and pale mucous membranes led to the suspicion of Haemonchosis. A definitive diagnosis of Haemonchosis was reached at post mortem where affected animals had ascites and wireworms were observed in the abomasum. Additionally, the abomasal worm counts were much higher than those previously reported in sub-clinically infected goats (Ramabu *et al.*, 2015). *Haemonchus contortus* has been reported to be the most pathogenic and leading cause of anaemia in small ruminants (Kaplan *et al.*, 2004). The organism is prevalent in sheep and goats in Botswana (Molefe and Makate, 2014, Ramabu *et al.*, 2015). Animals may withstand up to 500 worms in the abomasum depending on their age and immune status. A typical infected animal was found to have 1900 worms and thus about four times the tolerable burden indicating severe and fatal levels of infection.

Faecal egg counts are a quantitative measure of worm burden. Interpretation of FEC in small ruminants is variable considering confounding factors such as age of the animal, exposure to stress from transportation, handling for husbandry practises, physiological state of the animal notably stage of pregnancy and hypobiosis. Most advisors would consider 500-1000 eggs per gram as sufficient to warrant intervention. The FEC in the flock at BUAN farm averaged over 6500 EPG which is considered to have severe production losses and deaths. Animals that were monitored over six weeks peaked at an average of 4000 EPG for sheep and 1500 EPG for goats both sufficient to cause severe production losses and mortality. In comparison sub-clinically infected flocks around Gaborone tested at the end of 2016 dry season had 68.±14, 380±50 and 142.±27 EPG (Mean± SEM) in Modipane, Kopong and Gakuto villages respectively (unpublished). Thus the impact of over 6500 EPG levels of infection was severe in pregnant and young animals.

The rainy season in 2016/2017 was abnormal in that there was above average rainfall in Botswana including the southern region where BUAN farm is located. Preceding the episode of Haemonchosis reported here the region experienced a lot of rain from tropical cyclone Dineo. Departure from normal rainfall was recorded to be up to 100 percent (Anonymous, 2017). Previous studies have established an association between above average rainy season with increased worm burden in small stock (Pandey *et al.*, 1993; Nsoso *et al.*, 2001).

CONCLUSIONS

Above average rainfall as was experienced in February and March 2017 in Botswana during which time tropical cyclone Dineo brought an unusually high rainfall amounts can precipitate an outbreak of *Haemonchus contortus* in sheep and goats. Data collected in the case reported here provides evidence of an association between weather and worm burden in small stock in agreement with previous findings in neighbouring Zimbabwe.

ACKNOWLEDGEMENTS

The authors thank Ms Eunice Samakabadi and Betty Phalalo for technical assistance.

Conflict of interest

The authors declare that there is no conflict of interest.

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