

## Nematodiasis in Sheep and Goats Kept under Traditional Farming Practice in Batujajar, Cigudeg, Bogor

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### ABSTRAK

BERIAJAYA. 2005. Nematodiasis pada domba dan kambing yang dipelihara secara tradisional di Batujajar, Cigudeg, Bogor. *JITV* 10(3): 190-199.

Penelitian ini bertujuan untuk mengetahui hubungan umur, jenis kelamin, musim dan status reproduksi pada masa kebuntingan dan laktasi terhadap infeksi cacing nematoda pada domba dan kambing di daerah Bogor. Sebanyak 119 domba Indonesian Thin Tail (ITT) dan 130 kambing Peranakan Etawah (PE), dimonitoring selama 16 bulan. Umur dibagi dalam 3 kategori, untuk domba dan kambing masing-masing sebelum sapih (<4 bulan) 35 dan 32, setelah sapih (4-8 bulan) 53 dan 63; dan dewasa (>8 bulan) 31 dan 35. Setiap 4 minggu sekali dilakukan pengambilan sampel tinja untuk pemeriksaan jumlah telur cacing dan penimbangan berat badan. Selain itu, informasi terhadap kematian, angka kesakitan, kebuntingan, kelahiran, pemotongan dan penjualan juga dicatat. Hasil pengamatan menunjukkan bahwa *Haemonchus contortus* dan *Trichostrongylus* spp merupakan cacing yang dominan ditemukan dalam pupukan tinja. Selama periode pengamatan, jumlah telur cacing per gram tinja pada domba lebih tinggi ( $P<0,05$ ) dibandingkan dengan kambing, tetapi keduanya mempunyai pola yang sama. Jumlah telur cacing relatif stabil pada tiga bulan pertama pada ketiga kelompok umur, tetapi kemudian meningkat dan mencapai puncak 6186 epg pada domba dan 3434 epg pada kambing selama bulan Maret, setelah itu turun bersamaan dengan datangnya musim kemarau. Selain itu jumlah telur cacing meningkat ( $P<0,05$ ) mulai dari tiga bulan sebelum melahirkan sampai 2 bulan masa setelah melahirkan pada domba kelompok umur dewasa, tetapi tidak pada kambing. Kenaikan bobot hidup pada musim hujan lebih rendah ( $P<0,05$ ) dibandingkan pada musim kemarau. Selain itu tidak ada pengaruh jenis kelamin terhadap jumlah telur cacing pada domba dan kambing meskipun domba jantan mempunyai jumlah telur cacing yang lebih banyak dari betina pada bulan November dan Januari. Selama musim hujan, kasus diare lebih banyak terjadi dibandingkan dengan musim kemarau.

**Kata Kunci:** *Haemonchus contortus*, *Trichostrongylus* spp., Domba, Kambing

### ABSTRACT

BERIAJAYA. 2005. Nematodiasis in sheep and goats kept under traditional farming practice in Batujajar, Cigudeg, Bogor. *JITV* 10(3): 190-199.

This study was conducted to determine the relation of age, sex, season and reproduction on gastrointestinal nematode parasitism of the two most commonly kept breeds of sheep and goat in Bogor district. A total of 119 Indonesian Thin Tail (ITT) sheep and 130 Peranakan Etawah (PE) goats with different age and sex were monitored for 16 months. Age of sheep and goat was divided into 3 groups respectively, i.e. before weaning (<4 months) 35 and 32, after weaning (4-8 months) 53 and 63; and adults (>8 months) 31 and 35. Each 4 weeks, individual faeces were collected and individual animals were weighed. Information on the mortality, morbidity, pregnancy, slaughtered and sold was recorded. The results showed that *Haemonchus contortus* and *Trichostrongylus* spp. were dominant species of nematodes found in the faecal cultured. In the period of monitoring, egg counts of nematodes in sheep were higher ( $P<0.05$ ) than in goats, however both animals have similar pattern of egg counts. In the first three months, the egg counts remained steady relatively in 3 groups of age, but soon after that the egg counts increased and reached its peak (in March) of 6186 eggs in sheep and 3434 in goats, there after they decreased along with the onset of dry season. A part from this, the egg counts increased ( $P<0.05$ ) three months before lambing and remained steady until 2 months after partus in sheep, but not in goats. During the monitoring period, weight gain in wet season was lower ( $P<0.05$ ) as compared to dry season. There was no effect of sex on faecal egg count in either sheep or goats although male sheep had higher egg counts than female sheep had in November and January. Evidence of diarrhoeic faeces was higher in wet season than in dry season.

**Key Words:** *Haemonchus contortus*, *Trichostrongylus* spp., Sheep, Goats

### INTRODUCTION

Gastrointestinal nematode parasitism is mostly found in sheep and goats especially in grazing animals (VERCRUYSSÉ, 1983; CARMICHAEL, 1993; DORNY *et*

*al.*, 1995; 1996; BERIAJAYA and COPEMAN, 1997). Studies in West Java provided evidence of the importance of nematode parasitism in sheep and goats in term of growth rate and economic loss (BERIAJAYA and STEVENSON, 1986). Seasonal differences in

strongyle egg counts occurred in coastal areas such as Cirebon with distinct rainfall of wet and dry seasons (BERIAJAYA, 1986a). However, in high rainfall areas such as Bogor where the dry season is short, no seasonal changes in pattern of strongyle egg counts was seen (BERIAJAYA *et al.*, 1982). Most of the past studies carried out in West Java were designed as anthelmintic trials, mainly in young animals, to determine the benefit of treatment (BERIAJAYA, 1986a; 1986b). Young animals were studied because they were considered likely to be more susceptible to nematode parasitism than older animals (BISSET *et al.*, 1996). However, little is known about the effect of species, age, sex and season on the extent on gastrointestinal nematode infections of indigenous breeds of sheep and goats in Indonesia.

Studies in Cirebon demonstrated that sheep were more seriously affected by gastrointestinal nematode parasitism than goats (BERIAJAYA, 1986a). However, this evidence was not sufficient to support a conclusion that sheep are more susceptible than goats since PE goats in that study were mostly kept in pens whereas sheep were allowed to graze. Furthermore, goats are preferential browsers and therefore are not normally exposed to such a high larval challenge as sheep that preferentially graze pasture. As a consequence PRESTON and ALLONBY (1978) suggested that selective pressure for resistance to *H. contortus* infection in goats is less than that in sheep.

This study was designed to determine the effect of age, sex, season and reproduction on gastrointestinal nematode parasitism of the two most commonly kept breeds of sheep and goat in the Bogor district. An experimental site near Bogor was chosen for this study mainly because of its proximity to the laboratory, but also because the climate is similar to extensive areas of West Java and the concentration of sheep and goats is high.

## MATERIALS AND METHODS

### Location

The study was carried out in the village of Batujajar about 60 km to the west of Bogor. Annual rainfall in this area (3000 to 5000 mm) and seasonal pattern of rainfall (see Figure 1) is typical of Bogor district. The land around Batujajar is undulating at about 300 m above sea level. Agricultural production is mainly coconuts, rubber, rice and fruit. During the study mean monthly maximum temperature fluctuated between 28.5 and 32.9°C and minimum temperatures between 21.1 and 22.9°C. Mean monthly maximum and minimum relative humidity ranged between 75 and 89%.

### Animals

Indonesian Thin Tail (ITT) sheep and Kacang cross Etawah (PE) goats that are commonly reared by the farmers in this area were used in the study. On fine days the animals were allowed to graze under coconut trees or in the hilly uncultivated areas from about noon to 5.00 pm and penned at other times. During the rainy season, on the other hand, they were allowed to graze during the morning, as this is usually fine, whereas it rains in the afternoon and evening. Animals were housed in roofed pens with a slatted floor typically about 1 m above the ground. Each farmer kept about 5 animals.

There were 21 sheep farmers raising 119 ITT sheep and 22 goat farmers raising 130 PE goats in the study. All ages and both sexes were represented. Age was classified into three stages of sheep and goats respectively; before weaning (less than 4 months) 35 and 32; weaner (from 4 to 8 months) 53 and 63; and adult (older than 8 months) 31 and 35. All animals were identified with a unique collar number and recorded according to breed, age, sex and farmer.

### Observations

Records were kept of mortality, morbidity, pregnancy, births, slaughter and sale. Faecal samples were collected directly from the rectum and animals were weighed each 4 weeks. Faecal nematode egg counts were carried out using saturated sodium chloride for floatation and a 0.5 ml Whitlock counting chamber to give a sensitivity of 40 eggs per gram of faeces. Faeces from animals of the same age group in each pen were pooled for larval culture. Strongyle larvae were cultured in a moist mixture of faeces and vermiculite for 7 days at room temperature (about 28°C) the up to 100 larvae per culture were identified to genus.

Indicated treatments with antibiotics and B complex vitamins were given to the occasional sick animals (mainly pneumonitis and conjunctivitis). Two percent coumaphos ointment was also applied to the few cases of scabies that were observed on goats.

### Statistical analysis

During the period of observations, a number of animals were lost from the study due to sale, slaughter, death and unavailability when a farmer withdrew from the study. However, newborn animals and animals from other farmers in the area were added progressively to give a sufficient number in each sampling unit for statistical analysis. Each month animals were reallocated if they had reached a new age group. Data were then analysed to include reallocated animals. Egg counts were logarithmically transformed ( $\log x + 1$ )

prior to multivariate analysis over time using analysis of variance.

## RESULTS AND DISCUSSION

### Egg counts and larval culture

Mean strongyle egg counts of sheep and goats together with rainy days per month in the study area are presented in Figure 1. During the course of study the wet season spanned from September to May and the relatively dry season from June to August. Over the period of observation, the mean strongyle egg counts of sheep were higher ( $P<0.05$ ) than those of goats, however, the seasonal pattern of egg counts was similar. During the first three months, the level of mean strongyle egg counts remained steady; however, thereafter, the mean counts steadily increased ( $P<0.05$ ) to reach peaks of 6186 epg in sheep and 3434 epg in

goats in March. They then dropped steadily with the onset of the dry season ( $P<0.05$ ).

Data from faeces cultured for larval differentiation revealed that *H. contortus* and *Trichostrongylus* spp. were the predominant species, each comprising about 30 to 65% and together usually making up about 90 percent of the total. Larvae of *Cooperia* spp., *Oesophagostomum* spp. and *Bunostomum* sp. made up the remainder. Mean percent of *H. contortus* and *Trichostrongylus* spp. in faeces of sheep and goats, together with the number of rainy days per month during the period of observation are presented in Figures 2 and 3 respectively.

In both sheep and goats there was a trend for the proportion of *Trichostrongylus* spp. larvae to decrease progressively throughout the dry season and increase with the onset of wet season. In contrast, the proportion of *H. contortus* larvae increased somewhat during the dry season and declined during the wet season.

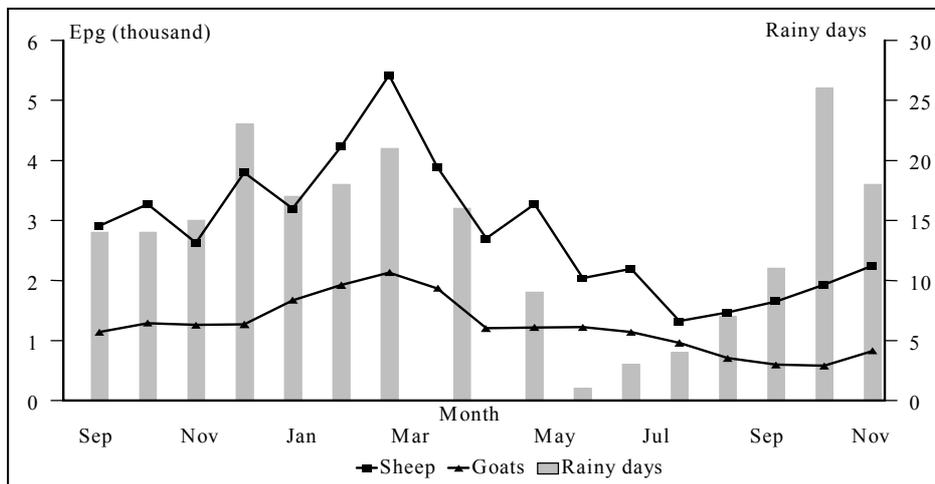


Figure 1. Mean strongyle eggs per gram (epg) of faeces of untreated ITT sheep and PE goats and rainy days per month at Batujajar

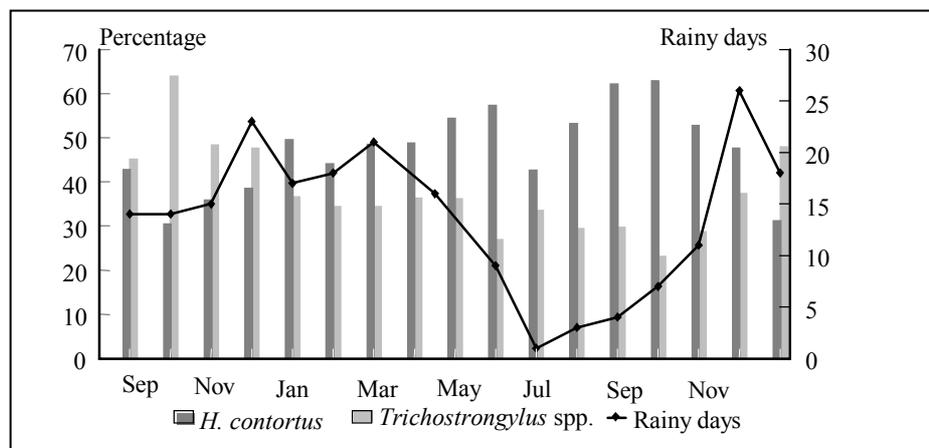


Figure 2. Mean proportion of larvae of *Haemonchus contortus* and *Trichostrongylus* spp. recovered from cultured faeces of untreated ITT sheep plotted with number of rainy days per month at Batujajar

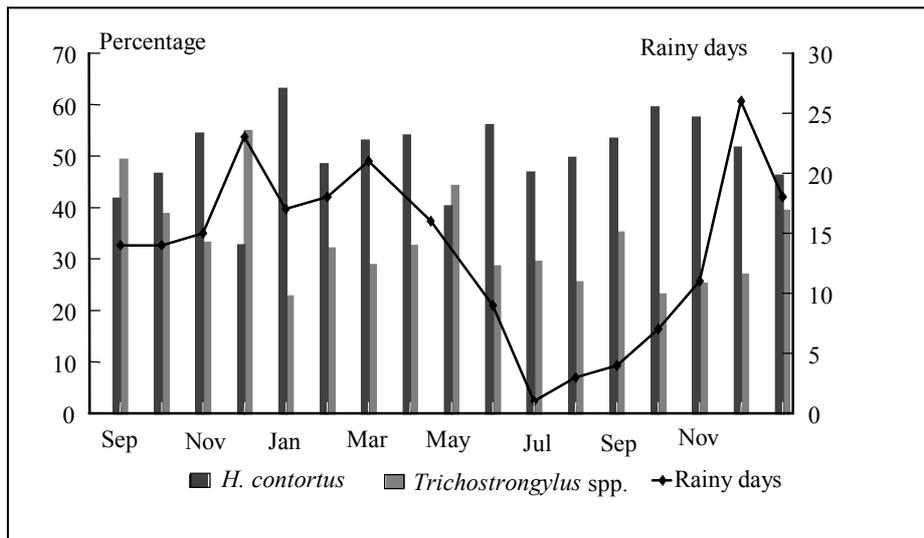


Figure 3. Mean proportion of larvae of *Haemonchus contortus* and *Trichostrongylus* spp. recovered from cultured faeces of untreated PE goats plotted with number of rainy days per month at Batujajar

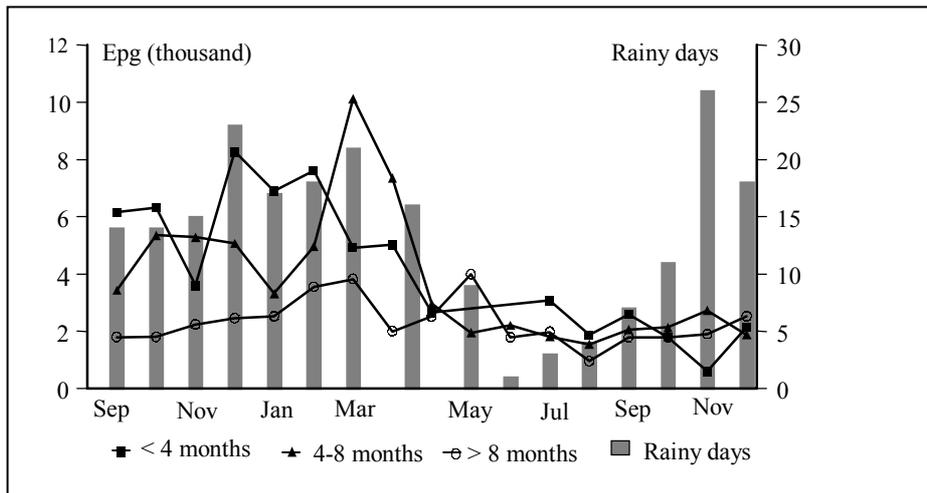


Figure 4. Mean strongyle eggs per gram (epg) of faeces of three age groups of untreated ITT sheep, and rainy days per month at Batujajar

**Effect of age on faecal egg count**

The mean strongyle egg counts of sheep and goats in three age groups are presented in Figures 4 and 5 respectively. In sheep, higher egg counts were observed ( $P < 0.05$ ) in the groups < 4 months and 4-8 months old during the wet season than during the dry season. However, toward the end of the wet season and throughout the dry season the egg counts of all 3 groups were similar. Adult sheep had similar mean strongyle egg counts throughout the wet and dry seasons.

In goats, the seasonal and age-patterns of strongyle egg counts were similar to those of sheep.

**Effect of sex on faecal egg count**

The effect of sex on faecal egg count was measured in animals >8 months old. Male sheep had significantly higher egg counts than females only in samples collected in November ( $P < 0.05$ ) and January ( $P > 0.05$ ), otherwise counts were similar. Egg counts of male and female goats were similar in all collections.

**Variation between animals in faecal egg count**

The mean faecal egg counts of sheep and goats are presented in Figure 1. In general, during the period of 16 weeks of observations, the mean of faecal egg counts

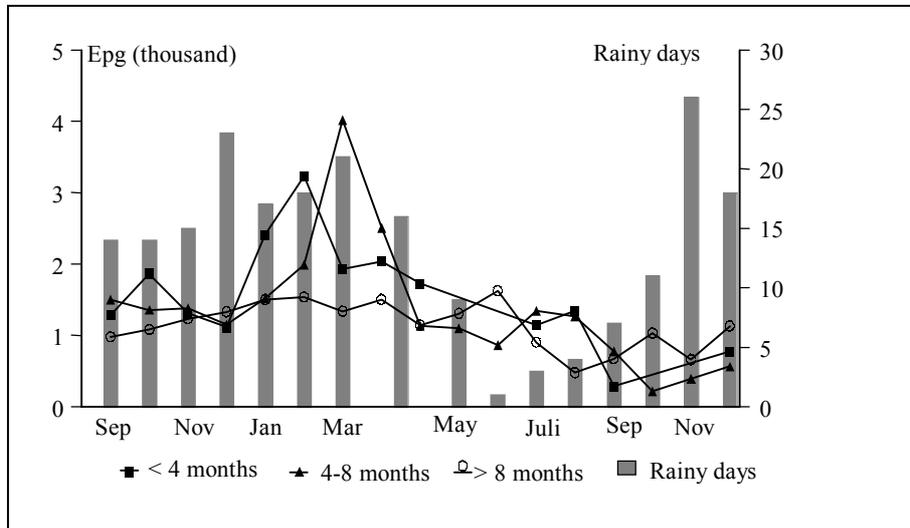
of sheep (3,000) was higher than the mean of faecal egg counts of goats (1,000) ( $P < 0.05$ ). During the wet season the mean egg counts of sheep fluctuated and reached an upper level of above 5,000 epg in March. Individual egg counts of sheep ranged from 0 to 11,640 and of goats from 120 to 39,520.

**Peri-parturient rise**

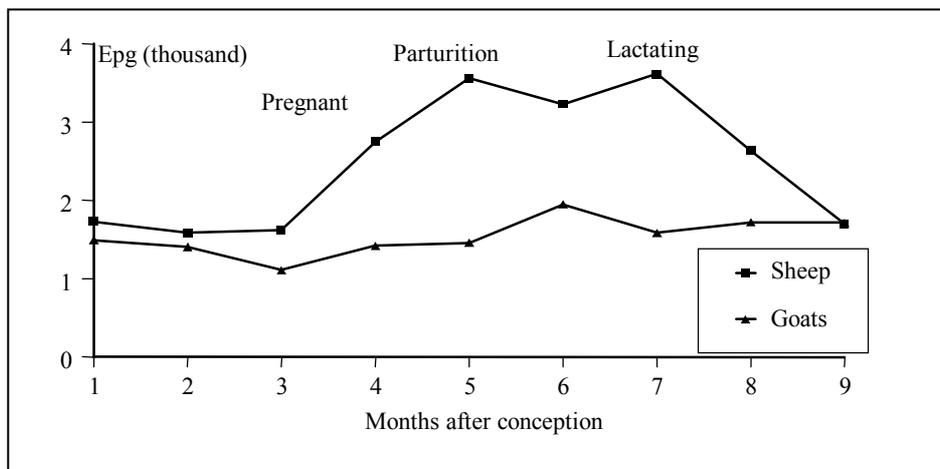
During the study period, 49 sheep and 44 goats underwent parturition. Since this was not synchronous, data of egg counts of parturient animals were reallocated and analysed according to time pre and post parturition. The mean strongyle egg counts of these animals are shown in Figure 6. During the first three months of pregnancy, the mean egg counts were about 1500 epg in both sheep and goats. Thereafter, in sheep

the egg counts rose significantly ( $P < 0.05$ ) to about 3500 epg at lambing. They remained at this level for the first two months of lactation then declined over the next two months to about 1500 epg. The egg counts of goats, on the other hand, remained unchanged throughout pregnancy, parturition and lactation.

In order to define the effect of season on the peri-parturient rise of egg counts, egg count data from animals which gave birth during the wet or dry season were separated then analysed according to time pre and post parturition (Figures 7 and 8). These graphs also demonstrated that egg counts rose during the peri-parturient period only in sheep ( $P < 0.05$ ) and, furthermore, this rise was independent of whether animals lambed during the wet or dry season.



**Figure 5.** Mean strongyle eggs per gram (epg) of faeces of three groups of untreated PE goats and rainy days per month at Batujajar



**Figure 6.** Mean strongyle eggs per gram (epg) of faeces of pregnant and lactating ITT sheep and PE goats at Batujajar

**Weight gain**

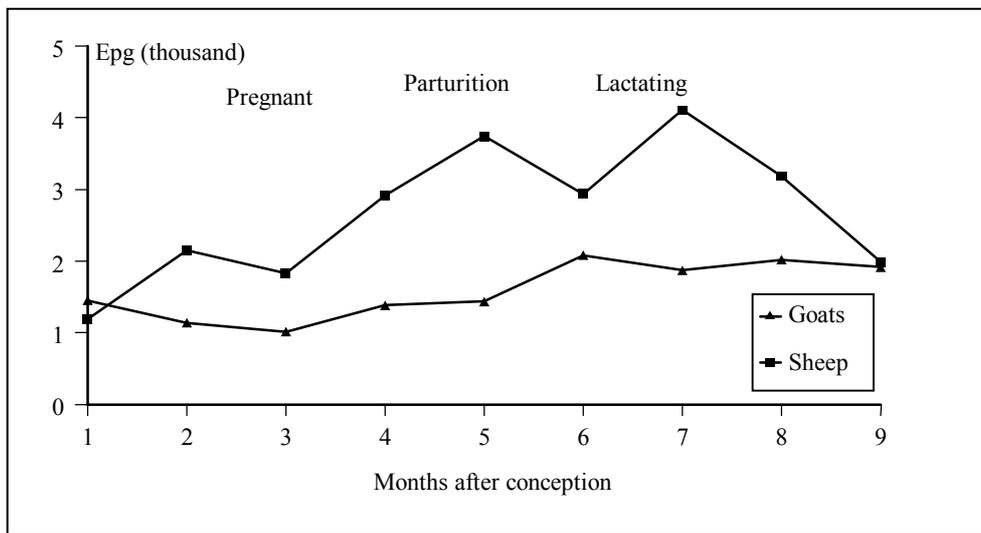
Mean weight gains each 4 weeks of sheep and goats age < 4 months, 4-8 months and > 8 months are presented in Figures 9 and 10 respectively. There was a trend ( $P<0.05$ ) for weight gain to be lower during the wet season (October to March) than the dry season (June to August) in both sheep and goats.

**Mortality and clinical signs**

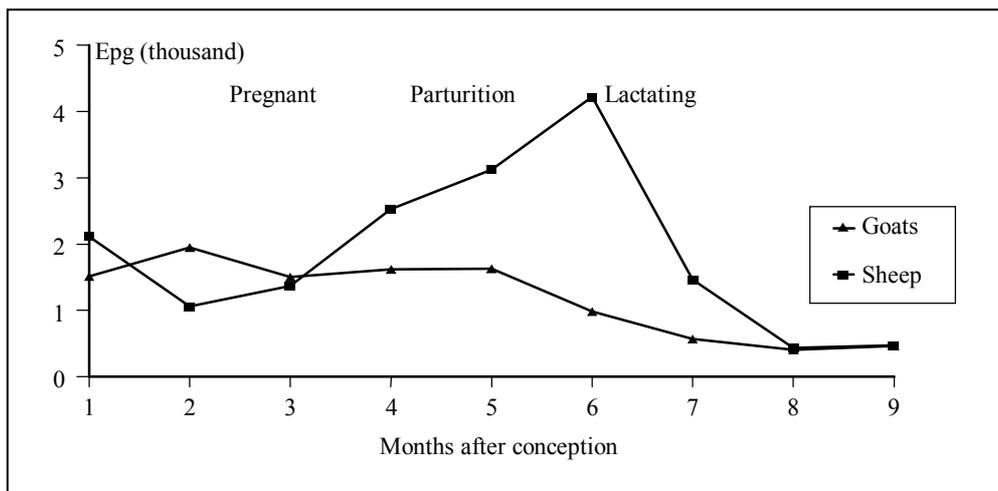
During the study period, a total of 6 sheep and 10 goats died. One sheep and 3 goats died at birth or soon after, one sheep and 2 goats were slaughtered for consumption and the remaining animals (2 sheep and 2

goats 4-8 months old; 2 sheep and 3 goats > 8 months old) died without confirmation of the cause of death.

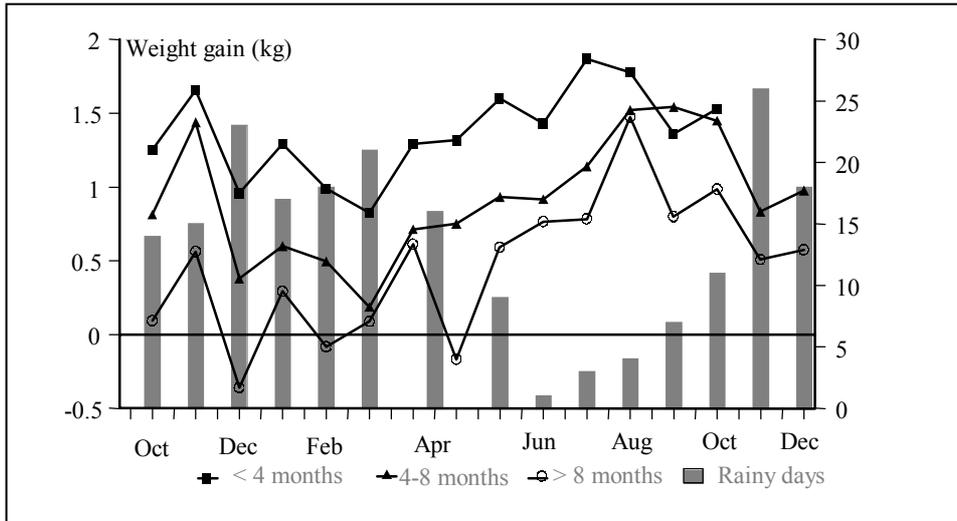
During the period of observations a number of animals had soft or diarrhoeic faeces. Such animals averaged 12.4 sheep and 7.8 goats per month during the wet season and 3.1 sheep and 0.2 goats per month during the dry season. Out of 40 goats and 73 sheep which experienced diarrhoea at least once during the course of observations, 32 percent of these goats and 20 percent of these sheep were < 8 months old, and the remaining animals were adult. Only 15 percent of goats and 22 percent of sheep with diarrhoea had it on more than one sampling occasion, and the most in any animal was 5 occasions.



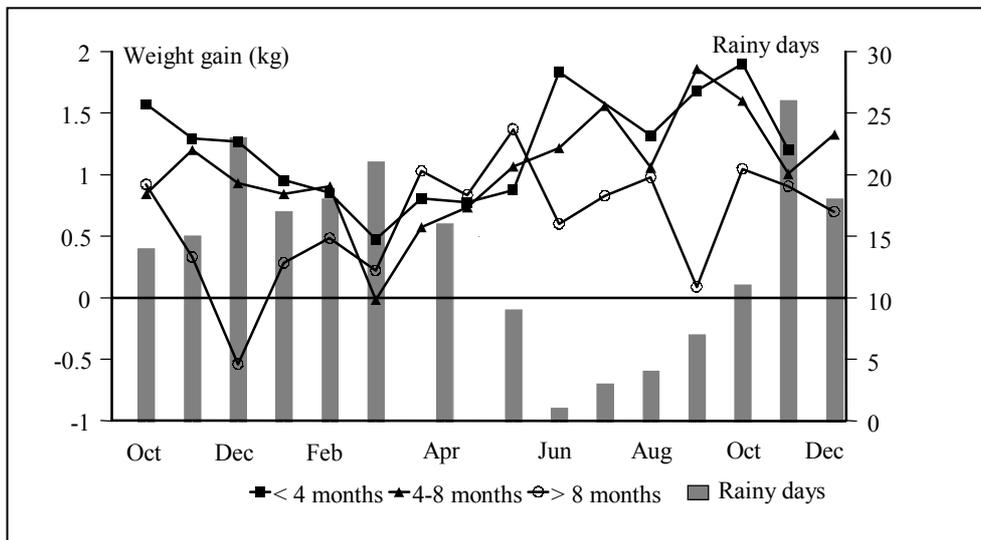
**Figure 7.** Mean strongyle eggs per gram (epg) of faeces of pregnant and lactating parturient ITT sheep and PE goats during the wet season at Batujajar



**Figure 8.** Mean strongyle eggs per gram (epg) of faeces of pregnant, parturient and lactating ITT sheep and PE goats during the dry season at Batujajar



**Figure 9.** Mean weight gain each four weeks of three age groups of untreated ITT sheep, and rainy days per month at Batujajar. Each datum point portrays weight gain over the previous four weeks



**Figure 10.** Mean weight gain each four weeks of three age groups of untreated PE goats, and rainy days per month at Batujajar. Each datum point portrays weight gain over the previous four weeks

The present study clearly demonstrates the occurrence of higher faecal strongyle egg counts in sheep and goats during the wet than the dry seasons and thus, by inference, a higher rate of infection with infective larvae during the wet than the dry season. This study was not designed to define the determinants involved in such fluctuation but some inferences may reasonably be made.

Seasonal differences in availability of infective larvae on pasture may be due to differences between seasons in development of larvae in faecal pellets, translocation of infective larvae to pasture or survival of infective larvae on pasture. It is unlikely that rate of development of larvae in faecal pellets would have been limiting as ambient temperature and relative humidity

fluctuated within the range optimal for such development (CROFTON, 1963; BOAG and THOMAS, 1985). However, both may have influenced length of larval survival on pasture; with the cooler wetter weather of the wet season promoting longer survival than the warmer drier weather of the dry season. Rainfall is the most important determinant affecting translocation of larvae from faecal pellets to pasture (LEVINE and ANDERSON, 1973; ROSSANIGO and GRUNER, 1995). However, the amount and frequency of rainfall are unlikely to have been limiting in this regard during any month except perhaps June. Even then the 69 mm that fell on one rainy day would have facilitated significant translocation. Furthermore, the seasonal reduction in faecal egg count was already apparent in

May, which had 18 rainy days, and reduced egg counts persisted for about 6 months. Thus, rainfall *per se* is unlikely to be an important determinant affecting seasonal rate of infection and thus faecal egg count in this study. These results suggest that, in spite of the small fluctuations in relative humidity and ambient temperature throughout the year, their effect on length of larval survival on pasture may, nevertheless, be the most important determinant regulating seasonal differences between rate of infection and thus faecal egg counts in this study.

Data from faeces cultured for larval differentiation revealed seasonal differences in the proportions of *H. contortus* and *Trichostrongylus* spp. larvae. More *Trichostrongylus* spp. eggs were recovered during the wet than the dry season whereas egg counts of *H. contortus* remained similar throughout. This result might reflect better survival during the wet season of infective larvae of *Trichostrongylus* spp. than those of *H. contortus*, possibly because the former are not washed off pasture by heavy rain as readily as *H. contortus* (BANKS *et al.*, 1990). A similar conclusion was also reached in studies of larvae recovered from artificially infested pasture plots. On the other hand, since seasonal fluctuation in proportions of larvae was predominately a reflection of the large drop in number of eggs of *Trichostrongylus* spp. over the dry season relative to the wet, seasonal differences may also be explained in terms of a relative intolerance by *Trichostrongylus* spp. larvae (in comparison to larvae of *H. contortus*) to the warmer drier weather of the dry season whereas the cooler wetter weather of the wet season was equally favourable to both genera. However, such an explanation is unlikely in view of the reported relative tolerance of *Trichostrongylus* spp. to desiccation (ROSE, 1963).

The allocation of faecal strongyle egg count data according to age group (TONGSON and TROVELA, 1980) revealed that the increase of faecal strongyle egg counts during the wet season in these studies only occurred in animals <9 months old. This result demonstrates that animals <9 months old are still susceptible to infection (BAHIRATHAN *et al.*, 1996), and that older sheep and goats have acquired a degree of resistance to gastrointestinal strongyles and are less susceptible to infection than younger animals (DOBSON *et al.*, 1990; DOUCH and MORUM, 1993). The data also indicate that the population of adult worms in adult animals was stable over the period of observation.

There was no effect of sex on faecal egg count in either sheep or goats although male sheep had higher egg counts than female sheep in November and January (BARGER, 1993). It is thus reasonable to conclude that males and females of these breeds are equally susceptible to infection with gastrointestinal nematodes.

It was interesting that this study demonstrated peri-parturient rise in egg counts in sheep but not in goats. The increase of faecal egg output from sheep during pregnancy and lactation is a potential source of infection for newborn lambs and others in the flock (COURTNEY *et al.*, 1984; JEFFCOATE *et al.*, 1990; SINGH *et al.*, 1997). However, since breeding in the village is not synchronized and flocks are not segregated by age or sex, from the epidemiological point of view the important of peri-parturient rise in strongyle egg counts as a source of increased infection for the flock would be minimised. Furthermore, farmers usually separate pregnant and lactating ewes from the flock for 1-2 weeks before and after parturition and hand-feed them in pens with cut herbage, thus further minimising the impact that peri-parturient rise is likely to have on infection rate for others in the flock.

Anthelmintic treatment of ewes either before or shortly after lambing has been recommended in temperate areas and regarded it as a standard method of control. The results of this study, however, suggest that selective anthelmintic treatment of peri-parturient ewes or does is not justified as they are likely to make no appreciable impact on infection rate for other animals in the flock.

The higher rate of weight gain in both goats and sheep during the dry season in comparison to the wet season was unexpected. Furthermore, only one previous report of seasonal differences in weight gain has been found (BERIAJAYA and COPEMAN, 1996). It seems likely that both level of exposure to larvae on pasture and level of nutrition might play a role (COOP and HOLMES, 1996; AGYEI, 1997).

During the wet season animals were more often hand-fed with cut herbage (CALLINAN and WESTCOTT, 1986) in pens to avoid the rain than during the dry season, and thus their freedom to select forage and perhaps the quantity available to them was reduced during the wet in comparison to the dry season, resulting in lower growth rate during the former than the latter. In addition the rate of infection with *Trichostrongylus* spp. larvae in particular was higher during the wet than dry season, thus contributing to the seasonal differences in growth rate, particularly in animals <9 months old.

The only clinical sign which may have been a consequence of parasitism was diarrhoea, but even this association is tenuous. In support of a link is the occurrence of most cases of diarrhoea during the wet season when the level of infection with *Trichostrongylus* spp. was highest. Furthermore, sheep, which had higher egg counts of *Trichostrongylus* spp. than goats, had proportionally more cases of diarrhoea than goats. On the other hand, 80 percent of cases in sheep and 68 percent of cases in goats occurred in adult animals; whereas it is reasonable to assume that the

more susceptible younger animals, which had higher egg counts of *Trichostrongylus* spp., should also have had more cases of diarrhoea had their been an association with parasitism. Furthermore, the colour of the diarrhoeic faeces was green suggestive of a nutritional causality, a possibility supported by the occurrence of most cases during the wet season when the herbage was lush.

It was not possible to carry out post mortem examination on any of the animals that died during the course of this study but there was no reason to believe that nematode parasitism was a contributing cause. Faecal egg counts from the samplings prior to death were not significantly elevated above mean value of survivors from the same age group, and farmers did not associate parasitism with mortalities. They reported poisoning from chemical sprays used in a rubber plantation where their animals grazed as an important cause of death.

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