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PASTURE CONTAMINATION WITH STRONGYLE EGGS ESTIMATED WITH COMPOSITE FAECAL EGG COUNTS IN GRAZING SHEEP: REPORT FROM A SMALL FLOCK*

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SUMMARY: Production limits in grazing sheep and increase of antihelmintic resistance are caused by strongyle parasites found on pasture. The aim of this study was to estimate spring and autumn pasture contamination using composite faecal egg counts (FEC). Sheep from one small flock from Srbobran (South Bačka province) were sampled in spring and autumn 2011. Estimation of contamination intensity was expressed as average spring and autumn FEC. Our results showed high and moderate level of pasture egg contamination in the spring and autumn, respectively, found in that flock and that composite FEC can be used in this estimation. Hence the presence of high egg numbers alter the number of infective larvae on pasture, obtained results may help development of successful and sustainable parasite control programs in our region, both biological and commercial.

Key words: *pasture contamination, composite faecal egg counts, sheep, control programs*

INTRODUCTION

Domestic ruminants, especially sheep, are very important protein source for people worldwide (Nwosu et al., 2007). In sheep production, grazing is very important practice for economic sustainability (Simin, 2009), but there are certain production limits due to parasitic gastroenteritis (PGE) caused by range of gastrointestinal nematodes

Short communication / *Kratko saopštenje*
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(GIN, also known as strongyle parasites or strongyles) found on pasture (comprehensive checklist of sheep parasites see in Lalošević et al., 2005; Taylor et al., 2007). PGE results in various kinds of losses with significant cost for sheep industry (Charon, 2004; Pavlović et al., 2003), especially in subclinical infected sheep (West et al., 2009).

Beside ill thrift, the importance of GIN is much higher nowadays because of increase of resistance to antihelmintics routinely used for helminth control (Papadopoulos et al., 2003). Thus, carefully targeted prophylaxis and metaphylaxis can improve the efficiency of parasite control and slow the rate of development of resistance by identifying groups of livestock that are in increasing need for treatment (Morgan et al., 2005; Abbott et al., 2009).

There are several approaches for diagnosing PGE in sheep (Taylor, 2010), but among these, faecal egg counts (FEC) are often favored because they are simple, non-invasive, relatively cheap and provide direct measure of rates of pasture contamination with nematode eggs (Morgan et al., 2005). However, since conducting multiple FEC tests on large number of animals can be uneconomical and time consuming, composite faecal egg count methods have been developed as useful tool for estimating level of parasite infection of a group of sheep (Morgan et al., 2005; Abbott, 2009).

Šibalić and Cvetković (1996) emphasized that there is no universal pattern for parasite control, but basic principle for deworming practice in sheep flock was recommended: pre-turn out dehelmintization in the spring to minimize pasture contamination high due to spring rise phenomena, and in the autumn, after housing, to decrease worm burden in winter months when nutrition is poor (common in some sheep flocks in Serbia) and possibility of infective larvae (L3) to overwinter and become available in the spring next year.

One of alternative methods to minimize number of L3 on pasture is the use of nematophagous fungi (Gómez-Rincón et al., 2006) which trap nematode larvae with three-dimensional sticky nets and chlamidospores (Larsen et al., 1997). Out of several species of fungi, *Duddingtonia flagrans* was one of most promising candidates for control of L3 in several animal species, including sheep, because of it's ability to pass unharmed through animal's digestive tract and trap larvae in faeces (Larsen, 1999). This leads to decrease of larval population on herbage resulting in lower availability for sheep which prevents both clinical and subclinical infection.

The aim of this study was to determine spring and autumn pasture contamination in small sheep flock infected with known GIN genera during one grazing season, following basic principles of control given by authors from Serbia (Šibalić and Cvetković, 1996). Estimation of egg contamination intensity via composite FEC will provide useful data as aid in planning fungus administration program.

MATERIAL AND METHODS

Sampled sheep originated from one small flock of about 120 Merinolandschaf ewes near the town of Srbobran (45.34° N; 19.48°E) in South Bačka region, Vojvodina province. All adult ewes graze for minimum eight months during the year at natural pasture beside Krivaja river, from early spring (end of March, beginning of April) to late autumn (end of November, start of December), depending of weather conditions.

For each coprological examination and determination of FEC, ten fresh faecal samples were randomly collected from the pasture as described by Abbott et al. (2009). Since average prepatent period for majority of species is about three weeks (Taylor et al., 2007), we have created sampling schedule for two sampling occasions in the spring and two in the autumn approximately 21 days apart, which is presented in Table 1.

Table 1. Sampling schedule for estimation of average composite FEC in sheep
Tabela 1. Raspored uzorkovanja fecesa za utvrđivanje broja jaja prosečnog zbirnog uzorka u ovaca

	Time of sampling / *Vreme uzorkovanja*	
	Spring /*Proleće*	Autumn /*Jesen*
First sampling / *Prvo uzorkovanje*	Middle of April / *Sredina Aprila*	End of October / *Kraj Oktobra*
Second sampling / *Drugo uzorkovanje*	End of May /*Kraj Maja*	End of November /*Kraj Novembra*

The samples have been packed separately in small plastic cups, sealed and shipped to the laboratory until the end of the day, and refrigerated until examination. Following procedure described by Morgan et al., 2005, composite sample was made by mixing of 3 g of faeces from each sheep, and two McMaster slides were examined with modified McMaster technique (Taylor et al., 2007) to obtain average composite FEC, where number of counted eggs was expressed as egg per gram (epg) of faeces. Sensitivity used in counting method was 50 epg – each egg counted under the grid is equivalent to 50 eggs in one gram of faeces.

Average values of two composite FEC in the spring and autumn are calculated, and expressed as spring and autumn FEC used for indication of pasture contamination in that particular time of year.

After two sampling in the spring, all sheep in the flock have been treated twice with antihelmintics one month apart. First treatment was carried out with ivermectin (Alfamec®, Alfasan) while the second time the ewes received a treatment with doramectin (Dectomax®, Pfizer).

RESULTS AND DISCUSSION

Average FEC (obtained at two separate occasions in spring and autumn) are showed in Table 2. Parasite genera *Trichostrongylus spp., Ostertagia spp., Chabertia spp., Bunostomum spp., Trichuris spp., Nematodirus spp.* and *Strongyloides papillosus* species in monoinfection or mixed infection have already been determined earlier in the same flock by Lalošević et al. (2008) and Simin (2009).

According to Taylor (2010), FEC determined in our study in the spring can be classified as high since FEC over 1000 epg of faeces are generally considered as heavy infections, while autumn findings suggest that there is moderate infection since number of epg exceeds treshhold limit of 500 epg. Similar interpretation of FEC found in grazing lamb flocks in southern Western Australia is given by Sweeny et al. (2011).

Table 2. Average composite FEC in sheep in spring and autumn
Tabela 2. Prosečan broj jaja u prolećnom i jesenjem zbirnom uzorku fecesa ovaca

	Composite FEC values / *Vrednosti prosečnog zbirnog uzorka*	
	Spring sampling *Prolećno uzorkovanje*	Autumn sampling *Jesenje uzorkovanje*
First sampling / *Prvo uzorkovanje*	1525 epg (April / *April*)	950 epg (October / *Oktobar*)
Second sampling / *Drugo uzorkovanje*	725 epg (May / *Maj*)	500 epg (November / *Novembar*)
Average FEC	1125 epg	725 epg

However, FEC have some limitations and should be viewed as additional diagnostic information to be considered with history and clinical signs (Abbott et al., 2009). It is impossible to calculate actual worm population of the host from epg of faeces, since many factors influence egg production of worms which may vary between parasite genera due to different female fecundity. As sheep grow older, they develop an immunity that reduces worm fecundity, so egg count becomes a less reliable indicator of the size of worm burden (Taylor, 2010). Despite these limitations, Taylor points that FEC can be used to help decide if treatment is necessary, while Morgan et al., (2005) suggest that a composite sample from 10 individual sheep is likely to give good results for routine examination of mixed trichostrongyle egg counts in grazing sheep. Papadopoulos et al. (2003) reported the highest FEC in sheep in the spring (FEC=1200 epg and 1100 epg; March and April; two regions of Greece) suggesting that this might be associated with the post-partum or spring egg rise. The second but smaller peak was observed in October (around 400 epg) due to reinfection of animals when increased rainfall provided a more suitable environment for the survival of infective larvae, as well in the spring.

These findings were similar with our data showing high degree of infection in spring in both studies, but less in the autumn. Findings of these authors support our decision to investigate pasture contamination level on this time of year, simultaneously validating basic parasite control recommended by Šibalić and Cvetković (1996).

In Sweden, Waller et al. (2004) found that high number *Haemonchus contortus* abomasal nematodes altered their life cycle adapting to cooler climate. They have developed very successful strategies to survive harsh winter conditions, together with other nematode genera, surviving in tissues of animal host as early L4 larvae (EL4), in stage known as hypobiosis or arrest (Waller et al., 2004; Lalošević et al., 2005). When the well known peri-parturient relaxation of immunity occurs, they resume their development and are primarily response for elevated egg counts of the ewes 4-6 weeks following lambing. So, if early contamination on pasture allow rapid development of L3, they could, together with other species capable to overwinter outside animal host (*Teladorsgia circumcinta*, for instance), trigger clinical episodes of PGE in young lambs and possibly in the ewes by auto-infection (Waller et al., 2004).

Same authors had to deworm their experimental group of lambs, because of high worm burden. Similarly, after finding high level of spring FEC in our research, we have treated sheep flock, as described earlier. One month after first treatment with ivermectin (Alfamec®, Alfasan), the owner requested a treatment with doramectin (Dectomax®, Pfizer) since we have proved it's efficacy in this flock (Lalošević i Simin, 2008).

Discussed data also clearly show the importance of autumn contamination, because high number of eggs on the pasture will develop to L3 under favorable conditions (Papadopoulos et al., 2003), increasing its possibility to be ingested and survive winter as EL4 or to be ingested in the spring after successful outside survival. On the other hand, during the hot and dry summer there is less infection risk since animals are faced to shortage of the green vegetation, and larvae do not easily survive such climatic conditions (Papadopoulos et al, 2003).

Innovative ways of controlling subclinical parasitism on pastoral farming systems need to be considered (West et al., 2009), and already mentioned capability of *D.flagrans* in reducing number of infective larvae on sheep pasture will may be useful innovative tool for biological control, regarding increasing resistance of parasites to antihelmintics and growing public demand for food without drug residues (Lalošević et al., 2009).

CONCLUSION

Our study showed that composite FEC can be used for estimation of pasture contamination and that there is high and moderate level of contamination in spring and autumn, respectively. These are important facts regarding higher availability of infective larvae on pasture and associated risks for sheep infection. The authors underline that these results are from one small flock only, so no generalizations can be made in estimation of pasture contamination level in this region of Serbia. Further studies are needed including more farms from region where grazing practices are common, so detailed information can be obtained. Our findings may help in developing successful and sustainable parasite control programs in our region, both biological and commercial, to minimize impact of GIN on production parameters in grazing sheep.

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PROCENA KONTAMINACIJE PAŠNJAKA BROJEM JAJA STRONGILIDA U ZBIRNOM UZORKU FECESA OVACA: NALAZI U MALOM ZAPATU

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Izvod

Ograničenja u uzgoju pašnih ovaca i povećanje rezistencije na antihelmintike izazvani su strongilidnim parazitima prisutnim na pašnjaku. Cilj ovog rada jeste procena prolećne i jesenje kontaminacije pašnjaka metodom brojanja jaja u zbirnom uzorku fecesa ovaca. Uzorci su sakupljeni u proleće i jesen 2011-te od ovaca iz jednog malog stada iz Srbobrana (grad na jugu Bačke). Utvrđeni intenzitet kontaminacije izražen je kao prolećni i jesenji prosek broja jaja u fecesu. Naši rezultati su pokazali da su na pašnjaku ispitivanog stada prisutni visoki i umereni stepen kontaminacije jajima u proleće i jesen (tim redom), kao i da brojanje jaja u zbirnom uzorku fecesa predstavlja odgovarajuću metodu za vršenje ovakve procene. Kako prisustvo velikog broja jaja na pašnjaku utiče na porast broja infektivnih larvi, dobijeni rezultati mogu doprineti razvoju efikasnih i primenljivih, kako bioloških tako i komercijalnih, programa kontrole parazita u našem regionu.

Ključne reči: kontaminacija pašnjaka, broj jaja u zbirnom uzorku fecesa, ovce, programi kontrole.

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