

## GASTROINTESTINAL HELMINTHS OF SHEEP BREED IN POMORAVSKI AND RASINA DISTRICT (SERBIA)

Ivan Pavlović<sup>1</sup>, Violeta Caro-Petrović<sup>2</sup>, Dragana Ružić Muslić<sup>2</sup>, Jovan Bojkovski<sup>3</sup>, Nemanja Zdravković<sup>1</sup>, Renata Relić<sup>4</sup>, Vukašin Stefanović<sup>5</sup>

<sup>1</sup> Scientific Veterinary Institute of Serbia, 11000 Belgrade, Serbia,

<sup>2</sup> Institute for Animal Husbandry, 11000 Belgrade-Zemun, Serbia

<sup>3</sup> University of Belgrade, Faculty of Veterinary Medicine, 11000 Belgrade, Serbia

<sup>4</sup> University of Belgrade, Faculty of Agriculture, 11000 Belgrade, Serbia

<sup>5</sup> University of Priština, Faculty of Agriculture, 38219 Lešak, Serbia

Corresponding author: Ivan Pavlović, dripavlovic58@gmail.com

**Abstract:** The study about gastrointestinal helminthes of sheep at central parts of Šumadija region - Pomoravski and Rasina district was started in March 2016 and finished in October 2018. During our research 937 fecal samples originated from 62 sheep flocks were collected individual at monthly intervals. A total of 57 animals we were analyzed by post-mortem examination. Determination of parasites eggs we performed by keys given by Euzéby (1981). We occurred next parasite species: *Haemonchus contortus*, *Teladorsagia (Ostertagia) circumcincta*, *Ostertagia trifurcata*, *Ostertagia ostertagi*, *Ostertagia occidentalis*, *Marshallagia marshalli*, *Trichostrongylus axei*, *Trichostrongylus colubriformis*, *Trichostrongylus vitrinus*, *Nematodirus filicolii*, *Nematodirus spathiger*, *Nematodirus abnormalis*, *Cooperia curticei*, *Cooperia oncophora*, *Cooperia punctata*, *Cooperia zurnabada*, *Skrjabinema ovis*, *Bunostomum trigonocephalum*, *Oesophagostomum venulosum* and *Chabertia ovina*. Most prevalence species of nematode are *Ostertagia*, *Trichostrongylus* and *Nematodirus*, species. Although most of the gastro-intestinal species appear to follow this general pattern of seasonal distribution, some variations in intensively and duration of these characteristics with different worm species occurred. Thus with *Trichostrongylus* and *Ostertagia* species infection at mature goats the spring peak was more pronounced than the autumn infection. Poliparasitism and infection were established at all examined animals. The intensity of infection and polyparasitism was monitored in relation to the age of sheep. It was found that in younger animals intensity of infection was lower than that of older animals.

**Key words:** sheep, gastrointestinal helminths, Serbia

## Introduction

Sheep play an important role in providing animal protein for diet, especially for those people who live in villages. Sheep are milked and they produce the bulk milk supply, together with a large proportion of the meat that is consumed (Petrović *et al.*, 2021). The method of breeding, which has been established in sheep breeding for centuries, is acquired through conditions that affect the development and maintenance of a significant number of diseases, including parasitic infections (Vlassoff, 1982; Rose and Jacobs, 1990; Cabaret *et al.*, 2002, Kenyon *et al.*, 2009). The grazing diet allows sheep constant contact with transitional hosts (oribatids, mollusks, etc.) and eggs and larval forms of parasites, so that there is no sheep that is not infected with at least one parasitic species (Ardelanu *et al.*, 2007). The harmful effect of parasites is reflected in the reduction of milk yield, reduction of body weight and the quality of wool, leading to large losses in sheep production (Karanfilovski, 1991; Pavlović *et al.*, 2009).

From these reasons in mind, during application of project BT 31053 we started with examination of parasitic fauna of goat and sheep at various parts of Serbia. In our paper we presented results of examination performed at Šumadija, a geographical region in the central part of Serbia. It is administratively divided into several districts - Šumadija, Pomoravski, Rasina, Podunavlje, Moravica, Kolubara and Belgrade City district. In the past period research of parasites on small ruminants are made in Podunavlje, Moravica, Kolubara and Belgrade City district (Pavlović *et al.*, 2012b, 2017a, 2019).

In our paper we presented result of examination from central Šumadija district which is well known for its rich horticulture and there is a large number of pastures suitable for growing small and larger ruminants. We examined central part of Šumadija, Pomoravski and Rasina district, areas where the largest number of sheep are bred in the Šumadija region.

## Material and Methods

The study about gastrointestinal helminthes of sheep at Pomoravski and Rasina districts, part of Šumadija region, was started in March 2016 and finished in October 2018.

Šumadija is a geographical region in the central part of Serbia. It is administratively divided into Šumadija district, Pomoravski district, Rasina district, Podunavlje district, Moravica district, Kolubara district, Belgrade City District. The area used to be heavily covered with forests, hence the name (from *šuma* 'forest'). In the relief of Pomoravski and Rasina district a series of surfaces stands out, above which rise low island mountains and wide valleys cut into the surface.

The island mountains of the southern rim of the Pannonian Basin in Šumadija are Gledičke planine, Kotlenik, Juhor, Rudnik, Crni vrh, Venčac, Bukulja, Kosmaj and Avala.

Pomoravski and Rasina district has a distinct temperate continental climate. Considering the size of this area and the height differences in it (100 to 1130 m), there are significant microclimatic differences in Šumadija. Temperature fluctuations in Šumadija, as well as in the entire southern edge of the Pannonian Basin, can be significant. It even happens that some winter day has a higher average temperature than some summer day (Ognjenović, 2008). Geographical and climatic conditions make this region rich in pastures suitable for breeding small ruminants. They are usually kept in small herds by rural households and spend most of the year grazing.

During our research 937 fecal samples originated from 62 sheep flocks were collected individual at monthly intervals. Examination were performed using standard coprological technique with saturated NaCl solution and sedimentation (Euzeby, 1981; Pavlović and Rogožarski, 2017). Total of 57 animals we were analyzed by post-mortem examination. Determination of parasites eggs we performed by keys given by Euzeby (1981).

## Results and Discussion

The faecal samples were obtained from a different source all together as they were collected from flocks in the field, and the results support the other findings. These counts were also of value in providing some information on the egg rise. Post mortal examination gave us insight into the types of parasites that were present in the infections.

During our examination parasites infection we occurred in 65.31% (612/937). Polyparasitism we established at all examined animals. With coprological examination we established the following genera of gastrointestinal helminths: *Ostertagia* sp. (72.22%), *Trichostrongylus* sp. (68.92%), *Nematodirus* sp. (66.45%), *Haemonchus* sp. (61.44%), *Chabertia ovina* (67.11%), *Oesophagostomum* sp. (39.77%), *Cooperia* sp. (27.66%), *Marshallagia* sp. (22.88%), *Skrjabinema* sp. (19.33%) and *Bunostomum* sp. (11,66%). The intensity of infection and polyparasitism was monitored in relation to the age of sheep. It was found that in younger animals intensity of infection was lower than that of older animals.

Species in the genus *Ostertagia*, *Trichostrongylus* and *Nematodirus* were present after the first appearance of those present during the entire study period. *Haemonchus contortus* is ordered in animals during the warmer and *Marshallagia marshali* during the colder period of the year. Species in the genus *Cooperia*, and

*Oesophagostomum*, *Bunostomum* were often present in lambs sacrificed during all the monitoring period. Species in the genus *Cooperia*, and *Oesophagostomum*, *Bunostomum* were often present in lambs sacrificed during the monitoring period. At the beginning of our research, conducted in March, the real extent of gastrointestinal infections strongilidae was 72.22%, after which he soon reached a level of 100% in the same way and moved to the end of follow-up period. Extensity of infection established genera gastrointestinal strongilidae was different. The distribution of the most prevalence genera species - *Ostertagia*, *Trichostrongylus* and *Nematodirus* was reached during the monitoring period almost the maximum level.

With post-mortem examination we found next parasite species: *Teladorsagia (Ostertagia) circumcincta*, *Ostertagia trifurcata*, *Ostertagia ostertagi*, *Ostertagia occidentalis*, *Trichostrongylus axei*, *Trichostrongylus colubriformis*, *Trichostrongylus vitrinus*, *Nematodirus filicoliis*, *Nematodirus spathiger*, *Nematodirus abnormalis*, *Haemonchus contortus*, *Chabertia ovina*, *Oesophagostomum venulosum*, *Cooperia curticei*, *Cooperia oncophora*, *Cooperia punctata*, *Marshallagia marshalli*, *Skrjabinema ovis* and *Bunostomum trigonocephalum*.

Their localization was different. *Haemonchus contortus*, *Ostertagia trifurcata*, *O. ostertagi*, *Marshallagia marshalli* and *Trichostrongylus axei* were found only in abomasus. In the small intestine we occurred only species of the genus *Cooperia*, and in the large intestine *Oesophagostomum venulosum* and *Chabertia ovina*. Other species of the genus *Ostertagia* were predominantly localized in the abomasum, rarely in the small intestine, and *Trichostrongylus colubriformis*, *Trichostrongylus vitrinus*, and species of the genus *Nematodirus* predominantly in the small intestine. *Bunostomum trigonocephalum* were predominantly localized in the small intestine, and a smaller number of parasites were found in abomasus.

The interrelationship of the total number of males and females of the established species of gastrointestinal strongylides varied greatly. In all species of the genus *Ostertagia* was found a larger number of specimens of female parasites. *Haemonchus contortus* and *Marshallagia marshalli* were also represented by a larger number of female parasites. The same case was found in species of the genus *Trichostrongylus*. In species from the genera *Nematodirus*, *Cooperia*, *Bunostomum*, *Oesophagostomum*, *Skrjabinema* and *Chabertia* we no found significant differences between males and females.

When we compared our results to the examination at hilly mountainous area of Serbia like Stara Planina (Pavlović et al., 2015), Sjenicko-Pesterski Highland, (Vujić et al., 1991) and at Prizren District and north Kosovo (Pavlović et al., 1995; Milanović et al., 2018), we were concluded that dominant nematode

species in such geographical conditions were *Ostertagia*, *Nematodirus* and *Trichostrongylus*. Same parasitic species we obtained during examination of goats and sheep at Vojvodina (Pavlović *et al.*, 2017b), Belgrade area (Pavlović *et al.*, 2012a) and south-east Serbia (Pavlović *et al.*, 2013), Timok District (Ilić *et al.*, 1991; Jovanović *et al.*, 1991). In other Western Balkan countries like Montenegro, Romania, Bulgaria, North Macedonia or Greece were also identified identical species of GI helminths, with different intensities of infections and species ratio (Denev and Kostov, 1984; Karanfilovski, 1991; Theodoropoulos *et al.*, 2000; Ardeleanu *et al.*, 2007; Georgievski, 1991).

## Conclusion

Results of our examination suggest that infections with helminths present significant problem of sheep in central part of Šumadija region. The infective rate of each of these parasites showed that the most of its followed the same general pattern, having a peak in the spring and an other in the autumn, separate by a trough during the hot dry summer period when the infection rate was low. At the same time, parasitic infections, in addition to harmful effects of sheep, affect the reduction of their production results - less milk yield, reduced growth and poor quality of wool. For these reasons, regular parasitological control of sheep before, during and after the grazing season must be taken into account. Sheep should also be regularly treated for parasites.

## Gastrointestinalni helminti ovaca gajenih na području Pomoravskog i Rasinskog okruga (Srbija)

Ivan Pavlović, Violeta Caro-Petrović, Dragana Ružić Muslić, Jovan Bojkovski, Nemanja Zdravković, Renata Relić, Vukašin Stefanović

## Rezime

Studija o gastrointestinalnim helmintama ovaca u centralnim delovima Šumadijskog regiona - Pomoravskog i Rasinskog okruga započeta je u martu 2016. godine, a završena u oktobru 2018. Tokom našeg istraživanja prikupljeno je 937 uzoraka fecesa iz 62 stada ovaca pojedinačno u mesečnim intervalima. Istovremeno je patoanatomskim pregledanom 57 zaklanih ili uginulih ovaca. Determinaciju parazita izvršili smo morfometrijskim pregledom pomoću ključeva koje je dao Euzebi (1981). Utvrdili smo sledeće vrste parazita: *Haemonchus*

*contortus*, *Teladorsagia* (*Ostertagia*) *circumcincta*, *Ostertagia* *trifurcata*, *Ostertagia* *ostertagi*, *Ostertagia* *occidentalis*, *Marshallagia* *marshalli*, *Trichostrongylus* *axei*, *Trichostrongylus* *colubriformis*, *Trichostrongylus* *vitrinus*, *Nematodirus* *filicoliis*, *Nematodirus* *spathiger*, *Nematodirus* *abnormalis*, *Cooperia* *curticei*, *Cooperia* *oncophora*, *Cooperia* *punctata*, *Cooperia* *zurnabada*, *Skrjabinema* *ovis*, *Bunostomum* *trigonocephalum*, *Oesophagostomum* *venulosum* i *Chabertia* *ovina*. Najzastupljenije vrste nematoda su bile vrste iz rodova *Ostertagia*, *Trichostrongylus* i *Nematodirus*. Iako je većina gastrointestinalnih vrsta imala uobičajeni obrazac sezonske distribucije, pojavile su se neke varijacije u intenzitetu i trajanju infekcija kod nekoliko vrsta parazita. Tako je kod infekcije vrstama *Trichostrongylus* i *Ostertagia* kod odraslih ovaca prolećni vrhunac bio izraženiji od jesenje infekcije. Poliparazitizam je utvrđen kod svih pregledanih životinja. Intenzitet infekcije i poliparazitizma praćen je u odnosu na starost ovaca. Utvrđeno je da je kod mlađih životinja intenzitet infekcije bio niži od intenziteta kod starijih životinja.

**Ključne reči:** ovce, gastrointestinalni helminti, Srbija

## Acknowledgments

This work was funded by Serbian Ministry of Education, Science and Technological Development (contract number 451-03-9/2021-14/200030 and no. 451-03-9/2021-14/200022).

## References

- ARDELEANU D., PIVODĂ C., NEACȘU M., IDA A. (2007): Bio-ecological phenomenon of poly-parasitism—actual major problem in breeding of sheep and goats. *Lucrari Stiintifica .Zootehnie și Biotehnologii*, 40(2), 309-317.
- CABARET J., MAGE C., BOUILHOL M. (2002): Helminth intensity and diversity in organic meat sheep farms in centre of France *Veterinary Parasitology*, 105(1), 33-47.
- DENEV I., KOSTOV R. (1984): Seasonal variations in the principal helminth infections on a sheep-grazing complex. *Veterinarno-meditsinski Nauki*, 21, 81-88.
- EUZEBY J. (1981): *Diagnostic experimental de helminthoses animals*, Vol 1. ITVC, Paris.
- GEORGIEVSKI B. (1998): Rasprostranjenost i dinamika nematoda digestivnog trakta ovaca u Republici Makedonija, Doktorska disertacija, Fakultet veterinarske medicine Skopje, Universiti Kiril i Metodij Skopje, Makedonia.

- ILIĆ G., JOVANOVIĆ D., NEŠIĆ D., PAVLOVIĆ I. (1991): Parasitose in goat and its role in pathology of goat at Timok District in period 1986-1989. Proceeding of 1th International Summer Conference for Advancement of Sheep and Goat Production, Ohrid, SFRJ, 390-395
- JOVANOVIĆ D., ILIĆ G., NEŠIĆ D., PAVLOVIĆ I., VALTER D. (1991): Parasitoses of sheep in Timok district during 1986-1989. Proceeding of 1th International Summer Conference for Advancement of Sheep and Goat Production, Ohrid, SFRJ 383-385.
- KARANFILOVSKI G. (1991): Štete od parazita u ovčarstvu, Veterinarska stanica Pljevlja, Pljevlja, SFRJ.
- KENYON F., SARGISONN D., SKUCEP J., JACKSON F. (2009): Sheep helminth parasitic disease in south eastern Scotland arising as a possible consequence of climate change. *Veterinary Parasitology*, 163 (4), 293-297.
- MILANOVIC V., PAVLOVIC I., RADOVIC B., MILOŠEVIC B., KRAGOVC Đ., IVANOVIC S., BOJKOVSKI J. (2018): Helminth fauna of small ruminants in north Kosovo Serbia. - The 17th International Symposium Prospects for 3rd Millennium Agriculture, Cluj-Napoca, Romania, Book of Abstracts No5/2018, 404.
- OGNJENOVIĆ S. (2008): Ilustrovani atlas Srbije. Evro- Giunti, Beograd.
- PAVLOVIĆ I., KULIŠIĆ Z., NEŠIĆ D., ROMANIĆ S. (1995): Endoparasites of sheep and goats in Prizren district. 3<sup>rd</sup> International Conference of Sheep and Goats Production, Ohrid, Macedonia, 106-110.
- PAVLOVIĆ I., SAVIĆ B., IVETIĆ V., RADANOVIĆ O., ŽUTIĆ M., JAKIĆ-DIMIĆ D., BOJKOVSKI J. (2009): The effect of parasitic infections to production results of sheep. IV Balkan Conference of Animal Science BALNIMALCON 2009, Challenges of the Balkan Animal industry and the Role of science and Cooperation, Stara Zagora, Bulgaria, 389-391.
- PAVLOVIĆ I., IVANOVIC S., ŽUGIĆ G., JOVČIĆ D., BOJKOVSKI J., PAJIĆ M. (2012a): Season distribution of gastrointestinal helminths of small ruminants in spread Belgrade area. *Lucrări Științifice Medicină Veterinară Timișoara XLV(3)*, 155-160.
- PAVLOVIĆ I., IVANOVIC S., ŽUJOVIĆ M., TOMIĆ Z., MEMIŠI N. (2012b): Studies on the endoparasites of goats in spread Belgrade area in period 2009-2010. *Archiva Zootechnica*, 15(4), 27-31.
- PAVLOVIĆ I., IVANOVIC S., STOKIĆ-NIKOLIĆ S., BOJKOVSKI J., ŠEKLER M., SAVIĆ B., ŽUTIĆ M. (2013): Season distribution of gastrointestinal helminths of goats in south-east Serbia. - *Lucrări Științifice Medicină Veterinară Timișoara, XLVI(5)*, 138-143.
- PAVLOVIĆ I., IVANOVIC S., SAVIĆ M., ĆIRKOVIĆ D., JOVČEVSKI S.R., JOVCEVSKI S.T., SAVIĆ B., BEČKEI Ž., MARČIĆ D. (2015): Gastrointestinal

- helminths of goats breeding at Stara plana area (Serbia). - *Lucrări Științifice Medicină Veterinară Timisoara*, XLVIII (3), 159-166.
- PAVLOVIĆ I., IVANOVIĆ S., ĆIRKOVIĆ D., PETROVIĆ P.M., CARO PETROVIĆ V., MAKSIMOVIĆ N., IVANOVIĆ D. (2017a): Gastrointestinal helminths of sheep breeding at south west Serbia. *Bulgarian Journal of Veterinary Medicine*, 20, Suppl. 1, 402-406.
- PAVLOVIĆ I., BECSKEI Z., IVANOVIĆ S., PETROVIĆ P.M., SAVIĆ M., CARO PETROVIĆ V., BOJKOVSKI J. (2017b): Biodiversity of helminths of sheep breed in Vojvodina (Northern Serbia). *Bulletin of University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca* 74 (2), 162-166.
- PAVLOVIĆ I., ROGOŽARSKI D. (2017): Parazitske bolesti domaćih životinja sa osnovima parazitologije i dijagnostike parazitskih bolesti. *Naučna KMD, Beograd*.
- PAVLOVIĆ I., IVANOVIĆ S. (2019): Gastrointestinal helminths of goats breed in central part of Serbia. - *Proceedings of International symposium on animal science (ISAS) 2019, Herceg Novi, Montenegro*, 143-148.
- PETROVIĆ P.M., ILIĆ Z., CARO PETROVIĆ V., PAVLOVIĆ I. (2021): Uspešno i isplativo ovčarstvo. *Balkanski naučni centar ruske akademije prirodnih nauka, Beograd*.
- ROSE C.H., JACOBS D.E. (1990): Epidemiology of sheep nematodes in sub-arctic Greenland: sources of infection on rangeland grazing. *Acta Veterinaria Scandinavica*, 31(3), 339-345.
- THEODOROPOULOS G., ZERVAS G., KOUNELI A., MARTINEZ B., GONZALES G., PETRAKOS J., KOSTOPOULOS S. (2000): Seasonal patterns of strongyle infections in grazing sheep under the traditional production system in the region of Trikala, Greece, *Veterinary Parasitology*, 89(4), 327-335.
- VLASSOFF A. (1982): Biology and population dynamics of the free-living stages of gastrointestinal nematodes of sheep. In: *Internal parasites of sheep*. Ed. A.D.Ross. *Animal Industries Workshop, Lincoln College*: 11-20.
- VUJIĆ B., BOŠKOVIĆ V., SAVIN Ž. (1991): Most important parasites species of sheep and goat and its eradication. *Proceeding of I International Summer Conference for Advancement of Sheep and Goat Production, Ohrid, SFRJ*, 375-381.