Gastrointestinal Helminths of Small Ruminants in Banat (Vojvodina, North Serbia)

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Abstract
During our study performed in Vojvodina in period from 2011 to 2015, we collected fecal samples from more than 157 herds of small ruminants, totaling over 1,700 animals. Examination was performed using standard coprological technique. During this five years 374 sheep and goats we were examined by post-mortem examination. Determination of adult parasites and eggs of parasites were done by morphological characteristic. During post mortem examination we occurred: *Teladorsagia (Ostertagia) circumcincta* in 92.23% of animals, *O.ostertagi* (31.33%), *O.ocidentalis* (12.33%), *Trichostrongylus axei* (98.60%), *T. colubriformis* (91.57%), Nematodirus *spathiger* (100.00%), *N. filicollis* (22.31%), Haemonchus contortus (89.95%), *Marshallagia marshalli* (31.77%), Skrjabinema ovis (11.28%), *Bunostomum trigonocephalum (*15.28%), *Chabertia ovina* (69.14%), *Oesophagostomum venulosum* (24.39%), *Cooperia curticei* (50.52%), *C. oncophora* (7.29%) and C. punctata (2.26%). The intensity of infection and polyparasitsm was monitored in relation to the age of sheep and goats. It was found that in younger animals' intensity of infection was lower than that of older animals. At the beginning of our research, conducted in March, the real extent of gastrointestinal infections strongilidae was 83.33%, after which he soon reached a level of 100% in the same way and moved to the end of follow-up period.

Keywords: gastrointestinal parasites, goat, sheep, Serbia, Vojvodina

1. Introduction

Breeding of small ruminants represents a significant branch of livestock production. The reason for this lies not only in tradition, but also in the knowledge that the breeding of small ruminants represents a significant source of income, both due to the production of wool and milk, as well as lamb and goat meat, a highly sought after item on the world market [1,2,3].

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Way of breeding usually at sheep and goats breeding had prerequisite to a lot of infections including parasitoses. They are usually kept under extensive conditions and graze or brows on any land that is not being cultivated. After harvesting, the animals are turned onto wheat and barley stubble from which they obtained nourishment. Pasture breeding makes possible contact with eggs, larvae and intermediate hosts of parasites which was one of the main health problems of small ruminant.

Parasites infection results in direct and indirect economical losses. Direct losses are consequence

of development of a clinically manifested disease, with the death of a large number of animals, most often among the younger categories. More significant problems arise because in most cases, parasitic infections occur subclinical, that is, "imperceptibly" to the eye of the herdsman. Negative economic effects are also present in these situations and are manifested by a decrease in animal production, i.e. a decrease in the production of wool and milk, a poorer upbringing of the young, a decrease in general body resistance, i.e. an increased susceptibility to agents of other aetiology [4,5,6,7].

The study of biodiversity, season distribution and prevalence of gastrointestinal helminth s infection of small ruminants performed during 2010 to 2020 in all region of Serbia. In our paper we presented result of examinations obtained in the North part of Serbia in Banat region (Vojvodina)

2. Materials and methods

Vojvodina is situated in the northern part of Serbia in the southeast part of the Pannonia Plain, the plain that remained when the Pliocene Pannonia Sea dried out. Because of this, Vojvodina is rich in fertile loamy loess soil, covered with a layer of chernozem. The region is divided by the Danube and Tisa rivers into: Banat in the east, Bačka in the northwest, and Srem in the southwest. A small part of the Mačva region is also located in Vojvodina, in the Srem District.

Banat is characterized by a Pannonian steppe-continental climate. Southern Banat is warmer than the northern half of the region. Temperatures exceed 40 °C, while in the Banat Sandstone they reach even 60 °C due to the heating of the sand. In the southeastern Banat, about 700 mm of precipitation falls annually, and in the northwestern Banat slightly less (600–670 mm). The Sandstone receives the most precipitation (about 550 mm per year), and is therefore dry. In the summer half of the year, northwestern and western winds blow in Banat, and in winter, southeast winds blow. The Košava is the most frequent and strongest wind and is felt most in the southern part of the region, between the Danube and the Tamiš. Agriculture is a priority sector in Banat. Traditionally, it has always been a significant part of the local economy and a generator of positive results, due to the abundance of fertile agricultural land which makes up 84% of its territory. Banat is rich in grasslands suitable for sheep and goat grazing [8].

During our study performed in Vojvodina in period from 2014 to 2015, from Banat District we collected faecal samples from 97 herds of small ruminants (sheep and goats) totalling over 1,300 animals. Examination was performed using standard coprological technique with saturated NaCl solution and sedimentation. Eggs per gram count (EPC) and degree of infection we assessed by McMaster technique where EPC of 50-700 eggs we treated like low rate of infection, to 1100 like moderate and up 1100 like high [9, 10]. At same time we performed post-mortem examination of dead or slaughtered animals. In total we examined post mortem more than 374 animals. Found adult parasites we collected, persevered and determinate by morphological characteristic. Determination of adult parasites and parasites eggs we performed by keys given by Euzeby [9].

3. Results and discussion

During our examination infection with helminths, we occurred at 81.22% of sheep. With coprological examination we found eggs of next helminths genera: *Nematodirus sp.* (71.22%), *Ostertagia sp.* (69.22%), *Trichostrongylus sp.* (66.55%), *Haemonchus sp.* (64.44%), *Chabertia ovina* (60.11%), *Oesophagostomum sp.* (36.77%), *Marshallagia sp.* (29.66%), *Cooperia sp.* (27.88%), *Bunostomum sp.* (22.33%) and *Skrjabinema sp.* (13,66%).

During post mortem examination we occurred: *Teladorsagia* (*Ostertagia*) *circumcincta* in 92.23% of animals, *O.ostertagi* (31.33%), *O.ocidentalis* (12.33%), *Trichostrongylus axei* (98.60%), *T. colubriformis* (91.57%), *Nematodirus spathiger* (100.00%), *N. filicollis* (22.31%), *Haemonchus contortus* (89.95%), *Marshallagia marshalli* (31.77%), *Skrjabinema ovis* (11.28%), *Bunostomum trigonocephalum* (15.28%), *Chabertia ovina* (69.14%), *Oesophagostomum venulosum* (24.39%), *Cooperia curticei* (50.52%), *C. oncophora* (7.29%) and *C. punctata* (2.26%). The intensity of infection and polyparasitsm was monitored in relation to the age of sheep and goats. It was found that in younger animals' intensity of infection was lower than that of older animals. The infective rate of each of these parasites showed that the most of it followed the

same general pattern, having a peak in the spring and another in the autumn, separate by a trough during the hot dry summer period when the infection rate was low. During our research, the order of occurrence of the identified species of gastrointestinal strongylids was as follows:

- in March: *Teladorsagia* (*Ostertagia*) *circumcincta*, *Ostertagia ostertagi, Trichostrongylus colubriformis, Nematodirus filicollis* and *N. spathiger*
- in May: *Ostertagia occidentalis, Trichostrongylus axei, Bunostomum trigonocephalum* and *Chabertia ovina;*
- in June: *Skrjabinema ovis*
- in July: *Haemonchus contortus, Cooperia curticei, C. punctata C. oncophora* and *Oesophagostomum venulosum;*
- in November: Marshallagia marshalli

Species from the genera *Ostertagia, Trichostrongylus* and *Nematodirus* were present after the first appearance throughout the entire research period. Our research showed that *Haemonchus contortus* was found in animals during the warmer period, and *Marshallagia marshalli* during the colder period of the year.

There are many factors that contribute to the appearance, maintenance and spread of parasitosis. The two main factors are the climatic conditions that prevail in certain regions, and the other is the way of breeding sheep and goats,

Climate conditions have a great influence on the population dynamics of GI helminth. Population dynamics is related to the impact of climate factors like air temperature, relative humidity and rainfall. The dynamics of the first appearance of established gastrointestinal strongylid species in both populations of small ruminants [11,12]. The life cycles of all found helminths species are direct, requiring no intermediate hosts, which applies to all of the economically important strongylid parasites of small ruminants. In these cycles, adult female parasites in the GI tract produce eggs that are passed out with the faeces of the animal. Development and occurs within the faecal mass, the eggs embryonate and hatch into first-stage larvae (L1), which in turn moult into second-stage larvae (L2), shedding their protective cuticle in the process. During this time the larvae feed on bacteria. The L2 moult into third-stage larvae (L3), but retain the cuticle from the previous moult. The third stage (L3) larvae of this species develop in eggs. In the external environment, embryogenesis, hatching of larvae, their moulting and emergence of infective L3 larvae. The L3 constitute the infective stage, and these migrate onto surrounding vegetation where they become available for ingestion by grazing sheep and goats. The development, survival and transmission of the free-living stages of nematode parasites are influenced by micro-climatic factors within the faecal pellets and herbage. These include sunlight, temperature, rainfall, humidity and soil moisture [13,14,15].

The method of breeding is also of great importance [3,16,17,18]. Among them are: joint keeping of animals of different age categories, joint grazing of animals of different owners, keeping of large and small ruminants on the same pasture, improper use of pasture, large number of animals on pasture, favourable climatic conditions for the development and survival of pre-parasitic stages and transitional hosts that are necessary for the development of certain types of parasites in the external environment and therefore the infection of animals, quality of pastures, zootechnical measures that are implemented (or not implemented), etc. [13,19,20,21,22]. The absence or inadequate implementation of parasite control measures also contributes to the prevalence of parasitic infections. The lack of enlightenment of the population, primarily livestock farmers, is one of the significant factors in the epizootiology of these diseases [16,23,24].

The geographical distribution of established gastrointestinal helminths was fairly uniform. We came to this conclusion during fifteen-year research of the parasitic fauna of small ruminants carried out throughout the territory of Serbia [12, 25-37]. Related species of parasites was observed during the investigations performed at goats and sheep breed at other Balkan countries like Montenegro, Romania, Bulgaria, Macedonia or Greek [19,38,39,40]. The data on harmful before and effect of parasitic infections on the sheep and goat performance undoubtedly show that in the anthelminth conditions of rearing high-performance animals it is necessary to conduct the measures of prophylactic treatment [35].

4. Conclusions

Based on our research in Banat District diseases of parasitic aetiology dominate in sheep and goats both in terms of prevalence and incidence. This is

influenced by the way of holding and climatic factors in the area. The damage that occurs in this production is a consequence of the negative pathogenic effects of the parasite on the host organism and negative economic effects to production results. For these reasons, it is necessary to know the biodiversity and the seasonal dynamics of the appearance of parasitic infections in order to take certain preventive measures and create comprehensive programs to control these infections. Therefore, it is necessary to implement a regular program of parasitological control of the herd, which should be carried out before releasing it to pasture and during grazing, as well as regularly deworming the all animals in herd. [35].

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