

The Balkans Scientific Center  
of the Russian Academy of Natural Sciences

**4**<sup>th</sup>  
International  
Symposium

**MODERN  
TRENDS IN AGRICULTURAL  
PRODUCTION,  
RURAL DEVELOPMENT  
AGRO-ECONOMY  
COOPERATIVES  
AND ENVIRONMENTAL  
PROTECTION**

P R O C E E D I N G S



29 - 30 June 2022  
Vrnjacka Banja

**Modern Trends in Agricultural Production, Rural Development,  
Agro-economy, Cooperatives and Environmental Protection**

**Publisher**

The Balkans Scientific Center of the Russian Academy of Natural Sciences  
Belgrade

**In cooperation**

Faculty of Agriculture Cacak  
Institute for Animal Husbandry, Belgrade, Zemun  
Fruit Research Institute, Cacak  
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Zoran Stanisavljević, SaTCIP

**ISBN**

978-86-6042-014-7

**Circulation**

100 exemplars

**Printed by**

SaTCIP d.o.o. Vrnjačka Banja

Belgrade, 2022.

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CIP - Каталогизација у публикацији

Народна библиотека Србије, Београд

63(082)

502/504(082)

INTERNATIONAL Symposium Modern Trends in Agricultural Production, Rural Development, Agro-economy, Cooperatives and Environmental Protection (4 ; 2022 ; Vrnjacka Banja)

4th International Symposium: Modern Trends in Agricultural Production, Rural Development, Agro-economy, Cooperatives and Environmental Protection, Vrnjacka Banja, Serbia 29 – 30. Jun, 2022. / [editors Zoran Ž. Ilić, Mitar Lutovac]. - Belgrade: The Balkans Scientific Center of the Russian Academy of Natural Sciences, 2022 (Vrnjačka Banja: SaTCIP). - 551 str.: ilustr.; 25 cm

Tiraž 100. - Napomene i bibliografske reference uz tekst. - Bibliografija uz svaki rad.

ISBN 978-86-6042-014-7

а) Пољопривреда -- Зборници б) Животна средина -- Зборници

COBISS.SR-ID 69401097

BEES NOSEMOSIS IN ROUMANIA - THERAPEUTIC EFFICACY OF PLANT  
DIETARY SUPPLEMENT  
**Mederle Narcisa, Pavlovic Ivan, Hadaruga Nicoleta ..... 363**

GRANULATED MINERALS IN THE RATIONS OF LACTATING COWS  
**Aleksandr Itscovic, Sergei Nikolaev..... 372**

EXAMINATION OF GENETIC AND PHENOTYPIC TRENDS OF SOME  
BREEDING AND REPRODUCTIVE TRAITS OF THE SOUTH KAZAKH  
SHEEP POPULATION  
**E.I. Islamov, G.A. Kulmanova, B.T. Kulataev..... 384**

OCCURENCE OF GIARDIA SP. IN RUMINANTS IN SERBIA  
**Ivan Pavlović, Nemanja Zdravković, Oliver Radanović, Marija Pavlović,  
Milan P.Petrović, Dragana Ružić Muslić, Violeta Caro-Petrović, Bisa  
Radović, Valentina Milanović ..... 399**

SERUM ENZYME ACTIVITES IN THE BLOOD AND MILK IN THE  
DIFFERENT STAGE OF LACTATION IN HOLSTEIN DAIRY COWS  
**Radojica Djokovic, Marko Cincovic, Milos Petrovic, Vladimir Kurcubic,  
Zoran Ilic, Boban Jasovic, Miroslav Lalovic, Biljana Andjelic,..... 407**

SIGNIFICANCE OF HEAT SHOCK PROTEIN HSP70 IN EARLY LACTATION  
COWS  
**Miloš Ži. Petrović, Radojica Đoković, Vladimir Kurćubić, Milun D.  
Petrović, Miodrag Radinović, Branislava Belić, Jože Starič, Zoran Ž. Ilić,  
Marko Cincović ..... 415**

## PROTECTION OF PLANTS

INTEGRATED STRATEGIES FOR MANAGING FUSARIUM HEAD BLIGHT  
AND DEOXYNIVALENOL CONTAMINATION IN WHEAT  
**Vesna Krnjaja, Slavica Stanković, Ana Obradović, Violeta Mandić, Zorica  
Bijelić, Violeta Caro Petrović, Dušica Ostojić Andrić.....425**

YIELD AND YIELD COMPONENTS GRAINS OF PERSPECTIVE  
GENOTYPES OF WINTER WHEAT  
**Milomirka Madić, Dragan Đurović, Aleksandar Paunović, Desimir  
Knežević, Milan Biberdžić, Vladeta Stevović, Dalibor Tomić, Nenad Pavlović  
..... 443**

APPLICATION OF NEW STRATEGIES FOR ANALYSIS OF PESTICIDE  
RESIDUES IN FRUIT  
**Aleksandra Tasić, Ivan Pavlović ..... 451**

## OCCURENCE OF GIARDIA SP. IN RUMINANTS IN SERBIA

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### **Abstract**

*Giardia spp. are flagellates that are found in the intestinal tract of humans and other mammals, birds and amphibians. Infections with giardia have been reported widely in livestock and companion animals in different parts of the world. Evidence of infection in humans and animals of Giardia duodenalis, especially of assemblage A and B has firmly established giardiasis as a zoonotic disease. At ruminants giardiasis usually result with diarrhea, especially in young animals, which in turn adversely affect production resulting in economic losses. So far, no research has been done related to giardiasis in small ruminant and cattle in Serbia, and here we present the results of the first studies of the presence of giardiasis in ruminants in our country.*

**Keywords:** *Giardia duodenalis.*, cattle, goat, sheep, Serbia

### **Introduction**

*G. duodenalis* (syn. *Giardia lamblia*, *Giardia intestinalis*), a flagellate parasite, is one of the most prevalent and widespread intestinal parasite in humans and several vertebrate animal (mammals, birds, amphibian) worldwide. Parasites takes on two morphologically distinct forms during its life cycle. The replicative form is a motile pear-shaped cell that survives only in host small intestines called a trophozoite. Trophozoites swim through the intestinal mucus until they attaches to the epithelium by a ventral adhesive disc or sucker (Cernikova et al.,2018). To the host intestinal epithelium then divide by binary fission, forming either more



trophozoites or the non-replicative cyst stage. Cysts pass through large intestine of the host and are shed in the feces. Giardiasis represents a major public health concern in both developing and developed countries and infected animals (pets or domesticated species) present a main source of human infection because transmission of the *G. duodenalis* occurs directly (fecal/oral) by cyst contaminated food or water (Thompson et al.2008; Robertson,2009).

Parasites causing a diarrheal condition known as giardiasis. According morphology and genetic evidence six species have been recognized in the genus *Giardia*. These include *G. duodenalis* in humans and other mammals. Phylogenetic analysis and enzyme electrophoresis examination *G. duodenalis* revealed the existence of eight assemblages A–H within the species. Assemblage A and B is usually occurred at human but in ruminants higher occurrence genotype E, with genotypes A and B being less frequent (Giangaspero et al.2005; Castro-Hermida et al.2006; Gomez-Munoz et al.2009; Lim et al.,2013)

In small ruminants (sheep and goats), data tend to indicate an occurrence of around 20%–25%, ranging from <10% to >40%, with similar data for cattle. On farms where *Giardia* infection has been diagnosed in ruminant stock, a cumulative occurrence of close to 100% may be expected. In general, very young animals (neonates) are less likely to be infected, although animals <6 months of age tend to be more susceptible to infection with signs of disease. Frequently, however, even infections with very high cyst excretion are not associated with clinical signs. Nevertheless, diarrhea, weight loss, ill thrift, and even death have also been associated with *Giardia* infection in some animals.

So far, no research has been done related to goat giardiasis in Serbia, and here we present the results of the first studies of the presence of giardiasis in goats in our country performed in period from 2018 to 2021.

## Materials and methods

In the period 2018-2021 we examined 1274 fecal samples from 24 goats herds, 937 fecal samples from 31 sheeps herds and 197 fecal samples from 31 cattle herds and in central and south part of Serbia.

The diagnosis of giardiasis is commonly established by microscopic identification of cysts or less commonly trophozoites in faecal wet smear stained with iodine. During examination we did not include molecular identification of the giardia genotype. Examinations we performed with Carl Zeiss AxioLab A1 microscope with the AxioCam 105 Color microscope camera and Zen Lite software.

## **Results and Discussion**

During our examination infection with giardia we established in all ruminant species.

### **CATTLE**

Infection with giardia we established in seven herd and to 37 animals. In younger calves, especially below 6 months of age, the excretion of watery faeces with a mucoid appearance may be the only indication of infection with the parasite. Chronic cases of giardiasis in calves may impact negatively on performance which may be reflected in reduced weight gain, impaired feed efficiency and decreased carcass weight. Calves have been reported to be infected with *G. duodenalis* as early as 4 days of age, and the highest intensity of cyst excretion between the ages of 1 and 3 months. Transmission occurs among infected calves as well as chronically infected adults.

*Giardia* has been found in both beef and dairy cattle throughout the world with varying prevalence (Xiao and Herd, 1994, O'Handley et al.1999, Ralston et al., 2003). The infection pattern of *Giardia* appears similar between beef and dairy cattle with cysts appearing in the faeces at approximately 4 weeks of age (Trout et al.2005, Mendonca et al.2007). Both dairy and beef calves may harbour more than one genotype of *G. duodenalis*, which can be of zoonotic significance (O'Handley et al.1999, Trout et al.2005, Mendonca et al.2007).

*Giardia* has been implicated as an aetiological agent alone and in combination with other enteric pathogens in calf diarrhoea. Infection may also result in numerous diarrhoea episodes which in turn adversely affects production and result in economic loses for farmers. In calves, and to a lesser extent in other production animals, giardiasis can result in diarrhea that does not respond to antimicrobial or coccidiostatic treatment. The excretion of pasty to fluid feces with a mucoid appearance may indicate giardiasis, especially when the diarrhea occurs in young animals (1–6 months old). Chronic cases of giardiasis in calves may impact negatively on performance which may be reflected in reduced weight gain, impaired feed efficiency and decreased carcass weight (Huetink et at.,2001).

### **SHEEP**

During our examination infection with giardia we established only in five herd and to 64 animals. Infection we found in pre-weaned lambs having a

much higher compared to those that were over 3 months. In infected lambs we found clinical signs like foul-smelling diarrhoea which is lightly colored, greasy and mixed with mucous and reduced weight gain.

The prevalence of *G. duodenalis* infection in sheep varies considerably and was higher in lambs than in adults. All the findings from these studies suggest that the infection rates of *Giardia* tend to decline as the age of the animals increases (Ryan et al., 2005, Castro-Hermida et al., 2006, 2007). In most cases, infections are asymptomatic but infected animals are carriers shedding large numbers of cysts into the environment (Castro-Hermida et al., 2006). Even if most infections are asymptomatic, infections in lambs may result in a malabsorption syndrome, decreased feed efficiency and subsequently a decreased weight gain and sometimes death.

Host age and immune status of the host affect the severity of the disease but other factors such as the number of specimens examined, the age structure of the herds, management procedures and the health status of the animals may account for the discrepancies or variations in the infection rates in the different populations.

## GOAT

During our examination infection with giardia we established only in two goats herd and to 42 animals. A prevalence we established in pre-weaned animals ( $\leq 3$  months) having a much higher compared to those that were over 3 months. That confirmed results of numerous examination that infections are normally significantly higher in pre-weaned kids compared to that in older one (Xiao, 1994; Geurden et al., 2008; Taminelli and Eckert, 2008, Ma et al., 2014).

Examination of goat giardiasis established that most infections with giardia are asymptomatic (Castro-Hermida et al., 2007). Clinical signs that may be observed, mostly in young animals that are foul-smelling diarrhoea which is lightly colored, greasy and mixed with mucous and reduced weight gain (Olson et al., 1995; Aloisio et al., 2006, Pavlović and Ivanović, 2022). This symptoms we found during our research too.

In small ruminants, giardiasis more surveys from sheep than goat populations and therefore fewer publications on giardia in goats and that confirmed during our examination

As these were the first complete studies of giardiasis in ruminants in Serbia, they did not include molecular identification of the giardia genotype. First occurrence of giardiasis in goats was established by Pavlović during 2018 and it

was later confirmed in sheep and cattle (Pavlovic et al.,2020, 2021a,b, 2022). A numerous genotyping studies of *G. duodenalis* in ruminants report a higher occurrence of genotype E, with genotypes A and B being less frequent (Ruiz et al.,2008). Studies performed in Belgium have reported zoonotic genotype A infections in goats and sheep (Geurden et al.2008) and in study in Malaysia and India reported genotypes A and B in cattle and goats (Lym et al.,2013, Utaaker et al.,2017). These findings suggest that ruminants could be a potential source of zoonotic infection with giardia.

In the all cases in therapy were used febendazole an effective molecule, at least in terms of complete clinical recovery. They confirming observations of other authors, who successfully treated infected with *G.duodenalis* using similar therapy protocols (Xiao et al., 1996).

## Conclusions

The present study confirmed the presence of *Giardia duodenalis* in ruminants herds in Serbia. At infected animals giardiasis usually result with diarrhea, especially in young animals, which in turn adversely affect production resulting in economic loss. At the same time, diseased animal pose an epidemiological danger because they excrete infectious forms of giardia in their feces. In order to get acquainted with the genotype of established parasites, further research will be focused on the molecular identification of established parasites in goats.

## Acknowledgements

This study was supported by the Ministry of Education, Science and Technological Development, Republic of Serbia, Contract for research funding No. 451-03-68/2020-14/200030

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