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PARASITOLOGICAL STATUS IN MANGALITSA PIGS: A PRELIMINARY STUDY

Rumyana Ivanova*, Ivelina Zapryanova

Agricultural University - Plovdiv, Bulgaria
***E-mail: r.ivanova@au-plovdiv.bg**

Abstract

The present study aims to determine the parasitological status of Mangalitsa pigs from two age groups reared under extensive farming conditions. The investigation was conducted on an organic farm located in southwestern Bulgaria. Coprological examinations were performed on 22 animals. Fecal samples were collected in June from 12 adults and 10 growing pigs. Adhesive tape impressions from the periauricular and inguinal regions of the same animals were also taken. The most frequently isolated helminth was Ascaris suum, with a prevalence of 50% in adults and 30% in young pigs. Strongyloides ransomi was detected in 33% of adult and 40% of young pigs. Cystoisospora suis was found in 17% of adults and 50% of growing pigs. Age had a significant effect on egg counts ($P<0.05$). The infection intensity, expressed as eggs per gram of feces, was below 500, indicating a low level of infection. The results highlight the need for regular monitoring and effective deworming programs when rearing Mangalitsa pigs under semi-natural conditions.
Keywords: Mangalitsa breed, fecal samples, helminths, coccidia, infection

INTRODUCTION

The Mangalitsa pig is an autochthonous breed of Central Europe, and in recent years, interest in it has resurged due to the high quality of its meat and its robustness under adverse environmental conditions. However, pigs reared in extensive or pasture-based systems face an increased risk of parasitic infections, which may negatively affect their health and productivity. Their health status directly influences the economic efficiency of production. It has been demonstrated that parasitic infections account for the largest share of disease-related losses in pigs (Thomas et al., 2013). Such infections cause weight loss, impaired reproductive performance, compromised immunity, secondary infections, and mortality (Algañaraz et al., 2019; Abonyi and Njoga, 2020). Furthermore, parasitized pigs exhibit a 5% reduction in daily feed intake, a 31% decrease in average daily gain, and a 17% reduction in feed conversion ratio compared to healthy animals (Bohach et al., 2023). Although pigs may be subclinical carriers of numerous gastrointestinal parasites, heavy infections particularly in younger animals can lead to specific clinical manifestations (Weng et al., 2005).

Poor parasite control, inadequate or ineffective deworming, poor hygiene, and the commingling of different age groups contribute to the maintenance of a parasite reservoir in extensive farms (Balicka-Ramisz et al., 2020). The prevalence and intensity of parasitic infections depend on the rearing system, herd size and age structure, as well as the farm's geographical location (Delsart et al., 2022). Therefore, establishing the parasitic profile and implementing measures to limit infections are essential for the sector (Popiołek et al., 2009). Local pig breeds raised extensively tend to harbor a wide diversity of gastrointestinal parasites and often exhibit high levels of infection (Adhikari et al., 2021). Outdoor rearing offers behavioral freedom but poses significant challenges related to gastrointestinal parasites, which can adversely affect health and welfare (Băieş et al., 2022; Senanayake et al., 2025).

The aim of the present study was to determine the parasitological status of Mangalitsa pigs from two age groups reared under extensive farming conditions.

MATERIALS AND METHODS

The study was conducted on an organic farm located in the Razlog municipality, southwestern Bulgaria, during the summer of 2024. Coprological examinations were performed on 22 pigs. Fecal samples were collected in June from 12 adults and 10 young pigs. Adhesive tape impressions from the periauricular and inguinal regions of the same animals were also collected. A total of 44 samples were obtained and examined. Helminths from the genera Ascaris and Strongyloides, as well as protozoa from the genus Cystoisospora suis, were identified. The pigs were kept outdoors year-round on pasture enclosed by an electric fence.

To identify the taxonomy of gastrointestinal nematode eggs and protozoan oocysts, the classification guide of Tienpont and Rochette (1986) was used.

Fecal samples (approximately 10 g each) were collected individually during defecation, placed in sterile containers, examined macroscopically for visible parasites, labeled, and stored at 2–8°C for 24–48 hours before examination. Eggs were identified based on their morphology, size, color, and developmental stage.

In this study, the Füllebor n flotation method was used, in which helminth eggs rise to the surface of a solution with high specific gravity, from where they are isolated and examined microscopically. A saturated NaCl solution with a specific gravity of 1.180 is prepared. The fecal sample is diluted in the solution and strained through a wire sieve and funnel into a container with a capacity of up to 50 ml. Additional solution is added along the rim of the container, and the mixture is left to stand for 15 minutes. During this time, the helminth eggs float to the surface. A sample for examination is collected from the surface using a platinum loop; the drop is placed on a microscope slide and covered with a coverslip. Microscopy is performed immediately due to the possibility of the salt crystallizing. A biological sample is considered positive when at least one parasite is detected.

The level of infestation was determined using the McMaster method (Soulsby, 2012; Adhikari et al., 2021). This standardized method allows quantification of infection intensity, usually expressed as eggs per gram of feces (EPG). Two grams of the fecal sample are placed into a flask, and 28 ml of the Füllebor n solution are added, followed by homogenization. Using a pipette, 0.15 ml of the suspension is transferred into each of the two chambers of the McMaster slide. The loaded slide is left undisturbed to allow the eggs to float. Eggs located within the counting grid are recorded. The number of eggs is calculated using the formula: EPG = Total egg count × multiplication factor

The multiplication factor depends on the dilution and the chamber volume. In this study: 2 g feces + 28 ml solution → total volume 30 ml. McMaster chamber volume: 2 chambers × 0.15 ml = 0.3 ml total. Out of the 30 ml, only 0.3 ml enters the chambers, which is 1/100 of the total volume. Therefore, the multiplication factor is: EPG = egg count × 50 since 0.3 ml is 1/100 of 30 ml, and 2 g feces × 50 = 100 g, i.e., normalization to 1 g → ×50.

Ectoparasite examination was performed by placing adhesive tape strips on microscope slides, adding drops of glycerin, and observing them under a microscope.

For the basic statistical analysis, the corresponding modules of MS EXCEL and STATISTICA (StatSoft) were used. To improve approximation, the age of the pigs was included in the ANOVA model as age classes, as follows: 1 – growing pigs: from 2 to 12 months; 2 – adults: from 12 to 36 months. To investigate the effect of controlled factors on the number of parasite eggs recorded in the fecal mass, the following model was applied:

$$\mathbf{Y_{ijk} = \mu + V_i + P_j + e_{ijk}}$$

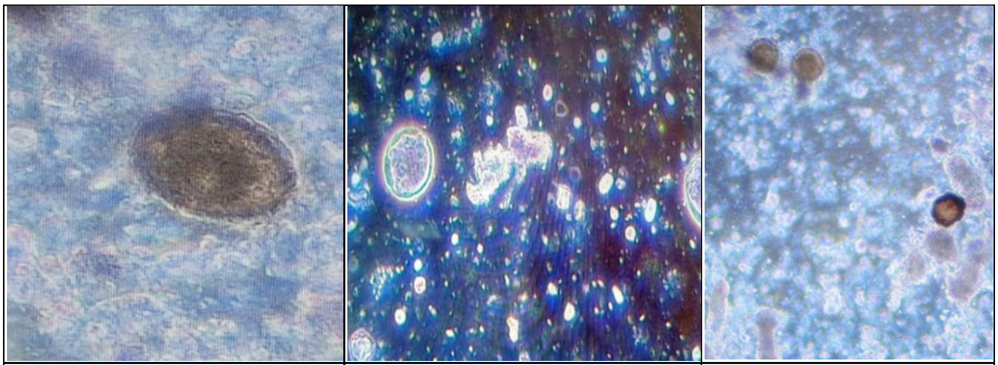
Where: $\mathbf{Y_{ijk}}$ is the dependent variable (number of recorded eggs), $\boldsymbol{\mu}$ is the overall mean of the model, $\mathbf{V_i}$ is the age class of the pigs, $\mathbf{P_j}$ is the parasite species recorded, $\mathbf{e_{ijk}}$ is the residual error term representing random effects not included in the model.

Using analysis of variance (ANOVA), least squares means (LSM) were obtained for the levels of the fixed factors. LSM represent the sums of squares calculated as deviations from the mean value of the trait estimated by the model.

RESULTS AND DISCUSSION

The presented results include the parasite species identified, prevalence rates, and differences between age groups. The coprological examination revealed infections with several parasites: Ascaris suum, Strongyloides ransomi, and Cystoisospora suis (Figure 1).

The findings are consistent with those reported by other authors studying parasitism in pasture-raised pigs (Kochanowski et al., 2017; Balicka-Ramisz et al., 2020). Although the Mangalitsa breed is considered more resilient to diseases, it is still susceptible to parasitic infections, particularly in the absence of routine prophylaxis. The extensive production system facilitates contact with a contaminated environment, including wildlife, which increases the risk of recontamination.



Ascaris suum	Strongyloides ransomi	Cystoisospora suis

Фигура 1. Яйца на нематодите Ascaris suum и Strongyloides ransomi, и ооцисти на протозой Cystoisospora suis
Figure 1. Eggs of the nematodes Ascaris suum and Strongyloides ransomi, and oocysts of the protozoan Cystoisospora suis

The study evaluated the prevalence and intensity of parasitic infections in pigs from two age groups raised in a free-range system. Overall, all three parasites were detected in both adult and growing pigs. Similar results were obtained by Kochanowski et al. (2017), who also demonstrated that mixed infections involving multiple parasite species occur more frequently than single-species infections. Moreover, parasitism was found to be more pronounced in farms using free-range systems compared with conventional production.

The most frequently isolated helminth was Ascaris suum, with a prevalence of 50% in adults and 30% in growing pigs. Strongyloides ransomi was detected in 33% of adults and 40% of growing animals. Cystoisospora suis was found in 17% of adults and 50% of growing pigs.

Table 1 presents the number and percentage of positive samples in the two age groups. A sample was considered positive when at least one parasite egg was detected. The total number of positive samples was 20 out of 22 examined (90%), with 18% of them containing eggs of more than one parasite species.

Gastrointestinal parasites are commonly encountered in pig herds, and previous studies have shown that the nematodes Ascaris suum, Oesophagostomum spp., and Trichuris suis, as well as the Coccidia Cystoisospora suis and Eimeria spp., are the most frequently detected parasites in pigs (Raue et al., 2017).

Таблица 1. Брой и процент от общия брой прасета с открити паразити по вид
Table 1. Number and percentage of total number of pigs with detected parasites by species

Age group	Ascaris suum		Strongyloides ransomi.		Cystoisospora suis		with two types	
	Number	%	Number	%	Number	%	Number	%
growing	3	30	4	40	5	50	2	20
Adult	6	50	4	33.33	2	16.67	2	16.67
All pigs	9	40.9	8	36.36	7	31.82	4	18.18

Cystoisospora suis was detected in 16% of the samples collected from adult pigs and in 50% of the samples from growing pigs. This parasite is widespread globally and is one of the major causes of diarrhea in young piglets (Pettersson et al., 2019; Hinney et al., 2020). The disease occurs primarily in younger pigs, with diarrhea being the main clinical sign due to the penetration of oocysts into the small intestine (Joachim et al., 2020). The oocysts damage the intestinal mucosa, negatively affecting nutrient absorption and assimilation (Komatsu et al., 2019). This protozoan predominantly affects young piglets, which are unable to mount an adequate primary immune response (Worliczek et al., 2009). Therefore, the higher parasite prevalence in younger pigs observed in our study is expected and logically explained. Adult pigs act as carriers of the parasite but do not typically exhibit clinical signs (Worliczek et al., 2009).

During sample collection, it was noticeable that the feces were firm in both adult and young pigs. Age influences the distribution of this parasite due to biological factors. The cohabitation of different age groups, along with the husbandry conditions under which the pigs are raised, contributes to the persistence of the infection. It is likely that the long-term presence of this parasite in the herd has resulted in a certain level of resistance, as no clinical signs were observed, although parasitic infection was clearly present.

The nematodes A. suum and Strongyloides ransomi were detected in the examined samples. Symeonidou et al. (2020) reported widespread parasitism in pigs in Greece with a broad range of helminths, including some species not identified in our study. A. suum is the most prevalent helminth in pigs, both in extensively raised animals and in conventional farm systems. Eggs of this parasite were detected in 50% of the samples from adult pigs and in 30% of the samples from growing pigs. The eggs are highly characteristic: oval with a thick, rough outer shell. No adult nematodes were observed in the feces, and no clinical signs typical of this parasitosis were noted.

The disease affects all age groups but is more common in growing pigs (Brewer et al., 2025). Clinical signs are usually nonspecific, but during larval migration through the lungs, coughing or even pneumonia may occur. Infected pigs often show reduced growth performance due to poor feed utilization (Thamsborg et al., 2013). Increasing welfare requirements have led many farmers to raise pigs on bedding with outdoor access, which facilitates the persistence of A. suum (Delsart et al., 2024). The same research group reported that in a survey of 80 farms, 50% of pigs older than one year and 30% of growing pigs tested positive for A. suum. The high prevalence observed in adult pigs in our study is likely due to the favorable environmental conditions for egg development and their high resilience in the external environment.

A study conducted in Albania reported A. suum in 83.68% of weaned pigs and 78.96% of fattening pigs from the examined farms (Raue et al., 2017). Lindgren et al. (2020) reported that all 11 organic pig farms included in their study were infected with A. suum.

Strongyloides ransomi was detected in 33% of samples from adult pigs and in 40% of samples from growing pigs. The parasite occurs in all age groups. The eggs hatch within 8–12 hours at room temperature; therefore, proper storage of fecal samples is essential for an accurate assessment of the actual level of infection. The eggs are oval, thin-shelled, and embryonated. Several studies from the 1970s report reduced feed intake in weaned piglets, poor weight gain, and even mortality in cases of heavy infestation (Stewart and Hoyt, 2006). One study showed that the most prevalent parasitoses in organically raised pigs are caused by parasites of the genus Strongyloides (Roesel et al., 2017).

Although the parasite was detected in 36% of the samples, no diarrhea was observed, and the animals were in good body condition. A similar picture was reported by Schubnell et al. (2016). The percentage of positive samples may in fact be considerably higher, since egg shedding by adult strongylids occurs for a relatively short period due to the rapid development of immunity in pigs (Kassai et al., 2013). Strongyloides spp. is characteristic of pigs raised under traditional husbandry systems with poor hygiene conditions (Nansen and Roepstorff, 1999).

The degree of infestation was determined as the arithmetic mean of the number of eggs and oocysts per sample, without differentiating between parasite species.

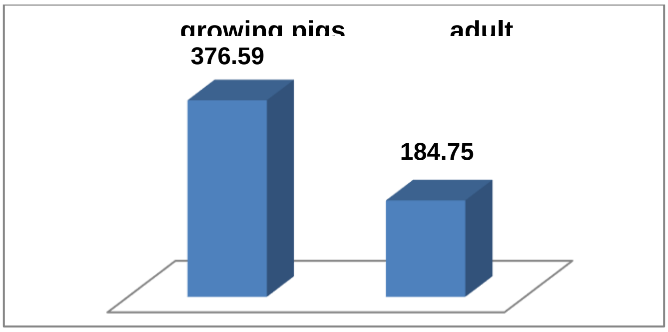
Table 2 presents the mean values and ranges of the identified eggs in the two age groups of pigs (Table 2).

The number of parasitic eggs in the samples ranged from 150 to 350 in adult pigs and from 150 to 750 in growing pigs. The mean number of the identified eggs was 225 eggs per gram of feces in adult pigs and 370 eggs per gram in growing pigs, respectively. Considering that parasitic infections predominantly affect younger animals, the results of our study are consistent with expectations (Figure 2). The figure clearly shows that the LS mean egg count in young pigs is more than twice that of fully grown animals.

Таблица 2. Брой яйца във фекалиите

Table 2. Number of eggs in feces

Age group	Number of pigs with eggs available	Total number of eggs			
	n	X ± SE	CV	min	max
growing	10	370±63.77	201.66	150	750
Adult	10	225±17.07	54.01	150	350
All pigs	20	297.50± 36.18	161.80	150	750



Фигура 2. LS среден брой яйца в зависимост от възрастта на прасетата

Figure 2. LS mean number of eggs according to the age of the pigs

A severe clinical manifestation is unlikely, as the level of infestation in the present study is moderate to low. According to Fourie et al. (2019), an infestation is considered moderate when the number of parasitic eggs reaches up to 500 per gram of feces.

Table 3 presents the analysis of variance assessing the effect of the controlled factors on the number of parasitic eggs recorded on the farm. It is evident that the age of the pigs has a significant effect on the egg counts detected in the fecal samples (P<0.05). Class et al. (2020) also reported a statistically significant influence of age on the level of infestation in pigs raised in small-scale family farms.

This study provides important information on the prevalence of gastrointestinal parasites in Mangalica pigs. It was established that 90% of the sampled animals tested positive for at least one parasite. Despite the absence of disease symptoms and visible clinical signs, parasitic infections can lead to economic losses due to tissue damage, inefficient feed utilization, poor weight gain, an increased risk of secondary infections, and deterioration of product and meat quality in parasitized animals.

Таблица 3. Анализ на варианса за влияние на контролираните фактори върху броя на отчетените яйца на паразити

Table 3. Analysis of variance for the effect of controlled factors on the number of recorded parasitic eggs

Source of variation	Degrees of freedom	Number of eggs	
	(n – 1)	MS	F P
General about the model	6	45163.4	2.59 -
Age of Pigs	1	150272.1	8.63 *
Type of Parasites	5	33171.1	1.90 -
Error	13	174.15	

*- significance at P<0.05

The assessment of the intensity of infection in pigs should be the basis for the control of endoparasites, thus deworming procedures would be more successful. Raising awareness among pig farmers about the negative impact of these parasites on the productivity and health of pigs will have a positive impact on economic performance but will also preserve human health (some of the parasites in pigs are zoonotic).

CONCLUSIONS

The parasitological status of Mangalitsa pigs in this study indicates the presence of parasites capable of compromising health and productivity. Regular monitoring, improved biosecurity, and tailored deworming programs are essential, especially under extensive or semi-natural rearing conditions.

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