ISSN : 2321-9602

Indo-American Journal of Agricultural and Veterinary Sciences




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Indo-American Journal of Agricultural and Veterinary Sciences

ISSN 2321–9602 www.iajavs.com

Diagnostic sensitivity during the course of a goose's life for nematodes

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Abstract

Successful combat and targeted prevention of poultry worms depend on prompt diagnosis, the culmination of which is the identification of adult worms, eggs, or larvae. The preferred techniques of helminthiasis laboratory diagnosis are those that may be used indefinitely on any animal, including poultry. The purpose of this study was to evaluate the efficacy of flotation coprovoscopy techniques for detecting goose nematodes. Coproovoscopic diagnosis of heterocosis, capillary disease, and tri- chostrongilosis in geese: an experimental determination of the efficacy of the well-known techniques of flotation and their comparative assessment. Invasion magnitude and sample flotation duration were the primary measures of the approaches' diagnostic accuracy. Kotelnikov-Hrenov (with ammonium nitrate) - at exposures of 20 minutes and Mallory (with saturated sugar solution) - at exposures of 10-15 minutes are the most accurate procedures for diagnosing goose geoccosis. Invasion intensities were 62.0 4.39 and 59.0 3.47 eggs/g, respectively. At exposures of 15-20 minutes, the most sensitive procedures for laboratory identification of goose capillary disease were Ko- telnikov-Hrenov and Mallory, with infestation rates of 34.0 2.22 and 33.5 2.64 eggs/g, respectively. The most sensitive time for the Kotelnikov-Hrenov technique to detect trichostrongilosis was 20 minutes, with an invasion intensity of 32.5 3.23 eggs/g. The Mallory technique was shown to be less successful, with an invasiveness of 23.5 1.81 eggs/g in chicken after 15 minutes of exposure. The Fulleborn technique (with NaCl) was the least susceptible to this invasion, with an intensity of 10.5 0.5 to 19.5 2.45 eggs/g after continuous treatment. In conclusion, when performing life-long coproovoscopic diagnostics of heterosis, capillary disease, and trichostrongilosis in geese, it is recommended to use the most sensitive methods and to consider the exposure, which ensures the concentration of the largest number of nematode eggs on the surface of the flotant.

Key words: geese, nematodes, laboratory diagnostics, efficiency, research methods.

1. Introduction

The consistent dynamics of production growth, rise in local demand, and export of products have made domestic poultry farming one of the most economically viable and competitive kinds of agribusiness. Many constraints, such as the harmful effect of helminths on the bird body (Poulsen et al., 2000; Ashenafi & Eshetu, 2004), limit the growth of this sector.

Timely diagnosis, which culminates in the discovery of the helminths themselves, their eggs, or larvae at different phases of development (Hasan et al., 2018; Denizha & Karakuş, 2019), is the foundation for effective management and targeted prevention of avian helminthiasis. Flotation methods, which involve the use of high-specific-gravity solutions to float nematode eggs to the surface of the flotation fluid, are employed in coprovo- scopic studies for the purpose of diagnosing nematodes in poultry, which can be fatal if left untreated (Meana et al., 1998; Rehbein et al., 2011; Jacob et al., 2016).Various flotation fluids on the market now have varying degrees of diagnostic effectiveness for identifying helminth disease pathogens. In addition, there are drawbacks to using some of the existing methods. Some have a deleterious impact on parasite eggs, altering their signature morphology. Nonaka et al. (1991); Mendes et al. (2005); Dahno & Dahno (2010) all found that the employment of others, in addition to intrusive components, causes a great deal of feed residues to float to the top, so diminishing their diagnostic efficacy.Diagnosing helminthiasis involves establishing not only the kind of parasite present, but also the strength of invasion, which allows for the detection of helminths and both a low and high degree of invasiveness. To do this, counting cameras are utilized in conjunction with other quantitative techniques of co- proscopic investigation (Pereckienè et al., 2007; Levecke et al., 2011).In light of the above, it is essential to evaluate the sensitivity of established coproscopy techniques for goose nematodes in order to provide the most competent experts in the field.This research set out to evaluate how well floating techniques of coprovoscopy for goose nematodes performed.

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Indo-American Journal of Agricultural and Veterinary Sciences
ISSN 2321–9602 www.iajavs.com

2. Materials and methods

The studies were conducted during 2019 in the laborato- ry of the Department of Parasitology and Ichthyopathology, Stepan Gzhytskyi National University of Veterinary Medi- cine and Biotechnologies Lviv.

To determine the sensitivity of well-known methods of coproovoscopic diagnostics of heterocosis, capillary disease,and trichostrongilosis, studies were conducted on sick geese belonging to the private farms in Lviv region that were dis- advantaged by the invasion. The invasion intensity rate (II) was determined by quantitative method (Trach, 1992), and the number of helminth eggs per 1 g of litter (eggs/g). The following methods were compared: Fulleborne – with salt (Pankov, 1975); Kotelnikov-Hrenova – with ammonium nitrate (Kotelnikov, 1974); Mallory – with a saturated sugar solution (Akbaev al., 1998). Studies were performed at ex- posures of 10, 15, 20, and 25 min. In total, 720 coproscopic examinations were performed.

Statistical processing of experimental results was per- formed by determining the arithmetic mean (M), its error (m) and the probability level (P) using the Student's t-test table. P values < 0.05 (*) were considered significant.

3. Results and discussion

The results show that the mallori method for exposuresof 10 and 15 min (Fig. 1) proved to be the most effective method of coproovoscopic diagnostics of geese.

Thus, the average invasion intensity was 18.13 ± 1.64and 59.0 ± 3.47 eggs/g, respectively, by 5.46 – 32.10%(P <0.05) and 22.88 – 70.33% (P < 0.05) more than using the Kotelnikov-Hrenov and Fulleborn methods. At 20 min exposure, the highest rates of invasion intensity (62.0 ± 4.39 eggs/g) were detected using the Kotelnikov-Hrenov method. Other methods were less sensitive (by 23.39– 45.97 %, P < 0.05) for geese gecosis. At the exposure of25 min, the rates of infestation with the use of the Kotelni- kov-Hrenov and Mallory methods gradually decrease, and with the use of the Fulleborn method – increase slightly to 37.5 ± 2.04 eggs/g.

In the case of geese capillaries, the most sensitive meth- ods of coprovascopy were Kotelnikov-Hrenov and Mallory (Fig. 2).

At 10 min exposure, the invasion intensity ranged from 10.76 ± 0.76 to 14.37 ± 1.28 eggs/g depending on the meth- od of study. Moreover, the highest number of eggs (by 24.64–25.12 %, P < 0.05) was found when using methods where a saturated solution of sugar and ammonium nitrate was used as the flotation fluid. Maximum II value were detected at exposures of 15 min (up to 34.0 ± 2.22 and 33.5 ± 2.64 eggs/g) using the same methods, by 61.19– 61.76 % (P < 0.05) is higher than when using the Fulleborn method. Subsequently, with the extension of the exposure to20–25 min, the II decreased by using the Kotelnikov-Hrenovand Mallory methods – to 19.5 ± 2.11 and 16.5 ± 2.08 eggs/g, respectively. At the same time, in a caproscopic study of geese by the Fulleborne method, the maximumnumber of capillary eggs was detected at the exposure of20 min (18.5 ± 1.66 eggs/g), but this indicator was lower by 37.28–39.34 % (P < 0.05) than using the Kotelnikov-Hrenovand Mallory methods.

In the laboratory diagnosis of trichostrongylosis of geese, indicators of the intensity of invasion depended onthe method of study and exposure (Fig. 3).

Indo-American Journal of Agricultural and Veterinary Sciences

ISSN 2321–9602 www.iajavs.com

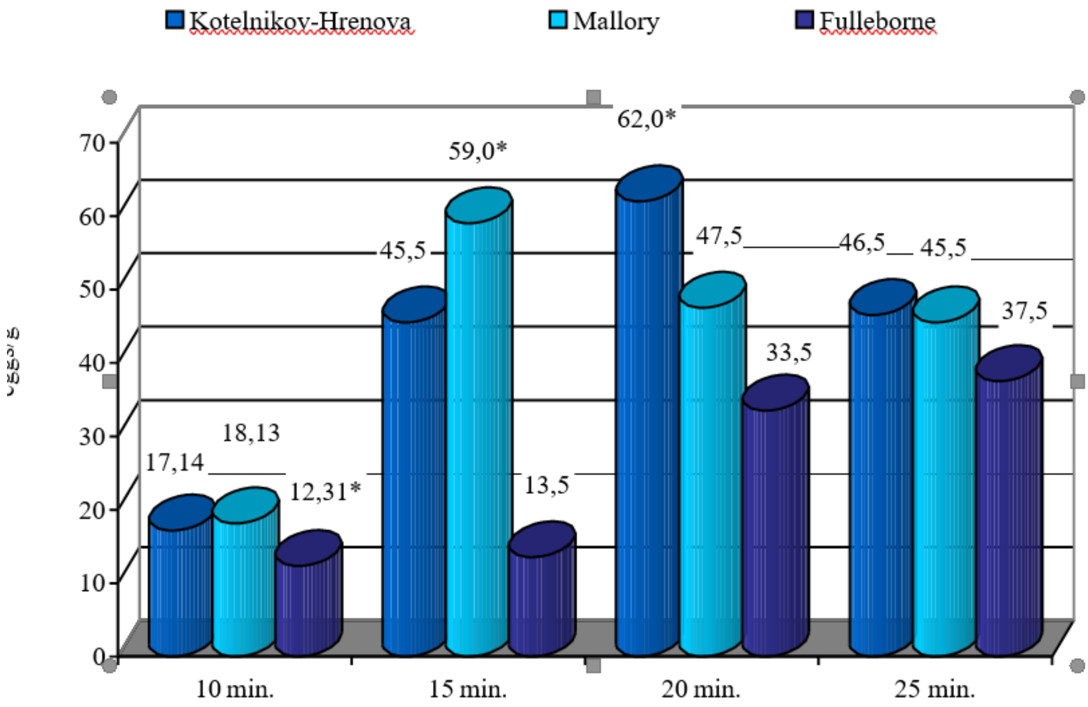

Fig. 1. Effectiveness of flotation methods for geese gecosis

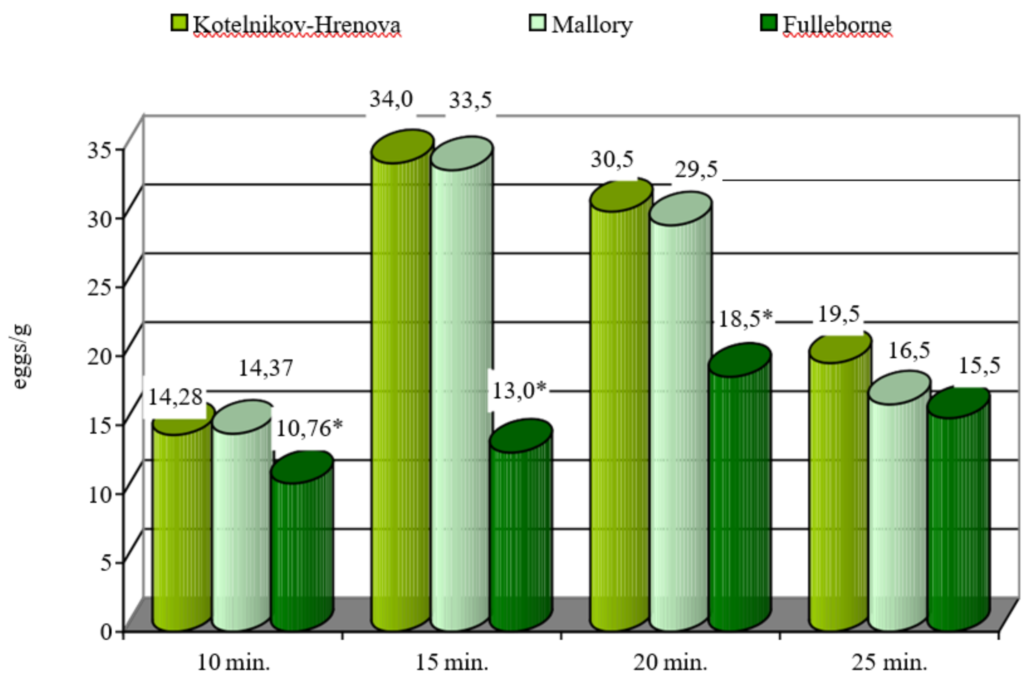

Fig. 2. Efficiency of flotation methods for geese capillary disease

Kotelnikov-Hrenova Mallory Fulleborne

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ISSN 2321–9602 www.iajavs.com

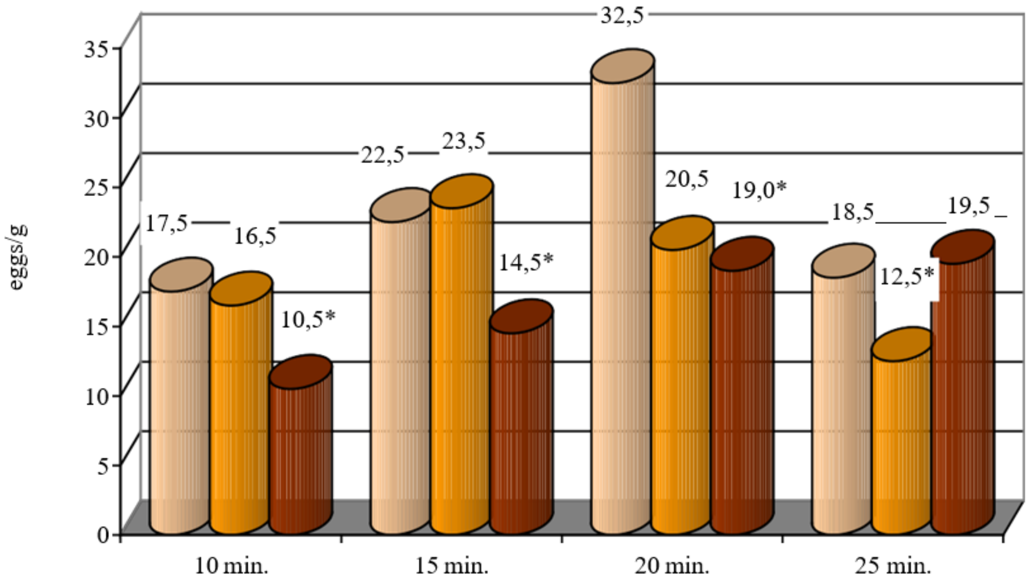

Fig. 3. Effectiveness of flotation methods for goose trichostrone

Thus, at the exposure of 10 min, the maximum numberof trichostrongilus eggs was detected using the Kotelnikov- Hrenov and Mallory methods (17.5 ± 1.75 and 16.5 ± 1.66 eggs/g), which is 36.36–40.0 %. (P < 0.05) higher than using the Fulleborn method (10.5 ± 0.5 eggs/g). Similarresults were obtained for exposures of 15 and 20 min. Ac- cording to the Kotelnikov-Hrenov and Mallory methods,respectively, 22.5 ± 2.16 and 23.5 ± 1.81 eggs/g and 32.5 ± 3.23 and 20.5 ± 1.84 eggs/g, respectively, were detected. At the same time, during these exposures, the Fulleborne meth- od showed the lowest efficiency (by 7.31–41.53 %, P < 0.05) – the invasion intensity ranged from 14.5 ± 1.69 to19.0 ± 2.39 eggs/g. At the exposure of 25 min with the ap- plication of the Kotelnikov-Hrenov and Mallory methods, the intensity of the invasion gradually decreased (up to 12.5 ± 0.99 eggs/g), and with the application of the Fulle- borne method – increase (up to 19.5 ± 2.45 eggs/g).

According to several researchers, coproscopy methods have different diagnostic efficacy due to the different com- position and specific gravity of the flotant, the settling peri- od for which helminth eggs should float, and the specific gravity of parasite eggs themselves (Kotelnikov, 1974; Mendes et al., 2005; Dakhno & Dakhno, 2010). Therefore, well-known flotation research methods for geese nematodes were tested.

According to the results of the studies, it was found that the most sensitive methods for the diagnosis of geese geco- sis are the methods of Kotelnikov-Hrenov (at 20 min expo- sure) and Mallory (at 10–15 min exposures). For geese ca- pillary disease, the most sensitive methods of life diagnosis were Kotelnikov-Hrenova and Mallory at exposures of 15– 20 min. At the same time, the method of Kotelnikov-Hrenov(with exposure of 20 min) showed the highest sensitivity for trichostrongilosis. It was also found that with the prolonga- tion of exposure during the application of the Kotelnikov- Hrenov and Mallory methods, the intensity of the invasion gradually decreased, indicating an increase in the proportionof eggs, due to their saturation with a flotant, after which they began to gradually settle. With the use of the Fulleborn method, on the contrary, with the prolongation of the expo- sure, the invasion intensity increased, which was due to the gradual floating of the nematode eggs on the surface of the flotant. Similar data were obtained by individual authors, who noted that with the prolongation of the settling time of the studied coprobes prepared according to flotation meth- ods, the number of nematode eggs, oyster oocysts and iso- spores isolated from pigs decreased on the surface of the flotant and increased in the sediment (Yevstafieva, 2007).

4. Conclusions

It has been experimentally established that flotation methods of Kotelnikov-Hrenov and Mallory coproovoscopy were the most sensitive in case of geese nematodes (hetera- cosis, capillary disease, trichostrongilosis). In the laboratory diagnosis of heteracosis and trichostrongylosis, the most effective is the exposure of samples 20 min - using the Ko- telnikov-Hrenov method and 15 min – using the Mallory method. The highest diagnostic efficacy for goose tricho- strongilosis is ensured by the use of these methods at expo- sures of 15 min.

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