

Original papers

Herbal formulations as feed additives in the course of rabbit subclinical coccidiosis

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ABSTRACT. Two simultaneous experiments were carried out in a breeding farm of New Zealand White rabbits (*Oryctolagus cuniculus* f. *domesticus*) to determine the feasibility of replacing coccidiostats with garlic and oregano preparation. The research took place during June and July, the period of the greatest threat of coccidiosis caused by *Eimeria* spp. (Apicomplexa: Eimeriidae). In one investigation, 40 rabbits aged 1–3 months were divided into four groups of ten animals: Group A being a control which received no coccidiostats in feed, Group B receiving the coccidiostat Baycox in water once at weaning, Group C receiving the coccidiostat robenidine in feed, and group D receiving herbal extracts in feed. In the second trial, six mated females were allocated equally to three groups analogous to A, C, and D above during pregnancy and lactation. Bulk stool samples were collected from each group of rabbits at weekly intervals for coproscopic analysis, and the production results of the animals were recorded. In the young rabbits, both the faecal coccidia oocyst counts and body weight gains were more favourable in group D than the remaining groups. Also, the female rabbits of group D were the least infected. The results demonstrate that garlic and oregano feed additives exert a positive influence on the level and course of coccidia infection, with regard to maintaining a good level of animal productivity, and these herbal extracts appear to have potential value in coccidiosis prophylaxy.

Key words: coccidia, rabbits, natural coccidiostats

Introduction

Coccidiosis caused by protozoans of the *Eimeria* genus (Apicomplexa: Eimeriidae) is a serious problem for the health of rabbits and their production (*Oryctolagus cuniculus* f. *domesticus*). Of special importance is the hepatic coccidia *Eimeria stiedae*, but some intestinal species are also highly pathogenic [1]. While young animals aged 1–3 months are most susceptible to the disease, especially after weaning [2,3], the mother rabbits are also more prone to infection during the perinatal period and before weaning [3,4]. So far, preventive measures consist of the administration of chemical coccidiostats to rabbit feed or water. However,

recent directives have forced their withdrawal (Regulation No 1831/2003 of the European Parliament and of the Council) and some natural coccidiocidal alternatives have since appeared on the market. Two such preparations, Bell Gold and Bell Premium (Bellako Ltd., Zabrze, Poland), are based on extracts of garlic (*Allium sativum*) and oregano (*Origanum vulgare*). These plants contain biologically active compounds which have demonstrated the potential to reinforce the animal immune system and improve production [5], or at least have been shown not to affect animal performance [6].

Bell Gold and Bell Premium formulations are already known to have some properties against

coccidia infection [7]. However, as previous research was only performed in late winter and spring, the decision was made to determine whether the products could also be effective at the period of the greatest threat due to coccidiosis in the herd, which is known to be the summer months [8]. In addition, it was unclear whether the herbal additives would lower the infection level and change its dynamics in the case of females with their litters. According to Pakandl and Hlásková [2], coccidiosis can affect sucklings as young as five weeks old, although a high oocyst output is usually not reached before weaning. Nevertheless, Balicka-Ramisz [9] observed a high level of infection in litters at weaning in a large and intensively kept flock.

Given the above, the aim of the present study was to assess the coccidiocidal activity of garlic and oregano extracts supplied to young rabbits aged 1–3 months, or mated female rabbits, during the period of the greatest risk of coccidiosis acquisition in the herd.

Materials and Methods

The investigations were performed on New Zealand White rabbits during June and July of 2012, at a breeding rabbitry located in Aleksandrowice, south Poland. The general conditions regarding hygiene and equipment were typical of this type of production. The animals were kept in tiered cages made of wire mesh, five young rabbits per cage, female rabbits singly, and were fed *ad libitum* with a standard complete diet in granular form. Water was distributed *ad libitum*. In the herd, the weaning of the litters occurred at the 35th day of life, and the fattening period for the weaned rabbits lasted eight weeks, up to the 90th day of life.

The study groups comprised a total of 40 young rabbits after weaning, and six mated females. The younger rabbits were assigned to four groups of ten young rabbits each (A, B, C and D), while the mothers were placed in three groups of two (A, C and D). The control group (A) received no food additives. Group B received the coccidiostat Baycox once at weaning, with water (0.5 ml/l). Group C was given feed supplemented with the coccidiostat Robenidine (66 mg/kg), while Group D was given feed supplemented with herbal extracts (0.5 kg Bell Gold plus 0.3 kg Bell Premium product per one ton of forage). The young of all groups were of roughly equal initial body weight, being 943.5 and 950.0 g in groups C and D, and 1052.0 and 1179.5 g in groups A and B, respectively.

Bulk stool samples were collected from each cage of young rabbits, or each mother at weekly intervals. The oocyst count per gram (OPG) of the faeces was assessed according to McMaster [10]. On the day before weaning, extra faecal samples were also taken from litters reared with the investigated mothers. Throughout the trial, both the animal production indicators and their health status were recorded.

Results and Discussion

All the animals were found to be infected with coccidia. Through the whole period of fattening, the mildest course of infection was demonstrated for young rabbits of herbal group D, and Baycox group B (Fig. 1), with *Eimeria* sp. infection ranging from 460 to 20260 OPG in group D, and from 760 to 20000 OPG in group B. The oocyst counts of the young rabbits in group C, robenidine, ranged from 580 to 34220 OPG, whereas the highest counts were found in rabbits without anticoccidial drugs in their feed (Group A) (840–49740 OPG).

Regarding the infection dynamics, although the young of group B were initially less infected, due to the Baycox treatment, a high reinfection occurred from the fifth week of fattening, and a higher level of infection remained until the end of the experiment. The maximal infection intensity occurred in group A in the fourth week of rearing, which was consistent with Papeschi et al. [3], and Połozowski [4], who note subsequent self-reduction in coccidia infection. Other studies [11–13] report that, in the absence of coccidiostats, oocyst counts increase with the age of rabbits until the end of the fattening period.

In the case of the does, the lowest infection was also found in group D (80–7280 OPG), followed by group C (920–16640 OPG) and A (100–19440 OPG) (Fig. 2). The infection reached the peak of intensity during the periparturient phase, parturition occurring between the 3rd and 4th weeks of the experiment; only herbal group D demonstrated no visible increase of infection at this time. Similarly, other surveys [3,4] report the shedding of faecal oocysts by female rabbits to be dependent on the time of parturition, although Papeschi et al. [3] note a higher oocyst output during the second week *post-partum*. Połozowski [4] identifies a further peak of infection intensity in females in the period preceding weaning, which was caused, however, by the sucklings remaining with the does for an

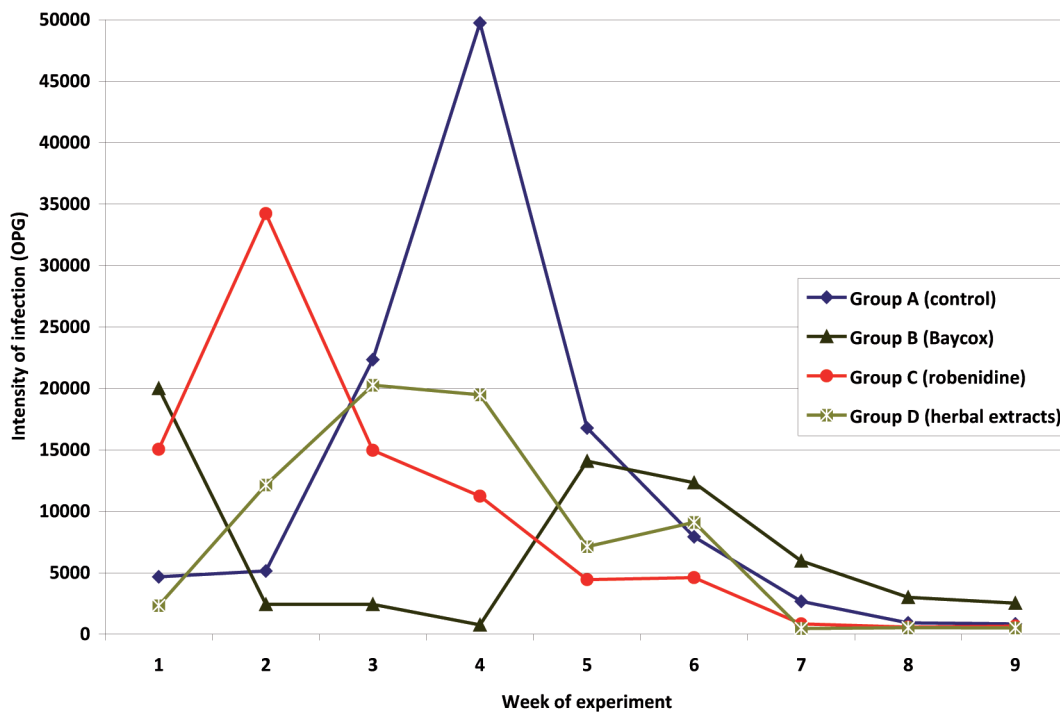


Fig. 1. The dynamics of coccidia infection in young rabbits within experimental groups, during the fattening

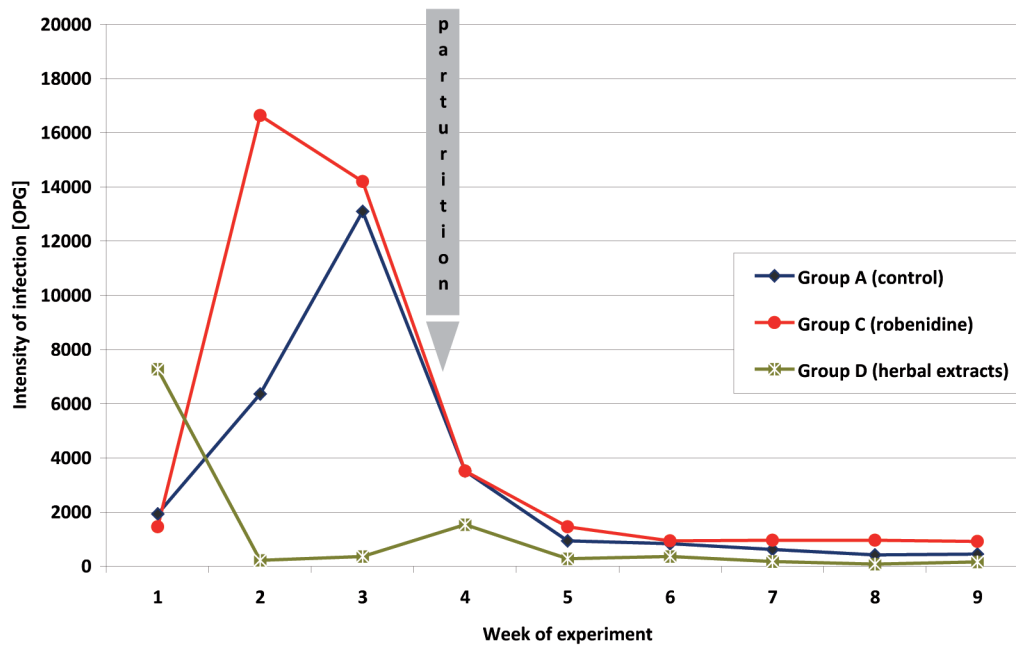


Fig. 2. The dynamics of coccidia infection in rabbit mothers during pregnancy and lactation (parturition before the 4th week of the experiment)

extended period of 8–10 weeks.

In the present study, the mothers' infection was correlated with that seen in the five-week-old litters before weaning, although not completely. Again, the least infected were sucklings of group D (66000 OPG), but the highest rates were seen in those of

group C (504000 OPG), whereas the *Eimeria* infection in litters from group A averaged 111000 (84000 and 138000) OPG.

Despite a 100% prevalence of infection in the present study, and the infection being of such high intensity, especially in the weaned sucklings, no

clinical signs of coccidiosis were observed. Similar findings were obtained by Ramisz [14], who found no disease symptoms in animals infected with 550000 OPG.

During the experiment, the number of litters born alive and weaned were similar for mother rabbits of all groups, each ranging in size from 6 to 8 sucklings. In young rabbits, the daily gains within eight weeks of fattening ranged, respectively, from 27.1 and 29.4 g in groups B and A, to 30.5 and 31.0 g in groups C and D. No mortality was recorded in group C of fatteners, but one death occurred in group B, and two deaths occurred in each of group A and D, however, no coccidia-induced lesions were observed in the intestine or liver of the dead rabbits.

As the beneficial influence of robenidine and Baycox on the survival of growing rabbits has been described previously [9,11,13], the adverse effect of robenidine on the rate of coccidia infection in sucklings observed in the present study is rather surprising. As regards the impact of coccidiostats on rabbit production, other studies report that either both Baycox and robenidine had a positive effect on the daily gains of the young [13], or that the addition of robenidine did not improve growing performance [11]. In the present study, the use of Baycox seemed to negatively influence productivity, but this could be explained to some extent by the higher initial body weight of the rabbits in this group. As regards robenidine, although this coccidiostat may only affect intestinal coccidiosis [4], the presence of hepatic *Eimeria stiedae* was fortunately not observed over the past years in the herd examined.

Plants rich in active compounds have previously been examined as prophylactic feed additives for prevention of rabbit coccidiosis in several studies. The efficacy of onion (*Allium cepa*) and white mustard (*Sinapis alba*) was investigated by Gugolek et al. [12,15], garlic by Abu-Akkada et al. [16], and garlic and oregano by Kowalska et al. [7], and all the studied herbs were found to lower the coccidia oocyst output to a degree.

It is known [3,12] that in many cases, *Eimeria* infection rates are not correlated with rabbit performance. In this study, treatment with garlic and oregano preparations was found to have a positive influence on the animals, with regard to both the resistance, assessed by reductions in coccidia oocyst output, and resilience, measured by the daily gains of the fatteners. These results may imply that the preparations have a favourable impact on the welfare and production of the rabbits.

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