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Published in:
Proceedings of the 18<sup>th</sup> European Symposium on Poultry Nutrition

Publication date:
2011

Document version
Publisher's PDF, also known as Version of record

Citation for published version (APA):
The use of *Artemisia annua* in the prevention of necrotic enteritis in a broiler disease model

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**Introduction**

The plant *Artemisia annua* contains considerable amounts of essential oils, i.e. camphor, 1,8 cineole and artemisia ketone with antimicrobial effect on *Clostridium perfringens* Type A, causing necrotic enteritis in broilers.

**Aim**

The aim of the study was to investigate the effect of a dietary supplementation of either dried *A. annua* leaves or an extract from dry leaves on the course of necrotic enteritis in broilers applying a disease model.

**Material and Methods**

**Antimicrobial effect of *A. annua* extracts against *C. perfringens***

In order to find the most potent *A. annua* extract to be used as feed additive in the consecutive broiler experiment, the minimal inhibitory concentrations (MIC values) of extracts extracted with either methanol or dichloromethane or *n*-hexane were determined in 96 well microplates. The plant extracts were initially dissolved in dimethylsulfoxide and serial two-fold dilutions were made in Anaerobe Basal Broth (Oxoid). A volume of 20 µl of an overnight *C. perfringens* culture (strain 48) was added to 250 µl medium in the wells of the microplates. The plates were incubated anaerobically at 38 °C. After 24 h microbial growth was recorded visually and by measuring the absorbance at 650 nm.

The *n*-hexane extract had the lowest MIC value indicating the strongest antimicrobial effect on *C. perfringens* (Table 1) and was therefore used as feed additive in the broiler experiment.

**Broiler experiment**

A broiler experiment was carried out over 27 days with 320 male broilers divided into 4 experimental groups (4 replicate floor pens/group).

- Group 1 control, non-infected
- Group 2 control, infected
- Group 3 dried plant 10 g/kg, infected
- Group 4 *n*-hexane extract 250 mg/kg, infected

The infection model was based on a sudden shift to a feed providing 30% fish meal in the contents of caeca (log CFU/g). The plant extracts were initially dissolved in *n*-hexane and serial two-fold dilutions were made in Anaerobe Basal Broth (Oxoid). A volume of 20 µl of an overnight culture (strain 48) was added to 250 µl medium in the wells of the microplates. The plates were incubated anaerobically at 38 °C. After 24 h microbial growth was recorded visually and by measuring the absorbance at 650 nm.

None of the feed additives could prevent the development of necrotic enteritis in the experimental birds. The most severe small intestinal lesions and the highest *C. perfringens* numbers in caecal content were found at day 24 (Table 2). Birds supplemented with the *n*-hexane extract had lower lesion scores (P<0.05) and lower caecal *C. perfringens* counts (P<0.05) on days 22 and 27 as compared to the other infected groups (Table 1). This indicates a positive influence on the course of the disease in terms of a later disease onset and a faster recovery of the birds. The infection caused a severe growth depression (Figure 1). In the period from 17-27 days, no difference regarding body weight gain was found between the infected control group and the group receiving dried plant material (P>0.05). Birds supplemented with *n*-hexane extract had a higher weight gain (P<0.05) than the other infected groups (Figure 1).

**Results and Discussion**

**Conclusion**

In a necrotic enteritis disease model, the dietary supplementation of a *n*-hexane extract from dried leaves of *A. annua* modulates the course of the infection in a positive way and prevents to a certain extent severe growth depression related to the disease.