UNIVERSITY OF DAMNHOUR
Faculty of Veterinary Medicine
Department of Pathology and Parasites

Assessment of Anticoccidial Effects of Aqueous Extract of Aloe Vera Leafs on Performance, Efficacy of Vaccination and Pathologic Parameters in Broilers Challenged with Eimeria Tenella

A thesis presented by
Rasha Mohamed Abd El Shafy Zayed.

B.v.sc., Fac. Vet. Med., Kafr Elsheikh Univ., (2003)

M. V. Sc. in pathology, Fac. Vet. Med., Moshtohor, Benha University, (2015)

Under supervision of

Prof. Dr. Abdel-Rahman A. Abou Rawash
Professor of Pathology
Head of Pathology Department.
Faculty of Veterinary Medicine,
Damanhur University.

Prof. Dr. Hany Fawzy Elakany
Professor of poultry disease
Department of Poultry and Fish diseases.
Faculty of Veterinary Medicine,
Damanhur University.

Prof. Dr. Sohair Ebrahim Ahmed Badr
Senior researcher,
Department of pathology,
Institute of Animal Health Research, Dokki

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7- Summary

The present study aimed to evaluating the anticoccidial effects of aqueous extract of *Aloe vera* gel (AG) on performance, oocysts shedding, cecal damage, levels of nitric oxide (NO) and cytokine concentrations during experimental *Eimeria tenella* infection in broiler chickens in comparison with standard anticoccidial drug (amprolium) and Fortegra vaccine. Two hundred and twenty five 225, one-day old unsexed broiler chickens (Avian 48), were randomly and equally allocated into nine groups, each of 25 chicks each, were reared for 5 weeks. The birds in vaccinated groups were vaccinated with coccidial vaccine by eye drop vaccine at 3 day old age. Coccidial infection in the assigned groups was performed at the 20th day of age by long rubber flexible tube through oral inoculation with 50,000 sporulated oocysts of *Eimeria tenella*. Birds in the treated groups treated with the anticoccidial drug (amprolium) 48 h after coccidial infection for 5 days. The aqueous Aloe gel was extracted from fresh Aloe leaves and 10% (w/v) solution was given to the assigned groups at a dose of 15 ml/liter in drinking water from 1 day old till the end of the experiment. The performance parameters included mean body weight, weight gain and daily feed consumption and feed conversion ratio. Serum biochemical parameters included Nitric oxide (NO) levels and cytokines: interferon gamma (INF-γ) and interleukin-4 (IL-4). Also CBC was investigated. *Eimeria tenella* oocyst output was also measured and expressed per gram faeces. Cecal tissue was collected from 5 experimental birds of each group, and then the specimens were preserved in 10% neutral buffered formalin for histopathological examination.

The results showed that in abscence of coccidial infection addition of *Aloe vera* produced the highest B.W. Gain, followed by amprolium, then the vaccine. Meanwhile in case of coccidial infection, both the *Aloe vera* and amprolium significantly improved feed intake and body weight gain. Group treated with amprolium showed the highest body weight among other groups. A coccidial vaccine effect on FCR and body weight was very close to the *Aloe vera* but *Aloe vera* was numerically higher in its effect. In case of no coccidial infection, the best haemoglobin concentration was obtained by *Aloe vera*. Meanwhile in case of infection, amprolium produced the highest Haemoglobin Concentration value among the experimentally infected groups. Group 6 (infected and treated with amprolium) showed the least WBCs count, lymphocyte, monocyte and heterophils percentage which are considered a good parameter for inflammation and protozoal infection, followed by *Aloe vera* then the coccidial vaccine.

The lowest nitric oxide (NO) levels were in group 7 (non-infected, amprolium-treated). Comparing the effects of *Aloe vera* and amprolium in reducing the NO as an indicator for inflammation, both amprolium and *Aloe vera* values reduced it very closely to each other and were non significantly different from each other. The infected non treated group 5 had the highest IFN-γ value. Amprolium was the best in reducing the level of IFN-γ and was significantly different from both effects of *Aloe vera* and vaccine. Amprolium was followed by the *Aloe vera* then the coccidial vaccine (was very close to the *Aloe vera* effect and non-significantly different). Also, the infected, non-treated group 5 had the highest interleukin 4 value. *Aloe vera* supplementation decreased the concentration of IFN-γ and interleukin 4 in the infected treated chickens. The *Aloe vera* treatment did not succeed to reduce the IFN-γ values like amprolium but it decreased the level of this cytokine compared to than the infected and non-treated group.

The lowest mortality was 8% in group infected and treated with amprolium. The mortalities in the infected non- treated control group were 24%. The mortalities in the

vaccinated and in the *Aloe vera* treated groups were 12% each. The highest oocyst shedding was observed on days 7p.i. and then gradually decreased on day's 8&9 P.I. Both *Aloe vera* and amprolium significantly reduced the oocysts shedding on day 6&10 (P.I.).

Coccidial infection damaged the integrity of the cecal mucosa and thickened cecal tunica muscularis. *Aloe vera* and amprolium supplementation reduced the cecal lesion scores. The histopathological examination of cecum in the infected non- treated group revealed blunting of cecal villi, degeneration and necrosis, sloughing of cecal epithelium into the lumen (necrotic enteritis). Impaction of submucosal glandular epithelium by various stages of Eimeria with shedding of them into the glandular lumen together with interstitial edema and infiltration with inflammatory cells mainly mononuclear cell. In severe cases, ulceration of the lamina epithelialis extending into the submucosal glandular epithelium. Interstitial edema in the submucosa extending in between the necrotic muscular layer associated with fibrous connective tissue proliferation was also seen. On the other hand, the histopathological examination of cecum of chicken treated with amprolium and infected with *Eimeria tenella* revealed blunting cecal villi and decrease number of Eimeria stages in the submucosa. Presence of moderate to low number of developed and degenerated Eimeria stages in submucosal glandular epithelium. Fibrous connective tissue proliferation in the submucosa extending in between the necrotic degenerated muscular layer was also seen. Presence of many destructed schizonts and oocysts in the submucosa and cecal lumen were seen. Cecum of chicken treated with *Aloe vera* and infected with *Eimeria tenella* revealed hyperplasia of epithelial goblet cells, dilated submucosal glandular epithelium with developed and degenerated Eimeria stages in the submucosa with low number of them. In case of cecum of chicken vaccinated and infected with *Eimeria tenella* revealed mild desquamation of epithelial lining cecal villi, hyperplasia of goblet cells of cecal villi and submucosal glands, severe inflammatory cells infiltrations and decrease number of oocysts were seen in the submucosa. Current results showed the anticoccidial properties, and beneficial effect on intestinal mucosa damage of *Aloe vera* in broiler chicks challenged with coccidiosis.

In conclusion, this study revealed that the *Aloe vera* improved the growth performance of broiler chicks infected by *Eimeria tenella*, reduced oocysts shedding and reduced the cecal lesions in broiler chicks challenged with coccidiosis. The use of *Aloe vera* consequently with either the anticoccidial drug (amprolium) or with coccidial vaccines can resolves the problem of drug resistance and drug residues. Coccidial vaccine gave lower efficacies than *Aloe vera* and amprolium.