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Effects of Green Oaks Acorns (*Quercus ilex*) Based Diets Added of Calcium Bentonite on Health of Broilers Reared in the Cages and Ground Modes

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Abstract: It is now known that the use of natural resources and food additives rich in bioactive nutrients in poultry diets offer better digestive use and have a proven health impact. In this context, the use of green oak acorn added of calcium bentonite are better suited to these tests to improve growth and enrich the meat with a some nutrients able to limiting the meat lipoperoxidation. In addition, the breeding battery mode compared to the ground mode offers better conditions and improves productivity. This study consists of evaluating the effects of diets based on green oak acorns supplemented with calcium bentonite on organ histology of broilers in order to evaluate the poultry health. The 300 broilers one day-old of the ISA F15 strain were divided into two groups, one raised on the ground and the other in cages. Each group was divided into three subgroups. Each subgroup receives either a standard diet without addition of acorn or bentonite constituting the Diet Control (DC), a diet with 19.8 g/kg of Oak Acorn (OA) without bentonite and another diet of 19, 8 g/kg of OA added of 2 g/kg of calcium bentonite (OAB). Analysis of the histological sections revealed that the addition of bentonite in the feed of poultry reared particularly on the ground seems to preserve at the best histological level of certain internal organs: Fabricius bursa, liver, small intestines. Adding bentonite to the acorn diet nearly halved the intensity of follicular necrosis compared to the lesion appearance of controls. Follicular scarring expressed by the extent of fibrosis was extensive on the bursae. This experiment suggests that the use of green oak acorn in chicken feed is therefore quite possible and the addition of 2% calcium bentonite shows the best beneficial effects on health status.

INTRODUCTION

In modern diets, meat is the subject of debate and criticism in a society increasingly attentive to the dietary composition and health value of its diet. Product quality has therefore become one of the major concerns of the various links in the meat industry and the consumer. Among the factors likely to alter or improve this quality is often mentioned diet, even if other parameters have a much greater influence such as genotype and age[1].

In this context, several research carried out by Algerian researchers have shown the possibility of using the Green Oak Acorn (GOA) (naturally rich in unsaturated fatty acids and bioactive compound) in the diet of broilers, without the growth performance and body composition are not altered. Interesting results have been obtained by Bouderoua, etc. on the productive performances and nutritional and dietetic qualities of white meats which are characterized by an acceptable slaughter yield. The breeding of broilers is practiced all over the world, in very variable conditions which can be done in three ways: in battery, on the ground, mixed (ground-battery). The ground-based method of rearing is often observed in extensive village ranching and also in free-range ranching. In both of these cases, the ground is made up of greenery or dirt. In the industrial confined type, floor rearing is more used for fattening chicks intended for meat production but also for laying eggs.

As for battery breeding, it began during the First World War in the United States, it is done in stages. Its appearance revolutionized world poultry production. It has the following advantages: removal of the litter which constitutes the first medium which harbors infectious agents, more favorable health status because the droppings rejected through the wire mesh reduce the risk of parasitism and infectious diseases, better growth because the chickens save energy by reducing their activity and therefore, using their food only to make meat.

Contamination of food ingredients by various mycotoxins and their effects on animal health and performance have been repeatedly reported[2-5], highlighting the need for strategies to mitigate the adverse effects of these substances.

For better control of breeding conditions, it seems necessary to enhance the feed of broilers in a few raw materials produced locally. For example, bentonite is one of these raw materials, known for its richness in minerals and capable of being used in animal feed.

About 50 years ago, scientists rediscovered clay minerals for medical purposes. The consumption of clay has been used for hundreds of years by animals and native cultures to promote internal healing and improved economic indicators and the use of marketing silicate minerals are recommended as an ingredient in the forage[6]. It is used as a feed additive in poultry feed and has no harmful effects on animal health[7, 8].

Bentonite or montmorillonite is a clay belonging to the smectic family. Clays are differentiated by their absorbent and adsorbent properties. Absorption refers to the ability to mop up or even pump liquids. Adsorption refers to the ability to exchange particles (this is the case when the ions in clay are not saturated), for example minerals against toxins. Bentonites have a very strong power[9].

This is the context in which this study which aims to monitor the effects of adding acorn and bentonite in the diet on the histopathological state of organs in broiler chickens, falls within this context reared in soil and battery modes.

MATERIALS AND METHODS

Three hundred day-old male Hubbard ISA 15 broilers were reared conventionally and fed until 12 days of age on a standard starter diet (3,100 kcal/kg, 22% protein) were allowed free access to water and food. The 12th day, birds with initial Body Weight (BW) 360 kg±23 g were divided into six groups according to the diet distributed during growth and finishing, the first group received the control diet without addition of acorn or bentonite. constituting the control batch and reared on the ground (CG), the second group fed on the acorn-based diet and raised on the ground (OAGS), the third group fed on the acorn-based diet and supplemented with bentonite and raised on the ground (OAGBS), the fourth group received the control diet and battery-matured (TB), the fifth batch fed acorn and battery-reared (GB) feed, the sixth batch fed acorn-bentonite and battery-matured (GBB) feed. The room temperature in experimental house was maintained at 38°C during the first days of experiment and decreased gradually by 3°C in the 2nd and 3rd week to be fixed at 22°C there' after chiks were vaccinated against New Castle disease at the 3rd and 30th days, via. drinking water. Animals used in this experiment were reared and slaughtered in compliance with ethics regulations for the humane care and use of animals in research.

In order to assess the state of health of the chickens, histological sections were made on the Fabricius bursa, liver and small intestines after fixation. The sections made are observed under a light microscope[10].

RESULTS AND DISCUSSION

Histological sections of Fabricius bursa, liver and small intestines of chickens are shown in Fig. 1-5 and Table 1.

Table 1: Microscopic characteristics of Gumboro disease

	1st slaughter 42nd day			2nd slaughter 56th day		
	Grade		No. of hearth	Grade		No. of hearth
Groups	Necrosis	Fibrosis	Necrotic	Necrosis	Fibrosis	Necrotic
CS	Moderate	Lighter than moderate	10	Moderate	Moderate to large	19
OAS	Light to wide	Lighter than wide	04	Large	More moderate than wide	08
OABS	Lighter than moderate	Lighter than moderate	06	More moderate than wide	Moderate	15
CB	Light to wide	Mild than moderate	03	Moderate	Moderate	06
OAB	Large	Moderate than wide	06	Moderate to large	Moderate	12
OABB	Large	Moderate	04	Moderate	Large	03

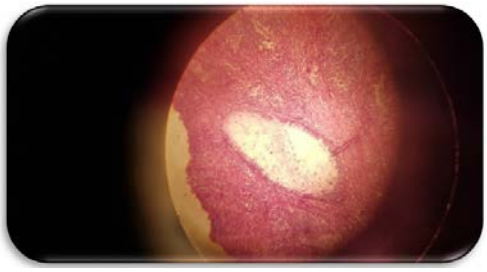

Fig. 1: Follicular necrosis with presence of neutrophils (soil control TS: 2nd slaughter, 49 days)

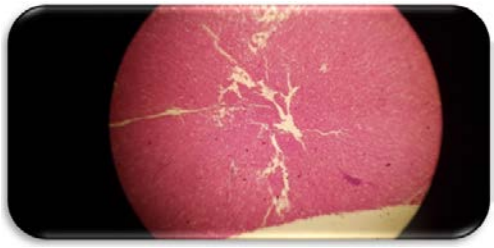

Fig. 2: Slight fibrosis (acorn+bentonite battery GBB: 2nd slaughter, 49 days)

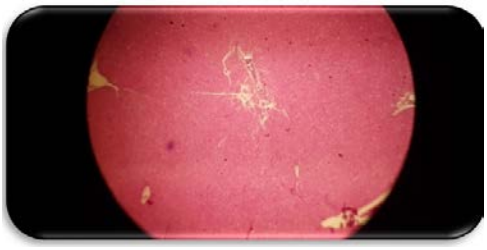

Fig. 3: Moderate necrosis of lymphoid follicles (GB battery gland: 2nd slaughter, 49 days)

Fabricius scholarships: Depending on the stage of the disease, lesions of hyperplasia, follicular atrophy and fibrosis were observed in control and experimental broilers. Follicular necrosis was especially dominant during the second sacrifice of broilers. During the experiment, the latter was also more intense in ground farming. Based on the diet and compared to the control lots, lymphoid follicle necrosis was moderate in the acorn

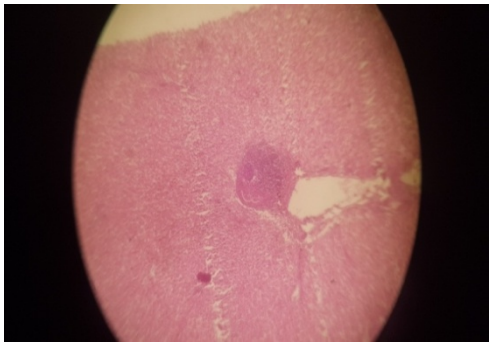

Fig. 4: Heterogeneous perivascular hepatic infiltrates (Gland Battery GB: 1st slaughter)

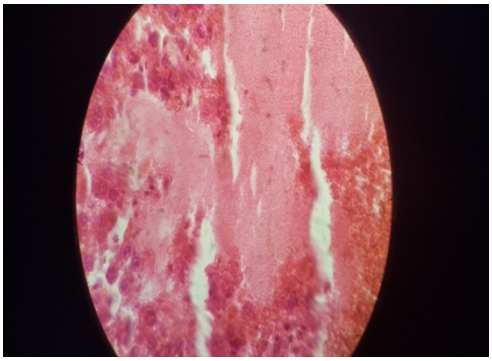

Fig. 5: Lysis and degeneration of hepatocytes (gland+ bentonite battery GBB: 1st slaughter)

diet. Adding bentonite to the acorn diet nearly halved the intensity of follicular necrosis compared to the lesion appearance of controls. The follicular scarring expressed by the extent of fibrosis was extensive on the bursae from the second sacrifice. Throughout the experiment and depending on the type of breeding, fibrosis was slightly more widespread on the purses from cage breeding. On the other hand, the diet based on acorn and bentonite showed extensive follicular healing compared to the controls and the groups fed with the acorn (Fig. 1).

Livers: All three diets failed to prevent the development of microscopic hepatic lesions (Fig. 4 and 5) which

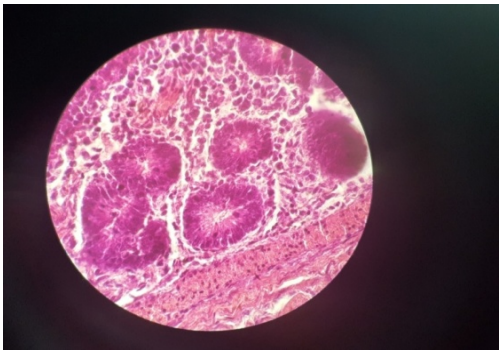

Fig. 6: Enteritis with slight infiltration of neutrophils in the crypts (TB battery witness: 2nd slaughter)

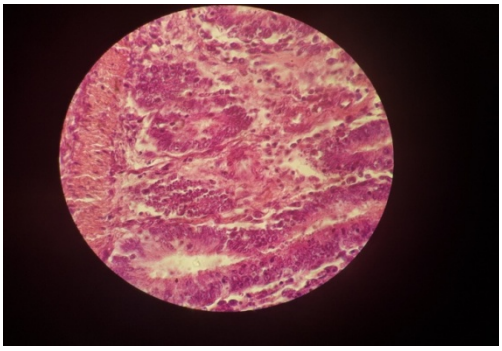

Fig. 7: Enteritis with strong neutrophil infiltration in the crypts (gland soil GS: 2nd slaughter)

included the presence of heterogeneous perivascular infiltrates, cytogresomes, megalocytosis, hepatic steatosis, hepatitis, lysis and degeneration of hepatocytes. Depending on the type of farm, the lesions of steatosis and megalocytosis were more evident in cage culture. In contrast, the presence of cytogresomes in the cytoplasm of hepatocytes was more intense in the soil culture. Lysis and degeneration lesions were often observed on lots reared in soil compared to those in cages.

Small intestines: The majority of transverse intestinal sections exhibited tissue changes at different grades of inflammatory activity. In fact, the severity of the enteritis lesions ranged from mild, localized in the lamina propria, then from the strong infiltration of neutrophils in the crypts until diffuse ulceration with the presence of granulation tissue at the level of the cell. epithelium of the intestinal mucosa.

According to the type of breeding, in general, the enteritis lesions showed in the submucosa and the mucosa infiltration of the crypts by neutrophils and local epithelial erosions more or less important in the lots raised on soil compared to those on cages. Depending on the diet, the control batch exhibited less inflammatory activity compared to the other two diets. On the other hand, on the three diets, the group fed with acorns showed a more marked transmural inflammation. That of the control diet was less intense compared to the batch fed with acorn and bentonite (Fig. 6 and 7).

The autopsy did not reveal any obvious macroscopic lesions on the different organs taken from the different groups of experimental animals with the exception of those observed on the bursa of Fabricius which showed swelling associated with congestion and atrophy accompanied by grayish color. The involvement of these bursaries was accompanied by mild perihepatitis, congestion and intestinal petechiae, more marked in chickens fed the control and the acorn-based diet and less pronounced in the animals that consumed the diet supplemented with bentonite. Based on the diet consumed and compared to the control batch, histology revealed necrosis of the lymphoid follicles of the Fabricius bursa more moderate with the acorn-based diet. Adding bentonite to the acorn diet almost halved the intensity of follicular necrosis compared to the lesion appearance of control animals. In addition, depending on the diet consumed, hepatic infiltrates were much less in the acorn and bentonite diet which even reduced the occurrence of hepatocyte lysis and degeneration compared to other experimental diets. Intestinal microscopy also revealed that the control batch exhibited less transmural inflammatory activity in comparison especially with the batch fed with acorns and bentonite.

As an indication, De Vries *et al*.[11] estimated the consumption of soil by a laying hen reared in the open air at nearly 10% of the dry matter ingested. Apparently, adding bentonite to broiler's feed strengthens the animal's immunity more and significantly reduces:

- The intensity of follicular necrosis of the bursa of Fabricius
- Hepatic infiltrates, lysis and hepatocyte degeneration
- Intestinal transmural inflammatory activity
- The number of peri-arterial sleeves in the spleen

Throughout the experiment and depending on the type of farming, the fibrosis was slightly more widespread on the purses resulting from cage farming as opposed to farming carried out on the ground. Steatosis and megalocytosis lesions as well as lysis and degeneration lesions were also more evident in hepatocytes from battery-reared animals. On the other hand, only a presence of cytogresomes in the cytoplasm of hepatic cells was noted in the culture carried out in the soil[12].

At the intestinal level, enteritis lesions in the submucosa and mucosa, infiltration of the crypts by neutrophils and more or less significant local epithelial erosions were observed in the animals of the batches raised on the ground than those raised in cages.

These responses are undoubtedly due to a difference in the breeding density of which the cage breeding was carried out more suffering by the animals because of the high density of 20 subjects per square meter compared to the ground breeding. having been established according to the required standard of 10 subjects per square meter.

CONCLUSION

At the end of this study and through the results obtained. In view of the improvement in the health value of chicken meat by the additional addition of bentonite, the use of Holm oak acorn in chicken feed is therefore, quite possible as the acorn is probably acting on the quality and health value of meat thanks to its richness in bioactive ingredients. Apparently, the addition of bentonite to poultry feed remarkably reduces in particular broilers the intensity of follicular necrosis of Fabricius bursa, hepatic infiltrates as well as lysis and hepatocyte degeneration, intestinal transmural inflammatory activity. Finally, we can say that the use of calcium bentonite in poultry farming can solve various problems such as pollution of livestock buildings, reduction of health risks. During the experiment, cage rearing as opposed to floor rearing showed slightly more extensive fibrosis on Fabricius bursa; lesions of steatosis and megalocytosis as well as lesions of lysis and more marked degeneration.

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