Assessment on the Effect of Lignin as a Feed Additive for Lohmann Brown egg layer Chickens: a case study at Neudamm farm, University of Namibia

Francisco Mausse[1]*, Japhet R. Lyaku[1], Edmond Beukes[2], Lazarus Nafenya[3]

[1]Department of Veterinary Medicine, Faculty of Agriculture and Natural Resources
University of Namibia, Neudamm Campus, Namibia

[2]Neudamm Farm, Faculty of Agriculture and Natural Resources, University of Namibia.

[3]Department of Animal Science, Faculty of Agriculture and Natural Resources
University of Namibia, Neudamm Campus, Namibia

Received: 27th October, 2013. Accepted: 17th March, 2014.

Abstract

The objective of this study was to test the effect of lignin as a feed additive under Namibian environmental conditions. A total of 871 chickens (482 experimental and 489 control groups), weighing an average mass of 2 kg/head, were subjected to an experiment under Neudamm Campus (UNAM) environmental conditions (32°C average temperature and 22% relative humidity). All chickens were fed with ordinary balanced ration earmarked for egg layers for 8 days and subjected to stress for 10 minutes per day. The experimental group was given purified lignin (Lignohumate KD) 60 mg/kg diluted in a litter of drinking water, as an anti-stressor feed additive and metabolic activity stimulator. Results of this study revealed an increase in egg production, reduction in feed intake, resistance to stress, and production of eggs of bigger sizes (graded as Extra-large), with strong shells as compared to those produced by the control group. At a certain stage, some chickens from the experimental group were unable to release eggs freely, a fact possibly related to egg size and possible deficient lubrication of cloacal environment. Studies are ongoing with the objective of identifying accurate amounts of lignin/kg necessary to feed egg-layer chickens for triggering an improvement of egg

*Corresponding author - E-mail: fmausse@unam.na

ISSN: 2026-7673

quality under Namibian environmental conditions, without affecting the bird's physiology and health.

Keywords: purified lignin; egg quality, and chicken physiology

ISTJN 2014; 4(1):31-35.

1 Introduction

The poultry industry benefits from the application of scientific achievements that enhance egg and meat production through the use of salts of trace elements, vitamins, amino acids, including natural products, as biological stimulators (Bessarabov et al., 2010). Egg (layers) and meat production (broilers) can be increased through the application of innovative technologies leading to intensive poultry response and enhanced egg quality. Bio-stimulators exert a direct influence on metabolic processes when given as feed additives facilitating growth thereby increasing egg-laying by enhancing the feed conversion rate, and natural resistance to diseases and stress caused by both internal and external factors (Gladkov, 2011).

Actualization of Ecological Technologies (A.E.T. Ltd), St. Petersburg, Russia, has developed the technology for production of high-concentration feed additives made of lignin, containing phytogenous material under the trade name Lignohumate KD. This additive is made in two forms, a dry Lignohumate in the form of powder of dark brown color with a slight vanillin smell, of pH 8.5–10, and moisture content not exceeding 14%, and soluble in water in any proportion and liquid form (A.E.T. Ltd- `http://www.lignohumate.com/en/animal_industries/cow/`).

Research aimed at determining acute and chronic toxicity of lignin was carried out by the laboratory of the Department of Poultry Farming and Poultry Diseases of the MSAVMiB (named after K.I. Skryabin, Moscow, (2010). Studies have shown that Lignohumate KD contents in recommended dosages are not toxic in poultry, and possess a stimulating effect on productivity. Research on the Lignohumate KD content was also carried out by the Analytical Laboratory Services CC, Windhoek, Namibia, where results also confirmed that lignin contents in normal dosages are non-toxic to poultry (Rugheimer et al., 2012).

Several studies on the clinical and metabolic effects of Lignin were successfully carried out in Canada as indicated by Nelson et al. (2010) who showed the effect of lignin on microoganisms; and in Russia by Gladkov et al. (2011) for improving growth rate in broilers, and to increase egg production. Based on the geographical locations where the studies were carried out, it becomes clear that all results may be specifically valid and

applicable in similar environmental conditions. The dosages of lignin per kg applied in chickens in arid and semi-arid environmental conditions, like those in Namibia, need to be investigated to establish the effect on both broilers and egg-laying chickens for subsequent recommendation to farmers.

The objective of this study was to establish the effect of lignin as a feed additive for egg laying chickens at Neudamm Campus (UNAM) under Namibian environmental conditions, without adversely affecting the health status of birds.

2 Methodology

Dry form of purified lignin under the trade name of Lignohumate (60 mg/kg live weight) was diluted into a liter of tap water earmarked for chicken's consumption. The temperature and relative humidity were measured on a daily basis; early morning (08:00) and afternoon (14:00), the times considered to being the hottest of the day. The facility contained two blocks of cages with a total of 971 chickens placed in batteries. Each battery contained 5 chickens, one chicken less, as compared to the battery carrying capacity.

The treatment group was composed of 482 heads while the control group was composed of 489. Each day, both groups of chickens were stressed for 10 minutes. The amount of feed consumed per day (morning and afternoon) was weighed before being fed to the chickens. All refusals were also weighed in both the experimental and control groups. The experiment was carried out for 18 days, with 8 days of lignin supplementation and 10 days of cumulative lignin effect. All eggs were harvested from chickens once a day (14:00) and categorized into different groups based on size. A special machine was used to sort eggs based on their weight, regarded as either "Extra–large", "Large", "Medium" or "Small". Ten eggs contents from each category were removed and the inner walls of shells were carefully cleaned using tissue paper (to absorb moisture). These tissues were subsequently weighed with an electronic scale, and content weights were then compared. Egg shells and chicken weights at the end of the 18-day experiment were not evaluated; therefore it will be done in the second phase of this experiment.

3 Results and Discussion

The chickens in the treatment group which were given a solution of Purified Lignin diluted in drinking water, showed low feed intake and also manifested high resistance to stress, produced larger eggs compared to those of the control group.

Five chickens died and samples taken at post-mortem were brought to the Central Veterinary Laboratory in Windhoek to determine the cause of death. Post-mortem observations and blood analysis indicated that no microorganisms were present in the intestinal gut content, a fact which may be attributed to the effect of lignin serving as a probiotic. It important to refer to experiments carried out on broiler chickens to which reveals that purified lignin has a potential to eliminate or kill pathogenic bacteria (Nelson et al., 1994; Newmann et al., 1994), but no further studies were conducted yet in the Namibian environmental conditions. The death of chickens was attributed to the infection of chickens by a mild strain of New castle Disease virus, probably contaminating the facility brought about by the previous unvaccinated chickens raised at this same facility.

These additional findings partially explain the increased head mortality in addition to the deaths attributed to the low fat depositions in the cloaca which resulted in difficult oviposition and eventual death. Other studies Mausse et al. (unpublished results, 2013), reveal a reduction of fat deposition on the skins of chickens fed with solution of purified lignin, a fact attributed to the insufficient lubrication of cloaca section thereby, impeding a smooth movement of eggs and difficult to release. The reduced level of fat deposition leading to inefficient lubrication of cloaca might also be an effect of excessive concentration of purified lignin diluted in drinking water availed to chickens, which may have triggered high levels of metabolic activities. These findings are in agreement with results by Pond et al. (2011) but are in disagreement with the findings of Baurhoo et al. (2007), on the use of excessive concentration of purified lignin in poultry diets.

It is important to observe that the control group of non-purified lignin fed chickens died more as compared to experimental group, a fact emphasizing the effect of lignin in controlling loads of microorganisms in chickens (Fernandez et al., 2002). Taking into account that contamination of chicken meat occurs through contact with cecum overloaded by microorganisms (Hooge et al., 2004), the use of lignin serving as an antibiotic without causing resistance in pathogenic agents, is recommended and more studies are required to ascertain this observation.

Experiments on the effect of lignin have started with the supplementation of 60 mg of lignin per live weight under Neudamm environmental conditions which are quite different from those in Russia and it can be related to over dosed lignin as compared to current environmental conditions of studies. The preliminary results in this study are in agreement with those found earlier by other researchers like (Gladkov et al. 2011), confirming that lignin (Lignohumate KD) has a high biological and economic efficiency both as a feed additive and an immune-modulator.

Future studies will be designed to establish the optimal doses of lignin to be administered to egg layer chickens under Namibian conditions by gradually increasing dosages which may lead to a reduced feed intake, resistance to stress, high egg quality, and production

of larger eggs. It is expected that the findings of this study will be of practical use for recommendations to poultry farmers in Namibia.

References

[1] Baurhoo B. Letellier A. and Ruiz-Feria C.A., (2007). Cecal population of *Lactobacili* and *Bifidobacteria* and *Escherichia coli* populations after in vivo *E.coli* challenge in birds fed diets with purified lignin or mannanoligosaccharides, McGill University, Quebec, Canada; paper presented.

[2] Bessarabov B.F, Melnikova I.I, Gontsova L.P.I.V Peppers, Kalinin Item and Dugin A.V. (RPA "RET") (2010). Application of Lignohumate in Poultry Farming, Methodical Recommendation, Federal Public Educational institution Russian Federation Moscow State Academy Of Veterinary Medicine and Biotechnology (named after K.I.Skryabin), Russia;

[3] Gladkov O.A., (2011). Life Soil Suppliers cc, Windhoek Namibia.

[4] A.E.T. Ltd, Saint-Petersburg, Russia. Lignohumate as forage additive. Available at `http://www.lignohumate.com/en/animal_industries/cow/`. Accessed on 14-04-2013.

[5] Lobastov A.E, Konopetsev I.G, Sapozhnikov A.F and Troegubov D.A (2010). Lignohumate test certificate, Directorate of the Stud Farm Federal State Unitary Enterprise, Russia.

[6] North, M.O and Maxwell D.D (1990). Commercial Chicken Production Manual, Van Nostrand Reinhold Co, New York, U.S.A.

[7] Pond W.G., Church D.C. and Pond K.R. (1995). Basic Animal Nutrition & Feeding, 2nd edition, Prentice Hall, Englewood Cliffs, New Jersey.

[8] Rugheimer S. (Laboratory Manager), (2012). Analytical Laboratory Services cc, Eros, Windhoek, Namibia.