



Effects of aqueous extract of Aloe vera leaves on performance, hematological and cecal histological parameters in commercial broiler chickens.

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ABSTRACT

The present study attempts to analyze the effects of Aloe vera aqueous extract on performance, hematological parameters and histological examination in broiler chicks. Fifty, one-day old, Avian 48 unsexed commercial broiler chickens were used on a completely randomized design in 2 groups each consisting of 25 broilers. The groups included the control group (basal diet) and the other group with basal diet and Aloe vera gel supplemented in the drinking water. The results obtained regarding performance of the broilers showed that Aloe vera gel group brought higher body weight gain and feed efficiency compared to the control group; however, significant difference was observed in mean body weight between the groups supplemented by Aloe vera gel and the control group ($P < 0.05$) and Aloe vera was better. Aloe vera resulted in the better hemoglobin concentration and red blood cells counts which were even significantly higher than the control group. The Aloe vera gel group had the largest cecal villus height and the greatest villus height to crypt depth ratio compared to the control group. Supplementation of Aloe vera extract in the water of chicks enhanced the gut health and gut development. Aloe vera, as an additive to broiler chicken feed, has a great potential for improving growth performance, hematological parameters, intestinal health, and immune system response.

Keywords: Aloe vera, broiler chickens, hematological, immune system

1. Introduction

Commercial poultry farming is one of the most flourishing industries in the world and it provides the cheapest source of animal proteins to human beings (Ahmad et al., 2011). Poultry meat is popular among Egyptian consumers across all income categories, because of its low cost compared to red meat and fish (El-Nagar & Ibrahim, 2016). The aim of the broiler industry is to produce as much chicken meat as possible in the shortest possible time and with the least possible expenditure of feed. With increasing demand of broiler meat consumption, efforts have been made to assure healthy food without health hazard to human being and better economic gains so the finding of natural replacer is worthy. Aloe vera is one of such plants, having a great medicinal potential (Ezeibekwe et al., 2009). Aloe vera is a succulent, stemless medicinal plant of the genus Aloe and belongs to the Liliaceae family with turgid lanced shaped leaves with jagged edges and sharp points (Qiao et al., 2013).

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Aloe vera is a succulent, stemless medicinal plant of the genus Aloe and belongs to the Liliaceae family with turgid lanced shaped leaves with jagged edges and sharp points (Qiao et al., 2013). Aloe barbadensis Miller (Aloe vera) considered the most biologically active (Bozzi et al., 2007). It found widely in India, China and Egypt, having more than 75 biologically active compounds. Application of Aloe vera dates back to distant past when it was used in traditional medicine (Christaki and Florou-Paneri, 2010; Ahlawat and Khatkar, 2011), and currently many countries use Aloe vera in manufacturing drugs, cosmetics, and food for human consumption (Eshun and He, 2004). Furthermore, farmers use Aloe vera to control and treat poultry diseases in rural areas (Mwale et al., 2005). Singh et al. (2013) concluded that Aloe vera has potential to be a growth promoter in broiler chicks and its growth promoting effects are comparable to that of antibiotic growth promoter (AGP). The most important part of Aloe vera is its leaf which is composed of two main sections: latex and gel (Boudreau and Beland, 2006). Its gel contains polysaccharides, minerals, phenolic compounds, proteins, sugars, vitamins, amino acids and saponins each with some pharmacological effects in different ailments (aysan et al., 2010&Tan et al., 2012) which give Aloe vera its antiseptic, anti-inflammatory and immune-modulator effects (Madan et al., 2008 and Moorthy et al., 2009), anti-oxidant effects (Christaki and Florou-Paneri, 2010), anti-parasitic properties (Waihenya et al., 2002). Aloe vera gel contains acemannan, which has been identified as the primary polysaccharide (Hamman 2008). Its polysaccharides are plant origin immunopotentiator (Sun et al., 2011& Zhang et al., 2011) and activate T cell mediated immunity (Strickland, 2001); however immune regulation pathways are not completely understood (Kim et al., 1998). Aloe vera carbohydrates showed also hematopoietic activities (Talmadge et al., 2004). The aim of the present study is to evaluate the effects of aqueous extract of Aloe vera gel (AG) on performance, hematological parameter and histological examination in commercial broiler chickens.

2. Materials and Methods

2.1. Experimental design

Fifty, healthy one-day old unsexed broiler (avian48) were purchased from Fat Hens Company, Tanta. Chicks were divided into 2 groups containing 25 birds each. Chicks obtained from a commercial hatchery at 1 day of age were fed on a well-balanced ration until the end of experiment for 35 days. Chicks were housed in clean well ventilated separate experimental rooms, previously fumigated with formalin and potassium permanganate. Birds were housed in floor – pen (0.1 m² / bird). Each room was provided by suitable numbers of feeders and water utensils. The birds were housed in a disinfected deep litter system with wood shavings being the bedding material. Ventilation was provided by negative pressure with fans. Heat was provided by gas-fired brooders. The ambient temperature in the experimental rooms was maintained at 32°C during the 1st week and gradually decreased by 3°C/week, and finally fixed at 22°C thereafter. Standard hygienic measures against infectious diseases were applied. Vaccination program was carried out using Hitchner B1 strain (Biovet

Egypt) at the 7th day of age and LaSota vaccine (Intervet Company) at 18th day against Newcastle disease was used in drinking water. Also, birds were vaccinated against Infectious Bursal Disease using (Gumboro, 228 and Intervet Company) at two weeks of age via drinking water.

2.2. The used ration

The Table (1) shows the basal corn-soybean meal diets used in this study that was formulated to meet or exceed requirements of broiler chicks as recommended by the National Research Council (NRC, 1994) for starter and grower broilers. Experimental chicks were fed a commercial broiler homemade starter ration and grower-finisher ration.

2.3. Plant materials

2.3.1 Preparation and dose of 10% Aloe Gel Infusion:-

Fresh Aloe leaves were collected for the extraction of gel. The Aloe gel was extracted from the fresh Aloe leaves manually by making a cut, using a pocket knife. Latex of the leaf was removed and gel was collected in a beaker. A 10% (w/v) concentrated infusion was prepared by taking 100 g of fresh gel in a glass bottle and one liter of hot boiled distilled water was poured on it. The bottle was shaken for 5-7 minutes to ensure thorough mixing and was then kept for 6-8 hours at room temperature prior to use as described previously by (Durrani et al., 2008). The Aloe extracts were stored for 6 days in a refrigerator at 4°C pending use to avoid oxidation, thereby maintaining the active ingredients in the liquid extracts. Aloe vera gel was given at a dose of 15 ml/liter in drinking water from 1 day old till the end of the experiment.

2.4. Efficacy parameters:-

2.4.1. Performance parameters:-

To determine the effects of Aloe vera on the feed intake, mean body weight, weight gain weekly. Two groups were weighed in the morning at 1, 7, 14, 21, 28 and 35 days of age, and daily feed consumption and daily weight gain were recorded. The daily feed given to each group of birds was weighed and the amount left in the feeders was also weighed the following day to determine the daily feed intake. Weekly, the birds were weighed individually. Mean weight gain and FCR for each group were determined as described by (Holdsworth et al., 2004).

The performance parameters were measured weekly and included:

• Body weight and body weight gain

The live body weight was determined weekly by weighing all chicks of all groups. The gain in body weight per week was calculated by subtracting the body weight between two successive weights

• Feed consumption (FC) and feed conversion ratio (FCR)

The feed consumption (FC) was calculated by dividing the amount of feed consumed in grams (by a certain group) during the week by the number of chicks of this group during the same week. Feed conversion ratio was calculated by dividing the amount of feed consumed in grams (by a chick) during the week by the weight gain in grams (of the same chick) during the same week

$$FCR = \frac{\text{Feed intake (g) bird/week}}{\text{Body weight gain (g) bird/week}}$$

2.4.2. Blood collection and analysis:-

Collection of blood for estimation of CBC:-

Blood samples were collected from 4 experimental birds of each group from the wing vein using a sterile syringe at 29 day old age and about 2 ml of blood were withdrawn and quickly added to vacutainer containing Ethylene Diamine Tetra Acetic Acid (EDTA). The sample bottle was shaken gently to mix up the blood with the EDTA to prevent clotting. For estimation of haematological parameters like Haemoglobin Concentration (HGB), Erythrocytic Count (RBCs), Mean Corpuscular Haemoglobin (MCH) and Mean Corpuscular Haemoglobin Concentration (MCHC).

2.4.3. Morphology and Histological examination

Neutral formalin solution (10%):

The solution was used to fix the collected tissue specimens. It was supplied by El-Gomhoria Co. for chemicals and laboratory supplies, Alexandria, Egypt.

Haematoxylin and Eosin (H & E) stain:

The stain was used for staining of the sectioned formalin- fixed, paraffin-embedded collected tissue specimens (Bancroft et al., 1996).

Samples:

Cecal tissue (4 cm) was collected from 4 experimental birds of each group, gently rinsed with phosphate-buffered saline (PBS) at pH 7.2, and then the specimens were preserved in 10% neutral buffered formalin for

histopathological examination. After proper fixation, the tissue specimens were trimmed, washed in running tap water, dehydrated in different ascending grades of ethyl alcohol, cleared in xylene and embedded in paraffin. The paraffin embedding block were sectioned at 5 µm thickness and stained with Hematoxyline and Eosin (H&E stain) according to the method described by Bancroft et al., (1996).

2.5. Statistical analysis:

All performance and blood parameters were determined by automatic vet CBC counter (sysme xt 2000 iv Corporation, KOBE, Japan) according to the manufacturer instructions. The mean and SE was calculated by T test (SPSS). Significant difference is indicated by (P < 0.05).

3. Results

3.1. Performance results:-

The best total body weight gain was obtained by Aloe vera in grp. A gave 2579.1g, followed by the blank control grp. B gave 2463.6g. There was good effect of Aloe vera on performance in the starter feeding phase period and improved the BWG (P < 0.05) of birds in the second and entire experimental period. Significant higher mean body weight was obtained by Aloe vera in grp. A gave 2630g followed by the blank control grp. B. As shown in Table (4), there was no difference in feed intake among the two groups in the entire experimental period but the feed intake of the chicks in group B was little higher than group A. Differences among the two groups regarding FCR were observed at 28 and days of 35 ages. At 28 days of age the best FCR was obtained by Aloe vera in grp. A gave 1.35 while grp. B gave 1.48. At 35 days of age the best FCR was obtained by Aloe vera in grp. A gave 1.55 while grp. B gave 1.58. There was good effect of Aloe vera on FCR. It was concluded that supplementation of Aloe vera with the drinking water of broiler chicks may improves the body growth.

3.2. Estimation of haematological parameter:-

3.2.1. Haemoglobin Concentration:-

Significant differences (P < 0.05) in Haemoglobin Concentration among the two groups were observed at 29 days of age. Better haemoglobin concentration was obtained by Aloe vera supplementation in grp. A gave 11.80±0.3 while grp. B gave 10.75±0.09.

3.2.2. Mean Corpuscular Hemoglobin (MCH) (Pg):-

Non-significant differences (P > 0.05) in mean corpuscular hemoglobin among the two groups were observed at 29 days of age. The mean corpuscular hemoglobin was numerically better obtained by Aloe vera supplementation in grp. A gave 46.65±2.97 while grp. B gave 41.78±0.80.

3.2.3. Mean Corpuscular Hemoglobin Concentration (MCHC) (g/dl):-

No significant differences in mean corpuscular hemoglobin concentration among two groups at 29 days of age. The mean corpuscular hemoglobin concentration was obtained by Group B (non-supplemented with Aloe vera) which was numerically higher non-significantly (P > 0.05) in its effect (36.05±0.03) without differences.

3.2.4. Red Blood Cells Count (RBCS) 1×10⁶ cells per Microliter (10⁶/UL):-

Significant differences (P < 0.05) in mean red blood cells count among two groups were observed at 29 days of age. The best red blood cells count was obtained by Aloe vera in grp. A gave 3.50±0.19 while grp. B gave 2.90±0.17.

3.3. Total and differential leukocytic counts at 29 old age:-

3.3.1. White Blood Cells Count (WBCS) (10³/UL):-

Non-significant differences (P > 0.05) in WBC among the two groups were observed at 29 days of age. The higher WBC was obtained by Aloe vera (2.40±0.10).

3.3.2. Lymphocyte (%)

Non-significant differences (P > 0.05) in lymphocyte percentage among the two groups were observed at 29 days of age. The lower value was in the group treated with Aloe vera in grp. A gave 87.4±0.38.

3.3.3. Monocyte percentage (%):-

Non-significant differences (P > 0.05) in monocyte percentage among the two groups were observed at 29 days of age. Aloe vera was numerically better in its effect (3.39±0.09).

3.3.4. Heterophils Percentage (%):-

There was non-significant differences (P > 0.05) in heterophils percentage among the two groups were observed at 29 days of age. The

lower heterophils percentage was obtained by Aloe vera supplementation in grp. A gave 3.50 ± 0.11 . Lower heterophil/lymphocytic ratio of grp. A suggested immuno-modulatory effect of the Aloe vera.

3.4. Histological examination:-

The histological examination of cecum of Aloe vera gel group had the largest villus height and the greatest villus height to crypt depth ratio compared to blank control G (B). Cecum of chicken of blank control group (GB) at 27 days old revealed normal cecal folds. Moreover, cecum of chicken of blank control group (GB) at 35 days old revealed normal condition of the epithelium and other layers of cecal wall.

4. Discussion

Regarding our results in this study it was shown that, Aloe vera was better than control group. Our results have provided evidence for the efficacy of Aloe vera and its effect on body performance. The obtained results on the efficacy of Aloe vera on body performance agreed with Bernard et al. (2016) and Nalge et al. (2017) who mentioned that Aloe vera gel extract in drinking water is more efficient in improving broiler performance than antibiotic growth promoter without any deleterious effect on the overall health status of the birds. Darabighane et al. (2011) mentioned that 2% Aloe vera gel groups brought (non-significantly different) higher body weight gain and feed intake than the antibiotic group (virginiamycin). Bolu et al. (2013) observed that the growth parameters, such as weight gain, feed conversion efficiency were significantly ($P < 0.05$) higher in poult given 30 ml/l Aloe vera gel. Fallah (2015) mentioned that broilers receiving 1.5% Aloe vera gel in drinking water + 1.5% garlic powder in diet had highest final body weight, feed intake and the lowest FCR. Also (Sinurat et al., 2002 and Akram et al., 2019) showed that Aloe vera supplementation for broilers increased the body weight gain, feed efficiency and decreased the feed intake as our work showed. This improvement was a result of reduction in feed intake without reducing the weight gain. But, (Mehala and Moorthy, 2008 and Hassanbeigy-Lakeh et al. (2012) supplemented broiler drinking water with Aloe vera gel (0.6, 1.2, 1.8, 2.4, and 3 ml per liter) and found that Aloe vera gel had no effect on feed intake over the total experiment period, and that the maximum body weight gain and the minimum FCR was observed after the use of 1.8 ml per liter Aloe vera gel group. The present observations were in conformity with the report of (Alemi et al., 2012; Khan et al., 2006; Odo et al., 2010 and Singh et al., 2017) who found that dietary supplementation of Aloe vera powder when used at 1.5% were more efficient than antibiotic growth promoter (Enramycin) in improving broiler performance and decreasing intestinal *Escherichia coli* and *Salmonella* species. Mmereole (2008) proposed that Aloe vera leaf powder (1%) can be used as a proper alternative for AGP (Teramycin). The anti-bacterial properties of Aloe vera can improve intestinal micro flora. Furthermore, the acemannan contained in Aloe vera stimulated immune system and improved body resistance against bacteria and viruses, thereby changing intestinal morphology and indirectly affects growth performance (Yang et al., 2009). The bitter Aloes consist of free anthraquinones and their derivatives like Aloe-emodin-9-anthrone, isobarbaloin, anthrone-C-glycosides, chromones and phenolic compounds. These compounds exert a powerful anti-oxidant and antimicrobial effects leading to better absorption of nutrients (Rajasekaran et al., 2005 and Arunkumar and Muthuselvam, 2009). Furthermore, Aloe vera has been found to contain several beneficial ingredients, including vitamins, minerals, organic acids, and carbohydrates (Boudreau and Beland, 2006) that could influence body weight gain in Aloe vera supplemented chickens. On the other hand, our results were not in accordance with Mohamed et al. (2017) who revealed that diets supplemented with Aloe vera leaves powder for 42 days had no significant effects on growth performance. Also we disagree with the results of Sinurat et al. (2002) and Mehala & Moorthy (2008) who mentioned that supplementation of whole Aloe vera leaves could not improve feed conversion in boilers. Amaechi and Iheanetu (2014) found that Enramycin gave a significantly better feed conversion ratio than Aloe vera powder. Also Darabighane et al. (2011) mentioned that 2% Aloe vera gel groups brought significant difference in feed conversion ratio between virginiamycin and Aloe vera in which antibiotic group was the best.

Regarding total erythrocytic counts, there was a significant difference in haemoglobin concentration and red blood cells counts among the two experimental groups was observed at 29 days of age. Aloe vera resulted in

the best haemoglobin concentration and red blood cells counts which were even significantly higher than the control group. No significant differences in mean corpuscular hemoglobin concentration among two groups were observed. Our results were in accordance with Singh et al. (2013) and Yadav et al. (2017) who reported that a significant increase in Hb and RBCs values in chicks supplemented with Aloe vera juice in drinking water was seen as compared to control groups. Mmereole (2008&2011); Mahdavi et al. (2012) and Yadav et al. (2017) reported that a significant increase in hematological values for MCHC and highest red blood cell count and MCH values were observed in Aloe vera supplemented birds compared with the control group. Talmadge et al. (2004) stated that Aloe vera carbohydrates showed hematopoietic stimulating activities. On the other hands our results were not in accordance with Tariq et al. (2014) who reported that Hb concentration was not affected by Aloe vera & clove supplementation in Japanese quails.

Monocytes, macrophages and dendritic cells are important hematopoietic cells that play critical roles in defense and in maintaining hemostasis (Iriazaary-Rovira, 2004). In our results, white blood cell was non-significantly increased in Aloe vera supplemented group (GA) when compared with blank control groups. Our results were in accordance with Valle – Paraso et al. (2005); Mmereole (2008&2011) and Mahdavi et al. (2012) who showed an increase in total white blood cell and lymphocytic count on days 37 and 52 for broilers that received 2% Aloe vera gel mixed with drinking water compared to the blank control group. Also Singh et al. (2013) and Yadav et al. (2017) reported that total leukocytic count increased in Aloe vera powder (0.5%) and Aloe vera juice (0.2% in drinking water) supplemented birds but was significantly. On the other hand, our results regarding the WBSs counts and lymphocyte % were in accordance with, Barman et al. (2019) who said that using of 0.5% Aloe vera powder caused non-significant difference in WBC and lymphocytic percentage compared with the control groups.

Regarding the histological examination, in our study the blank control group without Aloe vera supplementation revealed necrosis and degeneration of cecal folds associated with hyperplasia of its goblet cells while the other group supplemented with Aloe vera revealed normal cecal folds with largest height. Our results were in accordance with Darabighane et al. (2011) who mentioned that diet mixed with 2 % Aloe vera gel group had the largest villus height and the greatest villus height to crypt depth ratio compared to the antibiotic virginiamycin group. The results of our study are in agreement with the report of Homan et al. (2013), Kadhim et al. (2012) that longer villi are essential to animal development because it would result in an increased surface area for absorption of nutrients Moghaddam and Alizadeh-Ghamsari (2013). Accordingly, the significantly higher ratio of villus height: Crypt depth in the present study indicated that Aloe supplementation has made the gut environment free of microbial toxins. In addition, lower crypt depth with Aloe supplementation indicated for slow tissue turnover preventing the pathogens from tissue destruction in the gut (Ghazanfari et al., 2015).

5. Conclusion

Finally we can conclude that the supplementation of aqueous Aloe vera gel extract in drinking water could improve feed conversion ratio and increased body weight gain in boilers so Aloe vera improved the growth performance and also showed a hematopoietic stimulating activities. However, further studies are recommended to increase the concentration (m/v) of Aloe vera to levels beyond those used in this study and to determine the best form of the Aloe vera as it can be used for broilers in the form of gel, powder, ethanolic extract, and aqueous extract. . Also, further studies regarding Aloe vera should be applied to explain its effect on growth promotion and carcass characteristics.

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Fig. (1): Cecum of chicken of blank control group (GB) at 27- days' old age showing normal cecal folds. H&E stain, X 200.

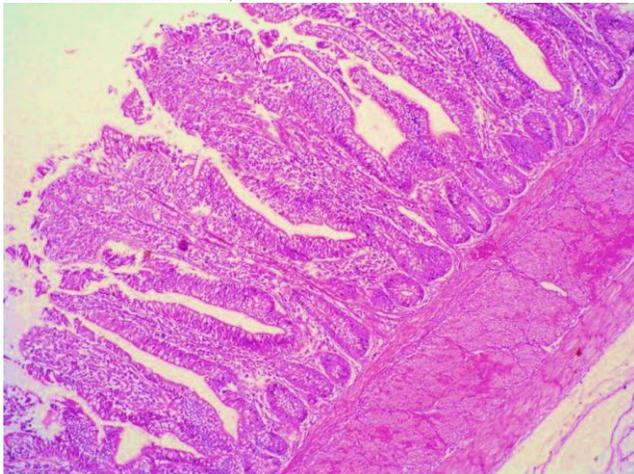


Fig. (2): Cecum of chicken of blank control group (GB) at 35 days old age showing normal condition of the epithelium and other layers of cecal wall. H&E stain, X 200.

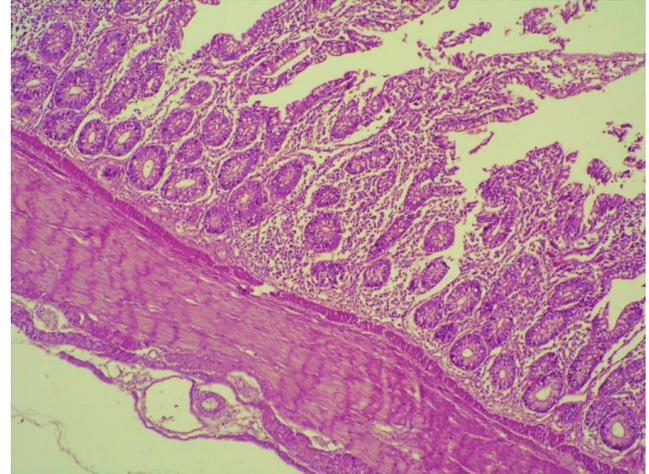


Fig. (3): Cecum of chicken supplemented with Aloe vera (GA) at 27 days old age showing normal cecal folds with largest height (black arrow). H&E stain, X 200.

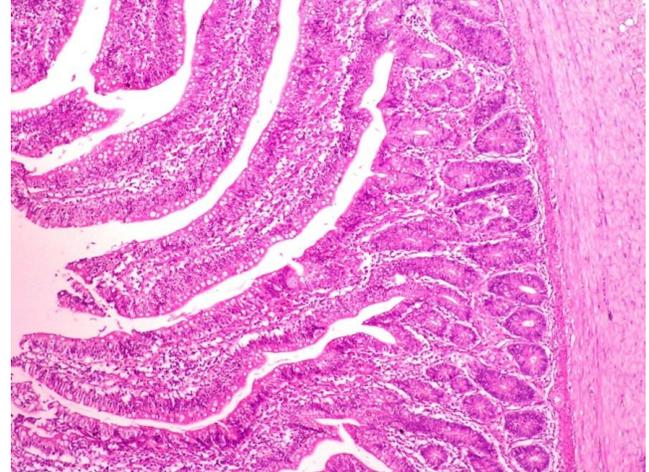
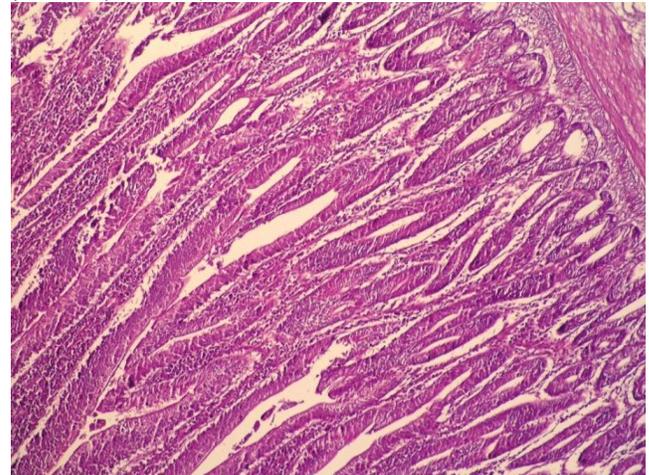


Fig. (4): Cecum of chicken supplemented with Aloe vera (GA) at 35 days old age showing normal cecal folds with largest villus height and normal sub mucosal glands (black arrow). H&E stain, X 200.



| Table (1):- physical composition of the ration used for feeding the experimental birds: | | |
|---|--------------------------|------------------------------|
| Ingredients (%) | starter diet (0-10 d) | Grower-finisher (11-35 d) |
| Yellow corn, ground | 57 | 60 |
| Soybean meal (44% CP) | 31.5 | 29 |
| Corn glutine meal | 5.1 | 3.3 |
| Dicalcium phosphate | 2.2 | 2.2 |
| Limestone, ground | 1.1 | 1.1 |
| Oil | 2.3 | 3.6 |
| Common salt | 0.45 | 0.40 |
| DL-methionine | 0.15 | 0.1 |
| L- Lysine | 0.11 | 0.1 |
| Permix | 0.3 | 0.3 |

Pfizer broiler premix: containing the following ingredients per kg of feed (vit. A;12000 IU, vit. D; 2000 IU, vit. E; 10 mg, folic acid; 1 mg, niacin; 20, mg, pantothenic acid; 10 mg, vit. K; 2 mg, vit. B1; 1 mg, vit. B2; 4 mg, vit. B6; 1.5 mg, vit. B12; 10 mg, biotin; 50 mg, iron; 30 mg, copper; 10 mg, zinc; 55 mg, manganese; 55 mg; iodine; 1 mg, selenium; 0.1 mg, choline chloride; 500 mg.

Table (2):- Chemical composition of the ration used for feeding the experimental birds:-

| Chemical composition | starter | Grower-finisher |
|-------------------------------------|---------|-----------------|
| metabolizable energy, ME (k cal/kg) | 3005 | 3145 |
| CP (%) | 21.5 | 19.5 |
| Ca (%) | 1.02 | 1.02 |
| Ph. (%) | 0.62 | 0.61 |
| Lys (%) | 1.12 | 1.12 |
| Na (%) | 1.9 | 1.7 |
| Linoleic acid% | 1.38 | 1.55 |
| Methionine% | 0.54 | 0.46 |

Table (4):- Mean body weights (g/bird), Mean Body Weight Gain, feed intake and FCR:-

| Grps Weeks | Mean Body Weight Gain (g) | | Mean Body Weight (g) | | Feed intake (g) | | FCR | |
|----------------------|---------------------------|--------|----------------------|------------|-----------------|--------|--------|--------|
| | G (A): | G (B): | G (A): | G (B): | G (A): | G (B): | G (A): | G (B): |
| 1 day old | - | - | 62 | 65 | - | - | - | - |
| 1 st week | 225.1 | 222.6 | 276 | 274 | 265.6 | 269.34 | 1.18 | 1.21 |
| 2 nd week | 239 | 229 | 515 | 503 | 332.2 | 327.47 | 1.39 | 1.43 |
| 3 rd week | 645 | 614 | 1160 | 1117 | 786.9 | 798.2 | 1.22 | 1.30 |
| 4 th week | 690 | 676 | 1850±17.80 | 1793±19.30 | 931.5 | 1000.4 | 1.35 | 1.48 |
| 5 th week | 780 | 722 | 2630±21.21** | 2515±44.44 | 1209 | 1140 | 1.55 | 1.58 |
| Total | 2579.1 | 2463.6 | - | - | 3525 | 3535 | - | - |

The values represent Mean ± SE. ** High significant differences (P < 0.05)

G (A): Supplemented with Aloe vera. G (B): Blank control.

Table (5):- Estimation of haematological parameter and total differential leukocytic counts at 29 day old:-

| Haematological parameter at 29 day old | | | Differential leukocytic counts at 29 day old | | |
|--|-------------|-------------|--|------------|------------|
| groups Parameters | G (A):** | G (B): | groups parameters | G (A): | G (B): |
| HGB(g/dl) | 11.80±0.3** | 10.75± 0.09 | WBCS (10 ³ / UL) | 2.40± 0.10 | 2.32± 0.06 |
| MCH(Pg) | 46.65±2.97 | 41.78± 0.80 | Lymphocyte (%) | 87.4±0.38 | 88.02±0.48 |
| MCHC(g/dl) | 35.53±2.61 | 36.05± 0.03 | Monocyte (%) | 3.39±0.09 | 3.25± 0.15 |
| RBCS (10 ⁶ / UL) | 3.50±0.19** | 2.90± 0.17 | Heterophils (%) | 3.50±0.11 | 3.75± 0.25 |

The values represent Mean ± SE. ** High significant differences (P < 0.05)

G (A): Supplemented with Aloe vera, G (B): Blank control, HGB:

Haemoglobin Concentration, RBCs: Red Blood Cells, MCH: Mean Corpuscular Hemoglobin,

MCHC: Mean Corpuscular Hemoglobin Concentration.