Effect of some Natural and Synthetic Antioxidant on growth performance and Fecal nitrogen of Broilers fed on low protein

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ABSTRACT

The objective of this study was to investigate the effects of using natural and synthetic antioxidants for improving growth performance, some blood parameters, manure characteristics and economical efficiency.

A total number of 300 Ross breed chicks, two day old, were weighted and randomly distributed into five groups each of sixty birds; each group has three replicates each replicates has 20 birds which were allocated in individual pin. The experiment was approved at the same time following similar design. Feed and water were provided ad labium.

The experimental groups were arranged as the following: T1: (positive control),commercial diet, received a 23% crude protein (CP), starter, and 19% CP (finisher), according to the breed requirements, without additives; T2: (negative control) received a 21% CP (starter) and 17% CP (finisher) without additives; T3: negative control + 15cm/L butylated hydroxyl toluene (BHT in drinking water ; T4: negative control + 30cm/L Pulicaria undulata extracte in drinking water .;T5 :negative control+30cm/L Deverra Tortuosa Extract .

Results showed that: increasing feed intake, body weight and body weight gain at group T5 at 35 days Also, group T5 at 35 days old was significantly ($P < 0.05$) the best feed conversion ratio (FCR) compared to T2 group. Group T5 at 35 days old was significantly ($P < 0.05$) the best values of total protein (TP), albumen (A), globulin (G), A/G ratio, total antioxidant capacity (TAC),glucose (Glu) and triglyceride TG. Also, T5 significantly ($P < 0.05$) achieved the best values of % nitrogen (N) reducing compared to positive control. From economical point of view, it can be concluded that negative control + 30cm/L Deverra Tortuosa Extract (T5) value for chicks could be recommended for releasing best results of performance.

Key words: pulicaria, Deverra, Nitrogen loss , Body weight gain , Economical Efficiency

الملخص

كان الهدف من هذه الدراسة هو تقييم تأثير استخدام مضادات الأكسدة الطبيعية والصناعية كأضافات الأعلاف منخفضة البروتين على أداء الأنتاج في دجاج اللاحم، والكيمياء الحيوية للدم و صفات الفضلات. والكفاءة الاقتصادية و اشتملت الدراسة على تجربة واحدة وتم اجرائها في وقت واحد بمزارع الدواجن التابعة لشركة الاخوه بمدينة السادات . وأجريت التحاليل والقياسات الكيميائية في مختبرات معهد الدراسات والبحوث

البيئية (ESRI). ومختبرات كلية الطب البيطري جامعة مدينة السادات .تم استخدام كتاكيت عمر يوم واحد بعدد 300 كتكوت ناتجة من قطيع سلالة روص تم تقسمها عشوائياً إلى خمس مجموعات كل مجموعة من 60 طائراً ؛ كل مجموعة مقسمة الي ثلاث مكررات بكل مكرر 20 طائرًا تم تسكينها في مكان منفصل . نفذت التجربة في نفس الوقت و بنفس التصميم لكن مع تغذية مختلفة ومياه شرب مختلفةحيثتم تغذية المجموعة الأولى (كنترول+) علي العليقة التجارية نسبة 23٪ بروتين (البادئ) و 19٪ بروتين (الناهي) بدون إضافات.. في حين أن المجموعة الثانية (كنترول-) تم تغذيتها علي عليقة بنسبة 21٪ بروتين (البادئ) و 17٪ بروتين (الناهي) بدون إضافات .وتم تغذية المجموعة الثالثةعلي عليقة تحتوي علي 21٪ بروتين (البادئ) و 17٪ بروتين (الناهي) بالأضافة الي BHT بنسب 15cm/L في مياه الشرب.وتم تغذية المجموعة الرابعةعلي عليقة تحتوي علي 21٪ بروتين (البادئ) و 17٪ بروتين (الناهي) بالأضافة الي مستخلص شاى الجبل pulicariaundulata extractبنسبة30cm/L(مستخلص) في مياه الشرب. وتم تغذية المجموعة الخامسةعلي عليقة تحتوي علي 21٪ بروتين (البادئ) و 17٪ بروتين (الناهي) بالأضافة DeverraTortuosa extract بنسبة 30cm/L (مستخلص) في مياه . حققت المجموعه الخامسه (عليقه منخفضة البروتين +30سم /لترdeverratortuoda مياه الشرب)افضل النتائج من حيث الوزن الحي و معدل الغذاء الماكول و الوزن المكتسب و قياسات الدم وكذلك نسبة النيتروجين المفقود في زرق الدجاج والكفاءه الاقتصاديه .بينما حققت المجموعه الثانيه (عليقه منخفضة البروتين بدون اضافات)المحتويه علي علائق منخفضة البروتين وبدون اضافات اسوأ النتائج من حيث الوزن الحيو معدل الغذاء الماكول و الوزن المكتسب و قياسات الدم وكذلك نسبة النيتروجين المفقود في زرق الدجاج والكفاءه الاقتصاديه

كلمات الدالة: مستخلص شاى الجبل- شبت الجبل- النيتروجين المفقود في زرق الدجاج- الكفاءه الاقتصاديه

INTRODUCTION

In developing countries, average daily protein intake in human diets is well below recommended standards.Poultry production is playing a major role to fill this gap. However, the poultry production in the tropics and developing countries has been challenged by the short age and high prices of poultry feeds which makes up to 60-80 %of the total production cost for broilers (Wilson and Beyer, 2000; Khatoon et al., 2016). Researchers have great interest in finding natural growth promoters to enhance poultry production and to reduce feed cost.

Plant products have been used for centuries by humans as food and to treat ailments. Natural medicinal products originating from herbs and spices have also been used as feed additives for farm animals (Guo, 2003).(Among the ingredients, protein supplements are very expensive; therefore, it is necessary to look for alternative sources available locally for use as a protein supplement in poultry feed.

The genus Pulicaria , which belongs to the family Asteraceae (tribe Inuleae), consists of more than 77 species found throughout the world. Members of this genus contain various bioactive compounds such as monoterpenes, flavonoids, acetylenes, isocomene, and sesquiterpene lactones .The leaves of Pulicaria inuloides areused to flavor foods and to make an herbal tea Biological actions reported for Pulicaria species include the antibacterial and antispasmodic activities of P. undulate, P. odora, and P. dysenterica [3]. In addition, members of this genus have been traditionally used to repel insects, to reduce influenza and common cold symptoms, and to treat back pain, intestinal disorders, and inflammation .(Nabil Qaid M Al-Hajj, *etal.,2014*)

The adaptation of Deverra to the arid environment in term of osmotic adjustment was documented in this study, it tended to accumulate certain compatible solutes to

reduce its internal osmotic potentials. These osmotically active metabolites include inorganic ions solutes (Ca2+, and SO42-), carbohydrates, soluble sugars, reducing sugars, and organic acids, which may act in osmotic adjustment, assist in turgor maintenance and help to enhance drought tolerance. Osmotic adjustment through the synthesis of soluble sugars, has been postulated to have a significant role in drought tolerance in Deverra, it seems to be the main active compounds in the osmotic potential. Since the estimated contributions of total soluble sugars to osmotic potential under stress conditions were 24.7% at Wadi Sudr and 30.4% at Wadi Um Ashtan and reached its maximum value of 35.9% at El-Alamein road. In conclusion, Deverra tortuosa depends on the accumulation of minerals, especially Ca2+ together with the organic solutes in its cytoplasmic osmoregulation to adapt to arid environments.(Taghried Mohammed El-Lamey., 2015)

2.MATERIALS AND METHODS:-

This study aimed to evaluate using natural and syntheyic antioxidant in low protein diets , these antioxidants used as dietry supplements, and compare the effect of these antioxidant on broiler performanc, blood chemistry ,manure , economical efficiency and histopathology. This experiment performed in the same time and same conditions in EL-Ekhwa company for poultry farming , analysis and chemical measurements in the laboratories of Sadat City in Environmental Sciences Institue(ESRI) .

We used broiler chicks (ROSS) strain in 1 day age , we used 300 chicks separated into five groups randomly ,every group separated into 3 replicates, every replicate has 20 chicks.Every group has 60 chicks , every group has its own place and own diet and drinking water (groups have the same design but different diet and drinking water).To determine the effect of using natural or synthetic antioxidants for improving growth performance, some blood constituents and economical efficiency, and decreasing the loss of nitrogen in broiler feces.

Performance parameters, hematological parameters, biochemical parameters, nitrogen feces , economical efficiency (EEf) are determined and histopathologicalparametres.A total number of 300 Ross breed chicks, one day old, were weighted and randomly distributed into five groups each of sixty birds; each group has three replicates each replicates has 20 birds which were allocated in individual pin. Butylated hydroxyl toluene (BHT) , pulicaria undulata exctract and deverratortuosa extract were added in drinking water at the levels (15cm/L ,30cm/L ,30cm/L) at straight with low crud protein diet (21% starter and 17%finisher), respectively compared to the normal crud protein (23% and 19%finisher), and compared also with (control-) is low protein diet without additives

Respectively at the starter (1- 21 d) and at the finisher (22- 35d) period. Birds received their diets to save the nutrient according to the NRC(1994).

Experimental design:

First group(control^{+}):- commercial diet(23% starter ,19% finisher) without aaditives .

Second group(control^{-}):- diet (21% protein in starter ,17% protein finisher) without additives.

Third group(T3):-diet (21% protein in starter ,17% protein finisher) +BHT(15 cm/L) in drinking water

Fourth group(T4):- diet (21% protein in starter ,17% protein finisher)+30cm/L *pulicariaundulata*exctract in drinking water.

Fifth group(T5):- diet (21% protein in starter ,17% protein finisher)+30cm/L *deverratortuosa*extract in drinking water .

Butylated Hydroxyl Toluene (BHT):

The BHT is an antioxidant that is added to prevent fats in feeds from becoming rancid. It is also added as dietry antioxidant to combat oxidative stress and improve broiler performance as well as meet quality BHT is soluable in water , and it was added 15cm/L during commercial standard drug. Acording to Saki.N, Arabaci.G and Akin.M(2013).

4.Statistical analysis.

The statistical analysis for the feeding trials were performed by using the general linear model (GLM) procedures according to SAS (2010) and significant mean differences between treatment means were
distinguished by Duncan's Multiple Range
Test (Duncan, 1955). All statements of significance were based on $P \leq 0.05$. The statistical model used in the experiment was as following:

$Y_{ij} = \mu + T_i + E_{ij}$ Where:

Y_{ij} = the individual observation.

μ = the overall mean.

T_i = treatment effect

E_{ij} = the experimental error

5-Result and Discussion

5.1.Growth performance:-

Results show that using (T5) recorded the best result comparing with other experiments (1.52%) and (T2) recoeded the worst result (2.17%). Natural antioxidants are stimulating increase growth performance, feed intake and therefore optimize feed utilization.

The health status of animals with a high growth performance is a predominant argument in the choice of feed additives. The use of feed additives is more and more questioned by the consumers.

Therefore, the feed industry is highly interested in valuable alternatives which could be accepted by the consumers. Probiotics, prebiotics, enzymes and highly available minerals as well as herbs can be seen as alternatives. Herbs, spices and their extracts (botanicals) have a wide range of activities. They can stimulate feed intake and endogenous secretions or have antimicrobial, coccidiostatic or anthelmintic activityA major field of application of herbs is the protection of animals and their products against oxidation.

5.2. Performance index , Economical Efficiency (EFf) and mortality rate:-

Results of performance Index (PI) % as affected by using natural or synthetic antioxidants in broiler chickens are presented in Table 3. Data exposed that PI was increased ($P \leq 0.05$) in chicks group T5, at 35 days old. With this regards, (Saki, et al., 2011) reported that the results of broilers index productions were significantly declined by fasting treatments rather than others at 21 and 42 days of age ($P \leq 0.05$).

Mortality% for a total experimental period (35 days) and performance Index as affected by using natural orsynthetic antioxidants in broiler chickens are offered in Table 3. Data denoted that T5 group recorded the best Mortality rate. Mortality rate was highly significantly affected by the feed type. Deverra Tortuosa extract reduced the mortality rate (1.2 %). Similar observation wasreported by Kopecky et al. (2012) for the diet added with organic acids.

Therefore ,Krishan and Narang (2014) found useful effects of essential oils contain improvement of enzyme secretion related to food digestion, desire stimulation and immune response activation.

Results of EFF as affected by using natural or synthetic antioxidants in broiler chickens are shown in the table below.

The economic efficiency values were calculated according to prevailing local market (selling) prices at the experimental time (2018).

Results showed an improvement in the average values of net revenue, economic efficiency, and relative economic efficiency due to using natural or synthetic antioxidants in broiler chickens feed compared to control group, which recorded the lowest values of net revenue and economic efficiency.

Also, chicks that fed with diet 21% CP starter and 17% CP finisher + 30cm/L deverra tortuosa extract (T5) recorded the highest value of economic efficiency(1.67) and relative economic efficiency(1.48%).

While, the lowest value of economic efficiency (0.8) and relative economic efficiency (100%) was obtained by broilers in positive control group (T1).These findings indicated that 30cm/L deverra tortuosa extract (low protein)tends to increase the net revenue.

Item	**Treatments**					**Sig**
	T1	**T2**	**T3**	**T4**	**T5**	
Mortality rate %	1.5^{c}**±0.3**	**3.6^{a}±0.3**	**2.1^{b}±0.3**	**1.8^{b}±0.3**	**1.2^{c}±0.3**	*
Performance Index	**137.1^{b}±5.8**	**79.1^{d}±5.8**	**98^{d} ±5.8**	**114.9^{c}±5.8**	**172.5^{a}±5.8**	*
European efficiency factor	**388.4^{ab} ±14.5**	**215.7^{c}±14.5**	**273.9^{bc} ±14.5**	**317.9^{b}±14.5**	**471.7^{a}±14.5**	*

5.3.Blood constituents:

Results of blood constituents at 35-d of age for a total experimental period (35days) as affected by using natural or synthetic antioxidants in broiler chickens are presented in Table 4. With the same trend, there is significant ($P \leq 0.05$) difference between chicks that fed natural or synthetic antioxidants in broiler chickens at age of 35 days.

Group T5 at35 days old was significantly ($P \leq 0.05$)the best values of TP, Al, GL, A/G, TL,TAC and Glu. While, the worst values showed on group T2. This would be expected founded on the fast metabolic exchange and excretion of EO from the body. It has been advised that birds fed EO have decreased concentrations of serum cholesterol and that the hypocholesterolemia effect of EO is due to compounds in EO that have the ability to prevent hepatic 3-hydroxy-3-methylglutaryl coenzyme A reeducates activity, a key regulatory enzyme in cholesterol synthesis **(Yu et al., 1994 and Case et al., 1995).**

Items	**HDL**	**TP(g/ dl).**	**AL.(g/ dl).**	**Gl. (g/ dl).**	**A/G ratio**	**TL. (mg/dl).**	**TAC(mg/dl)**	**GLU**

							.	
T1	**61.15^{a}±3.49**	**5.2^{a}±0.59**	**3.2^{a}±0.74**	**1.73^{a}±0.79**	**2.7^{a}±0.32**	**546.6^{a}±34.57**	**0.72^{ab}±0.12**	**256.25^{ab}±3.82**
T2	**63.41^{a}±3.49**	**4.41^{b}±0.59**	**4.41^{b}±0.74**	**1.38^{a}±0.79**	**2.1^{b}±0.32**	**351.5^{c}±34.57**	**0.52^{ab}±0.12**	**257.4^{ab}±3.82**
T3	**53.12^{ab}±3.49**	**5.42^{a}±0.59**	**2.9^{b}±0.74**	**1.76^{a}±0.79**	**2.3^{b}±0.32**	**491.2^{ab}±34.5**	**0.97^{ab}±0.12**	**259.2^{ab}±3.82**
T4	**47.23^{b}±3.49**	**5.55^{a}±0.59**	**3.77^{a}±0.74**	**1.85^{a}±0.79**	**2.84^{a}±0.32**	**457.1^{ab}±34.5**	**1.16^{a}±0.12**	**266.2^{a}±3.82**
T5	**48.95^{b}±3.49**	**5.7^{a}±0.59**	**3.96^{a}±0.74**	**1. 9^{a}±0.79**	**2.83^{a}±0.32**	**486.7^{ab}±34.5**	**1.2^{a}±0.12**	**267. 3^{a}±3.82**
Sig.	*	*	*	**N.S**	*	*	*	*

5.4.Manure Characteristics:

Results of manure characteristics at 35 days of age as affected by using natural or synthetic antioxidants in broiler chickens are presented in Table 5. Data indicated that T5 significantly ($P \leq 0.05$) achieved the best values of % N reducing being (2.3 %) compared to control and other experimental groups. While the worst values of % N reducing are presented on T3 being (2.7). When commercially available amino acids are used in diet formulation. Considerable research has been conducted to understand the precise requirements of pigs and poultry for each individual amino acid.

Feeding diets with high levels of feed-use amino acids results in performance similar to that of animals fed diets with intact protein sources. In addition, diet costs are reduced when feed-use amino acids are added to the diet when compared with intact protein sources.

Thus, feed-use amino acids allow producers to achieve similar animal performance, reduce feed cost, and reduce the environmental impact from nitrogen excretion. Reducing excess dietary protein reduces the amount of nitrogen excreted (Hartung and Phillips,1994). Cromwell and Coffey (1995) determined that reducing crude protein levels in the diet by 2 percentage points excretion by 35 % (Carter et al., 1998).

Items	**Treatments**	**si**

	T_1	T_2	T_3	T_4	T_5	g
Ash (%)	**22.1^{c}±0.6**	**21.1^{c}±0.6**	**26.5^{a}± 0.6**	**24.7^{b}± 0.6**	**24.7^{b}± 0.6**	*
Nitrogen (%)	**3.8^{a}±0.1**	**2.7^{c}±0.1**	**3.2^{b}±0.1**	**2.8^{b}±0.1**	**2.3^{d}±0.1**	*
Phosphors(mg/dl)	**67.1^{a}±1.5**	**62.2^{ab}± 1.5**	**60.1^{bc}± 1.5**	**53.6^{d}± 1.5**	**57.8^{c}± 1.5**	*
PH value	**8.9^{a}±0.1**	**7.1^{b}±0.1**	**7.1^{b}±0.1**	**6.5^{c}±0.1**	**5.7^{c}±0.1**	*
% N Reducing	**0**	**1.13**	**0.69**	**0.8**	**1.42**	
P Reducing (mg/dl)	**0**	**2**	**5.5**	**9.6**	**7.5**	

Conclusion

According to this study results show that *deverratortuosa* treatment has the best results in feed conversion ratio , body weight gain , blood parameters , Economical Efficiency and nitrogen loss in feces.

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