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EFFECT OF ADDING LIQUOR BIO-TONIC IN DRINKING WATER ON BROILER PERFORMANCE

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SUMMARY

One hundred and twenty Arbor Acers broiler chicks were used to study the effect of adding soluble Bio-Tonic (a mixture of herbal extracts) as growth promoter to drinking water on broiler performance, from one-day old up to 7 weeks of age.

The chicks were reared under the same management conditions and fed on starter-grower basal diets of about 21% CP and 2900 Kcal ME/Kg from 0-4 weeks of age. Then they were switched on finisher basal diets of about 17.5% CP and 3000 Kcal ME/Kg thereafter. At one-week of age, the chicks were distributed according to their weights into four groups of 30 chicks (3 replicatesX10 birds) and begin to receive the treated water in which Bio-Tonic was added at levels of 0.0 , 5 , 20 and 50 CC/L drinking water for control, T1, T2 and T3, respectively . Live body weight, feed consumption and mortality were recorded for calculating growth performance. At the end of the experiment, 9 birds from each treatment were taken for the determination carcass characteristics, tasting test and cetain serum constituents. The results showed that the best growth performance was obtained with 20 CC followed by 50 CC Bio-Tonic/L drinking water. Carcass characteristics (dressing, giblets & total edible parts) were not affected, but the flavor of broiler meat was markedly improved. Blood hematocrit and hemoglobin, and serum albumine, creatinine and transaminase (GOT) were significantly increased by increasing the level of Bio-Tonic in drinking water. The mean values of serum total proteins were insignificantly increased. Economically, the level of 5 CC/L recorded the best relative economic efficiency being 93.91% followed by the control being 100%, 20 CC/L being 100.43% and later 50 CC/L being 116.52%.

Keywords: Broiler, liquor Bio-Tonic, performance, carcass, flavor, serum constituents

INTRODUCTION

Livestocks regulate their intakes of feeds to mach, as far as the properties of feeds allowed, their requirements for energy, protein and the other certain nutrients (Overmann, 1976). On this basis, poultry could produce the expected production when their diets are satisfactory in all nutrient requirements.

In order to maximizing the efficiency of feed utilization for poultry many attempts were carried out to improve palatability, digestibility and absorbability of the offered diets. Pelleting, moisting with water and/or using some flavor additives in diets or

drinking water are such attempts (Petersen and Sauter, 1968; Soliman *et al.*, 1993; Abbas *et al.*, 1994 and Abdel-Malak *et al.*, 1995). The last few decades showed great attention for the use of some vegetables, herbs, edible plants and seeds as tonics and restoratives for livestocks. Moreover,such materials have antibacteriatic, antihelminthic and/or vermifuge effects that help in controlling diseases. Besids they may have some components which help in improving palatability, digestibility and/or absorbance of food and hence promote livestock performance (Boullos, 1983; Schragle and Muller, 1990; Best , 1994 and Abdel-Malak *et al.*, 1995).

Bio-Tonic, as one of feed additives, is a mixture of fermented and dried extracts of several herbs and edible plants in dried condensed corn distillers as a carrier (Abdel-Malak *et al.*, 1995). The present study aimed to assess the effect of adding different levels of Bio-Tonic (a mixture of herbal extracts) to drinking water on performance, carcass characteristics and certain serum constituents of commertial broilers raised under the Egyptian conditions.

MATERIALS AND METHODS

The experimental work was carried out at El-Kanater Poultry Farm, Animal Production Research Institute, A.R.C., Egypt, in winter, 1994.

A total of 120 Arbor Acers broiler chicks of one-day old were reared under the same management conditions in electric heated batteries in which artificial light was used along 24 hrs daily. They were fed on starter-grower basal diet of about 21% CP and 2900 Kcal ME/Kg from 0-4 weeks of age. Then they were switched on finisher basal diets of about 17.5% CP and 3000 Kcal ME/Kg from 5-7 weeks of age. The diets (Table 1) were adjusted to satisfy nutrient requirements of broilers according to NRC (1984). At one week of age, the chicks were distributed according to their weights into four groups of 30 chicks each (3 replicates X 10 birds). A liquor Bio-Tonic (Table 2) was obtained from Masaud Group Co., Cairo and was added to the drinking water at three levels of 5, 20 and 50 CC/L for T1, T2, and T3, respectively, while the control group was provided with plane water. Feed and water were provided daily *ad. lib.*. Live body weight (LBW), body weight gain (BWG), and feed consumption (FC) in grams were recorded to calculate feed efficiency (FE). Mortality was also recorded. An economic study was also carried out taken in consideration the cost of used Bio-Tonic.

At the end of the experiment (7 weeks of age), representative samples of 9 chicks from each treatment were slaughtered to determine carcass characteristics. Directly after slughter blood samples were taken for the determination of hematocrit (HT) and hemoglobin (HG),while serum total proteins, albumin, glubulin, glutamic oxaloacetic transaminase(GOT), glutamic pyruvic transaminase(GPT), creatinine and uric acid were determined as discribed by Abdel-Malak *et al.*,(1995). A flavor test was also carried out according to Price and Schweigert (1971) in which flavor score was judged on a 10 point scale from 10 (very acceptable) to 1 (very unacceptable). Five chicks from each treatment were cooked under similar conditions and were offered to 10 different persons to record the flavor score (each alone). The results were collected to calculate the average values of tasting test. The resulted data were statistically analyzed to evaluate the treatment effects using the general linear model program of SAS (1985).

Table 1. Experimental diets

Ingredient	Starter/grower diet %	Finisher diet %
Yellow corn	62.25	71.50
Soybean meal (44%)	24.00	24.25
Wheat bran	4.50	1.24
Fish meal (72%)	6.00	0.00
Bone meal	2.70	2.70
Vit. & Min. mixture*	0.30	0.25
D.L. Methionine	0.00	0.06
TOTAL	100.00	100.00
Calculated analysis:		
Crude protien%	21.41	17.40
ME (Kcal/Kg)	2900.00	2978.00
C / P ratio	135.00	171.00
Calcium %	1.03	0.89
Phosphorus(total) %	0.82	0.71
Methionine %	0.41	0.36
Lysine %	1.22	0.88
Meth. + Cyst.%	0.73	0.64

*Each 3 kg of vit.& min.premix for starter/grower diet contained: 2000 000 IU vit. A, 2200 000 IU vit. D3, 10 000 mg vit. E, 2000 mg vit. K3, 1000 gm vit. B1, 4000 mg vit. B2, 10 mg vit. B12, 10 mg vit. B12, 1500 mg vit. B6, 20000 mg niacin, 10000 mg pantothenic acid, 1000 mg folic acid, 50 mg biotin, 500 000 mg choline chloride, 10000 mg copper, 1000 mg idoin, 30000 mg iron, 50000 mg zinc, 55000 mg manganese and 100 mg selenium.

*Each 2.5 kg of vit. & min. premix for finisher diet contained : 12000 000 IU vit. A, 2000 000 IU vit. D3, 10000 mg vit. E, 2000 mg vit. K3, 1000 mg vit. B1, 4000 mg vit. B2, 1500 mg vit. B6, 10 mg vit. B12, 10000 mg pantothenic acid, 20000 mg niacin, 1000 mg folic acid, 50 mg biotin, 500 000 mg choline chloride, 10000 mg copper, 1000 mg iodine, 30000 mg iron, 55000 mg manganese, 55000 mg zinc and 100 mg selenium.

RESULTS AND DISCUSSION

Growth performance

The effect of adding Bio-Tonic to drinking water on the performance of Arbor Acers broiler chicks is presented in Table 3.

At 4 weeks of age, it was clearly noticed that the chicks that were drinking water added to it Bio-Tonic at level of(20 CC/L) attained significantly the heaviest LBW followed by those received (50 CC/L), (5 CC/L) and the control group. However, at 7 weeks of age no significant difference was observed between T3 and T1, while the control group attained significantly the lowest LBW.

All the chicks that received Bio-Tonic in drinking water showed significant increase in BWG from 5-7 weeks of age compared with the control.

The results of the overall experimental period (2-7 wks) showed that although the birds that received Bio-Tonic consumed significantly similar amounts of feed, nevertheless they surpassed the control in LBW, BWG and FE. This means that the Liquor Bio-Tonic in drinking water improved growth performance and feed efficiency with different degrees of success. The best results, however, were obtained with the birds of T2 followed by those of T3 and T1, respectively.

Table 2. Composition and chemical analysis of BioTonic*

Composition Ingredients	%	Chemical Analysis Proximate Analysis		%
Ferula Assafetida	0.01	Crude protein		27.00
Curcuma Longa	0.01	Ether extract		5.50
Citrullus Colocynthes	0.02	Nitrogen free extract		44.50
Prunse Viginiana	0.06	Crude fiber		8.10
Peganum Harmala	0.10	Ash		5.40
Plantago Ovata	0.10	Moisture		9.50
Punica Granatum	0.10	*Amino Acids Content*		
Cassia Fistula	0.10	Methionine		0.49
Zinziber Officinalis	0.20	Cystine		0.61
Glossostemon Brunguieri	0.20	Lysine		1.74
Sesame Oil	0.50	Tryptophan		0.19
Ceratonia Siliqua	0.50	Arginine		1.00
Foeniculum Vulgarae	0.60	Histidine		0.60
Pimpinella Anisum	0.80	Threonine		0.97
Carum Carve	0.80	Glycine		1.08
Acacia Nilotica	1.90	Phenyl alanine		0.86
Lactuca Sativa	1.00	Valine		1.38
Coriandrum Sativum	1.00	*Fatty acids content*		
Nigella Sativum	1.00	Caprylic	C 8:0	0.02
Cyperus Essulentes	1.00	Stearic + Oleic	C18:0 C18:1	3.07
Lepidium Sativum	1.00	Lauric	C12:0	0.08
Trigonella Faenum Graecum	2.00	Myristic	C14:0	0.07
Cicer Aritium	2.00	Palmitic	C16:0	0.80
Orchis Mascula	2.00	Linoleic	C18:2	0.02
Dried Condensed Corn Distillers (carrier)	83.00	Linolenic	C18:3	0.22
Total	*100*	Arachidonic	C20:4	0.05
		Mineral Content		
		Calcium		0.53
		Phosphorus		0.52
		Iron	PPM	150.00
		Copper	PPM	50.00
		Zinc	PPM	85.00
		Manganese	PPM	30.00
		Selenium	PPM	0.50
		Cobalt	PPM	0.10
		Choline	PPM	4200.00

*Abdel Malak et al (1995), on dry matter basis, while the carrier of the product used in the present study is corn distiller liquor.

It could therefore be postulated that, the digestive tract of the birds became more active in digestion and absorption and hence more efficient in feed utilization. One would speculate that the beneficial effect of Bio-Tonic is due to associative effect of

the materials in which it contained. This could be explained on the basis that, Bio-Tonic contains adequate levels of unsaturated fatty acids, minerals and trace elements and some amino acids.

The unsaturated fatty acids specially linoleic, linolenic and arachidonic acids are known to be essential for growth. Murray *et al.*,(1991) reported that linoleic (W6) or linolenic (W3) acids must be supplied in the diets to accomplish the synthesis of other members of W6 and W3 families of polyunsaturated fatty acids. The beneficial effect of Bio-Tonic might be due to the presence of fat soluble unidentified factors and vitamin F group (a mixture of unsaturated fatty acid including linoleic , linolenic and arachidonic acids) which have been determined essential for growth. Klatt (1986) showed that , dietary W3 fatty acids are the subject of current interest because they have been credited with a number of beneficial effects.

Minerals and trace elements, as it is known, are very necessary as co-factors in enzyme action. Earlier study by Dixon and Webb (1964) observed that, enzyme activity was often dependent on the presence of metal atoms, without which they were inactive. For example, carboxypeptidase contains zinc, leucine aminopeptidase requires manganese, and others specially require cobalt for their two activities.

Table 3. Effect of liquor Bio-Tonic in drinking water on broiler performanceand economic efficiency

Item	T1 control	T2 5CC/L	T3 20CC/L	T4 50CC/L
Initial LBW at 2 weeks(g)	100^{a}	99^{a}	101^{a}	99^{a}
LBW at 4 weeks(g)	631^{c}	658^{b}	687^{a}	661^{a}
LBW at 7 weeks(g)	1572^{c}	1679^{b}	1725^{a}	1701^{ab}
BWG from 2-4 weeks(g)	531^{d}	559^{c}	586^{a}	562^{b}
BWG from 5-7 weeks(g)	941^{b}	1021^{a}	1038^{a}	1040^{a}
BWG from 2-7 weeks(g)	1472^{c}	1580^{b}	1624^{a}	1602^{a}
FC from 2-4 weeks(g)	1368^{a}	1362^{a}	1367^{a}	1358^{a}
FC from 5-7 weeks(g)	2621^{a}	2547^{a}	2597^{a}	2596^{a}
FC from 2-7 weeks(g)	3989^{a}	3909^{a}	3964^{a}	3953^{a}
FE* from 2-4 weeks	0.388^{c}	0.410^{b}	0.429^{a}	0.414^{b}
FE from 5-7 weeks	0.359^{b}	0.401^{a}	0.400^{a}	0.401^{a}
FE from 2-7 weeks	0.369^{b}	0.404^{a}	0.410^{a}	0.405^{a}
Feed cost/Kg gain	2.30	2.16	2.31	2.68
Economic efficiency (EEF) **	0.972	1.091	0.941	0.641
Relative EEF*** (%)	100	93.91	100.43	116.52

* FE = Unit WG / unit FC. ** EEF = Net revenue (LE); *** REEF= Assuming the control equals 100, Except mortality and EEF means with different superscripts in the same row are significantly different ($P<0.05$).

Part of the beneficial effect of Bio-Tonic was due to its amino acids content specially those essential and limiting amino acids (i.e. lysine, methionine and cystine)

which were found in higher levels in Bio-Tonic (Abd-Malak *et al.*, 1995).

Schauenberg and Paris (1977) postulated that, Foeniculum Vulgariae, Nigella Sativa, Curcuma Longa and Pimpinella Anisum which are included in the composition of the Bio-Tonic had an appetizing effects.

Concerning the economic efficiency (EEF), it was observed that increasing the level of Bio-Tonic in drinking water followed by decrease in EEF since the best value was obtained with (5 CC/L) while the lowest one was obtained with (50 CC/L). Assuming EEF of the control equals 100, the relative EEF of 20 CC/L (the best treatment in chick performance) was nearly similar to that of the control. Therefore, from the practical standpoint of view, the level of 20 CC/L tended to be economically the preferable recommended level.

Carcass characteristics

The effect of adding soluble Bio-Tonic to drinking water on broiler carcass characteristics and tasting test are presented in Table 4. No significant differences were detected between all treatments in the percentages of either dressing, giblets or total edible parts.

The results of flavor test showed significant improvement for the flavor of the coocked meat of the treated birds than the control. It seemed likely that the favorable taste of the treated birds might be attributed to incorporation of polyunsaturated fatty acids, particularly W3 fatty acids, into tissues. In this respect, Cunnane *et al.* (1990) decided that the biological activities of W3 fatty acids depend upon their metabolism and upon their incorporation into tissue lipids. Furthermore, Palmer (1990) suggest that W3 fatty acids may affect muscle protein synthesis and protein deposition through a prostaglandin-dependent mechanism.

Some metabolic parameters in blood serum

Table 4 shows the blood and serum constituents of the control and the different experimental groups. It could be observed that, the chicks in which their drinking water supplemented with Liquor Bio-Tonic, as growth promoter, had higher significant effect on HT and HB than those of the control group. However, significant differences was observed between both 20, 50 CC/L and 5CC/L.

Dukes (1960) reported that, hemoglobin and hematocrit values were positively correlated. Moreover, hemoglobin increased when diet was adequate. In layer chicks, Soliman and Huston (1974) showed that the value of hematocrit was 29.8% for White Plymouth Rock, while Abdel-Moety *et al.* (1986) observed that, the hemoglobin value was 9.98 g/100 ml for Lohmann Selected Leghorn.

It is clearly seen from Table 4 that the serum albumin content increased, while it had no effect on the level of serum total proteins and globulin.

The results obtained in this study are in agreement with those reported by Meluzzi *et al.* (1992) who suggested that the limits for the total proteins and albumin in serum of broilers varied from 2.58 to 5.22 and from 1.17 to 2.74 g/100 ml., respectively, that could be used as indicators of metabolic and health condition of a poultry farm.

Concerning serum creatinine and uric acid, it is well known that, serum concenteration of creatinine is a better indicator of glomerular filteration rate (Enger and Blegen, 1964; Doolan *et al.*, 1962 and Goldman, 1954). The data obtained herein showed significant variations in serum creatinine content for treatments applied. It was evident that the lower level of serum creatinine (0.76 mg/100 ml) was found in

the serum of chicks received 50 CC/L in their drinking water. On the other hand, a slight decrease in serum uric acid content in chicks of the different treatments compared with the control group.

Table 4. Effect of liquor Bio-Tonic in drinking water on broiler carcass characteristics and some blood serum constituents.

Item	T1 control	T2 5CC/L	T3 20CC/L	T4 50CC/L
LBW at 7 weeks of age(g)	1590^{c}	1682^{b}	1730^{a}	1700^{ab}
Dressing weight (%)	64.52^{a}	65.33^{a}	65.59^{a}	63.60^{a}
Giblets weight (%)	6.44^{a}	6.33^{a}	6.15^{a}	6.13^{a}
Total edible parts (%)	70.96^{a}	71.65^{a}	71.75^{a}	69.76^{a}
Flavor test	7.80^{b}	9.00^{a}	9.40^{a}	9.60^{a}
Some blood serum constituents:				
Hematocrit (PCV) %	24.67^{c}	28.67^{b}	32.00^{a}	33.00^{a}
Hemoglobin (HB) %	8.24^{c}	10.26^{b}	11.72^{a}	11.42^{a}
Total protein gm/100 ml.	3.88^{a}	3.70^{a}	3.75^{a}	4.54^{a}
Albumin gm/100 ml.	1.47^{c}	1.40^{c}	1.70^{b}	2.10^{a}
Globulin gm/100 ml.	2.42^{a}	2.30^{a}	2.05^{a}	2.44^{a}
Creatinine mg/100 ml.	1.11^{b}	1.16^{b}	1.34^{a}	0.76^{c}
Uric acid mg/100 ml.	4.01^{a}	3.18^{a}	3.61^{a}	3.44^{a}
GOT units/ml.	93.00^{a}	74.67^{b}	66.33^{c}	69.67^{c}
GPT units/ml.	16.50^{a}	10.33^{a}	14.83^{a}	12.17^{a}

Means with different superscripts in the same row are significantly different ($P<0.05$).

Regarding to serum transaminases (Glutamic oxaloacetic transaminase and glutamic pyruvic transaminase; GOT and GPT), it was clearly noticed that, increasing the level of Liquor Bio-Tonic in drinking water resulted in significant decrease in GOT values, while such treatments did not affect GPT values.

Sherlock (1975) reported that, the increase in transaminases reflected the impairement of liver function.

It could be concluded that, Liquor Bio-Tonic when added to drinking water of broiler chicks had beneficial effects on their performance, improve meat flavor and increase certain blood serum constituents. From the econmic standpoint of veiw, the level of 20 CC Bio-Tonic/L drinking water is recommended.

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تأثير أستخدام البيوتينك المذاب فى ماء الشرب على الصفات الانتاجية لبدارى اللحم

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أستخدم فى هذة الدراسة ١٢٠ كتكوت (أربرايكرز) لدراسة تاثير اضافة البيوتينك السائل (مخلوط من مستخلصات الاعشاب) فى ماء الشرب على الصفات الانتاجية لدجاج التسمين.

تم تغذية الكتاكيت على عليقة بادئ ونامى بها ٢١٪ بروتين خام ، ٢٩٠٠ كيلو كالورى طاقة ممثلة/ كيلو جرام عليقة من عمر يوم وحتى ٤ اسابيع وبعد ذلك غذيت على عليقة ناهى بها ١٧,٥٪ بروتين خام ، ٣٠٠٠ كيلو كالورى طاقة ممثلة / كيلو جرام عليقة من الاسبوع الخامس وحتى نهاية الاسبوع السابع وتم تقسيم الكتاكيت تبعا لأوزانها الى اربعة مجاميع متساوية كل مجموعة بها ٣٠ كتكوت (٣ مكررات X ١٠ طيور) وتم إعطائها الماء المضاف الية البيوتينك السائل بمستويات صفر (مجموعة المقارنة) ، ٥سم٣ / لتر (المعاملة الأولى) ، ٢٠سم٣/ لتر (المعاملة الثانية) ، ٥٠ سم٣ / لتر (المعاملة الثالثة).

تم تسجيل وزن الجسم والغذاء المستهلك لحساب الصفات الخاصة بالنمو. وفى نهاية التجربة تم ذبح ٩ طيور من كل معاملة لتقدير صفات الذبيحة وعمل أختبار المذاق مع أخذ عينات دم لتقدير بعض مكوناته فى السيرم.

ويمكن تلخيص النتائج فى النقاط التالية:-

(١) كان أفضل اداء للنمو بأستخدام مستوى ٢٠سم٣/لتر من البيوتينك السائل المذاب فى ماء الشرب تبعه أستخدام مستوى ٥٠سم٣/لتر.

(٢) لم يؤثر استخدام البيوتينك السائل المذاب فى ماء الشرب بمعدل ٥٠سم٣/لتر على صفات الذبيحة ولكن كان له تاثيرا واضحا فى تحسين مذاق لحم الدجاج.

(٣) وجد تاثير أفضل بدرجة معنوية على كل من :

الهيماتوكريت – الهيموجلوبين – الكرياتينين – أنزيم GOT فى سيرم الدم بزيادة مستوى البيوتينك السائل المذاب فى ماء الشرب.

(٤) أزداد متوسط بروتينات الدم الكلية زيادة غير معنوية حتى مستوى ٥٠سم٣/لتر من البيوتينك السائل المذاب فى ماء الشرب.

(٥) سجل مستوى ٥سم٣/لتر أفضل كفاءه أقيصادية.