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A RAPID TWO WEEKS-EVALUATION OF VITAMIN C & B-COMPLEX, AND SODIUM CHLORIDE FOR HEAT-STRESSED BROILERS

(With 5 Tables & 4 Figures)

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مدى استجابة بدارى التسمين المجهده حرارياً لكل من فيتامين ج ، فيتامين ب المركب وكلوريد الصوديوم

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اجريت تجربتين لدراسة أثر كل من فيتامين ج وفيتامين ب المركب وكلوريد الصوديوم على بدارى التسمين المعرضه لدرجات حراره مرتفعه. لذلك تم تغذية كتاكيت تسمين من نوع الاربوايكر على عليقة تسمين تحتوى على ٤ر ٢١٪ بروتين خام و ٢٩٧٣ كيلوكالورى طاقه ممثله و ٩ر ٢٪ دهون و ١ر ٣٪ الياف. وعند بلوغ الكتاكيت عمر ٢٨ يوم تمت معاملتها فى كلتا التجربتين كالآتى: ١- **التجربه الأولى** : تمت الدراسه على عدد ٦٠ كتكوت قسمت الى اربع مجموعات (منها المجموعه الضابطه) وتحتوى كل منها على ١٥ كتكوت وقد تم وضع معامله لكل مجموعه فى مياه الشرب كالآتى: (١) فيتامين ج (٥ر٠ جم \لتر) ، (٢) كلوريد الصوديوم (٥ر٠ جم \لتر) ، (٣) فيتامين ب المركب (١ جم \لتر). وقد كانت درجة الحراره المحيطه بالكتاكيت ٣٨ درجه مئويه خلال ساعات النهار و ٣٥ درجه مئويه خلال الليل. وعند مقارنة المجموعات المعامله مع المجموعه الضابطه وجد تحسن فى وزن الجسم بمقدار ١٠٪ ، ٨ ر٨٪ فى حالة استخدام كل من فيتامين ج وكلوريد الصوديوم على التوالى. ٢- **التجربه الثانيه:** فقد تم اجراؤها فى احد المزارع حتى تتضح أثر الاضافات السابقه عند استخدام اعداد كبيره من الكتاكيت وأيضاً مدى فعاليته فى التطبيق العملى. وقد تمت على عدد ٤٠٠٠ كتكوت قسمت إلى أربع مجموعات (١٠٠٠ كتكوت \ مجموعه). اختلفت هذه التجربه عن الأولى فى اضافة فيتامين ج إلى العليقه (٢٠٠ مجم \كجم) وليس إلى الماء وقد تراوحت درجة الحراره المحيطه بالكاكيت ٣٥ - ٣٩ درجه مئويه. وعند مقارنة المجموعات المعامله مع الضابطه وجد تحسن فى وزن الجسم بمقدار ٨ ر٦٪ ، ٥ ر٥٪ مع كل من فيتامين ج وكلوريد الصوديوم ، كما وجد أن الفيتامينات وكلوريد الصوديوم تعمل على تقليل نسبة النفوق الناتج عن الاجهاد الحرارى. وقد خلصت التجربتين إلى ان اضافة فيتامين ج إلى ماء الشرب أو عليقة بدارى التسمين وكذلك كلوريد الصوديوم له فعاليه واضحه فى التقليل من الآثر الضار للاجهاد الحرارى عليها.

SUMMARY

Two experiments were conducted to determine the efficacy of Vit. C, Vit.B-complex and sodium chloride treatments for heat-stressed Arbor acres chickens. The birds were given access to water and commercial diet containing 21.4% protein , 2973 (Kcal/Kg diet) metabolizable energy, 2.9% fat and 3.1% fibre. At the age of 28 days, the birds in the two experiments were subjected to the different treatments. In the first experiment, the birds were subjected to drinking water supplemented with vit.C (0.5g/litre), vit B-complex (1g/litre) and sodium chloride (0.5g/litre) and maintained at a constant temperature of 38°C at day time and 35°C at night. In comparison with control, body weight was improved by 10%, 8.8% with vit.C and sodium chloride treatments ($p< 0.05$) respectively. The trial then repeated on large scale (field trial) in which the birds were subjected to the same drinking water supplementation of vit.B-complex and sodium chloride, while vit.C was added to the diet (200 mg/kg diet). The birds were exposed to an ambient temperature ranging from 35-39°C. Body weight was improved by 6.8% with vit.C ($p< 0.05$) and 5.5% with sodium chloride. Vitamins and sodium chlroride reduced mortality related to heat-stress. It could be concluded that Vit.C supplementation either in drinking water or in the diet and sodium chloride are beneficial for heat-stressed broilers.

Keywords: *Vit.C & B- Nacl - heat - broilers.*

INTRODUCTION

Heat-stress inferior performance and mortality due to the elevation of environmenttal temperatture in summer is very costly to all sectors of poultry industry. Because of the economic effects of reduced growth rates resulting from chronic heat exposure and death losses resulting from acute heat exposure, there is an interest in alleviting these effects through supplementation of drinking water or diets of poultry by electrolytes and/or vitamins. Early reports suggested that endogenous ascorbic acid (AA) synthesis is inadequate in acute heat episode. Supplemental AA has been reported to improve heat resistance and reduce mortality associated with elevated ambient temperaures in chickens *(ATTIA, 1976; PARDUE et al., 1984)*. In addition, *FERKET & QURESHI (1992)* recorded tha the vitamin treatment (A,D,E,K,B-complex) increased body weight gain by 3%, improved feed conversion by 10% and improved livability by 5% for heat stressed broilers.

Broilers receiving vitamin supplements in their drinking water had higher body weight, better feed consumption and greater livability throughout the heat stress period *(FERKET, 1990)*. Performance characteristics and immune

function of heat-stressed poultry have been shown to be improved significantly by increased fortificaion of vi.C *(PARDUE & THAXTON, 1984; PARDUE et al., 1985),* vit.E *(EL-BOUSHY, 1988)* and pyridoxin *(BLALOCK et al., 1984).*

Growth improvement of poultry at high temperature have been reported by *TEETER (1988)* with any one of a range of electrolytes (NH4cl, Kcl, Nacl, K2So4) added to the drinking water. At high ambient temperatures, increased respiration associated with the control of heat loss from body alters the acid base balance through the development of respiratory alkalosis. So, most of the research literaure directed toward changing the dietary electrolyte balance to overcome the respiratory alkalosis as a possible means of improving the performance of heat-stressed broilers.

The present study was designed to more clearly delineate the performance of heat-stressed broilers when their diet or water are supplemented either vitamins or electrolytes.

MATERIAL and METHODS

Two eperiments were conducted using 28 day old Arbor Acres chicks reared during the summer months (July-August). The first eperiment (Exp.trial) was carried as a piolet using a limited number of birds, while, the second one (Field trial) was considered as an applied field trial.

I- ***The experimental trial:***

One-day old Arbor Acres chicks were reared in an experimental room on litter floor and fed a commercial diet (Table, 1). At 28 days old, the experimental room was subdivided into four parts containing 15 birds/each and providing 0.1m2 floor space/ bird. Each group was assigned to one of four experimental water treatments: (1) Unsupplemented water (control), (2) Vit. C, (pure ascorbic acid, 0.5g/litre); (3) Sodium chloride, (0.5g/litre); (4)B-complex vitamin, (1g/litre).

All birds were provided ad libitum access to feed trough to 42 days of age and subjected to the water treatment from 28-42 days of age. The birds were exposed to 38°C ambient temperature during day time and 35°C through night along the experimental period and this temperature had been tried to keep constant through the experimental period by using artificial heating when the temperature had been decreased.

II- ***The field trial:***

This trial was performed on Rifa farm at Assiut Province. Four thausand Arbor Acres broilers of 28 days age were randomly assigned to four pens each of 1000 birds with 100 m2 floor space. The birds were fed

the same diet used in the experimental trial and subjected to the same treatments for vit.B and sodium chloride, while vit.C was supplemented in the diet in a coated form (Rovimix, coated ascorbic acid 20%, 200 mg/kg diet). This particular form of ascorbic acid was chemically stabilized to retard oxidation. The environmental temperature was recorded and it was averaged 38-40°C during day time and 35-37°C through night.

Birds were subjected to 24h lighting, and the feeding was ad-libitum during the experimental period which extended for 2 weeks. Mean body weights, feed consumption and feed conversion were determined at 28, 35 & 42 days of age and mortality was monitored daily in each experiment. All data were analysed statistically using Student-test.

RESULTS

The obtained results were summarized in tables (2-5) and figures (1-4).

DISCUSSION

Table (2) & Fig.(1) show the different responses of broilers to each of vit.C, common salt and B-complex vitamin supplementation of drinking water. In comparison with the control group, body weight was improved by 10%, 8.8% & 4.8% in case of supplementation of drinking water with vit.C, common salt and B-complex vitamin respectively.

The results clearly show the advantage of supplementing the drinking water of broilers with either vit.C or sodium chloride with the superiority of vit.C. The results came in agreement with the finding of *KAFRI & CHERRY, 1984 and PARDUE et al., 1985.* The same performance of broiler chicks has been obtained with high levels of vit.C (3000mg/kg diet) by *DORR & BALLOUN, 1976 and PARDUE et al., 1985* (1000mg/kg diet). The response to AA supplementation may be attributed to metabolic changes as cited by *AHMAD et al. (1967).*

On the other hand, the benefical response to sodium chloride at high temperature have been associated with a much greater intake of water (table 3&fig.3). *SMITH & TEETER (1987) and TEETER (1988)* have reported similar increase in water intake of broilers at high temperature by addition of various electrolytes (NaHco3, Nacl) to drinking water as these electrolytes acting as a heat sink, thereby, reducing body temperature. *HURWTZET et al. (1973) and MITCHELL & SIEGEL (1973)* found that, the blood electrolyte balance and Na:Cl ratios in chicken are altered during heat stress.

Results of the field trial are illustrated in tables (4&5) and fig. (2&3). The great response to vit.C supplementation was observed at 42 days only, while at 35 days, sodium chloride supplementation recorded prevalent response. This may be attributed to the supplementation of vit.C to the diet as recorded

by *FERKET (1990)* that drinking water is the excellent way to ensure that poultry consume enough vitamins during very hot weather because water intake goes up as the temperature goes up.

Table (5) also shows that, heat associated mortality was reduced in the treated groups compared to the control one. Similar results have been obtained by *PARDUE et al. (1985)* in a field trial by using high level of vit.C (500&1000 mg) when 4-week old broiler chicks were exposed to 38.8°C on two consecutive days. When the birds are subjected to heat stress condition, the endogenous synthetic capacity of Vit.C can be exceeded by metabolic demand and the results may be decreased performance coupled with increased mortality *(PARDUE & THAXTON, 1986).*

In this study, only one level of each supplementation was used. Further studies on Dose-response will clarify the effect of individual supplementation.

In conclusion, the limilted data presently available indicate that, growth rate and feed intake of broiler chickens at high temperature can be improved by supplementing the drinking water vit.C or sodium chloride. Diet fortified with vit.C is also promising.

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Table(1):The physical and chemical composition of the diet used in the experimental & field trials.

Ingredients	%
1-Physical composition:	
Yellow corn,ground	66.6
Soybean meal	23.4
Broiler concentrate*	10.0
2-Chemical composition:#	
Protein (%)	21.36
Metabolizable energy (Kcal/Kg)	2973
C/p ratio	139.18
Fat (%)	2.9
Fibre (%)	3.1

*Broiler conc.(Muvco) 52% protein,2200 Kcal metabolizable energy : Meat meal(60%),50.7 ;fish meal(72%),25 ;corn gluten (60%),6 ; calcium carbonate ,7.675; dicalcium phosphate ,5.6 ;sodium chloride,3.025 ;DL-methionine,0.65; choline chloride ,0.5; Min.mix.,0.25 ;Vit.mix. ,0.15 ;L-lysine ,0.2 ;anti-coccidial drug ,0.25.

#Calculated .

Table (2):Body weight response to different supplementations of drinking water in the experimental trial (g/bird).

Days	Groups			
	Control	Vit.C	Common salt	B-complex vit.
28	950±6.67	957±16.60	964±16.41	956±11.76
35	1200±24.68	1286±41.53	1269±15.52*	1230±28.75
42	1575±44.43	1733±55.88*	1713±32.38*	1650±30.72*

* Significant at P<0.05.

Table (3):Feed conversion index and water consumption of the different groups in the experimental trial.

Item	Groups			
	Control	Vit.C	Common salt	B-complex vit.
Feed intake(g/bird)	1841	1967	1820	1890
Weight gain(g/bird)	625	776	749	694
Feed conversion	2.95	2.53	2.43	2.72
Water consumption(ml/bird)	4142	4917	5223	4536

Table (4):Body weight response to the different supplementations in the field trial (g/bird).

Days	Groups			
	Control	Vit.C	Common salt	B-complex vit.
28	880±24.08	870±17.10	865±12.04	860±10.49
35	1200±23.93	1235±16.28	1275±14.92	1240±10.00
42	1545±22.47	1650±16.12*	1630±26.88	1580±28.50

*Significant at P<0.05.

Table (5):Feed conversion index,water consumption and mortality percent in the field trial groups.

Item	Groups			
	Control	Vit.C	Common salt	B-complex vit.
Feed intake(g/bird)	1820	1736	1897	1792
Weight gain(g/bird)	665	780	765	720
Feed conversion	2.74	2.23	2.48	2.49
Water consumption(ml/bird)	4186	3906	5122	4301
Mortality (%)	2.1	1.2	1.6	1.9

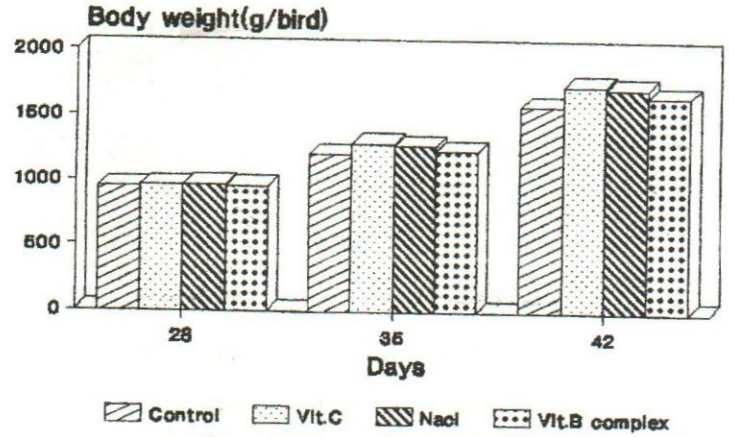

Fig.(1):Body weight development of the chicks in the experimental trial

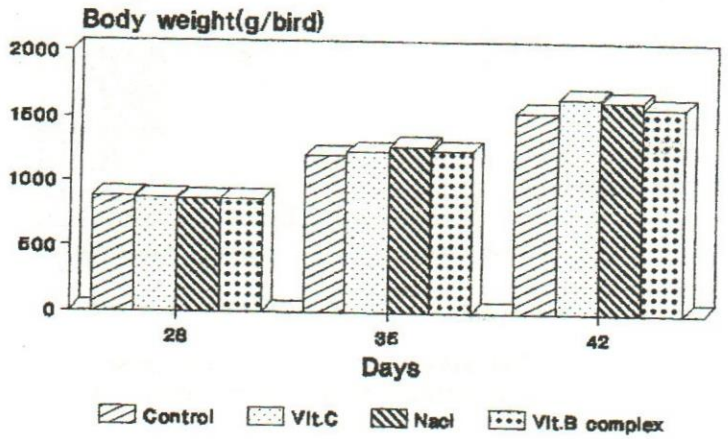

Fig.(2):Body weight development of the chicks in the field trial.

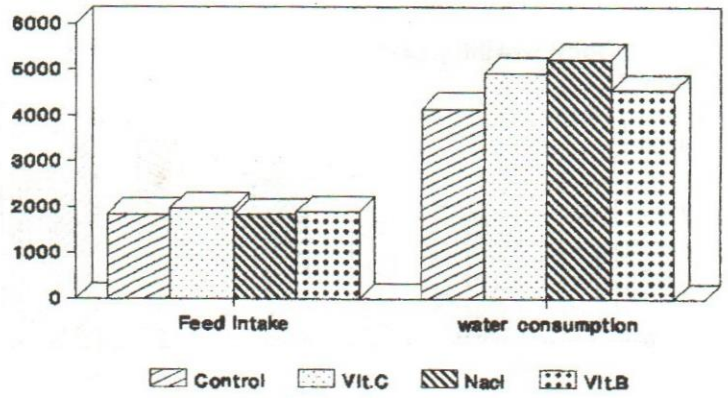

Fig.(3):Feed intake(g/bird)and water consumption(ml/bird)of the chicks in the experimental trial.

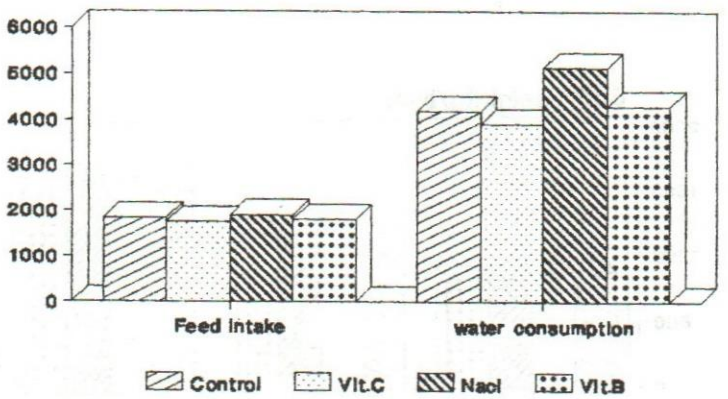

Fig.(4):Feed intake(g/bird)and water consumption(ml/bird)of the chicks in the field trial.