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EFFECT OF DIETARY VITAMIN "C" AND PROTEIN LEVELS ON BROILER PERFORMANCE IN SUMMER SEASON.

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SUMMARY

The experiment was conducted to examine the effect of dietary vitamin "C" supplementation at varying protein levels on performance and carcass characteristics of broiler chicks subjected to heat stress in summer season. During the starter period (0-4 wks) nine starter rations with three protein levels (17, 20 and 23%) were tested, while during the finisher one (5-8 wks) another nine rations with three protein levels (16, 18 and 20%) were formulated, each fed in combination with three vitamin "C" levels (0, 200 and 400 mg/ kg) in a factorial experiment, involving 135 broiler chicks. All diets were kept isocaloric with a metabolizable energy (3200 kcal/ kg diet). The following results were obtained:

1. Weight gain, feed efficiency and protein efficiency ratio during the starter period (0-4 wks) improved with increasing of protein but feed intake was not affected by protein levels.
2. Vitamin "C" supplementation significantly improved feed intake and feed efficiency but had no effect on weight gain.
3. Vitamin "C" by protein interaction effect was evident at all parameters measured.
4. Increased mortality due to heat stress was totally alleviated by addition of vitamin "C" 200 mg/ kg diet.
5. Weight gain feed intake and feed efficiency during the finisher period, were not significantly affected by protein or vitamin "C" levels.
6. Significant interaction effect between Vitamin "C" and protein on weight gains and feed efficiency was indicated.
7. Increased mortality due to heat stress was totally alleviated by addition of vitamin "C" 200 mg/ kg diet.
8. Maximum carcass yield was obtained with 20% protein diet supplementation with 200 mg/ kg vitamin "C".
9. Vitamin "C" supplementation at both levels decreased the percentage meat yield and increased bone mass of carcass, while Increased protein to 20% decreased the percentage meat yield.

Keywords: *broiler, vit. C, dietary protein, summer season, growth performance.*

INTRODUCTION

Sudan is a country, which lies with the tropics and characterized by a very hot summer season. Temperature of 35 °C (95 °F) and above are usually recorded during the day, starting in March and extending through July The deleterious effect of hot summer in broilers is invariably accompanied by a decline in feed consumption (energy intake), growth rate and survivability. This is considered a major improvement in weight gain or survival should have a positive economic impact (Cerniglia *et al.*,., 1978).

Several attempts were made to combat the adverse effects of heat stress on broiler chickens performance. Changes in the management practices or the summer feeding program proved to be beneficial cooling, modifying the lighting, program of adequate feed-space or lower housing density, were all employed to reduce heat stress (Pardue *et al.*,., 1985 a).

There has been a developing interest in use of vitamin "C" to overcome some of the deleterious effects of acute stress responses in birds. Vitamin "C" synthesis in stressed birds seems to be sufficient to alleviate many detrimental effects associated with stress (Henery and Fuller 1979). Therefore, supplemental ascorbic acid is considered a successful management practice to overcome heat stress affects. Ascorbic acid supplementation is made either via the drinking water, or to the diet.

Feeding of lower protein diets would result in arise in heat increment due to the efficiency of conversation of dietary energy to net energy of production (Njoku 1986). Inefficiency can also result from feeding of protein levels in excess of the requirement. The present experiment was designed to investigate the combination effect of three vitamin "C" (0, 200 and 400 mg/ kg) with (17, 20, and 23% protein) during the starter period (0-4 wks) and (16, 18, and 20% protein) during the finisher one (5-8 wks), on broiler performance and carcass characteristics.

MATERIALS AND METHODS

1 - Experimental chicks:

Day old unsexed, Lohmann broiler chicks from summer hatch were used. A total of 135 chicks were purchased from a commercial hatchery. On arrival, all chicks were fed a practical commercial starter diet for one day as an adaptation period. On day two post hatching, the chicks were divided into groups based on body weight. Nine treatments, three replicates and five birds in each pen. The average of five chicks in each pen was approximately the same.

2 - Housing management and experimental rations:

The experiment was carried in an open system oriented house, which was located in an east west direction to avoid solar radiation. Before the commencement of the experiments, the house was cleaned and disinfected. Dry wood shavings were used as a litter material with a depth of approximately 6 cm. A total of 27 pens measuring 1sqm area. Through the experiment period, light was provided for 24 hrs (sun light and artificial one at night). Immediately after hatching chicks were vaccinated.

The temperature and humidity were recorded twice daily. Feed and water were provided adlibitum. Rations formulated with varying levels of protein and vitamin "C". (Tables 1and 2). The control starter/ finisher diet containing 23/ 20% crude protein and no supplemented vitamin "C". Diets containing low levels of protein were supplemented with lysine and methionine to meet the NRC requirements. All diets were isocaloric (3200 kcal ME/ kg diet).

Table (1): Percent composition of the starter and finisher experimental diets.

Item	Starter diet (0-4 wks)									Finisher diet (5-8 wks)								
	0 mg/ kg			200 mg/ kg			400 mg/ kg			0 mg/ kg			200 mg/ kg			400 mg/ kg		
	17%	20%	23%	17%	20%	23%	17%	20%	23%	16%	18%	20%	16%	18%	20%	16%	18%	20%
Sorghum	66.5	63.12	60.7	7.35	63.78	63.3	67.35	63.78	63.2	67.10	67.5	63.3	67.5	68.7	63.7	68.9	67.5	63.7
Wheat bran	15.0	12.0	4.2	15.0	12.0	4.2	15.0	12.0	4.2	17.00	15.0	12.0	15.0	17.0	12.0	17.0	15.0	12.0
Sesame cake	5.0	11.7	16.2	5.0	11.7	16.2	5.0	11.7	16.2	5.0	7.00	11.7	7.0	5.0	11.7	5.0	7.0	11.7
Fish meal	9.0	10.9	16.0	9.0	10.9	16.0	9.0	10.9	16.0	5.5	8.03	10.9	8.9	5.5	10.9	5.5	8.9	10.9
Lysine	0.6	0.6	0.4	---	---	---	---	---	---	0.60	0.60	0.40	---	---	---	---	---	---
Methionine	0.6	0.6	0.4	---	---	---	---	---	---	0.07	0.03	0.03	---	---	---	---	---	---
Sesame oil	2.2	1.42	2.2	2.18	1.4	---	2.16	1.38	1.0	2.5	1.3	1.42	1.28	1.28	2.5	1.4	2.5	1.26
Di ca po	1.2	---	---	1.2	---	---	1.2	---	---	0.03	0.27	---	---	---	---	0.30	---	---
Vitamin "C"				0.2	0.2	0.2	0.4	0.4	0.4	0	0	0	0.02	0.2	0.2	0.4	0.4	0.4
Salt	0.2	0.2	0.24	0.25	0.2	0.28	0.25	0.2	0.26	0.2	---	0.25	1.00	---	0.28	1.0	---	0.30
Calculated Analysis :																		
ME kcal/ kg					3200									3200				
Lysine		0.82			1.00			1.30			0.86			0.75			1.00	
Methionine		0.40			0.49			0.67			0.32			0.35			0.55	

Table (2): Determined chemical composition of experimental feedstuffs.

Item	ME	Feed stuff analysis %						Lys	Meth	Ca	P
	Kcal	DM	CP	EE	CF	NFE	Ash	%	%	%	%
Sorghum	3348	95	12.6	2.8	2.5	74.1	2.0	0.30	0.40	0.040	0.10
Wheat bran	2170	94	16.1	3.1	2.3	49.0	4.7	0.60	0.16	0.120	0.13
Sesame cake	2760	96	46.6	14.3	2.7	21.3	1.6	1.20	2.30	1.900	0.35
Fish meal	3480	---	43.5	2.2	0.9	---	0.8	2.20	1.10	8.000	2.10
Sesame oil	8800	---	---	---	---	---	---			---	---
Di ca po	---	---	---	---	---	---	---			30.00	14.0
Oyster shell	---	---	---	---	---	---	---			---	38.0

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3 - Growth study and mortality:

Birds and feed were weighed every week to determine the average weight gain per chick and the feed intake for the different treatment groups. Then the feed conversion and protein efficiency ratios were calculated. Mortality was recorded daily as it occurred.

4 - Carcass evaluation:

At the end of week eight, two birds in each pen were selected which were close in body weight of the pen. Birds were fasted over night (12 hrs) but allowed free access to water pre-slaughtering then birds was slaughtered manually by serving the jugular vein at the ventrolateral base in the head. The Birds were allowed to bleed for 2minutes to avoid discoloration of the carcass. The feathers were plucked by hand after scalding the carcasses

in water heated to 75 °C (167 °F) for one minute. The carcasses were washed. Hot weights were recorded. The carcasses were cut into their parts. Weights of body parts with the weights of gizzards, livers and hearts were recorded. Hot carcasses dressing out percentages were expressed as percentages of life weights. The cut-up parts and the liver weight were expressed as percentages of dressed carcass. Furthermore, the carcass from each treatment was separated into meat and bone to determine the meat percentage.

5 - Statistical analysis:

The data obtained from the growth study was subjected to analysis of variance according to Steel and Torrie (1980), using a completely randomized design of factorial arrangement. The significance between treatments means determined using Duncan's (1955) multiple range test (DMRT).

RESULTS AND DISCUSSION

Temperature and humidity:

The Table (3) presented the weekly record of temperature and humidity during the experimental period.

Table (3): Weekly experimental house temperature and humidity during the starter and finisher period.

Week	Temperature				Humidity %
	Maximum		Minimum		
	C	F	C	F	
	Starter period (0-4 wks)				
1	39.8	103.6	32.0	89.2	16.7
2	34.1	93.3	29.0	84.2	20.7
3	37.4	99.3	32.0	86.0	18.0
4	36.0	96.8	30.0	86.0	19.0
Average	**36.8**	**98.3**	**30.8**	**87.4**	**18.6**
	Finisher period (5-8 wks)				
5	38.0	100.4	31.0	87.7	18.7
6	40.0	104.0	32.0	89.6	17.0
7	42.0	107.6	33.0	91.4	15.0
8	37.0	98.6	30.0	87.8	20.0
Average	**39.3**	**102.7**	**31.5**	**89.1**	**17.5**

Feed intake:

The effect of varying protein and vitamin "C" levels on weekly feed consumption during the starter period is presented in Table (4). Chicks fed the 17% or 20% protein consumed more feed than the control group (23%).The addition of 200 mg/ kg of vitamin "C", resulted in a significant improvement in feed consumption in a group fed 23% protein, while a significant reduction in feed intake was evident in the low protein diet groups (17% and 20%).

Increasing the level of supplemental vitamin to 400 mg/ kg, significantly reduced feed intake of the 23% protein, but non significant increase in feed consumption of the groups receiving the other protein diets.

Table (4): Effect of varying protein and vitamin "C" levels on feed consumption and weight gain of broiler chicks during the starter period (0-4 wks).

No	Treatment		Feed consumption (g/ chick a*)					Weight gain (g/ chick a**)				
	V. "C"	CP%	1st wk	2nd wk	3rd wk	4th wk	Overall	1st wk	2nd wk	3rd wk	4th wk	Overall
1	0	17	83.7	177.7	260.0	732.8	849.4 a	43.7	73.3	122.5	180.8	420.2 d
2	0	20	68.7	168.3	292.0	313.0	842.0 a	29.7	26.7	114.0	190.7	397.1 d
3	0	23	74.3	160.0	251.7	289.0	775.0 c	40.7	81.0	164.0	274.7	560.4 a
4	200	17	66.3	167.3	214.0	234.0	681.6 d	66.3	62.7	81.1	184.9	355.7 e
5	200	20	63.3	154.7	228.0	254.0	700.0 d	27.0	62.0	82.7	182.7	354.4 e
6	200	23	76.3	180.7	263.3	279.3	799.6 b	33.3	77.3	120.0	346.7	577.0 a
7	400	17	65.6	150.7	254.3	262.3	732.9 cd	28.0	67.0	82.7	176.0	353.7 e
8	400	20	76.0	155.3	232.0	255.3	718.6 d	33.3	69.0	94.0	236.0	433.0 c
9	400	23	70.0	158.7	244.0	244.0	716.7 c	38.3	74.0	130.7	227.3	470.3 b
Sem			3.6	6.1	20.2	21.5	4.7	1.8	6.2	7.3	9.3	7.4

a* values represent the mean of three replicate groups of 5chicks each.
a** values represent the mean of three replicate groups of 5chicks each.
SEM =Standard error of the means in overall column followed by the same letter are not significant.

Feed consumption during the finisher period (Table 5) was significantly different between treatment groups from week (5-8). Chicks fed the lowest protein level (16%) in combination with the highest vitamin "C" level (400 mg/ kg) consumed significantly more feed than the control and all other treatment groups. However, feed intake was significantly lower in chicks fed the control (20% protein) with or without 400 mg/ kg 0f vitamin "C". Although the overall feed intake of chicks fed the protein was significantly reduced by addition of 200mg/kg of vitamin "C", there was a significant interaction effect of protein by vitamin "C" on finisher feed intake.

Table (5): Effect of varying protein and vitamin "C" levels on feed consumption and weight gain of broiler chicks during the finisher period (5-8 wks).

No	Treatment		Feed consumption (g/ chick a*)					Weight gain (g/ chick a**)				
	V. "C"	CP%	5th wk	6th wk	7th wk	8th wk	Overall	5th wk	6th wk	7th wk	8th wk	Overall
1	0	16	455.9	899.9	925.0	1019.6	849.4 a	253.3	333.3	370.0	443.3	1389.6a
2	0	18	506.2	693.4	901.8	1004.7	3300.4 b	163.3	216.7	456.7	273.3	1110.0d
3	0	20	306.6	241.8	913.1	1050.0	3106.1 d	153.3	216.7	267.7	420.0	1066.7e
4	200	16	367.9	676.6	928.0	1016.0	2766.2 g	153.3	233.3	290.0	393.3	1069.9e
5	200	18	300.9	800.0	945.0	1o57.4	3033.5 e	176.7	250.0	315.0	406.7	1048.4d
6	200	20	432.0	800.0	841.0	1026.7	3099.8 d	180.0	250.0	290.0	466.7	1086.7c
7	400	16	494.6	748.1	949.4	1082.0	3674.1 a	173.3	226.7	296.7	466.7	1086.4d
8	400	18	515.5	765.2	953.9	920.0	3174.4 c	196.7	273.3	353.3	433.3	1030.0d
9	400	20	377.8	713.0	889.4	1000.0	2980.2 f	163.3	230.0	306.7	416.7	1116.7d
Sem			41.2	30.2	4.3	1.9	319.7	8.7	10.2	11.2	11.2	13.4

a* values represent the mean of three replicate groups of 5 chicks each.
a** values represent the mean of three replicate groups of 5 chicks each.
SEM= Standard error of the means in overall column followed by the same letter are not significant.

Weight gain:

The effect of varying protein and vitamin "C" levels on weekly weight gain is presented in Table (4). Weight gain was improved as the protein level was increased stepwise from 17 to 23% in week 1, 2, 3 and 4. The weight was greater significantly for those chicks fed 23% protein especially when 200 mg/ kg of vitamin "C" was added.

There were significant differences between treatment groups respect to the over all body weight gains during the finisher period (table 5). Highly significant increase was

elicited in the growth rate chicks fed the lowest protein level (16%) in combination with those fed the control diet (20%) When both levels of vitamin "C" (200 and 400 mg/ kg diet) were fed with 16% protein diet significant reduction in overall body weight gains occurred. The most adverse effect of added vitamin "C" on weight gains was evident at treatment 9 (400 mg/ kg diet with 20% protein).

Feed conversion and protein efficiency ratio:

The average weekly response to varying protein and vitamin "C" levels on the feed conversion and protein efficiency ratio is presented in (Table 6). Birds receiving the 23% protein or with added vitamin "C" at 400mg/kg were both significantly more efficient in utilization of feed than other treatments groups. Protein efficiency ratio calculated as grams of gain per grams of protein intake, increased slightly as vitamin "C" was increased from 200 to 400 mg/ kg. However, as protein level of the diet increased, the efficiency 0f protein utilization decreased.

Feed conversion during the finisher period (5-8 wks) was not different between treatments 1, 3, and 8. They are significantly more efficient in utilization of feed than other treatments groups. The Protein efficiency ratio of the groups fed 16% protein with 200 or 400 mg/ kg vitamin "C", were the highest.

Table (6): Effect of varying protein and vitamin "C" levels on efficiency of feed conversion and protein efficiency ratio 0f broiler chicks during starter (0-4 wks) and finisher (5-8 wks) periods.

No.	Treatment V. "C" mg/ kg	CP %	Feed consumption (g/ chick a*) 1st wk		2nd wk		3rd wk		4th wk		Overall	
			EFC	PER	EFC	PER	EFC	PER	EFC	PER	EFC	PER
			Starter period (0-4 wks)									
1	0	17	1.9	3.1	2.4	2.3	2.1	2.8	1.9	2.6	2.8 d	3.6
2	0	20	2.3	2.2	2.7	2.1	2.6	2.0	1.6	2.9	3.0 c	3.1
3	0	23	1.8	2.2	2.7	1.8	1.5	1.6	1.0	3.7	2.6 e	3.1
4	200	17	2.5	2.2	2.6	2.2	2.6	2.2	1.3	3.2	3.0 c	3.9
5	200	20	2.4	2.4	2.5	2.1	2.8	2.0	2.0	2.9	3.2 a	3.0
6	200	23	2.4	2.3	2.4	1.7	2.2	1.8	1.8	6.0	3.1 b	3.9
7	400	17	2.4	1.7	2.3	2.5	3.0	1.5	1.5	4.8	3.1 b	3.6
8	400	20	2.8	2.5	2.4	1.7	2.4	2.5	1.1	5.5	2.8 d	4.1
9	400	23	2.8	2.6	2.2	2.3	2.0	2.6	1.2	4.0	2.4 e	3.8
Sem			0.13		0.13		0.14		0.16		0.14	
			finisher period (5-8 wks)									
1	0	16	1.8	2.4	2.7	2.1	2.5	2.1	2.3	2.8	3.1 d	3.1
2	0	18	3.1	1.6	3.2	1.5	3.3	1.8	2.2	2.2	3.9 a	4.2
3	0	20	1.7	3.0	2.5	1.7	3.3	1.4	2.5	2.0	3.2 d	2.7
4	200	16	2.4	2.0	2.9	3.1	2.2	1.7	2.7	2.1	3.7 a	3.3
5	200	18	1.7	2.4	3.2	1.7	3.0	1.8	2.6	2.0	3.5 c	2.8
6	200	20	1.6	2.4	3.2	1.5	2.9	1.6	2.2	2.1	3.6 b	2.4
7	400	16	2.4	1.8	3.3	2.0	3.2	2.0	2.4	3.6	3.6 b	3.3
8	400	18	1.6	2.4	2.8	1.9	2.7	2.1	2.3	3.1	3.1 d	2.9
9	400	20	2.4	1.8	3.1	1.7	2.9	1.7	2.4	2.0	3.6 b	2.4
Sem			0.24		0.09		0.12		0.09		0.14	

EFC: efficiency of feed conversion :gram of feed consumption of gain.
PER: protein efficiency ratio: gram of gain per gram of protein consumed.
SEM Standard error of the mean.in overall column followed by the same letter are not significantly different.

Mortality:

Mortality data (Table 7), was calculated in terms of the proportion of the initial number in each treatment group (15 chicks). Mortality percentages were highest among receiving no vitamin "C". But no mortality was reported in the groups receiving the 200 mg/ kg vitamin "C" across all protein levels.

During the finisher period (5-8 wks), there was no mortality was reported in the groups receiving the 200 mg/ kg vitamin "C". Treatments (1-9) recorded similar mortality rate (6.7%), which was attributed to heat stress.

Table (7): Effect of experimental diet on the mortality rate of broiler chicks during the starter and finisher periods.

Treatments No	Vitamin "C" (mg/kg)	Starter period (0-4 wks)		Finisher period (5-8 wks)	
		Protein %	Mortality a*	Protein %	Mortality a*
1	0	17	13.3	16	6.7
2	200	20	0.0	18	0.0
3	400	23	6.7	20	0.0
4	0	17	0.0	16	0.0
5	200	20	0.0	18	0.0
6	400	23	0.0	20	0.0
7	0	17	13.3	16	0.0
8	200	20	0.0	18	0.0
9	400	23	13.3	20	6.7

a* : Mortality rate calculated for each treatment as a percentage of dead birds out of 15 chicks.

Carcass quality:

The effects of diets on carcass yield, is presented in (Table 8). It was noticed that adding vitamin "C" at either levels to the diets containing 20% protein improved their dressing percentage. Total meat yield increased percentage wise when chicks received 16% protein in combination with chicks fed the control diet (20%protein). Best meat yield was in the group receiving 18% protein. Supplementation 0f vitamin "C", increased bone mass.

Table (8): Effect of varying protein and vitamin "C" levels on carcass parameters and meat yield of broiler chicks. (8 wks).

Item	Treatment No.								
	1	2	3	4	5	6	7	8	9
Life body eight(g)	1930.0	1415.0	1406.7	1385.0	1440.0	2033.3	1318.3	1443.3	1598.3
Hot carcass (%)	96.3	93.8	90.7	94.8	92.9	96.0	93.0	95.7	95.4
Liver (%)	2.9	2.8	2.7	2.8	2.8	2.9	2.8	2.9	2.9
Thigh (%)	12.0	11.7	11.0	13.0	11.6	12.0	11.6	12.0	11.9
Drumstick (%)	14.0	13.6	13.0	13.7	13.5	13.2	13.5	13.8	13.8
Breast (%)	12.5	12.2	12.0	12.1	12.1	12.2	12.0	12.4	12.4
Back (%)	22.1	21.6	20.6	21.7	21.4	22.1	21.4	22.0	21.0
Wings (%)	10.6	10.3	10.1	10.4	10.2	10.6	10.2	11.7	10.5
Neck (%)	4.3	4.2	4.0	4.1	4.2	4.3	4.2	4.3	4.3
Gizzard (%)	3.4	3.3	3.3	3.3	3.3	3.4	3.3	3.4	3.3
Head (%)	2.4	2.3	2.2	2.4	2.4	2.3	2.3	2.4	2.4
Heart (%)	1.0	0.9	0.8	0.9	0.9	1.0	0.9	1.0	1.0
Meat yield %	67.7	50.7	58.8	52.5	52.8	52.5	56.0	61.0	56.0

Values are means of three replicate groups of 2 birds each.
Hot carcass calculated as% of life body weight.
All cuts calculated as% of hot carcass weight (eviscerated carcass).
Values are means of three replicate groups of 5 chicks each as a percent of meat from hot carcass.

The experiment was performed in summer season with daily higher temperature in the 90s and low in the 70s.

When chicks were subjected to heat stress, feed intake and body weight gains were reduced (Farry. 1965, Cerniglia *et al.*,. 1978 and Dale and Fuller, 1978). Many researchers have demonstrated the adverse effect of high environmental temperature on broiler chickens. Cerniglia *et al.*,. (1978), observed a 47% decrease in feed consumption and weight gain by broilers kept at 32 °C (89.6 °F) as compared with those kept at 24 °C (75.2 °F). Moreover, Squibb (1959) and Adams *et al.*,. (1962), indicated high ambient temperature decreased feed intake in of birds.

In this study the addition of 200 mg/ kg of vitamin "C" resulted in nil mortality from heat stress. This finding agrees with the results reported by Pardue *et al.*, (1985a), who indicated a reduction in mortality from heat stress in broilers from 22 to 7.3%. Gross (1988), also showed drastic in mortality with 330 ppm supplementation of vitamin "C" in the drinking water, of 6 week old chicks. Reduction in mortality with added vitamin "C", was attributed to a marked reduction in plasma adrenal steroids when chicks were subjected to heat stress. Pardue *et al.*, (1985a). Moreover Thornton, (1962), Ahmed *et al.*,., (1967) supplementation reduces body temperature in heat stressed birds and ameliorated the ability of birds to receive higher heat loads.

The addition of vitamin "C" in the starter diets and at 200 and 400 mg/ kg resulted in a significant effect on feed intake and feed efficiency. But weight gains were not significantly affected. The results are agree in agreement with the results reported by Njoku (1986), Alishehov (1980) and Kafri and Cherry, 1984), who demonstrated an improvement in feed intake and feed efficiency, when vitamin "C" was added to broiler diets. However, the optimum levels of supplementation to achieve this improvement in performance varied from 200 to 250 mg/ kg (Kutlo and Forbes 1993a) to 400 mg/ kg of diet (Njoku, 1986), up to 1000 mg/ kg (Mckee and Harrison 1995).

The results obtained in this study partially disagree with the findings of Mckee and Harrison (1995), who reported that vitamin "C" alleviated the reduction in body weight gain and feed consumption but not feed efficiency. This could be due to the differences in the level of Vitamin "C" (1000 mg/ kg) which used by above workers. Although, the precise biochemical mechanisms of vitamin "C", remain some what obscure, the use of this vitamin to alleviate some of deleterious effects of heat stress on the performance of poultry was well established. In this study, the addition of 200 mg/ kg vitamin "C", resulted in nil mortality from heat stress. These findings agree with the results reported by Pardue *et al.*, (1985a), who indicated that a reduction in mortality from heat stress in broilers from 22 to 7.3%. Gross (1988) also showed drastic reduction in mortality with 330 ppm supplementation of vitamin "C" in drinking water.

Reduction in mortality with added vitamin "C", was attributed to a marked reduction in plasma adrenal steroids when chicks were subjected to heat Pardue *et al.*, (1985b). Moreover, Thaxton (1962), Ahmed *et al.*, (1967) and Kutlo and Forbes (1993a), indicated that ascorbic acid supplementation reduces body temperature in heat stressed birds and ameliorated the ability of birds to receive higher heat loads.

The carcass yield data showed that supplementation with vitamin "C" did not improve vitamin "C" weight of the groups receiving 200 or 400 mg/ kg compared with the

un supplemented groups. However, the bone mass was greater vitamin "C" supplemented groups when yield was separated in meat and bone percentages. Vitamin "C" supplemented groups also had no changes in weights of internal organs (liver, gizzard and heart) compared with the un supplemented ones .These results disagrees with the finding reported by Farr *et al.*, (1988), who indicated that body weights at slaughter were significantly increased by the addition of 1200 ppm/ kg ascorbic acid .There increased weights were maintained through slaughter and processing, yielding increased weights of chilled carcass yields with 967ppm vitamin "C" supplementation but the yield of meat was found to be greater in males than females broilers. The difference between the results is expected due to the route of supplementation, the time of addition (pre-slaughter) and the level of vitamin "C" used. The role of vitamin "C" in reducing plasma Potassium and increasing plasma Sodium is well documented (Pardue *et al.*, 1985b)

In heat stressed birds, elevated plasma protein levels were associated with increased protein catabolism due to pre-slaughter In this study protein levels were reduced from 23% to 20 and 17%. It resulted significant effect on body weight gains and feed utilization, but had no effect on feed intake. This confirmed by Henery and Fuller (1979), who provided evidence for increased energy intake especially under heat stress and stated that protein was not a limiting factor even through protein intake was markedly reduced in their experiments. The level of critical amino acids was restored to recommended levels (NRC, 1984). The metabolizable energy kept in all diets at 3200 kcal/ kg diet as advocated by NRC (1984) in attempt to eliminate the energy content on feed.

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أثر ثلاثة مستويات من فيتامين (ج) مع مستويات مختلفة من البروتين على أداء دجاج اللحم أثناء فصل الصيف

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أجريت تجربة لتحديد أثر ثلاثة مستويات من فيتامين (ج) مع مستويات مختلفة من البروتين على أداء الدجاج اللاحم في مرحلتى البادئ والناهى أثناء فصل الصيف.

استخدمت كتاكيت لوهمان غير مجنسة من عمر يوم حتى عمر أربعة أسابيع ثلاثة مستويات لفيتامين (ج) (صفر،٤٠٠،٢٠٠ملجم/كجم عليقه) مع ثلاث نسب مئوية من البروتين (١٧،٢٠،٢٣ ٪).خلال مرحلة البادئ وثلاث مستويات أخرى من البروتين (١٦ ، ١٨ ، ٢٠٪) مع نفس مستويات فيتامين "ج" خلال مرحلة الناهى في تجربة متعددة العوامل تضم ١٣٥ كتكوت لاحم في ثلاث مكررات (٤٥ كتكوت بكل مكرر) تضم تسع معاملات وكل معاملة تشمل ٥ كتاكيت.

وقد خلصت نتائج التجربة للآتي:

- إضافة فيتامين (ج) أدت إلى زيادة الاستهلاك الغذائي ومعدل التحويل الغذائي ولكن لا أثر على النمو .
- إضافة البروتين لم تحدث أي أثر على استهلاك الغذاء.
- التداخل بين فيتامين (ج) و البروتين أدى إلى زيادة كل القياسات.
- مستوى فيتامين (ج) (٢٠٠ ملجم/كجم عليقه) أدى إلى تقليل نسبة النفوق الناتجة عن الإجهاد الحراري.
- التداخل بين فيتامين (ج) و البروتين أدى إلى زيادة كل من النمو ومعدل التحويل الغذائي معنويا خلال مرحلة الناهى.
- مستوى فيتامين (ج) (٢٠٠ ملجم/كجم عليقه) منع حدوث النفوق الناتج عن الإجهاد الحراري تماما.
- أعلى إنتاجية للذبيح حدثت عند المستوى ٢٠٠ ملجم مع ٢٠٪ بروتين ، نسب أوزان القانصة ، الكبد والقلب توضح عدم وجود أثر لإضافة فيتامين (ج).