

**SUDAN UNIVERSITY OF SCIENCE AND TECHNOLOGY  
COLLEGE OF GRADUATE STUDIES**

**RESPONSES OF BROILER CHICKS TO  
DIFFERENT LEVELS OF LYSINE  
AND METHIONINE**

*A thesis Submitted to the Sudan University of Science and Technology  
in Fulfillment of the Requirements for the Degree of Doctor of  
Philosophy*

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# **Dedication**

**To my Parents .....**

**My sisters.....**

**My sons, daughters and my wife**

**With gratitude and appreciation**

**Mukhtar**

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## LIST OF CONTENTS

	Page
Dedication -----	ii
Acknowledgements-----	iii
List of Tables-----	vi
List of Figures-----	x
English Abstract-----	xi
Arabic Abstract-----	xiv
<b>Chapter one: Introduction-----</b>	<b>1</b>
<b>Chapter two: Literature review-----</b>	<b>3</b>
2.1 The importance of dietary protein in broiler ration-----	3
2.1.1 biological value of proteins for the chicken-----	4
2.2 Dietary amino acids-----	5
2.2.1 Amino acid digestibility and availability -----	7
2.2.2 Factors affecting the responses of growing poultry to amino acids-----	9
2.3 Amino acids (lysine and methionine) requirements for broiler chickens-----	10
2.4. Effect of lysine and methionine deficiency in broiler diets-----	12
2.5 Effect of dietary lysine and methionine excess on broiler performance-----	13
2.6 The effect of dietary lysine and for methionine Supplemental to lysine or methionine diets on the performance of broiler chick.-----	15
2.7 Effect of dietary lysine and for methionine on carcass composition-----	18
<b>Chapter three: Material and Methods-----</b>	<b>20</b>
3.1 Experiment I-----	20
3.1.1 Duration -----	20

3.1.2 Experiment birds-----	20
3.1.3 Experimental diets-----	21
3.1.4 Management-----	24
3.1.5 Slaughter procedure-----	24
3.1.6 Carcass parameters and internal organs preparation ration-----	24
3.1.7 Chemical analysis-----	25
3.1.8 Panel taste -----	25
3.1.9 Calculation -----	25
3.1.10 Statistical analysis-----	25
3.2 Experiment 2-----	26
3.2.1 Experimental diets-----	26
3.3 Experiment 3-----	30
3.3.1 Duration birds and housing-----	30
3.3.2 Measurements-----	31
<b>Chapter four: Results-----</b>	<b>36</b>
4.1 Chicks performance-----	42
4.2 Effect of feeding increasing levels of synthetic lysine and methionine for broiler chicks-----	42
4.2.1 Effect on the chicks performance-----	42
4.2.2 Carcass, non-carcass yield and commercial cuts-----	45
4.2.3 The effect on carcass chemical composition-----	45
4.3.1 Chicks growth-----	57
4.3.2 Carcass, non-carcass yield and commercial each-----	58
<b>Chapter five: Discussion-----</b>	<b>59</b>
<b>Chapter six-----</b>	<b>64</b>
<b>Conclusion and Recommendations-----</b>	<b>64</b>
<b>Reference-----</b>	<b>65</b>
<b>Appendix-----</b>	<b>85</b>

## LIST OF TABLES

	Page
<b>Table (1):</b> Percent of inclusion rate of dietary ingredients used in the experiment-----	22
<b>Table (2):</b> Calculated and chemical composition (%)of diets used in experiment -----	23
<b>Table (3):</b> Percent of Inclusion rate of dietary ingredients used in experiment-----	28
<b>Table (4):</b> Calculated and chemical composition (%)of diets used in experiment -----	29
<b>Table (5):</b> Percent of inclusion -----	32
<b>Table (6):</b> Calculated and chemical -----	33
<b>Table (7):</b> Average feed intake for broiler chicks fed on local diet completed with synthetic lysine and/ or methionine-----	88
<b>Table (8):</b> Average body weight for broiler chicks fed on local diet completed with synthetic lysine and/ or methionine-----	90
<b>Table (9):</b> Average body weight gain for broiler chicks fed on local diet completed with synthetic lysine and/ or methionine-----	92
<b>Table (10):</b> Average feed conversion ratio for broiler chicks fed on local diet completed with synthetic lysine and/ or methionine-----	95
<b>Table (11):</b> Average performance of chicks fed on local diet used completed with pure lysine and/or methionine-----	36
<b>Table (12):</b> Effect of feeding for broiler chicks fed on local diet completed with synthetic lysine and/ or methionine on non-carcass components as (%) of final body weight-----	38
<b>Table (13):</b> Effect of feeding broiler chicks fed on local diet completed with synthetic lysine and/ or methionine on the hot and cold carcasses weights and yield of commercial cuts percentages---	39



<b>Table (14):</b> Effect of feeding broiler chicks fed on local diet completed with synthetic lysine and/ or methionine (Exp.1) on yield of meat and bone (as a percentage of the weight of its cuts)-----	40
<b>Table (15):</b> Chemical composition (%)of carcass meat of broiler chicks fed on local diet used in experiment -----	41
<b>Table (16):</b> Average feed intake of broiler chicks fed on increasing level of synthetic lysine and methionine. -----	42
<b>Table (17):</b> Average body weight of broiler chicks fed on an increasing levels of synthetic lysine and methionin-----	99
<b>Table (18):</b> Average body weight gain of broiler chicks fed on an increasing levels of synthetic lysine and methionine----- -----	101
<b>Table (19):</b> Average feed conversion ratio of broiler chicks fed on an increasing levels of synthetic lysine and methionine. ----- -----	102
<b>Table (20):</b> Effect of feeding on an increasing levels of synthetic lysine and methionine on the performance of broiler chicks-----	104
<b>Table (21):</b> Effect of feeding broiler chicks on an increasing levels of synthetic lysine and methionine on non-carcass components as percentage of final body weight -----	46
<b>Table (22):</b> Effect of feeding on an increasing levels of synthetic lysine and methionine on average values of hot and cold dressing percentages carcasses and percentage of commercial cut -----	47
<b>Table (23):</b> Effect of feeding on an increasing levels of synthetic lysine and methionine on yield of meat and bone from commercial cuts (as a percentage of its cuts)-----	48
<b>Table (24):</b> Chemical composition (%)of carcass meat analysis of broiler chicks fed on an increasing levels of synthetic lysine and methionine-----	49

**Table (25):** Average subject of meat quality values of chicks fed on an increasing levels of synthetic lysine and methionine-----50

**Table (26):**Average feed intake (g/bird)of broiler chicks fed on increasing level of synthetic lysine and methionine. -----  
-----106

**Table (27):** Average body weight (g/bird) of broiler chicks fed on an increasing levels of synthetic lysine and methionine replaced broiler super -concentrate. -----  
-----108

**Table (28):** Average body weight gain(g feed./g wt.) of broiler chicks fed on an increasing levels of synthetic lysine and methionine replaced broiler super concentrate. -----  
-----110

**Table (29):** Average feed conversion ratio (g feed./g wt.) of broiler chicks fed on an increasing levels of synthetic lysine and methionine replaced broiler super concentrate. -----  
-----112

**Table (30):** Effect of feeding broiler chicks on an increasing levels of synthetic lysine and methionine replacing broiler super concentrate.----- 51

**Table (31):** Effect of feeding broiler chicks on an increasing levels of synthetic lysine and methionine replacing broiler super concentrate on non-carcass components as percentage of final body weight ----- 52

**Table (32):** Effect of feeding broiler chicks on an increasing levels of synthetic lysine and methionine replacing broiler super concentrate on average values of hot and cold dressing percentages carcasses and percentage of commercial cuts -----53

**Table (33):** Effect of feeding on an increasing levels of synthetic lysine and methionine replacing broiler super concentrate on yield of meat and bone from commercial cuts (as a percentage of its cuts) -----54

**Table (34):** chemical composition of carcass meat analysis of broiler chicks fed on an increasing levels of synthetic lysine and methionine replacing broiler super concentrate-----55

**Table (35):** Average subject of meat quality values of chicks fed on an increasing levels of synthetic lysine and methionine replacing broiler super concentrate-----56

## LIST OF FIGURES

	Page
<b>Fig.1:</b> F1 for broiler fed on local diet completed with synthetic AAS--	89
<b>Fig.2:</b> ABW for broiler fed on local diet completed with synthetic AAS-----	91
<b>Fig.3:</b> AWG for broiler fed on local diet completed with synthetic AAS-----	94
<b>Fig.4:</b> FCR for broiler fed on local diet completed with synthetic AAS-----	96
<b>Fig.5:</b> F1/g chicks fed on an increasing level of synthetic AAS-----	98
<b>Fig.6:</b> BWG/g chicks fed on an increasing level of synthetic AAS---	100
<b>Fig.7:</b> BWG/g of chicks fed on an increasing level of synthetic AAS	103
<b>Fig.8:</b> FCR of chicks fed on an increasing level of synthetic AAS---	105
<b>Fig.9:</b> Feed intake (g) of chicks fed on diets free of super concentrate- -107	
<b>Fig.10:</b> ABW of chicks fed on diets without super concentrate-----	109
<b>Fig.11:</b> ABWS for chicks fed on diets free of super concentrate-----	111
<b>Fig.12:</b> FCR of chicks fed on diets free of super concentrate-----	113

## Abstract

The three studies were designed to determine the deficiency of essential amino acids, mainly lysine and methionine used in local Sudanese broiler diets, and the effect of completion of the diet with synthetic lysine or/methionine on the performance of broiler chicks and their economic impact.

The first experiment was carried out during winter season. In this experiment, a hundred one day-old unsexed broiler chicks were used, to determine the deficiencies of amino acids in the local diet used. Five experimental diets, (A, B, C, D and E), based on cereal grains were formulated. The local diet used (A) was deficient in both lysine (4.36%), and methionine (6.52%) and phosphorus (19.16%), diet (B) supplemented with phosphorus, diet (C) supplemented with methionine (0.49%), diet (D) supplemented with lysine only (1.2%) and diet (E) supplemented with both lysine and methionine (1.2, 0.49%). All diets had similar crude protein (22%) and methabolizable energy (2300kcal).

Chicks fed on diets E and D showed significant ( $P < 0.05$ ) differences compared to control diet (A) in average live body weight gain throughout the study duration the study period, chicks in group (C) showed significant more difference ( $P < 0.05$ ) with group (A) during the 3<sup>rd</sup> and 6<sup>th</sup> weeks and other groups showed no significant ( $P > 0.05$ ) differences compared to control (A). Feed intake for group (A) showed significant ( $P < 0.05$ ) different with D, E and C, other groups showed no significant difference ( $P > 0.05$ ) .

The treatment groups did not differ significantly ( $P > 0.05$ ) on hot and cold carcass dressing percentages, commercial cuts (breast, drumstick and thigh), meat percentage of these selected cuts and non-

carcass body components (liver, heart, head and gizzard). The average subjective meat quality scores (colour, tenderness, flavour, juiciness) did not differ significantly ( $P>0.05$ ) among dietary treatments. Scores given were above moderate acceptability level.

Four hundred day-old unsexed broiler chicks were used in the second experiment to determine the optimum level of lysine and methionine in broiler diet under Sudan condition. Chicks were randomly distributed to five treatments with eight replicates with ten chicks per each. Five iso caloric (3100kcal), isonitrogenous (22%) were formulated. Diet (A) was the best diet in the first experiment (1.2% lysine+ 0.49meth) used as control, diet (B) similar to diet (A) but without broiler supper concentrate, diet C (1.3 lysine+ 0.56meth), diet (D) (1.4 lysine + 0.6%meth), and diet (E) (1.5% lysine + 0.63%meth).

Results obtained revealed that group (E) differ significantly ( $P<0.05$ ) with other groups in feed intake, and group (D) was significant ( $P<0.05$ ) with group (A). Groups E, D, C and B showed significant difference ( $P<0.05$ ) with group (A) where as no significance ( $P>0.05$ ) between them in average live body weight.

The slaughter data showed that as the level of lysine and methionine increased, eviscerated carcass weight, hot and cold dressing percentages and the yield of commercial cuts (breast, drumstick and thigh) increased significantly ( $P<0.05$ ) compared to the control diet. The average meat yield from the commercial cuts increased significantly ( $P<0.05$ ) with the increase of the synthetic lysine and methionine levels. The carcass chemical composition showed no significant difference ( $P>0.05$ ). The marginal profit obtained from chicks fed on-diet (E) recorded (1154-32S.D) as the highest followed by group D (1074.67SD) and diet (A) (373.46S.D) as the lowest marginal profile.

200 chicks were selected from 1500 chicks after a week of adaptation, for the third experiment, to determine if the addition of both synthetic lysine and methionine could replace the broiler super concentrate, so to decrease feed cost and keep or increase broiler chicks growth. Five experimental diets (A, B, C, D and E) were formulated. Increasing levels of L-lysine and DL-methionine were supplemented without broiler super. Concentrate for diets A (1.2 lysine+ 0.49%meth) B(1.3%lysine+ 0.56%meth), C (1.4 lysine+ 0.59% meth) and D (1.5% lysine+0.63%meth), diet E (1.5% lysine+ 0.63%meth) with super-concentrate.

Results obtained showed that group (E) recorded significant difference ( $P<0.05$ ) with groups D, C, B and A, also groups D, C showed significant differences with groups B and A in feed intake, average final body weight and average body weight gain. In feed conversion ratio group (A) (3.45) significantly differ ( $P<0.05$ ) with groups C (2.85), E (2.67) and D (2.6). Also group B (3.27) significantly differ ( $P<0.05$ ) with group E and D as overall. Level of synthetic lysine and methionine without super-concentrate did not affect significantly ( $P>0.05$ ) on non-carcass components (heart, liver, gizzard, head and legs), hot eviscerated carcass, commercial cuts (breast, drumstick and thigh), the three selected cuts meat yield percentages. Also the average subjective meat quality scores (colour, tenderness, flavour and juiciness) did not differ significantly ( $P>0.05$ ) among the dietary tested groups.

The economical study for this experiment indicated that treatment E (690.05S-D/kg) recorded the highest value of marginal profit followed by treatment D (485.9S.D/kg) while treatment A (192.57S.D/kg) as the lowest value.

## ملخص الاطروحه

فى هذه الدراسة أُجريت ثلاثة تجارب لتحديد النقص فى الاحماض الامينية الاساسية (الايسين والمثيونين) فى علائق الدجاج اللاحم والاثري الاقتصا دى المترتب على ذلك

أُجريت التجربة الاولى فى فصل الشتاء حيث تم اختيار 100 كتكوت لآحم عمر يوم وغير مجنسة من سلالة روص 308 قسمت عشوائيا الى 5 مجموعات  $\times 8$  مكررات  $\times 4$  كتكوت لكل مكرر. تم تركيب 5 علائق (A و B, C, D, E). العليقة A عبارة عن العليقة المستخدمة محليا (والتي ينقصها الاليسين 4.36% والمثيونين 6.52% والفسفور بنسبة 4.36%، 19.16%)، B (عبارة عن A مع اكما ل الفسفور)، C (عبارة عن B مع اكما ل المثيونين)، D (عبارة عن B مع اكما ل الاليسين) و E (عبارة عن D مع اكما ل المثيونين).

أظهرت الكتاكيت المغذاة على العليقة E, D وجود فروقات معنوية ( $P < 0.05$ ) فى متوسط اوزان الكتاكيت والوزن المكتسب مقارنة بالعليقة الاساسية وذلك خلال فترة التجربة بينما اظهرت الكتاكيت المغذاة على العليقة D فروقات معنوية ( $P < 0.05$ ) فى الاسبوع الثالث والسادس بالعليقة الاساسية. أيضا أظهرت الكتاكيت المغذاة على العليقة الاساسية فروقات معنوية ( $P < 0.05$ ) بالنسبة للعليقة المستهلكة مقارنة مع المجموعات الاخرى والتي لم تظهر اى فروقات معنوية فيما بينها ( $P > 0.05$ ). كما أوضحت النتائج المتحصل عليها عدم وجود تأثير معنوى ( $P > 0.05$ ) للمعاملات المختلفة على نسبة النفق، نسبة التصافى للوزن الحار والبارد والقطع التجارية ونسبة الاجزاء الداخلية للذبيحة .

فى التجربة الثانية تم اختيار 400 كتكوت لآحم عمر يوم وغير مجنسة لتحديد اعلى مستوى لحمضى الاليسين والمثيونين تحت الظروف المحلية. تم توزيع الكتاكيت عشوائيا لخمسة معاملات  $\times 8$  مكررات  $\times 15$  كتكوت لكل مكرر. تم تركيب علائق التجربة (A و B, C, D, E). اعتبرت العليقة E فى التجربة السابقة كعليقة اساسية لهذه التجربة. اما فالعلائق



الآخري (E, D, C, B) تحتوى على مستويات مختلفة ومتدرجة من الأيسين والمثيونين (1.2, 0.49) و (0.56, 1.3)، و (0.6, 1.4)، و (0.63, 1.5) على التوالي.

أظهرت النتائج المتحصل عليها فروقات من هذه التجربة معنوية ( $P < 0.05$ ) للمجموعة D مقارنة مع المجموعات الأخرى فى العليقة المستهلكة وقد أظهرت المجموعات D و B, C, E فروقات معنوية ( $P < 0.05$ ) مقارنة مع المجموعة A والتي لم تظهر أى فروقات معنوية ( $P > 0.05$ ) بين المجموعات فى الوزن الحى للكتاكيت. أحدثت إضافات الأيسين والمثيونين المصنعين زيادة معنوية ( $P < 0.05$ ) فى نسبة التصافى للذبيح الساخن والبارد والأجزاء التجارية مع زيادة مستوى الحمضين فى العليقة مقارنة بالعليقة الأساسية كذلك لم تسجل النتائج المتحصل عليها من التحليل الكيمياءى لعينات اللحم فروقات معنوية ( $P > 0.05$ ).

أشارت النتائج المتحصل عليها من الدراسة الاقتصادية ان لاضافة الأيسين والمثيونين المصنعين بمستوياتهما المختلفة مردودا اقتصاديا أعلى من العليقة الأساسية حيث سجلت العليقة D أعلى هامش للأرباح (1145.32 S.D./kg) تلتها المجموعة C (1074.67 S.D./kg) وسجلت العليقة الأساسية A (373.46 S.D/kg) كادنى هامش للأرباح.

أما بالنسبة للتجربة الثالثة فقد تمت رعاية 200 كتكوت لآحم غير مجنسة من سلالة الروص 308 لفترة اسبوع للتأقلم ومن ثم قسمت الكتاكيت عشوائيا الى (5) خمسة مجموعات × مكررات 8 كتاكيت لكل مكرر. فى هذه الدراسة تم استخدام الأيسين والمثيونين المصنعين كبديل كلى لمركز الآحم وذلك لتقليل تكلفة التغذية مع الاحتفاظ او الزيادة فى نمو الكتاكيت. تم تركيب خمسة (5) علائق لتكون متساوية فى الطاقة الممثلة (3100 كيلوكالورى/كجم) والبروتين الخام (22%). تم استخدام الأيسين والمثيونين المصنعين بمستويات مختلفة وبدون استخدام المركز و (1.5, 0.6) D, (1.4, 0.6) C, (1.3, 0.56) B, (1.2, 0.49) A: على النحو التالى والتحتوى على (1.5, 0.63%) من (0.63%) على التوالي عدا العليقة الأيسين والمثيونين على التوالي مع استخدام مركز الدجاج الآحم. خلال

فترة التجربة. تم تسجيل قياسات استهلاك العلف، الاوزان الحية، مراقبة القطيع صحيا وحساب الكفاءة التحويلية.

أظهرت النتائج المتحصل عليها من خلال التجربة وجود فروقات مقارنة بالمجموعات الاخرى، كما اظهرت D للمجموعة (  $P < 0.05$  ) معنوية فى العليقة المستهلكة اختلافا معنويا فى متوسط A و B نتائج المجموعتين A الوزن الحى والوزن المكتسب. اما نسبة التحويل الغذائى للمجموعة D (2.85)، C مع المجموعات (  $P < 0.05$  ) فقد سجلت اختلافا معنويا (3.45) D (  $P < 0.05$  ) اختلافا معنويا (3.27) B كما سجلت المجموعة E (2.6) و (2.67) للمتوسط العام. مستويات الاليسين والمثيونين E و D مقارنة بالمجموعة المصنعين وبدون استخدام المركز فى تركيب العليقة لم تؤثر معنويا فى نسب اوزان الاجزاء الداخلية، وزن الذبيح الحار والاجزاء (  $P > 0.05$  ) التجارية.

أشارت الدراسة الاقتصادية لهذه التجربة ان الكتاكيت التى غذيت تلتها ( S.D/kg سجلت اعلى هامش للارباح (690.05 D على العليقة A (192.57 SD/kg) كما سجلت المجموعة E (SD/kg) المجموعة 485.9