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Compensatory growth in female Nubian goats in Sudan

effect on carcass characteristics, external body measurements and non carcass components (B)

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Abstract: Two groups of female goat kids less than one year in age, Nubian ecotype (15 kids/ group) and of the same initial weight (16.5 kg/kid) were subjected to two dietary levels of energy for 105 days, the first group was offered the highest energy diet (11.5 Mj ME/kcl) while the second group was given the lowest dietary energy diet (8.5 Mj ME/kcl). Through this term of the experiment (105 days) kids of the second group were found just to maintain their weight. Then seven kids from the second group was offered the highest energy diet (11.5 MjME/kcl) to reach the final weight obtained by the first group, it spent 175 days to reach that weight. Six kids from each group were selected randomly and slaughtered to study the effect of compensatory growth on carcass characteristics, external body measurements, non-carcass components and meat quality attributes. Carcass characteristics were not affected by compensatory growth. Carcass fat, bone and muscles were increased in the compensating group. Gut fill was slightly decreased in the compensated group. However, dressing percentage increased significantly ($P< 0.05$) in the compensated group. However Compensatory growth did not significantly affect fat distribution throughout the body, but total body, carcass and visceral fat were increased in the compensating group. All non carcass components were not affected by the compensatory growth except the liver which was significantly ($P< 0.05$) increased and the udder which was significantly ($P< 0.05$) decreased in the compensated group. Meat chemical composition was significantly affected by compensatory growth. Percentages of fat, sacroplasmic and Myofibrillar proteins increased significantly ($P< 0.01$) in the meat from the compensating goats. Moisture, ash, non-protein nitrogen percentages and pH values decreased but not significantly so in the meat from the compensated goat group. Meat from the compensated goat group showed superior water holding capacity and less cooking loss value. Meat from goats that experienced compensatory growth was significantly lighter in colour possibly due to increased fatness. However, redness values of the meat, though not significant . were lower compared with that from normally growing goat kids. Carcass measurements as heart girth and abdomen circumference were significantly ($P< 0.05$) increased by the compensatory growth, while measurements, as body length and scapular and thigh circumference were not significantly affected. Taste panel scores for meat quality revealed that the compensated goat group had significantly ($p<0.01$) less odour intensity, less tender meat and less meat colour values than the basal group. While juiciness scores were significantly ($p<0.05$) increased in the meat from the compensated goat group.

Keywords: compensatory growth, carcass characteristics, measurements and non-carcass components and female goats.

النمو التعويضي في إناث الماعز النوبي في السودان

(ب) الأثر على خصائص ومكونات اللحم ومكونات اللحم غير الذبيحة ومقاسات الجسم الخارجية

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المستخلص: استخدمت مجموعتين من إناث الماعز النوبي السوداني لدراسة أثر النمو التعويضي على خصائص ومكونات اللحم ومكونات اللحم غير الذبيحة ومقاييس الجسم الخارجية لإناث الماعز النوبي السوداني. (15 جدي لكل مجموعة وذات وزن ابتدائي 16.5 كيلوجرام) لمدة 105يوم. المجموعة الأولى أعطيت علف ذو طاقة أعلى (11.5 ميجاجول طاقة ممثله) بينما أعطيت المجموعة الثانية علف ذو طاقة أدنى (8.5 ميجاجول طاقة ممثلة). خلال هذه الفتره حافظ جديان المجموعة الثانية على أوزانهم بدون زيادة محسوسة. تم اختيار 7 جديان من المجموعة الثانية وتقديم العلف ذو الطاقة العليا (11.5) لهم للوصول للوزن النهائي الذي وصلته جديان المجموعة الأولى. استغرقت هذه المجموعة 175 يوم للوصول لذلك الوزن. تم اختيار 6 جديان من المجموعتين عشوائيا وتم ذبح هذه الجديان لدراسة أثر النمو التعويضي على خصائص ومكونات اللحم ومكونات اللحم غير الذبيحة ومقاييس الجسم الخارجية لإناث الماعز النوبي السوداني. لم تتأثر خصائص الذبيحة بالنمو التعويضي. مكونات الذبيحة كالعظام والعضلات والدهون زادت في مجموعة النمو التعويضي. أما توزيع الدهون فلم يتأثر معنويا بالنمو التعويضي. زادت نسبة التصافي معنويا في ذبائح الجديان التي استخدمت للتعويض. بينما كل مكونات اللحم غير الذبيحة لم تتأثر بالتعويض ما عدا الكبد التي ذادت معنويا والضرع الذي انخفض معنويا بالتعويض. مكونات اللحم الكيميائية ذادت بصورة عامه في مجموعة التعويض. كما أظهر لحم مجموعة التعويض افضلية فى قابلية مسك الماء. بالنسبة لمقاسات الجسم الخارجية فان محيط الصدر والبطن قد ازدادا بينما لم تسجل المقاسات الأخرى اختلافا يذكر. أما بالنسبة لأختبارات الذواقة لجودة اللحم فقد أظهرت مجموعة التعويض انخفاضا في رائحة وطراوة ولون اللحم عن المجموعة الأساسية.

الكلمات المفتاحية: النمو التعويضي- خصائص الذبيحة ومقاسات الجسم الخارجية.

1- INTRODUCTION

Compensatory growth represents an accelerated growth process occurring when an animal is adequately re-fed following a period of nutrient deficiencies or restriction (Hornick et al 2000). Compensatory growth constitutes a crucial physiological Phenomenon within the animal production system, especially significant in cattle production (Drouillard et al 1991). This growth pattern aids in reducing feed costs and typically enhances the feed efficiency of the animal during the re-feeding period (Keogh et al 2015). In addition to leveraging Compensatory growth for enhancing animal growth efficiency, Compensatory growth may also impact meat quality characteristics; however, this effect can be complex and varies depending on the experimental design and Compensatory growth factors (Keady et al 2017 and Andersen et al 2005). The intensity and effectiveness of compensatory growth are influenced by various factors, encompassing the degree and duration of feed restriction, re-feeding period, as well as the animal's sex and genotype (Andersen 2005 and Miszura et al 2021). For instance, a short-term and not too severe feed restriction may lead to more effective Compensatory growth (Menegat et al 2020). In addition, the effectiveness of compensatory growth is influenced by the animal's stage of growth, which may have a synergistic effect on compensatory growth when puberty occurs concurrently with re-feeding (Coleman and Evans, 1986) .The physiological and molecular mechanisms of Compensatory growth after feed restriction have been partially investigated [(Hornick et al 2000), Miszura et al 2021, (Keogh et al 2019), Keogh et al 2019]. It was found that during feed restriction, growth hormone production and secretion were enhanced, but the number of growth hormone receptors was reduced, leading to a decrease in growth hormone resistance and insulin-like growth factor secretion.

During re-feeding and compensatory growth, insulin secretion was sharply enhanced, and plasma growth hormone concentrations remained high, which may have allowed more nutrients to be utilized for the growth process (Hornick et al 2000) . In addition, the rates of protein synthesis and degradation during compensatory growth were shown to be accelerated, possibly by regulating transcriptional activity in muscle tissue (Menegat et al 2020). In contrast, at the molecular level, key genes during compensatory growth are often involved in energy metabolism, protein synthesis and degradation, and muscle growth and differentiation [Keogh et al 2019, Keogh et al 2016]. Nevertheless, based on the complexity of compensatory growth, a large number of observations and studies are needed to fill the gaps in the understanding of its molecular regulatory mechanisms.

The meat from goat is an important source of animal protein which is not yet fully utilized due to the widely held belief that goat meat is inferior to lamb and mutton because of its strong flavour. Gaili *et al* (1972) compared meat quality for desert sheep and goat and reported no flavour differences. Gaili and Ali (1985) studied the composition of muscular and fatty tissues in goats and stated that goat meat is not inferior to mutton. Babiker *et al.* (1990) found no significant difference in the eating quality of goat meat and recommended it as a healthy commodity due to its low fat content compared with lamb.

Goats are less efficient as feed converters into meat than lamb. In addition to that females tend to deposit more fat in their bodies than males particularly when raised on high dietary energy. To utilize female goats for meat production dietary energy manipulation is necessary.

The objective of this experiment was to study the effect of the compensatory growth on carcass characteristics, measurements and non-carcass components of female goats.

2- MATERIALS AND METHODS

Experimental animals: Thirty female Nubian goats were used in this experiment. Animals were selected according to their age (9–12 month) and weight which was approximately 16.5 Kg. Goats were ear-tagged and given an adaptation period of four weeks. During this period goats were fed groundnut halum and a mixture containing equal percentages of assigned experimental rations *ad libitum*. Spraying with an acricide solution against ectoparasites and deworming with thiobenzol as a drench solution was performed, the thiobenzol treatment was repeated after 15 days. Immediately after the adaptation period the animals were individually weighed and then randomly divided into two groups (A& B) of similar number and weight and each group was separately penned.

Feeds and feeding: Tow iso-nitrogenous diets, contains two levels of dietary energy (11.5 and 8.5Mj/KgDM) were used. The ingredient proportions and calculated chemical analysis of experimental diets are given in Table (1).During the feeding period animals were fed the assigned diets *ad libitum*.

Conduct of the experiment: The experiment was divided into two terms, in the first term which was lasted in 105 days. At the end of this term six animals from group A (control group), were selected randomly, weighed, slaughtered and carcass data was recorded. In the second term, seven goats from the second group B (compensated group) were refed with the highest dietary energy diet

(11.5Mj/KgDM).These goats were kept until they reach the final weight obtained by the first group (A); they spent 175 days to reach that weight. Then six animals were slaughtered and the data was recorded.

Data collection: Slaughter data which include, carcass measurements and carcass data was recorded as described by (El Moula et al1999).

Statistical analysis: The data was analyzed by student t-test according to (Snedecor and Cochran, 1980).

3- RESULTS

Slaughter data: Table (2) shows data related to carcass characteristics and composition of goats free fed (first group) and those exposed to compensation. Slaughter weight was not significantly different between the two groups. Gut fill, though not significantly different was heavier in the first group than in the compensated group. Empty body weight, hot, cold and half carcass weights were heavier but not significantly so in the compensated group than in the first group. Hot and cold dressing percentage on live weight base increased significantly (P< 0.05) in the compensated group while dressing percentage on empty body weight base increased but not significantly so in the compensated group. Carcass composition showed no significant changes in the percentages of muscle, bone, fat and trim tissues. However, the major tissues were greater in the compensated group than in the first group. The data of carcass measurements are shown in Table (3). Carcass length was greater and heart girth and abdomen circumference were significantly (P< 0.05) greater in the compensated group than in normally growing group. Thigh circumference was almost identical in the two groups. Table (4) shows fat distribution in the first and compensated goat groups. Total body fat, carcass fat and visceral fat increased but not significantly so in the compensated group compared with the first group.

The proportion of the non-carcass components of the two groups are shown in Table (5). Values of head, skin, empty rumen and intestine, heart, lungs and trachea, were heavier but not significantly so in the compensated group. The liver was significantly (p<0.05) heavier in the compensated group and the udder was significantly (p<0.05) heavier in the first group. But values of full rumen and intestine, kidney, four feet, gut fill and spleen decreased but not significantly so in the compensated group. Fat depots as omentums fat, mesenteric fat and kidney fat were heavier but not significantly so in the compensated group. Joint composition of the compensated and basal goat kid groups are presented in Table (6).The muscle tissue of the compensated group decrease but not significantly so in cuts as breast and best end of the neck compared with first group. However, in cuts as single short forequarter and neck, the muscular tissue increased but not significantly so in the compensated group.

Muscular tissue in leg and chump joint was almost similar in the two groups. While in the loin and tail joint, the muscular tissue was significantly (P< 0.05) lower in the compensated group than in the first one. Fat tissue increased but not significantly so in all joints of the compensated group except the breast joint. In loin joint the increase of fat tissue was significant (P< 0.05).Bone tissue increased but the increase was insignificant in all cuts of the compensated group except in the single short forequarter which showed a reduction in bone proportion. In the compensated group trim tissue tended to increase in cuts as single short forequarter, loin and breast and it decreased in cuts as leg and chump, best end of neck and neck. Meat chemical composition data of the two experimental goat groups are shown in Table (7). There were no significant differences between the two groups in the percentages of moisture, ash, and non protein nitrogen and pH values. Percentages of myofibrillar proteins increased and that of fat and sacroplasmic proteins increased significantly (P< 0.01) in the meat from the compensated goats than in that from the first group.

Muscle protein percentage decreased slightly, but the decrease was significant (P< 0.01) in the compensated group. Table (8) shows data related to meat quality attributes of the tow goat groups. Meat from compensated goat group showed superior water holding capacity value than the first group. Consequently cooking loss was less in the meat from the compensated goat group than the first one.

Colour coordinate (L) was significant (P< 0.01) higher in the meat from compensated group than the first group. Redness (a) values were lower but not significantly so, yellowness (b) values were slightly higher in the compensated group.

As seen in Table (9) no significant differences were detected in the meat from the two goat kids groups in colour, tenderness and overall acceptability. Odour was rated significantly (P< 0.01) lower in compensated group than in the first group. Juiciness was significantly (P< 0.05) higher in the compensated group.

4- DISCUSSION

Carcass characteristics and composition:

The effects of compensatory growth are often influenced by factors such as sex Miszura et al (2021) and, Whitaker et al (2012), genotype, Keady et al (2017) and Andersen et al (2005), a stage of growth, Coleman and Evans (1986) and degree and duration of feed restriction, Menegat et al (2020).

Empty body weight was not significantly different between the compensated and normally growing female goat kids, as these animals were slaughtered at equal body weights and their gut fill was not significantly different. These results were in line with those of Tianyu et al (2024) who found that restricted feeding and full compensatory growth led to similar values in carcass weight, eye muscle area, and yield of several important meat cuts including strip loin, high rib, and tender lion

Hot and cold carcass weights were also similar between the compensated and normally growing goat groups, as these groups had similar empty body weights and that their non-carcass components were not significantly different in weights.

Dressing percentages were more in the compensated group than in the continuously fed goat kids. The compensated goat groups were fatter than the normally growing group. Dressing percentages is known to increase with fatness (Preston *et al.*, 1963). These results were at variance with results of Ehoche *et al.* (1992) who found that continuously fed bulls had significantly (P< 0.05) higher dressing percentage than restricted bulls. Type of compensating diet and its quality as well as the degree of fatness might be the reasons. Carcass composition revealed that compensated goat kid group had more muscle, fat and bone tissues than continuously fed kids. These results were in accord with those of Wilson and Osbourn (1960) who found higher fat in lambs reefed on high level of feeding following feed restriction. On the other hand, Turgeon *et al.* (1986) and Casterns *et al.* (1991) reported a decrease in fat content in the carcasses of reefed lambs. Here species and age of animal and type of feed and duration of both feed restriction and rehabilitation might be the reasons.

Carcass measurements: Values for carcass measurements indicated that compensated goat kids had either longer or significantly more longer carcass measurement as carcass length, heart girth and abdomen circumference. Carcass length differences could be due to age differences as compensated group took longer time to reach the target slaughter weight. Skeletal developments are known to take place even in cases of under-nutrition. Heart girth and abdomen circumference are affected by the development of muscles and fatty tissues, and the rehabilitated group had equal muscle and more fat development than the normally growing group.

Fat distribution: Total body fat, carcass fat and visceral fat were not significantly different between compensated and normally growing goat kids; they were more in the compensated kids. Age of the animals might be responsible for this difference in fat percentages since the compensated group kids were slaughtered at an older age than the normally growing group. Fat deposition increases as age progresses. These results were in line with the results of Wilson and Osbourn (1960), however, they disagreed with those of Kabbali *et al.* (1992) who found that fat content was significantly (P< 0.05) reduced in reefed lambs. Duration of refeeding period might explain the difference in fat deposition in the latter study and the findings of this experiment. But in recent research held by Tianyu et al (2024) who work on cattle they found that muscle fat was increased in the compensated group. The difference between their findings and our results may be due to the difference in experimental animals.

Non-carcass components:

Non-carcass components were not significantly different in compensated and normally growing female goat kid groups except the liver which was significantly (P< 0.05) heavier in compensated goat kids and the udder which was significantly heavier in the normally growing kid group. The fact that these animals were slaughtered at equal body weight might be the reason. These results were similar to those obtained by Kabbali *et al.* (1992) and Gomez *et al.* (1999) who found the weight of liver was greater (P< 0.05) in reefed lambs than in control. Kabbali *et al.* (1992) found that mesenteric and kidney fat were reduced (P< 0.05) in reefed lambs which was at variance with the present results. This could be due to species differences.

Recent study carried out by Addah et al (2017) who work in sheep found that growth of most viscera was less responsive to the restriction-re-alimentation feeding regimen except for the weights of the lungs, heart and intestines.

Joint composition: Joint composition as percentage of joint weight indicated that muscular tissue was almost not significantly lower in compensated group except in cuts as single short forequarter and neck.

While fat tissue was almost higher but no significantly so in all cuts except the breast. These results agreed with the results of Wilson and Osbourn (1960) and Meyer and Clawson (1964) who reported increase in fat content of realiminated sheep.

Bone tissue was not significantly higher in compensated kid's cuts except in single short forequarter. Age of kids might be the main reason.

Trim tissue was slightly more in cuts as single short quarter loin, breast and tail obtained from compensated goat group than from the control, here also age of animals and the increased fatness might be the reason.

Meat chemical composition:

Extensive research has been conducted on the impact of compensatory growth on meat quality and its underlying causes; however, the findings are frequently contradictory, Keady et al (2017 and Moloney et al (2008).

Compensatory growth had a significant effect on the chemical composition of meat, whereas meat from compensated kids had significantly (P< 0.01) more fat, sacroplasmic and myofibrillar proteins. Also compensated kids had significantly (P<0.01) lower meat protein percentage than continuously fed kids.

Carcass fat was more in the compensated goat group than in the normally growing ones. This could be responsible for the increased meat fat of the compensated goat group. These results agreed with those obtained by Wilson and Osbourn (1960) who found higher fat and lower protein content in reefed lambs. Gomez *et al.* (1999) found that carcass protein decreased in the restricted lamb group, which also agreed with the present findings.

Water holding capacity: Water holding capacity was superior in compensated kids than in continuously fed ones. Compensated kid's muscles had more sacroplasmic and myofibrillar proteins and also more fat and fat in the muscles tend to improve their water holding capacity (Lawrie, 1979).

Cooking loss: Meat from compensated kids had less cooking loss value than that from normally fed kids. This might be due to the superior water holding capacity of the compensated kids group and their highest fat content. These results were not in line with those obtained by many workers on cattle as Moloney et al (2008) who found that compensating blue Belgian cattle showed greater cooking losses, than Angus cattle in the same study and reporting no differences in cooking losses in Friesian castrates. Difference in species of the animal may be the reason.

Colour: Hunter colour components indicated no significant difference in redness (a) and yellowness (b) values; however, compensated kids had significantly higher lightness (L) values than the control group. Fat content of muscles might be the reason as fat is expected to increase light reflectivity.

Subjective evaluation of meat quality:

The fact that compensated group had lower colour and tenderness score could be due to age effect as older animals had less tender meat compared with young ones.

Odour was significantly (p<0.01) lower and juiciness was significantly (P<0.05) higher in the compensating group than in normally growing kids. Here again age difference could be the reason as older animals have strong flavour in their meat. Juiciness is more affected by the degree of fatness and here compensated group was found to have more fat in its meat. Researchers as **Addah et al (2017) who work in sheep** found that meat from sheep re-alimented with high energy had a more intense 'sheepy' flavour than those re-alimented with high protein, but juiciness and tenderness were not affected.

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Table (1): Ingredients proportion and chemical composition of Experimental diets.

Item %		A	B
Physical Composition (As fed)	Sorghum grain	40	0
	Wheat bran	15	4
	Groundnut cake	15	4
	Groundnut hulls	17.8	54.8
	Urea	0.2	3.2
	Molasses	10	32
	Lime stone	1	1
	Common salt	1	1
Percentage Chemical composition (DM)	Moisture	6.2	5.08
	Crude protein	17.48	17.89
	Crude fiber	16.5	22.3
	Ether extract	2.43	1.68
	Ash	14.3	16.65
	Calculated Metabolizable	11.55	8.50
	Energy (Mj/Kg DM)*		

*** Calculated according to Ministry of Agriculture, Fisheries and Food, London, U.K. (1975).**

Table (2): Effect of compensatory growth on Slaughter weight and carcass characteristics.

Item		Basal group (A)	Compensating group (B)	P
Slaughter weight (Kg)		24.3±0.72	24.22±1.37	NS
Empty body weight (Kg)		21.51±0.79	21.82±1.33	NS
Gut fill as % of empty body weight		11.56±1.01	10.01±0.64	NS
Hot carcass weight (Kg)		12.53±0.48	12.97±0.73	NS
Cold carcass weight (Kg)		12.08±0.50	12.65±0.69	NS
Half carcass weight (Kg)		5.81±0.22	5.93±0.30	NS
Hot dressing percentage	Live weight base	50.68±0.74	53.57±0.66	0.05
	Empty body base	58.26±0.59	59.54±0.66	NS
Cold dressing percentage	Live weight base	49.66±0.79	52.28±0.63	0.05
	Empty body base	56.15±0.60	58.11±0.83	NS
Carcass composition %	Muscle	55.78±1.38	56.94±1.39	NS
	Bone	20.22±0.74	21.12±0.35	NS
	Fat	13.47±1.24	14.6±1.08	NS
	Trim	5.69±0.26	5.40±0.29	N.S

Table (3): Effect of compensatory growth on carcass measurements (cm).

Item	Basal group (A)	Compensating group (B)	P
Carcass length	47.5+1.46	50.6+1.39	NS
Heart girth	66.6 +1.50	70.7+1.06	0.05
Abdomen circumference	43.7+0.56	46.3+0.81	0.05

Item	Basal group (A)	Compensating group (B)	P
Thigh circumference	31.80+1.56	31.75+0.98	NS

Table (4): Effect of compensatory growth on fat distribution.

Item	Basal group (A)	Compensating group (B)	P
Total body fat (Kg)	3.372+0.26	3.790+0.36	NS
Total body fat (as %of empty body weight)	15.60 ±.2.16	17.31±2.46	NS
Total carcass fat (Kg)	0.786± 0.08	0.869±0.09	NS
Total carcass fat (as % of empty body weight)	3.64±0.82	3.97±0.61	NS
Total visceral fat (Kg)	2.586±0.21	2.918±0.26S	NS
Total visceral (as % of empty body weight)	11.97±1.81	13.34±2.07	NS

Table (5): Effect of compensatory growth on non carcass Components (as % of EBW*).

Item	Basal group (A)	Compensating group (B)	S.L.
Head	6.69±0f.22	7.06±0.27	N.S.
Skin	6.93±0.17	7.34±0.39	N.S.
Rumen (full)	12.06±0.83	10.25±0.57	N.S.
Rumen (empty	3.20±0.14	3.25±0.22	N.S.
Intestine (full)	7.89±0.45	7.40±0.65	N.S.
Intestine (empty)	3.57±0.35	3.79±0.37	N.S.
Liver	1.76±0.06	2.01±0.0	0.05
Heart	0.53±0.013	0.55±0.031	N.S.
Lung and trachea	2.29±0.0.75	2.30±0.078	N.S.
Kidney	0.36±0.15	0.30±0.001	N.S.
Four feet	3.23±0.301	2.99±0.096	N.S.
Gut fill weight	13.14±1.304	11.15±0.790	N.S.
Mesenteric fat	2.48±0.460	3.12±0.381	N.S
Ometum	5.55±0.237	5.85±0.641	N.S.
Kidney fat	4.02±0.214	4.37±0.286	N.S.
Spleen	0.411±0.036	0.34±0.032	N.S.
Uterus	0.31±0.045	0.37±0.f017	N.S.
Udder	0.76±0.133	0.35±0.29	0.05

* EBW: Empty body weight

Table (6): Effect of compensatory growth on joint composition (As % of joint weight).

Item		Basal group (A)	Compensating group (B)	S.L.
Leg and Chump	Muscle	62.94±0.73	62.94±1.18	N.S
	Bone	19.74±0.82	21.50±0.75	NS
	Fat	11.44±0.86	11.93±1.01	N.S
	Trim	5.59±0.54	4.43±0.45	N.S.
Single short forequarter	Muscle	56.24±2.09	57.23±0.44	N.S
	Bone	25.22±1.91	22.25±0.50	NS
	Fat	13.54±0.10	14.40±1.19	N.S
	Trim	4.24±0.47	5.05±0.37	N.S.
Loin	Muscle	56.24±2.09	51.18±0.76	0.05
	Bone	13.73±1.02	15.73±1.14	NS
	Fat	18.71±1.54	21.83±0.78	0.05
	Trim	9.20±1.62	10.11±0.83	N.S.

Item		Basal group (A)	Compensating group (B)	S.L.
Breast	Muscle	54.03±2.45	50.79±0.72	N.S
	Bone	16.08±1.25	18.15±0.75	NS
	Fat	23.08±3.12	21.82±1.60	N.S
	Trim	5.68±0.42	7.16±1.09	N.S.
Best end of neck	Muscle	54.49±2.0	52.80±0.46	N.S
	Bone	21.53±1.57	25.28±1.25	NS
	Fat	15.37±1.46	15.87±1.23	N.S
	Trim	7.23±1.26	5.34±0.62	N.S.
Neck	Muscle	59.08±2.18	61.16±2.41	N.S
	Bone	23.04±1.46	23.19±1.00	NS
	Fat	8.32±2.45	8.85±1.24	N.S
	Trim	9.60±1.25	6.66±1.40	N.S.
Tail	Muscle	37.57±2.87	29.47±1.19	0.05
	Bone	22.91±3.08	29.00±2.02	NS
	Fat	31.29±4.75	35.89±3.52	N.S

Table. (7): Effect of compensatory growth on chemical composition of meat.

Item	Basal group (A)	Compensating group (B)	S.L.
Moisture (%)	74.88±0.95	74.85±0.95	N.S.
Protein (%)	21.56±0.14	20.32±0.15	0.01
Fat (%)	2.26±0.05	2.95±0.05	0.01
Ash (%)	1.13±0.15	1.07±0.11	0.01
Sacroplasmic proteins (%)	6.11±0.054	6.64±0.088	0.01
Myofibrillar proteins (%)	11.26±0.126	11.94±0.994	N.S.
Non protein nitrogen (%)	0.45±0.02	0.45±0.02	N.S.
pH value	6.05±0.03	6.03±0.97	N.S.

Table (8): Effect of compensatory growth on meat quality attributes.

Item	Basal group (A)	Compensating group (B)	S.L.
Water hold capacity (ratio)	2.47+0.174	2.16+0.043	N.S
Cooking loss	38.93+0.295	38.23+0.289	N.S.
Colour:			
Lightness (L)	29.7+0.94	33.2+0.16	0.01
Redness (a)	16.20+0.15	15.45+0.38	N.S.
Yellowness (b)	3.6+0.14	3.8+0.43	N.S.

*Higher ratio denotes inferior WHC.

Table (9): Effect of compensatory growth on the Subjective Evaluation of meat quality.

Item	Basal group (A)	Compensating group (B)	S.L.
Colour	3.3+0.14	2.8+0.18	N.S.
Odour	3.4+0.14	2.9+0.18	0.01
Tenderness	3.7+0.11	3.2+0.15	N.S.
Juiciness	2.8+0.15	3.2+0.15	0.05
Overall acceptability	3.5+0.11	3.6+0.08	N.S.