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Meat Quality and Consumer Acceptability of Broiler Chickens Fed Different Levels of Monosodium Glutamate (MSG)

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A B S T R A C T

The objective of this study was to evaluate the effect of monosodium glutamate (MSG) inclusion in broiler diet on meat quality of broiler chickens for 8 weeks. A total of 300 day old mixed sexed Abor-acre chicks were randomly allocated to six treatments with five replicates per treatment and ten birds per replicate in a completely randomized experimental design. Six administration levels of monosodium glutamate (0.00, 0.25, 0.50, 0.75, 1.00 and 1.25 g MSG/kg diet) were added as taste enhancing additive in the diet at both starter and finisher phases. Four birds (unsexed) per replicate were slaughtered at the end of the trial period for meat quality evaluation. The result revealed fat and crude protein contents of the meat and palatability of the thigh muscle were significantly influenced by MSG, but the oxidative stability, moisture, thawing and cooking loss were not significantly influenced by the dietary treatments. In summary, the palatability of chicken meat from broilers fed diet with MSG inclusion up to 0.75 g MSG/kg diet was enhanced, and fat content was reduced with dietary inclusion of MSG.

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Etlik Piliç Yemine Farklı Düzeylerde Monosodium Glutamate (MSG) İlavesinin Et Kalitesi ve Tüketici Beğenisi Üzerine Etkileri

M A K A L E B İ L G İ S İ

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Ö Z

Bu çalışmanın amacı, etlik piliç yemlerine monosodyum glutamat (MSG) ilavesinin etlik piliçlerde et kalitesi üzerindeki olası etkilerinin 8 hafta boyunca değerlendirmektir. Toplamda 300 adet günlük karışık cinsiyetteki Abor-acre civcivleri, rastgele olarak 6 muamele ve her muamelede 10 civciv olacak şekilde 5 tekerrürlü olarak deneme dizaynı kurulmuştur. Hem başlangıç hem de son dönem yemlerinde tat arttırıcı katkı maddesi olarak 6 farklı miktarda monosodyum glutamat (0,0; 0,25; 0,50; 0,75; 1,00 ve 1,25g/kg) eklendi. Et kalitesi değerlendirmesi için deneme süresi sonunda her tekerrürden dört civciv (cinsiyeti bilinmeyen) kesildi. Sonuçlar etin yağ ve ham protein içeriği ile uyluk kasının lezzetinin MSG' den önemli ölçüde etkilendiğini ortaya çıkardı, ancak oksidatif stabilite, nem, çözülme ve pişirme kaybı yemlerdeki uygulamadan etkilenmedi. Özetle, etlik piliç yemlerine MSG'nin 0,75 g/kg'a kadar eklenmesiyle piliç etlerinin lezzeti arttırılmış ve MSG içeren diyetle birlikte etin yağ içeriği azaltılmıştır.

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Introduction

Poultry meat is described as flesh of domestic birds suitable for consumption. It is a vital food source of protein and animal fat. Quality is the composite of those characteristics that differentiate individual units of a product and which have significance in determining the degree of acceptability of that unit to the user (Groom, 1990.). According to (Aduku and Olokosi, 2002) poultry meat is a source of essential vitamins and minerals such as arachidonic, linolenic, linoleic acids and iron, copper respectively. There are two major aspects of meat quality: nutritional quality which is objective and the eating quality as perceived by the consumer (Fletcher, 2000). The focus of broilers production has been on better body composition with higher breast meat yield and lower abdominal fat. For broiler production to be deemed as profitable it must be characterized by increase in the quantity of prime part such as breast meat in the carcass and reduced fat. To the consumers, appearance is the major attribute of purchasing, selection and initial evaluation of meat quality. In fact, it can be said that appearance is satisfaction (Fletcher, 1997). Other quality criteria are tenderness, juiciness, drip loss, thawing loss, cooking loss, pH, and shelf life are important to consumers.

The increase in lipid content of breast muscle with age may be involved in the increase in meat flavour (Baeza et al., 2002). The consumption of poultry meat has helped in reducing the gap between the supply and demand of animal protein by consumers in Africa (Ali and Zahran, 2010.). This is because it has been long recognized that meat palatability is the greatest driver of consumer satisfaction. Amongst several factors that affect the quality or palatability of meat are nutrition and food additives (Fletcher, 2000). The most closely studied taste enhancer is Monosodium Glutamate (MSG) which is the sodium salt of glutamic acid. Its use has increased throughout the world in recent years as flavouring ingredient in cooking (Chaudari and Roper, 1998) to increase palatability and food selection in a meal.

However, varying results have been reported by researchers on the impact of MSG at different dietary levels on broiler performance. According to (Saad et al., 2009) broiler chickens fed MSG (1%) increased feed intake and body weight, whereas, (Mohammed, 2015) reported that dietary inclusion of MSG up to 1% did not affect feed intake and body weight gain of broiler chickens. Therefore, due to increasing interests in the use of MSG in improving feed palatability for profitable broiler production, this study was conducted to determine the possible effect of MSG, as a feed taste enhancer, on meat quality as well as consumer acceptability of the meat from broiler chicken fed diets enhanced with monosodium glutamate up to 1.25g/kg diet.

Materials and Methods

The research was conducted at the Poultry Unit of the Teaching and Research Farm of the Federal University of Technology Akure while the laboratory analysis was carried out in the Nutrition Laboratory of the Department of Animal Production and Health. Three hundred (300) mixed sexed day old Abor Acre broiler chicks were purchased from a reputable hatchery and Vedan® which contains 95 MSG was purchased from a local market. Six administration levels (0.00, 0.25, 0.50, 0.75, 0.10 and 1.25 g/kg) were added as supplements in the broilers' diet as shown in Table 1. The chicks were assigned to the six treatment levels of five replicates each and at 10 chicks per replicate in a completely randomized experimental design. The feeding trial lasted for 8 weeks. Feed and water were provided ad libitum. Four birds were randomly selected from each replicate and slaughtered at the end of the experiment.

The cooking loss of the meat was determined for the three muscles types (thigh, drumstick and breast) as described by (Ku et al., 2014) with minor modifications. The samples were weighed and heated at 75°C in a water bath for 25minutes, and each cooked sample was cooled to room temperature, blotted dry and weighed.

Cooking loss (%) = {(weight before cook − weight after cook)/ weight before cook} × 100

Likewise, the thawing loss for the three muscles types (thigh, drumstick and breast) were determined by thawing the samples at room temperature for 3 hours as described by (Ku et al., 2014) with minor modifications. The difference between the initial weight and the final weights was used in calculating the thaw loss as:

Thawing loss (%) = {(weight before thaw − weight after thaw) / weight before thaw} × 100

More so, the thigh, drumstick and breast of the chickens were stored in the freezer (-18°C) for 20 days. Thereafter, the proximate composition of meat obtained from the chicken was determined using (AOAC. 2005) methods and measurement of the extent of lipid oxidation of the same sets of muscles was done using the thiobarbituric acid (TBA) assay method (Pikul et al., 1989).

Sensory evaluation was conducted on the thigh of the meat samples across the treatments for acceptability and taste. The cooked meat samples were de-skinned and cut into small pieces. These were coded, boiled for 15 minutes at 60°C and allowed to cool. Ten partially trained panellists administered questionnaires counting the 9-hedonic scale indicated by 1 point (Dislike extremely) to 9 point (Like extremely) (Mahendraker et al., 1988). The panellists were drawn from the postgraduate students and staff population of the Department of Animal Production and Health and had no knowledge of the experiment layout.

All data obtained were subjected to one-way and factorial analysis of variance as appropriate using general linear method (GLM) procedure of SAS. Significant differences were separated using Duncan's New Multiple Range Test (DMRT) of the same software.

Table 1. Composition of the experimental diets

Inclusion level (g/kg) of MSG in Starter diet						
Ingredients	1	2	3	4	5	6
Maize	51.00	50.75	50.50	50.25	50.00	49.75
Soybean Meal	15.00	15.00	15.00	15.00	15.00	15.00
Groundnut Cake	15.00	15.00	15.00	15.00	15.00	15.00
Fish Meal (72% CP)	5.00	5.00	5.00	5.00	5.00	5.00
Corn Bran	10.60	10.60	10.60	10.60	10.60	10.60
Bone Meal	1.50	1.50	1.50	1.50	1.50	1.50
Limestone	1.00	1.00	1.00	1.00	1.00	1.00
Salt	0.35	0.35	0.35	0.35	0.35	0.35
MSG	0.00	0.25	0.50	0.75	1.00	1.25
Lysine	0.10	0.10	0.10	0.10	0.10	0.10
Methionine	0.20	0.20	0.20	0.20	0.20	0.20
Broiler Premix	0.25	0.25	0.25	0.25	0.25	0.25
Total Calculated Nutrients	100	100	100	100	100	100
ME(Kcal/Kg)	2985.82	2977.24	2968.66	2960.08	2951.50	2925.76
Crude Protein (%)	22.60	22.58	22.56	22.24	22.22	22.15
Calcium (%)	1.28	1.28	1.28	1.28	1.28	1.28
Phosphorus (%)	0.52	0.52	0.52	0.51	0.51	0.51
Lysine (%)	1.15	1.15	1.15	1.15	1.15	1.51
Methionine (%)	0.56	0.56	0.56	0.56	0.56	0.56
Crude Fibre (%)	3.68	3.68	3.67	3.66	3.66	3.65
Inclusion level (g/kg) of MSG in Finisher diet						
Ingredients	1	2	3	4	5	
Maize	50.00	49.75	49.50	49.25	49.00	48.75
Soybean Meal	13.00	13.00	13.00	13.00	13.00	13.00
Groundnut Cake	13.00	13.00	13.00	13.00	13.00	13.00
Fish Meal (72% CP)	13.30	13.30	13.30	13.30	13.30	13.30
Corn Bran	6.00	6.00	6.00	6.00	6.00	6.00
Bone Meal	2.50	2.50	2.50	2.50	2.50	2.50
Limestone	1.00	1.00	1.00	1.00	1.00	1.00
Salt	0.35	0.35	0.35	0.35	0.35	0.35
MSG	0.00	0.25	0.50	0.75	1.00	1.25
Lysine	0.30	0.30	0.30	0.30	0.30	0.30
Methionine	0.30	0.30	0.30	0.30	0.30	0.30
Broiler Premix	0.25	0.25	0.25	0.25	0.25	0.25
Total Calculated Nutrients	100	100	100	100	100	100
ME(Kcal/Kg)	2964.16	2955.58	2947.00	2938.20	2929.84	2921.26
Crude Protein (%)	18.56	18.54	18.52	18.50	18.48	18.46
Calcium (%)	1.24	1.24	1.23	1.23	1.23	1.23
Phosphorus (%)	0.56	0.56	0.56	0.55	0.55	0.55
Lysine (%)	1.08	1.08	1.08	1.08	1.08	1.08
Methionine (%)	0.57	0.57	0.57	0.57	0.57	0.57
Crude Fibre (%)	4.85	4.83	4.83	4.82	4.82	4.81

ME: Metabolizable Energy. *Composition of premix: 2.5 kg of premix contains: Vit. A (10000000 iu), Vit. D3 (2500000 iu), Vit. E (12000 iu), Vit. B1 (2000 mg), Niacin (15000 mg), Vit.B6 (1500 mg), Vit.B12 (10 mg), Vit. K3 (2000 mg), Biotin (20 mg), Folic Acid (600 mg), Panthothenic Acid (7000 mg), Chlorine Chloride (150000 mg), Manganese (80000 mg), Iron (40000 mg), Copper (10 mg), Zinc (60000 mg), Selenium (150 mg), Iodine (1000 mg), Magnesium (100 mg), Ethoxyquine (500 g), BHT (700 g)

Results

Proximate Composition of Meat from Broiler-Chickens Fed Diet

The moisture, protein and fat contents of broiler chickens fed diets containing monosodium glutamate are shown in Table 2. Moisture contents of meat were not significantly ($p>0.05$) influenced by dietary treatment but was significant for muscle types ($p<0.05$). Values obtained for moisture did not follow any specific pattern.

Lipid contents of meat significantly increased with the dietary addition of MSG, especially at an inclusion level of 0.25, 0.50 and 1.00 g MSG/kg diet. Also, the result showed a higher lipid contents of meat in the thigh muscle type (4.62%) than drumstick (3.13%) and breast muscle (1.87%). The crude protein contents of meat were significantly reduced by dietary inclusion of MSG and muscle type ($p<0.05$). The result showed a higher crude protein content for breast and drumstick (22.73 and 22.12% respectively) than for thigh (17.94%).

Table 2. Proximate Composition of meat from broiler-chickens fed diet supplemented with monosodium glutamate

	Treatment	Level	Moisture (%)	Lipid (%)	Crude Protein (%)
MSG Level	0.		74.69±0.70	2.54±0.34^{c}	23.87±1.12^{a}
	0.25		75.61±0.58	3.36±0.36^{ab}	19.68±0.98^{cd}
	0.50		74.87±0.78	3.84±0.30^{a}	22.75±1.28^{ab}
	0.75		75.78±0.40	3.01±0.35^{bc}	18.62±0.82^{d}
	1.00		74.27±0.53	3.42±0.40^{ab}	19.54±0.95^{cd}
	1.25		75.47±0.34	3.07±0.32^{bc}	21.10±0.92^{bc}
Breast			74.22±0.50^{b}	1.87±0.15^{c}	22.73±0.65^{a}
Drumstick			75.86±0.36^{a}	3.13±0.16^{b}	22.12±0.56^{a}
Thigh			75.26±0.30^{ab}	4.62±0.18^{a}	17.94±0.84^{b}
Muscle type	Breast	1	73.17±1.45^{a}	1.23±0.32^{c}	24.35±0.62^{a}
	Breast	2	75.97±1.02^{a}	1.94±0.35^{b}	18.96±0.95^{b}
	Breast	3	71.87±1.53^{b}	2.82±0.41^{b}	25.81±2.16^{a}
	Breast	4	75.37±0.84^{a}	1.86±0.28^{b}	21.44±0.44^{a}
	Breast	5	73.13±1.00^{a}	1.73±0.33^{c}	22.31±1.05^{a}
	Breast	6	75.80±0.60^{a}	1.61±0.18^{c}	23.48±2.16^{a}
	Drumstick	1	76.37±0.88	2.56±0.32^{b}	21.15±1.00^{a}
	Drumstick	2	74.67±1.16	3.57±0.44^{a}	23.77±1.77^{a}
	Drumstick	3	77.27±0.72	3.54±0.38^{b}	25.66±0.95^{a}
	Drumstick	4	76.17±0.83	2.73±0.47^{b}	20.27±0.42^{a}
	Drumstick	5	74.40±0.96	3.25±0.31^{b}	20.85±1.52^{a}
	Drumstick	6	76.30±0.22	3.13±0.35^{b}	21.00±1.04^{ab}
	Thigh	1	74.53±1.04^{a}	3.82±0.52	26.10±2.98^{a}
	Thigh	2	76.20±0.89^{a}	4.58±0.55	16.33±0.37^{b}
	Thigh	3	75.47±0.55^{a}	5..14±0.23	16.67±0.69^{b}
	Thigh	4	75.80±0.46^{a}	4.46±0.49	14.15±0.53^{b}
	Thigh	5	75.27±0.68^{a}	5.29±0.38	15.46±0.70^{b}
	Thigh	6	74.30±0.58^{b}	4.45±0.27	18.81±0.87^{b}
Muscle type			*	*	*
Level			NS	*	*
Muscle type × Level			*	NS	*

^{abc} = Means along the column with different superscripts are significantly different (p<0.05), Mean ± Standard Error, NS =Not Significant (p>0.05); *= (p<0.05)

Table 3. Cooking loss, thawing loss and oxidative stability of meat from broiler-chicken fed diet supplemented with monosodium glutamate

	Treatment	Level	Cooking Loss (%)	Thawing Loss (%)	Oxidative Stability
Breast			20.31±1.19^{b}	2.77±0.53^{a}	0.23±0.02^{b}
Drumstick			25.87±1.39^{a}	1.37±0.26^{b}	0.24±0.02^{b}
Thigh			26.96±1.27^{a}	1.75±0.31^{b}	0.31±0.03^{a}
Level	0.00		24.87±0.95	1.75±0.45	0.22±0.02^{b}
	0.25		23.33±2.02	1.75±0.89	0.20±0.03^{b}
	0.50		24.92±1.02	1.08±0.22	0.34±0.04^{a}
	0.75		25.75±3.47	1.16±0.33	0.25±0.03^{ab}
	1.00		22.40±1.65	1.16±0.25	0.26±0.05^{ab}
	1.25		25.12±2.40	1.87±0.40	0.29±0.03^{ab}
Muscle type	Breast	1	22.28±0.87^{b}	2.67±1.21	0.21±0.04^{a}
	Breast	2	18.88±464^{a}	6.91±2.02	0.16±0.02^{a}
	Breast	3	22.19±0.91^{b}	1.45±0.49	0.32±0.08^{a}
	Breast	4	17.30±4.19^{a}	0.92±0.30	0.21±0.05^{a}
	Breast	5	19.33±2.67^{a}	1.35±0.55	0.19±0.06^{a}
	Breast	6	21.85±3.74^{a}	3.30±0.79	0.28±0.05^{ab}
	Drumstick	1	24.69±1.05^{ab}	1.25±0.58^{a}	0.25±0.05^{a}
	Drumstick	2	25.82±2.98^{a}	2.79±0.77^{a}	0.25±0.05^{a}
	Drumstick	3	25.20±1.71^{ab}	0.86±0.35^{a}	0.26±0.03^{a}
	Drumstick	4	31.36±6.50^{a}	1.57±0.93^{a}	0.23±0.04^{a}
	Drumstick	5	23.10±2.93^{a}	0.87±0.43^{a}	0.27±0.08^{a}
	Drumstick	6	25.07±3.85^{a}	0.86±0.34^{b}	0.20±0.04^{b}
	Thigh	1	27.65±1.35	1.31±0.20^{a}	0.21±0.05
	Thigh	2	24.98±2.03	4.55±1.27^{a}	0.21±0.06
	Thigh	3	27.37±1.40	0.93±0.28^{a}	0.43±0.08
	Thigh	4	28.60±5.40	0.99±0.33^{a}	0.31±0.08
	Thigh	5	24.75±3.02	1.27±0.36^{a}	0.33±0.12
	Thigh	6	28.43±5.42	1.45±0.47^{b}	0.38±0.03
Muscle type			*	*	*
Level			NS	NS	NS
Treatment × Level			NS	NS	NS

^{abc} = Means along the column with different superscripts are significantly different (p<0.05), Mean ± Standard Error, NS =Not Significant (p>0.05); *= (p<0.05)

Cooking Loss, Thaw Loss and Oxidative Stability of Meat

The results of cooking loss, thaw loss and oxidative stability of meat from chickens fed diets containing varying levels of monosodium glutamate are presented in Table 3. The cooking loss of the meat was not significantly ($p<0.05$) influenced by of MSG addition in the diet ($p>0.05$) but was significantly influenced ($p<0.05$) by muscle types with cooking loss values 20.31, 25.87 and 29.96% for drumstick, breast and thigh respectively. Thaw loss of the meat was significantly influenced by the muscle type ranging from 1.37-2.77% for muscle types but was not influenced by the dietary treatment ($p>0.05$). The breast had the highest thawing loss, followed by the thigh and then the drumstick muscle. No specific pattern was observed for thawing loss values influenced by dietary treatment. Oxidative stability of meat was not significantly influenced ($p<0.05$) by the dietary treatments but the muscle types showed significant differences ($p<0.05$). The thigh (0.31±0.03 mg MDA/kg muscle) had the highest value compared with drumstick (0.24±0.02 mg MDA/kg muscle) and breast muscle (0.23±0.02 mg MDA/kg muscle).

Sensory Evaluation

The taste/acceptability scores of the thigh meat of broiler chickens fed diet included with monosodium glutamate are shown in Table 4. The taste/acceptability of cooked thigh meat was determined by a panel of assessors and it was established that thigh meat of broilers fed with treatment 4 (0.75 g/kg MSG) had highest consumer acceptance.

Table 4. The sensory evaluation scores of meat from broiler-chicken fed varying monosodium glutamate levels

Treatment	Appearance/Taste
1	$6.70±0.63^{ab}$
2	$5.80±0.44^{ab}$
3	$5.40±0.56^{b}$
4	$7.20±0.49^{a}$
5	$5.70±0.52^{ab}$
6	$5.90±0.35^{ab}$

^{abc} = Means along the column with different superscripts are significantly different ($p<0.05$), Mean ± Standard Error

Discussion

Composition of Meat from Broiler-Chickens Fed the Diet

The moisture contents of the meat were not significantly influenced by the treatments. The values of the moisture contents of the meat did not follow any trend in relation to treatment levels or muscle type but conformed to the range of 65 to 76% as earlier reported in another experiment (Onibi et al., 2000). This finding is consistent with earlier studies on chicken meat which reveal that moisture content is higher in drumstick than thigh and lowest in breast muscles and that fat deposition is higher in the thigh than in drumstick followed by breast muscles because the thigh muscles have more fat globules (Onibi, 2006; Onibi et al., 2011). Although, the results reported by another development (Mustafa, 2014) were within the reported levels for protein and fat content, it stated that glutamine supplementation has no significant effect on meat characteristics (total protein and fat content). It has also been concluded that the addition of MSG up to 1% in broiler diet did not affect any meat quality parameter and that glutamine supplementation levels has no effect on the meat quality characteristics (ash, acidity, total protein, dry matter, fat, malondialdehyde (MDA) of meat and meat colour parameters) of broilers (Prada et al., 2007). This, however, disagrees with the findings of the current research that crude protein and fat contents were significantly influenced by MSG inclusion in broiler diet.

The values recorded for fat were below that earlier reported for broiler chicken by (Onibi et al., 2011). This may be as a result of glutamine conversion to glucose in the kidneys which occur without affecting the glucagon and insulin counts. Therefore, it contributes to energy supply while being able to bypass insulin-induced fat storage. Glutamate helps counteract the storage of dietary fats and thus help regulate fat deposition (Prada et al., 2007).

Cooking Loss, Thaw Loss and Oxidative Stability of Meat

High cooking loss percentage can be attributed to the high presence of the intramuscular fat in meat. The cooking loss of meat from this study ranged between 20.31- 29.96% which is in the same range with previous studies for broiler chickens (20-28%) are characteristic of reduced fat content of meat. (Liu et al., 2004). Higher cooking loss values are associated with reduced water holding capacity (Lee et al., 2007). Notably, high cooking loss of meat within the range of 35-50% can be associated with immense lipid content because during cooking some lipid would be lost (Xia et al., 2009). The thawing loss of meat refers to the melting process of conversion from frozen to liquid state (Leygoine et al., 2012). In this study the breast had the highest thawing loss, followed by the thigh and then the drumstick muscle. The nutritional quality of meat can be lost due to leaching of soluble protein and flavour, if percentage thaw loss is high (Adesua and Onibi, 2014). The differences in thawing loss can be attributed to the varied structure of the muscle cell and its components as well as the amount of extracellular space within the muscle itself which is susceptible to physical disruption caused by ice crystals formed in the meat (Diniz et al., 2004).

Oxidative stability of frozen meat expressed as concentration of malondaldehyde (MDA) was higher in the thigh compared with drumstick and breast muscles. In consonance with the reported earlier finding (Onibi, 2006), the thigh muscle had the highest value having oxidized the most due to its high lipid content. The results from this study were in harmony with another experiment (Zhu et al., 2011) which expressed that the susceptibility of chicken parts to oxidation differed from one another and that the higher the lipid contents of the meat the higher its susceptibility to peroxidative changes. In another experiment, the administration of MSG induced oxidative stress in the experimental animals and the significant increase of MDA level observed indicates the possibility of increased radical production and higher rate of lipid peroxidation (Moore, 2003).The beneficial effect of this amino acid (glutamate) reduction reaction is that it leads to the oxidation of meat tissue (Zhu et al., 2011).

Organoleptic Quality of The Meat

Appearance and taste of cooked thigh meat followed the same pattern among the panel of assessors. The results from this research agreed with another report that the enhancement of meat flavour by MSG may be due to the characteristic property of MSG as a flavour enhancer and subsequent acceptability by the consumers (Moore, 2003). Thigh meat of broilers fed treatment 4 (0.75 g/kg MSG) appeared better in terms of consumer acceptance and this implies that the inclusion of MSG as supplement in the diet enhanced the acceptability and taste of meat. It was also reported that MSG through its stimulation of the oral sensory receptors improved the palatability of meals and influenced the appetite positively (Moore, 2003).

Conclusion

From the results obtained in this study, it could be stated that MSG inclusion in broiler diets at 5g/kg optimally enhanced body weight gain and feed conversion ratio. Oxidative stability, moisture content, cooking and thawing losses were not influenced by MSG addition. However, meat quality parameters such as crude protein content was reduced while fat content was higher among the birds fed diets containing MSG. Muscle types also influenced crude protein and fat content. Therefore, broiler meat acceptability was enhanced with MSG inclusion up to 0.75 g/kg diet.

References

AOAC. 2005. Association of Official Analytical Chemists. 18th Edition. Washington DC.

Adesua, A., Onibi, G.E. 2014. Growth performance, haematology and meat quality of broiler chickens fed rumen liquor- fermented wheat bran-based diets. Jordan J Agric. Sci. 10(4):725-736.

Aduku, A.O., Olokosi, J.O., 2002. Animal products processing and handling in the tropics. Living Book Series. Pp121-126.

Ali, F.H., Zahran, D.A., 2010. Effect of growth enhancers on quality of chicken meat during cold storage. Adv. J Food Sci &Tech**.** 2:219-222.

Baeza, E., Dessay, C., Wacrenier, N., Marche, G., Listrat, A., 2002. Effect of selection for improved body weight and composition on muscle and meat characteristics in Muscovy duck. Brit. Poult. Sci. 43:560-568.

Chaudari, N., Roper, S.D., 1998. Molecular and physiological evidence for glutamate (umami) taste transduction via a G-protein-coupled receptor. Ann. NY Acad. Sci.; 855: 398-405.

Diniz, Y.S., Fernandes, A.A., Campos, K.E., Mani, F., Ribas, B.O., Novelli, E.L. 2004. Toxicity of hypercaloric diet and monosodium glutamate: oxidative stress and metabolic shifting in hepatic tissue. J Food Chem. & Toxicol. 42: 319-325

Fletcher, D.L. 1997. Quality of Poultry Meat: Texture and Colour. In: Proceedings of Georgia International Poultry Course, Athens, GA.

Fletcher, D.L. 2000. Poultry meat quality. W. Poul. Sci. J. 58:131-145

Groom, G.M., 1990. Factors affecting poultry meat quality. In : Sauveur B. (ed.). L'aviculture en Méditerranée. Montpellier : CIHEAM, Pp. 205-2102.

Ku, S. K., Jeong, J. Y., Park, J. D., Jeon, K. H., Kim, E. M., & Kim, Y. B. 2014. Quality Evaluation of Pork with Various Freezing and Thawing Methods. Korean J. food sci. & anim. res., 34(5), 597-603.

Lee, S.H., Park, E.W., Cho, Y.M., Kim, S.K., Lee, J.H., Jeon, J.T., Yoon, D. 2007. Identification of differentially expressed genes related to intramuscular fat development in the early and late fattening stages of hanwoo steers. J biochem. & mol. Biol. 40(5): 757-764.

Leygoine, C., Britz, C.J., Hoffman, L.C. 2012. Impact of freezing and thawing on the quality of meat: A Review. Meat Sci. 91: 93-98.

Liu, Y., Lyon, B.G., Winddham, W.R., Lyon, C.E., Savage, E.M. 2004. Principal component analysis of physical colour and sensory characteristics of chicken breasts deboned at two, four, six and twenty four hours postmortem. Poult. Sci. 83(1): 101-108.

Mahendraker N.S., Khabade V.S., Dani N.P. 1988. Studies on the effect of fattening on carcass characteristics and quality of meat from Bannu-lamb. J. Food Sci. Technol. 25: 228-230.

Mohammed, E. A. 2015. Effect of monosodium glutamate on performance, blood characteristics and carcass quality of broiler chicks. MSc Thesis, University of Khartoum, Khartoum, Sudan. Retrieved on December 14th, 2018.

Moore, K.L. 2003. Congenital malformations due to environmental factors. In: Saunders WB, editor. Developing Humans. 2nd ed. Philadephia: Saunders. Pp 173-183.

Mustafa, A. 2014. The effect of dietary Glutamine supplementation on performance and blood parameter, carcass characteristics, quality and characteristics meat of broiler chickens under continuous heat stress condition. Int'l. J Farming & Allied Sci. 3 (12): 1234-1242.

Onibi, G.E. 2006. Dietary oil quantity and vitamin E supplementation II: effect on carcass and meat quality of broiler chickens. Bowen J. Agric.3: 106-115.

Onibi, G.E., Babadoye, A.O., Folorunsho, O.R. 2011. Haematological indices, serum cholesterol and meat quality of broiler chickens fed diets with palm oil sludge substituting maize. Agric. & Biol. J N America. 2(3), 552-558.

Onibi, G.E., Scaife, J.R., Murray, I., Fowler, V.R. 2000. Supplementary α-tocopherol acetate in full-fat rapeseed diets for pigs: influence on tissue α-tocopherol content, fatty acid profiles and lipid oxidation. J. Sci. Food & Agric. 80:1625-1635.

Pikul, J., Leszcynsk, D.E., Kummerow, F.A. 1989. Evaluation of three modified TBA methods for measuring lipid oxidation in chicken meat. J Agric. & Food Chem. 37:1309-1313

Prada, P.O., Hirabara, S.M., de Souza, C.T., Schenka, A.A., Zecchin, H.G., Vassallo, J., Velloso, L.A., Carneiro, E., Carvalheira, J.B., Curi, R., Saad, M.J. 2007. L-glutamine supplementation induces insulin resistance in adipose tissue and improves insulin signalling in liver and muscle with diet-induced obesity. Diabetologia. 50 (9): 149-159

Saad, A. M., Mohamed H. E., Khadiga, A. Ati, A. and Mohammed S. (2009). Response of broiler chicks to dietary monosodium glutamate. Pakistan Vet. J. 29(4): 165-168**.**

Xia, X., Kong, B., Liu, Q., Liu, J. 2009. Physiochemical change and protein oxidation in porcine longissimus dorsi as influenced by different freeze-thaw cycles**.** Meat Sci. 83: 239-245.

Zhu, B., Xu, Q.Y., Xu, H., Wang, C.A., Sun, D.J. 2011. Dietary glutamine supplementation improves tissue antioxidant status and serumnon- specific immunity of juvenile hybrid sturgeon (acipenser schrenck and husodauricus). J Appl. Ichthyology. 27: 715-720