EFFECT OF FEEDING BROILER BIRDS WITH FATTY ACIDS RICH PLANTS (JUTE MALLOW AND WATERLEAF) ON THE FATTY ACID COMPOSITION OF THE RESULTING BROILER CHICKEN

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ABSTRACT

This study evaluated the effect of feeding broiler birds with fatty acid-rich plants on the resulting broiler chicken, specifically on the breast, thigh and drumstick of broiler birds fed diets containing varying levels of jute mallow, waterleaf and their combination. Four diets tagged as T1, T2, T3 and T4 were formulated such that T1 contained 0% of jute mallow and 0% waterleaf; T2 – 10% jute mallow, 0% waterleaf; T3 – 0% jute mallow, 10% waterleaf; T4 – 5% jute mallow and 5% waterleaf, respectively. The diets were fed to broiler birds for seven (7) weeks, and the effect was compared. One hundred and sixty broiler chicks were randomly assigned to the treatments; each treatment had four experimental units (replicates). At the end of the feeding trial, the breast muscle, thigh and drumstick of the birds were subjected to fatty acids analysis and statistical analysis was carried out on the results of said analysis. Significant difference ($p<0.05$) was recorded amongst the treatments in the level of capric acid in the breast muscle with treatment 3 (WL10%) recording the highest value (2.93), significant difference ($p<0.05$) was also observed in the levels of lauric acids with treatment 3 been higher than the other treatment, for palmitic acids in the breast muscles no significant difference ($P>0.05$) was recorded amongst the treatments while significant difference ($p<0.05$) was recorded for linoleic acids amongst the treatment with treatment three having the highest score (18.14). For capric acids in the chicken thigh there was significant difference ($p<0.05$) amongst the treatments with treatment 1, 2 and 4 been statistically different from treatment 3, for Myristic acids in the thigh significant difference ($p<0.05$) was recorded with treatment 1 having the highest value and no significant difference ($P>0.05$) was recorded amongst the treatment levels for linolenic acids. Significant difference ($p<0.05$) was observed in the oleic acids in the drumstick amongst the treatment levels with treatment 4 having the highest score, significant difference ($p<0.05$) was also recorded in the stearic acids in the drumstick amongst the treatment levels with treatment 1 having the highest score (11.42). The study indicated that the inclusion of jute mallow and waterleaf into broiler diets helped increase the levels of omega-3 (linolenic acid) and omega-6 (linoleic acid) acids in the resulting broiler chicken, more so in the breast muscle.

Keywords: Jute mallow, Waterleaf, Omega3 Fatty Acids and Broiler Birds

INTRODUCTION

Fatty acids, particularly essential fatty acids, are becoming of more importance in poultry feeding systems not only because they improve the health and productivity of birds, but because of the health-conscious society that prefers appropriately balanced diets to decrease adverse health issues (Cherian, 2015). Amongst various fatty acids, omega-6 (ω-6) and omega-3 (ω-3) fatty acids prove essential in a properly maintained ratio for several physiological, biological (Simopoulos, 2011), developmental (Kalakuntla *et al.,* 2017), reproductive (Feng *et al.,* 2015), and favourable health functions (Lee *et al.,* 2019).

Sufficient supplementation of poultry diets with new and beneficial feed additives or supplements is gaining interest as it significantly improves general poultry production and performance as well as ensures good health of birds (Dhama *et al.,* 2014). In human diets, ω-3 and ω-6 are essential fatty acids. Nevertheless, considerable alteration in dietary patterns has resulted in alterations of the consumption of such fatty acids, with a subsequent increase in the consumption of ω-6fatty acids and an obvious decrease in the consumption of ω-3 fatty acids. This alteration has led to an imbalance in the ω-6/ω-3 ratio, which is at 20:1 which now differs considerably from the original ratio of (1:1). Therefore, dietary supplement of foodstuffs such as eggs and meat are ways of improving the daily consumption of ω-3 to meet the recommended doses (Baiao *et al.,* 2005).

Omega-3 fatty acids do influence heart rates (Richardson, 2006). While the consumption of high rates of fatty acids (e.g., ω-6) has been associated with a higher incidence of health problems, such as obesity, type 2 diabetes and coronary artery diseases (Richardson, 2006). Maintaining an appropriate ratio of ω-3 and ω-6 fatty acids would not only improve performance but also prevent these health issues. Omega-3 fatty acids eicosatetraenoic (EPA) acid, docosahexaenoic acid (DHA) and alpha linolenic acid (ALA) have shown several health benefits; they are helpful in cardiovascular functions and fetal development, and prevent Alzheimer's disease (DiNicolantonio *et al.,* 2018). In addition, they play a vital role in modulating immunity (Swanson *et al,* 2012). The ratio of ω-6: ω-3 fatty acids play an important role in the immune response, production performance of broilers (Ibrahim *et al.,* 2018). The addition of ω-3, such as EPA and DHA-rich plant derivatives, to the poultry diet has been observed to improve the yield of poultry products such as eggs and meat (Al-Zuhairy *et al.,* 2014).

Jute mallow (*Corchorus olitorius)* is a vital leafy green vegetable in several regions, including but not limited to Tunisia, Southern Asia, China, Egypt, and Nigeria. In countries like Kenya, Cameroon, Nigeria, Côte d'Ivoire, and Benin, it is a major vegetable. The jute mallow (*Corchorus olitorius)* is usually prepared into a thick gooey soup, which is then added to a stew or a soup, depending on taste. Different parts of Jute mallow are also of medicinal purposes, especially the seeds as evacuant, the leaves for relieving stomach pain (Merlier, 1972), the roots for treating toothache (Nemb *et al*., 2011) and the stems for treating cardiovascular disorders (Deton, 1997). Jute mallow (*Corchorus olitorius)* is rich in ω-3 and ω-6 fatty acids, protein, carbohydrate, calcium, fibre, vitamin A, magnesium, thiamine, riboflavin, nicotinamide and ascorbic acid (Matsufuji *et al*., 2001; Mazen, 2004; Opabode and Adeboye, 2005; Ndlovu and Afolavan, 2008; Ibrahim and Fagbohun, 2011; Nemb *et al*., 2011). Waterleaf (*Talinum triangulare),* on the other hand, is an herbaceous annual and perennial plant with a worldwide distribution range. Waterleaf (*Talinum triangulare)* is a very abundant source of calcium, vitamin C, vitamin E, soluble fibres, magnesium, potassium, protein, carotene and dietary fibre (Ezekwe *et al*., 2001).

As such, it can also help prevent animals from internal organ damage caused by free radicals because of its vitamin C and E, which are very effective in combating free radicals. The objective of this study is to determine the omega-3 fatty acid and other fatty acid contents of the broiler chicken resulting from the feeding of the test ingredients.

METHODOLOGY

Experimental site

The experiment was conducted at the Poultry Unit of the Niger State Agricultural Mechanization Development Agency (NAMDA) in Maitumbi Minna. Minna is the capital of Niger State and it is located at latitude $9^0$33’ North and longitude $9^0$37’ East, with a mean annual rainfall of between 1200mm and 1300mm and mean annual temperature of between 38°C and 42°C. Geographically, Minna is situated in the Southern Guinea Savanna vegetation belt of Nigeria, and it is characterized by wet and dry seasons (Niger State Agricultural Development Project, 2009).

Source of experimental materials

Fresh jute mallow and waterleaf were purchased from Kure Ultra-Modern Market, Minna, Niger State, while other feed ingredients were purchased from Alkheri Animal Feeds opposite GidanMatasa, Bosso, Minna, Niger State. Agrited broilers chicks were purchased from Step-by-Step Poultry Store opposite Kure Ultra-Modern Market Minna, Niger State.

Preparation of the test ingredients (jute mallow and waterleaf)

The fresh jute mallow (JM) and waterleaf (WL) were thoroughly washed with clean fresh water to remove dirt (sand and stones). Subsequently, they were air dried at room temperature (29 - 31°C) for two weeks until they were dried and brittle, after which the dried leaves were milled using a hammer mill. The milled jute mallow and waterleaf were packed into different plastic bags and kept till they were to be used. They were eventually used alongside other feed ingredients in the formulation of the experimental diets (Tables 1 and 2).

Experimental design

A total of one hundred and sixty (160) day-old Agrited broiler chicks were used for the study. The birds were randomly allotted into four treatment groups T1, T2, T3 and T4, respectively. Each treatment had four replicates. There were ten birds per replicate, making a total of 40 birds per treatment. A complete randomized design was used. T1 (control) contained 0% jute mallow and waterleaf, T2 contained 10% jute mallow and 0% waterleaf, T3 contained 0% jute mallow and 10% waterleaf, while T4 contained 5% jute mallow and 5% waterleaf, as indicated in Tables 1 and 2.

Table 1: Gross composition of broiler starter diets containing jute mallow and waterleaf and their combination

Ingredients	T1 Control	T2 Jute-Mallow (10%)	T3 Waterleaf (10%)	T4 JM/WL (5:5)
Maize	52.06	44.06	44.06	44.06
Soybean meal	12.25	12.25	12.25	12.25
Wheat offal	7.50	7.50	7.50	7.50
GNC	18.99	16.99	16.99	16.99
Fishmeal	5.60	5.60	5.60	5.60
Jute mallow meal	-	10.00	-	5.00
Waterleaf meal	-	-	10.00	5.00
Bone meal	2.10	2.10	2.10	2.10
Vitamin premix	0.80	0.80	0.80	0.80
Lycine	0.20	0.20	0.20	0.20
Methionine	0.20	0.20	0.20	0.20
Salt	0.30	0.30	0.30	0.30
TOTAL	100	100	100	100
Crude protein (%)	23.14	23.47	23.32	23.37
M.E (kcal/kg)	2852.01	2729.21	2729.21	2729.21
Ether extract (%)	4.43	4.47	4.39	4.40
Ash (%)	3.41	3.17	3.20	3.19
Crude fibre (%)	4.06	4.67	4.22	4.48
Calcium (%)	1.16	1.17	1.15	1.16
Phosphorus (%)	0.76	0.75	0.73	0.74

[1]Premix: A – 12,000,000IU; Vitamin B_1 – 2,000mg; Vitamin B_6 – 3,500mg; Vitamin B_{12} – 20mg; Vitamin D_3 – 3,000,000IU; Vitamin E – 30,000mg; Vitamin K_3 – 2,500mg; Antioxidanrt – 125,000mg, Biotin – 80mg; Calpan – 10,000mg, Choline Chloride – 200,000mg; Cobalt – 250mg, Copper – 8,000mg, Folic acid – 1,000mg; Iodine – 1,200mg; Iron – 40,000mg; Manganese – 70,000mg; Niacin – 40,000mg; Selenium – 250mg; Zinc – 60,000mg.

Key:
ME= Metabolizable energy
T1 = control no jute-mallow and waterleaf
T2 = contains 10% of jute-mallow and 0 waterleaf meals
T3 = contains 0 % jute-mallow and 10 % of waterleaf meals
T4 = contains 5% jute-mallow and 5% waterleaf meals

Experimental birds and management

The birds were reared in a deep litter system, where they were uniformly cared for and managed. The experiment lasted for seven weeks. Feed and clean wholesome drinking water were provided for the chicks ad *libitum* throughout the experimental trial period. The birds were housed in an open-sided wall house to provide proper cross ventilation, while in the evening, when the temperature normally drops, the open sides were covered using tarpaulins to provide warmth. This was done both at the starter and finisher phases. Before the arrival of the birds, the poultry pen was rigorously scraped, scrubbed and swept, after which it was then washed and disinfected. Old newspapers were spread on the floor as litter material during the brooding stage charcoal stoves were used as the heat source. On arrival, they were carefully emptied from the cartons and immediately served water containing vitalyte to help cushion the effects of transportation stress. Feed and clean water were subsequently made available, and this continued *ad libitum*. The vaccination routine was carried out as follows:

2nd week - Lasota 1st dose
3rd week - Gumboro 1st dose
5th week - Lasota 2nd dose

Medication was also administered via drinking water. Vitalyte was often served to prevent stress and improve appetite. Virucine and Pox Proline were used for the control and treatment of fowl pox. Amprolium was administered to prevent coccidiosis.

Table 2: Gross composition of broiler finisher diets containing jute mallow and waterleaf and their combination

Ingredients	T1 Control	T2 Jute-Mallow (10%)	T3 Waterleaf (10%)	T4 JM/WL (5:5)
Maize	54.66	46.66	46.66	46.66
Soybean meal	10.34	10.34	10.34	10.34
Wheat offal	10.00	10.00	10.00	10.00
GNC	17.40	15.40	15.40	15.40
Fishmeal	4.00	4.00	4.00	4.00
Jute mallow meal	-	10.00	-	5.00
Waterleaf meal	-	-	10.00	5.00
Bone meal	2.10	2.10	2.10	2.10
Vitamin premix	0.80	0.80	0.80	0.80
Lycine	0.20	0.20	0.20	0.20
Methionine	0.20	0.20	0.20	0.20
Salt	0.30	0.30	0.30	0.30
TOTAL	100	100	100	100
Crude protein (%)	21.07	21.37	21.37	21.37
M.E (kcal/kg)	2855.34	2727.57	2789.13	2811.37
Ether extract (%)	4.32	4.39	4.27	4.36
Ash (%)	2.95	2.76	2.98	2.81
Crude fibre (%)	4.10	4.62	4.97	4.87
Calcium (%)	1.05	1.07	1.06	1.05
Phosphorus (%)	0.71	0.7	0.72	0.69

[1]Premix: A – 12,000,000IU; Vitamin B_1 – 2,000mg; Vitamin B_6 – 3,500mg; Vitamin B_{12} – 20mg; Vitamin D_3 – 3,000,000IU; Vitamin E – 30,000mg; Vitamin K_3 – 2,500mg; Antioxidanrt – 125,000mg, Biotin – 80mg; Calpan – 10,000mg, Choline Chloride – 200,000mg; Cobalt – 250mg, Copper – 8,000mg, Folic acid – 1,000mg; Iodine – 1,200mg; Iron – 40,000mg; Manganese – 70,000mg; Niacin – 40,000mg; Selenium – 250mg; Zinc – 60,000mg.

Key:

ME= Metabolizable energy
T1 = control no jute-mallow and waterleaf
T2 = contains 10% of jute-mallow and 0 waterleaf meals
T3 = contains 0 % jute-mallow and 10 % of waterleaf meals
T4 = contains 5% jute-mallow and 5% waterleaf meals

Fatty acids analysis of the broiler chicken (breast, thigh and drumstick)

The lipids were extracted from samples (breast, thigh and drumstick) by Soxhlet extractor using hexane as a solvent. Fatty acids were transformed into methyl esters according to the ISO procedure (ISO, method 5509, 2015). The fatty acid methyl esters (FAMEs) were extracted with petroleum ether and were analyzed by high-pressure liquid chromatography (HPLC) (Buck Scientific BLC 10/11 USA) equipped with a flame ionization detector and integrator. The mobile phase is (59:41) Acetonitrile: 2-propanol, and the column (Prevail C-18, 5u, 150 x 4.6mm) flow rate was 1ml/min. The oven temperature was maintained at 210°C for 45 minutes. The fatty acids were identified by comparing their retention times with those of standards. The content of the fatty acid was expressed as a percentage of total fatty acids.

Statistical analysis

All the data obtained were subjected to one-way analysis of variance (ANOVA) using Statistical Analysis System (SAS, 2010), and significant means were separated using Duncan's Multiple Range Test (Duncan, 1955).

Table 3: Proximte composition of jute mallow (*C. olitorius*) and waterleaf (*T. triangulare*)

Nutrients%	Jute mallow	Waterleaf
Moisture content	5.65	11.20
Crude fibre	17.95	8.19
Crude protein	13.15	13.06
Ash	6.9	7.87
Lipid	4.79	1.90
Nitrogen free extract	51.65	57.76

RESULTS AND DISCUSSION

RESULTS

Fatty acid compositions of the breast muscle of broiler chickens fed experimental diets

Table 4 below shows the fatty acid composition of the breast of the experimental broiler chickens, capric acid (2.93) level was significantly ($p<0.05$) higher in Treatment 3 (10%WL) while Treatments 1 (Control), 2 (10JM) and 4 (5%JM and 5%WL) were not significantly ($p>0.05$) different. Lauric acid level was significantly ($p<0.05$) higher in treatment 3, which was closely followed by Treatment 2, while treatments 1 and 4 were not significantly different. There was a significant ($p<0.05$) difference in the levels of Myristic acid, with Treatment 4 being significantly ($p<0.05$) different from Treatments 1, 2 and 3, while Treatments 2 and 3 were not significantly ($p>0.05$) different from one another.

For palmitic acid there was no significant ($p>0.05$) difference in all the treatments values, while significant ($p<0.05$) difference was observed in the values for stearic acid with treatment 1 been significantly ($p<0.05$) different from treatments 2, 3 and 4, while treatments 3 and 4 were not significantly ($p>0.05$) different from each other. There was a significant ($p<0.05$) difference in the levels of oleic acid in the breast of the broiler chicken, where all the treatments were significantly ($p<0.05$) different, with treatment 4 having the highest value and treatment 2 with the lowest.

The levels of Linoleic acid in the breast of the broiler chickens were significantly ($p<0.05$) different in all the treatments with treatment 3 having the highest value and treatment 1 having the lowest value while the levels of linolenic acids were also significantly ($p<0.05$) different in all the experimental treatments with treatment 3 having the highest value for linolenic acid while treatment 1 had the lowest value.

Table 4: Fatty acid compositions of the breast muscle of broiler chickens fed experimental diets

PARAMETER	T1	T2	T3	T4	SEM (±)
Capric	2.30^{b}	2.17^{b}	2.93^{a}	2.23^{b}	0.09
Lauric	3.83^{c}	4.38^{b}	4.60^{a}	3.94^{c}	0.08
Myristic	0.41^{b}	0.17^{c}	0.29^{c}	0.81^{a}	0.06
Palmitic	21.56	22.40	22.65	21.68	0.19
Stearic	15.08^{a}	11.32^{c}	12.41^{b}	12.41^{b}	0.36
Oleic	61.38^{c}	61.01^{d}	62.26^{b}	62.62^{a}	0.16
Linoleic	14.12^{d}	16.16^{b}	18.14^{a}	15.81^{c}	0.36
Linolenic	0.35^{d}	0.54^{b}	0.62^{a}	0.40^{c}	0.02

abc: means in the same row with different superscripts differs significantly (P<0.05)
Key:
T1 = control no jute-mallow and waterleaf
T2 = contains 10% of jute-mallow and 0 waterleaf meals
T3 = contains 0 % jute-mallow and 10 % of waterleaf meals
T4 = contains 5% jute-mallow and 5% waterleaf meals.

Fatty acid compositions of the thigh of broiler chicken fed experimental diets

Table 5 shows the fatty acid composition of the thigh of the experimental broiler chickens. Capric acid level was significantly (p<0.05) different with treatments 1, 2 and 4, been significantly (p<0.05) different from treatment 3. Lauric acid level was significantly (p<0.05) different across all the treatments, with treatment 1 having the highest value and treatment 2 having the lowest value. There was a significant (p<0.05) difference in the levels of myristic acid with treatment 1 being significantly (p<0.05) different from treatments 2 and 3, while treatment 4 was like those of treatments 1, 2 and 3.

For palmitic acid, there was a significant (p<0.05) difference in all the treatment values, with treatment 1 having the highest value, while significant (p<0.05) difference was also observed in all the treatment values for stearic acid, with treatment 4 having the highest value. There was a significant (p<0.05) difference in the levels of oleic acid values in the thigh of the broiler chicken, where all the treatments were significantly (p<0.05) different, with treatment 1 having the highest value and treatment 4 with the lowest.

The levels of linoleic acid in the thigh of the broiler chickens were significantly (p<0.05) different in all the treatments, with treatment 4 having the highest value and treatment 2 having the lowest value, while the levels of linolenic acids were not significantly (p>0.05) different in all the experimental treatments.

Table 5: Fatty acid compositions of the thigh of broiler chicken fed experimental diets

PARAMETER	T1	T2	T3	T4	SEM (±)
Capric	2.92[a]	3.01[a]	2.21[b]	2.83[a]	0.08
Lauric	4.32[a]	2.87[c]	2.97[bc]	3.00[b]	0.15
Myristic	0.44[a]	0.21[b]	0.24[b]	0.32[ab]	0.03
Palmitic	20.99[a]	18.17[b]	16.23[d]	17.45[c]	0.45
Stearic	16.24[b]	12.79[c]	12.14[d]	18.15[a]	0.63
Oleic	63.14[a]	62.85[b]	62.55[c]	58.87[d]	0.44
Linoleic	18.34[b]	17.12[c]	16.15[d]	19.45[a]	0.32
Linolenic	0.22	0.28	0.30	0.20	0.01

abc: means in the same row with different superscripts differs significantly (P<0.05)

Key:

T1 = control no jute-mallow and waterleaf

T2 = contains 10% of jute-mallow and 0 waterleaf meals

T3 = contains 0 % jute-mallow and 10 % of waterleaf meals

T4 = contains 5% jute-mallow and 5% waterleaf meals

Fatty acid compositions of the drumstick of broiler chicken fed experimental diets

Table 6 shows the drumstick fatty acid composition of the experimental broiler chickens. Capric acid level was significantly (p<0.05) different with treatment 2 being significantly (p<0.05) different from treatments 1, 3 and 4, while treatments 3 and 4 were not significantly (p>0.05) different. Lauric acid level was significantly (p<0.05) different across all the treatments, with treatment 1 having the highest value and treatment 4 having the lowest value. There was a significant (p<0.05) difference in the levels of Myristic acid, with treatment 1 being significantly (p<0.05) different from treatments 2, 3 and 4, while treatments 2, 3 and 4 were not significantly (p>0.05) different.

For palmitic acid, there was a significant (p<0.05) difference in all the treatment values, with treatment 1 having the highest value, while a significant (p<0.05) difference was also observed in all the treatment values for stearic acid, with treatment 1 having the highest value. There were significant (p<0.05) differences in the levels of oleic acid values in the drumsticks of the broiler chickens, as treatments 2 and 4 were significantly (p<0.05) different from treatment 3 but similar to that of treatment 1.

The levels of Linoleic acid in the drumstick of the broiler chickens were significantly (p<0.05) different with treatments 1 and 2 been significantly (p<0.05) different from treatments 3 and 4, the levels of linolenic acids were significantly (p<0.05) different where treatments 1 and 2 were different from treatments 3 and 4.

Table 6: Fatty acid compositions of the drumstick of broiler chickens fed experimental diets

PARAMETER	T1	T2	T3	T4	SEM (±)
Capric	2.22^{b}	3.03^{a}	1.81^{c}	1.78^{c}	0.13
Lauric	3.14^{a}	2.89^{b}	1.85^{c}	1.64^{d}	0.16
Myristic	1.84^{a}	1.73^{b}	1.62^{b}	1.67^{b}	0.02
Palmitic	20.36^{a}	19.04^{b}	17.98^{c}	16.31^{d}	0.39
Stearic	11.42^{a}	10.95^{b}	9.63^{d}	10.02^{c}	0.19
Oleic	64.17^{ab}	64.58^{a}	63.70^{b}	64.46^{a}	0.12
Linoleic	14.13^{a}	13.76^{a}	11.98^{b}	11.94^{b}	0.28
Linolenic	0.27^{a}	0.28^{a}	0.18^{b}	0.18^{b}	0.01

abc: means in the same row with different superscripts differs significantly (P<0.05)

Key:

T1 = control no jute-mallow and waterleaf
T2 = contains 10% of jute-mallow and 0 waterleaf meals
T3 = contains 0 % jute-mallow and 10 % of waterleaf meals
T4 = contains 5% jute-mallow and 5% waterleaf meals

DISCUSSION

The results obtained for fatty acid composition of the broiler chicken breast, thigh and drumstick in this study agrees with the results obtained by (Ondulla *et al.,* 2020) when they fed broilers with high oleic peanut. They observed that despite varying the levels of the inclusion of the peanut in the diets of the broiler birds all the treatments were significantly (p<0.05) different but higher than the baseline treatment, leading them to conclude that an increase in the fatty acid consumed by the birds will consequently result in an increased fatty acid in the body tissues of such birds.

A significant finding of the current trial was the effect that waterleaf and jute mallow had on total saturated fatty acids (Capric, Myristic, Lauric, Palmitic and Stearic) content of the broiler parts (breast, thigh and drumstick). Waterleaf and jute mallow treatments resulted in significantly (p<0.05) less total saturated fatty acids in all the broiler parts, compared to the control. However, of all the broiler parts the breast recorded the highest level of Saturated fatty acid, this could be attributed to the fact that the breast is a sedentary part of the broiler chicken which allows for easy deposition of fat, this is in agreement with Ayerza *et al*., (2002) in which saturated fatty acid reductions was noticed when chia was introduced into chicken diet as a source of omega – 3 fatty acids. The concentration of saturated fatty acid in bird tissues is related to its content in the ration, its oxidation rate, and its synthesis in the liver. Inhibition of fatty acid synthesis in the liver is greater during the digestion of unsaturated fats than of saturated fats (Simand Qi 1995). Thus, the greater reduction in saturated fatty acid found with the waterleaf and jute mallow diets compared to the control diet (maize) could partially be attributed to different degrees of lipogenesis reduction brought about by lower PUFA absorption from maize compared with jute mallow and waterleaf.

Hence, since dietary saturated fatty acid is an independent risk factor associated with coronary heart disease (CHD) (American Heart Association, 1988), the greater reduction in saturated fatty acid found with the broilers fed waterleaf and jute mallow seed could indicate a health advantage for consumers eating these meats.

CONCLUSION AND RECOMMENDATION

From the results obtained from this experimental research, it can be concluded that, significant ($p<0.05$) differences was observed in the results obtained for the fatty acid contents of the chicken breast, thigh and drumstick due to the use of jute mallow and waterleaf as omega 3 and 6 rich supplements in broiler diets. Both jute mallow and waterleaf could be included in poultry diets as a source of omega-3 and 6 fatty acids. Further work should be conducted on the utilization of jute mallow and waterleaf in the production of poultry birds as a source of increasing the essential fatty acid content of broiler chicken.

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