Performance and meat quality of chickens fed diets containing palm oil sludge supplemented with garlic

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Introduction

High cost of production has been a major problem militating against the success of the poultry industry to meet the level of animal protein requirement due to high cost of feed which is about 60-80% of total cost of production. The high price of maize, which is the most important source of energy pushes most medium and small scale poultry farmers out of business (1). This has led to the search for alternative feed resources that attract no competition in consumption between livestock and man. Palm oil sludge is the brown slurry that remains after decanting oil during the sterilization and clarification procedures in palm oil milling. It is composed of organic solids, residual palm oil and water (2). This by-product which could greatly pollute the environment has a similar crude protein and metabolizable energy (9.6% and 14.76MJ/Kg) to maize (9% crude protein and 14.37MJ/Kg Metabolizable energy). Garlic as an antioxidant is also able to reduce fat accumulation in tissues. This study assessed the performance and meat quality of broiler chickens fed diets containing palm oil sludge (POS) in partial replacement of the dietary energy from maize with/without garlic supplementation.

Materials and Methods

- Two hundred and sixteen (216) 4-week broiler chickens (Marshal Breed) were randomly assigned to the 6 experimental treatments.
- There were 3 replicates with 12 birds per replicate in a 3×2 factorial arrangement.
- Feed intake and weight gained by the birds were recorded weekly. Blood samples were collected after humanely slaughtering two female birds/replicate for serum cholesterol analysis.
- The moisture and lipid contents, oxidative stability and organoleptic characteristics of selected muscles were assessed.

Results

The final live weight, total weight gain, total feed intake and feed conversion ratio were not significantly (P>0.05) influenced by POS, garlic and the interaction between POSand garlic.

Serum cholesterol content of the birds increased numerically with higher level of POS in the diets but supplementary garlic significantly (P<0.05) reduced it.

Moisture content of meat was not significantly influenced by dietary treatments.

Garlic supplementation significantly (P<0.05) reduced the meat lipid content and increased its oxidative stability.

The acceptability of thigh meat from the birds increased with increased level of POS and garlic. Garlic aroma increased (P<0.001) with increased level of dietary garlic supplementation.

Table 4: Serum cholesterol and meat quality characteristics of thigh meat from broiler chickens fed diets containing palm oil sludge in partial replacement of maize's energy with/without garlic supplementation

% maize energy replaced by POS	Garlic (mg/kg)	Serum cholesterol (mg/dl)	Moisture content (%)	Lipid content (%)	Oxidative stability (mg MDA/Kg meat)	Organoleptic	
						General acceptability	Garlic aroma
0	0	240.00±70.0	64.53±0.86	8.80±0.71	0.44±0.03	7.10±0.88	1.10±0.32
	5000	180.00±43.6	63.02±5.01	10.11±0.25	0.38±0.02	7.70±0.95	1.60±0.70
20	0	263.30±65.1	61.14±1.43	11.80±0.68	0.37±0.02	7.20±0.63	1.00±0.00
	5000	193.30±65.1	62.06±0.71	10.44±0.44	0.22±0.05	7.70±0.95	1.90±1.10
40	0	293.33±11.6	60.42±3.77	10.89±0.33	0.74±0.01	7.60±1.08	1.20±0.42
	5000	203.30±23.1	60.88±0.11	10.50±0.11	0.32±0.03	7.60±1.08	1.70±0.95
Statistical significance							
POS		NS	NS	***	***	NS	NS
Garlic		*	NS	*	***	NS	***
POS*Garlic		NS	NS	*	***	NS	NS
Mean separation							
POS effect	0	210.00±61.6	66.20±2.84	7.89±1.62^{b}	0.26±0.13^{b}	7.40±9.40	1.35±0.59
	20	228.30±69.7	64.45±3.48	9.91±1.44^{a}	0.28±0.11^{b}	7.45±0.83	1.45±0.89
	40	248.30±51.9	63.26±4.28	10.08±0.96^{a}	0.36±0.19^{a}	7.60±1.05	1.45±0.76
Garlic effect	0	265.60±53.4^{a}	64.60±3.75	9.48±1.73^{a}	0.31±0.18^{a}	7.30±0.88	1.10±0.31^{b}
	5000	192.20±42.1^{b}	64.67±3.74	9.11±1.64^{b}	0.29±0.12^{b}	7.67±0.96	1.73±0.91^{a}

POS= Palm oil sludge
Mean±Standard deviation
NS= Not significant (P>0.05); * = Significant (P<0.05), *** = Highly significant (P<0.001)
Means with different superscripts within the same column and for the same parameter are significant

Table 1: Composition of experimental diets

Ingredients	Diets		
	1/1+	2/2+	3/3+
% energy from maize replaced with POS	**0**	**20**	**40**
Maize	50.00	40.00	30.00
Wheat offal	13.00	13.00	13.00
Soybean	13.00	13.00	13.00
Groundnut cake	13.00	13.00	13.00
Brewer' dried grain	5.30	6.33	7.36
Fish meal	1.20	1.20	1.20
Bone meal	2.50	2.50	2.50
Oyster shell	0.50	0.50	0.50

Diets 1,2 and 3 were without garlic supplementation
Diets 1+,2+ and 3+were supplemented with garlic

Table 2: Proximate composition of palm oil sludge and garlic (%)

	Moisture	Crude protein	Crude fibre	Ether extract	Ash
Palm oil sludge	22.08	9.43	8.30	33.95	1.87
Garlic	9.84	12.21	3.24	3.11	2.98

Table 3: Performance of broiler chickens fed diets containing palm oil sludge in partial replacement of maize's energy with/without garlic supplementation

% maize energy replaced by POS	Garlic (mg/kg)	Final live weight (kg)	Total weight gain (kg)	Total feed intake (kg)	
0	0	2.51±0.19	1.49±0.16	4.19±0.18	
	5000	2.54±0.19	1.54±0.13	4.10±0.11	
20	0	2.67±0.09	1.65±0.07	4.33±0.20	
	5000	2.47±0.08	1.46±0.05	3.39±0.06	
40	0	2.48±0.31	1.41±0.02	4.10±0.31	
Statistical significance	NS	NS	NS	NS	NS

POS= Palm oil sludge
Mean±Standard deviation
NS= Not significant (P>0.05)

Conclusion

To reduce the high cost of feed, up to 20% of the dietary energy from maize could be replaced with that of palm oil sludge without adverse effect on the performance characteristics of broiler chickens.

Garlic supplementation of diets containing palm oil sludge would improve oxidative stability and acceptability of meat from the chickens.

References
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