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EVALUATION OF NUTRITIVE VALUE OF REPLACING WHEAT OFFAL WITH PINEAPPLE WASTE MEAL ON THE CARCASS AND ORGANS PARAMETERS (STARTER PHASE) OF BROILER CHICKENS.

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ABSTRACT

The study was undertaken to evaluate nutritive value of replacing wheat offal with pineapple waste meal on the carcass and organs parameters (starter phase) of broiler chickens. This research was carried out at the Poultry Unit of the Teaching and Research Farm of OSUN State College of Education Ila-Orangun. The site is located within the derived savannah of Nigeria. Crops and livestock generally do well in the study. The pineapple wastes were sun dried for 25 days at above 300C to have constant weight and milled to obtain pineapple waste meal. The researchers came up with five experimental treatments were at different replacement levels of 0, 25, 50, 75 and 100% pineapple wastes meal (PWM) respectively for wheat offal in the diets. Table 4 showed the performance characteristics of broiler chicken fed pineapple waste diets. Final live weight and weight gain were not significantly different ($p > 0.05$) across the treatments, however, feed intake and feed to gain ratio were significantly ($p < 0.05$) affected. Final live weight of birds fed control diet (T1) was numerically higher than birds fed other diets. Feed intake of birds fed the T1 and those fed T2 showed similarity. Feed to gain ratio of birds fed T1, T2 and T5 were not different ($p > 0.05$). Table 5 showed the carcass and relative organs weight of broiler starter chicken fed pineapple wastes diets. Bled weight, defeathered weight, eviscerated weight, dressing percent, breast, back, drumstick, wing, shanks, head, liver, and gizzard were significantly ($p < 0.05$) different across Carcass characteristics revealed that the values of breast, back, drumstick and wings were comparable between birds fed the control diet and those fed T2 (25% PWM) and T3 (50% PWM). However, this similarity was appreciably ($p < 0.05$) higher than birds fed T4 (75% PWM). Values of the head also had similar presentation i.e. birds on the control diet and T4 had similar values which were superior than other treatments. Birds fed T4 had significantly ($p < 0.05$) depressed value (2.73%) of liver when compared with other treatments. Numerical diminish in the values of body weight and weight gain of the birds could be ascribed to the boost in the inclusion level of PWM. The age of the birds at this phase could not satisfactorily handle the fibre levels. Broiler chicken fed with the control had the maximum weight gain while birds on treatment 5(100% PWM) had the minimum weight gain. The study concludes that replacement of wheat offal with pineapple waste meal (PWM) increased the fibre quantity of the treatments (diets). Birds fed 50% PWM performed better than others in growth performance both in starter. The study recommends that , farmers could include pineapple waste meal (PWM) up to 50% for the replacement of wheat offal in the diet of broiler chicken as alternative source of fibre without any deleterious effect.

Keywords: Nutritive value, Growth, Carcass, Wheat offal, Pineapple waste meal and Broiler chickens

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INTRODUCTION

Animal nutritionists in Nigeria have over the decades engaged in various researches toward finding cheaper alternative feedstuff for poultry (Oladunjoye *et al.*, 2005; Otokumefor and Olumu, 2000). The search has been promoted by the ever escalating cost of the conventional feedstuffs which has resulted in the increasing cost of poultry production and consequent amplify in the cost of poultry products (Iyayi, 2007). To oppose this increase in the price of conventional feedstuffs and produce poultry product at reasonable prices, the use of agro-industrial by-product in poultry feeding is most exploited in Nigeria (Coppens d'Eeckenbrugge *et al.*, 2003). Such feedstuffs include by-products of agricultural products known to be dietary fibre sources. One of such readily accessible agro-industrial by-products is pineapple waste (PW).

With a global production of more than 18 million tons in 2009, pineapple ranked 12th among fruits crop worldwide (FAO, 2011). About 70% of the pineapple produced in the world is consumed as a fresh fruit in the country of origin (Loeillet, 1997). The remaining 30% is exported or transformed into canned slices, chunks, crush (solid pack) and juice. Costa Rica produce highest quantities of pineapple (26853.13 metric tonnes) in the world with Nigeria in the

The pineapple wastes (PW) includes: residual pulp, peels, and skin. They are 30-35% of the fruit weight (Lamidi *et al*., 2008). Like other fresh crop by-products, new PW are loaded with water (about 90%) and soluble carbohydrates and therefore, decay very quickly. They must be consumed as soon as possible, but factories are not located in areas of animal production, and transportation of such bulky product is expensive and may require daily visits to the factory (Nguyen Thi Hong Nhan *et al.*, 2009). For those reasons, fresh PW are often preserved by drying.

Further, Wheat offal is a derivative of wheat after obtaining flour for human use. Wheat offal is made up of wheat germ, bran (greatest proportion of the wheat offal), coarse middling and fine middling (Alawa and Umunna, 1993). Wheat offal contains 14.80-17.60% crude protein, 3.6-6.4% crude ash (Olomu, 1995; Yin *et al.*, 1993 and Maisari, 1986) and about 10% crude fibre (Olomu, 1995). The lower crude fibre content when compared to Brewers Dried Grain and Palm Karnel Meal makes wheat offal suitable for feeding monogastric animals (Alawa and Umunna, 1993). Agro-industrial by-products may have undergone changes in their proximate and nutrient symphony with time due to changes in the selection of crops used in producing them and methods of industrial processing.

Research Objective

The study aimed at investigating the effects of replacing wheat offal with varying levels of pineapple waste meal (PWM) on the growth characteristics of the starter phase broiler chickens.

LITERATURE REVIEW

BOTANY OF PINEAPPLE

The pineapple is an herbaceous perennial which grows to between 1.0 and 1.5 meter (3.3to4.9ft) tall, although sometimes, it can be taller. In appearance, the plant itself has a short, stout stem with hard, waxy leaves. When creating its fruit, it generally produces up to 200 flowers, although some large-fruited cultivars can exceed this. The flowers are pollinated by humming-birds, and these flowers usually develop small, hard seeds (Maxwell and Betty, 1984). Once it flowers, the individual fruit of the flowers come together to form what is

commonly referred to as a pineapple. It is both succulent and fleshy with the stem serving as the fibrous core (Morton, 1987). The tough, waxy rind may be dark green, yellow, orange-yellow or reddish when the fruit is ripe (Maxwell and Betty, 1984). The flesh ranges from almost white to yellow. In size the fruits are up to 12 inches long and weigh 1 to 10 pounds or more (Samson, 1986).

After the initial fruit is produced, side shoot (called "suckers" by commercial growers) are formed in the leaf axils of the main stem. These may be removed for transmission or left to produce additional fruits on the original plant ('how to grow a pineapple in your home', 2010). A sucker has 30 or more long, narrow, fleshy, trough-shaped leaves with sharp spine along the margins that are 30 to 100 centimeters (1.0 to 3.3 ft) long, near a thick stem ('how to grow a pineapple in your home', 2010). Other parts of pineapple that can be used for propagation are: slips that arise from the stalk below the fruit, crowns that grow from the top of the fruits, and rattoons that come out from the under-ground portions of the stems.

CULTIVARS OF PINEAPPLE

There are many cultivars. The leaf of the frequently grown "smooth cayenne" is smooth and is the most usually grown worldwide (Kochhar, 2006). Many cultivars have become dispersed from its origins in Paraguay and southern part of Brazil (Pineapples Arrive in Hawaii, 2009). Later improved stocks were introduced into the Americas, the Azores, India, Malaysia and Australia.

Varieties include:

Hilo: A compact 1-1.5kg, Hawaiian variant of "smooth cayenne", the fruit is more cylindrical and produces many suckers, but no slips.

Kona sugarloaf: 2.5-3kg, white flesh with no woodiness on the centre, cylindrical in shape, it has a high sugar content but no acid, an incredibly delicious fruit.

Natal queen: 1-1.5kg, golden yellow fleshy tissue, crisp texture and fragile mild flavour, well-adapted to fresh consumption, keeps well after ripening, spiny leaves, grown in Australia, Malaysia and South Africa.

Pernambuco ('Eleuthera'): 1-2kg, with pale yellow to white flesh, sweet, melting and excellent for eating fresh, poorly adapted for shipping, spiny leaves, grown in Latin America. **2.3.5 Red Spanish**: 1-2kg, pale yellow flesh with pleasant aroma, squarish in shape, well-adapted for shipping as fresh fruit to distant markets, spiny leaves, grown in Latin America. **2.3.6 Smooth Cayenne**: 2.5-3kg, pale yellow to yellow flesh, cylindrical in shape, elevated sugar and acid content, well-adapted to canning and processing, leaves without spines. This is the variety from Hawaii, and the most easily available in U.S. grocery stores.

Some pineapple species are grown as ornamentals for colour, novel fruit size and other esthetic qualities (Morton, 1987).

PROCESSING OF PINEAPPLE

Processed pineapple is a popular product which is exported by countries which produce pineapple (Calvalho *et al.*, 2008). During processing, nutrient worth of pineapple can be decreased but there are recent researches carried out which use new technologies which try to retain the nutritional quality of the pineapple fruit. This is to meet the customer demand for

healthy, nutritious and natural products (Deliza *et al.*, 2005).

WHEAT OFFAL (WHEAT BRAN)

Wheat offal, a derivative of the dry milling of common wheat (Triticumaestivum L.) into flour, is one of the main agro-industrial by-products used in animal feeding. It consists of the outer layers (cuticle, pericarp and seed coat) combined with minute quantity of starchy endosperm of the wheat kernel.

MATERIALS AND METHODS

EXPERIMENTAL SITE

This research was carried out at the Poultry Unit of the Teaching and Research Farm of OSUN State College of Education Ila-Orangun. The site is located within the derived savannah of Nigeria. Crops and live tock generally do well in the study.

PREPARATION OF TEST INGREDIENT.

The researcher collected Fresh pineapple waste (skins, peeling and the pulp peeling) from the FUMMAN Agricultural Products Nigeria Limited, Moor Plantation, Ibadan, Oyo State,Nigeria. The pineapple wastes then were sun dried for 25 days at above 300C to have constant weight and milled to obtain pineapple waste meal .

PREPARATION OF EXPERIMENTAL DIETS.

The researchers came up with Five experimental treatments were at different replacement levels of 0, 25, 50, 75 and 100% pineapple wastes meal (PWM) respectively for wheat offal in the diets.

Treatment 1 (T1): 0% pineapple wastes meal replacement for wheat offal.
Treatment 2 (T2): 25% pineapple wastes meal replacement for wheat offal.
Treatment 3 (T3): 50% pineapple wastes meal replacement for wheat offal.
Treatment 4 (T4): 75% pineapple wastes meal replacement for wheat offal.
Treatment 5 (T5): 100% pineapple wastes meal replacement for wheat offal

RESULTS AND DISCUSSION.

Proximate composition of experimental diet at starter stage.

The proximate composition of experimental diet at starter stage is presented below. Dry matter content were alike across the levels of PWM in the diets with control (0% PWM) contained the least (84.90%) and treatment T5 (100%PWM) contained the highest (85.55%). Crude protein and ether extract slightly decreased as PWM increased in the diet while crude fibre and nitrogen free extract also follow the trend of dry matter. Control had the highest crude protein (23.05%) and ether extract (3.93) while other treatments were within the range of 22.83 and 21.92%, 3.90 and 3.86 respectively. The treatment T5 (100 % PWM) had higher crude fibre and nitrogen free extract than the control and other treatments. The total ash found most in treatment 3 (50% PWM) and least in treatment 5 (100% PWM).

Table 1: Proximate composition of pineapple wastes meal (PWM) and wheat offal.

Parameters	PWM	Wheat offal
Crude protein	12.56	17.30
Crude fibre	15.37	10.40
Crude fat	1.97	3.90
Ash	16.29	5.60
Nitrogen free extract	42.66	49.80

How many determinations? Provide SE value. Source of W/O source.

Table 2: Proximate composition of experimental diets at starter stage.

Parameter (%)	Control	25% PWM	50% PWM	75% PWM	100% PWM
Dry matter	84.90	85.15	85.25	85.40	85.55
Crude protein	23.05	22.83	22.54	22.24	21.92
Crude fibre	3.85	4.15	4.40	4.65	4.90
Total ash	5.85	5.86	5.94	5.86	5.84
Ether extract	3.93	3.90	3.87	3.88	3.86
NFE	48.22	48.41	48.50	48.77	49.03

Growth performance (starter phase).

Table 4 showed the performance characteristics of broiler chicken fed pineapple waste diets. Final live weight and weight gain were not significantly different ($p > 0.05$) across the treatments, however, feed intake and feed to gain ratio were significantly ($p < 0.05$) affected. Final live weight of birds fed control diet (T1) was numerically higher than birds fed other diets. Feed intake of birds fed the T1 and those fed T2 showed similarity. Feed to gain ratio of birds fed T1, T2 and T5 were not different ($p > 0.05$).

Carcass and organs parameters (starter phase).

Research results showed the carcass and relative organs weight of broiler starter chicken fed pineapple wastes diets. Bled weight, defeathered weight, eviscerated weight, dressing percent, breast, back, drumstick, wing, shanks, head, liver, and gizzard were significantly ($p < 0.05$) different across the treatments.

Birds fed T1 (0% PWM) had significantly ($p < 0.05$) higher value in bled weight than other treatments. Birds fed T3 (50% PWM), T4 (75% PWM) and T5 (100% PWM) had similar bled weight. Starters fed T3 (50% PWM) had defeathered weight which was significantly ($p < 0.05$) elevated than those on other treatments. Birds placed on T1 (control) and T4 (75% PWM) had similar eviscerated weight which were significantly ($p < 0.05$) higher than those on other treatments. Dressing percentage of birds fed T3 (50% PWM) was significantly ($p < 0.05$) higher than others. Serious depression was seen in the values of eviscerated weight in birds fed T3 (50% PWM) and dressing percentage in birds fed T4 (75% PWM).

Carcass characteristics revealed that the values of breast, back, drumstick and wings were comparable between birds fed the control diet and those fed T2 (25% PWM) and T3 (50% PWM). However, this similarity was appreciably ($p < 0.05$) higher than birds fed T4 (75% PWM). Values of the head also had similar presentation i.e. birds on the control diet and T4

had similar values which were superior than other treatments. Birds fed T4 had significantly ($p < 0.05$) depressed value (2.73%) of liver when compared with other treatments.

Table 3: Growth performance of broiler starter chicken fed with varying levels of pineapple wastes based diets.

Parameters	T1(0% PWM)	T2 (25% PWM)	T3 (50% PWM)	T4 (75% PWM)	T5 (100% PWM)	SEM±
Initial weight (g)	39.12	37.64	38.73	37.65	38.28	0.13
Final live weight (g)	731.00	708.24	705.13	672.69	666.60	11.71
Weight gain (g/day)	24.71	23.95	23.80	22.68	22.44	0.42
Feed intake (g/day)	119.15^{b}	114.44^{b}	105.61^{c}	126.64^{a}	113.80^{b}	1.84
Feed gain ratio(g)	4.83^{ab}	4.78^{ab}	4.44^{b}	5.58^{a}	5.07^{ab}	0.13

^{abc} means in the same row with different superscripts are significantly different ($p < 0.05$).

S.E.M. = Standard error of mean.

Table 4: Carcass and relative organs weight of broiler starter chicken fed with dietary varying levels of pineapple wastes meal.

Parameters	T1(0% PWM)	T2 (25% PWM)	T3 (50% PWM)	T4 (75% PWM)	T5 (100% PWM)	SEM±
Bled weight (g)	698.99^{a}	660.51^{c}	666.79^{b}	641.32^{c}	649.96^{c}	65.78
Defeathered weight (g)	677.43^{a}	662.80^{a}	633.80^{b}	612.45^{c}	615.19^{c}	0.77
Eviscerated weight (g)	494.81^{a}	464.27^{b}	452.05^{c}	459.29^{c}	440.61^{c}	0.41
Dressing (%)	59.30^{a}	58.79^{a}	58.19^{b}	55.41^{c}	56.30^{c}	0.36
Breast (%)	15.02^{a}	14.80^{a}	14.57^{ab}	13.74^{b}	13.68^{b}	0.18
Back (%)	12.32^{a}	12.73^{a}	12.42^{a}	11.36^{b}	11.30^{b}	0.15
Thigh (%)	9.82	9.69	9.53	9.29	9.78	0.13
Drumstick (%)	9.02^{a}	8.90^{ab}	8.97^{a}	7.98^{c}	8.35^{bc}	0.12
Neck (%)	5.06	4.72	4.42	4.67	4.39	0.11

Wing (%)	9.17^{a}	8.80^{ab}	8.24^{c}	7.55^{c}	8.15^{bc}	0.18
Shank (%)	4.86^{b}	5.32^{a}	4.89^{b}	5.15^{ab}	4.95^{b}	0.05
Head (%)	4.04^{a}	3.62^{b}	3.82^{b}	4.10^{a}	3.76^{b}	0.05
ORGANS						
Heart (%)	0.55	0.51	0.41	0.49	0.52	0.02
Lung (%)	0.75	0.62	0.63	0.63	0.58	0.04
Kidney (%)	0.86	0.61	0.72	0.74	0.74	0.04
Liver (%)	2.94^{b}	2.93^{b}	3.03^{a}	2.73^{c}	3.05^{a}	0.03
Gizzard (%)	4.35^{ab}	4.41^{ab}	4.48^{ab}	3.92^{b}	4.61^{a}	0.09
Proventiculus (%)	0.58	0.55	0.64	0.42	0.51	0.04

^{abc} means in the same row with different superscripts are significantly different ($p < 0.05$). S.E.M. = standard error of mean.

Table 5: Growth performance of broiler finisher chicken fed with changeable levels of pineapple wastes based diets.

Parameters	**T1 (0% PWM)**	**T2 (25% PWM)**	**T3 (50% PWM)**	**T4 (75% PWM)**	**T5 (100% PWM)**	**SEM±**
Initial weight (g)	731.00	691.50	705.00	670.00	677.75	11.71
Final live weight (g)	1797.50^{b}	1931.50^{a}	1936.00^{a}	1797.00^{b}	1669.50^{c}	25.70
Weight gain (g)	38.09^{bc}	44.29^{a}	44.97^{a}	40.25^{b}	35.42^{c}	0.88
Feed intake (g)	165.00	165.50	164.50	167.00	180.50	3.14
Feed gain ratio	4.34^{b}	3.75^{c}	3.66^{c}	4.64^{ab}	5.10^{a}	0.14

^{abc} means in the same row with different superscript are significantly different ($P<0.05$).

S.E.M. means standard error of mean

TABLE 6: Carcass and relative organs weights of broiler finisher chicken fed with varying levels of pineapple wastes based diets.

Parameters	T1 (0% PWM)	T2 (25% PWM)	T3 (50% PWM)	T4 (75% PWM)	T5 (100% PWM)	SEM±
Bled weight (g)	1701.51^{b}	1866.02^{a}	1862.63^{a}	1731.41^{a}	1609.23^{b}	0.23
Defeathered weight (g)	1615.23^{b}	1783.93^{a}	1774.73^{a}	1659.35^{b}	1532.43^{c}	0.26
Eviscerated weight (g)	1272.89^{bc}	1477.98^{a}	1409.21^{b}	1307.50^{b}	1177.99^{c}	0.55
Dressing (%)	63.68^{b}	66.18^{a}	65.29^{ab}	65.15^{ab}	63.31^{b}	0.37
Breast (%)	16.29^{b}	17.64^{a}	17.84^{a}	18.26^{a}	16.63^{b}	0.21
Back (%)	12.15^{ab}	13.06^{a}	11.81^{b}	11.65^{b}	12.06^{ab}	0.19
Thigh (%)	11.30	11.38	11.60	11.80	10.47	0.20
Drumstick (%)	10.69^{a}	10.59^{ab}	10.13^{b}	10.17^{b}	10.33^{ab}	0.08
Neck (%)	6.66^{a}	5.49^{b}	5.76^{b}	6.61^{a}	5.46^{b}	0.15
Wing (%)	8.11^{ab}	8.03^{b}	8.17^{ab}	8.20^{ab}	8.47^{a}	0.06
Shank (%)	4.45^{b}	4.97^{a}	4.46^{b}	4.87^{ab}	4.32^{c}	0.08
Head (%)	2.74^{b}	5.37^{a}	3.04^{ab}	2.76^{b}	2.83^{b}	0.34
ORGANS						
Heart (%)	0.40^{b}	0.41^{b}	0.38^{b}	0.39^{b}	0.53^{a}	0.02
Lung (%)	0.57	0.57	0.61	0.62	0.57	0.02
Kidney (%)	1.70^{a}	0.61^{b}	0.69^{b}	0.64^{b}	0.66^{b}	0.12
Liver (%)	2.52^{a}	2.26^{ab}	2.02^{b}	2.49^{a}	2.65^{a}	0.06
Gizzard (%)	2.98^{b}	3.58^{a}	3.45^{a}	3.50^{a}	3.71^{a}	0.07
Proventiculus (%)	0.50^{b}	0.67^{a}	0.47^{b}	0.46^{b}	0.68^{a}	0.02
Spleen (%)	0.16^{a}	0.08^{b}	0.09^{b}	0.16^{a}	0.09^{b}	0.01
Abdominal fat (%)	1.65^{a}	0.46^{b}	0.93^{ab}	0.98^{ab}	1.46^{ab}	0.13

^{abc} means in the same row with different superscript are significantly different ($p < 0.05$).

S.E.M. means standard error of mean.

Table 7: Nutrients digestibility of broiler finisher chicken fed with varying level of pineapple waste based diets.

Parameters	T1 (0% PWM)	T2 (25% PWM)	T3 (50% PWM)	T4 (75% PWM)	T5 (100% PWM)	SEM±
Dry matter	94.18[a]	93.00[a]	89.97[b]	88.31[c]	87.31[c]	0.71
Crude protein	93.71[a]	89.50[b]	92.54[a]	89.82[b]	86.85[c]	0.72
Ether extract	92.01[a]	91.05[a]	91.11[a]	89.12[b]	86.67[c]	0.65
Crude fibre	93.48[a]	92.41[a]	92.37[a]	88.71[b]	87.71[b]	0.82
Ash	88.52[a]	87.91[a]	86.80[a]	80.24[b]	81.23[b]	0.70
Nitrogen free extract	95.00[a]	94.93[a]	94.92[a]	87.54[b]	86.43[b]	0.72

[abc] means in the same row with different superscripts are significantly different ($p < 0.05$).

S.E.M. means Standard error of mean.

Performance traits (starter phase).

Numerical diminish in the values of body weight and weight gain of the birds could be ascribed to the boost in the inclusion level of PWM. The age of the birds at this phase could not satisfactorily handle the fibre levels. Broiler chicken fed with the control had the maximum weight gain while birds on treatment 5(100% PWM) had the minimum weight gain. The lowest body weight gain recorded among birds given diets containing 100% pineapple waste meal may be attributed to the elevated fibre content of the diets (Farrel, 1994; Attia *et al.,* 2003a) which probably reached a serious level at this substitution level. Similar decline in performance had been reported by Madrigal *et al*. (1995).

Also, Makinde *et al*. (2013) had earlier reported that inferior body weight gain observed among birds fed high fibre diets could be as a result of the elevated fibre content of the diets. However, according to Bilgili *et al*. (1992) and Edwards *et al*. (1999), increase in juice waste mixture in the diets amplified the average daily weight gain of broilers. Some causes of the increase in normal daily gain are: high amino acid contents in the juice waste mixture such as tryptophan, lysine and threonine. According to them broilers are more responsive to high lysine in the diet.

The increase in the level of PWM augmented the feed eating of broiler starter as observed in birds fed T4 (75% PWM) with highest feed intake. This could be explained with the study of Banjoko *et al.,* 2008 and Agwunobi *et al.,* 2007) who reported higher feed ingestion in feed ingredients with lower energy density. It could be to the boost in the palatability of diets caused by the acid content (propionate) in the diet. According to Cave (1984) the accumulation of propionate in the diet amplified feed consumption of broiler chicks.

Lowest feed intake in treatment 5 (100% PWM) may be due to very high fibre amount in the feed because fibre tends to absorb water and swell in the crop of the birds, thereby reducing space for further feed intake (Ajaja *et al.*, 2002). Elevated fibre diet also increase water intake thereby reducing feed intake (Fadigba, 1987).

Birds in treatment three (50% PWM) had the least feed gain ratio among the treatments, that is, improved performance probably due to adequate crude fibre level, which activates the intestine and more occurrence of peristaltic movement, more enzymes production resulting in efficient digestion of nutrients. This observation agrees with earlier report by Cheeke *et al.* (1983); Kekeocha, (1984); Adeniji, (2001); Esonu *et al.* (2002); and Esonu *et al.* (2004). This finding was in line with the previous report of Lamidi *et al.* (2008) which fed broiler chickens with inclusion of PWM and recommended that broilers could bear up to 10% inclusion level in their diets without any deleterious effect.

Carcass and relative organ weights (starter phase).

Significant diminish in the dressing percentage value especially from the birds given T3 (50% PWM) could be described to what was observed in the final live weight of the birds which decreased numerically across the dietary treatments. Similar trend observed in bled weight, defeathered weight and eviscerated weight justified the significant contribution of blood, feathers and gut to the final live weight of the birds. Protein is the principal raw material for tissue formation.

In this study, protein level decreased crossways the dietary treatments as a consequence of PWM levels. The dressing percentage observed in the study is below 65-70% reported as optimum for table birds (Oluyemi and Roberts, 1979; Nwokoro and Tewe, 1998). Considerable decrease in the values of breast, back, drumstick, wings, shank and head of birds fed T5 (100% PWM) could be associated to the smaller terminal weights of the birds. Birds served with T3 (50% PWM) had highest weight in liver and birds fed T5 (100% PWM) had highest weight in gizzard.

The weight of organs in broiler starters indicates the reaction of birds to the feed intake in relation to their growth or age of the birds. It also reflects the anatomical response of the birds to the type of diets consumed such as the use of whole grain feed or large high fibre particle (Atteh, 2004). Organ weight is also an indicator of nutrients absorbed by the birds (Esonu *et al.*, 2008).

Birds consuming high protein level have been known also to have larger organ weights when compared to those on low protein level. The variation in the fibre quantity in the diets significantly affected the liver and gizzard percentage which indicated that the liver was performing more work as a product of high fibre content. According to Cherry *et al.*, (1982) and Dutta *et al.* (1986) that stated that diets containing high crude fibre impose more work for the liver due to the outcome of anti-nutrients in the PWM. Presence of anti nutritional factors

has been connected to the enlargement of organs because of their higher detoxification activities (Aderemi, 2003). Jaeger *et al.* (1998) had reported that pineapple contains tannins and pectins which have effects on growth.

CONCLUSION AND RECOMMENDATION.

The study concludes that replacement of wheat offal with pineapple waste meal (PWM) increased the fibre quantity of the treatments (diets). Birds fed 50% PWM performed better than others in growth performance both in starter. The study recommends that , farmers could include pineapple waste meal (PWM) up to 50% for the replacement of wheat offal in the diet of broiler chicken as alternative source of fibre without any deleterious effect.

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