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Effects of yeast (*Saccharomyces cerevisiae*) inclussion on the utilization of cassava peel meal in cockerel diets

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Abstract
This work determines the effect of Yeast (*Saccharomyces cerevisiae*) inclusion on the Utilization of cassava peal meal in Cockerel diets. Ninety six (96) white cockerel chicks were used for the study which lasted for twelve (12) weeks. The chicks were kept on commercial chicks' starter diet for the first four weeks of age before they were subjected to the treatment diets. The chicks were randomly assigned to six dietary treatments identified as C_0Y_0, C_1Y_0. C_1Y_1 and C_2Y_1 (containing 0%CPM and 0%yeast,11%CPM and 0%yeast, 22%CPM and 0%yeast, 0%CPM and 0.3%yeast,11%CPM/ and 0.3%yeast, 22%CPM and 0.3%yeast respectively). Data were obtained for weekly feed intake; weekly weight gain; weekly feed efficiency and final body weights. The results revealed that there were no significant differences (P> 0 05) in the final body weight and weekly weight gain for all the treatments. However there were significant differences (P<0.05) in feed intake and feed efficiencies with increasing levels of both CPM and YEAST. The effect of the interaction of CPM * YEAST on these two parameters was highly significant (P<0.05) especially in the combination C_2Y, followed by C_2Y_0. Economic analysis revealed that CPM inclusion reduced the cost of production and gave comparable net returns with the control diet. Yeast inclusion, however added to the cost of production and gave lower net returns. The study thus demonstrated that CPM could replace maize for up to 11% in chicks' starter without adverse effects. Furthermore, yeast powder can be useful in stimulating voluntary feed Intake in stressed animals. Good feeding enhances quick recovery from stressed or diseased conditions.

Keywords: yeast, utilization, cassava peel meal, cockerel diets

Introduction

The ever-increasing cost of maize and other grain crops in the country has seriously affected the livestock industry especially the poultry sub-sector, which depends largely on grains as its source of energy. This high cost of grains as reported by FAO, (1992) [8] is due to their demand by food and beverage industries, poultry feed millers and domestic consumption. Maize accounts for 45% - 65% of poultry feeds and therefore, any effort to substitute maize with cheaper raw materials will significantly reduce the cost of production (Okah, 2004.) [18]. Many authors have also noted that a solution to the problem of rising cost and scarcity of feed stuffs will be in seeking new and non-conventional raw material (Odunsi *et al.,* 1996), and consequently, nutritionists have been experimenting on the possibility of replacing maize with cheaper and more readily available raw materials that have comparable energy and crude protein contents. One of such raw material is cassava peel meal CPM). Igene and Oboh, (2004) [11], reports that cassava peel has an energy content ranging from 1400kcal/kg to 1360 kcal/kg, and a crude protein content of 9.0% to 13.5% depending on the method of processing. When compared with maize whose energy is about 3430kcal/kg and crude protein of 9.0 to 11.0% (Obioha, 1992) [16]

Cassava peels are waste materials in all cassava processing mills and could thus be obtained free, hence reducing the cost of production. The limitations on the use of cassava products in diet formulation include their high contents of some anti-nutritional compounds such as dietary fibre and linamerine (Igene and Oboh, 2004) [11]. High dietary fibre tend to mask the availability, digestibility and absorption of nutrients in non-ruminants (Nwokolo *et al.*, 1985). Linamerine on its part is converted to a toxic substance known as Hydrogen cyanide acid (HCN) by the enzyme linamerase (McDonald *et al.*, 1988) [14]. Hydrogen cyanide acid can depress growth and can be lethal in large doses (McDonald *et al.*, 1988) [14].

However, Olorede *et al.,* (2002) noted that properly processed cassava products (roots, stems, leaves and peels).Are good sources of energy and protein to all classes of animals. The processing methods recommended cassava include sun drying, soaking, oven drying, roasting and enzyme or yeast treatment Olorede *et al.,* (2002). Friesen *et al.,* (1992) [9] had earlier reported that enzyme or yeast inclusion is a good way of reducing fibrous polysaccharides and anti-nutritional compounds such as HCN in feed stuffs. Bradley *et al.,* (1994) [6] in consonance noted that yeast is an agent for dietry enrichment and a good source of cellulolytic enzymes. This study will evaluate the effect of yeast (saccftaromyces *cerevisiae)* treatment on cassava peel meal (CPM) used to replace maize in cockerel diets.

Materials and Methods

Experimental Site and Duration

The experiment was conducted at the poultry breeding unit of the Department of Animal Production and Fisheries Management of Ebonyi State University Abakaliki. The experiment lasted for a period of twelve weeks (12).

Experimental animals and management

Ninety six (96) day-old white cockerels chicks were used for the experiment were purchased from the Nkaliki Hatchery Projects, Abakaliki. 16m by 4m house was used for the experiment, and was divided into two rows with a passage in between. Each row was further divided into nine (9) pens measuring 1.75m by 1.12m, the floors and walls were thoroughly washed and disinfected with lsol^R germicide. Wood shavings were laid to a depth of about 2 inches with electric bulbs hung at a height of about two (2) feet above the floor. The chicks were brooded, using 100W electric bulb as heater, on deep litter flour. During the brooding period, the chicks were vaccinated against Newcastle diseases, infections bursai disease and fowl pox disease. Sulphanamide drugs were also given in drinking water to prevent coccidiosis.

The chicks were all fed together on commercial chicks' starter for the first four-week before being placed on the treatment diets. Water was supplied *ad-libitum.* The chicks were randomly assigned to the six treatments. There was strict sanitation throughout the experimental period. A foot dip treated with IZAL^R was provided at the entrance of the pen. Feeders and drinkers were also washed and rinsed with antiseptic solutions every morning, while bushes around the pen were cleared after every two weeks.

Experimental Diets

The cassava peels for the experiment were collected from a garri processing mill at lyonu in Ishielu Local Government Area of Ebonyi State Nigeria. The variety of cassava in this area is majorly the sweet variety. These peels were collected fresh, washed and sundried for five days during the dry season. The dried peels were then crushed in a hammer mill to obtain the Cassava Peel Meal (CPM) which on analysis was found to contain a total hydrogen cyanic content of 55.03ppm (parts per million). Picrate paper kits method was used for the cyanide analysis (Bradbury *et al.,* 1998). The experimental diets were shown in Table 1, while the results of proximate analysis were presented in Table 2. The six treatment diets formulated for the chicks were Isonitrogenous with 21% crude protein and metabolisable energy range of 2578-3000 kcal/kg. The yeast used in this experiment was the common baker's dry yeast (Natural Yeast, emulsifier) sold in the open market.

Table 1: Percentage composition of the experimental diets

Ingredient	C_0Y_0	C_1Y_0	C_2Y_0	C_0Y_1	C_1Y_1	C_2Y_1
Maize	55.0	44.0	33.0	55.0	44.0	33.0
CPM	0.0	11.0	22.0	0.0	11.0	22.0
Yeast	0.0	0.0	0.0	0.3	0.3	0.3
Soya mea!	20.0	20.0	20.0	20.0	20.0	20.0
Palm kernel cake (PKC)	7.0	7,0	7.0	7.0	7,0	7.0
Wheat offal	4.0	4.0	4.0	4.0	4.0	4.0
Fish waste	5.0	5.0	5.0	5.0	5.0	5.0
Groundnut cake(GNC)	6.0	6.0	6.0	6.0	6.0	6.0
Bone meal	2.0	2.0	2.0	2.0	2.0	2.0
Lysine	0.25	0.25	0.25	0.25	0.25	0.25
Methionine	0.25	0.25	0.25	0.25	0.25	0.25
Prem	0.25	0.25	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25	0.25	0.25
Calculated Analysis						
CP (%)	22.09	21.35	21.09	22.09	21.65	21.46
Energy(kcal/kg)	2900	2691	2482	2900	2691	24

Table 2: Proximate analysis of the experimental diets

Nutrients	CPM	C_0Y_0	C_1Y_0	C_2Y_0	C_0Y_1	C_0Y_0	C_1Y_1	C_2Y_1
CP(%)	9.83	21.31	21.33	21.45	21.34	21.32	21.34	21.45
FAT (%)	6.10	3.56	3.60	3.65	3.62	3.57	3.62	3.67
CF(%)	5.77	4.03	9.85	10.28	4.00	4.00	9.83	10.25
ASH(%)	2.12	5.74	5.73	5.61	5.77	5.77	5.75	5.65
DM(%)	88.81	89.96	89.43	89.98	89.55	89.55	89.55	89.44
GE(kcal/kg)	1526.03	3000	2791	2582	2797	2997	2780	2598
HCN(ppm)	55.03	0.00	6.03	12.07	0.00	0.00	6.00	12.01

Diets 1 to 3 contained CPM at 0%, 11% and 22% respectively at the expense of maize. Diets 4 to 6 also contained CPM at the same levels of 0%, 11% and 22% respectively at the expense of maize but in addition were treated with yeast powder at 0.3% (3g/kg% finished feed) each. This inclusion level was also used by Aderemi, (2003) [2] who reported improved growth rate and feed efficiency in broilers fed yeast supplemented maize offal.

Experimental Design/Layout:

This experiment was a typical factorial experiment which studied the effect of two factors (CPM and yeast) simultaneously. In this study, the yeast effect or factor was identified as 'Y' consisting of two levels 0% and 0.3% levels (Y_0 and Y-i). The CPM effect or factor was identified as 'C' consisting of three levels, 0% 11% and 22% (C_0, $C_{1(}$ C_2). The experimental design is therefore a two by three (2x3) factorial experiment in a Completely Randomized Design (CRD) The following table shows the experimental layout and the treatment

Table 3: Showing the experimental layout/treatment combinations

Three CPM levels (C_0, C_1, C_2) Two Yeast levels Y_0 and Y_1		
	Y_0 (0% yeast)	**Y_1(0.3% yeast)**
C_0 (0% CPM)	C_0 Y_0	CoY_1
	C_0 Y_0	CoY_1
	C_0 Y_0	CoY_1
	C_0 Y_0	CoY_1
C_1 (11% CPM)	C_1 Y_0	C_1Y_1
	C_1 Y_0	C_1Y_1
	C_1 Y_0	C_1Y_1
	C_1 Y_0	C_1Y_1
C_2 (22% CPM)	C_2 Y_0	C_2Y_1
	C_2 Y_0	C_2Y_1
	C_2 Y_0	C_2Y_1
	C_2 Y_0	C_2Y_1

Where C_0 = CPM at 0% level of inclusion
C_1 = CPM at 11 % level of inclusion
C_2 = CPM at 22% level of inclusion
Y_0 = yeast at 0% level of inclusion
Y_1 = yeast at 0.3% level of inclusion

The above combinations C_0Y_0, C_0Y_1, C_1Y_0, C_1Y_1, C_2Y_0 and C_2Y_1 correspond to the six treatment diets. Each treatment had four replicates giving a total of 24 observations (6x4). There were four (4) chicks per observation which gave a total of 4x24 = 96 chicks used for the study.

Data Collected

The data collected include the following:

1. Initial Body Weight (IBW): Each chick was weighed immediately after assigning them to the treatments to determine their Initial Body Weight before the experiment. The average initial body weight for each replicate and treatment was recorded.
2. Weekly Feed Intake (WFI): The total feed intake for each replicate was determined by weighing the leftover feed and subtracting this weight from the weight of feed fed the previous day. The result was divided by the number of chicks in that replicate to determine the average feed intake for each chick for that day. This was then used to obtain the weekly feed intake at the end of the experiment.
3. Weekly Weight Gain (WWG): The chicks were weighed every week to determine their increase in weight for the week. This was also divided by seven (7) at determine the daily weight gain. The feed intake and weight gain were also used to compute the weekly feed efficiency.
4. Total Feed Intake (TFI); The total feed consumed by each bird throughout the experimental period was determined by summing up the daily feed intake from the day one (1) of the experiment to the last day of the experiment.
5. Final Body Weight (FBW): Each bird was weighed at the end of the experiment to determine their final body weight.
6. Total Weight Gain (TWO): This was determined by subtracting the initial body weight from the final body weight.
7. Weekly Feed Efficiency (WFE): This was determined by dividing the weekly weight gain by the weekly feed intake.

3.6. Analysis of Data

The data on average weekly feed intake, body weight gain, feed efficiency and final body weight were analyzed using the 2x3 factorial arrangement in a Completely Randomized Design (CRD) The additive model is given by;

$$X_{ij}k = \mu + T_i + \alpha j + (T\alpha)_{ij} + {}_{ij}k$$

Results

Growth Performance Traits

The table presented in table 4 presents the summary of analysis of variance of the main effects of yeast on the growth performance traits of cockerels fed yeast treated cassava peel meal (CPM). The parameters analyzed include weekly feed intake (WFI) weekly weight gain (WWG), weekly feed efficiently (WFE) and final body weight (FBW).The table reveals a significant increase ($P<0.05$) in feed intake with increasing yeast levels. Such significant mean differences ($P<0.05$) were also observed on the average weekly feed efficiency. The weekly weight gain and the final body weights were however statistically similar ($P>0.05$),

Table 4: The summary of analysis of variance to the main effects of yeast on the performance traits of cockerels fed yeast treated CPM

Yeast level	WFI	WWG	WFE	FEW
Yi0	379.33±.19a	119.47±1.36a	0.32±.00a	1060.68±12.31a
Y1	407.01±.07b	117.53±1.57a	0.29±.00b	1061.54±12.91a

[ab]means on the same column followed by different superscripts are significantly different ($P<0.05$).

The result on table 5 presents a summary of the performance parameters as influenced by CPM. The table shows a significant increase ($P<0.05$) in feed intake as the CPM levels increased. Furthermore, the weekly weight gain and the final body weights were statistically different ($P<0.05$) between C_1 and others (C_0 and C_2).

Table 5: The summary of the analysis of variance on main Effects of CPM on the performance parameters.

CPM Level	WFI(g)	WWG(g)	WFE(%)	FBW(g)
C_0	373.97+.12[a]	125.87±2.67[a]	0.34±.01[a]	1120.61+21.04[a]
C_1	369.54±.27[b]	108.04±1.88[b]	0.29±.00[b]	975.52±15.34[b]
C_2	436.00±.22[C]	121.62±.28[a]	0.38±.00[b]	1087.20±1.54[a]

abc Means on the same column followed by different superscripts are significantly different (P<0.05)

The result presented in table 6 summarizes the interaction effects of CPM and yeast on the growth performance traits measured. The table reveal significant mean differences (P<0.05) in feed intake for increasing levels of both CPM and yeast The combination C_2Y_1 produced the highest effect on feed intake followed by C_2Y_0. On weekly weight gain, the table reveals no significant mean differences (P>0.05) between C_0Y_0 and C_2Y_0. The means for C_0Y_1, C_1 $Y_1$and C_2Y_1 were also similar (yeast treated diets). The C_1Y_0 combination were however, different (P<0.05) from the others. These relationships were also true for the final body weights. On weekly feed efficiency, the table reveal similarities between all the combinations, as the mean differences were not statistically different (P>0.05).

Table 6: The summary of analysis of variance on the effects of CPM*YEAST interaction on the growth performance traits.

Diet	C_0Y_0	C_2Y_1	C_1Y_0	C_2Y_0	C_2Y_0	C_2Y_0
WFI	383-15±.0^{d}	364.79±25	347.40±63^{F}	391.68±.15^{C}	407.45±25^{b}	464.S6+.33^{a}
WWG	131.94±3.17^{a}	119.79±4.52^{ab}	101.39±2.68^{b}	114.69±2.20^{ab}	125.14±1.33^{a}	118.09-*-06^{ab}
WFE	0.34±01^{a}	0.33±.01^{a}	0.29±.01^{a}	0.29±.00^{3}	0.31 ±00^{a}	026±00^{a}
FBW	1179.73±25.33^{a}	1061.46±35.59^{ab}	909.79±21.70^{ab}	1041.25±17.83^{ab}	1092.50±14^{a}	1081.89+15.76.12^{a}

abide means on the same row followed by different superscripts are significantly different (P<0.05)

Economic Analysis

The results on tables 7 to 9 present the summary of the economic analysis of cockerels fed yeast treated CPM. The parameters analyzed include: Cost Of 1g Of Feed, Total Feed Intake, Total Cost of Feeding, Total Weight Gain, Final Body Weight, Cost Benefit Ratio, Total Cost of Production, Total Revenue and Net Returns. The cost of 1kg live weight of birds was estimated at N500.00.

Main Effects of Yeast On The Economic Parameters

The effects of yeast on the economic parameters are summarized on table 7. It could be observed from the table that increase in yeast levels increased the cost of feed, total feed intake, total cost of production and the cost benefit ratio. However, the total weight gain, and net returns decreased numerically as the yeast levels increased. The final body weight was the same for the two levels.

Table 7: Showing the main effects of yeast on the economic parameters.

	Y_0	Y_1	Mean	Std.Error
Cost of 1g of feed(N)	0.026	0.0456	0.04	0.01
Total feed intake (g)	3026.66	3256.06	3141.36	114.70
Total cost of feed (N)	128.71	147.41	114.24	35.55
Total weight gain / bird (g)	958.34	941.14	949.74	8.60
Cost benefit ratio	1.69	1.87	1.59	0.44
Total cost of production / bird (N)	33.71	352.41	319.24	35.55
Total revenue / bird (N)	530.34	530.77	530.79	0.23
Net returns / bird (N)	196.63	1061.58	176.01	35.32
Final body weight / bird (g)	1060.68	1061.58	1061.13	0.45

Main effects of CPM

The influence of CPM on the economic parameters is summarized in table 8. The table reveals a progressive decrease in the cost of feed, total cost of production, total weight gain, final body weight, total revenue and net returns as the CPM level increased. Feed intake however increased significantly (P<0.05) with increasing level of CPM. Similar increases were also observed for benefit ratio.

Table 8: Showing the main effects of CPM on the Economic Parameters.

Error	C_0	C_1	C_2	Mean	Std.
Cost of 1g of feed(N)	0.04685	0.04655	0.03905	0.04	0.00
Total feed intake/bird (g)	2991.760	2956.288	3476.024	314136	167.64
Total Cost of feed/bird (N)	140.109	137.616	135.739	138.38	1.48
Total weight Gain/bird (g)	1005.605	866.045	977.57	949.74	42.62
Cost Benefit Ratio	1.6	2.12	1.7	1.89	0.25
Total Cost of Production/bird (N)	345.109	342.616	340.74	343.38	1.48
Total Revenue/bird (N)	560.305	487.76	543.60	530.56	21.93
Net Returns/bird (N)	215.196	145.15	202.86	196.20	28.45
Final Body weight/bird (g)	1120.61	975.52	1087.20	1061.11	43.87

Effects of CPM*YEAST interaction:- The effects of the CPM*YEAST interaction on the economic parameters are summarized in table 9 below. The table presents a progressive decrease in the cost of each treatment diet with consequent decrease in the cost of feeding as well as total cost of production as the CPM level increased. The reverse was however the case for increasing levels of yeast. The cheapest diet as revealed by the table was the C_2Y_0 combination while the most expensive diet was the C_0Y_1 combination. Feed intake however increased with increasing level of both CPM and YEAST. Thus, the combination C_2Y_1 produced the highest effect on feed intake. Increase in yeast level also reduced the total revenue and net returns because of the increase in the cost of production. The combination C_0Y_0 had the best net returns followed by C_2Y_0.

Table 9: Showing the effects of CPM*YEAST interaction on the economic parameters.

C_2Y_0	C_2Y_1	C_0Y_0	C_0Y_1	C_1Y_1	C_2Y_1	
Cost of 1g of feed (N	0.0461	0.0476	0.0435	0.0450	0.0383	0.0398
Total feed intake/bird (g)	3065.215	2918.304	2779.168	3133.408	3235.584	3716.464
Cost of feeding / bird (g)	141.306	138.911	120.894	141.000	123.923	142.341
Total weight gain /bird (g)	1054.73	956.48	811.79	920.30	1008.50	946.64
Cost of prod./bird (N)	346.306	343.911	325.894	346.400	328.923	352.915
Cost benefit ratio	1.39	1.84	2.52	1.89	1.55	1.79
Total revenue /bird (N)	585.31	530.03	455.12	520.22	545.14	540.13
Net returns /bird (N)	249.71	187.11	129.21	189.61	217.11	197.12
Final body weight (g)	1179.732	1061.486	900.798	1041.250	1092.500	1081.890

Discussion

The result presented in table 4 shows a significant (P>O.05) increase in feed intake with increasing yeast level and is consistent with the reports of Veum *et at.*, (1988) [27], Knabe (1988) [13] and Bradley *et al.*, (1994) [6] these authors reported that yeast inclusion in feed stuffs adds to the palatability of the diet with consequent increase in feed intake. This is also in line with Kepahart (1988), who observed that yeast inclusion could enhance feeding in stressed animal. This can in turn boost disease resistance or reduce susceptibility to diseases in stressed animals since high feed intake means more nutrient intake and/or availability to tissues which help recovery from stressed or diseased conditions.

There was no significant (P>0.05) difference in the result on table 5 in the mean values for increasing yeast levels on the weekly weight gain and final body weight. This is at variance with the reports of Aderemi *et al.*, (2003) [2], who reported that layers fed yeast supplemented diets had better growth parameters. The significant (P.05) effect of yeast on feed efficiency was not surprising because of its profound effect on feed intake while weight gain remained constant. Day (1997) [7], Onifade and Babatunde (1996) [21] had also reported the ability of yeast to improve feed efficiency. Such conflicting reports on the beneficial effects of yeast inclusion in poultry diets were reported by Hagat *et al.*, (1993) [10]. These authors concluded that the beneficial effects of yeast in poultry may be influenced by the bird's genome and suggested further studies.

The significant difference (P<0.05) in feed intake with increasing CPM level (table 5) is probably due to the decreasing contents of the diets as CPM level increase. This is also revealed by the results of proximate analysis (Table 2). The table shows a reduction of between 200 - 500cal/kg G.E as CPM level increase Therefore, there was progressive dilution of energy concentration of the diets with increasing CPM levels. This result of proximate analysis also confirms the reports of Igene and Oboh (2004) [11] who states that CPM is inferior to maize in terms of energy content. Abiola *et al.*, (2004) also reported that addition of fibrous feedstuffs like CPM, tend to increase feed intake because of their low energy density.

This high feed intake on low energy diets is in consonance with the reports of Fisher and Wilson (1973), who state that birds on low energy diets tend to adjust consumption so as to maintain their caloric needs. World poultry (1986) also reports that feed intake depends largely upon the level of the metabolic energy of diets. These similarities (P>0.05) in weight gain, final body weight and feed efficiency indicate that the two levels of CPM (11%, 22%) met the energy needs of the birds. That is they did not differ much in terms of nutritional quality and ability to promote growth.

This is in agreement with the reports of Omole (1977), Tewe and Okeh (1983) [24], Tewe and Egbunike (1998), and Olorede *et al.*, (2002). These authors reported that CPM could replace maize for up to 50% in cockerel diets with no significant (P>0.05) effect on the body weights. Such similar weight gain was also reported for cockerels fed CPM by Aina, (1990). Uko *et al.*, (1990) [26] has similar reports that there was no significant difference (P>0.05) in weight gain for layers fed 50% industrial maize offal. The numerical differences in body weights were consistent with the reports of Fisher and Wilson (1973) who reports a 4% decline in weight for every nine (9) to sixteen (16) mj/kg ME decline in energy of feed stuffs. Ezeishi *et al.*, (2004) also reported that weights of chicks were depressed whenever maize is replaced with lower energy feed stuffs. Eshiete *et al.*, (1979) made similar observations.

The HCN levels of the diets as revealed by results of Cyanide analysis ranged from 6-12ppm of the finished feeds. This is much lower than the safety level of 20 - 30ppm recommended by Oyenuga, (1968) [22]. Perhaps, this level was too low to have any significant influence on body weights, thus the similarities (P>0.05) in the final body and weekly weight gain of birds fed the treatment diests. The result presented in table 6 shows the significant (P<0.05) influence of two factors (CPM and YEAST) on feed intake made the combination C_2Y_1 produce the greatest effect on feed intake, followed by C_2Y_0 combination. The reasons for this profound influence on feed intake by these two factors had been pointed out earlier. The numerical reduction in mean weights with increasing level of both CPM and YEAST is also attributable to the high fibre and low energy contents of the diets. Nwokolo *et al.*, (1989) reported that high fibre diets tend to mask nutrient availability or digestibility with resultant decrease in growth rate.

The high fibre contents of the diets with CPM could have as well influenced these parameters. On the other hand, the slight negative effect of yeast on weight gain was however contrary to the reports of Knabe (1988) [13] who reported enhanced weight gain and feed efficiency in animals fed yeast products. This contrary observation could be traced to the result of proximate analysis which reveals a decrease of about 3-11 kcaf /kg GE energy of the diets for increasing level of yeast. Such conflicting report had been made by Hagat *et* a/, (1993) who further suggested that the effect of yeast in poultry could be influenced by the bird's genome. Moreover Ayanwale *et al.*, (2006) [4] observed an optimal inclusion level of 0.75%. These authors noted that inclusion levels of less than 0.5% or above 0.75% produced inferior results to control diet. However, the inclusion level used in this study was 0.3% (3g/kg of feed). This could be the more reason for these conflicting results obtain in this study.

The result on table 7 reveals a profound increase in the cost of production as yeast levels increased. This is due to the additional cost of yeast (N0.003/g of feed). This increase in the cost of feed also reflected on the total cost of production, cost benefit ratio and net returns. The profound the increase in feed intake without corresponding increase in weight gain resulted in poor economic results. High feed intake means high cost of production. While the result presented on table 8 reveals a progressive decline in the cost of feed and total cost of production. This produced favorable effect on the total revenue and net returns. This observation confirms with the report of Okah (2004) [18] who observed that cost of feed decreased with increasing levels of maize industrial waste, this observation also confirms that the solution to the raising cost of livestock production could be the substitution of maize with non-conventional feed stuffs Okah (2004) [18]
The progressive increase in the cost of feed as yeast levels increase was due to additional cost of the yeast product (5kobo/g) that is additional 15kobo/kg of feed, while the reverse was the case for increasing CPM levels. The result is that as CPM reduced the cost of production yeast is increased it. This is why the combination C_0Y_1 is the most expensive diets, while C_2Y_0 is the cheapest. The highest feed intake observed with combination C_2 Y_1 resulted in its very high cost of production in relation to others. The high feed intake as explained earlier on was because of the high fibre content and low energy content of the diets. This energy is further reduced by yeast addition as can be seen from the result of proximate analysis. From this observation, the cost of livestock production cannot be reduced with very low energy diets such as that obtained from the combination C_2Yi. Therefore in seeking substitutes for maize through non-conventional feed stuffs, the energy of the feeding stuffs should be considered before its inclusion in livestock dietary formulation.

Conclusions

Maize as a main source of energy in poultry feed formulation costs highest among the component ingredients. Hence discovery of a cheaper alternative will definitely reduce the cost of production. The results of this study however suggest that 11% of maize could be replaced by CPM in chick starter without any adverse effect on growth and feed utilization. The growth performance was better for the control diet, while in terms of economics of production, the CPM diet proved to be better. On the other hand, bakers' YEAST as revealed by this study did not favour growth parameters. The economic parameters also were not favoured because yeast supplemented diet were found to be less cost effective. The results of this study however indicate that this brand of yeast can be useful in stimulating feed intake in stressed or diseased animals for enhanced recovery. But in normal health animals, this particular brand may be sued to reduce the energy of diets when necessary, and/or in making feeds palatable to enhance voluntary feed intake.

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