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Effect of Dietary Levels of Decorticated Cow Pea (*Vigna unguiculata*) Supplemented with Molasses on Broiler Chicks Performance and Carcass Traits

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Abstract: Manny legumes are used extensively as animal feed. This study was conducted to look at the effects of decorticated cow pea seeds based diets supplemented with molasses on broiler performance and carcass traits. A total of 240 unsexed one-day old broiler chicks (Ross 308) were used .The birds were randomly divided into six equal groups (treatments) and each group consisted of 8 (replicates). Six experimental diets (starter and finisher) were formulated to be approximately isocaloric and isonitrogenous. The cow pea was included at three levels (0, 10 and 20%) with two levels of molasses at (0, 3%). Decorticated cowpea and raw cowpea contain 25.86 vs. 24.78% crude protein, 1.41 vs. 0.91% ether extract, 3.36 vs. 3.33% ash and 2.64 vs. 3.46% crude fiber on dry matter basis. Methionine content was high in decorticated cowpea (0.40%) compared with raw cowpea (0.35%), the vice versa hold true for lysine, 1.74 in raw seeds vs. 1.62% in decorticated seeds. Decorticated cowpea seed at 10 or 20% without molasses significantly ($p<0.05$) improved final body weight (1999.50-2051.32 g vs. 1986.32 in the control group). Whereas, the molasses addition at 3% significantly decreased final body weight (1838.42-1900.79 g vs. 1986.32 in the control group) and total feed intake (3150.75- 3300.75 vs. 3318.00±26.45 g in the control group). The inclusion of 20% cowpea with 3% molasses significantly improved feed conversion ratio in 20 cow pea with 3% molasses It is concluded that cow pea seeds is a good source of protein that can be used in broiler feeds safely to give satisfactory results.

Key words: Amino acids, carcass, hulls, liver, protein

INTRODUCTION

Recently, intensive poultry production is based on rations that contain high cereal grains and conventional protein sources is the most common. Researches on local protein sources are suggested to reduce the impact of imported concentrates on poultry producers (Algam *et al*., 2012). The protein content of grain legumes is characterized by high level of lysine and low level of methionine (Akanji, 2002). Sources of protein and energy as grain legumes, has contributed in the maintenance of poultry industry in Africa (Akanji *et al*., 2012). Soybean is the most prominent grain (44-48% crude protein) and is the major source of plant protein to animal feed. Increased prize of the latter grain (Robinson and Singh, 2001), suggested the search of good substitutes from local feed stuffs (Akanji *et al*., 2012). Cowpea grains (*Vigna unguiculata*) can serve as alternative to soybean meal as they have similar amino acid profile (Wiryawan and Dingle, 1999). Cowpea seeds have high potentials and desirable agronomic and nutritive characteristics as feedstuffs (Westphal *et al*., 1985). Cowpea seed is cheap and readily available leguminous seeds that thrive well where others fail due their excellent adaptability to extreme climatic conditions. Cowpeas as well as other peas can be excellent sources of dietary protein in animal nutrition (Igbasan and Guenter, 1997). Cowpea was biochemically analyzed by Farinu and Ingrao (1991). It was reported that the mean content (g kg^{-1}) of crude protein, ether extract, ash, total dietary fiber and carbohydrates were 245, 18.6, 38.8, 121.8 and 573.4, respectively. On the other hand, Farinu and Ingrao (1991) found that the proximate composition of six varieties of cow peas (*Vigna unguiculata*) were as follows: moisture (6.20-8.92%), protein (20.5-31.7%), fat (1.14-3.03%), fiber (1.7-4.5%) and carbohydrates (56.0-65.7%). The objectives of this study were to investigate the proximate analysis of cow pea seeds and assess the effects of dietary cowpea raw seeds inclusion with molasses on broiler performance, protein intake , protein efficiency and some carcass traits.

MATERIALS AND METHODS

Study location: This study was conducted at animal research center (Hellat kuku) to investigate the possible effect of dietary inclusion of cowpea seeds at different

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Table 1: Ingredient composition of experimental diets (starter and finisher)

	Starter (%)						Finisher (%)					
	0			3			0			3		
Decorticate cowpea	0	10	20	0	10	20	0	10	20	0	10	20
Sorghum grain	56.65	53.85	48.95	53.65	50.85	45.95	62.675	59.775	57.375	59.675	56.775	54.375
Ground peanut meal	23.30	17.20	11.10	23.30	17.20	11.10	15.000	8.900	2.800	15.000	8.900	2.800
Sesame meal	6.60	7.00	7.50	6.60	7.00	7.50	4.500	5.000	5.500	4.500	5.000	5.500
Cowpea	0.00	10.00	20.00	0.00	10.00	20.00	0.000	10.000	20.000	0.000	10.000	20.000
Molasses	0.00	0.00	0.00	3.00	3.00	3.00	0.000	0.000	0.000	3.000	3.000	3.000
Wheat bran	4.75	2.80	2.80	4.75	2.75	2.75	9.000	7.000	5.000	9.000	7.000	5.000
Concentrate	5.00	5.00	5.00	5.00	5.00	5.00	5.000	5.000	5.000	5.000	5/0	5.000
Dicalcium phosphate	0.90	0.90	0.90	0.90	0.90	0.90	0.700	0.700	0.700	0.700	0.700	0.700
Lime stone	0.60	0.60	0.60	0.60	0.60	0.60	0.500	0.500	0.500	0.500	0.500	0.500
NaCl	0.25	0.25	0.25	0.25	0.25	0.25	0.250	0.250	0.250	0.250	0.250	0.250
Lysine	0.10	0.10	0.10	0.10	0.10	0.10	0.050	0.050	0.050	0.050	0.050	0.050
Methionine	0.10	0.05	0.05	0.10	0.10	0.10	0.075	0.075	0.075	0.075	0.075	0.075
Vegetable oil	1.50	2.00	2.50	1.50	2.00	2.00	2.000	2.500	2.500	2.000	2.500	2.500
Premix	0.25	0.25	0.25	0.25	0.25	0.25	0.250	0.250	0.250	0.250	0.250	0.250

Concentrate CP 40%, lysine 10, methionine 3, methionine+cystin 3.3 ca 10 available phosphorus 6.40 cf 1.44.c fat 3.9 crude minerals 39.30 vitamin composition per kg of diet vitamin A = 200.000 IU , D3 = 70.000IU B1 = 50 mg, B2 = 120 mg, B12 = 180 mg K3 = 30 mg

Table 2: Chemical composition of experimental diets (starter and finisher)

	Starter (%)						Finisher (%)					
	0			3			0			3		
Decorticate cowpea	0	10	20	0	10	20	0	10	20	0	10	20
Moisture	8.08	6.90	7.05	8.75	7.43	7.39	8.71	7.25	6.45	8.41	7.63	6.92
Crude protein	23.08	23.09	23.07	23.06	23.09	23.06	20.01	20.06	20.07	20.04	20.02	20.69
Ether extract	4.44	4.01	3.61	3.82	3.48	3.07	3.76	3.32	2.95	3.18	2.78	2.45
Crude fiber	4.90	5.10	5.80	4.42	4.60	5.30	4.69	5.07	5.44	4.12	4.51	5.02
Calcium	1.20	1.20	1.20	1.20	1.20	1.20	0.91	0.91	0.91	0.91	0.91	0.91
Phosphorus	0.47	0.47	0.47	0.47	0.47	0.47	0.36	0.36	0.36	0.36	0.36	0.36
Lysine	1.20	1.21	1.28	1.20	1.21	1.20	1.11	1.11	1.19	1.11	1.11	1.14
Methionine	0.52	0.52	0.52	0.52	0.52	0.52	0.39	0.39	0.39	0.39	0.39	0.39
ME (Kcal kg^{-1})	3150.00	3150.00	3150.00	3150.00	3150.00	3150.00	3170.00	3170.00	3170.00	3170.00	3170.00	3170.00

levels of broiler diets on growth performance parameters, carcass quality of broiler chickens.

Experimental birds: A total of 240 one day-old Ross (308) broiler chicks of unsexed were used in this experiment. They were obtained from a local Sudanese private hatchery. The broiler chicks were randomly allotted into 6 equal groups (40 birds/ group), each group were allotted in 8 equal replicate (5 birds per each replicate).

Housing and management: Broiler chicks were housed in clean well-ventilated room the suitable temperature. The room floor was partitioned into six partitions. Each compartment was divided in eight equal areas and bedded by fresh clean wood straw forming a deep litter of four centimeters depth. Suitable feeder and water provided each area inside the compartment. The chicks were vaccinated against Newcastle disease using different types of Newcastle disease vaccines. After vaccination, broiler chicks received A, D3, E vitamins (1 mL L^{-1} of drinking water to improve vitality of chicks.

Cowpea collection and preparation: Cowpea seeds were obtained from the market located. White cowpea seeds were identified, sorted and screamed to remove the bad seeds. Dehulled sample was than processed for analysis. The dehulled seeds were dry-milled into coarse flour and used in the experimental diets. The removal of the hull and the preparation of the dehulled seeds were done according to the method of Oshodi and Ekperigin (1989).

Experimental diets: The ingredient of diets and calculated chemical composition of six diets (starter and finisher) are presented in Table 1, 2, respectively. A starter and finisher diets were formulated to meet the nutrient requirements of broiler chickens according to NRC (1994) to be approximately iso-nitrogenous and iso-caloric diets.

The diets were provided regularly at 9 a.m. daily and the daily feed intake was calculated by the difference between the weight of offered feed and the remained part, then divided by the number of birds in each group per day and totalized to be per week.

Evaluation of carcass quality: At the end of growing period, five birds from each dietary treatment were randomly taken, fastened for 6 h. then weighed and slaughtered birds were immersed in boiling water, for defeathering. The heads were removed close to the skull and shanks at the hock joint also were separated. Trachea, oesophagus, intestinal tract, spleen, lungs, kidneys, reproductive organs, abdominal fat, crop, liver and heart were completely removed. And carcasses were weighed.

Experimental design: Complete randomize design was employed (2×3) factorial arrangement and two levels of molasses (0, 3%) and three levels of cowpea (0, 10 and 20%).

Statistical analysis: The analysis of variance for collected data in all experimental parameters was performed using Statistical Analysis System (SAS, 1996).

RESULTS AND DISCUSSION

Proximate chemical analysis and amino acid composition of cowpea seeds are presented in Table 3. The results revealed that cowpea seeds with its hulls contain 24.8% crude protein, 0.91% ether extract, 3.46% crude fiber and 3.33% ash on dry matter basis. Removal of cowpea seeds hulls increased crude protein percent (25.86% vs. 24.78%), ether extract content (1.4% vs. 0.9%), ash content (3.36% vs. 3.3%) and calculated ME content (3190 vs. 3153 Kcal kg^{-1}) on the dry matter basis, while decreased crude fiber content (2.64 vs. 3.46%). These values were in accordance to Tshorhote *et al.* (2003) and Henshaw (2008). The calculated high metabolizable energy (ME Kcal kg^{-1}) for both full cowpea seeds and decorticated seeds are in harmony with those obtained by Nwokolo (1987) and Tshorhote *et al.* (2003). Regarding methionine and lysine content of cowpea seed, the data indicated that decorticated cowpea seed had higher methionine percentage (0.4%) than full cowpea seeds (0.35%) on dry matter basis, however, dehulling decrease lysine (1.62% vs. 1.74%). These values were similar to the findings of Apata and Ologhobo (1990), Kessler *et al.* (1990), Olomu (1995) and Aremu *et al.* (2006).

Table 4. shows the effects cowpea inclusion with molasses on body weight at different ages. Cowpea inclusion at 10% reduced (p>0.05) body weight by about 6.4, 3.8 and 0.6% at the 2nd, 3rd and 4th weeks of chicks age respectively when compared with control. Whereas, cowpea inclusion at 10% of broiler chick diet improved (p>0.05) body weight at the 5th and 6th weeks by about 1.9 and 0.7%, respectively when compared with broiler chick groups fed on the basal diet. On the other hand, cowpea inclusion at 20% reduced (p>0.05) body weight by about 2.0% at the 2nd week of broiler age when compared with the control. While, increased (p<0.05) broiler chicks weight at the 3rd and 6th week by about 3.3 and 3.3% when compared with the control and improved (p<0.05) body weight by about 6.1 and 5.9% at 4th and 5th weeks of broiler age, respectively . The response of broiler chicks to dietary cowpea were better during the finisher period and lowered gain were observed during the starter period, these observation may be related to the presence of some antinutritional factors of cowpea seeds Farinu and Ingrao (1991) and Tshorhote *et al.* (2003) adversely affected the growth performance of young chicks where as the older broiler chick tolerate the bad effect of those factors (Defang *et al.*, 2008).

At the end of the experiment, the highest body weight was obtained by chicks group fed on the cowpea containing diet at 20% inclusion rate without molasses (2051.32 g), followed by chicks fed 10% cowpea containing diet without molasses addition (1999.5 g), followed by the control group (1986.32 g), followed by chicks group fed on 20% cowpea containing diet with molasses addition (1900.79 g), followed by chicks group fed on 10% cowpea containing diet with molasses addition (1862.05 g) and the worst body weight was obtained by chicks group fed on the basal diet with

Table 3: Proximate chemical analysis of raw and decorticated cowpea

	Raw cowpea seeds		Decorticated cowpea seeds	
Items	Fresh basis	Dry matter basis	Fresh basis	Dry matter basis
Moisture (%)	6.34	--	11.07	--
Crude protein (%)	23.21	24.78	23.00	25.86
Ether extract (%)	0.85	0.91	1.26	1.42
Crude fiber (%)	3.24	3.46	2.35	2.64
Ash (%)	3.12	3.33	2.99	3.36
Total carbohydrate	63.24	67.52	59.33	66.72
ME (Kcal kg^{-1} diet)	2954.00	3153.00	2837.00	31900.00
Methionine (%)	0.33	0.35	0.36	0.40
Lysine (%)	1.63	1.74	1.44	1.62

Total carbohydrate (calculated by differences) = 100-moisture + crude protein +ether extract+crude fiber+ash). Metabolizable energy (ME) Kcal kg^{-1} calculated according to NRC (1994)

Table 4: Effect of dietary cowpea and inclusion of molasses on body weight (g/bird) of broiler chicks

		Molasses levels	
Age (weeks)	Cowpea (%)	0%	3%
1	0.0	171.25±3.06[ax]	170.50±2.97[ax]
	10.0	164.68±2.91[ax]	169.25±3.25[ax]
	20.0	171.50±2.83[ax]	169.00±3.03[ax] 2
	0.0	451.50±8.64[ax]	412.00±7.68[ay]
	10.0	422.00±8.67[ax]	433.75±7.06[ax]
	20.0	442.50±7.49[ax]	414.50±8.09[ay]
3	0.0	850.25±18.24[ax]	787.25±14.02[ay]
	10.0	818.01±14.88[ax]	803.00±16.28[ax]
	20.0	878.30±12.99[ax]	794.00±13.62[ay]
4	0.0	1252.75±23.39[bx]	1154.62±21.25[ay]
	10.0	1245.50±25.56[bx]	1150.00±23.11[ay]
	20.0	1328.75±19.33[ax]	1187.25±19.12[ay]
5	0.0	1613.08±24.92[bx]	1525.79±23.75[ay]
	10.0	1644.75±30.15[abx]	1544.76±28.32[ay]
	20.0	1708.16±27.53[ax]	1556.00±24.69[ay]
6	0.0	1986.32±31.44[ax]	1838.42±32.35[ay]
	10.0	1999.50±30.07[ax]	1862.05±37.30[ay]
	20.0	2051.32±33.24[ax]	1900.79±32.29[ay]

Values are means±standard error. Mean values with different letters at the same column (a-d letters) or row (x-y letters) and period differ significantly at p≤0.05

molasses (1838.42 g). These findings are similar with those obtained by Farinu and Ingrao (1991). It was observed that antinutritional factors such as trypsine inhibitors and tannins in cowpea seeds may be reduced considerably by common processing techniques like cooking and dehulling and consequently improve the nutrient digestibility. Moreover, Liener and Kakade (1980), Udedibie and Carlini (2000), Akanji *et al.* (2003) and Onu and Okongwu (2006) reported that processed pigeon pea seeds diets resulted in higher body weight of broiler chicken due to greater reduction of antitypic and hemagglutinating activities of processed pea.

The growth performance improvement with 20% cowpea inclusion instead of ground peanut cake in broiler chicks diets. This effect may be also attributed to the amino acid balance at that level of inclusion better than the lower level of decorticated cowpea seeds inclusion (10%) or better than control. This explanation are supported by Anderson and Warnick (1967), Allen and Baker (1972) and Scott *et al.* (1982). Molasses addition significantly decreased final body weight broiler chicks fed on the diet containing 10.0 or 20% decorticated cowpea seeds with molasses, respectively when compared with broiler chicken group fed on the same level of cowpea without molasses. Body weight reduction with molasses addition may be related to the Kabuage *et al.* (2000), Alvarez *et al.* (1977), Cabral and Melo (2006), Carew *et al.*, (1998) and Anele (2002), attributed this reduction to lower feed and water intake because of the high sugar content in molasses.

Effect of dietary cowpea inclusion with molasses on feed intake of broiler chicks are presented in Table 5. Dietary inclusion of cowpea at 10% of broiler chick diets reduced ($p<0.05$) feed intake by about 3.9% at the first week of the experiment (340 g) when compared with control (353.75 g), while increased ($p<0.05$) feed intake by about 6.4% at the 2nd week of the experiment (589.75 g) when compared with control (454 g). On the other hand 10% inclusion rate of cowpea in broiler chick diet improved ($p>0.05$) feed intake by about 0.6% at 3rd week of the experiment (754 g) and reduced feed intake by about 0.9 and 1.8% at the 5th and 6th weeks of broiler chicks age, respectively(815 and 822 g). Higher inclusion rate (20%) of cowpea increased ($p<0.05$) feed intake by about 2.5, 12.5, 10.4, 7.9 and 4.9% at the 1st (362), 2nd (623), 3rd (827), 4th (887) and 5th (879) weeks of the experiment, respectively when compared with chicken group fed on the basal diet (control). The birds apparently increased their intake of the diet containing cowpea seeds to meet their nutrient requirement from a diet contained antinutritional factors and this suggest that nutrients in cowpea seeds were not as available as they were in ground peanut diets (Amaefule and Obioha, 2001). On the

Table 5: Effect of dietary cowpea and inclusion of molasses on feed intake (g/bird) of broiler chicks

Age (weeks)	Cowpea level (%)	Molasses level 0%	Molasses level 3%
1-2	0.0	353.75±4.39^{bx}	351.25±3.03^{cy}
	10.0	340.00±3.56^{cx}	340.50±2.31^{bx}
	20.0	362.75±2.47^{ax}	355.25±1.61^{ay}
2-3	0.0	554.00±7.33^{cx}	570.00±5.09^{ax}
	10.0	589.75±7.05^{bx}	556.00±4.91^{ay}
	20.0	623.25±4.21^{ax}	583.00±6.35^{ay}
3-4	0.0	749.75±7.24^{bx}	707.75±10.32^{by}
	10.0	754.00±3.71^{bx}	722.25±10.69^{bx}
	20.0	827.38±6.53^{ax}	773.38±7.57^{ay}
4-5	0.0	822.63±13.51^{bx}	766.00±13.58^{ay}
	10.0	815.50±12.14^{bx}	800.00±12.65^{ax}
	20.0	887.63±14.34^{ax}	774.38±10.69^{ay}
5-6	0.0	837.88±11.96^{ax}	755.75±10.87^{by}
	10.0	822.50±20.81^{ax}	734.75±14.79^{by}
	20.0	879.25±27.76^{ax}	814.75±18.35^{ay}
1-6	0.0	3318.00±26.45^{bx}	3150.75±29.69^{by}
	10.0	3321.75±19.26^{bx}	3153.50±40.96^{by}
	20.0	3580.26±105.95^{ax}	3300.75±23.22^{ay}

Values are means±standard error. Mean values with different letters at the same column (a-d letters) or row (x-y letters) and period differ significantly at $p\leq 0.05$

other hand, Aduku (1993), Onu and Okongwu (2006) and Defang *et al.* (2008) due this increase in feed intake to increase the rate of gastric . Inclusion of decorticated cowpea seeds instead of ground peanut cake in broiler chick's diet increased daily feed intake. On the other hand, molasses addition decreased daily feed intake by about 5.1, 5.1 and 7.8% for groups fed on diet containing 0.0, 10 or 20% of decorticated cowpea seed with molasses addition when compared with broiler chicken group fed on the same diet without molasses addition. On the other hand, Amaefule and Osuagwu (2005) and Defang *et al.*, (2008) reported that feed consumption was significantly higher in the control birds during the starter and finisher periods when compared with birds groups fed on both cowpea or black common bean. They due this to anti-nutritional factors in test diets were not completely eliminated through boiling. In the present study decortications of cowpea seed may be more efficient in the elimination of anti-nutritional factors which may be concentrated at that part of the seeds (Scott *et al.*, 1982; D'Mello 1995; Onu and Okongwu, 2006; Abdelati *et al.*, 2009).

Cowpea inclusion at 10 or 20% instead of peanut meal in broiler chicks diet with molasses had no clear line effect on feed conversion ratio (Table 6). While, the average Feed Conversion Ratio (FCR) for the whole experimental period was significantly improved with 10% of cowpea inclusion rate at zero level molasses by about 0.5% (1.83) when compared with the control (1.84). However, 20% inclusion rate of cowpea in broiler chick diet without molasses addition deteriorate FCR by about 2.7% (1.92) when compared with chicken group fed on the

Table 6: Effect of dietary cowpea and inclusion of molasses on feed conversion ratio (FCR) values of broiler chicks

Age (weeks)	Cowpea level (%)	Molasses level 0%	Molasses level 3%
1-2	0.0	1.33 ± 0.06^{ax}	1.49 ± 0.05^{ay}
	10.0	1.36 ± 0.05^{ax}	1.30 ± 0.02^{bx}
	20.0	1.36 ± 0.03^{ax}	1.47 ± 0.03^{ax}
2-3	0.0	1.58 ± 0.12^{ax}	1.54 ± 0.04^{ax}
	10.0	1.51 ± 0.03^{ax}	1.53 ± 0.03^{ax}
	20.0	1.45 ± 0.02^{ax}	1.56 ± 0.02^{ax}
3-4	0.0	2.19 ± 0.10^{ax}	1.95 ± 0.07^{ax}
	10.0	1.80 ± 0.04^{cx}	2.12 ± 0.06^{ay}
	20.0	1.84 ± 0.03^{bx}	1.99 ± 0.05^{ax}
4-5	0.0	2.59 ± 0.70^{ax}	2.02 ± 0.04^{ax}
	10.0	2.07 ± 0.04^{ax}	1.99 ± 0.06^{ax}
	20.0	2.31 ± 0.06^{ax}	2.14 ± 0.06^{ax}
5-6	0.0	2.36 ± 0.10^{ax}	2.46 ± 0.06^{ax}
	10.0	2.36 ± 0.09^{ax}	2.38 ± 0.07^{ax}
	20.0	2.59 ± 0.10^{ax}	2.32 ± 0.08^{ay}
1-6	0.0	1.84 ± 0.02^{ax}	1.90 ± 0.04^{ax}
	10.0	1.83 ± 0.03^{ax}	1.88 ± 0.03^{ax}
	20.0	1.89 ± 0.06^{ax}	1.92 ± 0.04^{ay}

Values are means±standard error. Mean values with different letters at the same column (a-d letters) or row (x-y letters) and period differ significantly at $p\leq0.05$

Table 7: Effect of dietary cowpea and inclusion of molasses on protein intake (g/bird) of broiler chicks

Age (weeks)	Cowpea level (%)	Molasses level 0%	Molasses level 3%
1-2	0.0	81.36 ± 1.01^{bx}	80.79 ± 0.70^{ax}
	10.0	78.20 ± 0.82^{cx}	78.32 ± 0.53^{bx}
	20.0	83.43 ± 0.57^{ax}	81.71 ± 0.37^{ax}
2-3	0.0	127.42 ± 1.69^{cx}	131.10 ± 1.17^{bx}
	10.0	135.64 ± 1.62^{bx}	127.88 ± 1.13^{cy}
	20.0	143.35 ± 0.97^{ax}	134.09 ± 1.46^{ay}
3-4	0.0	172.44 ± 1.66^{bx}	162.78 ± 2.37^{by}
	10.0	173.42 ± 0.85^{bx}	166.12 ± 2.46^{by}
	20.0	190.30 ± 1.50^{ax}	177.87 ± 1.74^{ay}
4-5	0.0	164.53 ± 2.71^{bx}	153.20 ± 2.72^{ay}
	10.0	163.10 ± 2.43^{bx}	160.00 ± 2.53^{ax}
	20.0	177.52 ± 2.87^{ax}	154.88 ± 2.14^{ay}
5-6	0.0	167.58 ± 2.39^{bx}	151.15 ± 2.17^{by}
	10.0	164.50 ± 4.16^{bx}	146.95 ± 2.96^{by}
	20.0	175.85 ± 5.55^{ax}	162.95 ± 3.67^{ay}
1-6	0.0	713.31 ± 5.57^{ax}	679.01 ± 6.31^{by}
	10.0	714.86 ± 4.10^{ax}	679.26 ± 8.66^{by}
	20.0	770.45 ± 9.27^{ax}	711.50 ± 4.82^{ay}

Values are means±standard error. Mean values with different letters at the same column (a -d letters) or row (x-y letters) and period differ significantly at $p\leq0.05$

basal diet without molasses (1.84). This deterioration agreed with Kracht *et al.* (1999) who due this to poor accessibility of nutrients in the diets by enzymes and the treatment method used in detoxifying the test grains as explained.

Effects of dietary cowpea inclusion without or with molasses addition on protein intake are presented in Table 7. Dietary inclusion of cowpea at 10% of broiler chick diets reduced ($p<0.05$) protein intake by about 3.9% at the first week of the experiment (78.20 g) when compared with control (81.36 g), while increased ($p<0.05$) protein intake by about 6.4% at the 2nd week of the experiment (135.64 g) when compared with control (127.42 g). On the other hand 10% inclusion rate of cowpea in broiler chick diet improved ($p>0.05$) protein intake by about 0.6% at 3rd week of the experiment t (190.30 g)and reduced protein intake by about 0.9% and 1.8% at the 5th and 6th weeks of broiler chicks age respectively(177.5 and 175.85 g) compared with the control at each age. Higher inclusion rate (20%) of cowpea increased protein intake by about 2.5, 12.5, 10.4, 7.9 and 4.9% at the 1st (83.43 vs. 81.36 g), 2nd, 3rd (190.30 vs. 172.44 g), 4th (177.52 vs. 164.53 g) and 5th (175.85 vs. 167.58 g) weeks of the experiment respectively when compared with chicken group fed on the basal diet (control).

Cowpea inclusion at 10% of broiler chick diet increased ($p>0.05$) total protein intake throughout the experimental period by about 0.2% (714.86) while higher level of cowpea ,20% (770.45) significantly increased total protein intake by about 8.0% when compared with control (713.31) . Molasses addition to the experimental diet generally significantly ($p<0.05$) reduced protein intake by about 4.8 (679.01 vs. 713.31), 5.0 (679.26 vs. 714.86) and 7.7% (711.50 vs. 770.45) for broiler chicks fed on the basal diet containing 0, 10 or 20% of cowpea with molasses addition, respectively when compared with broiler chicks group fed on the same diet without molasses addition. Reduction of diet protein level has been recommended during many years aiming to reduce the amount of heat needed to be dissipated by the broiler chicken under heat stress (Waldroup, 1982). Never the less , recently it is concluded that low crude protein in the diet will decrease the performance under high temperature (Alleman and Leclerq, 1997). Temim *et al* (2000) found that feeding broilers high protein diets (25 vs. 20%)during growing period increased weight gain.

Cowpea inclusion at 10 or 20% instead of ground peanut meal in broiler chicken diet without or with molasses addition had no clear line effect on Protein Efficiency Ratio (PER) (Table 8). The average PER for the whole experimental period was significantly improved with 10% of cowpea inclusion rate without molasses addition and by about 0.8% when compared with the control (2.57 vs. 2.55). However, 20% inclusion rate of cowpea in broiler chick diet without molasses addition reduced per by about 3.57% when compared with chicken group fed on the basal diet without molasses (2.46 vs. 2.55). Molasses addition to the control diet or diets containing 0.0, 10 or 20% of cowpea reduced PER by about 3.1% (2.47 vs. 2.55), 2.7% (2.50 vs. 2.57) and 0.4% (2.45 vs. 2.46), respectively when compared with broiler chicks group fed on the same diet without molasses addition.

Effect of dietary cowpea inclusion without or with molasses addition on hot carcass weight, cold carcass

Table 8: Effect of dietary cowpea and inclusion of molasses on protein efficiency ratio (PER) values of broiler chicks

Age (weeks)	Cowpea level (%)	Molasses level 0%	Molasses level 3%
1-2	0.0	3.48±0.14^{ax}	3.01±0.08^{ay}
	10.0	3.31±0.09^{ax}	3.38±0.05^{ax}
	20.0	3.26±0.07^{ax}	3.01±0.06^{by}
2-3	0.0	3.14±0.15^{ax}	2.88±0.07^{ay}
	10.0	2.93±0.06^{ax}	2.89±0.07^{ax}
	20.0	3.02±0.04^{ax}	2.83±0.04^{ax}
3-4	0.0	2.43±0.14^{ax}	2.31±0.07^{ax}
	10.0	2.47±0.06^{ax}	2.09±0.05^{by}
	20.0	2.39±0.04^{ax}	2.22±0.04^{bx}
4-5	0.0	2.16±0.17^{bx}	2.52±0.05^{ay}
	10.0	2.47±0.06^{ax}	2.56±0.06^{ax}
	20.0	2.23±0.07^{abx}	2.42±0.07^{ax}
5-6	0.0	2.28±0.10^{ax}	2.07±0.05^{ay}
	10.0	2.22±0.07^{ax}	2.17±0.07^{ax}
	20.0	2.01±0.06^{bx}	2.26±0.08^{ay}
1-6	0.0	2.55±0.03^{ax}	2.47±0.05^{ax}
	10.0	2.57±0.04^{ax}	2.50±0.05^{ax}
	20.0	2.46±0.05^{ax}	2.45±0.05^{ax}

Values are means±standard error. Mean values with different letters at the same column (a -d letters) or row (x-y letters) and period differ significantly at $p\leq 0.05$

Table 9: Effect of dietary cowpea and inclusion of molasses on some carcass traits of broiler chicks

Traits	Cowpea level (%)	Molasses level 0%	Molasses level 3%
Pre slaughter wt	0.0	2167.33±45.79^{ax}	1923.33±52.94^{ay}
(g/bird)	10.0	2101.67±53.54^{ax}	1981.67±58.68^{ax}
	20.0	2222.50±58.36^{ax}	2000.42±40.49^{ay}
Hot carcass weight	0.0	1385.00±30.36^{ax}	1209.38±29.23^{ay}
(g/bird)	10.0	1363.75±40.91^{ax}	1224.58±39.28^{ay}
	20.0	1383.13±37.06^{ax}	1291.04±41.07^{ax}
Cold carcass weight	0.0	1339.58±28.11^{ax}	1157.50±28.81^{ay}
(g/bird)	10.0	1309.17±39.36^{ax}	1180.83±38.99^{ay}
	20.0	1320.42±37.75^{ax}	1232.50±41.43^{ax}
Shrink weight (g/bird)	0.0	47.50±3.31^{bx}	51.88±2.48^{bx}
	10.0	54.58±4.88^{bx}	45.42±2.17^{bx}
	20.0	63.13±3.62^{ax}	56.04±2.46^{ax}
Shrink relative	0.0	3.46±0.21^{ax}	4.33±0.22^{ay}
weight (%)	10.0	4.12±0.34^{ax}	3.80±0.22^{ax}
	20.0	4.71±0.33^{ax}	4.47±0.27^{ax}

Values are means±standard error. Mean values with different letters at the same column (a-d letters) or row (x-y letters) and period differ significantly at $p\leq 0.05$

Table 10: Effects of dietary cowpea and inclusion of molasses on dressing percentage and some organs weights relative chicks

Parameters	Cowpea level	Molasses level 0%	Molasses level 3%
Dressing (%)	0.0	63.74±0.53^{ax}	64.15±0.98^{abx}
	10.0	64.00±0.98^{ax}	61.41±0.93^{bx}
	20.0	62.35±0.88^{ax}	64.76±1.95^{ax}
Gizzard relative	0.0	2.61±0.06^{bx}	2.53±0.07^{ax}
weight	10.0	3.17±0.06^{ax}	2.65±0.12^{ay}
	20.0	2.51±0.09^{bx}	3.17±0.09^{ax}
Liver relative weight	0.0	2.91±0.07^{bx}	2.90±0.07^{ax}
	10.0	3.59±0.10^{ax}	2.96±0.17^{by}
	20.0	2.73±0.12^{bx}	2.54±0.10^{abx}
Abdominal fat	0.0	2.57±0.07^{bx}	2.82±0.07^{bx}
relative weight	10.0	3.25±0.07^{ax}	3.19±0.12^{ax}
	20.0	2.43±0.10^{bx}	2.66±0.05^{bx}
Neck weight (g)	0.0	91.21±1.84^{bx}	86.67±2.06^{bx1}
	10.0	97.50±2.27^{abx}	95.83±2.94^{ax}
	20.0	101.25±2.97^{ax}	95.00±2.48^{ax}

Values are means±standard error. Mean values with different letters at the same column (a-d letters) or row (x-y letters) and period differ significantly at $p\leq 0.05$

weight, shrink weight, shrink relative weight and neck weight in broiler chicks are presented in Table 9. Cowpea inclusion at different percentage of broiler chick diets had no significant effect on both broiler hot and cold carcass weight of slaughtered chicks when compared with the control. On the other hand cowpea seeds inclusion at 10% increased ($p>0.05$) carcass shrink weight and shrink percentage by about 14.9 and 19.1% (54.58 g and 4.12%), respectively compared with the control (47.59 g and 3.46%), while inclusion 20% of cowpea increased ($p<0.05$) shrink weight by about 32.9% (63.13 g) and non significantly increased carcass shrink percentage by about 36.1 and 4.71%) when compared with the control. Molasses addition to broiler chicks diet containing 10 or 20% decorticated cowpea seeds reduced the traits ($p>0.05$) by about (16.8 and 7.8%) and (11.2 and 5.1%), respectively, when compared with broiler chicks group fed on the same diet without molasses addition (45.42 vs. 54.58 and 56.04 vs. 63.13) and (3.80 vs. 4.12% and 4.47 vs. 4.71%). Defang *et al*. (2008) recorded that inclusion of cowpea seeds in broiler chicks feed showed the highest dressing percentage. The similar dressing percentage results imply that the observed final weight is not due to the visceral or waste such as shank, feather, etc. (Oluyemi and Roberts, 2000). The cut parts, organ weights and dressing percentage results for all the diets confirm the recommendation of 20% of dietary levels of cowpea seeds inclusion. The carcass yield recorded for all the treatment groups were lower than the range suggested by (Jourdain, 1980). The relative weight of the internal gizzard were affected by dietary treatment except to liver at 10% cowpea may be due to amino acid imbalance with level of cow pea. Broilers raised under heat stress have increased abdominal fat (Kubena *et al.,* 1972; McNaughton and Reece, 1984) and decreased carcass protein (Geraert *et al.,* 1996; Tankson *et al*., 2001).

Effects of dietary decorticated cowpea seeds inclusion without or with molasses on dressing percentage, gizzard relative weight, liver relative weight and abdominal fat relative weight of broiler chicken are presented in Table. 10. Cowpea inclusion at different rate without or with molasses addition had no significant effect on dressing percentage of broiler chicks. However, cowpea seeds inclusion rate at 10% without molasses addition increased ($p<0.05$) gizzard and liver relative weight by about 21.5% (3.17 vs. 2.61) and 23.4% (3.59 vs. 2.91) respectively. While 20% cowpea without molasses addition exhibited a reverse condition. On the other hand molasses addition reduced gizzard and liver relative weight in broiler chicks groups fed on 0.0, 10.0 or 20.0% cowpea containing diets with molasses addition by about 3.1% (2.53 vs. 2.61), 16.45 (2.65 vs. 3.17) and 7.6% (3.17 vs. 2.51) in gizzard weight and by 0.0% (2.90 vs. 2.9), 17.5% (2.96 vs. 3.59) and 7.0% (2.54 vs. 2.73), respectively when compared with broiler chicks group fed on the same diet without molasses addition. Relative weight of gizzard in this study was found to be in the range of 2.51±0.09 to 3.17±0.06 and this is in accordance to El-Gendy (2009) who reported 2.72±0.12- 3.33±0.11% but higher than the results reported by Aderemi *et al.* (2006) who reported 1.71-1.81%. Where as relative liver weight was in the range 2.54±0.10 to 3.59±0.10 which was similar to the findings of El-Gendy (2009). Relative abdominal weight in this study was 2.43±0.10-3.25±0.07 which was higher than the range reported by Aderemi *et al.* (2006), (1.05-2.7). Neck weight in this study was 95.00±2.48-101.25±2.97g this is higher than the results mentioned by Demirulus *et al.* (2006) who reported 57.7-90.0 g for the trait.

CONCLUSION

From the proximate analysis it is clear that Cow pea seeds contain high level of methionine and lysine than other legume seeds and can be used to replace protein sources with excellent results till the level of 20%. Broiler chicks can tolerate Inclusion of 20% cowpea seeds and has positive effective on body gain and performance. Inclusion of molasses in cowpea seeds diet has negative effect on broiler chick's performance. Cowpea seeds can be replace protein source at level 20% in broiler chicks diet at 2 weak of age Research is suggested to investigate the effects of low level of molasses with dietary cowpea. It is recommended further study should be conducted to investigate the economic value of using cowpea in broiler diets.

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