THE EFFECT OF GRADED LEVELS OF BOILED AND DRIED PIGEON PEA SEED MEAL ON THE CARCASS OF COCKERELS

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ABSTRACT

A 15-week experiment was conducted to determine the effect of graded levels of boiled and dried pigeon pea meal on carcass characteristics of cockerels. In a completely randomized design, two hundred 1-week old Bovan nera (dominant black) cockerels were divided into 5 groups of 40 chicks containing 4 replicates of 10 chicks each. They were assigned five dietary treatments containing 0, 10, 20, 30, and 40% levels of boiled and dried pigeon pea seed meal in diets 1, 2, 3, 4 and 5 respectively. Data obtained from the carcass measurements were subjected to analysis of variance using SPSS version 16. Processing reduced the levels of trypsin inhibitor, cyanide, tannins, and phytic acid, by 79.36 23.53, 99.06, and 6.07% respectively compared to the raw seed. Dressing percentage was not significantly affected by the inclusion of pigeon pea seed meal. There was no significant difference in dressing percentage amongst the pigeon pea seed-based diets. Carcass cut-up parts (breast, wings, thighs and drumsticks) were not affected by dietary pigeon pea levels. These results suggest that up to 30% boiled pigeon pea seed meal can be included in cockerel diets without adverse effects on the meat yielding components.

Keywords: *Pigeon pea seed, boiling, cockerels, carcass characteristics*

INTRODUCTION

Poultry are monogastric animals and their diet consist mainly of cereal (Maize, guinea corn, millet, wheat) and leguminous (soya beans, groundnuts, etc.) grains. The competition between man and poultry for these grains and their use for various industrial purposes leave very little amounts for poultry feeding (Biswas, Roy, Gogoi, Ahmed and Singh 2010). The best solution to this problem is the intensification of research into cheaper alternatives that would support a commensurate performance of the birds. Pigeon pea (Cajanus cajan) is one of the most widely grown agricultural legumes in tropical and sub tropical countries (Oyenuga, 1968; Singh and Dawikar, 1993; Purdue, 2006) and has very low human food and industrial preference (Amaefule and Obioha, 2001).

Being a perennial shrub, it has the advantage of producing peas for several years (Vickery M. and Vickery, B. 1979). It is a very hardy crop that can be cultivated on a very wide range of soils (MacDonald and Low, 1990). The crude protein content of the seed ranges from 19 - 29% which is of a good quality except that it is low in methionine (Olomu, 1995; Amaefule and Nwabara, 2004). The seeds are reported to contain lower levels of metabolic inhibitors when compared to other leguminous seeds (Leaky and Wills, 1977). The effects of pigeon pea seed meal on the performance of broilers and layers have been investigated (Etuk, Esonu, and Udedibie 2003; Ahmed, Abdel Ati, and Elawad 2006; Amaefule and Obioha, 2007; Saeed, Khadiga and Ati 2007) but there is dearth of information on its effect on performance of cockerels. This study reports the effects of graded levels of boiled and dried pigeon pea seed meal on the carcass measurements of cockerels.

MATERIALS AND METHODS

The pigeon pea seeds in this study were the brown variety obtained from Angwar Mailafiya local market in Jama`a Local Government Area of Kaduna State. The seed was poured into a pot of boiling water (100^{o}C) allowed to boil for 30 minutes as described by Amaefule and Obioha (2001), removed and sun dried for 72 hours, then ground and used in the formulation of the experimental diets. In a completely randomized design, two hundred seven-day old Bovan nera (dominant black) cockerels were divided into 5 groups of 40 chicks containing 4 replicates of 10 chicks each. The replicates were housed in floor pens measuring 2.4m^2 with the floor covered with wood shavings as litter material. A trough feeder and a plastic drinker were provided in each pen. The birds were vaccinated against Gumboro at 2 and 4 weeks, Newcastle at 3 and 5 weeks, fowl cholera at 6 weeks and fowl pox diseases at 9 weeks of age. The experiment lasted 15 weeks.

Five isonitrogenous diets (1,2,3,4 and 5) were formulated to contain 20% and 15% crude protein in the chick and grower mashes respectively (Table 1). The processed pigeon pea seed meal was included in both the chick and grower mashes at 0.00, 10.00, 20.00, 30.00 and 40.00% in diets 1 (control), 2, 3, 4 and 5 respectively. The diets and clean drinking water were provided ad libitum throughout the 15 weeks of the experiment. The chick mash was fed for 7 weeks (that is, 8 weeks of age) and the finisher mash for the remaining 8 weeks of the experiment.

At the end of the study, four birds were randomly selected from each treatment (onebird per replicate) and used for carcass measurements. The birds were staved for 12 hours, weighed individually afterwards and then slaughtered. The slaughtered birds were scalded in hot water (50^{o}C) for 1 minute, plucked, eviscerated and dissected using carcass dissection methods described by Hann and Spindler (2002). The carcass and different cut up parts (breast, wings, thighs and drumsticks) were weighed and expressed as percentages of the live weight before slaughter.

The raw and boiled pigeon pea seeds were analysed for trypsin inhibitor, phytic acid, total cyanide and tannin contents. Samples were assayed for trypsin inhibitor according to the method of Kakade Rackis, Mcghee and Puski (1974) as modified by Liu and Markakis (1989). The determination of phytic acid was done according to the method of McCance and Widdowson (1935) as reported by Stewart (1974). Total cyanide and tannins were determined using the method of AOAC (1990). The experimental diets and the boiled pigeon pea seed were analyzed for proximate composition (AOAC, 2006). Data obtained from the carcass measurements were subjected to analysis of variance using SPSS version 16 (SPSS, 2007).

RESULTS AND DISCUSSION

The levels of the antinutritional factors analysed (Table 2) in the raw seeds are comparable with those reported by Salunkhe Kadam and Chavan (1985), D'Mello (1995), Udedibie and Carlini (2002) and Onwuka (2006). The seed used in this experiment contains however, more phytic acid than the 12.0mg/100g reported by Onimawo and Akpojovwo (2006) and more trypsin inhibitor activity than the 4.8mg/g observed by Purdue (2006). Differences due to the variety as well as analytical methods used may be responsible for the variations in the toxic factor content of the seeds.

Tannins and trypsin inhibitor contents were markedly reduced by boiling suggesting the effectiveness of moist heat in reducing these factors. Although cyanide is known to be destroyed by even slight heat application (Say, 1992), it

was reduced only by about 24% by boiling. The reason for this phenomenon was not understood. Amongst all the toxic factors analysed, phytic acid had the lowest percent reduction. This result is in agreement with that obtained by Diarra Usman, Kwari and Yisa (2008) who observed that the phytic acid in sesame seed was reduced more by soaking in water for 24 hours than boiling for 30 minutes. They concluded that phytic acid is lost more through hydrolysis than the action of heat. The levels of dietary crude protein in the chick and grower mashes (20 and 15% respectively) on table 3 are sufficient to meet the protein requirement of cockerels as recommended by Olomu (1995) and Smith (2001) under tropical conditions. Similarly, the energy levels of the diets met the recommendations of these authors. The results of carcass measurements as reveal by the study on table 4 showed no significant ($P>0.05$) effect of pigeon pea seed on carcass yield up to 30% level of inclusion. Beyond this level however, carcass yield was markedly ($P<0.05$) reduced compared to the control but there were no statistical differences ($P>0.05$) amongst the pigeon pea seed-based diets.

Similar trends of carcass yields were observed by Bamgbose, Abioye Oboh, Aruna, Isah, and Ebosohan (2004) and Iorgyer, Odoh, Ikondo, and Okoh (2009) when they fed fermented and boiled pigeon pea seeds respectively to finishing broilers. The yields of breast, wings, thighs and drumsticks were not affected ($P>0.05$) by dietary levels of pigeon pea seed meal, a finding which is consistent with the reports of Bamgbose et al. (2004) and Iorgyer, Odoh, Ikondo, and Okoh (2009) that the yields of these cut-up parts were not affected by the inclusion level of pigeon pea seed meal in broilers. The results of this study show that boiled pigeon pea seed meal can be included in cockerel diets at levels up to 30% without adverse effects on dressing percentage and the yield of carcass cut-up parts.

Table 1: Ingredient composition of the experimental diets.

	Chick mashes					Grower mashes				
Ingredients	1	2	3	4	5	1	2	3	4	5
Maize	41.27	37.21	33.17	29.13	25.08	49.49	45.44	41.38	37.33	33.70
Wheat bran	27.51	24.81	22.11	19.41	16.72	32.99	30.29	27.59	24.89	22.46
Soya bean cake	25.47	22.23	18.97	15.71	12.45	11.77	9.52	6.28	3.02	0.00
PPSM	0.00	10.00	20.00	30.00	40.00	0.00	10.00	20.00	30.00	40.00
Fish Meal	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
Bone meal	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
Salt	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30	0.30
*Premix	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Lysine	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Methionine	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10

Source: Survey 2010

** Vitamin/Mineral premix from Bio-organics supplied/kg. Vit A = 4,000,000.00 IU; Vit D3 = 8000.00mg; Vit E = 9,200.00mg; Niacin = 11,000.00mg; Vit B1 = 720.00mg; Vit B6 = 1200.00mg; Vit B12 = 6.00mg; Vit K3 = 800.00mg; Panthotenic acid = 3,000.00mg; Biotin = 24.00; Folic acid = 300.00mg; Choline Chloride = 120,00.00mg; Cobalt = 80.00mg; Copper = 1,200.00mg; Iodine = 400.00mg; Iron = 8,000.00mg; Manganese = 16,000.00; Selenium = 80.00mg and Zinc = 12,000.00mg; anti oxidant 250mg. PPSM = Pigeon Pea Seed Meal*

Table 2: Effect of boiling on the antinutritional factor content of pigeon pea seed.

Antinutritional factor	RPP	BDPP	level of reduction (%)
Hydrogen cyanide (mg/g)	0.17	0.13	23.53
Phytic acid (mg/100g)	24.03	22.57	6.07
Tannins (mg/100g)	2.13	0.02	99.06
Trypsin inhibitor (TIU/g)	5.62	1.16	79.36

Source: Survey 2010

RPP = Raw Pigeon Pea

BDPP = Boiled and Dried pigeon Pea

Table3: Proximate compositions of experimental diets and boiled and dried pigeon pea

	Starter Diets					Finisher Diets					
Nutrients (%)	1	2	3	4	5	1	2	3	4	5	BDPP
Dry Matter	89.85	89.55	88.97	89.20	90.00	86.02	86.54	87.30	86.95	87.02	91.36
Crude Protein	18.08	18.10	18.04	18.12	18.07	14.98	15.02	15.01	15.04	14.89	24.75
Crude Fibre	8.67	7.77	8.54	8.59	7.92	7.67	7.51	7.04	7.86	8.01	8.31
Ether extract	4.91	3.95	4.01	3.86	3.50	3.23	3.18	3.30	3.09	3.24	5.07
Nitrogen Free Extract	59.66	62.13	61.22	61.46	62.17	66.25	66.14	66.36	65.71	65.92	57.85
Total Ash	8.68	8.05	8.19	7.97	8.34	7.87	8.15	8.29	8.30	7.94	4.11
[1]Lysine	1.18	1.19	1.19	1.20	1.21	1.11	1.12	1.14	1.15	1.17	
[1]Methionine	0.51	0.49	0.48	0.47	0.47	0.87	0.87	0.86	0.86	0.85	

Source: Survey, 2010

*M E (Kcal/kg)	2913.04	2979.18	2946.60	2958.60	2971.79	2968.14	2964.51	2978.17	2848.70	2957.22	3015.24

BDPP = Boiled and Dried Pigeon Pea.

*M E = Metabolizable Energy calculated according to the formula of Pauzenga (1985): M E = (35×%CP) + (18.8%×EE) + (35.5×%NFE).

[1]Calculated using table values for other ingredients and analysed values for pigeon pea.

Table 4: Carcass characteristics of cockerels fed graded levels of boiled and dried pigeon pea

	Levels of boiled and dried pigeon pea seed meal (%)					
Parameter	0	10	20	30	40	SEM
Carcass (%)	69.39a	66.27ab	67.86ab	65.62ab	63.50bc	1.18*
Breast (%)	18.00	17.88	17.39	17.58	17.81	1.71NS
Wings (%)	11.46	10.92	11.78	10.95	10.51	0.30NS
Thighs (%)	12.57	12.48	12.30	11.65	11.61	0.40NS
Drumsticks (%)	12.34	11.70	12.95	13.05	11.53	0.57NS

Source: Survey 2010

a,b,c: means within the same row having different superscripts are statistically different ($p<0.05$).

SEM = Standard Error of the Mean * Significant ($p<0.05$). NS = Not Significant

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