

Feed intake and growth rate of finisher broilers fed diets containing raw and cooked *Napoleona imperialis* seed meals

Consumo de alimento y tasa de crecimiento de pollos de engorde en fase de acabado alimentados con dietas conteniendo harina de semillas crudas y cocidas de *Napoleona imperialis*

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ABSTRACT

A thirty-five day feeding trial was carried out to determine the effect of dietary raw and cooked *Napoleona imperialis* seed meals (NISM) on feed intake and weight gain of finisher broilers. Four treatment diets were formulated to contain 0% (control) or 5% raw NISM and 5% or 10% cooked, respectively. One hundred and twenty Hubbard broilers of 4 weeks of age were divided into 4 treatment groups of 30 birds, which were further subdivided into subgroups of ten birds each to represent the 3 replicates per treatment group. The treatment groups were, randomly, assigned to the four dietary treatments. The daily weight gains (DWG) (g) of the control group (29.14) was significantly higher ($p < 0.05$) than the group fed 5% raw NISM (15.14) but similar ($p > 0.05$) to the groups fed 5% (20.57) or 10% (20.86) cooked NISM. Feed conversion ratio (g feed/g gain) of birds on control diet (3.88) was significantly lower (better) ($p < 0.05$) than that of the birds on 10% (5.08) cooked NISM diets. The daily feed intake (DFI) (g) of the control birds (113.00) was significantly higher ($p < 0.05$) than that of the 5% raw NISM birds (68.00), but similar ($p > 0.05$) to that of the birds on cooked NISM. The results suggest that cooked NISM could replace maize up to 10% in finisher broiler ration without any visible deleterious effect.

Key words: Finisher broilers, *Napoleona imperialis*, performance, seed meal.

RESUMEN

Se realizó un experimento de alimentación de 35 días para determinar el efecto de la dieta de harinas de semillas crudas y cocidas de *Napoleona imperialis* sobre el comportamiento de pollos de engorde en fase de acabado. Se formularon cuatro dietas de tratamientos conteniendo 0% (control) y 5% de harina de semillas crudas de *N. imperialis* (HSCNI) y 5% y 10% de harina de semillas cocidas de *N. imperialis* (HScNI). Se dividieron 124 pollos de engorde Hubbard de cuatro semanas de edad en cuatro grupos de tratamiento de 30 pollos y cada grupo fue posteriormente sub-dividido en tres repeticiones de 10 pollos cada una. Los grupos de tratamientos se asignaron al azar a los cuatro tratamientos de dietas. La ganancia diaria de peso del grupo control fue significativamente mayor ($p < 0,05$) que la del grupo alimentado con 5% HSCNI pero similar ($p > 0,05$) a los grupos con 5 y 10% de HScNI. La relación de conversión de alimentos de los pollos de engorde en la dieta control fue significativamente menor (mejor) ($p < 0,05$) que aquella de los pollos de engorde con la dieta de 10% HScSM. El consumo diario de alimento de los pollos de engorde en el control fue significativamente mayor ($p < 0,05$) que aquella de los pollos alimentados con 5% HSCNI, pero similar ($p > 0,05$) a aquella de los pollos con HScSM. Los resultados sugieren que el HScSM pudiera reemplazar el maíz hasta 10% en la ración de pollos de engorde en fase de acabado sin efectos deleterios.

Palabras clave: Pollos de engorde en fase de acabado, *Napoleona imperialis*, comportamiento, harina de semillas, broiler

INTRODUCTION

The poultry industry in the developing countries such as Nigeria has been plagued with numerous problems, which include limited number of feed ingredients that are not in competition for consumption between man and broilers. The high cost

of conventional feedstuffs has already sent a lot of livestock farmers out of business, thus leading to reductions in overall animal protein production and availability for human's dietary needs. Provision of feed alone has been reported to account for 60-80% of total cost in most livestock production in developing countries as Nigeria (Igboeli, 2000; Esonu, 2006) but

it is about 50% in developed countries, and this emphasize the interest to develop local feedstuffs. In view of this, there is increased interest by Nigerian livestock farmers on the search for unconventional feed ingredients of comparable feed quality that are believed to be cheaper such as seed meals of tropical legumes, shrubs and trees that are readily available but not competed for in man's dietary needs.

In an effort to use new feedstuffs for animal rearing, a number of researchers in recent times has investigated the proximate composition of *Napoleona imperialis* seed meal (NISM) (Uchegbu *et al.*, 2002) and its use as feedstuff for farm animals as poultry (Uchegbu *et al.*, 2004) and weaner rabbits (Iheukwumere *et al.*, 2002). A decline in performance with increasing inclusion levels of raw NISM in broilers have been reported (Uchegbu *et al.*, 2004). Such declines or poor performance by animals fed raw NISM diets tend to suggest that it contains some anti-nutritional factors as has been reported for most unconventional feedstuffs (D'Mello, 1982; Udedibie and Carlini, 1998). Results of the proximate analysis of *N. imperialis* showed that the dry seed meal had 4.8% moisture, 11.7% crude protein, 4.95% ether extract, 3.60% crude fibre and 3.52% ash. The mineral content of the seed meal included 5.01 g/kg Ca, 17.5 g/kg K and 16.1 g/kg Na and the values for saponin and cyanide contents were 20% and 135 mg/kg, respectively (Ukpabi and Ukpabi, 2003). Radostits *et al.* (1997) reported that saponins could cause gastroenteritis, manifested by diarrhea and dysentery and (Westendarp, 2005) reported negative effects of saponins on farm animals.

Therefore, the objective of the study was to determine the effects of dietary raw and cooked *Napoleona imperialis* seed meal on the feed intake

and weight gain by finisher broilers.

MATERIALS AND METHODS

The research was carried out at the Poultry Unit of the Teaching and Research Farm, Department of Animal Science and Technology, Federal University of Technology, Owerri, Nigeria. The agro-climatic characteristics as well as poultry production system of the area have been described by Okoli (2004). Ripe *Napoleona imperialis* fruits were harvested in and around the project area with the pods opened, the seeds extracted, and then sun dried for 7 days. A portion of the sun dried *N. imperialis* seeds was milled using hammer mill to produce the raw *N. imperialis* seed meal (NISM) while, the remaining portion was cooked in water for one hour then sun-dried before milling to produce cooked NISM. The NISMs were then used in the formulation of four broiler finisher diets (T_{0%}, T_{5%R}, T_{5%C}, T_{10%C}) containing raw NISM at 0% and 5.0%, and cooked NISM at 5% and 10%, respectively. The chemical composition of the experimental diets have been shown in Table 1.

One hundred and twenty (120) Hubbard broilers of 4 weeks of age with average initial weight of 520g were divided into four treatment groups of 30 birds and each group sub-divided into 3 replicates of 10 birds each. The treatment groups were randomly assigned to the 0% and 5% raw NISM, and the 5% and 10% cooked NISM diets for T_{1R}, T_{2R}, T_{3C} and T_{4C}, respectively, in a completely randomized design (CRD) experiment. The birds were raised in a litter system. They were raised with Guinea feed for four weeks prior to the commencement of the experiment to stabilize the birds. Experimental feed and water were given *ad libitum*. The animals were weighed at

Table 1. Ingredient composition of experimental diets fed to finisher broiler birds.

Ingredients*	Diets (%)			
	T _{0%}	T _{5%R}	T _{5%C}	T _{10%C}
Maize	60.00	55.00	55.00	50.00
<i>Napoleona imperialis</i> seed meal	-	5.00	5.00	10.00
Calculated nutrient composition				
Crude protein (%)	20.48	20.71	20.58	20.68
Crude fibre (%)	4.24	4.44	4.30	4.36
Ether extract (%)	4.12	4.36	4.20	4.30
Metabolizable energy (kcal/kg)	2887.01	2821.20	2840.80	2794.60

* Each diet contained 16% soybean meal, 3% local fish meal, 10% wheat offal, 3% blood meal, 2% bone meal, 1% oyster shell, 4% palm kernel cake, 0.25% lysine, 0.25% methionine and 0.25% salt; NISM- *Napoleona imperialis* seed meal; R – Raw; C – Cooked.

the beginning of the experiment and on weekly basis thereafter for 35 days.

Statistical differences between treatment means were determined with the analysis of variance (ANOVA) for completely randomized design (Steel and Torrie, 1980). Where significant differences were detected among treatment means, mean separation was done using Duncan's New Multiple Range Test (DNMRT) as outlined by Obi (1990).

RESULTS AND DISCUSSION

The effects of graded levels of raw and cooked *Napoleona imperialis* seed meals (NISMs) on feed intake and weight gain of finisher broilers over 35 days are shown in Table 2. The final body weight of birds on control diet were, statistically, similar ($p>0.05$) to those on 10% cooked NISM, but significantly ($p<0.05$) higher than those on 5% raw and 5% cooked NISM. The significantly higher ($p<0.05$) mean final body weight of the control birds relative to the bird on 5% raw *Napoleona imperialis* seed meal diet reflects the inability of these birds to adequately handle and tolerate the anti-nutritional factors at this level of inclusion of raw NISM. The comparable results of the control diet and 5% and 10% cooked NISM diets was an indication that cooking *Napoleona imperialis* seed in water for one hour might have reduced the anti-nutritional contents of the test ingredient to a tolerable level other than saponins because these are not destroyed by thermal treatment, but by fermentation (Fenwick and Okenfull, 1983; Reddy and Pierson, 1994). The daily feed intake of birds on control diet were, statistically, similar ($p>0.05$) to those on 5 and 10% cooked NISM, but significantly ($p<0.05$) higher than those on 5% raw NISM. The negative effect of saponins on

feed intake is known (Cheeke, 1971; Westendarp, 2005).

The daily weight gain of birds on the control diet was similar ($p>0.05$) to those on 5% and 10% cooked NISM (Table 2). In absolute terms the birds on 5% and 10% cooked NISM had higher daily weight gains than those on the 5% raw NISM diet. The lower daily weight gain recorded for the birds on 5% raw NISM diet as observed in the study implied a reduction in growth rate. The decrease in weight gain observed in the birds fed 5% raw NISM could be attributed to the presence of anti-nutritional factors contained in these seeds (Dutta *et al.*, 1986; Udedibie and Carlini, 1998; Uchegbu *et al.*, 2004). It appeared that different toxic components of NISMs were responsible for depression in nutrient utilization and, consequently, reduction in the growth of broilers fed the seed meal. The daily feed intake of the control birds was, significantly, higher ($p<0.05$) than that of the group fed 5% raw NISMs, but similar ($p>0.05$) to those on 5% and 10% cooked NISM. It appeared the anti-nutritional factors might have created a palatability problem which depressed the consumption of diet containing raw NISM.

The feed conversion ratio of the birds on the control diet was, significantly, lower ($p<0.05$) than those on the 10% cooked NISM diet. This indicates that the control diet was better utilized than the 10% cooked NISM diets although, the control diet compared favourably with both the 5% raw and 5% cooked NISM diets. The mortality recorded in the study was quite insignificant and could not be attributed to the effect of NISMs, especially, as equal number of deaths occurred both among the birds on 0% and those on 10% cooked NISMs.

Table 2. Effect of raw and cooked *Napoleona imperialis* seed meals on the feed intake and weight gain of finisher broilers over 35 days.

Parameter	NISM diets (%)				SEM
	T _{0%}	T _{5%R}	T _{5%C}	T _{10%C}	
Initial body weight (kg)	0.53	0.52	0.51	0.52	0.005
Final body weight (kg)	1.55 ^a	1.05 ^b	1.23 ^b	1.25 ^{ab}	0.120
Daily weight gain(g)	29.14 ^a	15.14 ^b	20.57 ^{ab}	20.86 ^{ab}	0.117
Daily feed intake (g)	113.0 ^a	68.0 ^b	94.0 ^{ab}	106.0 ^a	11.4
Feed conversion ratio (g feed/g gain)	3.88 ^b	4.49 ^{ab}	4.57 ^{ab}	5.08 ^a	0.284
Mortality (No.)	1.00	-	-	1.00	

^{a,b} Means within row with different superscripts are significantly ($p<0.05$) different according to Duncan's New Multiple Range Test. NISM - *Napoleona imperialis* seed meal; R - Raw; C - Cooked. SEM: Standard error of the mean

CONCLUSION

The superiority of the birds on control diet relative to those on 5% raw *Napoleona imperialis* seed meal (NISM) diets as evidenced by reduced final body weight, daily weight gain and daily feed intake means that inclusion of raw NISM in the diet of broilers could, adversely, affect the growth performance of finisher broilers.

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