



## Impacts of Unprocessed Graded Levels of (*Senna*) *Senna obtusifolia* Seed Meal on Performance, Egg Production and Egg Qualities of Japanese Quails (*Coturnix coturnix japonica*)

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### ABSTRACT

A study was conducted on one hundred and twelve (112) Japanese quails of (4) four weeks old. The study is aimed at investigating the effect of graded levels of (*Senna*) *Senna Obtusifolia* seed meal on egg production and egg quality. The birds were randomly assigned to four experimental treatment containing 0%, 2.5%, 5% and 7.5% inclusion levels. The parameters assessed were feed intake, weight gain, FCR, egg production, shell thickness, albumen index, yolk index, Haugh unit and egg weight. The results obtained in this present study showed significant differences ( $P < 0.05$ ) for shell thickness, yolk index, haugh unit, egg weight and hen-day egg production, across the dietary treatments groups with the high profile of nutrients, it was concluded that *senna obtusifolia* seed meal can be included up to 5% level in practical diets of layer quails.

### ARTICLE INFO

Article History

Received: August, 2020

Received in revised form: December, 2020

Accepted: January, 2021

Published online: April, 2021

### KEYWORDS

*senna obtusifolia*, egg quality, hen-day production, Japanese quails, performance.

### INTRODUCTION

Poultry production is unique in that it offers the highest turnover rate and the quickest returns to investment outlay in the livestock enterprises (Sanni and Ogundipe, 2005). Funds invested in poultry production are recovered faster than in any other livestock enterprise. The rate of growth in production of poultry is the highest when compared with ruminants and other monogastrics animals (Braenkaert *et al.*, 2002) and the cheapest, commonest and the best source of animal protein (Ojo, 2002). Poultry is the quickest source of meat production and its production involves the least hazardous and arduous process in relation to other livestock enterprise. It is relatively free from

some pathological, ecological and economic constraints which affect the commercial production of other breeds and classes of livestock in Nigeria (Obioha, 1992). Umeh and Udo (2002) observed that the major constraints in poultry production in Nigeria is the high and rising cost of inputs, particularly feed which accounts for more than 85%. Therefore any attempt to substitute the conventional feed stuff in poultry feed will greatly reduce the cost of production. The Japanese (*coturnix coturnix japonica*) which is now being bred for meat and eggs has the potential to serve as an excellent and cheap source of animal protein for Nigerians. (Babangida and Ubosi, 2006), NRC (1991) quails are so precious that they can lay eggs

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when hardly more than five weeks old and it is said that about twenty of them are sufficient to keep an average family in eggs all year round. The quail meat is renowned for its low caloric value in addition to having high quality protein of high biological value (Haruna *et al.*, 1997).

*Senna obtusifolia* commonly known as *Senna* or coffee plant is an underutilized legume, it has a crude protein content of 27.00 – 29.54 % with good amino acid and mineral profile relative to soya bean, thus has a high potential as an ingredient for livestock feed (Ingweye *et al.*, 2010). However, the *Senna* seed like other legumes contain ant-nutritional factors that need to be treated using various processing methods, but toasting was employed in the present research (Tuleun and Patrick, 2007).

The objectives of the study therefore were to investigate the egg production and

A total of 112, 4 weeks old Japanese quails were randomly allotted to four dietary treatments at the rate of 28birds per treatment. Each dietary treatment was replicated 4 times with 7birds each. Feed and water were supplied adlibitum. The parameters that were measured are egg quality such as shell thickness, egg weight, albumen index, yolk index, Haugh unit and percentage hen-day egg production was assessed as:

$$\text{Percentage hen-day egg production} = \frac{\text{No of eggs laid} \times 100}{\text{No of live birds} \times 1}$$

Shell thickness was measured using a micrometer screw gauge in millimeter.

$$\text{Albumen index} = \frac{\text{Mean albumen height}}{\text{Mean albumen width}}$$

Yolk index is measured by braking the egg along the equator with the yolk intact, the height and width of the yolk

egg quality of Japanese quail fed graded levels of processed *senna* seed meal.

## MATERIALS AND METHODS

The study was conducted at the poultry unit of the research and teaching farm. College of Agriculture, Jalingo Taraba State (Latitude 8°53N and Longitude 11°23E) Nigeria. The area has an annual rain fall ranging from 1000 – 1500mm and temperature of 30 – 38°C (Encarta, 2009). The *Senna* seed were obtained from road sides and waste lands. The pods were split open and the seed processed by toasting. The proximate analysis of the seed was then carried out according to the method describe by AOAC, (1990). The product was used in formulating four diets designated as: T1 (control) 0%, T2 (2.5% SOSM), T3 (5% SOSM) and T4 (7.5% SOSM) respectively (Table 1).

measured using vernier caliper. Yolk index calculated as described by Paddhi *et al.*, (1998)

$$\text{Yolk index} = \frac{\text{Yolk mean height}}{\text{Yolk mean width}}$$

The haugh unit was calculated according to the formular of Haugh (1937).

$$Hu = 100 \log (11 + 7.5 - 1.7 W^{0.37})$$

Hu = Haugh unit

H = Height of albumen in millimeters.

W = Weight of eggs in grams.

All data obtained were subjected to analysis of variance as described by Steel and Torrie, (1990) and treatment means were separated using Duncan multiple range test as described by Obi (2002).

Parameters on live weight and live weight gain were also assessed. The initial live weight of birds per replicate was recorded in grams and the average weight obtained for each bird per treatment by dividing the total weight by the number of birds in that treatment. The average live

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weight gain of each treatment group was calculated as the average weight of the groups in the current week less the average weight of the group in the previous week. Daily weight gain obtained by dividing average live weight gain by number of days in a week. Feed intake and feed conversion ratio was also assessed.

## RESULTS AND DISCUSSION

Data on the percentage-hen-day-egg production and egg quality is presented in table 2. The result obtained for percentage hen-day-egg production showed that there was a significant ( $P < 0.05$ ) difference among treatment means of T3 (61.92) and T1 (47.52), no difference was observed for other treatments.

The observed trend in egg production pattern in this study could be attributed to the enhance utilization of the diet by birds in T3 (5%SOSM). The egg production values in this study range from 47.52 – 61.92% which compared unfavorably with range values of 30.28 – 36.39% reported by Babangida (2001) on effect of varied CP levels (22%, 20%, 18% and 16% CP) on egg production and egg quality of Japanese quail. High ambient temperatures of 38 – 40°C during the study (March – April) hence also affected the percentage hen-day egg production due to reduced feed intake.

The values obtained for shell thickness, yolk index, Haugh unit showed significant ( $P < 0.05$ ) differences among treatment groups while the values for albumen index was not significant ( $P > 0.05$ ) among treatment groups. Egg weight of Japanese quail has been significantly ( $P < 0.05$ ) influenced by the treatment diets. Eggs of birds in treatment T1 (9.43g) was highest while T2 (8.99g) was the lowest.

The significant ( $P < 0.05$ ) differences across the dietary treatment means was

observed for shell thickness in this present study. The mean value range was 0.2 – 0.27mm, this range compared favorably with 0.24 – 0.26mm reported by Bawa *et al*, (2010) for work on ranging dietary protein levels on breeder quails in the tropics. The values from this study showed gradual increase in shell thickness because of the high content in calcium of 10.18mg/100g of *senna obtusifolia*. Babangida (2001) reported range value between 0.19 – 0.22mm on varying crude protein levels on egg production and egg quality of Japanese quail contrast with the range in this study.

The mean value recorded for albumen index showed no significant ( $P > 0.05$ ) difference among treatment groups. The values in this present study range from 0.19 – 0.20 compared with 0.14 – 0.19 reported by Babangida (2001) but compared unfavorably with 0.04 – 0.05 reported by Bawa *et al*, (2010).

The level of significance observed in the present study for yolk index ( $P < 0.05$ ) was across the treatment groups. The values in this study range from 0.42 – 0.45, the yolk index reported by Bawa *et al*, (2010) was 0.35 across dietary treatment groups of varied CP levels (18 - 26%CP). This value (0.35) compared favorably with range values obtain in this study.

Birds fed 2.5% inclusion of *Senna obtusifolia* seed meal had significantly ( $P < 0.05$ ) better haugh unit compared to birds on other dietary treatments. Bawa *et al*, (2010) reported haugh unit range of 78.73 – 80.31 against the range of 63.97 – 64.82 in this present study. Babangida and Obosi (2006) reported a range of 63.54 – 75.82, while Babangida (2001) recorded a range of 83.15 – 85.61 which contrast the range values in this study. The low haugh unit values from this study may be attributed to traces of anti-nutrients presence in *Senna obtusifolia* seed and

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partly on high ambient temperature which affect albumen content of quail eggs.

The egg weight values for this study range from 8.99 – 9.43g and is significantly ( $P < 0.05$ ) different among treatment groups. The values agreed with the range of 9.3 – 9.7g reported by Yamane *et al*, (1979) also, compared favorably with the range of 8.92 – 10.13g reported by Babangida and Ubosi (2006). This results could be an indication that anti-nutritional factors. Oxalate, phylate and probably tannin might have inhibited the absorption of Ca, P, Mg and Mn which are important constituents in determining egg weight beside crude protein levels.

Result from this study indicated that 5% inclusion level of SOSM gave the best performance in terms of percentage hen-day-egg production, yolk index, haugh unit, egg weight and shell thickness; but not significant in case of albumen index. It was therefore, concluded that 5% inclusion level of SOSM is required for optimum performance by laying Japanese quails. Further research should be conducted to determine the optimal level of SOSM inclusion for best performance in laying Japanese quail.

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**Table 1:** Proximate Composition of *Senna obtusifolia* seeds

Parameters	Raw Concentration (%DM)	Toasted Concentration (%DM)
Dry matter	92.50	91.20
Crude protein	29.54	23.50
Ether extract	2.21	5.30
Crude fibre	10.18	11.22
Nitrogen free extract	46.77	57.44
Ash	3.70	2.54
Caloric value (Kcal/kg)	3252.80	3109.50

**Mineral Composition of *S. obtusifolia* seeds**

Mineral element	Raw concentration (Mg/100g)	Toasted concentration (Mg/100g)
Calcium	960.00	750.62
Potassium	1200.00	1502.45
Phosphorus	810.00	821.35
Sodium	600.00	75.40
Magnesium	640.00	530.20
Iron	232.60	20.21
Zinc	52.12	40.32
Copper	10.48	3.20

**Anti-nutrient Composition of *S. obtusifolia* seeds**

Phytochemical	Raw Concentration (Mg/100g)	Toasted concentration (Mg/100g)
Saponin	182.00	46.00
Tannin	380.50	75.00
Oxalate	80.25	26.00

**Table 2:** Composition of Experimental Layer Diets (6-10 weeks)

Ingredients	T1	T2	T3	T4
Maize	36.50	38.50	40.00	40.00
Soya bean (whole)	18.00	17.00	16.00	15.00
Fish meal	3.00	3.00	3.00	3.00
SOSM	0.00	2.50	5.00	7.50
Bone meal	3.00	3.00	3.00	3.00
Salt	0.50	0.50	0.50	0.50
Methionine	0.50	0.50	0.50	0.50
Lysine	0.80	0.80	0.80	0.80
Premix	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00

**Calculated Analysis**

ME (Kcal/kg)	2869.39	2898.85	2923.65	2934.47
Crude protein (%)	17.52	17.60	17.65	17.77
Crude fibre (%)	6.13	6.00	5.92	5.95
Calcium (%)	1.22	1.23	1.25	1.27
Phosphorus (%)	0.82	0.83	0.84	0.85

SOSM = *Senna obtusifolia* Seed Meal

ME = Metabolizable Energy (Kcal/kg)

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**Table 3:** Pooled Performance of Japanese Quail Fed Graded Levels of *Senna obtusifolia* Seed Meal (2-10 weeks)

Parameters	T1	T2	T3	T4	LSD
Initial weight (g)	25.20	25.51	25.22	25.09	7.20 <sup>NS</sup>
Final weight (g)	144.82 <sup>c</sup>	156.32 <sup>a</sup>	148.92 <sup>b</sup>	148.36 <sup>b</sup>	17.12 <sup>*</sup>
Mean daily feed intake g/bird/day	16.58 <sup>b</sup>	16.99 <sup>b</sup>	18.27 <sup>a</sup>	18.07 <sup>a</sup>	0.78 <sup>*</sup>
mean daily weight gain g/bird/day	2.14	2.34	2.20	2.20	0.23 <sup>NS</sup>
feed conversion ratio	3.27 <sup>c</sup>	3.36 <sup>c</sup>	3.47 <sup>a</sup>	3.36 <sup>b</sup>	0.09 <sup>*</sup>
mortality (%)	0.00	0.00	0.00	0.00	0.00

NS = Not Significant (P>0.05)

\* = Significant (P<0.05)

Means in the same row with different superscripts are significantly (P<0.05) different.

LSD = Least Significant Different

**Table 4:** Effect of Graded Levels of *Senna obtusifolia* Seed Meal on Egg Quality

Parameters	T1	T2	T3	T4	LSD
% Hen-day egg production	47.52 <sup>b</sup>	54.73 <sup>ab</sup>	61.92 <sup>a</sup>	56.7 <sup>ab</sup>	12.94 <sup>*</sup>
Shell thickness (mm)	0.25 <sup>b</sup>	0.26 <sup>ab</sup>	0.27 <sup>a</sup>	0.27 <sup>a</sup>	0.015 <sup>*</sup>
Albumen Index	0.20	0.20	0.20	0.19	0.011 <sup>NS</sup>
Yolk Index	0.42 <sup>b</sup>	0.45 <sup>a</sup>	0.45 <sup>a</sup>	0.43 <sup>ab</sup>	0.022 <sup>*</sup>
Haugh Unit	63.97 <sup>b</sup>	64.82 <sup>a</sup>	64.41 <sup>ab</sup>	64.58 <sup>a</sup>	0.57 <sup>*</sup>
Egg Weight (g)	9.43 <sup>a</sup>	8.99 <sup>b</sup>	9.06 <sup>b</sup>	9.03 <sup>b</sup>	0.27 <sup>*</sup>

NS = Not Significant (P>0.05)

\* = Significant (P<0.05)

Means in the same row with different superscripts are significantly (P<0.05) different.

LSD = Least Significant Different

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