EFFECTS OF DIFFERENT PROCESSING METHODS OF KENAF SEED MEAL ON EGG QUALITY PARAMETER OF LAYING HENS

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ABSTRACT
A twenty (20 weeks) experiment was conducted with one hundred and forty-four (144) laying hen at 6 weeks in lay, to evaluate the benefit of feeding processed kenaf (Hibiscus cannabinus L.) seed meal (KSM) as replacement for full fat soya (FFSM) in the diets on the egg quality parameters of eggs layed by laying hen in a 3 x 4 factorial arrangement, consisting four processing methods (raw kenaf seed meal RKM, cooked kenaf seed meal CKM, fermented kenaf seed meal FKM and autoclaved kenaf seed meal AKM) and 3 inclusion levels (0%, 10% and 20%). Data were collected on internal and external egg quality parameters. Results showed that the processing methods significantly (p<0.05) influenced the mean values obtained for shell thickness, yolk percentage and Haugh unit (HU). While yolk percentage, shell surface area, yolk height, yolk width and Albumen percentage were significantly influence by the levels of inclusion. There were significant (p<0.05) interaction effects of processing methods and levels of inclusion on shell thickness, percentage shell weight, yolk height, yolk width, yolk percentage, Albumen weight, Albumen height and HU. It can be concluded that inclusion of processed KSM had no effect on egg shape index of the laying. In similar way processing of KSM and the inclusion levels had no effect on Haugh unit. Therefore, for better shell thichness, farmers can feed their laying hens with 10% RFM.
Keywords: Laying hen, Processed kenaf, Diet, Egg quality

INTRODUCTION
Protein supplementation is often important to improve livestock performance, and this needs to be done with respect to the requirement of the animal in addition to the balance of other nutrient available. Soya bean meal and fish meal have been widely and successfully used as conventional protein sources for livestock (Oyebimpe *et al.,* 2006). However, the prices of these protein sources have been increasing continuously in recent times, whilst availability is often scarce. The shortage has been worsened due to the increasing competition between humans and livestock for these protein ingredients as food. According to Odunsi, (2003). Hence, any similar high protein ingredient which could partially or completely be used as a substitute for soybean meal or fishmeal is desirable. This could help to reduce cost of production and ensure cheaper meat production thereby making available the major crops for human consumption. One of such high protein ingredient crops is Kenaf (*Hibiscus cannabinus L*). Kenaf, (*Hibiscus cannabinus L)* has been, primarily used as a fibre crop and secondarily as a livestock feed (Dempsey, 1975). Kenaf seed have a crude protein content of 30.88%, with an organic matter content of 95.15% and ether extract content of 18.55% on a dry matter basis. (Rajashekher *et al.,* 1993).

MATERIALS AND METHODS
Collection and preparation of kenaf seed meal
The kenaf seeds were collected from the Institutes of Agriculture Research and Training, Ibadan, South West Nigerian. The seeds were thoroughly cleaned to remove all the foreign materials, the seeds were divided into four equal parts. One part was ground into raw kenaf seed meal (RKM). The second portion was cooked by boiling 25 litres to 100°C in a 50 litres drum, 12.5kg of raw kenaf was poured into the boiled water and allowed to cook for 15minutes. At the end of 15 minutes cooking, water was drained off and the cooked seeds sun-dried at a temperature of 27°C for 4 days before been milled into boiled kenaf seed meal (CKS). The third portion were fermented for three days in an air-tight plastic drum at the rate of 1kg to 5 litres of water, the seeds were allowed to ferment for 72 hrs (Adejinmi *et al*., 2007). Water was drained off and fermented seeds sun-dried at a temperature of 27°C for 4 days before being milled into Fermented kenaf seed meal (FKS) while the last portion were autoclaved using steam type autoclave at 121°C (250°F) at 15psi (1.5kg/cm2) of pressure for 15 minutes. The autoclave was allowed to cool down, the seeds removed; air dried for 24 hrs, milled into autoclaved kenaf seed meal (AKM). A total of 144 laying hen at 6 weeks in lay were used for this experiment. Birds were divided into 12 groups of 12 birds each. Each group were further subdivided into 4 replicates of 3 birds each in a 3 x 4 factorial arrangement. A total of twelve (12) diets was formulated such that soybean was replaced with graded levels of raw, cooked, fermented and autoclaved KSM. The replacement was in order of 0, 10 and 20% of each of the differently processed KSM.

Evaluation of eggs quality parameters

Fifty (50) eggs from each treatment were selected at every 2 weeks intervals. Egg quality assessment was done within 24 hours of lay on external qualities, weight, length, breadth, width and shape index) and internal qualities like albumen height, albumin weight, yolk height, yolk weight, shell weight shell thickness and haugh unit. The external and internal egg qualities of the laying hen were evaluated as outlined by Odetola, (2014).

RESULTS AND DISCUSSION

Main and Interaction effect of inclusion levels and processing methods of KSM on internal egg quality parameters of laying hen is presented in Tables 1 and 2. Shell thickness, yolk height, yolk% and Haugh unit were significantly influenced by the processing methods of KSM, while %shell weight, shell surface area, yolk height, yolk width, yolk index and albumen% were significantly ($p<0.05$) influenced by the levels of inclusion. The eggs laid by birds fed with FKM had the highest shell thickness (1.01mm) while those fed with BKM had the lowest (0.88mm). Birds fed RKM, CKM and FKM had significantly ($p<0.05$) similar yolk height, which were higher than those recorded for AKM. Highest (27.62%) was recorded for birds fed CKM while those fed FKM had the lowest (25.28%). The egg laid by birds fed AKM recorded the highest (86.56) Haugh unit (HU) while those of birds fed RKM recorded the lowest (76.47) value. The %shell weight was increasing as the inclusion levels of KSM increases, while the yolk height and yolk index were reducing with increased substitution of full fat soya for KSM.The results of the interaction effect of inclusion levels and processing methods KSM on egg quality parameters of laying hen reveals significant ($p<0.05$) interaction effect on the mean values obtained for shell thickness, %shell weight, yolk height, yolk width, yolk%, albumen weight, albumen height and HU. Shell thickness value range (1.07-0.83), %shell weight (15.15-13.28), yolk height (2.10-1.80), yolk width (4.90-4.45) and HU (77.96- 74.46) respectively. Birds fed 10% RKM, 10% CKM and 10% AKM had similar albumen weight which are significantly higher than the values obtained for other KSM based diets. The HU was highest in the eggs laid by birds on 10% AKM while those on 10% RKM had the lowest.

The shell thickness, % shell weight, yolk height, yolk percentage and Haugh unit were significantly ($p<0.05$) influenced by the dietary treatment. Although, the egg shape index was similar for all dietary treatments and slightly higher than the ideal value reported by Smith (2001). Egg shell thickness values were very close and the variations observed in this study were significant. However, the values obtained in this study were similar to the values reported for layers (Smith, 2001), but higher than the values reported by Kwari *et al*. (2010) who fed raw and processed sorrel seed meal to laying birds. Economically, the yolk colour is important because it is a quality criterion for consumer (Matt *et al*., 2011). The yolk colour score was the same for average (2.0) obtained was because white maize was used in formulating the diets. White maize and other ingredients used lack colouring pigments which could impacted colour to the yolk.

Table 1: Main effect of kenaf seed processing method and level of inclusion on internal egg quality parameters of laying birds (20-40wks)

Parameters	Processing methods of kenaf seeds					Levels of inclusion of kenaf seeds			
	RKM	CKM	FKM	AKM	SEM	0%	10%	20%	SEM
Egg weight (g)	58.81	59.83	59.90	60.71	0.80	58.99	60.24	60.21	0.70
Egg length (cm)	6.98	7.01	7.15	7.04	0.09	7.10	7.00	7.04	0.08
Egg width (cm)	5.55	5.45	5.63	5.48	0.09	5.61	5.49	5.47	0.08
Egg shape index	0.80	0.78	0.79	0.78	0.13	0.79	0.78	0.78	0.11
Shell weight (g)	8.23	8.27	8.12	8.25	0.16	8.15	8.30	8.20	0.14
Shell thickness (mm)	0.89^{ab}	0.88^{b}	1.01^{a}	0.93^{ab}	0.04	0.94	0.89	0.94	0.03
%shell	14.24	14.38	14.38	14.83	0.22	13.97^{b}	14.52^{a}	14.89^{a}	0.20
Shell surface area	74.95	75.15	75.79	78.08	1.01	74.99^{ab}	75.00^{ab}	77.49^{a}	0.94
Yolk weight (g)	14.09	14.85	14.45	14.69	0.42	14.61	14.26	14.69	0.38
Yolk height(cm)	2.02^{a}	2.05^{a}	2.04^{a}	1.93^{b}	0.02	2.03^{a}	2.01^{ab}	1.97^{b}	0.02
Yolk width(cm)	4.81	4.77	4.68	4.84	0.05	4.84^{a}	4.68^{b}	4.82^{a}	0.05
Yolk colour	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	0.00
Yolk%	27.37^{ab}	27.62^{a}	25.28^{b}	26.49^{ab}	0.72	25.72	26.91	27.44	0.63
Yolk index	0.42	0.43	0.44	0.40	0.10	0.42	0.43	0.41	0.09
Albumin weight (g)	34.90	34.48	35.08	35.70	0.65	34.84	35.53	34.74	0.56
Albumin height(cm)	0.88	0.90	0.94	0.87	0.03	0.88	0.91	0.90	0.26
Haugh unit	76.47^{b}	76.73^{b}	85.54^{ab}	86.56^{a}	0.40	76.88	76.75	75.55	0.50
Albumin%	59.34	57.63	58.56	58.80	1.23	59.06^{a}	57.84^{ab}	57.70^{b}	1.07

[abc]: Mean on the same row with difference superscripts differ significantly($P<0.05$). RKM = Raw kenaf seed meal, CKM = Cooked kenaf seed meal, FKM = Fermented kenaf seed meal, AKM = Autoclaved kenaf seed meal, SEM = standard error of me

Table 2: Interaction effect of kenaf seed processing method and level of inclusion on internal egg quality parameters of laying birds (20-40wks)

Parameters	RKM			CKM			FKM			AKM			
	0%	10%	20%	0%	10%	20%	0%	10%	20%	0%	10%	20%	SEM
Egg weight (g)	59.30	59.20	57.93	59.30	59.63	60.56	59.05	61.54	60.11	59.30	60.60	62.23	1.39
Egg length (cm)	7.10	7.00	6.85	7.10	6.88	7.05	7.10	7.13	7.23	7.10	7.00	7.02	0.16
Egg width (cm)	5.68	5.60	5.38	5.66	5.35	5.33	5.67	5.62	5.58	5.43	5.40	5.60	0.16
Egg shape index	0.80	0.80	0.79	0.80	0.78	0.76	0.80	0.79	0.77	0.80	0.77	0.80	0.16
Shell weight (g)	8.40	8.10	8.18	8.15	8.40	8.25	8.15	8.28	7.93	7.90	4.43	8.43	0.28
Shell thickness (mm)	0.95^{ab}	0.83^{b}	0.90^{ab}	0.95^{ab}	0.83^{b}	0.88^{ab}	0.95^{ab}	1.01^{a}	1.07^{a}	0.95^{ab}	0.90^{ab}	0.93^{ab}	0.07
%shell weight	14.28^{ab}	14.08^{b}	14.38^{ab}	13.28^{b}	14.53^{ab}	15.33^{a}	14.28^{ab}	14.53^{ab}	14.35^{ab}	14.05^{ab}	14.95^{ab}	15.50^{a}	0.38
Shell surface area	74.56	72.76	77.53	72.59	76.16	76.71	74.89	75.23	77.26	73.93	75.85	78.45	1.88
Yolk weight (g)	14.60	12.95	14.73	14.70	15.15	14.70	14.70	14.45	14.20	14.43	14.50	15.15	0.72
Yolk height(cm)	1.98^{abc}	2.04^{ab}	2.03^{ab}	2.05^{ab}	2.04^{ab}	2.05^{ab}	2.05^{ab}	2.10^{a}	1.96^{bc}	2.05^{ab}	1.90^{cd}	1.84^{d}	0.04
Yolk width(cm)	4.84^{a}	4.70^{ab}	4.90^{b}	4.84^{b}	4.75^{b}	4.73^{b}	4.84^{b}	4.45^{b}	4.77^{b}	4.83^{b}	4.83^{b}	4.87^{b}	0.09
Yolk colour	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	0.00
Yolk%	25.86^{b}	28.45^{ab}	27.81^{ab}	25.86^{b}	26.90^{ab}	30.12^{a}	25.31^{b}	25.38^{b}	25.17^{b}	25.86^{b}	26.94^{ab}	26.65^{ab}	1.25
Yolk index	0.41	0.43	0.41	0.41	0.43	0.43	0.42	0.47	0.41	0.42	0.43	0.39	0.18
Albumin weight (g)	34.90^{ab}	39.95^{a}	34.85^{ab}	34.68^{ab}	36.40^{a}	32.35^{b}	34.90^{ab}	34.90^{ab}	35.43^{ab}	34.90^{ab}	35.85^{a}	36.35^{ab}	1.21
Albumin height(cm)	0.89^{ab}	0.93^{ab}	0.83^{b}	0.88^{ab}	0.91^{ab}	0.91^{ab}	0.89^{ab}	1.02^{a}	0.92^{ab}	0.87^{ab}	0.81^{d}	0.92^{ab}	0.05
Haugh unit	76.00^{bc}	75.70^{bc}	74.71^{c}	76.00^{bc}	74.48^{bc}	74.71^{bc}	76.00^{bc}	77.17^{ab}	74.46^{bc}	76.00^{bc}	77.96^{a}	76.71^{ab}	1.63
Albumin%	58.85	67.48	60.16	58.48	61.04	53.42	59.10	56.71	58.94	58.85	59.16	58.41	2.13

[abc]: Mean on the same row with difference superscripts differ significantly($P<0.05$). RKM = Raw kenaf seed meal, CKM = Cooked kenaf seed meal, FKM = Fermented kenaf seed meal, AKM = Autoclaved kenaf seed meal, SEM = standard error of mean,

CONCLUSION

Similarly, inclusion of KSM had no effect on egg shape index both at early lay and late lay periods. In similar way processing of KSM and the inclusion had no effect on Haugh unit, nutrient digestibility, haematological parameters and biochemical indices of layers – both in the early and late periods of lay.

RECOMMENDATION.

It can be recommended that be recommended that farmers can fed their laying hens with fermented kenaf seed meal at 10% inclusion levels for better shell thickness.

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