



## **PRODUCTIVE PERFORMANCE OF LAYER CHICKENS FED DIETARY LEVELS OF SORGHUM ICSV400 VARIETY**

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### **ABSTRACT**

The study was conducted to evaluate the reproductive performance of layer chickens fed dietary levels of sorghum ICSV400 variety. Five (5) diets (17% CP) were formulated, in which the sorghum variety ICSV 400 was included at 0, 25, 50, 75 and 100% levels and the diets designated as treatments T1, T2, T3, T4 and T5, respectively. Sorghum was used to replace maize as a dietary energy source. The study used 400 Shika brown points of lay pullets allotted to five (5) treatments which were replicated four (4) times each with 20 birds per replicate in a completely randomized design (CRD). After flushing for seven (7) days using the experimental diets, initial weights of the birds in each replicate were recorded. Records of feed intake, number of eggs laid with egg mass was taken on daily basis. The initial weights of layers were similar statistically and ranged from 1.65-1.74 kg. Daily feed intake (DFI) was significantly ( $P<0.001$ ) affected by the dietary treatments with the values varying between 111.00 and 123.00 g. The feed consumption and number of eggs laid increased with the increase in levels of sorghum variety ICSV400. The highest percent hen day production was observed in birds on diet 5 (100% ICSV400) which was significantly ( $P<0.001$ ) different from the remaining diets. The henhouse percent egg production (HHPP) was also better on diet 5 (100% ICSV400) and significantly ( $P<0.001$ ) differ with the rest of the four (4) diets. The feed conversion ratio (FCR) was better (1.71) on diet 1 (control) and the lowest on diet 5 (100% ICSV400) which differ significantly ( $P<0.01$ ) among the five (5) treatments. It was concluded that ICSV400 sorghum is suitable and safe as an energy source in layer diets and can completely (100%) replace maize without negative effects on any of the performance parameters. It is recommended that ICSV400 sorghum variety is suitable source of energy in the diets of layer chickens.

**Keyword:** Chicken, Egg, Feed, ICSV400, Layer, Variety.

### **INTRODUCTION**

Animals eat to acquire the energy and building materials that they need to live and grow. For maximum performance and good health, poultry need a steady supply of energy, protein, essential amino acids, fats and oils, minerals and vitamins and most importantly water (Food and Agriculture Organization [FAO], 2016).

Poultry require the correct balance of these classes of nutrients for optimum growth, maintenance, reproduction and production. Poultry convert feed into food products quickly and efficiently and this high rate of productivity results in relatively high nutrient needs (Mahmoud and Kirk, 2014).

Poultry require the presence of at least 38 nutrients in their diets in appropriate concentrations and balance to perform optimally (Steve and Bruce, 2016). Therefore in considering any material as a component of poultry feeds, its nutritive value, availability, price and ease of processing should be considered. Many feed ingredients of both plant and animal origins have been used by many researchers to meet the bird's requirements with the view of minimizing cost of production and improving or at least maintaining performance.



**MATERIALS AND METHODS**

The research was conducted at the poultry section of Teaching and Research Farm, Abubakar Tafawa Balewa University, Bauchi, Bauchi State, Nigeria. The study used 400 Shika brown points of lay pullets allotted to five (5) treatments which were replicated four (4) times each with 20 birds per replicate in a completely randomized design (CRD). After flushing for seven (7) days using the experimental diets (17%CP), initial weights of the birds in each replicate were recorded. Records of feed intake, number of eggs laid with egg mass was taken on daily basis. The percent and proximate compositions of the experimental diets are presented in Table 1.

**Table 1:** Ingredients and Percentage Composition of Sorghum ICSV400 Variety Based Diets Fed to Layers in Experiment 2

Ingredients%	Diets				
	1(0%)	2(25%)	3(50%)	4(75%)	5(100%)
Maize	47.83	35.87	23.92	11.96	0.00
ICSV400	0.00	11.96	23.92	35.87	47.83
FFSB	19.37	19.37	19.37	19.37	19.37
Wheat offal	20.00	20.00	20.00	20.00	20.00
Fish meal	2.00	2.00	2.00	2.00	2.00
Lime stone	7.00	7.00	7.00	7.00	7.00
Bone meal	3.00	3.00	3.00	3.00	3.00
Salt	0.25	0.25	0.25	0.25	0.25
*Premix	0.25	0.25	0.25	0.25	0.25
Methionine	0.20	0.20	0.20	0.20	0.20
Lysine	0.10	0.10	0.10	0.10	0.10
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>
<b>Calculated analysis</b>					
Crude Protein (%)	16.93	17.05	17.17	17.29	17.41
ME (kcal/kg)	2712	2686	2681	2665	2649
Crude Fiber (%)	3.75	3.75	3.75	3.75	3.75
Ether Extract (%)	6.19	6.07	5.95	5.83	5.72
Ca (%)	3.70	3.70	3.70	3.71	3.71
Phosphorus (%)	0.61	0.64	0.66	0.69	0.72
Methionine (%)	0.48	0.47	0.46	0.45	0.44
Lysine (%)	0.96	0.97	0.98	1.00	1.01

\*Vitamin-mineral Premix contains the following per 2.5 kg: Vitamin A 10,000 IU, Vit. D3 2,000,000IU, Vit E 12,000mg, Vit K3 2,000mg, Vit B1 1,500mg, Vit B2 4,000mg, Vit B6 1,500mg, Niacin 15,000mg, Vit B12 10mcg, Pantothenic acid 5,000mg, Folic acid 500mg, Biotin 20mcg, Cholinechloride 100,000mg, Manganese 75,000mg, Zinc 50,000mg, Iron 20,000mg, Copper 5,000mg, Iodine 1,000mg, Selenium 200mg, Cobalt 5000mg, Antioxidant 125,000mg.

**RESULTS AND DISCUSSION**

**Reproductive Performance of Layer Chickens Fed Dietary Levels of Sorghum ICSV400**

The initial weights of layers used in the experiment were similar statistically and ranged from 1.65-1.74 kg. This is within the range given by poultry CRC (2014) that at 18-20 weeks of age layers should weigh 1.68-1.72 kg. Daily feed intake (DFI) was significantly affected by the dietary treatments with the values varying between 111.00 and 123.00 g. The values obtained were within the range (120-150 g) given by Olomu (1995). Feed consumption and number of eggs laid increased with the increase in levels of sorghum variety ICSV400 (Table



2). As sorghum is generally lower in metabolizable energy (ME) than maize, the ME decreases as the inclusion levels increased and the birds tend to eat more to meet their energy requirement. This pattern is similar to the report of Salissou (2009) that feed intake and egg production tend to be greater in layers fed sorghum based diets. This however differ from the report of Prochaska *et al.* (1996) who found similar feed consumption among layers fed sorghum based diets.

**Table 2:** Reproductive Performance of Layer Chickens Fed Dietary Sorghum ICSV400

Parameters	Diets					SEM	LS
	Replacements levels of Sorghum ICSV400 Variety with Maize						
	1(0%)	2(25%)	3(50%)	4(75%)	5(100%)		
Initial weight (kg)	1.70	1.74	1.69	1.65	1.66	0.04	NS
Daily feed intake (g)	111.00 <sup>e</sup>	115.00 <sup>d</sup>	117.00 <sup>c</sup>	121.50 <sup>b</sup>	123.00 <sup>a</sup>	0.03	***
Hen day production (%)	79.32 <sup>b</sup>	80.91 <sup>ab</sup>	83.70 <sup>ab</sup>	81.96 <sup>ab</sup>	85.61 <sup>a</sup>	1.11	***
Hen house production (%)	79.30 <sup>b</sup>	79.89 <sup>ab</sup>	82.61 <sup>ab</sup>	81.95 <sup>ab</sup>	84.52 <sup>a</sup>	1.10	***
Feed conversion ratio	1.71 <sup>b</sup>	1.75 <sup>ab</sup>	1.72 <sup>ab</sup>	1.80 <sup>a</sup>	1.77 <sup>ab</sup>	0.02	**
Mortality (number)	1	2	0	1	1	-	-

NS = not significant, SEM = standard error of means, LS = level of significance, \*\* (P <0.01) and \*\*\* (P <0.001). a,b,c,d and e = means in the same raw bearing the same superscripts are statistically similar.

#### Cost-Benefit of Egg Production Using Diets Containing Sorghum ICSV400 Variety

The highest percent hen day production was observed in birds on diet 5 (100% ICSV400) which was significantly different from the remaining diets. This finding is not in conformity with the findings of Narkhede *et al.* (1981), Thakur *et al.* (1985) and Rama Rao *et al.* (1995) that egg production remained unaffected with sorghum in diet. In those experiments, sorghum was used at a single level to replace maize part per part. However, the result obtained in this research agreed with the reports of Gowda *et al.* (1984) that egg production did not decrease when layers were fed diets with sorghum at 32 to 50 % of their diets or when sorghum was the sole cereal in the diet (Ambula *et al.*, 2003; and Parthasarathy *et al.*, 2005). Similarly, this result is close to the findings of Issa *et al.* (2007) that 57 % egg production for layers fed sorghum compared to 47% from birds fed a corn-based diet, but is higher than that of Ezeogwu *et al.* (2003) for layers fed graded levels of garcinia kola seed meal. Henhouse percent egg production (HHPP) was also better on diet 5 (100 % ICSV400) and significantly (P<0.001) differ with the rest of the 4 diets. This may be attributed to the higher feed intake experienced on the diet and the result is also better than some of the reported works like Isika *et al.* (2006) who fed layers with palm oil and animal fats and found 67.8-73.3 % as HHPP.

Feed conversion ratio (FCR) was better (1.71) on diet 1 (control) and the lowest on diet 5 (100% ICSV400) which differ significantly (P<0.01) among the 5 treatments. This result did not agree with the reports of Salissou (2009) of non-significant differences in average egg weight and feed conversion ratio among birds fed corn and sorghum based diets and that of Narkhede *et al.* (1981); Thakur *et al.* (1985) and Rama Rao *et al.* (1995) of non-significant effect in FCR by including sorghum in the diets of layers. The mortality of 5 birds obtained during the period of the research was within the range (20-25 % per year) reported by FAO (1997). Total feed intake increased with increased levels of sorghum in the diets however all the economic parameters were better as the level of inclusion of the test material (Sorghum ICSV400 Variety) increases in the diets. The economics of layer performance using Sorghum ICSV400 Variety is presented in Table 3.



**Table 3:** Cost-Benefit of Egg Production Using Diets Containing Sorghum ICSV400 Variety

Parameters	Diets				
	1(0%)	2(25%)	3(50%)	4(75%)	5(100%)
Total feed intake (kg)	8.88	9.20	9.36	9.72	9.84
Feed cost (₦/kg)	91.29	90.63	89.98	89.32	88.66
Total feed cost (₦)	810.66	833.80	842.21	868.19	872.41
Dozens of egg produced	5.19	5.39	5.48	5.68	5.81
Feed cost/dozen (₦)	156.20	154.69	153.69	152.85	150.16

### CONCLUSION AND RECOMMENDATION

The study concluded that ICSV400 sorghum is suitable and safe as an energy source in layer diets and can completely (100%) replace maize without negative effects on any of the performance parameters. The study recommended ICSV400 as energy source in the diets of layer chickens and as it confers more economic advantage than the conventional maize.

### REFERENCES

- Ambula, M. K., Oduho, G. W. and Tuitoek, J. K. (2003). Effect of high tannin sorghum and bentonite on the performance of laying hens. *Tropical Animal Health and Production*, **35**(3): 285-292.
- Ezeogou, L. I., Duodu, K. G., Emmambux, M. N. and Taylor, J. R. N. (2003). Influence of cooking on the protein matrix of sorghum and maize endosperm flours. *Cereal Chemistry*, **85**: 397-402.
- FAO (1997). *Special programme for food security (SPPS)*. Food and Agriculture Organisation. Diversification component. Rome, Italy.
- FAO (2016). *Poultry, Nutrition and Feed*. FAO's Animal Production and Health Division.htm.
- Gowda, D. R., Devegowd, A. and Ramappa, B. S. (1984). Effects of subabul leaf meal (*Leucocephala*) and sorghum in layer diets. *Indian Journal of Poultry Science*, **19**: 180-186.
- Isika, M. A., Agiang, E. A. and Okon, B. I. (2006). Palm oil and animal fats for increasing Dietary energy in rearing pullets. *Journal of Poultry Science*, **5**(1): 43-46.
- Issa, S. J., Hancock, D., Tuinstra, M. R., Kapran, I. and Kaka, S. (2007). Effects of sorghum Variety on growth and carcass characteristics in broiler chicks reared in West Africa. *Journal of Poultry Science*, **86**(1): 69.
- Mahmoud, EL- Begearmi and Kirk, C. K. (2014). *Nutritional Requirements of Poultry*.
- Narkhede, P. N., Kaduskar, M. R. and Thatte, V. R. (1981). Replacement of maize by sorghum (Jowar grain) in layer rations. *Indian Journal of Poultry Science*, **16**: 403-405.
- Olomu, J. M. (1995). *Feeding Management of Poultry*. In: Monogastric Animal Nutrition. Principles and Practice. A. Jachem publishers Nigeria Pp 19-118.
- Parthasarathy, P. R., Gurava, K. R., Reddy, V. S. and Gowda, C. L. (2005). *Linking producers and processors of sorghum for poultry feed: A case study from India*. International Institute for Semi Arid and Tropics (ICRISAT). www.globalfoodchanpartnerships.org.
- Prochaska, J. F., Carey, J. B. and Shafer, D. J. (1996). The effect of L-Lysine Intake on Egg Component Yield and Composition in Laying Hens. *Poultry Science Association*, **75**(10): 1268-1277.
- Rama Rao, S. V., Praharaj, N. K., Raju, M. V. L. N., Mohapatra, S. C. Chawak, M. M. and Mishra, S. K. (1995). Replacement of yellow maize with tannin free sorghum in white Leghorn layer diet. *Indian Journal of Poultry Science*, **30**: 76-78.



- Salissou, I. (2009). *Nutritional value of sorghum for poultry feed in West Africa*. Ph.D thesis Department of Animal Sciences and Industry College of Agriculture, Kansas State University, Manhattan, Kansas.
- Steve, L. and Bruce, S. B. (2016). *Nutritional Requirements of Poultry: Introduction to Poultry Nutrition*. htm Merck and the Merck Veterinary Manual.
- Thakur, R. S., Gupta, P. C., Sagar, V., Prasad, D. and Lodhi, G. P. (1985). Different sorghum grain varieties as an alternative to maize in layer rations. *Journal of Poultry Science*, **20**: 85-88.