Assessment of yeast supplementation on the onset of laying and subsequent performance of *Shika brown* layers fed high levels of rice bran during growing period

Abubakar*, A; Tukur, H.M; Hassan, W.A; Sekoni, A. A; Bashar, Y.A; and Odunsi***, A.A**

*Department of Animal Science, Usmanu Danfodiyo University, Sokoto, Nigeria; **National Animal Production Research Institute, ABU, Zaria and *** Department of Animal Nutrition and Biotechnology, Ladoke Akintola University of Technology, Ogbomoso, Nigeria*

**Corresponding author: illela@yahoo.com*

Abstract

The study assessed the effect of feeding grower pullets with high levels of rice bran supplemented with or without yeast (Saccharomyces cerevisiae) on sexual maturity and subsequent laying performance. The treatment groups were: treatment 1, 0% rice bran without yeast, treatment 2, 45% rice bran without yeast, treatment 3, 50% rice bran without yeast treatment 4, 45% rice bran supplemented with yeast and treatment 5, 50% rice bran supplemented with yeast. These diets were fed from the 9th to 20th week of age. Thereafter, a common layer diet was fed to all treatment groups from 20th - 40th week. Results of the study indicated that feeding rice bran at the growing phase did not affect age at point of lay. Indeed the birds fed rice bran diets without yeast reached point of lay earlier than the control group. Similarly, birds on high rice bran + yeast reached peak production earlier than the control group. However, hen-day egg production was higher for the birds fed control diet. It could be concluded therefore that feeding diets containing up to 50% rice bran with or without yeast supplementation during the growing phase did not adversely affect the onset of laying and subsequent performance of Shika brown pullets.

Keywords: Yeast, rice bran, pullets, egg

Introduction

Rice bran is a rice milling byproduct largely used as animal feed (Wang 1997). It is a valuable feedstuff, rich in B vitamins, fat, and protein, and compares favorably with cereal grains in amino acid composition (Warren and Farrell, 1991). Rice bran is already in use in livestock feed formulation, its role being essentially a source of fiber to facilitate intestinal mobility in the diets of non-ruminant animals (Okosun, 1985). The levels used does not however exceed 20%, even with finishing pigs (Okosun, 1985), due mainly to its high fiber content (Warren and Farrell, 1990; Farrell, 1994). The fiber fraction of rice bran is rich in hemicellulose containing branched arabinoxylans (Erbingerova *et al.*, 1994).

A significant decline in chick performance with increasing dietary rice bran levels has been observed in several studies (Warren and Farrell, 1990; Farrell, 1994; Madrigal *et al*., 1995). Indeed, Issaks *et al. (*1959) had earlier suggested *ad-libitum* feeding of high fiber diets as a method of controlling weight gain. Issaks *et al. (*1959) further reported that increasing amount of rice hulls in the diet of broiler pullets fed *ad-libitum* resulted in educed gains during the feeding period, and inclusion of as much as 50% of ground

rice hulls was not satisfactory for maintaining body weight. Average feed consumption increased significantly as the amount of rice hulls in the diet increased. This could be due to reduction in energy, as the rice hulls may be lower in energy than the substituted ingredient. The researchers concluded that if body weight of breeder pullets is to be controlled by the addition of fibrous materials, levels in excess of 22% fiber must be discouraged.

Several additives have been included in the diets of poultry in order to improve the utilization of nutrients by the birds (Abou El-Ella, 1996), yeast (Yalcin et al 2008; Abubakar, 1997), antibiotics (Onifade et al 1999) with positive results. Yeast release enzymes, which aid the breakdown of non starch polysaccharide components of feeding stuffs (Dawson, 1993). This study assessed the impact of feeding high levels of rice bran supplemented with yeast at the grower stage to *Shika brown* laying chickens. The response was measured in term of average age at point of lay, 5%, 50% and peak egg production levels.

Materials And Methods

Location of the experiment

The experiment was conducted at the Poultry Production and Research Unit of the Department of Animal Science located along Aliyu Jodi Road, Sokoto.

Experimental layout

The experimental layout was a completely randomized design (CRD) with five treatments replicated three times. The trial commenced at point of lay (20^{th} week) when the birds dropped the first egg. Immediately after attaining point of lay, the grower experimental diet (Table 1) fed to different treatment groups during the growing stage was withdrawn. Birds (24 birds per treatment with three replications each) were used and left in their pens. Birds for all treatment groups were fed with a common layer diet irrespective of the treatment allocation during the grower stage. Feed and water were given *ad-libitum* and eggs were collected twice a day (mornings and evenings).

Table 1: Gross composition (%) of grower diets containing different levels of rice bran (RB) and with or without supplemental yeast (Y) (fed 9 – 20th week)

	Treatments				
	1	2	3	4	5
Ingredients	0% RB - Y	45% RB - Y	50% RB - Y	45% RB+ 2gkg^{-1} Y	50% RB+ 2gkg^{-1} Y
Maize	42.0	32.0	27.0	32.0	27.0
Groundnut cake	4.15	5.15	5.15	5.15	5.15
Soybeans	7.00	7.00	7.00	7.00	7.00
Wheat offal	38.0	0.0	0.0	0.0	0.0
Rice bran	0.0	45.0	50.0	45.0	50.0
Blood meal	2.00	4.00	4.00	4.00	4.00
Bone meal	3.00	3.00	3.00	3.00	3.00
Limestone	3.00	3.00	3.00	3.00	3.00
Premix*	0.25	0.25	0.25	0.25	0.25
Lysine	0.15	0.15	0.15	0.15	0.15
Methionine	0.20	0.20	0.20	0.20	0.20
Salt	0.25	0.25	0.25	0.25	0.25
Total	**100**	**100**	**100**	**100**	**100**
Calculated analysis					
ME (kcal/kg)	2514.00	2506.39	2500.00	2506.39	2500.00
Protein (%)	15.84	15.01	14.96	15.01	14.96
Crude fiber (%)	4.80	18.50	20.22	18.50	20.22
Ether extract %)	3.5	5.9	6.2	5.9	6.2

RB; rice bran, Y; yeast,

*Premix provide the following vitamins and minerals (kg^{-1} of diet) Vitamin A, 1000IU; Vitamin D, 3000IU; Vitamin E, 8.0IU Vitamin K, 2.0mg; Vitamin $B_{1,}$ 2.0 mg; Vitamin $B_{6;}$ 1.2 mg ; Vitamin B_{12} 0.12mg, Niacin 1.0mg ; Panthothenic acid 7.0 mg ; Mg, 1000mg ; Cu, 8.0 mg Co and Se 0.1 mg

Experimental diet and data collection

A common layer diet was fed to all the five treatment groups (Table 2) during throughout the 20th - 40th week of age. Records collected include feed intake, egg production, mortality as well as age at 5%, 50% and peak egg production levels. Peak production was considered when the birds attained a consistent production at over 70% for seven consecutive days. Hen house was calculated based on the initial number of birds at the commencement of the trial while hen day was based on the actual number of birds at the time of calculation.

Table 2: Gross composition (%) of the common diet fed to experimental birds from 20 – 40 weeks of age

Ingredients	Levels (%)
Maize	42.60
Groundnut cake	6.00
Soybean meal	8.00
Wheat offal	30.00
Rice bran	0.00
Blood meal	2.50
Bone Meal	5.00
Limestone	5.0
Premix*	0.25
Lysine	0.20
Methionine	0.20
Salt	0.25
Total	**100**
Calculated chemical analysis	
Protein (%)	16.99
ME (kcal/kg)	2511.13
Crude fiber (%)	4.30
Calcium (%)	3.66

*Premix provide the following vitamins and minerals (kg^{-1} of diet) Vitamin A, 1000IU; Vitamin D, 3000IU; Vitamin E, 8.0IU Vitamin K, 2.0mg; Vitamin $B_{1,}$ 2.0 mg; Vitamin $B_{6;}$ 1.2 mg ; Vitamin B_{12} 0.12mg, Niacin 1.0mg ; Panthothenic acid 7.0 mg ; Mg, 1000mg; Cu, 8.0 mg Co and Se 0.1 mg

Statistical analysis

All data collected were subjected to analysis of variance using completely randomized design (CRD) following the procedures of SAS (1990) and mean separation was carried out using Duncan Multiple Range Test as described by Steel and Torrie (1990).

Results And Discussion

Onset of egg laying

Birds fed diet 2 during the growing phase attained point of lay earlier (140 days) compared to those on diets 1 (146 days) and 4 (145 days) ($P<0.05$) (Table 3). Similarly, birds fed diet 3 attained point of lay earlier (an average of 142 days) compared to those fed the control diet (an average of 146 days) ($P<0.05$). Differences in attainment of point of lay between the other treatments were not significant ($P>0.05$).

Table 3: Impact of grower experimental diets on the onset of laying by *Shika brown* pullets

Treatments (the levels were fed during growing stage 9-20th week)

Parameters	1 0 % RB - Y	2 45% RB – Y	3 50% RB – Y	4 45% RB +2gkg-1 Y	5 50% RB +2gkg^{-1} Y	SEM
Average age at first lay (days)	146.0^{a}	139.66^{c}	141.67^{bc}	144.67^{ab}	146.33^{ab}	1.16
Average age at 5% production (days)	150.67^{ab}	146.33^{b}	146.67^{ab}	150.00^{ab}	151.00^{a}	1.43
Average age at 50 % production (days)	178.67^{a}	174.33^{a}	167.0^{b}	174.13^{a}	172.67^{ab}	2.11
Average age at peak (> 70 %) production (days)	195.00^{b}	194.67^{b}	194.00^{b}	197.33^{a}	194.33^{b}	0.68
Average weight of birds at point of lay (kg)	1.40	1.42	1.38	1.37	1.38	0.04
Average weight of first egg (g)	41.02^{ab}	36.73^{c}	38.56^{bc}	41.68^{a}	38.96^{abc}	0.86

$^{abc:}$ Means along the same row with different superscripts are significantly different (P<0.05)

Birds fed diets 2 and 3 during the growing period reached point of lay earlier at an average of 139.66 and 141.67 days respectively. This indicated that addition of yeast seemed to prolong the age at point of lay (145 days). From the results, 5% level of production for birds on all treatment diets were similar except for the birds on diets 2 and 3 which differed significantly. Birds on high rice bran with no yeast supplementation reached 50% production earlier (167 days) than the control group (179 days) and those on low rice bran diets (with or without yeast) (174 days). Peak production (70%) was reached at about 195 days for all the treatments except for the low rice bran yeast supplemented treatment where peak production was reached 2 days later (197 days). These results indicated yeast supplementation to high rice bran influenced the age at which birds reached five percent production. However, both high levels of rice bran and yeast supplementation could not impact age at 50 and 70% egg production. Results also indicated that the onset of lay does not necessarily speed up egg production, as birds on the control and high rice bran yeast supplemented diets, which had delayed onset caught up with the other

treatments. In this trial, the birds on rice bran supplemented or un-supplemented reached 50% production at an earlier period compared to the age of 182, 177 and 176 days reported by Dairo (2004) when he fed diets containing 20, 30 and 40% coconut meal respectively, and 168 – 197 days reported for *Shika Brown* layers (Abdullahi 2004; Abubakar *et al.*, 1995;). Nursoy et al (2004) further reported on the beneficial effects of yeast culture in egg producing layers.

Average weight of birds at point of lay did not differ significantly (P>0.05) between the treatments (Table 3). However, birds on low rice bran without yeast recorded the highest body weight (1.42kg) at point of lay. Incidentally, this group of birds was the first to come into lay. This agrees with the assertion of Summers and Leeson (1994) that pullets may come into production early, often due to heavier weights. . Dairo (2004) reported slightly higher body weights of 1.4 – 1.68kg at the beginning of the laying period. The average weight of first egg differed significantly (P<0.05) between treatments. Weight of first egg was higher (P>0.05) for birds fed the control diet (41g) and diet 4 (42g) compared to those fed diet 2 (P>0.05). Thus, the group that first came into lay – i.e. those raised on diet 2 had the least weight of first egg.

Early laying performance (20 – 40 weeks)

Average feed intake of birds did not differ significantly (P>0.05) between the treatments, even though birds fed diet 4 consumed more feed compared to the other groups (Table 4). Hen day egg production (HDE) was higher (P<0.05) for birds raised on diet 4 (61%) compared to those for the control diet (51%) and diet 5 (53%) (Table 4). Hen housed egg production (HHE) varied between 44% for birds raised on the control diet to 48% for those raised on diet 3, but the differences were not statistically significant (Table 4). The average daily feed intake of 122g/b recorded across the treatments was higher than the 95 – 105g/bird/day reported by Onifade *et al*. (1999). Higher hen-day egg production for birds fed the low rice bran yeast supplemented diet (61%) compared to those fed the control (51%) and the high rice bran yeast supplemented diet (53%), this could be due to the relatively higher feed intake of birds in this group. The average hen day egg production recorded in this experiment is similar to the values of 57.6 to 68.5% and 57.2% reported by Onifade *et al.* (1999) and Abdullahi (2004) between 26^{th} – 35^{th} weeks of age.

Feed conversion ratio (kg of feed consumed per dozen eggs produced) varied from 2.5 for birds raised on diet 2 to 2.8 for those raised on the control diet, with no significant differences between the groups (Table 4). Mortality of birds (1 – 2%) recorded during the period was not significantly influenced by treatments. Tangendjaja and Yoon (2002) using yeast culture based diets had reduced mortality with layers. Abdullahi (2004) recorded 12% mortality for *Shika Brown* layers, whereas Ayorinde *et al.* (1999) reported mortality of less than 1%.

Table 4: Influence of grower diets on the performance of birds fed a common diet from the point of lay to 40 weeks of age

	Treatments (diets fed during growing stage)					
	1	2	3	4	5	
Parameters	0% RB - Y	45% RB - Y	50% RB - Y	45% RB +2gkg^{-1} Y	50% RB +2gkg^{-1} Y	SEM
Average total feed intake (kg/b)	16.79	16.42	16.83	19.04	16.64	12.57
Average daily feed intake (gb^{-1}d^{-1})	119.98	117.28	120.24	136.01	118.85	8.98
Hen day egg production (%)	51.33^{b}	57.00^{ab}	56.42^{ab}	60.79^{a}	53.00^{b}	1.86
Hen housed egg production (%)	44.00	46.00	48.33	46.33	45.67	3.69
Feed conversion (kg dozen eggs^{-1})	2.80	2.47	2.53	2.70	2.70	0.18
Mortality (%)	1.00	1.33	1.00	1.67	1.00	0.49

abc: means along the same row with the same superscripts are not significantly different (P>0.05) RB rice bran and Y yeast.

These results show that any limitation that could have arisen as a result of feeding a low quality diet at grower phase could be overcome when a better quality feed is fed at the laying phase. This interesting trend by which laying pullets rapidly overcome the residual effect of a poor grower feeding regiment has been previously observed by Summers and Leeson (1994) and Hussein *et al.* (1996).

Conclusion

It could be concluded from the results of this study, that feeding rice bran containing diets at the growing phase did not affect age at point of lay. Indeed the birds fed the rice bran diets with no yeast supplementation reached point of lay earlier than the control group. Similarly, birds on high rice bran yeast supplemented diet reached peak production earlier than the control group. In addition, hen-day egg production was higher for the birds fed control diet. It could be concluded therefore that feeding diets containing up to 50% rice bran with or without yeast supplementation during the growing phase does not adversely affect the onset of laying and performance of *Shika brown* pullets.

References

Abdullahi, A. U. (2004). Performance and egg quality characteristics of the Shika Brown Layer in Sokoto, North – West Nigeria. Msc Thesis, Department of Animal Science, Usmanu Danfodiyo University, Sokoto, Nigeria.

Abou El-Ella, M. A., M. Y. Attia, K. Y. El-Nagmy, and M. A. H.

Radwan.(1996). *The productive performance of layers fed diets supplemented with some commercial feed additives. Egypt J. Anim. Prod. Suppl. 33: 423–430.*

Abubakar, A. (1997). Influence of yeast supplementation on the performance of starter pullet chicks fed high palm kernel meal. MSc. Thesis. Department of Animal Science, University of Ibadan, Ibadan, Nigeria.

Abubakar, B.Y., O.O. Oni, A.I. Adeyinka, B.I. Nwagu, S.O. Ogundipe, and A.A. Sekoni (1995). The development of a commercial layer at Shika. Paper presented at the 20th Annual Conference of the Nigerian Society for Animal Production. Federal University of Technology, Minna. Nigeria.

Ayorinde, K.L., J.K. Joseph, O.E. Adewale and I.J. Ayandibu (1999). Growth, laying and egg quality traits of NAPRI commercial layers on deep litter and Cages. Tropical *Journal of Animal Science, 1:147 – 155*

Dairo, F.A.S (2004). Effect of the inclusion of cocoanut meal of high lipid and high fibre content on the attainment of sexual maturity in growing pullet grower chickens. In: *Sustaining livestock production under changing economic fortunes.* Proceedings of the 29th Annual Conference of the Nigerian Society for Animal Production, H.M. Tukur, W.A. Hassan, J.K. Ipinjolu, A. I. Daneji, K.M. Baba and B.R Olorede (eds) Usmanu Danfodiyo University Sokoto, 21st – 25 March 2004. P 247 – 252.

Dawson, K. A.(1993). Current and future role of yeast culture in animal production: A review of research over the last seven years. Pages 169–171 in Biotechnology in the Feed Industry. Proc. 9th Annual Symposium. Alltech Technical Publications, Nicholasville, KY.

Erbingerova, A.; Hromadkova, I. and G. Berth (1994). Structural and molecular properties of a water-soluble arabinoxylans-protein complex isolated from rice bran. *Carbohydrate Research,* 264: 97-109.

Farrell, D. J. (1994). Utilization of rice bran in the diets of domestic fowls and ducklings. *World's Poultry Science Journal,* 50: 115 - 131.

Hussein, A.S., A.H. Cantor, A.J Pescatore and T.H Johnson (1996). Effect of dietary protein and energy levels on pullet development. *Poultry Science,* 75: 973 – 978.

Issaks, R. E., B. L. Reid, R. E. Davies, J. H. Quisenbery and J. R. Cough (1959). Feeding of broiler type replacement stock. *Poultry Science,* 39: 339 - 446.

Madrigal, S. A., Watkins, S. E., Adams, M. H. and P. W. Waldroup (1995). Defatted rice bran to restrict growth rate in broiler chickens. Journal of Applied Poultry Research, 4: 170-181.

Nursoy, H., O. Kaplan, M. N. Ođuz, and O. Yilmaz.(2004). Effects of varying levels of live yeast culture on yield and some parameters in laying hen diets. Indian Vet. J. 81:59–62.

Okosun, S. E. (1985). Studies on calorie and protein requirements of cockerels. Ph.D. Thesis, Department of Animal Sci*ence*, University of Ibadan, Nigeria.

Onifade, A. A., A. A. Odunsi, G. M. Babatunde, B. R. Olorede, and E. Muma.(1999). Comparison of the supplemental effects of Saccharomyces cerevisiae and antibiotics in low-protein and high-fibre diets fed to broiler chickens. Arch. Anim. Nutr. 52:29–39.

Onifade, A. A. and Odunsi, A. A. Adebisi, O. A., Abubakar, A, Enohoebot, A. E. Muna, E. and Akinsoyinu O. A. (1999). Comparison of the performance of starting pullets' fed supplemental baker's or feed grade yeast in diets containing high levels of palm kernel meal. *Arch Gefluigelk*, 64 (4): 1-5.

SAS (1990) Statistical Analysis for Social Sciences. User's Guide, SAS Institute, Inc., Cary, NC, USA.

Sekoni, A. A., P. C. Njoku, S. O. Ogundipe and J. M. Olomu (1991). Effect of qualitative feed restriction on egg type pullet development and subsequent egg production. NAPRI, Shika, Zaria. March 1991. 30-37 pp.

Steel, R.G.D. and J.H., Torrie (1980). *Principles and Procedures of Statistics. A Biometric Approach,* 2nd ed. McGraw Hill book Co., New York. , U.S.A.

Tangendjaja, B., and Yoon, I (2002). Effect of yeast culture on egg production and mortality in layer chickens. Page 89 in Poultry Science Association 91st Annual Meeting Abstracts. August 11–14, 2002. Newark, DE. Abstract No: 380.

Summers, J.D and Leeson (1994). Laying hen performance as influenced by dietary protein intake to sixteen weeks of age and body weight at point of lay. *Poultry Science, 73:495 – 501.*

Wang, G. J. (1997). Effects of enzyme supplementation and irradiation of rice bran on the performance of Leghorn broiler chicks. *http:/www.idrc Ca/books/focus/821/chp.7. Html.* Pp. 1 - 10.

Warren, B. E. and D. J. Farrell (1990). The nutritive value of full fat and defatted rice bran. II. Growth studies with chickens, rats and pigs. *Animal Feed Science and Technology,* 27: 229 - 246.

Warren, B. E. and Farrell, D. J. (1991). The nutritive value of full-fat and defatted Australian rice bran. V. The apparent retention of minerals and apparent digestibility of amino acids in chickens and adult cockerels with ileal cannulae. *Animal Feed*

Science and Technology, 34: 323 - 347.

Yalcin,S,. Ozsoy, B Erol, H and S. Yalcin, S (2008) : Yeast Culture Supplementation to Laying Hen Diets Containing Soybean Meal or Sunflower Seed Meal and Its Effect on Performance, Egg Quality Traits, and Blood Chemistry **.***J. Appl. Poult. Res. 17: 229-236*