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Effects of Feeding Varying of Castor Fruit Meal (*Ricinus communis*) on Performance Characteristics of Layers

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Abstract: A site week feeding trial was conducted to study the effects of varying levels of castor fruit meal (CFM) on 40-week old Shavers 579 strains layers. Sixty-four layers were allotted to four dietary treatments, 1,23 and 4 which contained 0, 3.5, 7.0 and 14% castor fruit meal respectively. Layers in group (control diet) was significantly better ($p<0.05$) than the rest fed other diets in feed intake, hen-day production, egg weight, egg mass output and feed conversion efficiency. There were no significant differences ($p>0.05$) among the four dietary treatments in body weight, egg index, yolk percentage, albumen percentage, shell thickness and Haugh units. This study reveals that the inclusion of CFM in the diet of layers has adverse effects on their performance characteristics that are valued by poultry operators.

Key words: Effect castor fruit meal, performance characteristics, layers

INTRODUCTION

In recent times, the use of alternative sources of protein has steadily increased and the use of animal protein has decreased. This has been true for many countries including United states [1]. By 1969, as reported by Fanguaf [2], all requirements for a minimum amount of fish meal in poultry diets were removed. Vogt [3] reported that excellent performance may be expected from all-plant proteins in laying diet. As a result of this, various locally available plant protein sources are being used to substitute most of the available animal protein source. One of such plant protein sources is castor plant.

In peasant farming communities, castor plant is grown around compounds as hedges, this can thus avail the various livestock raised around the compounds the opportunity to feed on the whole fruits or on the bean of the plant. Studies in animal nutrition have shown that castor oil bean meal can be used as a protein supplement for ruminants, pigs and chicks [4, 6]. Castor bean meal is deficient in methionine, lysine and tryptophan. The deficiencies of the aforementioned amino-acids and the presence of anti-nutrients such as feed in poultry enterprise. However, [6] advocates the use of castor bean meal. There has been no report on the use castor fruit meal as component of the diet of laying hens (layers).

This study was to examine the effects of varying levels of castor fruit meal (CFM) on performance characteristics of laying hens. The study will afford the opportunity of ascertaining layers tolerant levels of CFM inclusion in diets.

MATERIALS AND METHODS

Preparation of materials: The castor fruits were obtained from the Institute of Agricultural Research and Training, Moor-Plantation, Ibadan, Oyo-State, Nigeria. The fruits were ground with the pericarps, using hammer mill to obtain Castor Fruit Meal (CFM). The meal obtained was stored in an air-tight condition.

Preparation of experimental diets: Four experimental diets were formulated such that diet 1 did not contain castor fruit meal while diets 2, 3 and 4 contained 3.5, 7.0 and 14% inclusion levels of castor fruit meal respectively. The four diets contained amount of other ingredients except wheat offals and groundnut cake (Table 1). Proximate analysis of castor fruit meal and experimental diets were determined according to the methods of [8].

Animals management and feeding: A total of 64 shavers 579 strain layers of 40-weeks of age were used for this study. The birds were randomly allotted to four dietary treatments of sixteen birds per treatment. Each treatment was replicated four times and each replicate had four birds in a completely randomized design experiment. Feeds and water were offered ad-libitum. The study lasted six weeks.

Experimental parameters measured: Feed intake and hen day egg production were determined on daily basis. The latter was calculated using the formula given by North and bell [8]. Average egg weight per hen was determined

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on weekly basis using a mettler. Egg mass output was computed by multiplying percent hen day production by mean egg weight [8]. Feed Conversion Efficiency (FCE) was determined as gram feed per egg mass output.

Measurement of internal egg quality: Four eggs per treatment (one per replicate) were randomly sampled from the total eggs collected per week. Each egg was broken and shell weight determined according to the procedures described by [9]. Shell thickness was measured using a micrometer screw gauge. Measurements were taken from sharp end, equator and broad end of the egg [10]. The shells from individual eggs were dried according to the method of [11], thereafter shell weight was recorded. The yolk was separated from the albumen using a plastic egg separator and weighed using a mettler electronic balance. The albumen was estimated by subtracting both the yolk and shell weights from the egg weight. Both yolk and albumen weights were expressed as percentage of egg weight multiplied by 100. yolk index is a ratio of yolk height and yolk length. Haugh unit was calculated using the formula of Haugh (1937) as cited by Stadelman (1977).

Statistical analysis: The data generated were subjected to analysis of variance (37). Duncan's multiple range test was used to determine the differences treatment means [14].

RESULTS AND DISCUSSION

Table 1 showed the gross composition of experimental diets and determined proximate analysis. The experimental diets were fairly iso-caloric and isonitrogenous. The values obtained were slightly lower than the values obtained by [15] when castor oil bean meal included in the diets of broiler starters.

Table 2 shows the effects of experimental diets on the performance and egg quality parameters. Feed intake, hen-day production, egg weight, egg mass output and feed conversion efficiency were significantly affected ($p<0.05$) by different dietary treatments. The significant difference observed in feed intake is in line with the findings of [16] that ingestion of castor beans caused a loss of appetite and general inappetite. However, it was observed that no significant difference ($p>0.05$) existed among diets 2, 3 and 4. this is contrary to the submission of [17] that increased amount of castor meal in the feed decreased feed intake. This is partly attributable to increase fibre levels in the feed as conditioned by the increased percentage of husks. The significant differences observed ($p<0.05$) in egg production and egg mass output were in line with the observations of [19, 18]. This means that the castor fruit meal cannot lead to any reasonable performances of laying hens. Birds on diets 2, 3 and 4 had significantly

Table 1: Gross composition of experimental diets (%)

	Diets			
Ingredients	1	2	3	4
Maize	40.9	40.9	40.9	40.9
Wheat offal	32.3	32.3	32.3	24.6
Groundnut offal	15.8	12.3	10.8	9.5
Castor fruit meal	-	3.5	7.0	14.0
Oyster shell	6.75	6.75	6.75	6.75
Bone meal	3.00	3.00	3.00	3.00
Premix *	1.00	1.00	1.00	1.00
Determined analysis				
Metabolizable energy (Kcal/kg)	2425.44	2452.42	2518.35	2612.93
Crude protein	16.69	16.32	16.50	17.35
Crude fibre	4.36	5.18	5.93	7.37
Ether extract	3.72	3.95	4.23	5.56

* Premix supplied per kg diet: Vit. A 10,00IU, Vit. D2 2000IU, Vit. E. 12IU, Vit. Kr8IU, Thiamine 1.5mg, folic acid, 0.6mg, Cobalamines 10mg, Biotin 20mg, Niacin 15g, Pantothenic 5mg, Folic acid 0.6mg, Manganese 75mg, Zinc 50mg, Iron 25mg, Copper 5mg, Iodine 4mg, Selenium 100mg, Cobalt 0.02mg, B.H.T. 125g and Choline 150mg

($p<0.05$) lower egg weight is proportional to body weight. Body weight however, is not significant ($p>0.05$) in this study and agrees with previous report of [22, 23] viewed tht weight gain although not a performance characteristics or parameter in laying hens but that if laying hens gained weight at a particular interval, it could only point to adequacy of nutrition for hens especially if egg production is not affected. But in this study both the feed intake interms of nutrition and production were affected. Also, [23] reported that both hen day production and egg size to be a function of nutritional status of the hen. Feed conversion efficiency for the reference diet (1) indicated a highly significant difference ($p<0.05$) compared to birds in other diets. Birds on diet 2 that received lowest percentage of castor fruit meat were mostly affected. As a result, a kind of relationship is established between feed intake, egg production, egg weight and egg mass feed conversion efficiency [24] however reported that increasing levels effect on efficiencies of feed [25, 26] and made simiar observations.

Egg yolk index, yolk percentage, albumen percentage, shell percentage shell thickness and Haugh unit indicated no significant differences ($p>0.05$) among the laying hens on different diet groups. This is in line with the finding of [29]. The values obtained therein for egg quality parameters (especially internal) showed a very good comparison of reference diet and other birds in other groups. The egg yolk index indicated for different treatment falls within the range of 0.33-0.50 reported by [28, 29] also asserted that dietary treatment has no influence on this parameter. This may be as a result of immunity developed by the hens with different inclusions of CFM against a toxic components- rain.

Considering the rate of recovery of the experimental birds in terms of hen-day production, feed intake and feed

Table 2: Performance and egg quality parameters of layers fed Castor fruit meal diets

	Diets				
Parameters	1	2	3	4	'Level of significance
Feed intake (g/h/d)	125.00+2.45[a]	112.62+2.76[b]	113.79+2.65[b]	114.11+2.71[b]	S
Hen-day production(%)	80.48+1.63[a]	28.81+1.06[b]	26.79+1.12[b]	33.33+1.23[b]	S
Body weight (kg)	1.81+0.36	1.80+0.40	1.78+0.37	1.74+0.31	NS
Feed conversion efficiency	2.50+0.03[a]	9.81+1.21[c]	8.50+1.10[bc]	7.38+1.12[b]	S
Egg weight (g)	62.17+2.71[a]	48.22+3.10[b]	49.98+3.74[b]	46.67+3.22[b]	S
Egg mass output	50.03+3.51[a]	11.48+2.21[b]	13.39+2.11[b]	15.46+2.43[b]	S
Yolk index	0.45+0.02	0.47+0.02	0.44+0.01	0.39+0.03	NS
Yolk weight(%)	24.99+1.42	25.56+1.44	25.61+1.39	25.51+1.40	NS
Albumen weight (%)	65.51+4.02	65.04+4.11	64.93+4.21	65.06+0.21	NS
Shell weight (%)	9.50+1.11	9.40+1.09	9.46+1.12	9.43+1.10	NS
Shell thickness(%)	0.31+0.02	0.30+0.03	0.29+0.02	0.28+0.03	NS
Haugh Units	98.84+3.16	90.16+4.12	94.25+3.21	92.00+3.08	NS

a,b,c Means within the same column with different superscript are significantly different ($p<0.05$). S: Significant, NS: Not Significant

conversion efficiency, the results agreed with the finding of [30] that the immunity developed is proportional to the dose rate and frequency of administration. The birds in group 4 with highest inclusion level of CFM were the first to recover, followed by the groups 3 and 2. One mortality was recorded three days into the experiment. Most of the symptoms associated with castor poisoning were noticed.

In conclusion, ingestion of castor fruit meal has negative effects at inclusion levels considered in this study. Performance characteristics were mostly affected. Therefore, to maintain a reasonable level of Fruit Meal (CFM) in the diet of laying hens and if at all there is a need for inclusion, below 14% should be employed.

REFERENCES

1. Balloun, S.L., 1980. Soybean Meal in Poultry Nutrition. Publ. By Ovid Bell Press, Inc. Fulton Missouri pp: 75.
2. Fanguaf, 1962. Personal correspondence.
3. Vogt, H.V., 1968. Versuche uber de vollstandigen erstazcon fischchmehl durchpflanzliche Eiweisstrager. Arch Fur Geflugelkunde, 32: 225-241.
4. Vilhjalmsdottir, L. and H., Fisher, 1971. Castor bean meal as a protein source for chickens. Destruction and determination of limiting amino-acids. J. Nutri., 101: 1185-1192.
5. Browning, J., C. Ken, R. Hawkins and R. Vignolo, 1990. The feasibility of domestic castor production. National workshop on castor production sponsored by U.S. Dept. Agric and Texas and M University Plainview, Texas.
6. Clarke, E.G.C.J., 1953. Pharm. Pharmac, 5:458.
7. Association of Official Analytical Chemistry. AOAC 1990. Official Method of Analysis (13th Ed. Washington D.C.).
8. North, M.O. and O.O., Bell, 1990. Commercial Chicken Production Manual 4th Edn. Van Nostrand Reinhold, New York 686.
9. Apata, D.F., A.B. Bamisile, S.S. Oyebanji and A.M. Bamgbose, 1999. Response of pigs to dietary levels of detoxified castor seed cake. Book of Proc. Annual NSAP Conf, pp: 257-277
11. Moreki, J.C. van Der Merwe and J.P. Hayes, 2005. Effect of dietary calcium levelon egg weight, egg shell weight, egg shell percentage and egg production in broiler breeder hens at peak production. Proc. 1st Nig. Inter. Poultry Ogun-State, Nigeria, pp: 79.
12. Stadelman, W.J., 1977. Quality Oreservation of Shell Eggs In: egg Sci. and Technol 2nd Ed. W.J. Stadelman and O.J. Cotterill (Eds.). Aul Publ Co. Inc., West port C.T. 41-47.
13. Steel, T.G.D. and J.H. Torrie, 1980. Principles and procedures of statistics. A Biometrical Approach. 2nd Edition, McGraw Hill, Book Co., New York.
14. Ducan, D.B., 1955. Multiple range and multiple F. Best Biometrics 11:1-42.
15. Ani, A.O. and A.U. Okorie, 2005. The effects of graded levls of dehulled and cooked castor oil bean (Ricinus communis, L) meal on performance of broiler starter, Nig. J. Prod., 32: 54-60.
16. Fox, M.W., 1959. Castor Seed residue poisoning in dairy cattle. The Veterinary Record, 73: 885.
17. Jenkins, J.P., 1963. Allergenic and toxic components of castor oil bean meal: Review of Literature and studies of inactivation of these components J. Sci. Food Agric., 14: 778-780.
18. Geary, T., 1950. Castor bean poisoning veterinary record, 62: 472-473.
19. Clarke, E.G.C. and M.L. Clarke, 1975. Veterinary toxicology. Bailliere Tindall, Published by Cassell, Collier Macmillian, London, pp: 310-312.
20. Nordskog, A.W., 1960. Importance of egg size and other factors in determining net income in random sample test. Poultry Sci. J., 327-338.

21. Dacosta, B.L. and G.F. Laun, 1964. Detoxified castor bean meal for feeding chickens, Nutri Abstr. Rens, 6744 38 19.
22. Bamgbose, A., 1991. The performance of Issa brown layers fed graded levels of rumen content-blood mixture. B. Agric thesis. Department of Animal Production, University of Ilorin, Nigeria.
23. Harvestein, G.B., R.L. Latshaw and J.E. Savage, 1990. Energy levels in laying hen diets and its effect on the performance of three commercial laying strains. Poultry Sci., 67: 902-907.
24. Ani, A.O. and A.U. Okorie, 2002. The nutritive value of dehulled and cooked castor oil mean to broiler finishers. Proc. 27th Ann. Conf., Nig. Soc. For Anim. Prod. INSAP) pp: 141-143.
25. Okorie, A.U., C.A. Enunwoye and F.O.I. Anugwa, 1988. Response of broilers to graded levels of heat-treated castor oil bean (*Ricinus communis*) cake supplemented with dl. Methionine. Arch Geflugelk, 52: 127-132.
26. Okoye, J.O., C.A. Enuunwonye, A.U. Okorie, F.O.I Anugwa, 1987. Pathological effects of feeding roasted castor bean meal (*Ricinus communis*) to chicks. Avian pathology, 16:283-290.
27. Hazen, E.L., 1926. General and local immunity to ricin. J. Immunol., pp: 171-217.
28. Ngoddy, D.O. and Ihenkoronye, 1985. Integrated Food Sci and Tech for Tropics. Macmillan Publishers.
30. Fox, M.W., 1961. In veterinary toxicology J. Vet. Rec., 13: 885.