Nutritional Quality and Factors Affecting Production of Commercial Poultry Feeds in Dar Es Salaam

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Abstract

A study was conducted to evaluate the nutritional quality and factors affecting production of quality commercial poultry feeds in Dar es Salaam City. Five different types of poultry feeds were sampled using spot sampling method in nine out of 18 feed industries surveyed in Dar es Salaam. The feed types were layers, breeders, broilers, growers and chick starter mashes. Values of proximate analysis, calcium and phosphorus contents were determined and metabolisable energy predicted on the samples and compared with the recommended standards. Information on the factors affecting production and quality of feeds was obtained from the industry officials and personal observations. All breeder mash samples exhibited lower energy content but sufficient crude protein when compared with the recommended values. Layers feed sample from industry I_1 had the lowest crude protein (13.1%, DM) whereas that from I_4 had highest crude fibre (13.5%, DM) content. More than 60 percent of the broiler feed samples were deficient in protein and rich in energy. Layers and breeders feed samples were found to be deficient in calcium, with average of 1.2 and 1.0 % DM, respectively. All feed samples analysed had higher levels of ether extract and ash contents than the recommended standards. Inadequate supply of good quality raw materials, high production costs, poor hygiene and inadequate system of feed quality control were among the major factors affecting production and quality of poultry feeds in Dar es Salaam. The study concluded that all the feeds sampled in Dar es Salaam have unbalanced nutrients and may adversely affect the performance of birds. Further studies were recommended on continuous assessment of the feeds, including essential amino acids, vitamins, safety and hygiene conditions.

Keywords: Nutritional quality, commercial poultry feeds, Dar es Salaam

Introduction

Animal feed industry in Tanzania has gone through various changes from the time of independence to date. These are associated with political economic changes that have been taking place in the country. Trade liberalization and privatization policies have led to changes of ownership of various sectors from government to private ownership. Several poultry feed compounding companies have emerged, especially in Dar es Salaam. These companies are commercial profit oriented. Since the government has relaxed its control over the private companies, the quality of products, including poultry feeds is questionable. In addition, there have been persistent claims among commercial poultry keepers that the commercial poultry feeds do not reflect the expected performance of birds. This low performance has in most cases been associated with poor nutritional quality of the commercial feeds without any evidence on which particular feed or nutrients. As a result other poultry keepers add some ingredients, such as fishmeal and minerals in feeds where they suspect deficiency of some essential amino acids or minerals. The implications of this move are that of additional cost and possibility

of much imbalances of the feeds due to oversupply of some nutrients and hence reduction in performance and gross margin of the enterprise.

Therefore, there is a need for conducting studies to assess the nutritional quality of the poultry feeds currently compounded in this country. Results from such studies will provide a baseline data to the poultry keepers for purchasing feeds selectively in the competitive market. These will also provide guidance to the feed manufacturers in correcting the deficient nutrients and hence improve the quality of the feeds. The findings will also bring awareness to the policy makers and follow-up bodies like, The Tanzania Bureau of Standards (TBS) on the real situation of the poultry feed industry in the country. The objectives of the study were therefore to assess the nutritional quality and factors affecting production and quality of the poultry feeds produced in Dar es Salaam.

Materials and Methods

A survey was made to establish the locations of poultry feed industries in Dar es Salaam. Retail shops for poultry feeds were used as the main source of information.A total of eighteen (18) poultry feed industries were surveyed in Dar es Salaam, whereby nine were selected randomly for feed sample collection. Twenty-one replicate samples were drawn from five different poultry compounded feeds using spot sampling method. The feed types included layers, broilers, chick starter, growers and breeder mashes. Information on the types and sources of ingredients used in feed compounding and major problems facing the industries was also gathered during the survey. In addition, personal observations on the premises, cleanliness, storage and mixing facilities and compounding procedures were made.

Proximate components were estimated according to the standard analytical procedures (AOAC, 1990). Phosphorus was determined using conical EE model 197 Spectrophotometer. Calcium was analyzed by atomic absorption spectrophotometer (AAS). The metabolisable energy content was calculated according to the formula established by Carpenter and Clegg (1956). That is, ME = 53 + 38 (CP + 2.25EE + 1.1STA + Sug) ± 190 Kcal/kg, where ME is the metabolisable energy in Kcal, and CP, EE, STA and Sug are percentage of crude protein, ether extract, starch and sugar content of the sample. The sugar content was determined using the method of Luff-Schoorl and starch by multiplying the amount of sugar in the sample with a factor of 0.923 (Egan *et al.*, 1981). The industries where samples were taken were randomly coded I_1 to I_9.

Results and Discussion

Chemical composition

The chemical composition of layers mash samples is shown in Table 1. With the exception of layers feed from industry I_6 the energy contents of the other feeds were in agreement with the level recommended by Singh (1990). The lowest crude protein (CP) value was shown by the layers feed from industry I_1 and this resulted into extremely high energy to protein (E:P) ratio. This implies that protein could be the limiting factor for egg production when birds were fed this feed. The crude protein contents in some of the layer mashes were in agreement with that of standard level of 16%, except those from industry I_1 and I_6, which had relatively low values. The calcium contents in all the layers mash ranged from 0.6 to 2.0% DM, values which were lower than the recommended value of 3.5% DM. Low Ca level in layers diets indicate that either the materials used as Ca source had lower Ca content than the required level or a limited quantity of Ca source was used. The possible effects of low Ca content in layers feeds are reduced egg production and eggshell quality (Singh, 1990). The phosphorus contents

ranged from 0.45 to 0.63% and were comparable to the recommended level of 0.5%

level of 19%, DM, except the broiler feed from I_8 (22.9%), I_2 (19.6%) and I_4 (19.3%)

Table 1. Chemical composition (% DM) of layers mash from the differ ent poultry feed industries (I_1 to I_7) in Dar es Salaam compared with Tanzania standards (TBS, 1979)

	Layer Diets							
	I_1	I_2	I_3	I_4	I_5	I_6	I_7	
ME (kCal/kg)	2928	2722	3069	3046	2601	2578	2632	2904
DM	93.9	95.8	96.3	95.4	96.3	95.1	94.7	90
CP	13.12	16.24	16.28	17.20	14.49	15.43	17.52	17
EE	4.52	5.87	5.35	4.45	5.08	4.41	4.04	3
CF	3.93	3.38	4.91	13.51	5.89	5.45	4.71	8
ASH	18.85	19.31	17.03	12.68	9.87	21.03	22.91	4[2]
Ca	1.27	1.25	1.14	1.16	0.62	1.26	1.95	3.5
P	0.48	0.46	0.45	0.48	0.60	0.63	0.48	0.5
E/P[1]	223	168	188	177	179	167	150	182

In this and subsequent tables;

[1] ME per unit CP

[2] Acid insoluble ash

Table 2. Chemical composition (% DM) of broiler mash from the differ ent poultry feed industries (I_1 to I_8) in Dar es Salaam compared with Tanzania standards (TBS, 1979)

	Broiler Diets								
	I_1	I_2	I_3	I_4	I_5	I_6	I_7	I_8	
ME (kCal/kg)	2362	3353	3271	3184	3029	3285	2685	3394	3048
DM	94.5	96.15	95.9	95.6	96.4	94.9	94.9	95.10	90
CP	17.94	19.57	17.09	19.26	15.61	17.45	17.38	22.86	20.5
EE	5.39	7.17	7.26	5.21	5.2	7.02	4.76	5.93	3
CF	3.65	6.32	5.42	7.99	5.52	8.02	6.0	5.23	4.5
ASH	16.4	14.46	8.45	13.18	17.43	11.8	10.64	14.3	3.5[2]
Ca	1.06	0.99	0.49	1.04	1.20	0.85	0.70	1.39	1.1
P	0.788	0.71	0.44	0.478	0.620	0.683	0.52	0.571	0.5
E/P[1]	132	171	191	165	194	188	154	148	150

[3] Average for broiler starter and broiler finisher

DMThe chemical composition of broiler feed samples is shown in Table 2. With the exception of the broiler feed from industries I_1 and I_7, which had slightly lower energy values, energy contents of the broiler rations were within the specifications of 3000 kCal ME/kg recommended by TBS (1979). Although the energy content was adequate, the concentration of protein was lower than the recommended animal feeds, which contained relatively higher values. This low protein content caused relatively high ratios of energy to protein (E:P), which may have a negative effect on the feed intake and total protein intake, leading to reduced growth rate of the birds. This effect is more pronounced at chick stage when the growth is rapid and require high levels of protein (22%, DM) in their diet (Singh, 1990).

The chemical composition of breeders, grower and chick starter feed samples is shown in Table 3. The breeder feeds contained higher contents of crude protein and lower energy concentration and hence lower energy to protein ratio than the levels recommended by TBS (1979). The grower feeds contained relatively high energy concentration, the highest shown by industry I_6 feed, which had 680 and 970 kCal ME /kg DM higher than the recommended values by Singh (1990) and TBS (1979), respectively.

The contents of ether extract and ash were extremely high compared with the recommended levels in all the feeds analyzed. This is in agreement with other works done with Tanzanian livestock feeds (Pullise, 1997 and Ngowo, 1986). The high levels of ether extract may be associated with the use of high levels of oil seed cakes, which are partially extracted in the formulation of the feeds. High levels of oil in poultry feed may undergo rancidity and lower the shelf life of the feed. In addition, it may lead into diets with high-energy content and hence over fattened birds. In case of layers and breeders, it may result into high fat deposition on the oviduct, which eventually may cause problems in egg production (Rose, 1997). The high levels of ash in the feeds might have been caused by contaminants such as sand and other inorganic compounds from the local limestone, which is used as source of calcium or from dusts in the stores. Other types of feed ingredients, such as rice polishing and pelagic fish contain considerable amounts of inorganic contaminants, which contribute to the ash content. The implication of high ash content in the poultry feed is to lower the organic matter of the feed, and hence its value.

Factors affecting production and quality

The major factors affecting production and quality of the poultry feeds were found to be the size of the industries, availability of the feed ingredients and storage conditions. Most of the industries visited were quite small with average capacity ranging from 2 to 5 tons/day. This small size of operation might have contributed to the observed low quality feeds for two possible reasons. Firstly, the owners might not have machines for thorough mixing of the feeds and secondly, based on the economies of scale, small size of production may lead into high operation costs per unit product. In order to accrue profit the producer is likely to incorporate ingredients, which are cheap on the expense of quality.

Feed ingredients used for compounding the feeds were obtained from various parts of Tanzania, some quite far from Dar es Salaam. The price and availability of these

Table 3. Chemical composition of broiler's (B) and layer's (L) breeder feeds, growers and chick starter samples from the different poultry feed industries compared with Tanzania standards (TBS, 1979)

Component	Breeder Diets		TBS (1979)	Grower Diets			TBS (1979)	Chick	TBS (1979)
	I_9B	I_9L		I_3	I_6	I_9		I_3	
ME (kCal/kg)	2453	2586	2904	2860	3660	2845	2690	3034	2904
DM	96.90	96.60	90	95.50	95.0	96.5	90	18.51	90
CP	19.30	20.41	17	17.38	15.76	20.49	15	19.51	20
EE	6.18	7.20	3	7.38	7.47	5.55	3	8.02	3
CF	3.59	4.10	8	5.38	4.77	5.21	7	6.32	4
ASH	11.66	12.73	4	9.11	11.37	19.79	4	10.56	4[2]
Ca	1.02	1.01	3.5	0.62	0.81	0.76	1	0.93	1
P	0.67	0.51	0.5	0.46	0.55	0.52	0.5	0.58	0.5
E/P[1]	127	127	171	165	232	139	179	155	145

ingredients fluctuates with seasons and this could influence the quality of the feeds. Feed ingredients from distant places are most likely to go bad during transportation and hence poor quality feeds. Purchasing of a large stock of feed ingredients and proper storage could overcome the problem of seasonal availability of ingredients, though it adds up the costs of storage. The cleanliness and storage conditions for most industries were not conducive. With the exception of industries I_8 and I_9, other industries had no separate warehouses for raw feed stuffs and compounded feeds. Feeds were stored direct on the floor. The storage conditions and poor hygiene observed imply that lot of dust is likely to get into the feeds, introducing micro-organisms, which are sometimes pathogenic to chickens and consumers of the poultry products. Moist and warm conditions could contribute to hydrolytic and oxidative rancidity, which may lower the shelf life of the feed and quality of the essential fatty acids. This condition could also result into moldy feed, which may lead to growth of aflatoxins and hence call for intervention.

The agencies responsible for ensuring good quality feeds were found to be inefficient by failing to ensure quality and safety of feeds, and impose laws, which govern the sector of feed manufacturing practices and combat dishonest in business. During the study, for example, information on the current list of poultry feed industries operating in Dar es Salaam could neither be found at Tanzania Bureau of Standard office nor at the Ministry of Agriculture and Cooperatives. This shows how these responsible bodies do not take the matter seriously and could be one of the major factors contributing to low quality poultry feeds.

Conclusion and Recommendations

It can be concluded that all the feeds analyzed have imbalances in some nutrients. Calcium was the most deficient in Layer and Breeder feeds, whereas ether extract and ash contents were extremely high in all the analyzed feeds. The possible factors affecting production and quality of poultry feeds are seasonal availability of the raw materials, small size of the industries, storage conditions and inefficient system of feed quality control. However, continuous monitoring of the composition of the feeds and their hygiene status is recommended.

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