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Effect of Dried Brewers' Grains as a Source of Fibre in the Diet of Angora Rabbits on the Growth Performance

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Abstract: An attempt was made to study the effect of incorporation of Dried Brewers' Grains (DBG) as a source of fibre on the growth performance of Angora rabbit. Forty Angora rabbits of eight month age were selected, sheared and grouped into four body weight categories namely Low Weight (LW), Medium Low Weight (MLW), Medium Heavy Weight (MHW) and Heavy Weight (HW) groups, each with 10 rabbits. There were five treatments, namely, T_1 (Control with 40% Dehydrated Lucerne Meal (DLM) as a major fibre source), T_2 (Equal parts of DLM and DBG as major fibre sources), T_3 (40% DBG as a major fibre source without DLM), T_4 (Ricebran extraction as a major fibre source without DLM), T_5 (DLM and sunflower cake as major fibre source). Two rabbits from each body weight category were randomly allotted to all the treatments (8 rabbits in all) such that average initial weight was uniform under all dietary treatments. All rabbits were fed *ad libitum* and weighed once a week. The rabbits had an average body weight of 2.83, 2.97, 2.97 and 3.05 kg with mean gain in body weight as 12.7, 13.3, 8.8 and 9.8 g per day showed the feed efficiency of 11.8, 12.2, 20.8 and 15.3 under LW, MLW, HW and MHW groups respectively, among which feed efficiency of first three were statistically similar ($p = 0.01$) within themselves whereas, LW and MLW category were significantly different ($p = 0.01$) from HW category. Despite a non-significant ($p = 0.01$) effect in the gain in body weight or feed efficiency due to treatments, the T_2 diet (13.8) may prove satisfactory.

Key words: Dried Brewers' grains, Angora rabbit, beer

INTRODUCTION

Brewers' grain is a by-product obtained in association with the production of beer and it can be useful in a variety of diets (Westendorf and Wohlt, 2002). Dried Brewers Grain (DBG) contains 28% protein and 18% crude fibre, which is sufficient to meet the protein and fibre requirement for growth of rabbits (Ekpenyong, 1986). The level of crude fibre usually recommended for all purpose rabbit ration is 12 to 14% as fed (MAFF, 1978). Yu and Chiou (1996) studied the effects of 5.5, 8.5, 11.5 and 14.5% dietary fibre levels on growth performance in growing rabbits. Food intake and body weight gain increased with increasing dietary fibre levels, feed conversion was highest with 11.5% dietary fibre. Gutierrez *et al*. (2002) investigated that there was an impairment in average daily gain and feed efficiency in the starter ($p<0.002$) and in the overall ($p<0.03$) fattening period of early weaned rabbits of age 25 days when fed with increased levels of fiber (30 or 36% Neutral detergent fibre).

DBG at 100, 150 or 200 g/kg concentrations of broiler chicks diet revealed the increase in feed intake, growth rate but, the efficiency of food utilization decreased as their concentrations increased (Onifade and Babatunde, 1998). In an experiment with New Zealand White rabbits, Omole and Ajayi (1976) observed a significant increase in feed intake and decrease in efficiency of feed utilization as the level of DBG increased from 0 to 45% in the diets. The features like fine, lengthy and fast growing wool under commercial exploitation however make Angora rabbit to have different nutritional approach. Angora rabbits are being fed successfully with a concentrate diet consisting of all nutrients in a balanced manner. Such concentrate diets invariably have the Dehydrated Lucerne Meal (DLM) as a potential fibre as well as protein supplement. DLM may often become scarce or costly ingredient. In this direction, an experiment was taken with an objective of studying the effect of substitution of DLM with the by-product of Brewers Industry viz., Brewers grains on the growth performance of Angora rabbits, which may alleviate the shortage of animal feed ingredients.

MATERIALS AND METHODS

Experimental diets: Five diets were designed and fed to experimental animals as mentioned below.

- T_1 Control with Dehydrated Lucerne Meal (DLM) as a major fibre source
- T_2 Equal parts of DLM and DBG as major fibre source
- T_3 DBG as a major fibre source without DLM
- T_4 Ricebran extraction as a major fibre source without DLM.
- T_5 DLM and sunflower cake as major fibre source.

Diet was given in the form of compounded and pelletized mashes with a size of 6 mm diameter and length of 1.5 -2.0 cm.

Experimental animals: Forty castrated male Angora rabbits of eight months age were sheared weighed and distributed into four different body weight groups namely Low Body Weight (LW), Medium Low Body Weight (MLW), Medium Heavy Body Weight (MHW) and Heavy body weight(HW) groups, each to have 10 rabbits. Randomly two rabbits from each body weight group were allotted to every dietary treatments (8 rabbits in all), such that average initial weight was uniform under all dietary treatments as depicted in Table 4. All rabbits were housed in individual cages maintained in perfect hygienic environment with free access to feed and water. Each rabbit was weighed at every one week interval, although such obtained data was further compiled into three periods i.e., at 28 days interval. The relative growth rate was also calculated during the three 28-day periods. The daily average feed intake was measured during experimental period of 84 days. The efficiency with which the rabbits under different dietary groups could convert feed into body weight was measured at 28-day intervals (Feed efficiency for body weight gain = feed consumed (g)/ body weight gain (g))

RESULTS AND DISCUSSION

The chemical composition of DBG used in the present study (Table 1) closely corresponds to the value obtained by Draganov (1986), Virk and Chopra (1979). The wide variation in chemical composition of DBG might be due to several factors like type of processing, nature of fermentation and the type of ingredients used in breweries. The chemical compositions of all the experimental diets (Table 2) were found to be well within the prescribed values (NRC, 1977).

The effect of various diets, body weight groups and periods on the status of body weight has been presented on the basis of average body weights and average daily weight gain (Table 5). As the experimental period progressed, the body weights in general increased, because all the rabbits were still in a growth stage as well as the fact that a gradual growth of wool fibre was apparent. Nevertheless, the treatment effect in general was not significant (Table 5) and that it was the period effect rather than the treatment effect, which were to reckon with.

Quite interestingly the LW and MLW category rabbits gained cumulatively significant higher body weights than their counterparts in MHW and HW groups (Table 5), a feature possibly because such rabbits were still growing. As against this trend, the body weight category did not have such significant influence when data was analyzed on the basis of individual period daily body weight gains. The results suggest that source of fibre other than that from lucerne has equal effect on maintaining the body weight which includes the actual tissue mass as well as the wool fibre growth (Singh and Nagi, 1986, 1987).

Table 1: Chemical composition (% Dry matter) of Dried Brewers' Grains (DBG) and Dried Lucerne Meal (DLM)

Nutrient	DBG	DLM
Dry matter	92.2±1.0	84.8±1.7
Organic matter	89.8±0.1	83.1±0.2
Crude protein	21.0±0.2	19.0±0.3
Ether extract	3.05±0.1	2.47±0.2
Crude fibre	20.2±0.9	23.9±1.0
Total ash	10.2±0.1	16.9±0.2
NFE*	45.6±1.5	37.8±1.1
AIA*	7.63±0.4	3.15±0.1
Calcium	2.68±0.6	3.06±0.2
Phosphorus	1.73±0.4	0.16±0.0
NDF*	62.9±1.6	51.4±0.6
ADF*	23.9±0.8	42.0±1.0

*NFE-Nitrogen free extract; AIA-Acid insoluble ash; NDF-Neutral detergent fibre; ADF-Acid detergent fibre

Table 2: Percent composition of experimental diets (kg)

Ingredients	T_1	T_2	T_3	T_4	T_5
Dried lucerne meal (DLM)	40.0	20.0	-	-	30.0
Dried Brewer's grains (DBG)	-	20.0	40.0	16.6	-
Ricebran extraction	25.7	22.0	24.1	40.5	5.42
Sunflower cake	12.9	20.0	20.0	20.0	38.0
Rice polish	7.19	6.94	4.72	4.81	-
Maize gluten meal	12.4	9.01	9.33	16.0	-
Sorghum	-	-	-	-	24.0
Oil	-	-	-	-	1.00
Dicalcium phosphate	0.76	0.24	-	0.24	0.50
Lime stone	-	0.80	0.80	0.78	-
Methionine synthetic	0.04	0.05	0.04	0.02	0.08
Vitamin mix	0.50	0.50	0.50	0.50	0.50
Salt	0.50	0.50	0.50	0.50	0.50
Total	100	100	100	100	100

The rabbits on an average consumed the air dried pelleted feed at the rate of 145 g per day during the 84 day experimental period (Table 5). Following the shearing, the results depicted in table 5 indicate that the rabbits consumed dried pellets at the rate of 5.43, 4.89 and 4.48% of the body weight during 0 to 4, 0 to 8 and 0 to 12 weeks of experimental period. The lower percentage of feed intake based on the body weight as the post shearing age advanced is due to higher requirement of nutrients for the rapid wool growth during the early stages. The feed intake values during such periods are found to be quite normal (Lall *et al*., 1985; Singh and Negi, 1987). When the feed intake was calculated on the average body weight basis using the data of Table 5, it was found that the feed intake was 4.93(LW), 5.05(MLW), 4.76(MHW) and 4.56(HW) % of their body weights while such an irregular trend in feed intake was not in tune with the body weights. The daily feed intake: body weight ratio in the different dietary groups have been found to be 4.82(T_1), 4.93(T_2), 5.04(T_3), 4.76(T_4) and 4.98(T_5) % of the body weight which appeared to be quite close to each other. A much clearer understanding of the effect of periods, body weights and treatment could be observed from the feed consumption data on the individual period basis (Table 5). However, the trend in variation due to the said factors was similar when the data analyzed on the basis of cumulative as well as individual periods.

Table 3: Chemical composition of experimental diets (% of dry matter)

Nutrients	T_1	T_2	T_3	T_4	T_5
Dry matter	85.0	88.9	89.4	89.0	88.2
Organic matter	84.6	86.2	87.8	86.5	88.6
Crude protein	23.6	20.8	20.2	21.0	20.9
Ether extract	4.33	4.43	5.06	3.59	3.38
Crude fibre	15.4	13.5	16.4	14.6	14.8
Total ash	15.4	13.8	12.2	13.5	11.5
NFE*	41.3	47.4	46.2	47.4	49.5
AIA*	4.18	5.72	5.06	5.60	3.39
Calcium	1.65	1.59	1.34	1.21	1.73
Phosphorus	0.75	0.97	1.20	1.44	0.74
NDF*	38.7	45.0	47.5	44.9	44.4
ADF*	26.3	28.7	29.3	28.8	30.3

*NFE-Nitrogen free extract; AIA-Acid insoluble ash; NDF-Neutral detergent fibre; ADF-Acid detergent fibre

Table 4: Mean body weight (Kgs) of rabbits selected for the present study under different body weight and dietary treatment groups

	Body weight groups				
	LW	MLW	MHW	HW	Mean
T_1	2.19	2.30	2.44	2.70	2.41
T_2	2.20	2.29	2.46	2.65	2.40
T_3	2.21	2.29	2.47	2.64	2.40
T_4	2.20	2.31	2.47	2.63	2.40
T_5	2.20	2.31	2.47	2.63	2.40
Mean	2.20	2.30	2.46	2.65	2.40

Table 5: Average body weight (ABW) in kg (Mean ± SE), Average Daily Weight Gain (ADG) in g (Mean ± SE), Average Daily Feed Consumption (ADFC) in g (Mean± SE) and Feed Efficiency for body weight gain (FE) (Mean ± SE) of Angora rabbits during experimental period under different body weight, dietary treatment and period groups

		ABW	ADG	ADFC	FE
Body weight groups					
a.	LW	2.83 ±0.09^{a}	12.7±2.09^{a}	139.6±4.79^{a}	11.8±1.42^{a}
b.	MLW	2.97±0.09^{ab}	13.3±2.30^{a}	150.0±4.73^{b}	12.2±1.81^{a}
c.	MHW	2.97±0.09^{ab}	9.8±1.37^{b}	141.3±2.85^{a}	15.3±1.59^{ab}
d.	HW	3.05±0.13^{b}	8.8±0.58^{b}	149.0±1.39^{b}	20.8±2.65^{b}
Dietary treatment groups					
a.	T_1	2.92±0.12^{a}	10.1±0.39^{a}	140.7±2.24^{a}	14.7±0.55^{a}
b.	T_2	3.00±0.07^{a}	11.5±1.26^{a}	148.0±3.83^{c}	13.8±1.35^{a}
c.	T_3	2.87±0.07^{a}	10.6±1.60^{a}	144.7±2.65^{bc}	18.0±6.39^{a}
d.	T_4	3.02±0.03^{a}	12.4±2.26^{a}	143.8±4.78^{ab}	14.2±3.50^{a}
e.	T_5	2.97±0.08^{a}	11.0±1.27^{a}	148.0±3.83^{c}	14.5±1.56^{a}
Periodic groups					
a.	Period 1	2.79±0.03^{a}	13.9±0.93^{c}	151.1±4.7^{a}	14.4±2.62^{a}
b.	Period 2	2.96±0.06^{b}	11.0±0.44^{b}	144.7±1.6^{b}	13.9±0.50^{a}
c.	Period 3	3.11±0.02^{c}	8.3±0.45^{a}	139.2±1.1^{a}	16.8±0.44^{a}

Note: Values within a column and within each group with similar superscripts are statistically similar (p = 0.01)

A value of 15 unit feed consumed per unit body weight gain (Table 5) obtained under the present study is rather poor when compared to other livestock animals. This effect was mainly due to the fact that the rabbits in general had approached adult body weight and as such the relative gains over periods were not much and in that the gains encompassed both the actual tissue gain as well as the wool growth. The efficiency was cumulatively better up to the period 2 (0-8 weeks) following which, the efficiency became much poorer(period 3: 0-12 weeks) indicating that feed consumption during last 28 day period was more or less used up for maintenance of body. A notable feature observed in the feed efficiency due to the effect of body weight category was that there was a progressive, often significant, decline in feed efficiency as the initial body weight was of the ascending order. Thus the low body weight categories of rabbits are to be preferred perhaps. Despite a non-significant effect in feed efficiency due to treatments, the T_2 diet (13.8) containing 20% DBG and represent DLM was found to be better. However, the T_3 diet (40%) DBG had resulted in lowest feed efficiency (18.0) suggesting that higher levels of DBG may not be conductive while its lower level of 20% in association with equal level of DLM may prove satisfactory.

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