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THE EFFECT OF BREWERS GRAINS ON EGG PRODUCTION OF CHICKENS

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RINGKASAN

Satu kajian selama 52 minggu telah dilaksanakan dengan menggunakan 450 ekor ayam penelur Hisex Brown yang berumur 25 minggu untuk meneliti kesan 'brewers grains' (BG) atau hampas kilang bir di dalam makanan penelur terhadap prestasi pengeluaran telur. BG yang mengandungi 18% protein kasar telah dimasukkan ke dalam makanan-makanan yang sama paras proteinnya di antara 5% hingga 30 peratus. Kesemua campuran makanan tersebut mempunyai tenaga metabolisma yang seimbang di antara 11.0 – 11.1 MJ/kilogram. Satu campuran makanan yang tidak mengandungi BG telah digunakan sebagai makanan kawalan, manakala tiga makanan lagi yang mengandungi 10%, 20% dan 30% BG tanpa menyeimbangkan tenaga dirumus untuk dibandingkan dengan makanan yang seimbang tenaganya. Purata pengambilan makanan didapati sama di antara semua makanan. Purata pengeluaran telur yang lebih tinggi didapati pada kumpulan makanan kawalan dan yang mengandungi 5% dan 10% BG dengan nilai di antara 71.3% hingga 71.9 peratus. Paras BG lebih daripada 10% tanpa mengira keseimbangan tenaga dalam makanan akan menyebabkan kesan buruk pada prestasi pengeluaran telur. Nisbah makanan/jumlah jisim telur adalah lebih buruk pada makanan yang mengandungi 20% dan 30% BG dengan tenaga yang tidak diseimbangkan, tetapi mutu albumen berdasarkan Haugh Unit yang lebih baik terdapat daripada kedua-dua makanan ini. Paras optimum campuran BG ke dalam makanan ayam penelur dicadangkan supaya tidak melebihi 10% dengan paras tenaga metabolisma 11.1 MJ/kilogram.

INTRODUCTION

Brewers grains (BG) or brewer's dry grains are by-products from the brewery after the barley grains have gone through germination, fermentation and extraction processes. The annual consumption of BG in animal feeds was estimated to be around 4 500 tonnes of which about 1 615 tonnes were imported annually (ANON., 1981).

Brewers grains are high in fibre and contain relatively higher level of protein as compared with common cereal by-products particularly when yeast residues are present. KIENHOLZ, THORNTON and MORENG (1963) reported that a diet containing 40% BG supported excellent egg production in chicken. However, in a subsequent study, birds fed diets with 20% or 40% BG laid smaller eggs (KIENHOLZ, DARAS and CAVENY, 1972). When the BG was withdrawn, the egg size slowly increased. ELDRED, DAMRON and HARMS (1975) added 5% or 10% BG or BG-yeast mixture into layer diets containing different levels of total sulphur amino acids and protein. They found that the diets with 5% BG gave significantly better egg production, but did not improve feed efficiency. They concluded that 10% dietary BG was acceptable for laying hens. To further ascertain the suitability of the use of BG in layer diets, a trial was conducted to study the optimum utilization of BG in layer diets under Malaysian climatic conditions.

MATERIALS AND METHODS

The brewers grains used in this trial were obtained from ingredient supplier and had the nutrient composition as in *Table 1.*

A total of 450 25-week-old Hisex Brown pullets were used in the trial. They were randomly distributed to the individual battery layer cages. Nine cages were joined up to a block with a common feed trough. Water was supplied by automatic cup drinkers. There were ten dietary treatments

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Table 1. Nutrient composition of brewers grains used

Constituent	Level
Crude protein (%)	18.00
Crude fibre (%)	18.00
Ether extract (%)	7.90
Ash (%)	3.40
ME (MJ/kg)	7.50
Calcium (%)	0.18
Phosphorus (%)	0.33
Lysine (%)	0.75
Methionine (%)	0.21
Cystine (%)	0.23

(Tables 2 and *3)*. All the seven diets which contained 0%, 5%, 10%, 15%, 20%, 25% and 30% of BG were in isonitrogenous (17% crude protein) and isocaloric basis (11.0-11.1 MJ/kg) with palm oil supplementation to balance the dietary energy. Three diets containing 10%, 20% and 30% of BG and varied in dietary metabolizable energy from 10.0 MJ/kg to 10.8 MJ/kg were used to compare with the above seven isocaloric diets *(Tables 2* and *3)*. Feed intake was in *ad libitum* basis and the duration of the trial was 52 weeks. Daily egg production was recorded individually. Egg weight was taken daily and feed intake was recorded weekly in groups of nine birds. Egg quality was measured by Haugh Unit biweekly. At the end of the trial, data were compiled and analysed using the analysis of variance according to the procedures outlined by STEEL and TORRIE (1960). The means were compared by using Duncan's Multiple Range Test (DUNCAN, 1955).

RESULTS AND DISCUSSION

Results from the 52-week trial are shown in *Table 4*. The average daily feed intake of the chickens ranged from 105.5 g to 108.2 grammes. The percentage of egg production and total egg number tended to decrease as the dietary levels of BG increased above ten per cent. Similar results were reported by ELDRED *et al.* (1975). These adverse effects were more significant with diets containing 10%, 20% and 30% BG, in which the energy contents were not balanced by palm oil supplementation. In terms of total egg mass, there was no significant difference among the control and the isocaloric diets containing 5% – 25% BG. Birds fed diets with 20% and 30% BG but without proper balance of energy showed adverse results in this parameter.

In terms of feed/egg mass ratio, there

Table 2. Experimental layer diets with graded levels of brewers grains

Ingredient (%)	Diet no.									
	1	2	3	4	5	6	7	8	9	10
Brewers grains	0.00	5.00	10.00	15.00	20.00	25.00	30.00	10.00	20.00	30.00
Corn	30.45	30.00	31.00	31.00	30.00	30.00	30.00	30.00	30.00	30.00
Rice bran	10.00	5.95	2.00	–	–	–	–	3.00	–	–
Tapioca	7.00	7.00	6.00	4.00	1.45	1.45	–	7.00	3.95	3.95
Lucerne leaf meal	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Soybean meal	17.00	17.00	17.00	16.00	16.00	15.00	13.50	17.00	16.00	13.50
Broken rice	16.00	16.00	16.00	16.00	15.00	11.00	7.95	16.00	15.00	8.00
Fish meal	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
Peanut meal	5.00	4.00	2.45	1.95	0.50	–	–	2.45	0.50	–
Palm oil	–	0.50	1.00	1.50	2.50	3.00	4.00	–	–	–
Tricalcium phosphate	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Limestone powder	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
Vitamin-mineral premix	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Choline chloride (50%)	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
Salt	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
ME (MJ/kg)	11.1	11.1	11.1	11.1	11.1	11.0	11.0	10.8	10.5	10.0

Table 3. Calculated constituents in experimental diets

Constituent	Diet no.									
	1	2	3	4	5	6	7	8	9	10
Crude protein (%)	17.06	17.09	17.00	17.00	17.06	17.00	17.00	17.02	17.10	17.07
Crude fibre (%)	4.62	4.94	5.18	5.64	6.22	6.94	7.65	5.31	6.32	7.80
Ether extract (%)	2.95	3.55	4.16	4.89	6.09	6.85	8.14	3.19	3.64	4.22
ME (MJ/kg)	11.10	11.10	11.10	11.10	11.10	11.00	11.00	10.80	10.50	10.00
Calcium (%)	3.40	3.41	3.41	3.41	3.40	3.41	3.40	3.41	3.41	3.42
Phosphorus (%)	0.73	0.67	0.62	0.59	0.59	0.58	0.57	0.64	0.60	0.58
Lysine (%)	0.94	0.94	0.93	0.92	0.93	0.92	0.90	0.93	0.93	0.90
Methionine + cystine (%)	0.54	0.54	0.53	0.53	0.53	0.52	0.52	0.53	0.53	0.52

Table 4. Effect of brewers grains in layer diets (52 weeks)

Dietary BG (%)	Dietary ME (MJ/kg)	Daily feed intake (g)	Av. egg wt. (g)	Egg prodn. (%) (hen-day)	Total egg no.	Total egg mass (kg)	Feed/egg mass ratio	Haugh Unit
0	11.1	106.0b	60.2	71.9a	261.6a	15.7ab	2.42a	77.0c
5	11.1	106.1b	61.5	71.0a	258.3a	15.9ab	2.41a	78.2abc
10	11.1	105.5b	62.1	71.3a	259.5a	16.1a	2.41a	76.7c
15	11.1	108.2a	62.7	68.3ab	248.5ab	15.6ab	2.45a	77.9abc
20	11.1	106.4b	62.8	68.3ab	248.5ab	15.6ab	2.53a	76.0c
25	11.0	105.6b	61.1	67.7ab	246.6ab	15.1bc	2.54a	75.8c
30	11.0	105.7b	61.5	64.6bc	235.3bc	14.5cd	2.68b	77.6bc
10	10.8	106.4b	60.8	70.6a	257.1a	15.6ab	2.51a	77.6bc
20	10.5	105.9b	61.1	64.6bc	235.3bc	14.4cd	2.69b	80.8a
30	10.0	105.6b	61.9	60.4c	219.8c	13.6d	2.87c	80.3ab

Values followed by different letters in the same column denote significant difference at 5% level.

was no significant difference among the control and isocaloric diets with BG up to 25%, and also diet with 10% BG but without dietary energy balance. Lower feed/egg mass ratio was observed in diets with BG levels higher than 15 per cent. There was no definite trend in the effects of dietary BG inclusions on albumen quality in terms of Haugh Unit. However, two groups of birds fed diets with 20% and 30% BG with lower dietary energy had lowest egg production but highest Haugh Unit score as compared with other higher laying groups. The reason for this phenomenon is unknown since the levels of CP and essential amino acids in these two diets were similar to other diets. In terms of egg weight, there was no sign of smaller eggs in the high BG based diet as reported by KIENHOLZ *et al.*(1972). On the contrary, birds fed diets with higher level of BG laid slightly heavier eggs than those fed diets with low BG level or control. This effect of BG might be caused by the sufficiency of sulphur amino acids present in the diets. In egg, the sulphur amino acids contribute 5.8% of the total egg protein. Since methionine is the first limiting amino acid in layer feed, the function of dietary methionine was probably further enhanced by the inclusion of 0.1% dietary choline chloride, which can furnish methyl groups for methionine synthesis.

In conclusion, BG can be included in layer diets up to 10% without affecting the egg production and feed efficiency. Since BG is low in energy, the dietary metabolizable energy in BG based diets should be balanced to approximately 11.1 MJ/kg, which is the optimum dietary energy level for layer diet in the Malaysian environment.

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ABSTRACT

A 52-week layer trial was carried out with 450 25-week-old Hisex Brown pullets to study the effect of dietary brewers grains (BG) on egg laying performance. BG containing 18% crude protein was included into isonitrogenous diets from 5% to 30% with balanced dietary metabolizable energy ranging from 11.0 to 11.1 MJ/kilogramme. A basal diet without BG was used as a control while three other diets containing 10%, 20% and 30% BG without energy balance were compared with the isocaloric diets. It was observed that daily feed intakes were comparable among the treatments. There were higher percentage of egg production ranging from 71.3 to 71.9 in the control, 5% and 10% BG based diet group. BG above 10% in the diet irrespective of energy content had an adverse effect on egg production. Lower feed/egg mass ratios were observed in isocaloric 30% BG based diet and diets with 20% and 30% BG without energy balance. However, significantly superior egg albumen quality in terms of Haugh Unit was observed in the last two diets. It was suggested that BG could be included in layer diets up to 10% with metabolizable energy maintained at 11.1 MJ/kg in the diets.

REFERENCES

ANON. (1981). *Import and Export Trade in Food and Agriculture Products, 1981* p. 158. Kuala Lumpur: Ministry of Agric.

DUNCAN, D.B. (1955). Multiple range and F tests. *Biometrics* ***11***, 1–42.

ELDRED, A.R., DAMRON, B.L. and HARMS, R.M. (1975). Evaluation of dried brewers grains and yeast in laying hen diets containing various sulfur amino acid levels. *Poult. Sci.* ***54***, 856–60.

KIENHOLZ, E.W., DARAS, C.A. and CAVENY, D.D. (1972). Small egg size from dried brewers grains. *Poult. Sci.* ***51***, 1 825 *(abstr.)*.

KIENHOLZ, E.W., THORNTON, P.A. and MORENG, R.E. (1963). The use of dried brewers grains in some poultry rations. *Poult. Sci.* ***42***, 1 280 *(abstr.)*.

STEEL, R.G. and TORRIE, J.H. (1960). *Principles and Procedures of Statistics*. New York: McGraw–Hill Book Co. Press.

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