Effects of Different Pelleted Diets and Pellet Size on Bird Performance

(Pengaruh Bentuk Pellet dan Ukuran Pellet terhadap Penampilan Ayam Broiler)

B Sundu[1*], A Kumar[2] and J Dingle[2]

[1]Animal Husbandry Department, Agriculture Faculty, University of Tadulako, Palu
[2]School of Animal Studies, The University of Queensland, Gatton, Australia
*Correspondence author email: b_sundu@yahoo.com

Abstract. An experiment investigated performance of birds fed the pelleted corn-soy diet versus the pelleted 30% copra meal based diet with different pellet sizes. This study was conducted for six weeks. A total of 144 male day old chicks were used in this trial. One day old birds were randomly allocated to four treatment diets with six replications. The starter and grower pelleted diets were with or without 30% copra meal and in two forms, either fine or mixed sized particles. The experimental design was a two way factorial with two basal diets, two particle sizes and six replicate cages of six birds per treatment. The inclusion of 30% copra meal in the pelleted diet decreased body weight and feed intake, but improved feed eficiency. Grinding the diet to a fine pellet size impaired the body weight and feed intake. The effect of pellet size became more evident when the birds grew older. Birds fed the pelleted form of copra meal accelerated their growth rate so that they were not significantly different from the weight of birds fed the pelleted form of the corn-soy diet. However the feed intake of birds fed the pelleted copra meal diet was lower than the feed intake of those fed the pelleted corn soy diets. It was concluded that inclusion of copra meal in the diet impaired growth of birds, particularly in the starter phase. Pelleting and crumbling copra meal diet could increase the bird performance to the same level of the performance of birds fed the pelleted corn-soy control diet while fine grinding the pelleted diet reversed this trend.

Key Words: broilers, pellet diet, pellet size, copra meal

Introduction

The effects of pelleted diets on the performance of birds have been investigated by a number of workers (Isabelle *et al*., 2009; Choi *et al.,* 1986; Nir *et al.,* 1994). There is no doubt that pelleting improves body weight of birds. However, the reasons given for the improvement vary from one experiment to another, and may depend on the ingredients included in the diet. Improved feed intake (Engberg *et al.,* 2002), decreased energy spent for eating (Jensen *et al.,* 1962; Skinner-Noble *at al.,* 2005), chemical change during pelleting and change in physical form (McCracken, 2002) have been stated as the reasons for the improvement of the performance of birds fed pelleted diets. Nir *et al*. (1995) and Sundu *et al*. (2005) measured weight: volume of the diet and found that pelleting increased bulk density of the diet.

The increased bird performance due to pelleting could be associated with increased feed intake. The ideal pellet size for optimal growth of birds has been a concern in poultry industry due to a practical implication in commercial production. This study aimed to investigate the effect of pellet size of feeds made from a low bulk density diet (using copra meal) and a high bulk density diet (using corn-soy) on bird performance.

Research Methods

Animals and diets

This study was conducted for six weeks. A total of 144 male one day old chicks were used in this trial. Six chicks at one day old were randomly allocated to each of six replications of four treatment diets. The cages were equipped with trough feeders and drinkers. The starter and grower diets (Table 1) were all pelleted and with or without 30% copra meal and in two forms either fine ground or mixed particle sizes containing fine, medium and coarse sized particles. The diets were formulated to meet the nutrient requirements of broilers reccommended by NRC (1994).

Diets were mixed in a cement mixer prior to being pelleted. One third of the pelleted diet was

kept in the form of pellets, one third was crumbled, and one third was ground to fine particles. The fine particle size batch of each diet was used as one of the diet form treatments. The other diet form was a diet composed of equal quantities of pellets, crumbles (medium) and fine particles. Two diet composition treatments were corn-soy and copra meal based diets, with two pellet size treatments: fine and mixed pellet sizes (see Table 2). The distribution of pellet sizes of each diet is shown in Figure 1.

Starter diets were offered *ad libitum* from day 1 to 21 by topping up feed troughs twice a day at 09.00 and 14.30 hours. and grower diets from day 21 to 42.The water was available at all times. The birds were weighed weekly and feed intake was also measured on weekly basis.

The experimental design was a two way factorial with two basal diets (CS and CM based diets), two pellet size treatments (fine and mixed particle size) and six replicate cages of six birds in which birds were randomly allocated to each cage. Data was analysed by analysis of variance using the SAS 6.2 statistical program (SAS Institute, 1990). The significance of difference between pairs of treatment means was tested by Duncan's Multiple Range Test (Steel and Torrie, 1980).

Table 1. Ingredient and nutrient composition of the experimental diets (g/kg)

Ingredients	0 % copra meal diet		30 % copra meal diet	
	Starter	Grower	Starter	Grower
Copra meal	0..00	0.00	300.00	300.00
Maize	608.80	663.30	340.00	390.00
Soybean	220.60	171.50	128.00	90.00
Fish meal	120.00	120.00	120.00	110.00
Vegetable oil	32.90	27.00	101.00	97.00
Limestone	5.00	5.00	2.00	4.00
DCP	4.30	5.00	0.70	0.70
Salt	3.60	4.70	2.00	2.70
Vitamin Mix	1.00	1.00	1.00	1.00
Mineral mix	1.00	1.00	1.00	1.00
DL Methionine	1.80	0.50	1.70	0.80
L Lysine	1.00	1.00	2.60	2.80
Calculated:				
ME (MJ/kg)	13.39	13.39	13.39	13.39
Crude protein	231.00	211.00	230.00	210.00
Meth + Cys	9.00	7.60	9.00	7.60
Lysine	11.00	10.00	11.00	10.00
Arginine	14.40	13.00	20.20	18.70
Calcium	10.70	10.70	10.60	10.60
Phosphorus	6.00	6.00	6.70	6.40

DCP: Dicalcium phosphate; ME: Metabolizable energy; Meth: Methionine; Cys: Cystine

Table 2. Treatment diets

Diet	Feed particles	Composition
Copra meal diet	Fine	100%
	Mixed	33,30%; fine 33,30% medium and 33,30% coarse
Corn-soy diet	Fine	100%
	Mixed	33,30%; fine 33,30% medium and 33,30% coarse

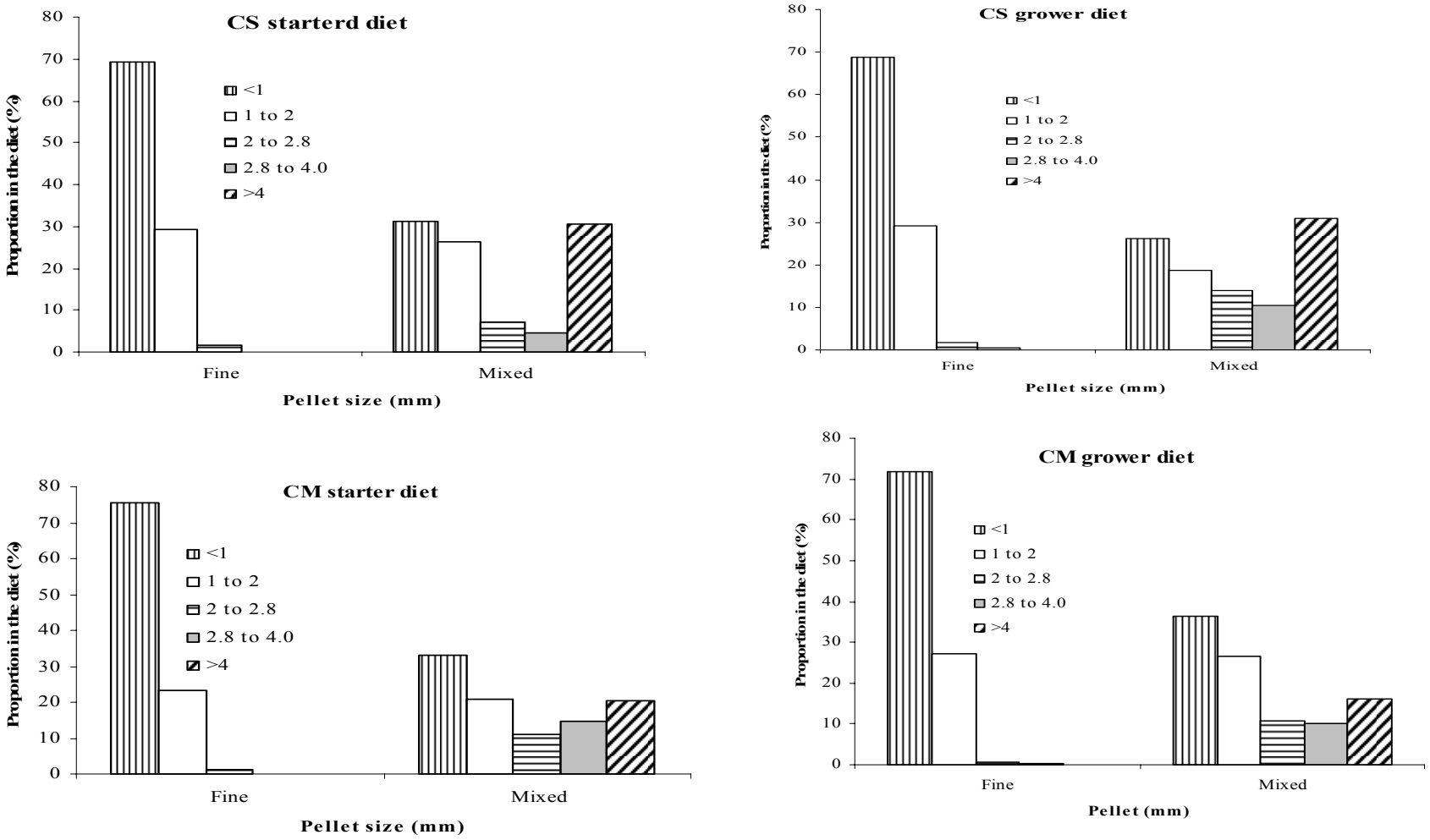

Figure 1. Pellet distribution of the basal diets used in this experiment

Results and Discussion

The means of body weight, feed intake and feed conversion ratio (FCR) are shown in Table 3. The body weight and feed intake of birds fed the corn soy based diet were significantly (P<0.05) greater than those of birds fed the copra meal based diet. The larger pellet sizes of the mixed diet increased body weight and feed intake significantly (Table 3). Interaction between diet and pellet size size was found in body weight and feed intake (Table 4). Consumption of the copra meal based mixed size diet caused a significant improvement in body weight of birds, which exceeded the level of the standard body weight of birds as reccommended by Ross (2002). Interestingly, the body weight of the mixed particle sized copra meal fed meat chickens was achieved with a smaller amount of feed consumed. The birds tended to prefer larger pellet sizes. Fine pellet sized diets (more than 50%<2.0 mm) were not attractive to the birds at any age, and they become less attractive as the birds got older.

The results obtained indicated that problems of low growth rate of birds fed the copra meal based diet that have been perviously reported by Sundu *et al.* (2009) have been overcome, particularly in the aspect of increasing growth rate of birds.

It is clear that when bulk density and particle size of copra meal were increased by pelleting, its quality was just as good as the corn-soy diet and produced better growth than the commercial Ross standard (Table 4). This finding supports the previous experiments of Sundu *et al*. (2005).

The effects of increased particle size on bird performance have been reported by a number of workers (Douglas *et al.,* 1990; Nir *et al.,* 1990; Engberg *et al*., 2002). The body weight of birds fed a larger mean particle size was greater than that of birds fed a smaller mean particle size. This may be associated with the increased feed intake. These current data show a 22% increase in feed intake of birds fed the copra meal mixed diet, compared with the copra meal fine diet. The difference in body weight increased up to 5 weeks (24% greater) (Figure 2).

The beneficial effect of increasing the pellet size of the diet became evident in the copra-meal based diet. In week six, birds fed the bigger pellet sizes of the copra meal diet had a body weight that was not significantly different from body weight of birds fed the bigger pellet sizes of the corn-soy based diet. Interestingly, when the feed intake of birds fed the mixed pellet sizes of the copra meal diet was at the same level as that of birds fed the fine particle sizes of the corn-soy diet, the body weight of the copra meal fed birds exceeded the body weight of the corn-soy fed birds. Therefore, the copra meal diet is as good as the corn soy diet for increasing the growth rate of birds provided feed intake can be maximized. In week six, the mean body weight of birds fed the bigger pellet sizes, of either the copra meal or the corn-soy based diets, overtook the standard body weight expected for Ross (2002) meat chickens fed the best commercial rations (Table 4).

Table 3. Body weight, feed intake and feed conversion ratio (FCR) of birds fed different diets and pellet size

Diets	Body weight (g)	Feed intake (g)	FCR
Copra meal diet	2447[b]	3786[b]	1.55[b]
Corn – soy diet	2672[a]	4478[a]	1.68[a]
Fine pelleted	2349[b]	3833[b]	1.63[a]
Coarse pelleted	2770[a]	4432[a]	1.60[a]
Ross Standard	2676	4485	1.68

For the basal diets and the pellet size, means with a different superscript in each column are significantly different (P<0.05)

Table 4. Interaction between diet and pellet size

Diets	Body weight (g)	Feed intake (g)	FCR
Copra meal fine	2184[c]	3400[c]	1.66
Copra meal mixed	2710[a]	4173[b]	1.54
Corn – soy fine	2515[b]	4266[b]	1.70
Corn – soy mixed	2830[a]	4692[a]	1.66
Ross Standard	2676	4485	1.68

For the basal diets and the pellet size, means with a different superscript in each column are significantly different (P<0.05)

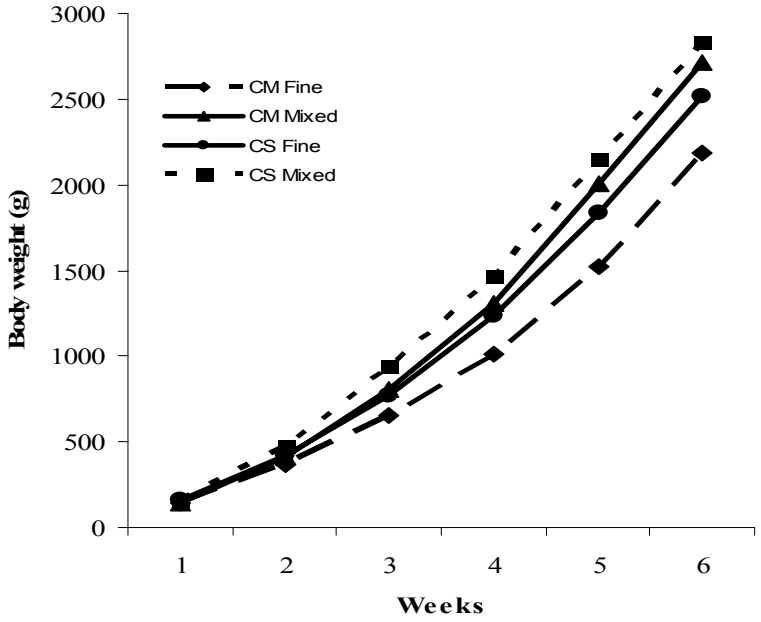

Figure 2. Pattern of growth of birds fed copra meal and corn-soy diets with different pellet sizes

Conclusions

In conclusion, the inclusion of 30% copra meal in a corn-soy based diet did not depress body weight and feed intake when fed as coarser ground pelleted particles. Decreased pellet size of the diet decreased bird performance.

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