EFFECT OF FEEDING RATIONS BASED ON COOKED SWEET POTATO AND A PROTEIN SUPPLEMENT TO BROILER AND CROSSBRED POULTRY

W. J. TURNER*, G. L. MALYNICZ† AND H. NAD†

ABSTRACT

Two strains of poultry, a commercial broiler strain and a crossbred multi-purpose strain, were fed ad libitum *on one of three rations:* (1) *a 21 per cent crude protein broiler starter control ration;* (2) *a mixture of three parts by weight of boiled sweet potato to one part of protein-vitamin-mineral supplement and* (3) *free choice boiled sweet potato and protein supplement offered independently. Growth performance, dressing percentage and chemical composition of the carcass at slaughter were estimated. There were significant differences in growth performance due to breed and diet, with broiler birds and control rations being superior. There were few important differences in carcass characteristics.*

INTRODUCTION

Grains are the most common constituent of poultry rations. In certain situations, however, cost and availability may make it more attractive to feed alternative feedstuffs, particularly for the provision of the energy component of the ration. Such a situation exists in many parts of Papua New Guinea where the availability of cereals is limited to large-scale intensive poultry and pig units. Under these conditions the use of the Papua New Guinean staple, sweet potato (*Ipomoea batatas*), warrants investigation. This report describes an experiment designed to study two ways of feeding cooked sweet potato with a protein-vitamin-mineral supplement.

Rosenberg and Seu (1952) fed growing chickens sweet potato as a replacement for maize at levels of up to 45 per cent of the ration. A decline in performance was observed with increasing levels of sweet potato. This decline was reduced by cooking the tubers.

Springhall (1964) was able to feel levels of dried milled sweet potato in the ration at levels as high as 20 per cent without adversely affecting performance.

MATERIALS AND METHODS

The design of the experiment was a 2 x 3 factorial with two replicates involving two breeds, a commercial broiler strain[1] and a mixed group of Australorp, Rhode Island Red and New Hampshire breeds and crosses. A total of 300 birds of each breed was used. The second factor investigated was diet. Three diets were used:

1. A commercial broiler starter ration[2] containing 21 per cent crude protein, from day-old to slaughter weight (1 600 g).
2. Broiler starter from day-old to three weeks followed by a mixture of cooked sweet potato and protein-vitamin-mineral supplement[3] to provide a 21 per cent protein ration, offered *ad libitum* until the birds reached market weight.
3. Broiler starter from day-old to three weeks, but with cooked sweet potato and protein supplement offered separately and *ad libitum*.

*Formerly Animal Production Officer, Poultry, Poultry Research Centre, DPI, Lae. Present address: c/o Wesfeeds, Bentley, W. A., Australia.

†Senior Veterinary Officer and Rural Development Technician respectively, Tropical Pig Breeding and Research Centre, DPI, Goroka.

[1]Hyline, Ilimo Farm Products Pty Ltd, Port Moresby.

[2]Kainani Feed Mills Pty Ltd, Lae.

[3]Provincial Traders, Brisbane, Queensland, Australia: contained 50 per cent crude protein.

Table 1—Details of composition and consumption per bird per day of rations

Ingredient	Ration			
	Strain*	Control	Mixed	Separate
Broiler starter	B	83.0	—	—
	MP	62.2		
Boiled sweet potato	B	—	138.3	144.2
	MP	—	102.7	140.2
Protein supplement	B	—	46.2	42.2
	MP	—	34.2	31.4

* B=broiler
MP=Multi-purpose

Details of the rations used are shown in *Table* 1. Day-old chicks were wingtagged, weighed and allocated to treatments in such a way that mean body weight and distribution about this mean were similar for each pen.

For the first three weeks of life all birds were kept on broiler-starter rations in kerosene brooders. Records were kept of food consumption during this period. At three weeks birds were re-weighed and treatment groups allocated to 12 deep litter pens in a randomized block arrangement.

The diets described above were fed until check weighing revealed that an average bird of 1 600 g had been reached. Feed consumption records were kept for each pen as were mortality figures. Food consumption and food conversion rations were calculated on a dry matter basis, allowing for 10 per cent moisture in the broiler ration and concentrate and 70 per cent moisture in the sweet potato.

On reaching slaughter weight, all the birds were weighed. Eight birds selected at random from each pen were slaughtered to obtain estimates of dressing percentage.

From the eight slaughtered birds, three were randomly selected and frozen. Each carcass was then cut into 2 cm cubes with a band saw and minced three times. An aliquot of the mince was taken for estimation of chemical composition. Ether extract estimations were obtained by difference. Mean values for each pen were calculated for each parameter and analysed for variance. Differences between means were tested by Duncan's New Multiple range analysis (Steele and Torrie 1960).

RESULTS AND DISCUSSION

Treatment means, growth performance and carcass parameters are shown in *Table* 2.

Breed—Breed differences accounted for the major part of the variation in performance of birds on the experiment. Broiler strain birds grew more quickly, had a higher daily food consumption and converted dry matter to weight gain more efficiently. Carcasses of broiler strain birds contained significantly less crude protein than those of the multi-purpose crosses.

Diet—Chickens on the control diet reached slaughter weight in significantly shorter time than those on the mixed sweet potato and supplement diet. With the exception of dry matter intake of the crossbred chickens on the mixed diet, which was greater than that of other diets, there was little effect of diet on dry matter consumption. Food convertion ratios were significantly better on the control grain rations. The only significant dietary effects on carcass measurements were on dressing percentage and carcass ether extract.

Birds on the mixed ration had a significantly higher dressing percentage than those on the other two treatments. This is a rather surprising finding in view of the greater weight of food consumed by birds receiving sweet potato.

Carcass ether extract was lowest in birds on the separate sweet potato and supplement diets. This is an interesting finding, suggesting that if chickens are allowed to select their own level of energy and protein consumption, less feed will be converted to body fat.

Table 2—**The effect of breed and diet on growth performance and carcass characteristics**

Breed and ration	Feed consumed during three weeks g	Days to reach 1 600 g	Daily dry matter consumption g	Daily sweet potato consumption g	Daily protein concentrate consumption	Feed conversion ratio	Dressing percentage	Carcass dry matter %	Carcass crude protein %	Carcass ash %	Carcass fat %
Broiler—											
Control	404	60	74.7	—	20.0	2.20	71.9	34.7	16.2	3.6	14.9
Mixed	404	66	83.0	92.2	30.7	2.77	75.7	31.2	16.9	3.9	10.4
Separate	429	62	81.3	93.5	27.7	2.47	72.0	34.1	16.4	3.3	14.4
Multi-purpose crossbred—											
Control	343	98	56.0	—	19.5	3.03	74.0	34.0	17.5	3.9	12.7
Mixed	360	106	61.6	84.5	28.2	3.59	72.8	31.3	18.6	3.7	9.1
Separte	332	107	70.4	118.4	26.5	4.21	72.8	35.0	16.8	3.6	14.7
Significance of differences—											
Diet	—	NS	*	—	—	*	*	NS	NS	NS	**
Breed	—	**	**	—	—	**	NS	NS	*	NS	NS
Breed x diet	—	NS	NS	—	—	NS	**	NS	NS	NS	NS

NS = not significant. *=$P<0.05$. ** = $P<0.01$

Breed diet interactions—Although significant differences occurred between individual breed-diet treatments for most of the parameters estimated, the only significant factor interaction was for dressing percentage. This was low for rations containing sweet potato in the multi-purpose birds and high for the broiler strain, suggesting that gut fill on the bulky diets was greater for multi-purpose birds than for the broiler strain. This is not easy to reconcile with their lower daily food consumption. Reference to *Table* 1 shows quite large differences between breeds in the ratio of protein supplement to cooked sweet potato which was selected. Calculating the content of the rations, it appears that the fast-growing broiler strain were selecting a ration containing 21 per cent crude protein, while the multi-purpose birds were selecting a 19 per cent ration. Expressed in terms of consumption of crude protein per day the figures are 18 and 14 g respectively.

It appears from these figures that the fast-growing broiler birds are able to select, not only increased total food consumption, but higher protein intakes as well.

Economic aspects—The slow growth rate and poor food conversion ratio of the crossbred birds show their unsuitability for use in intensive production systems.

A system of free choice feeding gives results which are only about 10 per cent worse than those of the control ration. The cost of production, using a protein concentrate and sweet potato, is very sensitive to the cost of these feeds. From *Table* 1 the amounts required can be calculated. Unless concentrate prices are low, and sweet potato is considered as a free food, it would appear more economic to use a fully prepared ration.

ACKNOWLEDGMENTS

The authors would like to thank Mr N. Clark, Tropical Pig Breeding and Research Centre, for care of the birds during the experiment.

REFERENCES

ROSENBERG, M. H. AND SEU, J. (1952). Sweet potato meal versus yellow corn meal in the chick's diet. *World's Poultry Science Journal*, 8:93-98.

SPRINGHALL, J. A. (1964). Locally available ingredients for poultry rations in New Guinea. *Proc. Aust. Poultry Conv.*, pp. 123-126.

STEELE, R. G. D. AND TORRIE, J. H. (1960). *Principles and Procedures of Statistics.* McGraw Hill, New York.

(Accepted for publication June, 1976.)