I. 解体成績におよぼす影響(ブロイラー飼料における羽毛粉と牛脂の利用)(畜産学科)

Use of Hydrolyzed Poultry Feather and Beef Tallow in the Broiler Ration

I. Effect on Dissecting Yield of Broiler

Sadao SHIROMA* and Fujiya HONGO*

I INTRODUCTION

Hydrolyzed poultry feather or feather meal as well as hog and cattle hairs, horn and hoof is mainly composed of keratin which belongs to an albuminoid. Hydrolyzed poultry feather, which is processed from poultry feather obtained as a by-product at the processing plant, is estimated to be produced approximately 360 tons every year in Okinawa.

Nutritive value of feather meal is greatly affected by treatment conditions such as pressure, temperature and duration of treatment. The value of this by-product is also influenced by the amount of blood, head, shank and toe and internal organs or viscera. In other words, the value is variable according to the processing plants or places where it is produced (21). Hence, the nutritive value of hydrolyzed poultry feather must be determined where it is processed.

Since the importance of the productive energy for each nutrient or ration was emphasized by Fraps in 1946, fats or oils of animal or plant origin have been usually used in broiler rations. This practice eventually have led scientists to accentuate the calorie-protein ratio of broiler rations (3, 4, 5, 7, 23). The wide ratio results in deposition of body fat, while the narrow one brings about economical loss due to increased metabolism and heat increment (7, 17).

Nutritive value of feeds is also determined by the amount of nutrients, biological value, balance of the nutrients, performance of the animal and characteristics of products. Although in Okinawa some workers (8, 9) have reported the effect of feather meal and/or high energy ration using beef tallow on feed conversion, weight gain and cost of gain, no informations concerning the effect of these two materials on meat production of broiler are available.

The work to be reported herein was a study of the effect of feather meal and beef tallow, produced in Okinawa, on the dissecting yield of broiler. Also

* Department of Animal Science, College of Agriculture, University of the Ryukyus
Sci. Bull. Coll. Agr. Univ. Ryukyus, **21** : 305～318 (1974)

influence of sex was determined at the same time.

II EXPERIMENTAL PROCEEDURE

1. Breed used

Two hundred forty White Cornish (Vantress ♂) x White Rock (Arber Acre ♀) unsexed birds were obtained from a hatchery in Okinawa on the 24th of January in 1973 and raised for 58 days until March 21st in the same year. Out of these, 48 birds were used for the dissectional yield trial.

2. Experimental design

Trial design for feeding test is shown in Table 1. Completetely randomized 2 x 2 factorial design consisting of two protein sources (fish and feather meals) and energy levels (standard: 1,220 cal to 1,300 cal／lbs., high energy: 1,350 cal to 1,450 cal／lbs.) was used. The birds were randomly assigned to 12 pens each containing 20 chicks of combined sex. Three pens or replications were al-loted to 4 experimental diets.

Table 1. Randomized 2 x 2 factorial design for feeding trial

Treatment		Replication			Total
Energy	Protein	1	2	3	
Standard energy	Fish Meal	20	20	20	60
	Feather Meal	20	20	20	60
High energy	Fish Meal	20	20	20	60
	Feather Meal	20	20	20	60
Total		80	80	80	240

For dissecting yield test, sex was added to the above mentioned 2 factors resulting in 2 x 2 x 2 factorial design as shwon in Table 2.

3. Feeding and management

The birds were kept in a thermostatically controlled brooder for the first two weeks after which they were transfered to non-heated standard intermediate and finisher batteries at the begining of the third and 6th week, respectively, for the remainder experimental period.

Compositions, amino acids, Vitamines and minerals of the rations used are presented in Tables 3, 4, and 5. Feed and water were supplied *ad libitum* throughout the feedign trial period.

Table 2. Ransomized 2 x 2 x 2 factorial design for dissecting trial

Treatment			Replication			
Energy	Protein	Sex	1	2	3	Total
Standard Energy	Fish Meal	♀	2	2	2	6
		♂	2	2	2	6
	Feather Meal	♀	2	2	2	6
		♂	2	2	2	6
High Energy	Fish Meal	♀	2	2	2	6
		♂	2	2	2	6
	Feather Meal	♀	2	2	2	6
		♂	2	2	2	6
	Total		16	16	16	48

4. Killing, dissection and data treatment

At 58 days of age, 2 birds of each sex from each treatment combination with 3 replicates were selected at random for processing. The birds were fastened approximately 12 hours before processing while water was provided freely. The chickens were sacrificed by severing jugular artery with a sharp knife and allowing them to bleed until dead. The birds were then scalded for about 5 to 6 seconds at 70℃ and then feathers were removed by hand picking.

Dessection was conducted to determine the following criteria : dressing percentage, percentage of eddible meat, weights of blood, head, shank and toe, bone, skin, abdominal depot fat, heart, liver, spleen, kidney, lung, gizzard, proventriculus and viscera. Dressing percentage was the ratio of the total weight of skin, bone, meat, heart, liver, abdominal depot fat, and gizzrd to live weight, while percentage of eddible meat was determined by dividing these organs total weight, except bone, with live weight.

Collected data were analyzed using analysis of variance described by Snedecor and Cochran (20). However, no range test was applied even if there were significant main effects.

Table 3. Composition of experimental diets used in the growing trial

Ingredient	Starter				Finisher			
	Standard E[a]		High E[b]		Standard E		High E	
	FI[c]	FE[d]	FI	FE	FI	FE	FI	FE
Ground yellow corne[e]	63	63	60	60	80	80	60	60
Soybean oil meal	20	20	25	25	10	10	23	23
Fish meal（60% protein）	4	2	7	5	4	—	5	—
Feather meal	—	2	—	2	—	4	—	5
Wheat bran	8	8	—	—	—	—	—	—
Beef tallow	—	—	4	4	—	—	8	8
Dehydrated alfalfa meal	2.4	2.4	1.4	1.4	3.1	3.1	3.1	3.1
Ground lime stone	1	1	1	1	1	1	1	1
Tricalcium phosphate	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Salt	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Vitamin premix	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Methionine	—	—	—	—	0.2	0.2	0.2	0.2
Lysine	—	—	—	—	0.1	0.1	0.1	0.1
Total	100	100	100	100	100	100	100	100

[a] Standard energy
[b] High energy
[c] Fish meal
[d] Feather meal
[e] Contains 5% fish meal

Table 4. Content[*] of proximate nutrients, amino acids and minerals in the experimental diets (calculated value)

Nutrient	Starter				Finisher			
	Standard E		High E		Standard E		High E	
	FI[a]	FE[b]	FI	FE	FI	FE	FI	FE
Crude protein (%)	20.89	21.36	23.27	23.75	17.25	18.20	21.05	22.24
Arginine	1.24	1.31	1.37	1.44	0.95	1.09	1.26	1.21
Lysine	1.09	1.01	1.47	1.40	1.08	0.92	1.40	1.13
Methionine	0.38	0.36	0.45	0.42	0.57	0.51	0.60	0.70
Cystine	0.36	0.42	0.39	0.45	0.31	0.44	0.35	0.54
Tryptophan	0.22	0.22	0.37	0.37	0.16	0.18	0.35	0.66
Glysine	1.10	1.16	1.62	1.67	1.04	1.14	1.45	1.58
Phenylalanine	0.92	1.00	1.08	1.12	0.79	0.87	0.99	1.10
Leucine	1.84	1.89	1.99	2.05	1.63	1.74	1.95	1.74
Isoleucine	0.99	1.01	1.15	1.18	0.77	0.82	1.04	1.24
Threonine	0.77	0.81	0.88	0.92	0.63	0.71	0.79	0.69
Valine	1.41	1.45	1.28	1.34	0.94	1.06	1.15	1.28
Histidine	0.52	0.58	0.62	0.59	0.46	0.41	0.54	0.67
Crude fat (%)	3.45	3.31	7.11	7.07	3.71	3.63	10.95	10.72
Crude fiber (%)	2.98	2.99	2.39	2.40	2.23	2.23	2.06	2.03
Calcium (%)	0.78	0.59	0.92	0.84	1.05	0.87	1.06	0.84
Phosphorus (%)	0.79	0.66	0.80	0.76	0.60	0.50	0.61	0.49
Manganese (mg)	65.57	67.71	70.91	69.80	65.57	67.77	70.91	69.80

[*] % or in kg [a] Fish meal [b] Feather meal

Table 5. Calculated values of vitamines, total digestible nutrients, metabolizable energy and calorie-protein ratio*

Item	Starter				Finisher			
	Standard E		High E		Standard E		High E	
	FI	FE	FI	FE	FI	FE	FI	FE
Vitamin A (IU)	18,697	19,698	17,597	17,597	22,057	22,057	17,024	17,024
Vitamin D (ICU)	1,000	1,000	1,000	1,000	1,003	1,003	1,001	1,001
Thiamine (mg)	4.5	4.4	4.0	4.0	3.8	3.8	3.9	3.8
Riboflavin (mg)	6.7	6.6	6.1	6.6	6.5	6.3	6.4	6.2
Niacin (mg)	64.9	64.1	50.4	49.7	49.9	48.4	48.6	46.7
Pantothenic acid (mg)	18.3	18.3	20.0	20.0	15.7	15.7	16.0	16.0
Vitamin B6 (mg)	7.1	7.1	6.1	6.1	6.5	6.4	5.9	5.8
Choline (mg)	1,738	1,700	1,852	1,815	1,501	1,426	1,735	1,642
Vitamin B12 (mcg)	14.2	12.1	19.8	17.7	15.7	11.4	16.7	111.4
TDN (%)	68.9	68.8	75.3	75.2	72.3	72.2	80.7	80.5
Metabolizable E／lbs.[a]	1,227	1,223	1,352	1,349	1,299	1,292	1,449	1,440
ME／Protein	57.6	58.2	59.0	57.7	76.5	72.1	70.0	65.8

* % or in kg [a] cal

III RESULTS

The effect of protein source, energy level and sex on the live weight and dissecting yield is presented in Tables 6 and 7.

Table 6. Effect of protein sources and energy levels on dissecting yield of broiler[a]

Item	Treatment			
	Protein		Energy	
	FI[b]	FE[c]	LE	HE
	g	g	g	g
Live weight	1,894	1,886	1,892	1,887
% eddible meat	49.97	50.17	49.44	50.69**
Drssing percent (%)	70.77⊛	69.83	70.12	70.53
Feather wt.	187.33	189.58	194.42	182.50
Abdominal fat wt.	32.25	38.96	34.00	40.21
Blood wt.	65.85	64.22	64.52	65.53
Head wt.	64.50	66.63	64.58	66.54
Shank and toe wt.	97.63	102.25	95.58	100.29
Bone wt.	447.88	429.54	468.25*	409.16
Skin wt.	171.96	175.17	168.46	178.67
Meat wt.	619.91	621.96	616.70	625.17
Heart wt.	13.64	13.85	13.02	14.47(*)
Spleen wt.	4.64	4.54	4.12	5.05
Kidney wt.	14.59	14.44	14.12	14.91
Gizzard wt.	50.12	48.46	50.13	48.44
Proventriculus wt.	8.26	7.54	8.04	7.76
Lung wt.	11.07	10.66	10.40	11.33*
Liver wt.	40.51	38.82	38.42	40.91
Others	106.33	108.58	105.79	109.13
Total internal organ wt.	247.42	249.87	245.31	251.99

* $P < .05$

** $P < .01$

(*) Close to 5% level

⊛ When two factors were considered

a Comparison was made within protein source or energy level

b Indicates fish meal

c Means feather meal

Table 7. Effect of sex on dissecting yield of broiler and interactions of protein source, energy level and sex

Item	Sex		Interaction			
	♀	♂	EP	ES	PS	EPS
	g	g				
Live wt.	1,697	2,083**	*	–	–	–
% eddible meat	50.78	49.35	–	–	–	–
Dressing percent (%)	69.85	70.77	–	–	–	–
Feather wt.	185.17	192.25	–	–	–	–
Abdominal fat wt.	40.71*	33.50	–	–	–	–
Blood wt.	55.88	74.20**	–	–	–	–
Head wt.	54.50	76.63**	–	–	–	–
Shank and toe wt.	81.08	118.79**	–	–	–	–
Bone wt.	401.13	476.29**	–	*	–	–
Skin wt.	158.38	188.75	–	–	–	–
Meat wt.	562.92	678.88	–	–	–	–
Heart wt.	12.21	15.30**	*	–	–	–
Spleen wt.	4.17	5.00	–	–	–	–
Kidney wt.	14.12	14.90	–	–	–	–
Gizzard wt.	47.25	53.00**	**	–	–	–
Proventriculus wt.	7.52	8.25	–	–	–	–
Lung wt.	9.47	12.26**	*	–	–	–
Others	36.03	43.30**	–	–	–	–
Total internal organ wt.	99.88	115.05	–	–	–	–
	228.87	268.43**	*	–	–	–

* $P<.05$

** $P<.01$

1. Effect of protein source

When data were treated without considering sex by using Lambda coefficient, birds on fish meal showed significantly ($P<.05$) higher (70.77%) dressing percentage than those on feather meal (69.83%). Also the difference in proventriculus weight between two protein sources was close to statistical significance at 5% level of probability; chickens on fish meal showing 8.26 g while those on feather meal 7.45 g. Otherwise, consideration of all three factors resulted in no significant differences in any criteria determined.

2. Effect of energy level

Sex being disregarded, chickens on high energy ration gave higher percentage of eddible meat and heavier heart weight values (50.69% and 14.47 g) than those (49.44% and 13.02 g) of birds on the standard energy ration ($P<.01$ and $P<.05$, respectively). Contrary to eddible meat and heart weight, bone weight (468.25 g) of birds on the standard energy ration was significantly ($P<.05$) higher than that (409.16 g) of chickens on the high energy ration.

On the other hand, when all three factors were considered and the data were treated by analysis of variance, no differences were found in any weight of organs or criteria examined, except weights of spleen and lung; birds on the high energy ration showing higher spleen (5.05 g) and lung (11.33 g) weights than those (4.12 g and 10.40 g, respectively) of chickens on the standard energy ration ($P<.05$).

Although not significant, the difference in heart weight approached to 5% level of significance.

3. Effect of sex

Male had significantly higher ($P<.01$) values of 2,083 g, 76.63 g, 118.79 g, 476.29 g, 15.30 g, 12.26 g, 43.30 g and 268.43 g in live weight and weights of blood, head, shank and toe, bone, heart, gizzard, lung, liver and viscera, respectively than female with the values of 1,697 g, 55.88 g, 54.50 g, 81.08 g, 401.13 g, 12.21 g, 47.25 g, 9.47 g, 36.03 g and 22.87 g, respectively.

However, female diposited more fat (40.7 g) than male (33.5 g) at 1% level of significance.

4. Interaction of the factors

Two way interactions between protein source (P) and energy level (E) were observed in live weight and weights of heart, lung and viscera at 5% and in gizzard at 1% level of probability, respectively. For each of these criteria, birds on feather meal showed higher values than those on fish meal at the standard energy level, while at the high energy level birds on fish meal had higher values.

Also, two way interaction of energy level (E) x sex (S) was found in bone weight. In this interaction, the difference between male and female was prominent at the high energy level, though male was heavier than female at both energy levels.

No two way interaction between protein source and sex and three way interaction of E x P x S were detected in any criteria determined.

IV DISCUSSION

Feather or ground untreated poutry feather has been reported not to be used efficiently in the broiler rations (8, 9, 14, 15, 21, 22). According to Moran et al. (14), the low digestibility of this untreated material is attributed to its high cystine content and complicated bonding. Krimmer (1961), cited by Moran et al., postulated that basic unit in feather keratin is a β-helix, an extended chain which coils slowly and forms a helix of relatively large pitch. These helices have tendency to aggrigate by hydrogen bonding and form cylindrical units which then aggrigate to organize a cable like structure. In above mentioned mechanism, cystine is supposed theoretically to stabilize the cable by extensive disulfied bridging between cylinders.

On the other hand, in the hydrolyzed poultry feather, such bridging is destroyed by hydrolysis under steam pressure. Feather meal used in this experiment was processed in Okinawa with the treatment conditions of temperature (140 ℃), pressure (4 ㎏/㎠) and treatment duration of 30 minutes.

In the application of protein sources to the formulation of broiler rations, the kinds of amino acids or amino acid balance as well as the amount of crude protein must recieve careful attention. Usually, methionin, lysine, histidine and tyrosine are considered to be defficient in feather meal, while arginine, cystine, phenylalanine, threonine, valine, leucine and glycine are abundant compared to fish meal. However, the feather meal rations were not particularly supplemented with methionine, lysine, histidine and tyrosine from stand point of amino acid balance. As shown in table 4, it appears that there is no significant differences in amino acid content among the rations.

Research group of Cornell University (5) proposed calorie-protein ratio in broiler ration: 60 to 62 for 0 to 4 week old chicks and 70 to 74 for 5 to 8 week old birds. In this experiment, the C/P ratios were lower than those of Cornell group with 58 to 59 and 66 to 77 for 0 to 4 and 5 to 8 week old chickens, respectively.

As no significant differences due to protein source in criteria studied were found when all three factors were considered, it appears as Morimoto (13) pointed out that addition of 2 to 5% feather meal in the broiler ration is feasible. Amino acids such as methionine, lysine, histidine and tyrosine are well balanced with those from soybean oil meal, corn containing 5% fish meal and dehydrated alfalfa meal as shown in table 4. However, when sex is disregarded, dressing percentage of chicks on fish meal is higher approximately 1% than those on feather meal ration. This probably suggests that fish meal is more efficient as protein source in the broiler ration than feather meal under present marketting practice in which no sexing is done.

Also when sex was disregrded, birds on high energy ration gave about 1% higher value in amount of eddible meat than those on the standard energy ration ($P<.01$) implicating that high energy ration, which was enriched in calorie content by addition of 4 to 8% of beef tallow, is more economical for producers. However, the relative prices of beef tallow and other energy sources must be considered.

Lipids have been reported to enhace absorption of Ca (11). It is interesting to note that bone weight of birds on the standard energy ration was heavier ($P<.05$) than those on the high energy ration. This probably suggests energy level be involved in absorption and/or retention of Ca. On the other hand, birds on the high energy ration showed high values ($P<.05$) in weights of heart, spleen and lung than those on the standard energy ration indicating the effect of tallow or energy level on the metabolisms related to the tissure sythesis of these organs. Because of wide range in calorie-protein ratio (66 to 77) and difference in energy level, significant variation was expected in weight of liver (fat liver), skin (subcutaneous fat) and abdominal depot fat. Against such anticipation, no statistical significant differences were observed.

Sex difference was present in live weight, male being approximately 23% heavier than female ($P < .01$). This result is similar to the report of Sera et al. (19) who found 17 to 21% difference between sexes advocating male when four different cross breeds of White Cornish x White Rock, White Rock x White Cornish, Plymouth Rock x White Cornish and *Tokin* x *Tokin* were used. Contrary to the body weight, female was higher than male in abdominal depot fat ($P < .05$). This is easily understood because of high correlation of live weight with these criteria. According to Naito et al. (16), the correlation coefficients of live weigt with these criteria are : shank and toe (0.837), bone (0.834), heart (0.744), gizzard (0.620), liver (0.537) and viscera (0.501).

V SUMMARY

This experiment was conducted to determine the effect of hydrolyzed poultry feather and beef tallow, processed in Okinawa, on the dissecting yield of broiler and eventually to evaluate the nutritive value of these two ingredients. At the same time, effect of sex was studied.

Under the conditions of this experiment, the following summary appears justified :

1. Protein source and energy level had no singificant effect on weights of blood, head, shank and toe, meat, abdominal depot fat, spleen, kidney, gizzard, lung and viscera.

2. Considering protein source and energy level, birds on the ration with fish meal showed higher dressing percentage (70.77%) than those on ration with feather meal (69.38%) at 5% level of probability.

3. Also when sex was disregarded, birds on high energy ration was high in percentage of eddible meat than those on standard energy ration ($P < .01$); 50.69 % and 49.44%, respectively.

4. No differences due to energy level in weight of liver, skin and abdominal depot fat were found.

5. Male showed higher ($P < .01$) values than female in live weight and weights of blood, head, shank and toe, bone, heart, gizzard, lung, liver and viscera though no differences were found in dressing and eddible meat percentages.

6. Two way interaction of energy x sex was present in bone weight, though neither two way between protein and sex nor three way interactions existed in any criteria studied.

Considering all these results, it can be said that addition of hydrolyzed poultry feather at the rate of 2 to 5% in the broiler ration seems to be feasible and that producers are able to replace some portions of grains with 4 to 8% of beef tallow without any adverse effects. Although male is more produc-

tive for a producer from view point of weight gain, no advantages for a processor are found since no differences were observed in rate of eddible meat and dressing percentages.

REFERENCES

1. Arscott, G. H. 1957 Performance data and flavor evaluation of broilers fed diets containing varying amounts of animal fat, Poultry Sci., **51** : 1126 ~ 1132
2. Beilhary, R. G. and McDonald, M. W. 1959 The use of high quality fat, Poultry Sci., **38** : 844 ~ 850
3. Donaldson, W. E., Combs, G. E. and Romoser, G. L. 1957 Studies on energy levels in poultry rations. 3. Effect of calorie-protein ratio of the ration on growth, nutrient utilization and body composition of poults, Poultry Sci., **37** : 614 ~ 619
4. Douglas, C. R. and Harms, R. H. 1960 Effects of varying protein and energy levels of broiler diets during the finishing periods, Poultry Sci., **37** : 1003 ~ 1008
5. Gasperdon, H. C. and Pope, W. H. 1972 Broiler production: 25 years, World Poultry Science J., **27** : 241 ~ 261
6. Gehle, M. H., Spers, G. H., Miller, D. L. and Balloun, S. L. 1967 Nutritive value of hydrolyzed hog hair as a protein source for chicks and poults, Poultry Sci., **46** : 156 ~ 164
7. Marion, J. E. and Woodroof, J. G. 1966 Composition and stability of broiler carcasses as affected by dietary protein and fat, Poultry Sci., **45** : 241 ~ 247
8. Matsuda, Y. 1972 Effect of high energy ration for broiler feeding, The Science Bulletion of the College of Agriculture, University of the Ryukyus, **19** : 457 ~ 464
9. Matsuda, Y. and Shiroma, S. 1973 Effect of feather meal and beef tallow on the performance of broiler, Unpublished data
10. Mckerns, K. W. and Ritterspairn, E. 1957 The nutritional significance of processed keratin in poultry feeding, Poultry Sci., **37** : 433 ~ 436
11. Morimoto, H. 1962 Animal nutrition, YOKENDO, Tokyo, 243
12. ___________ 1972 Feeds, YOKENDO, Tokyo, 35
13. Moran, E. T., Summer, J. D. and Slinger, S. J. 1967 Keratins as sources of protein for the growing chick. 2. Hog hair, a valuable source of protein with appropriate processing and amino acid balance, Poultry Sci., **46** : 456 ~ 465
14. Moran, E. T. and Summer, J. D. 1968 Keratin as sources of protein for the growing chick, Poultry Sci., **47** : 570
15. Naber, E. C., Toughburn, S. P., Barnett, B. D. and Morgan, C. L. 1961 Effect of processing method and amino acid supplementation on dietary utilization of feather meal protein by chicks, Poultry Sci., **40** : 1234
16. Naito, M. 1970 Animal breeding, YOKENDO, Tokyo, 143

17. Richard, M. V. and Ringrose, R. C. 1957 The effect of protein, fat levels and calorie to protein ratio upon performance of broilers, Poultry Sci., **37** : 147 ~ 151
18. Sasaki, K. 1966 CHIKUSAN DAIJITEN, YOKENDO, Tokyo, 551
19. Miyagi, T., Sera, H. and Kojima, M. 1963 Studies on the broiler meat. 2. On the chemical composition of broiler meat, Sci. Bull. Coll. of Agr., University of the Ryukyus, **10** : 105 ~ 115
20. Snedecor, G. W. and Cochran, W. G. 1969 Statistical methods, The Iowa State University Press Ames, Iowa, U. S. A.
21. Wessels, J. P. H. 1972 Study of the protein quality of different feather meals, Poultry Sci., **51** : 537 ~ 541
22. Wisman, E. L., Holmes, C. E. and Engel, R. W. 1957 Utilization of poultry by-products in poultry ration, Poultry Sci., **37** : 834 ~ 838
23. Wisman, E. L. and Beane, W. L. 1966 Protein and energy requirement of meat-type chickens to fifteen weeks of age, Poultry Sci., **45** : 305 ~ 312

ブロイラー飼料における羽毛粉と牛脂の利用

I. 解体成績におよぼす影響

城間定夫*・本郷富士弥*

要　　約

本報は，沖縄産羽毛粉および牛脂を用いて蛋白質源，エネルギー源を異にして飼養試験を行なった前報(9)と同様の供試ブロイラー（White Cornish × White Rock）の各試験区より12羽ずつ，合計48羽を選出し58日令における屠体各部位生産割合の効果を調査するために解体試験を行ない，次の結果を得た。

1. 血液，頭，脚，肉量，腹部脂肪，脾臓，筋胃および肺臓などの生産量は，飼料中の蛋白源およびエネルギー水準によって有意な影響を受けなかった。
2. 枝肉歩留りは，飼料中の蛋白質源とエネルギー水準のみを考慮した場合，魚粉給与区の方が，羽毛粉給与区よりも高い値を示した（P＜.05）。
3. 同様に，高蛋白質，高エネルギー区は，標準区に比べ可食部生産量において有意な増加が認められた（P＜.05）。
4. 肝臓，皮および腹部脂肪などの生産量に対しては，エネルギー水準に基づく有意性は認められなかった。
5. 生体重および血液，頭，脚，骨，心臓，筋胃，肝臓ならびに肺臓などの生産量は，性別による差が顕著で，雄が雌よりも高い値を示した（P＜.01）。
6. エネルギー水準と性別間の交互作用が，骨の生産量において認められた。

以上の結果，2～5％の羽毛粉のブロイラー飼料への配合および4～8％の牛脂の添加は，屠体各部位生産割合に対して，なんら悪影響を与えないものと考えられる。発育の点では，雄が雌よりもすぐれていたが，可食部収量および枝肉歩留りには差が認められなかった。

* 琉球大学農学部畜産学科