PERFORMANCE OF "PELUNG x KAMPUNG" (= PELUNG-CROSS) CHICKENS AS INFLUENCED BY DIETARY PROTEIN

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ABSTRACT

The study was undertaken in order to look for appropriate feeding of native meat type of chickens (crossbred of Pelung x Kampung, named as Pelung cross chicken). There were 360 day-old crossbred chicks raised in colony type of cages, provided with drinkers and feed troughs. Commencing from one day old, the chicks were grouped into ten of mixed sex in each cage. The birds were then fed with nine experimental diets, varied in protein content and patterns. The patterns were starting period, commencing from 0 to 6 weeks of age and finishing period, continuing from 6 to 12 weeks of age. The first dietary protein treatment (=P1) was 210 g Crude Protein (CP) /kg at starting and 170 g CP /kg for finishing; P2 was 190 at starting and 170 g CP /kg at finishing; P2 was for treatment with 170 at start and 170 g CP/kg at final periods; P4 was for 210 and 150 g CP /kg; P5 was for 190 and 150 g CP/kg; P6 was for 170 then 150 g CP/kg; P7 was for 150 then 150 g CP/kg; P8 was for 190 then 190 g CP/kg, and P9 was for 150 then 190 g CP/kg. Weekly bodyweight and food consumption were recorded. At the end of feeding trial period, metabolizable energy, nitrogen retention, food retention time and feeding capacity measurements were then carried out from different groups of birds within the same group of treatment. Bodyweight at twelve week of age of chickens of P1, P2, P4, P5, P8 and P9 (ranging between 1146 and 1205 g/chicken) were not significantly different (P>.05). Whilst bodyweight of chickens of P3, P6 and P7 were significantly (P>.05) lower (ranging between 1046 and 1099 g/chicken) than of the chickens of previous groups. Feed intake of all groups of chickens was not significantly different (P>.05) with the highest was shown by the chickens from P1 (3403 g/bird) and the lowest was of chickens from P9 (3198 g/chicken). Feed conversion ratio was affected by dietary treatments, where the chickens showed the lowest value on P1 (2.90) and the highest shown by the chickens in group P6 (3.18). Calculating income over feed cost, chicken of P1 returned the highest income (Rp 4,672), which was significantly different (P<.05) from the lowest income of chicken in P6 (Rp 3,879). The shortest food retention time of chicken of P7 (122 minute/bird) was significantly different (P<.05) from the bird of P5 (172.5 minutes/bird, the longest). There was not consistent effect of dietary protein treatments on ME- and nitrogen retention figures, which were ranging between 11.14 and 12.91 MJME/kg and 4.75 g protein retained/ kg). Four-hour feed intake as proportion to 24-hour intake was the lowest (37.66 %) in P8 and the highest (54.37 %) in P4 chickens. The pattern of P9, offering 150 g CP/kg at starting period and 190 g CP/kg at finishing period, was probably optimum pattern for fattening native chickens of Pelung-cross.

Key words: Pelung-cross chicken, Dietary protein, Growth.

INTRODUCTION

The increasing demand for utilizing indigenous natural resources and pressure of financial crisis, swiping the industry of selected fast growing chickens has led researchers to make some efforts in finding cheaper substitutes for actual imported chickens. The technology as the targeted outcome of the research has to be ended up

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with ease implementation by the farmers, whilst the most sources of components for generated technology has to be obtained from local with small amount of unavoided imported-sources. Native chicken has been one of kinds of livestock in Indonesia that has important role in socioeconomic of farmers in the villages. Nataamidjaja (1993) was reported that there were considerable numbers of lines of native chickens in Indonesia, which had distinct biological and economical differences among themselves, although as it was recognized the performance of native chickens was below the performance of imported selected-chickens. Now we should choose what kind of research strategies that can be applied in order to provide the farmers with improved local breed. Grading up with selected lines of chicken is one technique that can be proposed, but since the consumers have recognized and demanded low fat poultry meat, the technique was taken account in low priority. The products of upgraded native chicken with selected lines of chickens reported more fatty (Dharsana *et al.*, 1997). Gunawan *et al.* (1998) have crossed male Pelung with female Kampung chickens to achieve one kg marketed life-bodyweight of native chicken by 12-week of age.

Moreover, this new synthetic line of native chickens had to be accompanied with appropriate feeding technique, which might be different from ordinary feeding technique applied to ordinary Kampung chickens (reviewed by Gunawan *et al.*, 1996 and Diwyanto and Iskandar, 1998).

The objective of this experiment was to formulate feeding appropriate dietary protein to F1 Pelung-cross (male Pelung x female Kampung chickens) up to 12-week of age. The approach concept of compensatory growth suggested by Zubair and Leeson (1996) to overcome problems associated with early life fast growth rate in broiler fed *ad libitum*, was considered.

MATERIALS AND METHODS

F1 Pelung-cross fertile eggs were obtained by artificially inseminated female Kampung chickens with semen of male Pelung chicken raised at the Research Institute for Animal Production of Bogor. The eggs were also incubated and hatched at the same institution. There were 360 day-old chicks divided into 9 dietary-protein patterns, consisted of 4 different ration varying in crude protein (CP) content (Table 1). The patterns of treatments were to provide dietary protein for chickens at starting period (0-6 weeks) and finishing period (6-12 weeks).

The treatment patterns were coded as P1, providing 210 g CP/kg at starting (S) followed by 170 g CP/kg at final (F) periods. P2 was for S190-F170, P3 was for S170-F170, P4 was for S210-F150, and P5 was for S190-F150, P6 was for S170-F150, P7 was for S150-F150, P8 was for S190-F190, and P9 was for S150-F190. Each treatment was replicated by 4 groups of 10 chicks, mixed males and females per sub-cell. The cages were made of wire placed in a building provided with heating and light bulbs, exhaust fans and ventilation. The cages were placed side by side along the length of the building 1 meter high above the concrete floor. The cages were provided with feed troughs attached in front and a communal drinker with continues flow of water at the back of the cages.

Active Newcastle-disease vaccine (*La Sota* strain) was applied by the drop to the eyes at 4 and 36 day of age followed by anti stress drinking water for a couple days. Bodyweight and feed consumption were recorded weekly. At the end of the experiment, the chickens were allocated to measure feed-retention time (FRT), using ferric oxide suggested by Tuckey *et al.*, (1958) and Golian and Polin (1984). Metabolizable energy (ME) and nitrogen-retention (NR) were determined using diatomaceous earth, an indigestible marker to boost the Acid-Insoluble ash fraction added to the diet at the rate of 10 g/kg (Vogtman *et al.*, 1975). Feeding capacity (FC) was indicated by the amount of food eaten in a 4-hour feeding period following 24-hour starvation, and continued to feed *ad libitum* up to 24 hours (Newcombe and Summers, 1984).

Data were analyzed by analysis of variance using MSUSTAT computer program. Treatment means were compared

Table 1. Ingredients and nutrients composition of experimental diets

Ingredients	Diet 1	Diet 2	Diet 3	Diet 4
Commercial ration, g/kg	1,000	831.5	670.6	510.6
Corn, g/kg	-	152.9	301.6	449.8
Wheat polar, g/kg	-	13.1	18.3	22.8
Dicalcium-phosphate, g/kg	-	-	3.6	8.2
Calcium-carbonate, g/kg	-	1.7	3.9	5.5
L-Lysine, g/kg	-	0.2	0.6	1
Vit.-mineral premix, g/kg[1)]	-	0.7	1.4	2.1
Total, g/kg	1,000	1,000	1,000	1,000
Calculated nutrients content:				
Crude protein (CP), g/kg	210	190	170	150
Metabolizable energy (ME), MJ/kg	13.13	13.13	13.13	13.13
Calcium, g/kg	7	9	9	9
Phosphorous, g/kg	6	7.2	7	7
Lysine, g/kg	9	8.9	8	7.1
Methionine, g/kg	4.2	4.0	3.6	3.2
Cost, Rp/kg	1,115	1,112	1,085	1,060

[1)] Every 1 kg of premix contains 1,200,000 iu vit.A, 200,000 iu vit.D3, 800 iu vit.E, 200 mg vit.B1, 500 mg vit.B2, 50 mg vit.B6, 1,200 mcg vit.B12, 200 mg vit.K, 2,500 mg vit.C, 600 mg Ca D-phantothenate, 4000 mg Niacin, 1000 mg Choline chloride, 3,000 mg Methionine, 3,000 mg Lysine, 12,000 mg Mn, 2,000 mg Fe, 20 mg I, 10,000 mg Zn, 20 mg Co, 400 mg Cu, 1,000 Santoquin (antioxidant), 21,000 Zn-bacitracin.

using the Least Significant Difference (LSD) test (Snedecor and Cochran, 1980).

RESULTS AND DISCUSSION

Bodyweight, growth patterns and food intake

There were not significant differences (P>.05) of 12-week bodyweight for chickens in P1, P2, P4, P5, P8 and P9. The figures were ranging from 1116 g/bird of P9 to 1205 g/bird of P1. Whilst chickens in P3, P6 and in P7 showed less (P>.05) bodyweight, ranging from 1046 g/bird in P6 to 1099 g/bird in P3, than in the former groups, except chickens in P1. The superiority of the first groups was the response to higher dietary protein consumed up to 6 weeks old, as indicated by the significantly higher bodyweight of chickens in the first groups (see Table 2).

It is surprising the chickens in P9, which ate low-protein diet (150 g CP/kg) at starting period followed by medium-protein diet (190 g CP/kg) at finishing period showed a 12-weeks bodyweight insignificantly (P>.05) differed from chickens in P1. This phenomenon was also discussed by Leeson and Summers (1991), where early slow-growing chickens adopted lower nutrient requirement followed by higher requirement as the growth going rapidly. As it is indicated by the growth pattern of all experimental chickens (Figure 1), than F1 Pelung-cross chicken has slow-growing period up to about 3-4 weeks old, then followed by rapid growing afterward. This exercise is not actually giving such pressure (feed restriction) on early age to get compensation later (Yu *et al.*, 1990; Robinson *et al.*, 1992 and Plavnik and Hurwitz, 1991), but it is more to set appropriate feeding in accordance with the actual pattern of chicken's growth.

The groups of chickens other than P9 seems to be more likely in a normal response, where the animal is utilizing as much as

Table 2. Mean values of bodyweight (g/ chicken) and food intake (g/chicken), of Pelung-cross chicken given diets different in crude protein content

Treatments	Bodyweight (g/chicken)		Food intake (g/chicken)	
	6 weeks	12 weeks	up to 6 weeks	up to 12 weeks
P1: S210-F170 [1)]	414[c2)]	1205[c]	851[ab]	3403[a]
P2: S190-F170	403[de]	1146[abc]	859[ab]	3293[a]
P3: S170-F170	373[bc]	1099[ab]	821[ab]	3248[a]
P4: S210-F150	424[c]	1146[abc]	877[b]	3365[a]
P5: S190-F150	405[de]	1159[bc]	870[b]	3398[a]
P6: S170-F150	381[dc]	1046[a]	874[b]	3217[a]
P7: S150-F150	352[ab]	1084[ab]	803[a]	3220[a]
P8: S190-F190	405[de]	1168[bc]	852[ab]	3336[a]
P9: S150-F190	347[a]	1116[abc]	838[ab]	3198[a]
LSD (5%)	22	100	65	212

[1)] S= Starter diet 1-6 week, F= Finisher diet (6-12 week). The following number is crude protein content (in g/kg) of the dietary treatment.

[2)] Figures with different superscript in the same column of each parameter are significantly different (P<.05)

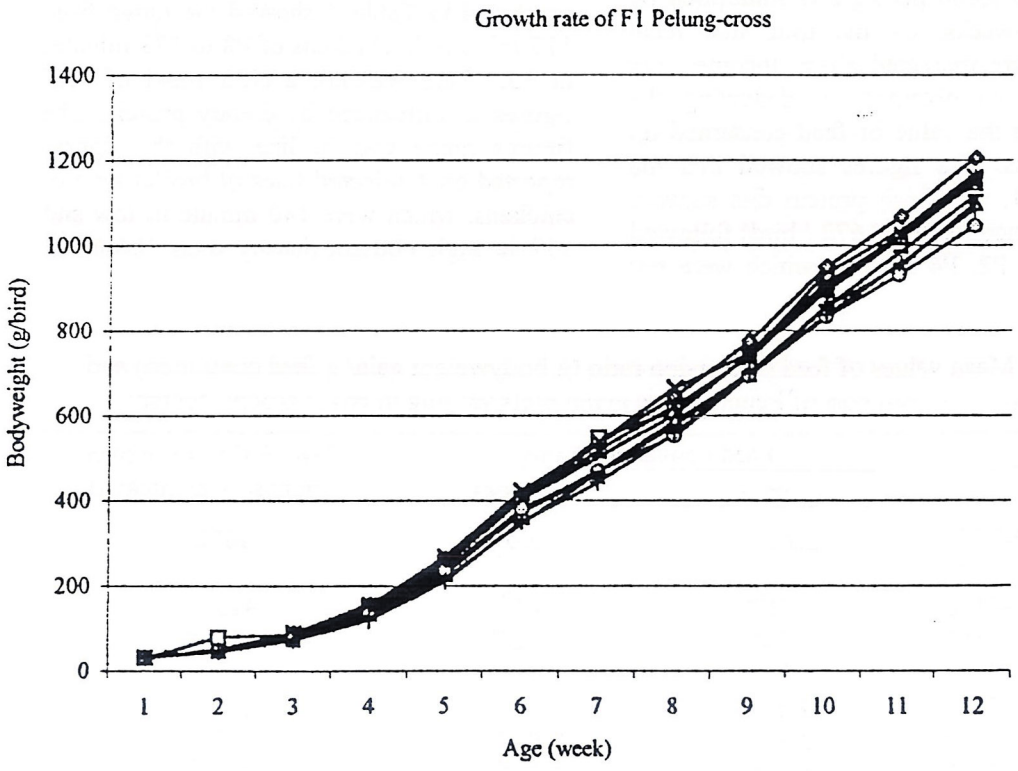

Figure 1. Growing pattern of experimental chickens

nutrients offered, although there were not any significant differences in 12-week food intake (Table 2).

Food conversion ratio and income over feed cost

As it was expected food conversion ratio decreased on high protein diet and went down as the protein content decreasing (see Table 3) especially at 6 weeks old and carried through up to 12 weeks. Food utilization efficiency at 12 weeks old was the highest for chicken in P1 (2.22), followed by chickens in P8 (2.94), P9 (2.95) and in P2 (2.96), whilst other groups (P5, P4, P3, and P7) performed less. The utilization efficiency of P9 was not significantly different (P>.05) from that of P1, with the highest dietary protein. This trend is following again the phenomenon that giving lower dietary protein at early age for this new line of native chickens followed by medium dietary protein, performed better feed utilization efficiency.

Income as calculated by the price factor of Rp 7,000 per kg BW multiplied by BW at 12-weeks, by the time that local chickens were marketed alive. Income over feed cost then obtained by deducting the income with the value of feed consumed up to 12 weeks. The figures showed that the treatment P1, with high protein diet showed the highest income (Rp 4,672 / bird) followed by P5, P8, P2, P4 and P9, which were not significantly difference (P>.05), whilst the least income was shown by P6 (Rp 3,879/ bird) and the rest were in between. Again, the chickens in P9 had lower income (Rp 4,290) compared to income of chickens on highest dietary protein (P1, Rp 4,672) (Table 3). P1 as a more profitable pattern, was then determined, but in practice for some extent this patterns need higher capital. Therefore the pick will go to P6 pattern with lower income. Chicken in P9, given slightly lower protein (150 g CP/kg) at the starting then followed with medium amount (190 g CP/kg) performed in a considerably better economic return.

Food-retention time (FRT), metabolizable energy (ME), nitrogen retention (NR) and feeding capacity (FC)

FRT was determined as the time elapsed between placing a gelatine capsule of Fe2O3 (200 mg per kg bodyweight) in the esophagus and the first appearance of a distinct red color in the excreta. FRT figures presented in Table 4 showed the range from 117 minutes in chickens of P8 to 173 minutes in P5. There was not a clear trend of FRT figures as influenced by dietary protein. The figures range was in line with the figures reported on 4 selected lines of broiler type of chickens, which were 140 minute in low and 157 in high nutrient-density diets (Iskandar,

Table 3. Mean values of feed conversion ratio (g bodyweight gain/ g feed consumed) and income over feed cost of Pelung-cross given diets varying in crude protein content

Treatments		Feed conversion ratio		12-weeks' income over feed cost (Rp/chicken)
		6weeks	12 weeks	
P1:	S210-F170 [1)]	$2.22^{a2)}$	2.90^{a}	4672^{b}
P2:	S190-F170	2.32^{ab}	2.96^{ab}	4414^{b}
P3:	S170-F170	2.41^{bc}	3.05^{bc}	4156^{ab}
P4:	S210-F150	2.24^{a}	3.02^{ab}	4366^{ab}
P5:	S190-F150	2.33^{ab}	3.01^{ab}	4458^{b}
P6:	S170-F150	2.51^{c}	3.18^{c}	3879^{a}
P7:	S150-F150	2.51^{c}	3.07^{bc}	4166^{ab}
P8:	S190-F190	2.28^{ab}	2.94^{ab}	4454^{b}
P9:	S150-F190	2.67^{d}	2.95^{ab}	4290^{ab}
	LSD (5%)	0.15	0.13	523

[1),2)] See foot notes on Table 2.

Table 4. Food-retention time (FRT), metabolizable energy (ME) and nitrogen retention (NR) of Pelung cross given diets varied in protein content up to 12 weeks of age

Treatments	FRT (minutes/bird)	ME (MJ/kg of feed)	ME (% of GE) [3]	NR (g/kg of feed)
P1: S210-F170 [1]	132$^{ab2.}$	11.14^{a}	63.66^{a}	7.65^{bc}
P2: S190-F170	135^{ab}	11.63^{a}	66.46^{ab}	8.60^{dc}
P3: S170-F170	128^{ab}	11.21^{a}	64.08^{a}	10.7^{d}
P4: S210-F150	124^{a}	11.99^{ab}	67.33^{ab}	5.20^{ab}
P5: S190-F150	173^{c}	12.12^{ab}	68.11^{ab}	4.75^{a}
P6: S170-F150	156^{bc}	12.33^{ab}	69.27^{ab}	6.80^{abc}
P7: S150-F150	122^{a}	11.67^{ab}	65.56^{ab}	7.55^{bc}
P8: S190-F190	117^{a}	12.89^{b}	72.44^{b}	17.00^{f}
P9: S150-F190	140^{ab}	12.91^{b}	72.50^{b}	13.60^{e}
LSD (5%)	31	1.06	8.06	2.70

[1), 2)] See foot notes in Table 2, [3)] GE = Gross Energy of food

1989). The unclear trend of the figures might be the reflection of less severe treatments together with the big genetic variation of unselected native chickens.

ME values (in MJ and as percentage of gross energy) presented in Table 4 were ranging from 11.14 MJ/kg (63.66 % of GE) to 12.91 MJ/kg (72.50 % of GE), which was lower than calculated in Table 1 (13.13 MJ ME/kg). Such differences are to be expected since the ME values of the ingredients used was not determined prior to formulation. NR values were varying from 4.75 g N/kg for chickens in P5 to 17 g N/kg for chickens in P8. The figures do not seem to indicate a clear trend due to dietary protein content. Chickens in P9 retained more feed energy and feed nitrogen, but again these figures were not expressed in a distinct higher bodyweight compared to chicken in other groups.

The amount food eaten during the period of first 4 hours following 24 hours fasting was not significantly different (P>.05) as influenced by dietary-protein. Four-hour food eaten varied between 31.25 g/chicken in P1 to 42.25 g/chicken in P4. Whilst *ad libitum* 24-hour food intake varied form 61 g/chicken in P5 to 97 g/chicken in P9 and the

Table 5. Feeding capacity measure in Pelung cross chickens given diets varying in protein content at 13 weeks of age

Treatments	Food intake		
	4-hour (g/bird)	24-hour (g/bird)	4-h in proportion to 24-h (%)
P1: S210-F170 [1]	31.25$^{a2)}$	75.75^{a}	41.75^{ab}
P2: S190-F170	36.00^{a}	80.00^{a}	45.74^{abc}
P3: S170-F170	37.00^{a}	75.25^{a}	50.46^{bc}
P4: S210-F150	42.25^{a}	72.00^{a}	54.37^{bc}
P5: S190-F150	31.50^{a}	61.00^{a}	52.14^{bc}
P6: S170-F150	32.75^{a}	80.00^{a}	42.80^{abc}
P7: S150-F150	40.00^{a}	88.75^{a}	44.53^{abc}
P8: S190-F190	32.00^{a}	82.50^{a}	37.66^{a}
P9: S150-F190	41.25^{a}	97.00^{a}	42.51^{ab}
LSD (5%)	11.50	36.51	11.18

[1), 2)] See foot notes in Table 2

rest of the groups were in between. So the proportion of 4-hour to 24-hour feeding was varied from 37.66 % for chickens in P8 to the highest of 54.37 % for chickens in P4. As expected the differences were not significant (P>.05) both for 4-hour and 24-hour feed intake since the differences in dietary protein was not so great, on which appetite of the chickens would not be much influenced as they were on the growing stage which was in line with their reducing protein : energy requirements (Forbes and Shariatmadari, 1994). In comparison with broiler type of chickens (Iskandar, 1989), the amount of food eaten in this experiment was lower. The average 4-hour food intake of the chickens in this experiment was 36 g/chicken for the weight of 1,130 g/chicken *vs* 55.9 g/chicken of broiler type with average bodyweight of 1,346 g. The average 24-hour food intake of chickens of the experiment was about one-third of broiler type of chickens. However, 4-hour feed intake in proportion to 24-hour feed intake of this experiment was higher than that of reported by Iskandar (1989) on broiler type of chickens. The differences between the two groups of line of chickens might be the reflection of the differences in selection intensity affecting the gut capacity.

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REFERENCES

Dharsana, R., S.N. Jarmani, Abubakar, W.K. Sejati, B. Wibowo, E. Basuno, A.G. Nataamidjaja, R.H. Matondang and P. Setiadi. 1996. Perbanyakan ayam lokal melalui persilangan. *Laporan Hasil Penelitian.* Balai Penelitian Ternak.

Diwyanto, K. and S. Iskandar. 1998. *Livestock sub-sectors: Review, Indonesia : Kampung Chickens*, F.A.O, Rome (in press).

Forbes, J..M. and F. Shariatmadari. 1994. Diet selection for protein by poultry. *World's Poult. Sci. J.*, 50:7-24.

Gunawan, B., K. Diwyanto and T. Sartika. 1996. *Proc. Seminar Nasional Peternakan dan Veteriner.* Pusat Penelitian dan Pengembangan Peternakan.

Gunawan, B., Z. Desmayati, T. Sartika, A.G. Nataamidjaja, and B. Wibowo. 1998. Crossbreeding ayam Pelung jantan dengan ayam buras betina untuk menghasilkan ayam buras pedaging. *Laporan Hasil Penelitian.* Balai Penelitian Ternak.

Golian, A. and D. Polin. 1984. Passage rate of feed in very young chicks. *Poult. Sci.*, 63:1013-1019.

Iskandar, S. 1989. Genotype x Nutrition Interaction in Chickens Selected for Increased Growth Rate, Appetite or Food Efficiency and in Commercial Broiler Strains. *PhD Thesis at The University of Queensland.* Brisbane, Australia.

Leeson, S. and J.D. Summers. 1991. *Commercial Poultry Nutrition.* University Books. Guelph Ontario.

Nataamidjaja, A.G. 1993. Pengamatan terhadap status ayam pelung, Nunukan, Kedu, Gaok dan Sentul di pedesaan serta ekplorasi kemungkinan keberadaan ayam buras langka lainnya. *Proc. Seminar Nasional Pengembangan Ternak Ayam Buras Melalui Wadah Koperasi Menyongsong PJPT II.* Universitas Padjadjaran. Bandung.

Newcombe, M. and J.D. Summers. 1984. Comparison of the digestive tract of broiler and Leghorn-type chicks. *Nutrition Report International*, 30:297-304.

Plavnik, I., and S. Hurwitz. 1991. Response of broiler chickens and turkey poults to food restriction of varied severity during early life. *British Poultry Sci.*, 67:1407-1413.

Robinson, E.E., H.L. Clansen, J.A. Hanson and D.K. Onderka. 1992. Growth performance, feed efficiency and the incident of the skeletal and metabolic disease in full-fed and feed restricted broiler and rooster chickens. *J. of Applied Poult. Research*, 1:33-41.

Snedecor, G.W. and W.G. Cochran. 1980. *Statistical Methods*. The Iowa State University Press. Ames, Iowa, USA.

Vogtmann, H, H.P. Pfiter and A.L. Prabucki. 1975. A new method of determining metabolizability of energy and digestibility of fatty acids in broiler diets. *British Poult. Sci.*, 16:531-534.

Tuckey, R., B.E. March and J. Beiley. 1958. Diet and the rate of food passage in the growing chick. *Poult. Sci.*, 37:786-792.

Yu, M.E., E.E. Robinson, M.T. Clandinin and L. Bodras. 1990. Growth and body composition of broiler chicken in response to different regimes of feed restriction. *Poult. Sci.*, 69:2074-2081.

Zubair, A.K. and S. Leeson. 1996. Compensatory growth in the broiler chicken: a review. *World's Poult. Sci. J.*, 52:189-201.