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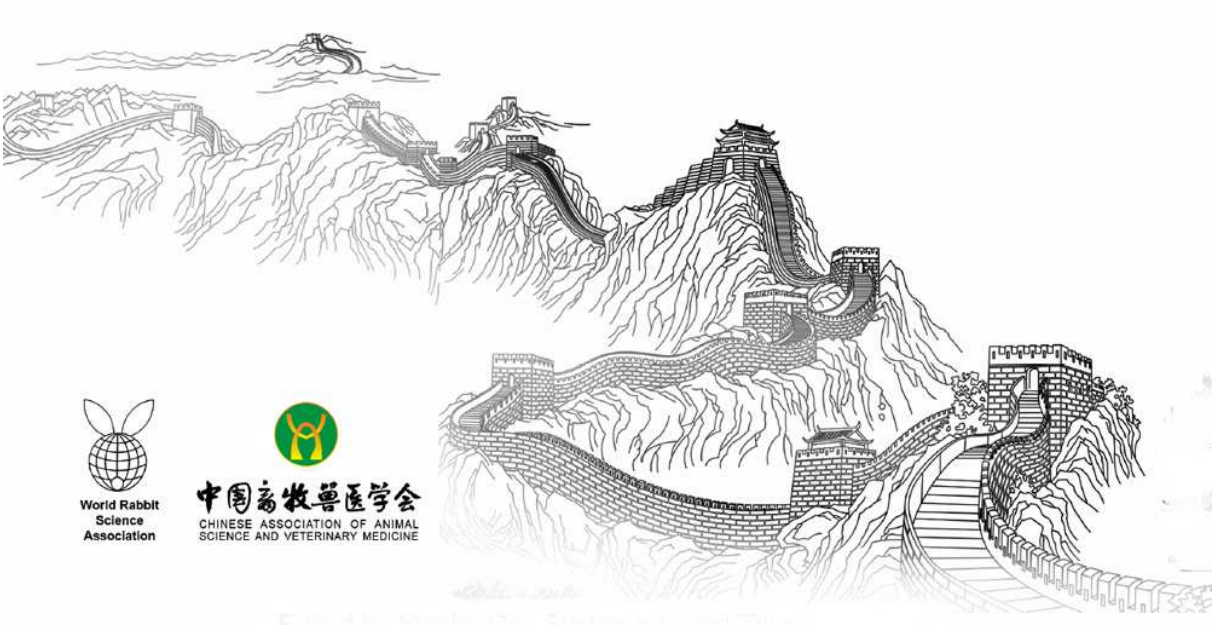

A RESPONSE OF FEED INTAKE, CARCASS VALUE AND ECONOMIC RETURN OF CROSSBRED RABBITS (NEW ZEALAND X LOCAL) TO THE MIXED OR SEPARATE FEEDINGS

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ABSTRACT

A study was conducted at the experimental farm and laboratory of Can tho University to evaluate feed utilization, growth performance and economic return of Crossbred rabbits (New Zealand x local). The experiment was a factorial design in which the first factor was feeding method (Separate and mix) and second factor was the levels of *Centrosema pubescens* : Para grass (20:80, 40:60, 60:40 and 80:20), with three replications and 4 rabbits per experimental unit. The results indicate that values of dry matter (DM), crude protein (CP), ether extract (EE), neutral detergent fiber (NDF), acid detergent fiber (ADF), metabolizable energy (ME) intakes were significantly higher (P<0.05) in the separate feeding. The CP and EE intakes gradually increased (P<0.05) when increasing the levels of *Centrosema pubescens* in the diets. The daily weight gain, weight of carcass, and thigh meat of rabbits fed separated feeds and the level of 80:20 *Centrosema pubescens* and Para grass (*Brachiaria mutica*) had the highest results (P<0.05). It was concluded the separate feeding and the level of 80: 20 *Centrosema pubescens* and Para grass had better growth performance and gave higher economic efficiency.

Key words: Carcass straits, daily weight gain, nutrient intake, feed utilization, feeding.

INTRODUCTION

Organic rabbit farming based on forages is a sustainable feeding system for the poor farmers to improve their economical lives in villages of Vietnam. Within these feeding strategies, forages and agricultural by-products are used as the main protein and fibre sources, while for the improved performance of growing rabbits, sources of soluble carbohydrate supplementation are very important (Preston, 2008). Besides, rabbits have characteristic of high feed selection based on types of feeding or size of feed particles as well as the type of feeds in order to meet nutrient requirement in their diets. Therefore feeding choice will increase feed intake of the forages-fed rabbits resulting in high performance. In the Mekong Delta has abundance of locally available forages almost all year round in which Para grass (*Brachiaria mutica*) has high fibre content, while *Centrosema pubescens* with high crude protein. Thus the appropriated associations between these feeds will give balanced nutrient diets for rabbits. However, the understanding of this scientific area for rabbit performance has still limited in literatures. Therefore a study of nutrient utilization, digestion process and performance of growing rabbits based on forages mixed or separated and supplemented small amount of protein and energy from soya waste and dried sweet potato should be investigated for improving rabbit production and increasing farmers' income.

MATERIALS AND METHODS

Animals and experimental design

The experiment was conducted in the experimental farm in Cantho City. Ninety six Crossbred rabbits (New Zealand x local) at 6 to 8 weeks of age were devised to 3 blocks corresponding with 3 ranges of live weight from 440, 520 and 650 g/rabbit. They were allotted in a factorial design with 2

factors and four rabbits (balanced sex) in an experimental unit. The first factor was feeding method (Separate and mix) and second factor was level of *Centrosema pubescens* (CPU) and Para grass (PG) (20:80, 40:60, 60:40 and 80:20). Three replicates were applied for all treatments in the study. The *Centrosema pubescens* (CPU) and Para grass (PG) were hung and fed separately for first factor, while CPU and PG were chopped, then mixed and fed in a trough in the treatments for the second factor. Soya waste, extracted soybean and dried sweet potato waste were supplied at the same level of each feed for all treatments to provide protein and energy. The experimental period was lasted 10 weeks.

Feeds, feeding and management

The animals were fed three times a day at 8:00 h, 14:00 h and 18:00 h. *Centrosema pubescens* (CPU) and Para grass (PG) were separately offered in the first factor, while they were chopped and mixed before feeding in the second factor**.** Fresh water was available for all rabbits almost all day and night time. The refusals and spillage were daily collected and weighed in the morning to calculate the feed intake.

Measurements and statistical analysis

The feeds and refusals were taken for analysis of dry matter (DM), organic matter (OM), crude protein (CP), ether extract (EE), neutral detergent fiber (NDF), acid detergent fiber (ADF) and ash following procedures of AOAC (1990) and Van Soest *et al* (1991). During the experiment four rabbits per experimental unit were individually weighed every week. Daily feed intakes, growth rate, and feed conversion ratio were measured and calculated. At the end of experiment the rabbits were slaughtered for evaluating carcass quality. The data from both experiments were analyzed by analysis of variance using the ANOVA option of the General Linear Model of Minitab Reference Manual Release 13.21 (Minitab 2000).

RESULTS AND DISCUSSION

Feed characteristics

The chemical compositions of the feed ingredients of rabbits are presented in Table 1.

Table 1: Chemical composition of feed ingredients (% in DM, except for DM which is on fresh basis)

Ingredients	DM	OM	CP	EE	NDF	ADF	ME (MJ/kg DM)
Centrosema pubescens	25.4	91.9	22.0	6.20	45.0	32.0	7.70
Para grass	15.2	88.3	9.20	4.5	65.2	35.2	8.30
Soya waste	9.50	96.3	19.1	10.0	47.6	33.4	11.3
Extracted soybean	90.4	90.6	43.4	2.4	28.7	19.2	11.4
Dried sweet potato waste	94.3	97.1	2.70	1.59	15.6	5.85	13.4

DM: dry matter, OM: organic matter, CP: crude protein, EE: ether extract, NDF: neutral detergent fiber, ADF: acid detergent fiber, ME: metabolizable energy (Maertens et al., 2002)

Centrosema pubescens (CPU) had twice as much protein and much less than the NDF component compared to the Para grass (PG). The CP content of CPU used in our experiment is consistent with the value (21.2% CP) stated by Hang (2012). The NDF contents of CPU and PG in the current experiment were lower than those reported by Tung (2012). This might have been caused by different collection seasons and soil characteristics.

Feed and nutrient intakes

Table 2 indicated that daily intake of CPU was significantly higher in separate feeding than in the mixed feeding ($P<0.05$), and the results increased with increasing levels of CPU in the diets, reaching the highest value (47.3 g) in the CPU80-PG20 diet ($P<0.05$). The significantly higher daily intake of PG was found in separate feeding, however the results decreased when increasing levels of CPU in the diets, the lowest value in the CPU80-PG20 diet ($P<0.05$). The total daily intakes of DM, OM, CP, EE, NDF, ADF and ME were higher for the separate feeding ($P<0.05$). The explanation was that the rabbits have high feed selection characteristics thus feeds offered separately stimulated them consume

more feeds. However, the DM, OM, NDF, ADF and ME intakes were unaffected by the inclusion of graded CPU levels in the ratios of CPU and PG. The CP and EE intakes were significantly increased corresponding with increasing levels of CPU in the ratios between CPU and PG of the diets, probably due to higher intake of CPU with high CP and EE contents in CPU as compared with those in PG. The results showed that there were no significantly different (P>0.05) of interaction effect of FM and CL for the above criteria.

Table 2: Daily intakes (g/rabbit) of feeds and nutrients of growing rabbits in feeding trial

Item	Feeding method (FM)		*Centrosema pubecens* level (CL)				SE/P	
	Separate	Mixed	CPU20 PG80	CPU40 PG60	CPU60 PG40	CPU80 PG20	FM	CL
CPU-DM	36.2	24.8	12.5^{a}	23.7^{b}	38.5^{c}	47.3^{d}	0.56/0.001	0.80/0.001
PG-DM	32.6	27.3	47.0^{a}	37.2^{b}	23.6^{c}	12.0^{d}	0.42/0.001	0.59/0.00 1
DM	61.8	56.8	58.2	58.9	61.3	58.9	0.95/0.002	1.34/0.42
OM	57.3	52.7	53.9	54.4	56.8	54.2	0.82/0.002	1.17/0.33
CP	10.8	9.65	9.05^{a}	9.70^{a}	10.9^{b}	11.2^{b}	0.12/0.001	0.17/0.001
EE	2.87	2.55	2.53^{a}	2.63^{ab}	2.87^{c}	2.82^{bc}	0.05/0.001	0.06/0.008
NDF	27.5	24	26.2	25.9	26.3	24.5	0.43/0.001	0.61/0.18
ADF	16.2	14.1	15.0	15.1	15.7	14.9	0.25/0.001	0.36/0.41
ME(MJ/rabbit)	0.62	0.59	0.60	0.60	0.62	0.60	0.008/0.01 9	0.01/0.58

CPU: Centrosema pubescens, PG: para grass. Means with different letters within the same rows are significantly different at the 5% level. CPU20-PG80, CPU40-PG60, CPU60-PG40, CPU80-PG20 were diets had *Centrosema pubescens* and para grass at levels of 20:80, 40:60, 60:40, 80:20%, respectively

Growth rate, final live weight and economic analysis

Table 3: Growth rate and economic analysis (VND) of crossbred rabbits

Item	Feeding method (FM)		*Centrosema purbescens* level (CL)				SE/P	
	Separate	Mixed	CPU20 PG80	CPU40 PG60	CPU60 PG40	CPU80 PG20	FM	CL
Initial weight, g	539	540	539	537	543	541	2.28/0.69	3.23/0.62
Final weight, g	1959	1904	1826^{a}	1880^{b}	1997^{c}	2024^{c}	7.09/0.001	10.0/0.001
Daily gain, g	20.3	19.2	18.4^{a}	19.2^{b}	20.8^{c}	21.2^{c}	0.08/0.001	0.12/0.001
FCR	3.05	2.93	2.99	3.01	3.05	2.90	0.04/0.07	0.06/0.40
Total feed cost	17,650	16,691	17,678	17,284	16,807	16,607		
Total expense	87,650	86,690	87,678	87,284	86,807	86,607		
Total income	117,540	114,24	109,56	112,80	119,82	121,44		
Profit	29,890	27,550	21,882	25,516	33,013	34,833		

Means with different letters within the same rows are significantly different at the 5% level. Means with different letters within the same rows are significantly different at the 5% level.

Daily weight gain (DWG) and final live weight (FLW) were significantly higher for that rabbits offered separate CPU and PG (P<0.05). This was explained that the rabbits consumed higher amounts of DM and nutrients such as CP, EE and ME. These values also gradually increased with increasing levels of CPU in the diets, approaching the highest value in the CPU80-PG20 diet (P<0.05), possibly due to higher CP and EE intakes for animals in this diet. The results of DWG are similar to those found by Nhan (2011) (18.1-20.4 g) in which Crossbred rabbits fed *Psophocarpus scandens* and Para grass. Feed conversion ratio was similar between two feeding methods and among 4 levels of CPU (P>0.05). These values were lower than those of 3.23 -3.89 by Giang (2010). The economic analysis showed that the slightly higher total expense, but higher income were found in the separate feeding and the CPU80-PG20 diet, resulting in giving more benefits in these diets. The results showed that the better separate feeding and the promising diets for the rabbits could be the CPU80-PG20 diet.

Mean values for slaughter weights and carcass traits

The live weight, carcass weight, thigh meat and percentage of lean meat and carcass weight were significantly affected (P<0.05) by feeding method and graded levels of *Centrosema pubescens*, the highest values were obtained for the animals fed separated feeds and the CPU80-PG20 diet (Table 4). Our results were consistent with those in an earlier study of sweet potato vine replacing para grass in the diets reported by Thu and Dong (2005) that the percentage of carcass (without head) and lean meat of growing crossbred rabbits were from 41.6 to 47.1% and from 67.8 to 79.2%, respectively. There were no significantly different interactions between two factors of feeding method and diet in feeding trial (P>0.05) for all of the criteria in Table 4.

Table 4: Mean values for slaughter weights and carcass traits of growing rabbits

Item	Feeding method (FM)		*Centrosema purbescens* level (CL)				SE/P	
	Separate	Mixed	CPU20 PG80	CPU40 PG60	CPU60 PG40	CPU80 PG20	FM	CL
Live weight , g	2040	1930	1840^{a}	1975^{ab}	2050^{b}	2075^{b}	28.7/0.02	40.6/0.01
Carcass W., g	938	887	786^{a}	907^{b}	936^{b}	1022^{c}	12.0/0.008	17.0/0.001
Carcass ,%	45.9	46.0	42.8^{a}	45.9^{b}	45.6^{b}	49.3^{c}	0.08/0.49	0.11/0.001
Thigh muscle W., g	396	370	324^{a}	382^{b}	396^{b}	428^{c}	5.56/0.004	7.86/0.001
Lean meat W., g	685	677	580^{a}	681^{b}	716^{bc}	748^{c}	10.9/0.61	15.5/0.001
Lean meat/CW ,%	73.2	76.3	73.8^{a}	75.3^{b}	76.8^{c}	73.2^{a}	0.23/0.001	0.33/0.001

Means with different letters within the same rows are significantly different at the 5% level. W: weight, LW: live weight, CW: carcass weight.

CONCLUSIONS

Based on the results obtained it was concluded that the separate feeding had higher intakes of feeds, nutrients, better growth performance and higher profit. A ratio of 80 % *Centrosema pubescens* and 20% Para grass in the diet gave the highest daily gain, better meat performance and profit.

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