

## **A RESPONSE OF NUTRIENT AND METABOLIZED ENERGY INTAKES AND GROWTH PERFORMANCE OF CROSSBRED RABBITS TO FEEDING STRATEGIES AND DIETARY *POPHOCARPUS SCANDEN* SUPPLEMENTATION IN *BRACHIARIA MUTICA* DIETS**

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### **ABSTRACT**

A study was conducted at the experimental farm and laboratory of Can tho University to evaluate feed utilization, and growth performance of 96 crossbred rabbits (New Zealand x Local). The experiment was arranged in a 2x4 factorial design. The first factor was feeding strategies (separate and mix) and second factor was levels of *Psophocarpus scanden* (PS) supplementation (0, 25, 50 and 75%, DM basis) in Para grass as basal diets, with three replications and 4 rabbits per experimental unit. The results indicate that values of nutrients and ME intakes were significantly higher ( $P<0.05$ ) for the separate feeding. The CP and EE intakes gradually increased ( $P<0.05$ ) when increasing the levels of *Psophocarpus scanden* in the diets. The daily weight gain and feed conversion ratio of the rabbits fed in separation diet and 75% PS supplementation were improved ( $P<0.05$ ). It was concluded that separated feeding and 75% *Psophocarpus scanden* supplementation had better growth rate and gave higher economic return.

**Keywords:** *Feed conversion ratio, forages, growth rate, nutrient consumption, rabbit, separate feeding.*

### **INTRODUCTION**

Organic rabbit farming in villages of Vietnam based on green forages is a sustainable feeding system to improve the utilization of local feed sources and producers' income due to the feed costs reduction, even though having a rather low productivity as compared to rabbits fed industrial feeds from the companies. Within these feeding strategies, forages and agricultural by-products are used as the main protein and fibre sources for the improved performance of growing rabbits that are very important (Leng, 2008 and Preston, 2008).

Besides, rabbits have characteristics of high feed selection based on method of feeding or size of feed particles as well as feed nutrition quality in order to meet nutrient requirement in their diets. Therefore, feeding choice will increase feed intake of the forages-fed rabbits resulting in improving performance. In the Mekong Delta of Vietnam has an abundance of locally available forages in almost all year round in which Para grass has neutral detergent fiber (NDF) of 62.0 %, while *Psophocarpus scanden* has crude protein content of 19.0% (Nguyen Van Thu et al. (2021). A suitable association between two forages could give a balanced-nutrient diet for rabbits, while this scientific area has still limited in literatures. Thus the growth performance rabbits based on the forages mixed or separated should be investigated for improving farmers' income.

### **MATERIALS AND METHODS**

#### **Location and time**

This experiment was carried out from January to May 2021 at the Nam Can Tho Farm in Phong Dien district of Can Tho City, while chemical feed composition was analyzed at the Laboratory E 205, Department of Animal Science, College of Agriculture, Can Tho University.

### Animals and experimental design

Ninety six crossbred rabbits (New Zealand x Local) at 7 weeks of age with average live weight of  $839 \pm 0.15$  g, were vaccinated to prevent hemorrhagic and parasite diseases, and arranged in a 2 x 4 factorial design with 3 replications with four rabbits (balanced sex) in an experimental unit (kept in a cage of 0.35m width x 0.40m length x 0.50m height) The first factor was the feeding strategy (separate or mix of two forages) and second factor was the supplementation of *Psophocarpus scanden* (PS) being 0, 25, 50 and 75% of the diet (DM basis), while the Para grass (PG) was fed *ad libitum*. The experimental period was lasted 10 weeks, while the amount of feeds offered was increased based on the refusals during the experiment.



Photo 1: *Psophocarpus scanden*



Photo 2: Para grass

### Feeds, feeding and management

The animals were fed three times a day at 7:00 h, 13:00 h and 17.00 h. *Psophocarpus scanden* (PS) and Para grass (PG) were hung and fed separately for first factor, while SP and PG were chopped into 1.0 – 1.5cm length, then mixed and fed in a trough in the treatments for the second factor. Before entering the experiment all the treatments were offered the feeds for measurement the feed intakes following the designed experiment to assure the amount of feeds for feeding. Soybean extraction meal and maize were given at the same level (15 g/head/day) of each feed for all treatments to supply protein and energy. Fresh water was available for the rabbits all day and night time.

### Measurements

The refusals and spillage were daily collected and weighed in the morning to calculate the feed and nutrient intakes. The feeds given and refusals were taken for analysis of DM, OM, CP, EE, NDF, ADF and ash following procedures of AOAC (1990) and Van Soest *et al.* (1991). While the metabolizable energy (ME) was calculated by Maertens *et al.* (2002) During the experiment four rabbits per experimental unit were individually weighed weekly. The growth rate and feed conversion ratios were calculated. The economic returns were also analyzed among the treatments.

### Statistical analysis

The data of the experiment were analyzed the variance using the ANOVA option of the General Linear Model (GLM) of Minitab Reference Manual Release 18.1 (Minitab 2017).

Economic analyses were done using current prices in Vietnamese Dong (VND) to compare differences of income and the feed cost in different treatments.

## RESULTS AND DISCUSSION

### Feed characteristics

The chemical compositions of the feed ingredients of rabbits was 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)
<i>Psophocarpus scanden</i>	17.6	91.6	18.8	6.15	48.4	33.2	8.00
Para grass	17.2	91.3	12.1	4.32	65.5	35.2	8.30
Extracted soybean	90.4	90.6	43.4	2.45	28.7	19.2	11.4
Maize	88.0	92.3	8.60	4.36	22.9	5.25	14.6

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)

*Psophocarpus scanden* (PS) had much CP and much less than the NDF component compared to the Para grass (PG). The CP and NDF contents of PS used in this experiment are consistent with the values (19.3% CP, and 49.1% NDF) stated by Truong Thanh Trung (2017). This might have been caused by different collection seasons and soil characteristics.

### Feed and nutrient intakes

Daily intakes of *Psophocarpus scanden* (PS), Para grass and nutrients of crossbred rabbits are shown in Table 2.

Table 2. Daily feed and nutrients intake (g/rabbit) of growing rabbits in feeding trial

Item	Feeding strategy (FS)		Diet (D)				SE/P	
	Separate	Mixed	PS0	PS25	PS50	PS75	FS	D
PS	34.1	28.1	-	21.0 <sup>c</sup>	37.4 <sup>b</sup>	66.2 <sup>a</sup>	2.83/0.153	4.00/0.001
PG	60.2	43.0	74.8 <sup>a</sup>	57.5 <sup>ab</sup>	46.9 <sup>bc</sup>	27.2 <sup>c</sup>	3.93/0.007	5.56/0.001
Total DM	73.2	61.8	63.5	65.3	68.1	73.1	2.73/0.009	3.86/0.348
OM	66.9	56.4	58.0	59.6	62.2	66.8	2.50/0.009	3.53/0.341
CP	12.9	11.4	10.6 <sup>b</sup>	11.6 <sup>b</sup>	12.4 <sup>ab</sup>	14.0 <sup>a</sup>	0.41/0.015	0.57/0.005
EE	2.87	2.55	2.53 <sup>c</sup>	2.63 <sup>ab</sup>	2.87 <sup>a</sup>	2.82 <sup>ab</sup>	0.05/0.001	0.06/0.008
NDF	34.5	27.4	31.0	30.4	30.9	31.5	1.61/0.007	2.28/0.998
ADF	16.2	14.1	15.0	15.1	15.7	14.9	0.25/0.001	0.36/0.41
ME (MJ/rabbit)	0.72	0.63	0.65	0.66	0.68	0.72	0.02/0.010	0.31/0.393

PS: *Psophocarpus scanden*, PG: Para grass. Means with different letters within the same rows are significantly different at the 5% level. The treatment PS0, PS25, PS50, PS75 were diets had *Psophocarpus scanden* at levels of 0, 25, 50, 75 and Para grass ad-libitum, respectively

Table 2 indicated that daily intake of PS was higher in separate feeding method than in the mixed feeding one, however the difference was not significant ( $P>0.05$ ), while the results significantly increased with increasing levels of PS in the diets, reaching the highest value (66.2 g) in the PS75 diet ( $P<0.05$ ). The significantly higher daily intake of PG was found in separated feed, however the values decreased when increasing levels of PS in the diets, the lowest value in the PG75 diet ( $P<0.05$ ). The total daily intakes of DM, OM, CP, EE, NDF, ADF and ME were higher for the separate method ( $P<0.05$ ). 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 PS levels in the diets. The CP and EE intakes were significantly increased corresponding with increasing levels of PS in the diets, probably due to higher PS intake, with high CP and EE contents in PS as compared with those in PG. The daily CP and NDF intakes in this trial are in agreement with the results (10.8 - 11.2 gCP/rabbit and 20.7-26.6 g NDF/rabbit) reported by Nguyen Truong Giang (2010) of previous study in which rabbits fed Para grass and water spinach leaves with supplemented sweet potato tuber.

### Final live weight, growth rate and economic analysis of crossbred rabbits

Table 3. Growth rate and economic analysis (VND) of crossbred rabbits in the Exp.

Item	Feeding strategy (FS)		Diet (D)				SE/P	
	Separate	Mixed	PS0	PS25	PS50	PS75	FS	D
Initial live weight, g	874	804	806	826	850	874	0.15/0.130	0.22/0.720
Final live weight, g	2252	2072	2021 <sup>b</sup>	2120 <sup>ab</sup>	2210 <sup>ab</sup>	2298 <sup>a</sup>	31.0/0.004	43.9/0.010
Daily weight gain, g	19.7	18.1	17.4 <sup>d</sup>	18.5 <sup>c</sup>	19.4 <sup>b</sup>	20.4 <sup>a</sup>	37.5/0.001	53.0/0.001
FCR	3.74	3.39	3.65	3.52	3.50	3.61	0.15/0.114	0.21/0.951
Total feed cost	44.590	42.822	46.482	44.366	42.852	41.123		
Total expense	111.590	109.822	113.482	111.366	109.852	108.123		
Total income	146.396	134.691	131.354	137.778	143.661	149.381		
Profit	34.806	24.869	17.872	26.413	33.809	41.258		

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 animals offered separated PS 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 results also gradually increased with increasing levels of PS in the diets, approaching the highest value in the PS75 diet ( $P<0.05$ ), possibly due to higher CP and EE intakes for animals in this diet. It was superior to the reported growth rates of rabbit within the ranges (15.9 to 19.4 g/day) by Nakkiset (2007) and (17.8-21.5 g/day) obtained in a study on rabbits fed *Arachi pinto* stated by Nguyen Thi Kim Dong and Nguyen Van Thu (2018). Feed conversion ratio was similar between two feeding methods and among 4 levels of PS in the diets ( $P>0.05$ ). These values were consistent with those of 3.23 -3.89 by Nguyen Truong Giang (2010).

The economic analysis indicates that the slightly higher total expense, but higher income were found in the separate method and the PS75 diet, resulting in giving more benefits in these diets. The results showed that the better separate feeding strategy and the promising diets for the rabbits could be the PS75 diet.

## CONCLUSIONS

Based on the results obtained it was concluded that:

The separate feeding method had higher intakes of feeds, nutrients, better growth performance and higher profit.

A level of 75% *Psophocarpus scanden* in the Para grass diet gave the highest daily gain, better meat performance and profit.

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