EFFECT OF *PSOPHOCARPUS SCANDENS* REPLACING PARA GRASS IN THE DIETS ON FEED UTILIZATION, GROWTH RATE AND ECONOMIC RETURN OF GROWING CROSSBRED RABBITS IN THE MEKONG DELTA IN VIETNAM

Nguyen Van T.*, Nguyen Thi K.D.

Department of Animal Sciences, Faculty of Agriculture and Applied Biology, Can Tho University, Vietnam
*Corresponding author: nvthu@ctu.edu.vn

ABSTRACT

One experiment was carried out to evaluate the effects of levels of fresh *Psophocarpus scandens* (PS) replacing fresh para grass (*Brachiaria mutica)* in the diets on feed and nutrient utilization, growth performance and economic return of crossbred rabbits. Rabbits received in addition 15 g/d of concentrate during the experiment. A complete randomized design with five treatments and three replicates was used. Two female rabbits at 60 days of age (799 g on average) were allocated in one experimental unit for 70 days. The treatments were levels of 0, 15, 30, 45 and 60% (DM basis) of *Psophocarpus scandens* replacing para grass in the diets corresponding to the treatments named PS0, PS15, PS30, PS45 and PS60, respectively. The PS protein content was higher than that of PG (23.1 vs. 9.9% DM) and NDF content was lower (41.8 vs. 61.6% DM).

The results showed that dry matter intake was significantly reduced by the highest PS proportions ($P<0.01$) with 93.5, 93.0, 92.7, 85.0 and 84.5 g/d for the PS0 to PS60 diets, respectively. Crude protein intake of rabbits significantly ($P<0.01$) increased with increasing PS proportion. The daily weight gains of the rabbits were higher in the diets with PS replacement (15.1, 17.3, 18.2, 16.3 and 17.5 g/d for diets PS0 to PS60, respectively). However, only the daily weight gain of the PS30 treatment was significantly higher than that of the PS0 one. The profit was improved with the increased replacement of PS. The nutrient digestibility (dry matter and crude protein) and nitrogen retention of rabbits were also significantly ($P<0.01$) improved with increasing PS levels in the diets. The conclusion of the study was that using *Psophocarpus scandens* to replace para grass improved nutrient utilization, daily weight gain and profits. Replacing para grass by *Psophocarpus scandens* at a level of 30% could be practiced by farmers.

Key words: Para grass, *Psophocarpus scandens*, growing rabbit, Feed utilization, Daily weight gain, Economic return.

INTRODUCTION

Due to the bird flu, rabbit meat production has been more developed recently in Vietnam in order to meet the meat demand of human food. Rabbit production is good for commercial farm income and also a tool of the poor producers for erasing starvation and alleviating poverty. Crossbred rabbits (Local and improved pure breeds) are popularly raised in the Mekong delta because of a good adaptation to the local climate and feeds. Organic rabbit farming based on locally available feeds resources, particularly natural grasses, legume leaves and wild vegetables have a very important role for production. There are also several kinds of naturally available protein-rich forages in the Mekong Delta, which have been very good plant protein sources for rabbits (Nguyen Van Thu and Nguyen Thi Kim Dong, 2005). They provides adequate protein and other essential nutrients for rabbits, particularly *Psophocarpus scandens* which is available through out a year, while para grass (*Brachiaria mutica*) from natural pastures is a good fiber feed source as a basal diet for rabbits (Nguyen Thi Kim Dong *et al*., 2007; Le Nguyen Huyen Trang, 2006). However, using solely para grass in the diets could reduce the growth rate of rabbits due to the high dietary fiber (Nguyen Van Thu, 2005). Therefore, the

objectives of study are to evaluate effects of *Psophocarpus scandens* replacing para grass at different levels in the diets on feed nutrient utilization, growth performance and economic return of growing crossbred rabbits. The results of the study will be disseminated to producers for practice.

MATERIALS AND METHOD

The experiment aimed to measure the effects of the replacement of para grass (PG) by *Psophocarpus scandens* on dietary nutrient digestibility, growth rate and economic analysis of crossbred rabbits. Thirty growing female rabbits (New Zealand x local breed) at 60 days of age (mean live weight of 799 g) were allocated in a complete randomized design with 5 treatments and 3 replications (two rabbits in an experimental unit). The treatments were the replacement of para grass (*Brachiaria mutica*) by *Psophocarpus scandens* at levels of 0, 15, 30, 45 and 60% (DM basis), while the concentrate supplementation was the same in all treatments of 15 g/day/rabbit. At 105 days of age, the feeds offered, refusals, feces and urine were collected for nutrient digestibility and nitrogen retention measurement. Total experiment length was 70 days.

The feeds and refusals were taken for analyses of DM, OM, CP, NDF, and ash following procedure of AOAC (1990) and Van Soest *et al.* (1991). At the beginning of the experiment two rabbits per experimental unit were weighed individually and then they were weighed weekly during experimental period. Daily feed intakes, growth rate, and feed conversion ratios were measured and calculated. The economic analysis was also done among the treatments. For the measurements of nutrient digestibility and nitrogen retention feeds, refusals and urine were daily measured during six days. DM, CP and NDF digestibility were employed according to *Mc Donald* (2002).

The data from the experiment were analyzed by analysis of variance using the ANOVA of General Linear Model, while Tukey test was used to compare the means of treatments of Minitab Reference Manual Release 13.21 (Minitab, 2000). 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

Chemical composition of feeds was stated in Table 1. The DM of Para grass was 19,1% and higher than *Psophocarpus scandens* of 14% DM of para grass reported by Nguyen Thi Xuan Linh (2005) was of 16.4% and Danh Mo (2003) of 18.4%. The higher figures of DM of para grass in the experiment could be caused by cutting during the dry season. The CP content of *Psophocarpus scandens* was of 23.1%, while it was only 9.92% in para grass. NDF content of *Psophocarpus scandens* was lower than that of para grass (41.8% vs. 61.6%).

Table 1: Chemical composition of feeds used in the experiment

Feeds	DM	OM	CP	NDF	Ash
Para grass	19.1	89.6	9.92	61.6	10.4
Psophocarpus scandens	14.0	90.4	23.1	41.8	9.60
Concentrate	87.0	91.1	20.0	23.6	8.90

DM: dry matter % fresh feed, and CP (crude protein), OM (organic matter), NDF (neutral detergent fiber) in % of DM

The dry matter intake of rabbits was reduced with the increasing proportion of PS (Table 2). The DM intake of PS60 rabbits was significantly lower than that observed for PS0 and PS15 diets due to the lower DM of the PS compared to the PG. These results were consistent of that reported by Nguyen Thi Xuan Linh (2005) and Dao Hung (2006). The CP intake proportionally increased in the diets with the increase of the PS proportion and they are significantly different among the treatments ($P<0.01$), while opposite pattern occurred for the NDF intake, due to the lower NDF content in the PS. Daily weight gain, feed conversion ratio and economic return of the rabbits were stated in Table 3.

Table 2: Feed and nutrient intakes of rabbits in the Experiment (g/rabbit/day)

Intake (g/rabbit/day)	Treatments					SE	Prob.
	PS0	PS15	PS30	PS45	PS60		
Para grass (PG)	77.7[a]	64.9[b]	51.5[c]	39.0[d]	28.7[e]	1.52	<0.01
Psophocarpus scandens (PS)	0.0[a]	12.2[b]	25.3[c]	30.2[d]	39.9[e]	0.71	<0.01
Concentrate	15.8	15.9	15.9	15.8	15.9	0.05	ns
Dry matter	93.5[a]	93.0[ac]	92.7[ab]	85.0[bc]	84.5[b]	1.82	<0.01
Organic matter	84.0[a]	83.6[ab]	83.5[ab]	76.7[ab]	76.3[b]	1.63	<0.01
Crude protein	10.9[a]	12.4[b]	14.0[cd]	13.8[c]	15.0[d]	0.32	<0.01
NDF	51.6[a]	48.8[ab]	46.1[b]	40.4[c]	38.1[c]	1.04	<0.01

NDF: neutral detergent fiber; PS0: no *Psophocarpus scandens* (PS), PS15: PS replace 15% PG, PS30: PS replace 30% PG, PS45: PS replace 45% PG, PS60: PS replace60% PG

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

Table 3: Daily weight gain, feed conversion ratio and economic return of the rabbits fed different diets in the Experiment

	Treatments					SE	Prob.
	PS0	PS15	PS30	PS45	PS60		
LW at initial (g)	807	784	798	803	805	6.44	0.16
LW at finishing (g)	1860[a]	1955[ab]	2075[b]	1943[ab]	2027[ab]	42.1	0.04
Daily weight gain (g/rabbit)	15.1[a]	17.3[ab]	18.2[b]	16.3[ab]	17.5[ab]	0.62	0.04
Feed conversion ratio	6.20[a]	5.4[ab]	5.10[b]	5.27[b]	4.83[b]	0.62	0.04
Cost of feeds and rabbits (VND/rabbits)	40 948	41 810	42 747	42 537	43 209		-
Income (VND/rabbit)	55 800	59 850	62 250	58 290	60 810		-
Difference (VND/rabbit)	14 852	18 040	19 503	15 753	17 601		-

LW; live weigh, PS0: no *Psophocarpus scandens* (PS), PS15: PS replace 15% PG, PS30: PS replace 30% PG, PS45: PS replace 45% PG, PS60: PS replace 60% PG

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

Daily weight gain of the rabbits were higher in the diets with PS, however only the daily weight gain of the PS30 treatment was significantly higher than that of the PS0 one. The daily weight gain of rabbits in this experiment was similar to results in the crossbred rabbits reported by Dao Hung (2006) from 14.5-19.0 g/d and Nguyen Van Thu and Nguyen Thi Kim Dong (2005) from 12.9-19.0 g/d. The feed conversion ratio of the PS30, PS45 and PS60 was significantly lower than that of PS0 and the results were consistent with those reported by Dao Hung (2006) of 4,27. The economic analysis showed that the PS30 diet gave the best benefit from the experiment.

Nutrient digestibility and nitrogen retention of rabbits were showed in Table 4.

Table 4: Nutrient digestibility (%) and nitrogen retention (g/kg $W^{0.75}$) of rabbits in Experiment 1

	Treatments					SE	Prob.
	PS0	PS15	PS30	PS45	PS60		
Dry matter digestibility (%)	42.1[a]	43.5[ab]	51.7[bc]	55.0 [c]	57.2[c]	1.9	<0.001
Organic matter digestibility (%)	43.2[a]	45.6[ab]	54.0[bc]	57.5[c]	58.5[c]	2.0	<0.001
Crude protein digestibility (%)	62.7[a]	67.3[a]	79.3[ab]	81.9[ab]	84.4[b]	3.6	0.005
NDF digestibility (%)	35.3	36.2	36.8	38.1	40.9	1.3	0.098
Nitrogen balance (g/kg $W^{0.75}$)							
Nitrogen intake	2.38[a]	2.52[a]	2.68[ab]	2.76[abc]	2.99[c]	0.10	0.002
Nitrogen retention	1.78[a]	1.84[a]	2.03[ab]	2.10[ab]	2.42[b]	0.10	0.007

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

DMD: dry matter digestibility , CPD: crude protein digestibility, OMD: organic matter digestibility, NDFD: neutral detergent fiber digestibility. PS0: no *Psophocarpus scandens* (PS), PS15: PS replace 15% PG, PS30: PS replace 30% PG, PS45: PS replace 45% PG, PS60: PS replace 60% PG

The digestibility of DM, OM and CP were improved with the increase of *Psophocarpus scandens* leaves in the diets. The DM digestibility were significantly higher for the PS45 and PS60 diets, while the lowest DM digestibility was for the control PS0 diet (42.1%). These results were consistent with figures reported by Dao Hung (2006) from 46.1-66.7%. and Nguyen Thi Xuan Linh (2005) from 41.7-73.0% which included para grass and sweet potato leaves in the diets. The increasing OM digestibility pattern was similar to that of the DM. There was an increase of CP digestibility corresponding to the

increased *Psophocarpus scandens* in the diets with a significantly higher CP digestibility for the PS60 diet (84.4%) compared to that of the PS0 one. The result was also consistent with that (82.0-83.0%) reported by Nguyen Van Thu and Nguyen Thi Kim Dong (2005). The digestibility of NDF in different diets was not significantly different; however there was numerically an improvement of NDF digestibility (from 35.3 to 40.9%) with the increase of *Psophocarpus scandens* leaves in the diets. Similar patterns of nitrogen intake and retention were obtained in diets, however, they were significantly different ($P<0.01$) among the treatments with the highest values of the PS60 diet (2.99 and 2.42 g/kg $W^{0.75}$, for N intake and retention respectively). This indicated that there was better utilization of plant foliated protein in rabbits when increasing legume leaves in the diets.

CONCLUSIONS

The conclusion of the study was that the use of *Psophocarpus scandens* to replace para grass in the growing rabbit diets with benefits. It improved crude protein intake, dietary digestibility, daily weight gain and profit. A replacement of para grass in the diet of growing crossbred rabbits by *Psophocarpus scandens* at a level of 30% should be practiced by farmers for a better income.

REFERENCES

AOAC 1990. Official methods of analysis (15th edition). *Washington, DC. Volume 1, 69-90.*

Danh Mo. 2003. A study of improving in vitro forage digestibility measurement by using rumen fluid as nutrient source replacing chemicals for microbes in swamp buffaloes (Vietnamese). *MSc thesis, Faculty of Agriculture and Applied Biosciences, Cantho University, Vietnam.*

Dao Hung 2005. Breed characteristics and productivity; and effect of crude protein levels on growth rate, feed intake, nutrient digestibility and nitrogen retention of crossbred rabbits (Vietnamese). *MSc thesis, Faculty of Agriculture and Applied Biosciences, Cantho University, Vietnam.*

Le Nguyen Huyen Trang 2006. Effect of sweet potato and water spinach as protein sources on the meat performance and digestibility of crossbred rabbits (Vietnamese). *Under Graduated Thesis, Faculty of Agriculture & Applied Biology, Cantho University.*

McDonald P., Edwards R.A., Greehalgh J.F.D., Morgan C.A. 2002. Digestibility evaluation of foods. *In Animal Nutrition. 6th Edition, Longman Scientific and Technical, New York, USA, 245-255.*

Minitab 2000. *Minitab reference manual release 13.20. Minitab Inc.*

Nguyen Thi Kim Dong, Nguyen Van Thu, Brian Ogle, Thomas R. Preston 2007. Effect of supplement level of water spinach leaves in diets based on para grass on intake, nutrient utilization, growth rate and economic returns of crossbred rabbits in Mekong delta, Vietnam. MEKARN. *In: Proc. Workshop on Forages for Pigs and Rabbits, 2006 August, Phnom Penh, Cambodia, Agricultural Publishing house, Hanoi, 176-182.*

Nguyen Thi Xuan Linh 2005. Effect of sweet potato vines replacing para grass (*Brachiaria mutica*) on feed and nutrient digestibility and nitrogen retention of growing crossbred rabbits. *BSc thesis, Faculty of Agriculture and Applied Biosciences, pp. 4-12, 17.*

Nguyen Van Thu, Nguyen Thi Kim Dong 2005. Effect of replacement of different levels of para grass by sweet potato vines on feed utilization, growth rate and carcass quality of crossbred rabbits in the Mekong delta of Vietnam. *In: Proc. Integrating Livestock-crop systems to meet the challlenges of globalisation. Ed. Rowlinson P., Wachirapakorn C., Pakde, P. and Wanapat M., Vol 2, T51.*

Nguyen Van Thu 2005. Nutrition and feeds. Raising rabbit (Vietnamese). *Cantho University Publishing house. 57 pages.*

Van Soest P.J., Robertson J.B.., Lewis B.A. 1991. Symposium: Carbohydrate methodology, metabolism and nutritional implications in dairy cattle: methods for dietary fiber, and non-starch polysaccharides in relation to animal nutrition. *J. Dairy Sci., 74, 3585-3597.*