A STUDY ON NUTRIENT INTAKE, GROWTH PERFOMANCE AND ECONOMIC RETURN OF CROSSBRED RABBIT (NEW ZEALAND x LOCAL) SUPPLEMENTED CASSAVA TUBE AS A DIETARY ENERGY SOURCE

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ABSTRACT

This study aimed to evaluate potential benefits from supplementing Para grass with dried cassava chips in diets of growing rabbits. Sixty crossbred rabbits (local x New Zealand) with average initial live weight of 735±4.64g and 8 weeks of age were allocated in a completely randomized design with 5 treatments and 3 replications and were fed 5 levels of dried cassava chips (0, 10, 20, 30 and 40 g/rabbit/day) as a energy supplement source to Para grass fed *ad libitum*. While soybean extraction meal and soybean waste were used to supply protein for adjustment of the same protein level of 11.5g/day/rabbit and Para grass was fed *ad libitum.* The results showed that enhancing the offer level of dried cassava chips (DC) from the 0 to 40 g DC (rabbit/day) in a basal diet of Para grass significantly ($P<0.05$) and gradually increased dry matter (DM), organic matter (OM), ether extraction (EE), neutral detergent fiber (NDF) and metabolizable energy (ME) intakes. The cassava supplementation also improved the growth and economic return. It was also found that there was a linear relationship between daily weight gain and DC supplementation with the function of $y = 0.196x + 16.1$ and $R^2 = 0.974$. Dried cassava chip should be used to enhance the rabbit growth rate and profits for producers.

Keywords: *carbohydrates, digestibility, N balance, Para grass, growing rabbit.*

INTRODUCTION

Rabbits are popularly raised in Vietnam, particularly in the Mekong delta provinces and contribute to improving the nutrition and economy of famer smallholders, both as a source of animal protein as well as a source of extra income. Nguyen Van Thu (2020) reported that rabbit meat production has considerably increased in Vietnam in recent years in order to meet the increasing demand of human food. Rabbit meat is nutritious, low fat and cholesterol. Cost for rabbit production investment is low, because rabbit producers can utilize cheap materials for housing and local plants or wild vegetables for rabbit feeds. Crossbred rabbits (New Zealand x Local rabbits) are raised in the Mekong delta due to the good adaptations to the local climate, feedstuffs and diseases.

In the Mekong delta of Vietnam feeding of rabbits is mainly based on natural grasses and agro-industrial byproducts (Nguyen Thi Kim Dong and Nguyen Van Thu, 2009) so the cost for rabbit production is lower than for the other animal species ones. In the feeding strategies, green forages are used as the main protein sources and fiber, while for the improved performance of growing and reproductive rabbits; sources of soluble carbohydrate supplementation are very important (Nguyen Thi Kim Dong and Nguyen Van Thu, 2019). This is a cause of low performance of the forages-fed rabbits in the villages as compared to the concentrate/pellet-fed rabbit in the industries with more soluble carbohydrate as a necessary energy source. While cassava tubes are very good source of energy with the cheapness and availability. Thus this study aimed to evaluate potential benefits from supplementing Para grass with dried cassava chips in diets of growing rabbits.

MATERIALS AND METHODS

Location and time

The experiment was conducted in the farm of Cho Moi District of An Giang Province, while the feed samples were sent and chemically analyzed by the Laboratory E205, College of Agriculture of Can Tho city. It was implemented from Aug 2019 to Jan 2020.

Experimental design

For this feeding trial, sixty crossbred rabbits (x improved breeds) at 8 weeks of age with average initial weight around 735g, were arranged in a completely randomized design with 5 treatments and 3 replications. Four rabbits balanced for sex were the experimental unit. The treatments were dried cassava chips (DC) supplemented to the Para grass (PG) basal diet at levels of 0 (DC0), 10 (DC10), 20 (DC20), 30 (DC30) and 40g (DC40) / day/ animal. The experimental period lasted 9 weeks**.**

Feeds and Feeding

Para grass was collected daily in the areas surrounding the farm. Soybean waste was bought daily from the soybean milk factory in the city; cassava chips and extracted soybean meal were bought on one occasion from an animal feed shop for using throughout the trials.

Soybean waste was offered at 150g/day/animal and soybean extraction meal was fed at 7-11g/day/animal for adjustment of the same protein level of 11.5g/day/rabbit and Para grass was fed *ad libitum.*

The measurements taken

Feed, nutrient and ME intakes: dry matter (DM), organic matter (OM), ash, neutral detergent fiber (NDF), Chemical analyses of DM, OM, CP, EE, CF, NFE, NDF and ash followed the procedure of AOAC (1990) and Van Soest et al. (1991), while ME was calculated according to Maertens et al. (2002).

Daily weight gain was measured by weighing the initial live weight and final live weight.

Feed conversion ratio was calculated by the daily DM intake and weight gain.

Economic returns were evaluated by the net income from the total cost and income with the recent prices of animals, feeds, labours and others.

Statistical analysis

The data were firstly calculated by Excel software and then analyzed using the General Linear Model (GLM) option in the ANOVA program of the Minitab software, release 18.1 and comparison of differences between 2 treatments was done by Tukey test of Minitab (2017).

RESULTS AND DISCUSSION

Chemical composition of feeds

Chemical composition of feeds of the experiment was presented in Table 1.

Table 1. Chemical composition of feeds (% in DM except for DM which is on fresh basis, and ME) in the experiment

Item	DM	OM	CP	EE	CF	NFE	NDF	Ash	ME, MJ/kg
Para grass	17.4	89.6	12.3	5.09	28.9	43.3	67.1	11.2	8.72
Dried cassava chips	94.3	97.1	2.70	1.59	3.39	89.4	15.6	3.09	13.4
Soya waste	12.0	95.3	21.3	15.4	3.50	55.1	35.0	4.96	13.1
Soybean ext. meal	87.9	90.1	42.8	3.22	3.70	40.4	27.4	11.3	12.4

DM: dry matter, OM: organic matter, CP: crude protein, EE: Ether extract, CF: crude fiber, NFE: nitrogen free extract, NDF: neutral detergent fiber.

Table 1 showed that dried cassava chip had the higher values for OM, NFE and ME compared to the other feeds, while it was lower in CP, EE and NDF. While CP and EE had higher values for the soybean extraction meal, soya waste and Para grass and the highest NDF value was for the Para grass.

Feed, nutrient and ME intakes

In Table 2 the feeds, nutrients and ME intakes were showed.

Table 2. Daily intakes of feeds, nutrients and metabolizable energy (g DM/animal) of rabbits in the experiment

Item	Treatments					SEM/P
	DC0	***DC10***	***DC20***	***DC30***	***DC40***	
DM	53.4^{c}	55.2^{c}	68.2^{b}	68.5^{b}	79.9^{a}	1.43/0.001
OM	48.7^{c}	51.0^{c}	63.4^{b}	64.3^{b}	75.3^{a}	1.33/0.001
CP	11.0	10.4	11.2	10.3	10.6	0.26/0.140
EE	4.02^{bc}	3.92^{c}	4.47^{ab}	4.18^{bc}	4.55^{a}	0.11/0.008
NDF	28.0^{a}	25.1^{ab}	27.8^{a}	24.7^{b}	27.7^{ab}	0.69/0.012
ME, MJ/ani./day	0.56^{c}	0.62^{c}	0.79^{b}	0.82^{b}	0.96^{a}	0.16/0.001

DC: dry cassava chip, DM: dry matter, OM: organic matter, CP: crude protein, EE: Ether extract, CF: crude fiber, NFE: nitrogen free extract, NDF: neutral detergent fiber and Metabolizable energy (ME). $^{a, b, c}$ *Means with different letters within the same rows were significantly different at the 5% level (P<0.05).*

The results in Table 2 indicated that the DM intakes were significantly different (P<0.05) among the treatments with the lowest values for the DC0 treatment and the highest value for the DC40 treatment. OM and ME intakes of rabbits gradually increased from the DC10 to DC40 treatments (P<0.05), while NDF intakes were not followed by any pattern and CP intakes were similar among the treatments. The data of feed intakes in the experiment were indicated that intake of Para grass declined as the offer level of cassava chips was increased and actual intake of cassava chips was slightly less than the offer level, but was strongly and positively related to total DM and ME intake and growth rate (Table 3).

Live weight, feed conversion and economic return

The live weight changes, feed conversion ratio and profits were showed in Table 3.

Table 3. Mean values for changes in live weight, feed conversion and economic return

Item	Treatments					SEM/P
	DC0	***DC10***	***DC20***	***DC30***	***DC40***	
Initial live weight, g	737	735	738	727	738	5.53/0.567
Final live weight, g	1755^{a}	1848^{ab}	2047^{abc}	2083^{bc}	2255^{c}	67.5/0.003
Daily weight gain, g	16.2^{a}	17.7^{ab}	20.8^{abc}	21.5^{bc}	24.1^{c}	1.09/0.002
FCR	3.33	3.13	3.28	3.18	3.35	0.14/0.761
Total cost, ND/rabbit	122,850	129,360	143,290	145,810	157,850	-
Total income, VND/rabbit	95,401	98,273	105,124	108,020	113,037	-
Net income, VND/rabbit	27,449	31,086	38,166	37,790	44,813	-
Net income compared to DC0 treatment, %	100	113	139	138	163	

FCR: feed conversion ratio. $^{a, b, c, d, e}$ *Means with different letters within the same rows were significantly different at the 5% level (P<0.05).*

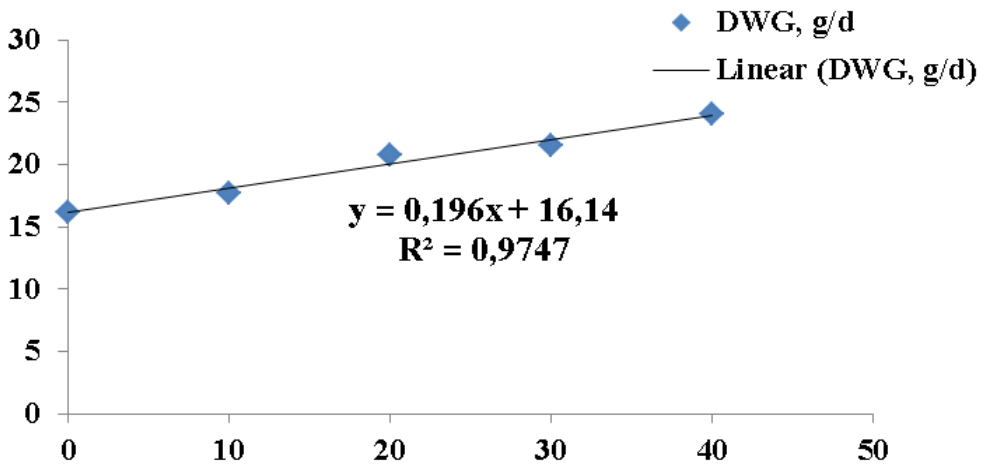

Fig.1. Linear relationship between DWG and DC supplementation

It was found that the final live weight of rabbit were significanlly different ($P<0.05$) among the treatments, and a gradual increase from the DC0 to the DC40 treatment (Table 3). A similar increase pattern of daily weigh gain (DWG) was also found ($P<0.05$) and they were 16.2, 17.7, 20.8, 21.5 and 24.1 g. There was no relationship between cassava chip intake and feed conversion. Nguyen Thi Kim Dong and Nguyen Van Thu (2017) also indicated that the DWG of the crossbred rabbit (New Zealand x Local) was from 18.6 to 20.8 g when supplementing copra meal to Para grass and water spinach leaves and although they were significantly different ($P<0.05$) among the treatments, no significant FCR was found. Under the conditions in Vietnam, economic benefits were increased by almost 65% by supplementing Para grass with cassava chips at the DC40 treatment (Table 3). The reason may be that the response to supplementation with a starch-rich carbohydrate is more a function of the effect on the digestibility of the diet, than of the nature of the carbohydrate. In this respect, the digestibility of Para grass is considerably inferior to that of water spinach (Nguyen Thi Kim Dong et al., 2006). There was a close linear relationship of between the daily weight gain and the DC supplementation levels ($R^2 = 0.974$) in the present experiment.

CONCLUSION

The results indicated that increasing the offer level of dried cassava chips in a basal diet of Para grass fed to growing rabbits led to linear increases in total DM intake, live weight gain and economic benefits. It is also proposed that the determinant of rabbit growth rate in forage-based diets is the overall apparent digestibility of the diet rather than the composition of the diet in terms of the relative proportions of soluble and structural carbohydrates.

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