

The Nutritive Value of Banana Peel (*Musa sapientum* L.) in Growing Pigs

Tinnagon Tartrakoon¹, Nitima Chalearmsan¹, Therdchai Vearasilp² and Udo ter Meulen³

¹Rajamangala Institute of Technology, Phitsanulok Campus,
Phitsanulok 65000, Thailand

E-mail: tin15@yahoo.com

E-mail: nokrit@psnulok.loxinfo.co.th

²Department of Animal Science, Faculty of Agriculture, Chiang Mai University, Chaing Mai
52000, Thailand

E-mail: agiskch@cmu.chiangmai.ac.th

³Institute for Animal Physiology and Animal Nutrition, Georg-August- University,
Kellnerweg 6, 37077 Göttingen, Germany

E-mail: umeulen@uni-goettingen.de

Abstract

A study on the nutritive value of banana peel (*Musa sapientum* L.) in growing pigs was conducted. Twenty castrated male growing pigs were randomly divided into 5 groups of each 4 pigs. A randomised complete block design (RCBD) was applied on the study, using period of experiments as blocks. Each group of animals was randomly selected to be fed with one of the 5 experimental semi - purified diets; diet 1: protein free diet, diet 2: soybean meal diet (used as basal feed in the experimental diets), diet 3: green banana peel diet, diet 4: almost ripe banana peel diet and diet 5: ripe banana peel diet. Diet 2, 3, 4 and 5 contained 10 % protein. The animals were kept in metabolic cages where faeces and urine could be completely collected. Digestible coefficients of dry matter, organic matter and protein, net protein utilisation, biological value, digestible energy and metabolisable energy were recorded. The results indicated that there was no statistical difference among the treatments. However, the nutritive value of ripe banana peel was slightly better than the green and almost ripe peels.

Keywords: Banana peel, nutritive value, growing pig.

Introduction

Banana (*Musa sapientum* L.) is the one of the major fruits in Thailand. It is a fast-growing plant with a 3-5 m high herbaceous stem and almost every part of it is usable. It is the main plant for fruit production in Phitsanulok province where many people have their own family industry for banana products. Therefore, every year this province has a problem of banana waste, especially banana peel. The proportion of the banana which is wasted as peel is 18-20 % (Dividich et al., 1976). Traditionally the peel is disposed in the fields or just thrown into the ponds, which may cause environmental problems. As the peel has a high energy content but is low in protein (Table 1) and amino acid composition (Table 2) it seems a possible alternative ingredient in pig feeding.

Table 1. Nutrient composition of banana peels

Nutrient composition	Type of banana peels		
	Green	Almost ripe	Ripe
Dry matter ¹ (%)	91.62	92.38	95.66
Crude protein ¹ (%)	5.19	6.61	4.77
Ether extract ¹ (%)	10.66	14.20	14.56
Crude fiber ¹ (%)	11.58	11.10	11.95
Ash ¹ (%)	16.30	14.27	14.58
Calcium ¹ (%)	0.37	0.38	0.36
Phosphorus ¹ (%)	0.28	0.29	0.23
Gross Energy ¹ (Kcal/kg)	4383	4692	4592
Tannin ¹ (%)	6.84	4.97	4.69

¹Analyzed by Animal Feed Lab, Animal Science Department, Kasetsart University, Thailand.

²Analyzed by Science and Technology Institute, Thailand.

Table 2. Amino acid composition of banana peels

Amino acid *	Type of banana peels		
	Green	Almost ripe	Ripe
Aspartic acid (%)	0.299	0.409	0.331
Threonine (%)	0.140	0.189	0.153
Serine (%)	0.156	0.211	0.169
Glutamic acid (%)	0.382	0.539	0.454
Proline (%)	0.129	0.173	0.171
Glycine (%)	0.196	0.273	0.228
Alanine (%)	0.250	0.286	0.255
Cystine (%)	0.059	0.080	0.061
Valine (%)	0.193	0.260	0.223
Methionine (%)	0.051	0.063	0.060
Isoleucine (%)	0.122	0.155	0.127
Leucine (%)	0.225	0.297	0.242
Phenylalanine (%)	0.061	0.080	0.064
Lysine (%)	0.119	0.136	0.104
Arginine (%)	0.078	0.102	0.084

*Analyzed by Ajinomoto Co., (Thailand) Ltd.

Objective

The study was set with the objective to assessment the nutritive value of green, almost ripe and ripe banana peels for evaluate the use of banana peel in pig feed.

Materials and Methods

Twenty castrated male growing pigs of the Largewhite x Landrace breed were obtained from the Department of Animal Science, Rajamangala Institute of Technology, Phitsanulok Campus, Thailand and randomly divided into five groups and each fed one of five experimental diets (Table 3). All diets were Semi-purified diets and contained 10 % protein, except diet 1 which was a protein free diet used for assessment of metabolic faecal and endogenous urinary nitrogen. All pigs were kept in metabolic cages. Chromic oxide (Cr₂O₃) was included in each diet as marker. Feces and urine samples were collected and stored frozen. Analyses for nitrogen and dry matter were carried out according to AOAC (1990) procedure.

Table 3. Ingredient composition of experimental diets (g/kg air dry)

Ingredients (kg)	Diets ¹				
	Diet 1	Diet 2	Diet 3	Diet 4	Diet 5
Cassava	951.5	724.2	-	-	-
Soybean meal	-	227.3	130.4	99.3	139.3
Green banana peel	-	-	821.1	-	-
Almost ripe banana peel	-	-	-	852.2	-
Ripe banana peel	-	-	-	-	812.2

¹ each diet contained Dicalcium phosphate, 30 g/kg; Salt, 3.5 g/kg; Vegetable oil, 10 g/kg and Vitamin-mineral mix, 5 g/kg.

Results and Discussion

Data on digestible coefficient of dry matter, organic matter and protein, net protein utilization, biological value, digestible energy and metabolisable energy of the pigs in the growing period is showed in Table 4. There were no statistically differences (P>0.05) among the treatments. However, the nutritive value of ripe banana peel was slightly better than the green and the almost ripe peels. According to Göhl (1981) peels of green banana are very rich in active tannins. These are bound in an inactive form when the banana are completely yellow. Tannins are believed to exert adverse effects by reducing protein digestibility through the formation of complexes with dietary protein and by inhibiting the activities of proteolytic enzymes in the digestive secretion (D'Mello, 1982). Their level show negative correlation coefficient with percent of dry matter digestibility (Harris et al., 1970).

Table 4. Nutritive value of green, almost ripe and ripe banana peels in growing pigs

Nutrient values	Type of banana peels		
	green	Almost ripe	ripe
Digestible coefficient of dry matter (%)	78.71	82.23	84.11
Digestible coefficient of organic matter (%)	78.72	82.06	84.01
Digestible coefficient of protein (%)	74.76	79.39	84.00
Net protein utilization (%)	59.06	64.96	66.85
Biological value (%)	65.92	70.34	73.07
Digestible energy (Kcal/kg)	2,922	3,393	3,553
Metabolisable energy (Kcal/kg)	2,775	3,211	3,377

Conclusions

1. Digestibility coefficient of dry matter, organic matter and protein, net protein utilisation, biological value, digestible energy and metabolic energy in three types of banana peel indicated no statistical difference.
2. The nutritive value of ripe banana peel was slightly better than the almost ripe and green peel.

References:

- AOAC 1990. Official Methods of Analysis (12 th Ed.). Association of Official Analytical Chemists., Washington DC, USA. 122p.
- D'Mello, J. P. F., (1982). Toxic factors in tropical legumes. *World Rev. Anim. Prod.* 18(4), pp. 41-46.
- Dividich, J. I., Ceoffory, F., Canope, I., Chenost, M., (1976). Using waste bananas as animal feed. *World Anim. Rev.* 20 (20), pp. 22-30.
- Göhl, B., (1981). Tropical feeds. Food and Agriculture Organization, International Foundation for Science., Stockholm, Sweden. 529p.
- Harris, H. B., Gummins, D. G., Burn, R.R., (1970). Tannin content and digestibility of sorghum grain as influenced by bagging. *Agron. J.* 62, pp.633-635.