STUDIES ON FAECAL OUTPUT IN MONG CAI PIGS FED DIETS RICH IN CRUDE FIBRE

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SUMMARY

An experiment was conducted with a total of eight Large White and Mong Cai castrate male pigs of approximately 20 kg allocated at random according to breed into a two-period change over design to study the effect of ground, full-fat rubber seeds (none and 20%) on faecal characteristics of these animals fed wheat bran based diets.

There was any significant (P>0.05) interaction genotype x diet in the evaluated measurements. There were no significant (P>0.05) effect of genotype in any indices determined in pig faeces, although faecal output of fresh material, water dry matter, SCFA and ammonia appeared to be greater in Mong Cai pigs, in contrast to what occurred in Large White animals. Faecal pH was unaffected by examined treatments. The introduction of rubber seeds in the diet determined a significant increase in faecal DM concentration (P<0.01) and output (P<0.05). The excretion of water, SCFA and ammonia were significantly (P<0.05) increased too as a consequence of the presence of rubber seeds in the diet. There was no effect of treatment on faecal SCFA concentration and pH, but ammonia concentration was greater (P<0.05) in faces from pigs fed rubber seeds as compared to those which had no seeds in the feed.

It is suggested that more degrees of freedom are necessary for obtaining the adequate response when genotypes are compared from the nutritional point of view.

Key words: *pigs, Mong Cai, genotype, faecal output, fibre*

Short title: *Faecal output in Mong Cai pigs*

ESTUDIOS SOBRE SOBRE LA SALIDA FECAL EN CERDOS MONG CAI ALIMENTADOS CON DIETAS RICAS EN FIBRA CRUDA

RESUMEN

Se hizo un experimento con un total de ocho cerdos Large White y Mon Cai, machos castrados de aproximadamente 20 kg y ubicados al azar de acuerdo con el genotipo en un diseño de cambio con dos períodos para estudiar el efecto de semillas de caucho sin extracción de grasa, molidas (0 y 20%), en las caracteristicas fecales de los animales alimentados con una dieta de afrecho de trigo.

No hubo interacción significativa (P<0.05) genotipo x dieta en las mediciones hechas. No hubo efecto significativo (P>0.05) del genotipo en ninguna de los índices determinados en las excretas, aunque la salida fecal de material fresco, agua, MS, AGCC y amoníaco parecieron ser mayores en los cerdos Mong Cai, en contraste con lo que ocurrió en los Large White. El pH fecal no cambió por efecto de tratamiento. La introducción de semillas de caucho en la dieta determinó un incremento significativo en la concentración de MS (P<0.01) y en su salida (P<0.05). La excreción de agua, AGCC y amoníaco se elevaron significativamente (P<0.05) como consecuencia de la presencia de semillas de caucho en la dieta. No hubo efecto de tratamiento en la concentración fecal de AGCC y el pH, pero la concentración de amoníaco fue mayor (P<0.05) en las excretas de los cerdos alimentados con las semillas de caucho en comparación con los que no las comieron.

Se sugiere que se necesitan más grados de libertad para obtener la respuesta adecuada cuando los genotipos se comparan desde el punto de vista nutricional.

Palabras claves: *cerdos, Mong Cai, genotipo, salida fecal, fibra*

Título corto: *Salida fecal en cerdos Mong Cai*

INTRODUCTION

The use of high fibrous, sources of protein for feeding pigs is a reasonable strategy in the tropics. In the particular case of Cambodia, several fibrous feedstuffs, such as wheat bran, cassava foliage, water spinach and rubber seed, have been assayed as possible contributors to meet protein requirements in feed formulation for pigs (Ly 2005). In this connection, it is a common practice in Cambodian areas to feed pigs with these local products due to its relatively availability and not commercial value, if any. However it is well known that cell wall fraction determines changes in the pattern of digestion of nutrient in the pig (Wenk 2001), and the overall effect is an effective depression of availability of nutrients for pigs (Fernández and Jorgensen 1986). Therefore, basic research is needed to further know the alternatives to improve the efficiency in digestion of such fibrous feeds in pigs.

On the other hand, there are several local breeds of pigs in Indochina, which has been poorly study from the point of view of physiology of digestion. In this connection, Mong Cai pigs could be an illustration of the status quo of lack of information concerning the nature of digestive process occurring in these Vietnamese genotype. In fact up to now very few is know about its digestive capacity, and particularly, the efficiency of these breeds for using feedstuffs rich in cell wall. The present communication aimed to report the effect of graded levels of some Cambodian sources of fibre on faecal ouput of materials in Mong Cai pigs, and is complementary of another study concerning digestibility data (Pok Samkol and Ly 2008).

MATERIALS AND METHODS

Two diets, mainly consisting of wheat bran and full-fat rubber seed meal, were employed in this experiment, and the composition of these diets is presented in table 1. Whereas wheat bran was assessed in the local market, at Phom Penh City, rubber seeds were collected from Chub rubber seed plantations, Kampong Cham province, and were ground and then mixed with the other components of the diet.

The diets were formulated to contain approximately 18% crude protein, and wheat bran was substituted by 0 and 20% full fat rubber seed. The cyanide content of a representative sample of the batch of the rubber seeds revealed a content of 28 mg/kg DM. In this experiment, diet composition was equivalent to that used by Bun Tean et al (2002). Details of the diets are in table 1.

The experiment was conducted with a total of eight Large White and Mong Cai castrate male pigs of approximately 20 kg allocated at random according to breed into a two-period change over design (Gill and MacGee 1976; Gill 1978) to study the effect of full-fat rubber seeds on faecal characteristics of these animals. Mong Cai animals were from a herd of the Centre, and were originated from other Vietnamese herd which was kept at the University of Agroforestry, Ho Chi Minh City.

Every animal was housed in metabolism cages (Chiv Phiny and Rodríguez 2001). The diets were offered to the pigs as a meal at a rate of 35 g DM/kg body weight. Every experimental period consisted of 10 days, divided into two aequal five-day periods of adaptation and quantitative collection of feed refusals, feeds and urine (Pok Samkol and Ly 2008). Details concerning housing and daily work routine have been described elsewhere (Ly and Pok Samkol 2003). In this experiment, aliquots from faeces were collected at 12:00 m and 4:00 pm, conveniently pooled and sent to the laboratory in order to avoid a long stay of faeces under the metabolism cage. This procedure was repeated during five successive days, with independence of the daily quantitative collection of faeces from every pig. Samples of food and faeces were analyzed for DM by microwave radiation (Undersander et al |933), ash, crude fibre and N according to the Association of Official Analytical Chemists (AOAC 1990). The filtration alternative of Tsaras et al (1998) as undertaken by Ly et al (2003) was choose for the measurement of water holding capacity (WHC) of the samples. Faecal pH and bacterial metabolites were assayed as previously described (Ly and Pok Samkol 2003); in summary, total short chain fatty acid (SCFA) and ammonia in faeces were determined as decribed by Phimmasam et al (2004) after distilling a faecal slurry supernatant (fresh faeces to distilled water, 1:4 by weight) in a Keltec distilling unit. All analyses were conducted by duplicate.

Table 1. Details of the diets (percentage in dry basis)

	Full-fat rubber seeds, %	
Ingredients	**-**	**20**
Wheat bran	94.0	74.0
Fresh water dry fish	5..0	5.0
Full-fat rubber seeds	-	20.0
NaCl	0.5	0.5
Vitamins and minerals[1]	0.5	0.5
Analysis		
DM	88.02	86.97
Ash	6.14	5.56
Organic matter	93.86	94.44
NDF	30.84	36.95
Crude fibre	9.70	18.62
Nx6.25	18.05	18.05
WHC, g H2O/g DM[2]	4.85	6.15

[1] According to NRC (1998) requirements for vitamins and trace elements
[2] Water holding capacity (WHC) was determined according to Tsaras et al (1998). See text

Analyses of variance and correlation were conducted according to a standard technique (Steel et al 1997). The Minitab software (Ryan et al 1992) was used in the biometrical approach of data.

RESULTS

There was any symptom of cyanide intoxication in the pigs. All animals appeared in good health and during the duration of the trial (20 days), average daily gain of pigs was 340 g. there was no significant (P>0.05) effect of period on any of the parameters studied. Therefore the data were analyzed according to a factorial arrangement 2 x 2 with four replications per treatment. In this case, there was any significant (P>0.05) interaction genotype x diet in the evaluated measurements. The effect of genotype on faeces characteristics are in table 2. There were no significant (P>0.05) of genotype in any measurement determined in the faecal samples of pigs,

although faecal output of fresh material, water and dry matter appeared to be greater in Mong Cai pigs, in contrast to what occurred in Large White animals. This same trend was observed in faecal output of SCFA and ammonia. Faecal pH was unaffected by examined treatments.

Table 2. Faecal characteristics of pigs fed wheat bran and full-fat rubber seeds. Effect of genotype

	Genotype		
	Large White	Mong Cai	SE ±
n	8[1]	8	-
pH	6.82	6.83	0.05
DM, %	27.82	30.22	3.51
Metabolites, mmol/100 DM			
SCFA	49.53	46.32	4.87
Ammonia	26.68	27.74	2.46
Output, per kg DM intake			
Fresh material, g	878	929	73
Water, g	251	276	20
DM, g	627	653	72
SCFA, mmol	120.8	133.0	12.4
Ammonia, mmol	68.4	78.6	12.2

[1] Two observations per animal

Results concerning the effect of rubber seeds in the diets are presented in table 3. The introduction of rubber seeds in the diet determined a significant increase in faecal DM concentration (P<0.01) and output (P<0.05). The excretion of water, SCFA and ammonia were significantly (P<0.05) increased too as a consequence of the presence of rubber seeds in the diet. There was no effect of treatment on faecal SCFA concentration and pH, but ammonia concentration was greater (P<0.05) in faeces from pigs fed rubber seeds as compared to those which had no seeds in the feed.

Table 3. Faecal characteristics of pigs fed wheat bran and full-fat rubber seeds. Effect of rubber seeds

	Rubber seed, %		
	-	20	SE ±
n	8[1]	8	-
pH	6.82	6.84	0.04
DM, %	25.58	32.45	2.53**
Metabolites, mmol/100 DM			
SCFA	50.71	46.21	4.30
Ammonia	24.88	29.53	2.14*
Output, per kg DM intake			
Fresh material, g	946	862	71
Water, g	705	575	63*
DM, g	241	287	16*
SCFA, mmol	113.5	139.8	10.9*
Ammonia, mmol	60.3	86.8	10.4*

[1] Two observations per animal
* P<0.05; ** P<0.01

DISCUSSION

The observed changes in the pattern of faecal excretion of several compounds were more marked as influenced by the introduction of full-fat rubber seeds in the diet, as compared to the possible influence of genotype as those examined in the current investigation. This same findings has been observed in other previous studies from this laboratory when either rectal or faecal characteristics were from Mong Cai to Large White Animals (see for example, Chiv Phiny et al 2003; Ly et al 2003), and it appears that variability among individual observations does have not the same magnitude so as to detect significant levels of difference among treatments, if any, in dependence of the type of response in search. Even in very young piglets, Tranthi (2007) provided evidences in Vietnam that Mong Cai animals had advantages in rectal digestibility indices as compared to Landrace x Yorkshire pigs, but in this experiment 32 animals from every genotype were employed.

It appears that even in a basal diet rich in cell wall so as the herein evaluated, if partially substituted by full-fat rubber seeds, a remarkable effect may be found in faecal characteristics. It is probable that a decrease in overall DM digestibility caused by the presence of these seeds in the feed (Pok Samkol and Ly 2008), should originate an increase in DM concentration and output at the rectal site of pigs. On the other hand, modifications in the pattern of fermentation in caecum and colon of pigs must be expected, as determined by two different sources of cell wall containing feedstuff, according to a possible influence of different cell wall characteristics present in wheat bran and rubber seed (Bach Knudsen and Jorgensen 2001). It is possible that differences in water holding capacity of both feedstuffs should be the cause (Decuypere et al 1994). Even so, it is not known to what extent the fat content of rubber seeds could influence microbial digestion in the large intestine of pigs. Overall, differences due to a different rate of passage of digesta through the large intestine of pigs, either caused by the cell wall per se, or by dissimilitude in its physico-chemical properties (Pok Samkol et al 2004) could be responsible of variations in the status of microbial metabolites in colon and faeces, as it has been claimed by Bird et al (2000).

If it is considered that there were no changes in the rate of absorption of microbial metabolites in that part of the gastrointestinal tract, an increase in faecal ouput of SCFA and ammonia would be an indication in modifications to enhance microbial activity in caecum and colon. According to Varel (1987) and Varel et al (1984), dietary fibre affects to great extent microbial activity in pig large intestine. In this connection, Williams et al (1998) suggested that bacterial population of pig faces can be representative of that inhabiting large intestine. Changes in microbial activity could be interdependent with modifications in composition of colonic populations of bacteria in pigs.

According to the herein discussed results, more degrees of freedom are necessary for obtaining the adequate response when genotypes are compared from the nutritional point of view. From this it follows that more research is needed in this direction.

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