Effect of fiber source on the performance of weaned pigs from 4 up to 10 weeks of age[1]

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ABSTRACT: A study on the effect of feeding 2 levels of wheat bran and lucerne *(Medicago sativa)* on the performance of weaning pigs from 4 up to 10 weeks of age was carried out. Five diets were formulated based on 65.95% maize + 30% toasted soybean meal + 4% vitamin mix – 0.5% L-lysine-HC1. 10.75 and 21.50% wheat bran, and 8.63% and 17.26 lucerne meal were substituted into diets I; II; III and IV, to provide 1 and 2% additional dietary crude fiber. 95 weaned piglets were divided into 5 treatments groups with 2 replicates. Average daily feed intake (kg), weight gain (kg) and feed efficiency (kg pig/kg feed) of each diet group are respectively: 0.773;0.400 ;0.576 (basal diet); 0.776;0.409 ;0.562 (diet I); 0.713; 0.393 ;0.571(diet II); 0,743;0.366 ;0.552 (diet III) and 0.738;0.355 ; 0.523 (diet IV). Statistical analysis shows, there is no significantly difference ($p>0.05$) between the diet groups in all variable studied during the entire experiment**.** The conclusion is that the capability of the piglets to utilize fiber from wheat bran (up to 5.21%) and lucerne meal (up to 7.42%) were not different after 6 weeks of feeding trial. It is recommended that: 1). Providing weaned pigs with a single-setting value diet may not be adequate for 4 and 10 weeks of age; 2). The use of high levels of fiber but not higher than 7.5% CF could be a useful and economical tool in pig production.

Key words: fiber; weaned pig; lucerne; wheat bran; soybean.

INTRODUCTION

Fiber one necessary dietary components of pig's diet, has been studied widely in later decades. Inclusion of fiber or fibrous feeds in pig's diet is studied experimentally directly on pigs. Inborr *et al* (1993) studied the tolerance level of pig to fiber from production performance, Fernandez and Jørgensen (1986) and Chaebuti *et al* (1991) studied the nutrient digestibility and absorption; Rodriguez *et al* (1986) studied the development of digestive tract of pigs. The studies were purposed to understand the properties, characteristics and the tolerance levels and the role of fiber in pigs.

Van Soest (1985) explained that beside species (sources), properties and characteristics of fibers from different parts of plants are different; between oat and wheat bran are different, and stem contains higher cellulose and lignin than of leaves. These result in differences in digestibility of feeds in pig from mouth until large intestine of pigs. Since fiber stimulates the salivary gland in the mouth, gastric gland in the stomach and pancreatic gland in pancreas, Graham and Åman (1991) reported that volume of saliva of growing pigs increased as the fiber increased in the diet. In addition, Low (1985); Whittemore (1993) reported that gastric juice, HCl and pepsinogen of pigs secreted increased as fiber content from barley in the diet increased. Fernandez and Jørgensen (1986) reported that differences in chemical characteristics or properties among feeds and their components depress feed digestibility in pigs (and other animals) to various degrees. Although additional dietary fiber such as on increasing voluntary intake and seem good for pigs, Graham and Åman (1991) reported that every 1% increase in crude fiber can depress energy digestibility by 1.3% and growth by 2%.

However, the advantages of such an increase of gastric and pancreas juice and development of digestive tract are very important for the young pigs, such as a preparation for future digestion (Low, 1985; Hartog *et at*., 1986). Kyriazakis and Emmans (1995) found that daily feed intake of young growing pigs fed wheat bran from 500 up to 750 g (51-74 g crude fiber) per kg fresh diet was low at

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the beginning, but as the adaptation and development of digestive tract, it increased 1.54-1.77% times during the later period of the experiment. It shows that pigs can utilize high fiber in the diet whenever they have well adapted it and it can be reached by introducing pigs with high fiber diet since early ages. Krider *et al* (1982); Drochner (1991) suggested weaning age of pigs is the best stage to introduce high fiber diet started with 5-6% CF of DM and could be increased as the pigs grow older. It assumes that an introduction high fiber diet from the weaning age is a good idea to improve pig capability in utilize fiber but this (Calvert, 1991) explained is influenced by either source or level of the fiber.

Objective.-The study was proposed to evaluate the effect of 2 level of both wheat bran and lucerne meal on the performance of weaned pigs from 4 up to 10 weeks of age.

MATERIALS AND METHODS

95weaned (4 weeks of age, males and females) pigs from 18 litters with balance weight were used in the study. The piglets were divided into 5 treatment groups with 2 replicates of each group (50 for replicate one and 45piglets for replicate 2). The 5 treatment groups were randomly allotted *ad libitum* 5 treatment diets under the unbalance complete design of 5 treatments with 2 replicates. They were fed in weaning pens for 3 weeks (7 weeks of age) then moved into growing pens from fourth up to sixth week (8-10 weeks of age).

Feed intake was collected daily and body weight gain was measured weekly. Water was provided *ad libitum* and measured daily. The 5 treatment diets offered were formulated as: basal diet (10.5-10.8 g digestible lysine based); diet I (basal diet containing 107.5g wheat bran); diet II (basal diet containing 215g wheat bran); diet III (basal diet containing 86.3g lucerne in flower meal); and diet IV (basal diet containing 172.6g lucerne in flower meal). Diet compositions are shown in Table 1.

Table 1. Composition and nutrients content of the 5 treatment diets

	Diets				
Componenets	Basal diet	Diet I	Diet II	Diet III	Diet IV
Maize meal, kg	65.95	55.21	44.47	57.32	55.51
Soybean meal, kg	30	30	30	30	30
Wheat bran, g	--	10.75	21.50	--	--
Lucerne meal, g				86,3	172.6
Premix, kg	4	4	4	4	4
L-lysine, g	50	40	35	50	50
Nutrients, g/kg DM					
DM	87.42	87.43	87.61	88.13	88.22
CP	206.59	215.94	234.68	232.61	237.67
Fat	32.72	33.51	34.13	33.59	33.10
CF	40.84	43.69	48.17	52.08	70.51
ADF + ADL, g/kg	3.96 + 0.76	4.64 + 0.89	5.30 + 1.22	5.87 + 0.95	7.61 + 1.48
Lysine, g/kg	13.11	13.39	14.72	15.42	15.08
Ca + P	8.3 + 7.86	8.43 + 8.48	8.54 + 9.08	8.89 + 7.94	8.92 + 8.15

RESULTS AND DISCUSSION

The average daily feed intake, daily body weight gain and feed efficiency of the piglets are repeatedly shown in Table 2, 3 and 4.

Table 2. Average daily feed intake of the piglets during entire experiment (42 days) (gram)

Replicate	Basal diet	Diet I	Diet II	Diet III	Diet IV	Average
1	817	742	683	761	778	756
2	727	810	742	725	697	740
Average[ns]	773	776	713	743	738	749

[ns] Non significance

As shown in Table 2, including 10.75kg (added CF 1%) wheat bran increased slightly feed intake to higher than basal diet then decreased at level 21.5kg (added 2%); but including 8.63 – 17.26kg (added CF 1-2%) lucerne meal tend to depress feed intake slightly. Statistically analysis, either increasing or depressing of feed intake was not significantly different ($p>0.05$).

Slightly increasing feed intake by adding 1% CF of wheat bran agrees with study by Low (1985).This increasing could be associated with reduction of transit time of feeds in stomach and small intestine of piglets resulting in a faster emptying (Bach Knudsen, 1991). Feed intake depressed by adding 2% CF of wheat bran is assumed as the fiber content of diet was above of the tolerable levels of piglet at the such age (4-10 weeks) (Kyrizakis and Emmans,1994).

Slightly reducing feed intake by adding 1-2% CF of lucerne meal may more associated with fiber characteristics rather than only fiber level. Fiber of lucerne meal contains both ADF and ADL higher than these in wheat bran (Van Soest, 1985) that are resistant to digestive enzymes (Wallace *at al*, 1991).

Table 3. Average daily weight gain of the piglets during entire experiment (42 days) (gram)

Replicate	Basal diet	Diet I	Diet II	Diet III	Diet IV	Average
1	436	408	398	420	402	413
2	360	410	387	306	306	352
Average[ns]	400	409	393	366	355	384

[ns] Non significance

Statistical analysis of effect of treatment was not significant ($p>0.05$) on daily weight gain of piglets. It could have been related to the similarity in feed intake of piglets among treatment groups. A slightly difference in ADF and ADL fractions between the two fiber sources seemly has only a little impact on the difference in body weight gain between the treatment groups. It seems that range of difference up 50% in either NDF or NdL content (Table 1) could perform a similar body weight gain of 4 -10 weeks of age piglets. Agree with Acker and Cunningham (1991) could be assumed that such range differences perform the similar results in both feed digestion and absorption resulting in a similarity in body weight gain.

Table 2. Average feed efficiency of the piglets during entire experiment (42 days) (gram)

Replicate	Basal diet	Diet I	Diet II	Diet III	Diet IV	Average
1	534	550	583	552	518	547
2	495	506	522	422	439	477
Average[ns]	515	528	552	487	479	512

[ns] Non significance

Statistical analysis showed that there was no significant difference among treatment groups. It assumed that this has a strong relation with the similarity in both feed intake and body weight gain for feed efficiency is a conversion (result) of feed consumed into body gain. Therefore, it is logic that the similarity in feed intake resulting in a similarity in body weight gain will perform a similarity in feed efficiency too. The result may show that the piglets have a similar capability in adapting the high fiber diet as they are at the same age and breeds. This result is lower than result of study by Kalasica *et al* (1989) adding 3% lucerne meal in a corn-soybean diet of 4-10 weeks piglets.

CONCLUSIONS

The capability of piglets in utilize the two fiber source were low and slightly different from the beginning but not significantly different after 6 weeks of feeding trial Inclusions of wheat bran and lucerne meal into a corn-soybean based diet for weaned pigs in order to provide an additional 5-7 crude fiber are beneficial from economic view point, because it can reduce the cost per kg diet. Study the inclusion of 1 - 2 % CF of wheat bran should be continued as it indicated an improvement on performance of piglets, although it was not significantly different with others.

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