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On-farm comparison of Mong Cai and Large White pigs fed ensiled cassava root, rice bran and duckweed

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Abstract

The hypotheses to be evaluated in this study were: Mong Cai pigs would eat greater amounts of duckweed (*Lemna minor*) than Large White pigs; and that duckweed growing well in natural ponds would be a suitable on-farm source of protein for diets based on rice bran and ensiled cassava roots. Eight Mong Cai piglets (2 - 14 kg) and eight Large White pigs (from 10 - 13 kg) were used for this study. Four farm families were selected to participate in the experiment. Each farmer received two Mong Cai and two Large White piglets. The pigs were fed fresh duckweed and ensiled cassava root ad libitum and a fixed amount of rice bran (500 g/pig/day). Feed intake was recorded daily and the pigs were weighed every ten days.

The Mong Cai pigs grew faster than the Large White pigs and this was consistent for every participating family. The average liveweight gain (g/day) for Mong Cai pigs was 200 and for Large White pigs 87. Mong Cai pigs ate a greater proportion of their diet in the form of duckweed with the result that their protein intake was higher (48.2 g/day) than for the Large White pigs (27.9 g/day). Dry matter conversion was better in the Mong Cai.

The results of this on-farm experiment provide some indications that there may be an interaction between nutrition and genotype when a critical component of the diet (eg: protein) is present in a voluminous vegetative state as is the case for fresh duckweed.

Key words : Pigs, Mong Cai, Large White, protein, duckweed, ensiled cassava root

Introduction

The Mong Cai breed is the most numerous of the pig breeds in North Vietnam (Le Ba Lich 1995). Of the estimated 1.45 million sows in the North, 40-45% are of the Mong Cai breed. It is highly appreciated as the female line for crossing with exotic White pigs to produce crossbred progeny for fattening (Rodriguez et al 1996). Farmers consider that the advantages of the Mong Cai are in its ability to utilize local feed resources especially fibrous vegetative feeds of low protein content (Rodriguez and Preston 1997). However, there appear to be few studies comparing the Mong Cai with "improved" White breeds using diets based on local feed resources. In the study reported by Lai and Rodriguez (1998) there were no apparent differences between Mong Cai and Large White piglets in their capacity to digest or retain nitrogen when fed diets based on sugar cane juice or ensiled cassava roots supplemented with either fresh duckweed or ensiled cassava foliage. However, there were only four pigs of each breed type and the restrictive conditions of the metabolism cage may have been a factor limiting the full expression of the eating behavior of the pigs.

A study was therefore undertaken to compare the performance of piglets of the Mong Cai And Large White breeds managed by small farm householders and fed local resources available at farm and village level.

Materials and Methods

Working with the farmers

Organization and preparation of the trial

The An Phu village in Thu Duc district, Ho Chi Minh City was chosen for the study as it has many lakes and ponds where water spinach (*Ipomoea aquatica*) and duckweed grow naturally. The families in the village traditionally harvest water spinach for human consumption and for pigs. The duckweed is also harvested mainly to sell in the market and in some cases for feeding to ducks. However, it seems there is no experience of feeding duckweed to pigs.

Several visits and meetings were held to establish communication with the farmers in the village. The purpose of the visits was to find:

- The main constraints to animal production
- How the farmers used the local resources

- *Find a possible solution to improve the situation in this village.*

Criteria about the site

The farmers in the village had previous experience in pig raising, but mainly with pigs of the "improved" breeds of commercial Landrace, Large White and Duroc and their crosses and with feeding systems based on the use of purchased balanced pig feeds. The experience of the farmers was that after deducting the price of the piglet and the feed there was little profit from this activity. Abandoned pig sheds in the village were proof that the "commercial" system was not sustainable.

Experimental design and planning

After several meetings and after securing the agreement of the farmers, the experimental design and feeding plan were presented and discussed. The purpose of the presentation was to hear comments and suggestions from the farmers about the conduct of the trial. It was agreed that each of four farm families would raise 4 pigs, two of each of the Mong Cai and Large White breeds and that the feeding system would be based on ensiled cassava root, rice bran and duckweed harvested daily from the ponds. Selection of the farmers was based on the following criteria:

- Experience in growing duckweed and having access to ponds where duckweed was already growing
- Main income derived from farming and experience with raising pigs
- Interested in working with researchers

A contract was signed among three sides (farmer, researcher and farmer's union) concerning the agreed conditions required for the trial.

Monitoring of the experiment

The farm families were the main source of labour to conduct the experiment with the assistance from the researcher when the pigs were to be weighed . Several visits were made to the village during the experiment so that the farmers could easily communicate with the researcher and so facilitate the solving of problems that happened during the experiment.

Presentation of results to the farmers

A farmers meeting was organized after the experiment. The farmers who had the best results were encouraged to explain to the others the reasons for their success.

Experimental procedure

Climate details

The experiment was conducted from March to August 1997. During the whole experiment (three months) the temperatures ranged from 24 ºC to 38 ºC; minimum humidity was 60% and the maximum 100%.

Animals

Eight Mong Cai pigs (from 2 - 14kg) were supplied from the Finca Ecologica and eight Large White pigs (from 10 - 13kg) were purchased from the pig farm of the College of Agriculture and Forestry. All the pigs were vaccinated against swine fever, de-wormed and ear-notched for identification.

Feeding system

Duckweed was harvested every morning in the ponds that belonged to each of the families. Cassava roots were bought from neighbours, milled by machine into chips and then ensiled with added salt (5 g/kg). The silage was prepared at least 8 weeks before the start of the experiment. Rice bran was acquired from the market.

Experimental design

Each farmer received four pigs which were provided by the researcher. Two were of the Mong Cai breed and two were Large White.

Measurements

Feed intake was recorded every day . The amounts offered were weighed and the following day the refusals were collected and weighed so as to estimate daily feed intake. The pigs were weighed the first time before starting the experiment and then every ten days. Samples of feeds offered were taken at monthly intervals for dry matter estimation by micro-wave (Undersander et al 1993); the bulked dry samples were analyzed for nitrogen (AOAC 1985). Data on feed composition are in Table 1.

Table 1: Content of dry matter (DM) and nitrogen (N) in the feeds

	DM, %	N in DM, %
Duckweed	4.60	5.8
Rice bran	92.0	1.95
Ensil cassava root	40.5	0.35

Statistical analysis

Liveweight gain was calculated for individual pigs by linear regression of liveweight (dependent variable) on days from start of trial (independent variable). The data were subjected to analysis of variance using the General Linear Model (GLM) procedure of Minitab (1991) with initial liveweight as covariant. Farm families were considered as replicates.

Results and discussion

The pigs were generally healthy, with only a few cases of diarrhoea during the first days of introducing the experimental diets. Growth rates of the pigs for each farm family are shown in Figure 1 together with overall means. Data on liveweights and feed intake are in Table 2.

Table 2: Comparative performance of Mong Cai (MC) and Large White (LW) weaned pigs fed ensiled cassava root, rice bran and fresh duckweed (all data except initial and final weights were corrected by covariance for differences in initial weight). There were two pigs of each breed in each of four family farm households

	LW	**MC**	**SE/Prob**
Initial wt, kg	11.3	6.38	0.38/ 0.001
Final wt, kg	20.7	22.6	0.64/ 0.06
ADG, g/day	87.1	200	7.5/ 0.001
DM conversion	2.52	2.02	
Intake, g/day			
Dry matter	242	314	25/ 0.24
Protein	27.9	48.2	3.6/ 0.075
Diet composition, % of DM			
Protein	12.0	15.1	0.96/0.003
Duckweed protein	58.4	72.5	0.19/ 0.001
Rice bran	41.4	28.3	0.16/ 001
Ensil. cassava root	36.6	39.2	0.27/0.03
Duckweed	21.9	32.6	0.37/0.003

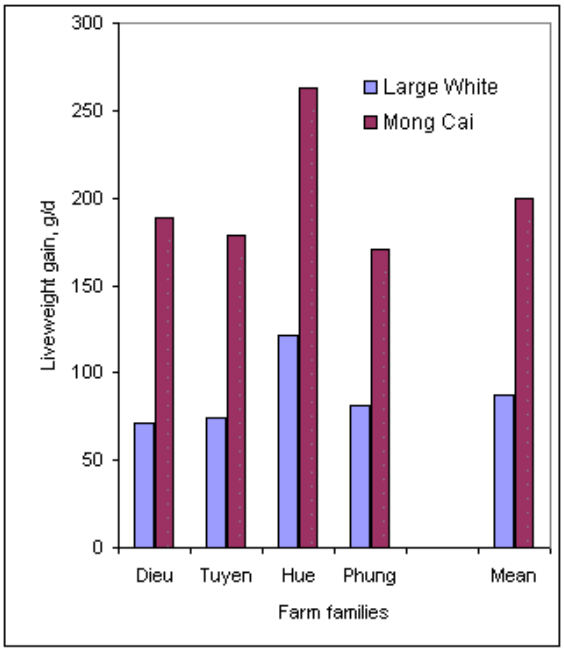

Figure 1: Comparative growth rates of Large White and Mong Cai pigs fed rice bran, ensiled cassava root and duckweed on four farms (SE of mean ±7.5; P=0.001)

Mong Cai pigs grew faster (200 g/day) than the Large White pigs (87 g/day) (SE of means ±7.5; P=0.001). These growth rates are normal for Mong Cai (a survey of on-farm data reported a range of 180 - 200 g/day; Nguyen Kim Dong 1998) but much lower than the norm for Large White which would be expected to be of the order of 400 - 500 g/day (Nguyen Thi Loc et al 1997).

The feeding regime was such that the allowance of rice bran was restricted (300 rising to 500 g/day/pig) while the duckweed and ensiled cassava root were fed to appetite. Under these conditions the Mong Cai pigs ate almost twice the amount of duckweed compared with the Large White pigs (Figure 2) and as a result had significantly higher intakes of protein (48 and 28 g/day, respectively; Table 2). At such low rates of protein intake the Large White pigs were unable to express their genetic potential for growth. Unlike the Mong Cai pigs they could not adapt their eating pattern to consume more of the high protein duckweed. The reason for this difference in eating behavior may be that the exotic pig needs more time than the local Mong Cai pig in order to adapt to an unconventional feed such as freshly harvested duckweed. It is relevant to report that in a recently concluded on-station experiment, with the same two breeds and similar diets, the Mong Cai grew faster than the Large White during the first two months following weaning but this situation was subsequently reversed in the succeeding two months (Nguyen Van Lai 1998, unpublished data) when the Large White demonstrated the faster growth. While this could indicate the effect of adaptation to the duckweed in the diet, another factor could have been the effect of onset of puberty in the early maturing Mong Cai which is known to reduce feed intake (Nguyen Kim Dong 1998). This is an obvious topic for future research.

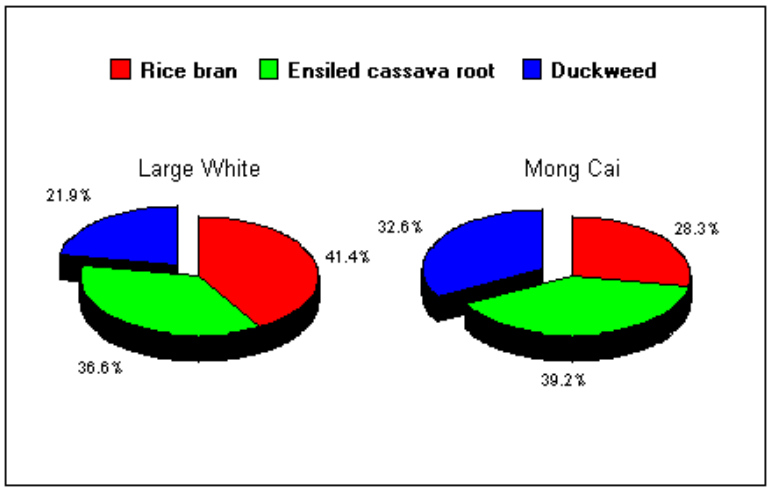

Figure 2: Relative intakes of duckweed, ensiled cassava roots and rice bran

Conclusions

The Mong Cai undoubtedly have a lower potential growth rate than Large White yet they grew significantly faster under small farm conditions on a diet in which the main protein source was duckweed offered on a free choice basis as a supplement to a fixed amount of rice bran and free choice ensiled cassava root. The apparent reason was that the Mong Cai were able to consume a significantly greater proportion of their diet in the form of duckweed, thus their diet was richer in protein of good quality and they were therefore able to grow faster than the genetically superior (for growth rate) Large White pigs.

The results of this on-farm experiment provide some indications that there may be an interaction between nutrition and genotype when a critical component of the diet (eg: protein) is present in a voluminous vegetative state as is the case for fresh duckweed.

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References

AOAC 1985 Official methods of analysis. Association of Official Agricultural Chemists. 12th edition, Washington DC

Le Ba Lich 1995 Animal production in Vietnam in the plan for year 2000. (In Vietnamese). Agriculture Publishing House 1995

Minitab 1991 Statistical software (Minitab inc, 3081 Enterprise drive, State College, PA, 1680 - 3008, 1991, USA)

Nguyen Van Lai and Lylian Rodriguez 1998 Digestion and N metabolism in Mong Cai and Large White pigs having free access to sugar cane juice or ensiled cassava root supplemented with duckweed or ensiled cassava leaves. Livestock Research for Rural Development. Volume 10, Number 2 (http://www.cipav.org.co/lrrd)

Nguyen Kim Dong 1998 Preliminary determination on the growth and oestrous of Mong Cai pig. Report of the Agriculture, Forestry and Fishery centre of College of Agriculture and Forestry, National Vietnam University, Ho Chi Minh City

Rodríguez Lylian and Preston T R 1997 Local feed resources and indigenous breeds: fundamental issues in integrated farming systems; Livestock Research for Rural Development. Volume 9, Number 2 (http://www.cipav.org.co/lrrd)

Rodríguez Lylian, Preston T R and Dolberg F 1996 Participatory Rural Development: "Experiences in Binh Dien and Xuan Loc Villages in Central Vietnam. Livestock Research for Rural Development. Volume 8, Number 2(http://www.cipav.org.co/lrrd)

Undersander D, Mertens D R and Thiex N 1993 Forage analysis procedures. National Forage Testing Association. Omaha pp:154

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