ผลของการใช้กากถั่วเหลืองหมักนมเป็นแหล่งโปรตีนในสูตรอาหารต่อสมรรถภาพการผลิตของสุกรไทยพันธุ์พื้นเมือง

Effect of Soybean meal fermented with milk (SBMFM) as a protein source in diet on the performance of Thai native pigs

Sineenart Polyorach*, Ornanong Poungchompu2 and Metha Wanapat1

บทคัดย่อ: งานทดลองครั้งนี้วัตถุประสงค์เพื่อศึกษาผลของการใช้กากถั่วเหลืองหมักนมเป็นแหล่งโปรตีนในสูตรอาหารต่อสมรรถภาพการให้ผลผลิตของสุกรไทยพันธุ์พื้นเมือง การศึกษาครั้งนี้ใช้สุกรพันธุ์พื้นเมืองจำนวน 8 ตัว โดยใช้แบบการทดลองแบบ t-test เพื่อเปรียบเทียบระหว่างการใช้กากถั่วเหลืองหมักนมเป็นแหล่งโปรตีนในสูตรอาหารกับกลุ่มควบคุมเป็นระยะเวลา 30 วัน จากผลการทดลองพบว่าสุกรพันธุ์พื้นเมืองในกลุ่มที่ได้รับกากถั่วเหลืองหมักนมเป็นแหล่งโปรตีนในสูตรอาหารได้รับผลที่ดีกว่ากลุ่มควบคุม ซึ่งตัวแปรที่มีการเปลี่ยนแปลงที่สำคัญคืออัตราการเจริญเติบโต และอัตราการแปลงอาหารที่ดีกว่ากลุ่มควบคุมซึ่งผ่านการทดสอบทางสถิติ (p<0.05) ทำให้เห็นว่ามีการใช้กากถั่วเหลืองหมักนมเป็นแหล่งโปรตีนที่มีประสิทธิภาพในการเพิ่มอัตราการเจริญเติบโตและอัตราการแปลงอาหารในสุกรไทยพันธุ์พื้นเมือง

คำสำคัญ: กากถั่วเหลืองหมักนม, ยีสต์, ชีวินทรีย์ที่ผลิตกรดแลคติก, สมรรถภาพการผลิต, สุกรไทยพันธุ์พื้นเมือง

ABSTRACT: The objective of this study was to study effect of soybean meal fermented milk (SBMFM) as a protein source in diet on production performance of Thai native pigs. Eight growing native pigs were used in t-test to compare between the use of SBMFM as a protein source in diet group and control group. The experiment was conducted for 28 days. The results revealed that the native pigs fed SBMFM as a protein source in the diet were higher significant (P<0.05) in average daily gain (ADG) and feed conversion ratio (FCR) than pigs fed control group. In conclusion, SBMFM is a new alternative high quality protein source and could improve ADG and FCR of Thai native pigs.

Keywords: soybean meal fermented milk (SBMFM), yeast, lactic acid bacteria, production performance, Thai native pigs

1 ศูนย์วิจัยและพัฒนานาทวิทยากรอาหารสัตว์ มหาวิทยาลัยขอนแก่น 40002
2 สาขาวิชาสัตวศาสตร์ คณะทรัพยากรธรรมชาติ มหาวิทยาลัยเทคโนโลยีราชมงคลอีสาน วิทยาเขตสกลนคร

* Corresponding author: neenart324@hotmail.com
Introduction

At present, most of the northern Thai native pigs are still traditionally raised by hill tribes or smallholders due to customs, religion and for use in ritual sacrifice. Initially, research concern Thai native pigs was conceived to be useful only for comparisons that such research made possible between native pigs and other breed pigs. This was case during the period when Thailand’s commercial pigs industry was being developed.

In livestock productions, the protein and essential amino acids content of most formula feeds manufactured in many poor tropical developing countries fall far short of the stipulated standards for adequate growth and performance of the animal for which the feed is intended. It is possible for the feed manufacturer, by improving protein sources performance with is very important. Soybean (Glycine max) is an economic crop used for both human and animal feeding. Soybean meal is the by-product of the extraction of soybean oil. It is the most important protein source used to feed farm animals. Soybean meal is usually standardized commercially to contain 44% or 48% crude protein. Moreover, yeast (Saccharomyces cerevisiae) and lactic acid bacteria has been widely used for protein production. Eukaryotic and prokaryotic microorganisms can be considered a suitable host for the production because firstly, growth of microorganism is very much fast, secondly, a broader range of materials may be considered as suitable substrates depending on the microorganism chosen. The process of protein enrichment of animal feed using microorganisms to improve the nutritional value of animal has been evaluated (Oboh, 2006). This method of upgrading the protein content of cassava has been developed. Recently, Oboh and Akindahinsi (2003) reported that S. cerevisae could also be used for enriching cassava products. Boonnop et al. (2009) demonstrated that supplementation of cassava chip with Bakers’ yeast (S. cerevisiae) could increase crude protein from 2% to 32.4%.

Research has indicated that fermented soybean meal have improved feed efficiency and AA digestibility (Min et al., 2004; Kim et al., 2007; Cho et al., 2008; Jones et al., 2010). The fermentation process is thought to eliminate residual trypsin inhibitors and some oligosaccharides in soybean meal that can decrease pig performance. Kim et al. (2010) showed that FSBM (Fermentation of SBM by A. oryzae) as a novel vegetable protein source increased CP concentrations from 50.3 to 55.3% without affecting concentrations of the major limiting AA for pigs. Moreover, Polyorach et al. (2012) reported that yeast fermented cassava chip protein (YEFECAP) could be prepared to increase crude protein level up to 47%. The beneficial of YEFECAP has been evaluated (Polyorach et al., 2010; Wanapat et al., 2011). Recently, Polyorach et al. (2014) studies the improving of soybean meal nutritive value by using yeast and lactic acid bacteria, it was found that when soybean meal fermented milk with yeast and lactic acid bacteria could improve nutritional value of soybean meal by significantly (p<0.05) increased CP and EE, especially, CP was increased from 46.8 up to 70.6%DM while ADF was significantly (p<0.05) decreased, both, CF and NDF were numerically decreased when compared with unfermented group. However, the used of soybean meal fermented milk as a feed for animal still lack of data.

Therefore, the objectives of these study was to study effect of Soybean Meal Fermented Milk (SBMFm) as a protein source in diet on the performance of Thai Native pigs.
Materials and Methods

Preparation of soybean meal fermented milk (SBMFM)

SBMFM preparation was done according to the method of Polyorach et al. (2014) and some details are as follows:

**Fermented milk process:** 
*Activated yeast:* weight Baker’s yeast 20g into a flask mixed with sugar 20 g and distill water 100 ml. then incubated at room temperature for 1 h (A).  
*Activated Lactic acid bacteria:* mixed commercial yoghurt 50 g, molasses 25 g and distilled water 25 ml incubated at room temperature for 2 h (B). Mix (A) and (B) with 500 g of raw milk (pH 5-7) then flushed with air for 4 days at room temperature by using air pump (600 W).

**Soybean meal fermented milk production:** 
After fermented milk for 4 days, mixed fermenting milk with soybean meal in tank at proportion 1.5:1 kg, fermented for another 3 days and then sun-dry until dry (2 days). Products were used as a protein source for animal.

Experimental Diets and Animal

A total of 8 growing pigs (Thai Native pigs, 60 d old) with an average initial body weight (BW) of 11.0 ± 5 kg were used in a 28-d growth trial. The experimental diets were soybean meal (control group) and soybean meal fermented milk (SBMFM group).

Pigs were assigned to 2 groups according to 4 pigs per group (2 males and 2 females). Dietary used in this experiment as showed in Table 1. Individual pig weight and feed consumption of each pen were recorded on d 0, 7, 14 and 28 to evaluate ADG and FCR.

Statistical analysis

All data were statistically analyzed according to the t-test (SAS, 1998) to compare the chemical composition, ADG and FCR of the two treatments (control and SBMFM). Each treatment was containing 4 replications. Treatment means were statistically compared using Duncan’s New Multiple Range Test (Steel and Torrie, 1980). Differences were assumed to be significant at P<0.05.

Result and Discussion

The chemical compositions of dietary used in this experiment were showed in Table 1. Crude protein and metabolisable energy between Control and SBMFM group were similarly.

Table 2 showed effect of SBMFM as a protein source in diet on final weight, dry matter intake (DMI), growth performances (ADG) and feed conversion ratio (FCR). It was found that the pigs in SBMFM group could improved (P<0.05) final weight, DMI, ADG while numerically decreased FCR when compared with control group, This might be due to SBMFM contained height quality of protein. Polyorach et al. (2014) studied the improving of soybean meal nutritive value by using yeast and lactic acid bacteria, it was found that fermented soybean meal with yeast and lactic acid bacteria could improve nutritional value of soybean meal by significantly (p<0.05) increased CP and EE, especially, CP was increased from 46.8 up to 70.6%DM. ADF was significantly (p<0.05) decreased while CF and NDF were numerically decreased when compared with unfermented group. Moreover, the results from this study probably due to effects of lactic acid bacteria and yeast contained in SBMFM which affected on improved production perform-
ance of Thai native pigs. The result related with Giang et al. (2010) reported that lactic acid bacteria complexes, comprising combinations of Enterococcus faecium6H2 (3×10^8 CFU g⁻¹), Lactobacillus acidophilus C3 (4×10^6 CFU g⁻¹), Pediococcus pentosaceus D7 (3×10^6 CFU g⁻¹), L. plantarum1K8 (2×10^6 CFU g⁻¹) and L. plantarum 3K2 (7×10^6 CFU g⁻¹), increased (p<0.05) daily feed intake and weight gain and improved feed conversion ratio. Some reports have indicated that feeding lactic acid bacteria by Lactobacilli improves performance in suckling pigs (Abe et al., 1995), weanling pigs (Jasek et al., 1992), grower pigs (Baird, 1977) and finishing pigs (Hong et al., 2002; Jonsson and Conway, 1992). Live yeast supplementation to the diet of pigs has resulted in demonstrable improvements in growth rate (Mathew et al., 1998) and reductions in the quantity of pathogenic bacteria (Anderson et al., 1999).

Table 1 Composition of experimental diets

<table>
<thead>
<tr>
<th>Ingredients</th>
<th>Control</th>
<th>SBMFM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rice bran</td>
<td>76.0</td>
<td>84.4</td>
</tr>
<tr>
<td>Soybean meal</td>
<td>23.4</td>
<td>-</td>
</tr>
<tr>
<td>SBMFM</td>
<td>-</td>
<td>15</td>
</tr>
<tr>
<td>Premixed</td>
<td>0.35</td>
<td>0.35</td>
</tr>
<tr>
<td>Salt</td>
<td>0.25</td>
<td>0.25</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Crude protein, %</td>
<td>16.32</td>
<td>16.4</td>
</tr>
<tr>
<td>Metabolisable energy, MJ/kg</td>
<td>2.8242</td>
<td>2.8788</td>
</tr>
</tbody>
</table>

1SBMFM= Soybean meal fermented milk, Premix supplied per kg diet 4,000,000 I.U Vit.A, 800,000 I.U Vit. D3, 12,000 I.U Vit E, 0.80g Vit K, 0.60g Vit B1, 2.0g Vit B2, 1.40g pantothenic acid, 20.00mg biotin, 0.40g folic acid, 120.0g cholinechloride, 8.0g zinc, 40.0g manganese, 18.0g iron, 0.80g copper, 0.60g iodine, 0.09g cobalt, 0.04g selenium, 36.0g lasalocid (Avatec)

Table 2 Growth performances and feed conversion ratio of Thai Native pigs in this experiment.

<table>
<thead>
<tr>
<th>Dietary</th>
<th>Control</th>
<th>SBMFM</th>
<th>SEM</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial weight (kg)</td>
<td>11.7</td>
<td>11.4</td>
<td>0.35</td>
<td>ns</td>
</tr>
<tr>
<td>Final weight (kg)</td>
<td>15.2&lt;sup&gt;a&lt;/sup&gt;</td>
<td>17.1&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.39</td>
<td>*</td>
</tr>
<tr>
<td>DMI (g/d)</td>
<td>417.0&lt;sup&gt;a&lt;/sup&gt;</td>
<td>486.0&lt;sup&gt;b&lt;/sup&gt;</td>
<td>11.07</td>
<td>*</td>
</tr>
<tr>
<td>ADG (g/d)</td>
<td>125.0&lt;sup&gt;a&lt;/sup&gt;</td>
<td>203.6&lt;sup&gt;b&lt;/sup&gt;</td>
<td>12.88</td>
<td>*</td>
</tr>
<tr>
<td>FCR</td>
<td>3.3</td>
<td>2.4</td>
<td>0.19</td>
<td>ns</td>
</tr>
</tbody>
</table>

<sup>ab</sup> Value on the same row with different superscripts differ (P<0.05), SEM= standard error of the means, ns = non significant difference, ADG = average daily gain, DMI = dry matter intake, FCR = feed conversion ratio, control = control group, SBMFM = soybean meal fermented milk as a protein source group
Conclusions and Recommendations

Based on this study, it could be concluded SBMFM as a new alternative high quality protein source could improve ADG and tended to improve FCR in Thai native pigs.

Acknowledgements

The authors would like to express their most sincere thanks to all who have assisted and supported the research in this study, particularly Department of Animal Science, Faculty of Natural Resources, Rajamangala University of Technology-Isan, Phang Khon, Sakon Nakhon, Thailand for kind facilitation in the use of the equipment, laboratory and analysis.

References


