Effect of Wheat Bran Utilization on the Performance of Finishing Pig at Tang Hang Ly Farm

SIEK DARITH
Royal University of Agriculture, Phnom Penh, Cambodia
Email: sdarith@yahoo.com

Abstract The experiment was conducted at the Tang Hang Ly pig farm, located in Kandal province. 24-crossbred growing pigs were identified initially as T_0, T_1, T_2, T_3 with average weight 49.17±0.75 kg, 49.33±1.37 kg, 49.33±1.63 kg, 49.83±1.47 kg respectively. The aims of this research were, (1) to determine the optimum level of wheat bran in the diet for growing-finishing pig and (2) to evaluate the economic efficiency of using wheat bran in pig diet. The experiment was randomly designed by CRD (completely randomized design) and was divided into four treatments and three replicates. There were two pigs in each replicate and the pigs were offered feed with different levels: 0%, 25%, 35% and 45% of wheat bran in the feed concentration. The results showed that, the average daily weight gain in T_2 (610.4±38.3g) with the 35% concentration of wheat bran was significantly higher than the feed concentrations of 45% in T_3 (570.8±79.7g) and 25% in T_1 (562.1±71.58g). The control diet in T_0 had a weight gain of 558.6±88.62g. The daily feed intake was highest with the 35% wheat bran concentration in T_2 (2.231±0.02 kg/head), followed by lower feed intake with the wheat bran concentrations of 45% in T_3 (2.018±0.11 kg/head). This did not differ from the control diet in T_0 (2.032±0.23 kg/head) and the 25% wheat bran concentration in T_1 (2.023±0.09 kg/head). It was noted that the diet of T_2 with a wheat bran concentration of 35% consumed the most feed compared to the other treatments. Besides, there was a significant interaction with feed conversion ratio (P<0.05) in which T_2 (3.66±0.21) were much higher than T_0 (3.65±0.24), T_1 (3.62±0.34), and T_3 (3.55±0.21). This means that wheat bran was more effective if it was used at a lower feed concentration in order to gain 1 kg of meat. In conclusion, the results showed that the T_2 which was fed the 35% concentration of wheat bran could be utilized effectively as basal diet for growing finish-pig, which started from 50 kg to 100 kg, with superior economic returns.

Keywords pigs, wheat bran, feed conversion ratio (FCR), feed intake (FI), weight gain

INTRODUCTION

Pig meats are the main current concern for food of human and food security in rural areas if people did not know how effective and efficient to raise pigs. Therefore, pig raising is a vital part to increase profitability of household income, and because farmers really want to find out new techniques of raising pigs with low spending and suitable level of nutrition, many scientists are trying to develop new techniques for them. As Pok et al.(1998) reported that it would have high demand for human-being in which provide meat account for 58 percent of total meat output, and 31 percent of world meat produce by developing countries in 1980 and would produce 60 percent in 2020.

Currently, the number of farms to raise pigs is gradually increasing in Cambodia meanwhile the demand on pig meats is sharply increased. Looking to the general census 2008 compiled by the ministry of planning, the population in Cambodia has 11,437,656 in 1998 to 13,395,682 in 2008 which has increased by about 1.96 million during the decade 1998-2008, it reach to 15,500,000 people in 2010. This showed that the higher demand increases, the more pigs need to be raised. Anyways, farmers in Cambodia mostly used traditional techniques to raise pigs without analyzing

the economics. For instance, they raised pigs with kitchen wastes and vegetable wastes with rice bran, etc. Also, some farmers had new acceptable techniques to raise pigs efficiently and effectively but they still not knew the benefit of wheat bran with other feed ingredients. The wheat bran had the cellular less than rice bran and it was also good smell and easily melted when the pigs ate (Sodany, 2005).

As consistent with Harris et al. (1982) reported that metabolism energy of wheat bran, calcium, and phosphor was about 2210 kcal/ kg, 0.13%, and 0.81% respectively. For the experiment in RUA (2008), it was about 18.14 for crude protein, 85.35% for dry matter and 9.62% for crude fibre in the wheat bran. These showed that the wheat bran had high benefit for farmers to raise their pigs. Moreover, the effect of wheat bran utilization on performance of finishing pigs was still not clearly investigated.

MATERIALS AND METHODS

There were four treatments to make an experiment at Tang Hang Ly pig farm, where located at Sdaou Kanlaeng village Dei Edth commune Kien Svay district Kandal province around 25km off Phnom Penh city, Cambodia.

Animals and experimental design

24-crossbred growing pigs (Large white x Landrace) were put initially by T_0, T_1, T_2, T_3 with average live weight 49.17±0.75 kg, 49.33±1.37 kg, 49.33±1.63 kg, 49.83±1.47 kg respectively. All pigs were de-wormed and vaccinated before making the experiment. The experiment was randomly designed by CRD (completely randomize design) that divided by four treatments and three replicates for each. There were two pigs to put in each replicate and offered feed by different dietary treatment as shown in table 1.

- T_0: Control (Mize, Broken rice, Soybean meal, Fish meal)
- T_1: Maize, Broken rice, Soybean meal, Fish meal within 25% of Wheat Bran
- T_2: Maize, Broken rice, Soybean meal, Fish meal within 35% of Wheat Bran
- T_3: Maize, Broken rice, Soybean meal, Fish meal within 45% of Wheat Bran

Table 1 Experimental design by CRD

Replicates	Treatment			
1	T_0	T_1	T_2	T_3
2	T_1	T_0	T_3	T_2
3	T_3	T_2	T_1	T_0

Feed and feeding

In table 2, the composition of feed stuffs used for the experiment was focused on maize, broken rice, soybean meal, fish meal, and wheat bran. The diets were formulated by the two growing phases; first, it was from 50-100 kg (phase1) in table 3 and 80-100 (phase2) in table 4. The daily feed allowance was distributed equally into 3 meals per day: morning at 7:00 am, afternoon at 12:00 pm and evening at 5:00 pm.

Table 2 Chemical composition of the feed stuffs used in the experiment

Feed stuff	DM,%	ME (kcal/kg)	% of dry matter		
			CP	Ca	P
Maize	84.70	3350	9.84	0.09	0.14
Broken rice	90.00	2976	7.50	0.20	0.40
Soybean meal	89.61	3757	49.80	0.26	0.67
Fish meal	93.76	3341	64.10	5.10	2.90
Wheat bran	88.90	2210	14.29	0.10	1.10

Table 3 Ingredient and chemical composition of the diets in Phase 1 (50-80 kg)

Ingredient, %	T_0	T_1	T_2	T_3
Maize	48.50	36.00	36.00	36.10
Broken rice	31.00	19.40	10.00	0.00
Wheat bran	0.00	25.00	35.00	45.00
Soybean meal	8.80	8.00	8.00	6.60
Fish meal	10.20	8.60	7.50	7.40
Salt	0.50	0.50	0.50	0.50
Premix	0.50	0.50	0.50	0.50
Minerals	0.50	0.50	0.50	0.50
oil	0.00	1.50	2.00	3.40
Total	100.00	100.00	100.00	100.00
Composition , % in DM (except for ME which is in kcal/kg DM)				
ME	18.00	18.00	18.00	18.00
Crude Protein	3218	3056	3004	3000
Calcium	0.84	0.74	0.68	0.66
Phosphorus	0.50	0.71	0.75	0.80

Table 4 Ingredient and chemical composition of the diets in Phase 2 (80-100 kg)

| Ingredient, %	T_0	T_1	T_2	T_3
Maize	54.00	44.00	39.00	29.00
Broken rice	30.00	16.00	11.00	10.50
Wheat bran	0.00	25.00	35.00	45.00
Soybean meal	6.00	5.00	5.00	5.50
Fish meal	8.50	7.00	6.00	5.00
Salt	0.50	0.50	0.50	0.50
Premix	0.50	0.50	0.50	0.50
Minerals	0.50	0.50	0.50	0.50
oil	0.00	1.50	2.50	3.50
Total	100.00	100.00	100.00	100.00
Composition , % in DM (except for ME which is in kcal/kg DM)				
ME	16.00	16.00	16.00	16.00
Crude Protein	3211	3056	3016	2960
Calcium	0.75	0.66	0.60	0.55
Phosphorus	0.48	0.64	0.69	0.75

Measurements and statistical analysis

Feed consumption was balanced for the amounts given and then subtracted any remaining feed. The remaining feed and given one was recorded by every morning. If the remaining feed was wet, it had to dry up and rebalanced for estimating the intake amount. The pigs were individually weighed for every10 days at 5:30 in the morning before feeding and watering. Economic returns were estimated using current market prices of feed ingredients and lives pigs. Moreover, all data from the experiment were stored in Microsoft Excel and analyzed by ANOVA using SPSS Version 12.0 to analyze on compared mean, daily growth, feed intake, and others.

RESULTS AND DISCUSSION

Average of growing weight every 10 days

Regarding 80 day-experiment in pigs' farm by balancing pigs for every 10 days, there were many records of dietary, feed composition and average weight. In Fig.1 illustrated about the changing comparison between the average growing weights of crossbred pigs for four different treatments: T_0, T_1, T_2 and T_3. The pig growing trend for each treatment was not quite different from each other since the beginning of dietary.
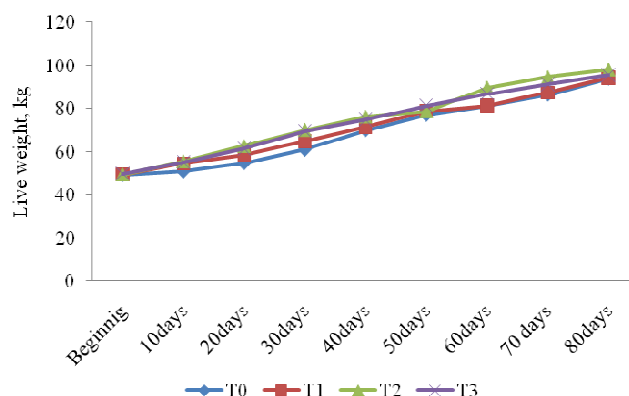
Fig. 1 Average daily growing weight every 10 days of trail

As the start of the experiment which was divided by T_0, T_1, T_2, and T_3 with average live weight 49.17±0.75 kg, 49.33±1.37 kg, 49.33±1.63 kg, 49.83±1.47 kg respectively. After providing the different level of wheat bran, the result for 80 days showed that the growth weigh of the crossbred pigs was exactly the same at all weighing in which was made for every 10days, excluding the second and third weighing at all statistically significant level (P < 0.05). Therefore, the average growing weight of crossbred pigs was 93.83±7.41 kg, 94.33±5.71 kg, 98.17±3.82 kg, and 95.50±5.96 kg for T_0, T_1, T_2, and T_3 respectively. However, the highest growing treatment was in T_2, which was put about 35% of wheat bran.

Live weight, feed intake and feed conversion ratio

Feed was the main factor for growing pigs in the farm, but it had to have the fattening and watering in order to get more profits. There were four treatments to be experimented in Tang Hang Ly Farm in which there were four different feed compositions to put for each trial. What the difference was the composition of wheat bran of all trials. In table 5, the effect of wheat bran on performance and intake of crossbred-pig growths was mentioned about the changing comparison of each treatment. Moreover, in fig.2, it was also shown about the net weigh gain of the crossbred pigs in each treatment.

Table 5 Effect of Wheat Bran on performance and intake of crossbred growing pigs

	T_0	T_1	T_2	T_3	Prob.
Live weight, kg					
Initial	49.17±0.75	49.33±1.37	49.33±1.63	49.83±1.47	0.84
Final	93.83±7.41	94.33±5.71	98.17±3.82	95.50±5.96	0.47
Daily gain, g	558.33±88.62	567.50±71.58	610.42±38.30	570.83±79.70	0.59
Feed intake, kg/head					
Total	325.13±36.40	323.73±14.05	356.93±3.24	322.88±18.17	0.23
Daily	2.03±0.23	2.02±0.09	2.23±0.02	2.02±0.11	0.23
Daily gain, g/head	278.75±20.57	219.79±24.64	242.71±9.15	181.14±7.24	0.00
Feed conversion radio, kg feed/kg gain	3.65±0.24	3.62±0.34	3.66±0.21	3.55±0.21	0.95

The wheat bran was used by different level for each treatment. In the table 5 shown that the average daily weight gain for T_2 of wheat bran 35% was about 610.4±38.3g and it was the significantly highest of all treatments while T_3 with wheat bran 45% was around 570.8±79.7g, T_1 with wheat bran 25% was probably 567.5±71.58g, and the control diet in T_0 gained weight about 558.3±88.62g. As Chansery (2004) which was experimented about the wheat bran composition for pig meats by using 10%, 20%, 30% and control reported that there was the effect of wheat bran for the pig growth when the higher input of wheat bran was. So, T_2 using 35% of wheat bran was reasonable to grow pigs effectively.

Daily feed intake was quite different from each treatment. T_2 using the 35% of wheat bran was the highest of daily feed intake and followed by T_0 (control), T_1 using the 25% of wheat bran and T_3 consisting of the 45% of wheat bran. For T_2, T_0, T_1, and T_3 the pig ate about 2.231±0.02 kg/head, 2.032±0.23 kg/head, 2.023±0.09 kg/head and 2.018±0.11 kg/head respectively. This was consistent with Chansery. (2004) reported that the daily feed intake was in the control which had no any wheat bran. However, the experiment resulted that T_2 was not so quite different from T_0 (control). It was that T_2 and T_0 was good for the daily feed intake but maybe not for the weight growth on T_0 in contrast toT_2.

Besides, there was a significant interaction with feed conversion radio at $P<0.05$ in which T_2 (3.66±0.21) were the highest of T_0 (3.65±0.24), T_1 (3.62±0.34), and T_3 (3.55±0.21). It showed that wheat bran was better if it was used less as feed concentration in order to gain 1 kg of pig meat. According to NRC (1988), feed conversion ratio of pig was 3.79, so it had to put 3.79 kg of feed concentration for getting 1 kg of pig meat. Therefore, with this experiment, the feed conversion ratio was in T_2. Moreover, it was really quite better compared to Chansery. (2004) who reported at 30% of wheat bran composition, the feed conversion ratio was about 4.70. Therefore, the result showed that at the 35% of wheat bran, it influenced to the weight growth of crossbred pigs to grow fast but the feed conversion ratio was less. This was consistent with Muir et al. (1992) reported that using the wheat bran for growing pigs was about 30% and 50% for fattening pigs. Also, Godinho (1986) shown that the wheat bran could be added up to 30% for the growing animals.
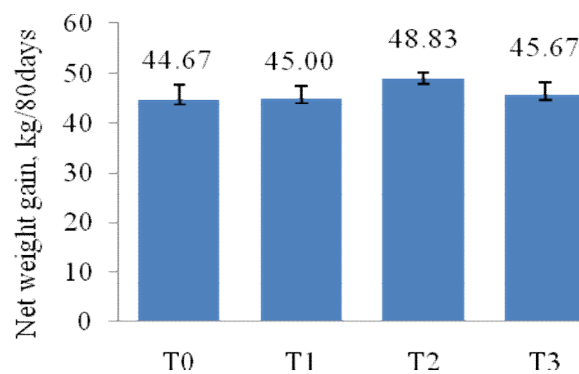

Fig. 2 Net weigh gain during 80 days

Table 6 Economic analysis of the trial with finishing pigs

	T_0	T_1	T_2	T_3
Piglet cost, riel	417,900	419,300	419,300	423,500
Feed cost, riel	547,200	503,700	530,700	481,400
Medicine cost, riel	10,000	10,000	10,000	10,000
labor and depreciation of cage, riel	40,000	40,000	40,000	40,000
Reservation cost 5%, riel	50,700	48,700	50,000	47,800
Total cost, riel	1,065,800	1,021,700	1,050,000	1,002,700
Total finishing growth weight, kg	93.83	94.33	98.17	95.50
Market price/kg, riel	11,500	11,500	11,500	11,500
Total revenue, riel	1,079,045	1,084,795	1,128,955	1,098,250
Marginal over cost, riel	13,245	63,095	78,955	95,550
Economic Efficiency	1.01	1.06	1.08	1.10

After long period of raising pigs, economic analysis was very important to find out how effective and effecient the wheat bran was for growing pigs. As the table above, there were four trials: T_0, T_1, T_2, and T_3. The economic efficiency of T_0 was 1.01 which was meant that if the trial spent 100 riel, the net profit was 1 riel, and T_2 was 1.06 which was better than T_0. The highest one was in T_3 in which economic efficiency was about 1.10. If the trail of T_3 spent 100 riel, the net profit was 10 riel followed by T_2 which was 8 riel. However, the weight gain in T_2 was the highest of all treatments.

CONCLUSION

Raising pigs had to analyze about the growth, weight gain, and economic efficiency, so not just the farmers, many scientist had tried more and more for finding new techniques and dietary nutrition for raising pigs. As the experiment conducted, 35% of wheat bran could be utilized effectively as basal diet for growing finish-pig which started from 50 kg to 100 kg if compared to the other treatments in the trial. These diets significantly improve growth performance without affecting carcass quality with acceptable economic returns. Although its economic efficiency was lower than that of 45% of wheat bran, the weight gain was the highest of all treatments. Thus, the trial in T_2 which composed with 35% of wheat bran was accurately acceptable and it could be recommended for producers.

ACKNOWLEDGEMENTS

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