



Traditional Feeding Practices with Brewer's Cake (*Xaj pitha*) on Growth Performance of Crossbred Pigs

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ABSTRACT

The present investigation was conducted for a period of 6 months from April, 2022 to September, 2022 under the Department of Livestock Production and Management, at institutional pig farm (30- Sow Teaching Unit), College of Veterinary Science, Assam Agricultural University, Khanapara, Guwahati, Assam, India to evaluate the effect of feed prepared by using *Xaj pitha* on crossbred Hampshire pigs. The experiment was conducted to study the impact of feeding indigenously fermented feed on growth performance of crossbred Hampshire pigs under farm condition. A total of 18 weaned Crossbred Hampshire pigs irrespective of sex with an average age of around 8 weeks were randomly selected for the study. Thereafter, the piglets were divided into three experimental treatment groups viz., Standard Conventional feed (T_0), Indigenously fermented feed by using traditional Brewer's Cake (*Xaj pitha*) (T_1) and boiled feed (T_2). Findings revealed a significant effect ($p < 0.01$) on final body weight of pigs fed with indigenously fermented feed when compared to boiled feed and conventional feed. No significant difference was found in average final daily body weight gain, feed consumption and feed conversion efficiency of the crossbred Hampshire pigs in different experimental groups. The digestibility co-efficient of crude protein and ether extract were significantly higher ($p < 0.01$) in group fed with fermented feed as compared to groups given boiled feed and conventional feed. From the present study it can be concluded that pigs fed with fermented feed by using traditional brewer's cake (*Xaj pitha*) had better results in comparison to pigs given conventional feed and boiled feed.

KEYWORDS: Brewer's cake, body weight, feed intake, digestibility, pigs

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1. INTRODUCTION

Livestock industry produces a variety of foods for human use, including meat, milk and eggs. Approximately 10.25 mt of meat are produced during 2023–24 in India (Anonymous, 2024). Among livestock options, piggyery emerges as a potent force for uplifting the socio-economic status of resource-poor farmers. As per the 20th livestock census (Anonymous, 2019) the total pig population in India is 9.06 million, which is 1.26% of the total livestock population. Improving feed efficiency is essential for profitable pig production because feeding costs account for about two thirds of all production costs in the swine industry (Liao and Nyachoti, 2017). For thousands of years, fermented foods and beverages have played a vital role in human and animal diets. Several scientists have reported the beneficial effects of fermented medicinal plants on growth performance, immune system and meat quality of broilers and pigs (Kim et al., 2012; Jeong and Kim, 2015; Zhou et al., 2015). Feeding fermented feed to weaned pigs may improve nutrient digestibility and gut health and thereby reduce diarrhea incidence (Le et al., 2016). Fermented feed additives promoted growth at all stages. The improvement in pig growth performance with FF supplementation is attributed to enhanced feed efficiency, which results from improved nutritional value and nutrient availability rather than increased feed intake (Mukherjee et al., 2016; Zhang et al., 2018; Xu et al., 2020). Feeding of Fermented liquid feed (FLF) either with *Lactobacillus acidophilus* or *Enterococcus faecium* to grower-finisher pigs enhance growth performance and improve economic returns for pig farmers (Buragohain et al., 2022). The high cost of oil cakes and cereals prevents farmers from funding the expensive feeding programs. Therefore, in order to create an affordable feeding program for pigs and other livestock, animal nutritionists used to look for novel feed supplies, particularly unconventional feeds (Abd El-Hack et al., 2017a; 2017b). One such unconventional feed resource that farmers is brewer's rice byproduct; use to lower feed costs for swine (Barman et al., 2020), as well as other livestock such as Rabbit (Adeniji and Adewole, 2015), lamb (Radzik et al., 2018), broiler chicken (Abd El-Hack et al., 2019) and beef cattle (Stefanello et al., 2019). A brewer's rice product locally referred as 'Mewa' or 'Juguli', is sometimes used as feed for pigs in tribal and rural areas of North Eastern states of India (Barman et al., 2020). In Northeast India, particularly in the state of Assam, various tribes have a rich tradition of preparing fermented rice beers. These beers, known by different names like *Apong* (Mising tribe), *Xaj-Pani* (Ahom tribe), *Sujenfero* (Deori tribe), and *Jou-Bishi* (Boro tribe), are not just beverages but hold cultural and religious significance. Amongst these *Xaj-pani* or *Xaj* is intricately associated with the social and religious belief system of the *Ahoms* or *Tai-Ahoms*, an ethnic

community of Assam (Saikia et al., 2007). The traditional fermentation process of *Xaj* involves mixing of parboiling rice with the ethnic starter culture called *Xaj pitha*. The starter culture (*Xaj pitha*) contains a diverse community of microorganisms viz. starch degrading moulds (fungi), alcohol-producing yeasts and lactic acid bacteria maintained on substrates like rice powder supplemented with various herbs specifically adapted to control and safe fermentation of rice (Keot et al., 2020). These organic starter cultures traditionally employed in preparing rice beers hold immense potential for preparation of fermented feed for sustainable pig production. Therefore this study was conducted to know the effect of feeding indigenously fermented feed prepared by using *Xaj pitha* on growth performance crossbred Hampshire pigs.

2. MATERIALS AND METHODS

The present study was conducted for a period of 6 months from April, 2022 to September, 2022 in the institutional pig farm (30- Sow Teaching Unit) College of Veterinary Science, Assam Agricultural University, Khanapara, Guwahati-22. The study was conducted after being approved by the Institutional Animal Ethics Committee.

Eighteen (18) weaned Crossbred Hampshire pigs irrespective of sex with an average age around 8 weeks were randomly selected for the study. Thereafter, the piglets were divided into three experimental treatments groups (T_0 , T_1 and T_2) depending upon nearness of body weight and age in such a manner that each treatment consisted of six pigs. The T_0 group was provided with standard non-fermented feed, while the T_1 group received indigenously fermented feed starting at 8 weeks of age. The T_2 group was fed standard conventional feed that was boiled, cooled, and then given to the animals.

The ingredient of the concentrate mixture included Maize, Wheat bran, Rice polish, Ground nut cake (DO), Fish meal, Mineral mixture and common Salt. The experimental rations were prepared as per BIS (Anonymous, 2005b). The ration was provided in two halves i.e. morning at 9 am and afternoon 3 pm.

Fermented feed was prepared with locally available brewer's cake *Xaj pitha* which is used for preparation of rice beer with standard conventional feed. The brewer's cake was thoroughly mixed and moistened with the standard conventional feed at the rate of 1:1 i.e. 1 number of *Xaj pitha* in 1 kg of feed. This mixed feed was kept in airtight polythene bags to ferment for 72 hours at 35–37°C temperature and a sweat fermented smell indicated good fermentation of feed which may take 7 to 10 days (Amadou et al., 2009). This indigenously fermented feed was offered

to T₁ group of pigs.

The fortnightly body weight, average daily gain, average daily feed intake, feed conversion efficiency and digestibility trial were recorded during the experimental period. The protein content of grower ration was 20.29, 22.23 and 19.95 in T₀, T₁ and T₂ group, respectively and for finisher ration was 18.74, 19.16 and 17.38 in T₀, T₁ and T₂ group, respectively. The proximate composition was done as per AOAC (Anonymous, 2005a).

The experimental data were analyzed by using one way ANOVA, two way ANOVA and Post-Hoc test were carried out based on Tukey's Honestly Significant Difference method. Statistical software package used for the analysis was SYSTAT 13.2.

3. RESULTS AND DISCUSSION

3.1. Growth performance

The average initial body weights of crossbred pigs were 9.33±0.43, 9.45±0.41 and 9.38±0.23 kg in Group T₀, T₁ and T₂, respectively and were not significant ($p>0.05$) among each other. Thereafter, a gradual increase in the fortnightly body weight was recorded with a highly significant difference ($p<0.01$) in between the groups. The final body weight at 13th fortnight was recorded as 85.98±0.43, 95.01±0.70 and 89.84±0.92 kg in Group T₀, T₁ and T₂, respectively (Table 1). Similar findings were reported by Rahman et al. (2015), Balasubramaniam et al. (2016), Buragohain et al. (2022), Haldar et al. (2017) and Vazquez and Brenner (2020) while Chu et al. (2012) and Ahmed et al. (2018) reported that

Table 1: Fortnightly average body weight (kg) of experimental animals

Fortnight	Experimental group			<i>p</i> value
	T ₀	T ₁	T ₂	
Initial	9.33±0.43	9.45±0.41	9.38±0.23	0.975
1 st	10.75 ^b ±0.27	12.32 ^a ±0.30	11.17 ^b ±0.30	0.004
2 nd	14.98 ^b ±0.19	17.34 ^a ±0.26	15.54 ^b ±0.53	0.001
3 rd	20.11 ^b ±0.20	22.84 ^a ±0.41	20.19 ^b ±0.64	0.001
4 th	25.51 ^b ±0.24	28.44 ^a ±0.74	25.39 ^b ±0.80	0.007
5 th	31.11 ^b ±0.29	34.14 ^a ±0.52	31.71 ^b ±0.54	0.001
6 th	37.01 ^b ±0.15	39.89 ^a ±0.64	38.04 ^b ±0.65	0.005
7 th	43.24 ^b ±0.26	46.29 ^a ±1.06	44.82 ^b ±0.58	0.028
8 th	49.51 ^b ±0.33	53.47 ^a ±0.57	51.62 ^c ±0.53	0.000
9 th	56.24 ^b ±0.93	60.82 ^a ±0.90	58.44 ^{ab} ±0.71	0.006
10 th	63.14 ^b ±1.89	68.65 ^a ±0.59	65.41 ^{ab} ±0.77	0.021
11 th	70.26 ^b ±0.45	76.57 ^a ±0.57	72.76 ^c ±0.87	0.000
12 th	77.53 ^b ±0.59	85.49 ^a ±1.57	80.39 ^c ±0.81	0.000
13 th	85.98 ^b ±0.43	95.01 ^a ±0.70	89.84 ^c ±0.92	0.000

*Means in columns with different superscript differs significantly

there was no significant difference among the groups when given fermented mushroom by-product and fermented bamboo vinegar liquid, respectively.

The average final daily body weight gain of the crossbred Hampshire pigs in different experimental groups were 0.39±0.03, 0.44±0.03 and 0.41±0.03 kg in group T₀, T₁ and T₂, respectively and no significant difference was found (Table 2). Similar findings were observed by Lan et al. (2016), Ahmed et al. (2018), Dowarah et al. (2018), Buragohain et al. (2022) and Roy (2022). The reports on average daily gain found to be lower than the present findings as reported by Chu et al. (2012) and Le et al. (2016). From the present study, it has been observed that the pigs

given fermented feed (T₁) achieved higher weight gain which might be due to high protein content of fermented feed.

3.2. Feed consumption and feed conversion efficiency

The average daily feed intake was recorded as 1.46±0.14, 1.32±0.14 and 1.40±0.14 kg, in T₀, T₁ and T₂ respectively where no significant difference was recorded among the groups (Table 3). Similar findings were reported by Dung et al. (2005), Giang et al. (2011), Chu et al. (2012), Missotten et al. (2015) and Le et al. (2016). Higher average daily feed intake than the present study were reported by Buragohain et al. (2022) in large white Yorkshire pigs. In the feeding trial carried out by Cheng et al. (2017), the pigs' diet containing

Table 2: Average daily gain (kg) in body weight of experimental animals

Fortnight	Experimental group			<i>p</i> value
	T ₀	T ₁	T ₂	
1 st	0.09 ^b ±0.02	0.19 ^a ±0.02	0.12 ^b ±0.03	0.022
2 nd	0.28±0.03	0.33±0.02	0.29±0.05	0.481
3 rd	0.34±0.02	0.37±0.02	0.31±0.05	0.526
4 th	0.36±0.02	0.37±0.07	0.35±0.06	0.938
5 th	0.37±0.03	0.38±0.06	0.42±0.06	0.773
6 th	0.39±0.01	0.38±0.06	0.42±0.07	0.871
7 th	0.42±0.02	0.43±0.04	0.45±0.06	0.826
8 th	0.42±0.02	0.48±0.11	0.45±0.05	0.831
9 th	0.45±0.08	0.49±0.05	0.45±0.07	0.894
10 th	0.46±0.07	0.52±0.05	0.46±0.04	0.666
11 th	0.47±0.11	0.53±0.05	0.49±0.02	0.868
12 th	0.48±0.05	0.59±0.10	0.51±0.09	0.623
13 th	0.56±0.05	0.63±0.13	0.63±0.06	0.809
Overall	0.39±0.03	0.44±0.03	0.41±0.03	0.624

*Means in columns with different superscript differs significantly

Table 3: Average daily feed intake (kg) of experimental animals

Fortnight	Experimental group			<i>p</i> value
	T ₀	T ₁	T ₂	
Initial	0.61±0.04	0.55±0.02	0.60±0.04	0.452
1 st	0.75±0.06	0.66±0.01	0.70±0.03	0.282
2 nd	0.82±0.07	0.76±0.03	0.77±0.05	0.643
3 rd	0.95±0.06	0.86±0.05	0.90±0.04	0.468
4 th	1.16 ^a ±0.07	0.97 ^b ±0.02	1.09 ^a ±0.01	0.046
5 th	1.32±0.05	1.16±0.05	1.24±0.03	0.073
6 th	1.49±0.07	1.30±0.04	1.43±0.02	0.054
7 th	1.65 ^a ±0.02	1.45 ^b ±0.03	1.58 ^a ±0.04	0.002
8 th	1.79±0.05	1.66±0.01	1.76±0.04	0.078
9 th	1.92±0.05	1.83±0.05	1.88±0.04	0.437
10 th	1.95±0.03	1.92±0.02	1.96±0.03	0.503
11 th	1.96±0.05	1.93±0.02	1.98±0.02	0.532
12 th	1.98 ^a ±0.03	1.74 ^b ±0.06	1.83 ^b ±0.03	0.015
13 th	2.03 ^a ±0.06	1.76 ^b ±0.03	1.86 ^b ±0.04	0.007
Average	1.46±0.14	1.32±0.14	1.40±0.14	0.790

*Means in columns with different superscript differs significantly

fermented soyabean meal had higher average daily feed intake as compared to the control group. The differences in findings might be due to different breeds and environmental conditions at the time of experiment.

Feed conversion efficiency of an animal is defined as unit of feed consumed per unit gain in body weight. The feed conversion efficiency was calculated as 3.99±0.35, 3.25±0.14 and 3.65±0.24, respectively in T₀, T₁ and T₂ groups. The feed

conversion efficiency did not show any significant difference in between the groups (Table 4). More or less similar trend on feed conversion efficiency was reported by Aguilera-Soto et al. (2009) in pigs given wet brewers grain, Lan et al. (2016) on feeding *Lactobacillus acidophilus* on weaned pigs and Roy (2022) in Hampshire pigs. A lower feed conversion efficiency than the present study was found by Ahmed et al. (2018), Dowarah et al. (2018), and Buragohain et al. (2022). The differences in feed conversion efficiency might be due to differences methodology in experiment, breeds and agro-climatic conditions.

Table 4: Feed conversion efficiency of experimental animals

Fortnight	Experimental group			<i>p</i> value
	T ₀	T ₁	T ₂	
1 st	7.93	3.44	5.91	
2 nd	2.92	2.26	2.66	
3 rd	2.78	2.34	2.90	
4 th	3.21	2.59	3.15	
5 th	3.55	3.05	2.95	
6 th	3.78	3.38	3.39	
7 th	3.97	3.40	3.49	
8 th	4.28	3.47	3.88	
9 th	4.28	3.74	4.15	
10 th	4.24	3.67	4.22	
11 th	4.13	3.66	4.04	
12 th	4.08	2.93	3.59	
13 th	3.60	2.77	2.96	
Overall	3.99±0.35	3.25±0.14	3.65±0.24	0.051

*Means in columns with different superscript differs significantly

3.3. Digestibility trial

The digestibility co-efficient of the group fed fermented feed (T₁) had better results than pigs fed with boiled feed (T₂) and conventional feed (T₀) in crossbred Hampshire pigs. The digestibility co-efficient of crude protein and ether extract were significantly higher ($p < 0.01$) in T₁ group than T₀ and T₂ groups (Table 5). Similar findings were recorded by Yu et al. (2008), Giang et al. (2010), Dowarah et al. (2018), Lee et al. (2018), Barman et al. (2020) and Buragohain et al. (2022). The reports on digestibility co-efficient were in contrary with Balasubramaniam et al. (2016) and Shi et al. (2016). According to Yu et al. (2008), weaned pigs fed a diet supplemented with *Lactobacillus fermentum* and Lactobacilli complex showed increased apparent crude protein digestibility ($p < 0.05$). They speculated that this could be due to the production of lactic acid and

proteolytic enzymes, which improved nutrient digestion in the gastrointestinal tract.

Table 5: Digestibility co-efficient of pigs under different experimental groups

Group	T ₀	T ₁	T ₂	<i>p</i> value
DM	81.51±1.36	82.21±0.55	81.22±0.97	0.783
CP	79.84 ^b ±0.66	82.68 ^a ±0.39	80.75 ^b ±0.32	0.007
EE	51.32 ^b ±0.67	53.95 ^a ±0.49	51.67 ^b ±0.43	0.014
CF	45.24±0.68	47.50±0.46	46.96±0.65	0.061
NFE	87.85±0.16	88.95±0.24	88.12±0.38	0.051

4. CONCLUSION

Feeding of fermented feed to growing-finishing pigs resulted in significant improvement in the growth performance of the crossbred pigs than the conventional and boiled feed. Feed intake did not show any significant difference in the crossbred pigs, however the feed conversion efficiency was better in the animals fed with fermented feed compared to the conventional feed and boiled feed. The nutrient digestibility was better in the animals fed with fermented feed.

5. FURTHER RESEARCH

Further study with larger sample size might be very beneficial to understand and exploit the benefit of the present study for the pig production.

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