# EFFECT OF YEAST (*SACCHAROMYCES CEREVISIAE)* AS FEED ADDITIVE ON GROWTH PERFORMANCE OF WEANED PIGLETS

**BHIM KUMARI SUBBA[1*], UGYEN LHADEN[1], GYEMBO TSHETEN[2] AND TENZIN PENJOR[3]**

[1]College of Natural Resources, Royal University of Bhutan, Lobesa, Punakha.
[2]Livestock Research & Extension Division, Department of Livestock, Thimphu.
[3]National Livestock Research Centre, Bumthang.

*Author for correspondence: bimkumarisubbha@gmail.com



**ABSTRACT:** The study was carried out to assess the effect of yeast (*Saccharomyces cerevisiae*) as a feed additive on the growth performance of weaned piglets. A total of 28 weaned piglets with an average age of 45 days were selected and allocated into four groups of seven piglets each; control group ($T_0$) with no yeast supplemented, and treatment 1 ($T_1$), treatment 2 ($T_2$), and treatment 3 ($T_3$) with 2%, 4% and 6% yeast-supplemented in their diet respectively. During the 42-day experimental period, the weight gain of the piglets and Feed Conversion Ratio (FCR) were taken weekly. Average initial body weight was 9.97 ± 1.46 kg for $T_0$, 9.97 ± 1.14 kg for $T_1$, 9.83 ± 0.94 kg for $T_2$, and 9.84 ± 0.90 kg for $T_3$. The result indicated that the body weight gain differed significantly (p = .014) between different treatment groups. $T_1$ obtained the highest weight gain (7.27 ± 1.87 kg) when compared to $T_0$ (4.78 ± 0.69 kg), $T_2$ (6.80 ± 1.63 kg) and $T_3$ (6.34 ± 0.90 kg). Moreover, there was a significant difference, (p = .016) in Average Daily Gain (ADG) of the experimental animals between different treatment groups. The ADG was significantly higher for $T_1$ (0.172 ± 0.045 kg) compared to $T_0$ (0.113 ± 0.016 kg), $T_2$ (0.161 ± 0.038 kg) and $T_3$ (0.150 ± 0.21 kg) proportionately. However, the results suggested that the FCR among the treatment groups did not differ significantly (p = .063). Nevertheless, $T_1$ (3.91 ± 0.91 kg) showed the lowest FCR compared to $T_0$ (5.16 ± 0.76 kg), $T_2$ (4.15 ± 1.14 kg) and $T_3$ (4.22 ± 0.61 kg) correspondingly. This study concludes that yeast (*Saccharomyces cerevisiae*) as a feed additive improved the growth performance of weaned piglets, and piglets supplemented with 2% yeast had a noticeable effect on weight gain, ADG, and FCR compared to the other treatment groups.

**Keywords**: ADG; FCR; Performance; Piglets; Treatment; Yeast.

## 1. INTRODUCTION

Pig farming is a viable and profitable enterprise that can be easily taken up by poor farmers (Dietze, 2011). In Bhutan, piggery farming is still dominated by smallholder farms which are mostly concentrated in the southern belts. According to Nidup (2011), some farmers in the southern belt rear pigs on a commercial scale while in the other regions operate on a smaller scale. Piggery farming is considered very crucial as it is one of the main sources of income and livelihood of farmers and also contributes to the socio-economic development of the farming communities. As per NSB (2022), Bhutan has 22954 pigs which constitute about 1.3% of the total livestock population. Feeding of pigs with appropriate feed additive is essential in pig farming to ensure proper health, growth and productivity. Probiotic yeast is one of the alternatives to increase digestibility and feed efficiency with minimum cost.

Although, over the last three decades, the pig production in Bhutan has gained momentum

and popularity, it is still confronted with many underlying challenges. The main challenges in pig farming are the rising feed cost, low feed efficiency and high production costs, and frequent disease outbreaks in the farms due to transboundary animal diseases. One of the most important aspects of raising pigs for pork production is feeding them appropriately. The rising cost of commercial feeds is one of the key bottlenecks for setting up piggery farms. This is because feed alone accounts for approximately 70% of the total pig production costs (Bocian et al. 2017). As a result, improving feed efficiency is crucial for the profitability of pig production (Patience 2012).

To improve feed efficiency or the metabolic utilization of dietary nutrients, a healthy gut or gastrointestinal tract is essential for better feed digestion and nutrient absorption by the epithelial membranes (Willing et al. 2012). Healthy pigs can efficiently utilize dietary nutrients for tissue accretion, resulting in improved production performance and a higher return on investment for swine producers (Pickard 2017). However, at the moment, very limited information is available on the effect of feed additives on the growth and production performance of pigs. Although yeast is considered as one such feed additive to boost pig growth, no proper scientific research has been done so far to establish the facts. Thus, this study is designed to assess the effect of yeast (*Saccharomyces cerevisiae*) as feed additive on growth performance of the weaned piglets.

## 2. MATERIALS AND METHOD

### 2.1 Study area

The on-farm feeding trial was conducted in National Piggery Research and Development Centre (NPiRDC) in Gelephu under Sarpang Dzongkhag. The study was conducted for a period of 42 days.

### 2.2 Experimental Design

A total of 28 weaned piglets were selected and allocated in a group using Randomized Complete Block Design (RCBD). All the 28 piglets were allocated to four different treatment groups of seven piglets each. The piglets were supplemented with different concentration of yeast (*Saccharomyces cerevisiae*) as additive with the concentrate feed.

The treatment groups were control ($T_0$) without yeast supplement, treatment 1 ($T_1$) with 2% yeast, treatment 2 ($T_2$) with 4% and treatment 3 ($T_3$) with 6% yeast supplementation in their diet as adopted by Kim (2008) and Kabugo et al. (2014). Animals were fed twice a day with ad libitum water. Yeast was supplemented by mixing apportioned dosage with the concentrate feed (Dhejung) depending on different treatments. The Dhejung concentrate feed supplemented with yeast was fed at 5% of body weight per pig for a duration of 42 days.

### 2.3 Data collection

The weaning weights of the piglets were considered as initial body weights of the experimental animals. Body weight measurement of animals was carried out using digital weighing balance Model No: AN ISO 9001.2000. A weigh crate was used to hold the animals during weight measurement. During the trial period of 42 days, the weight of the animals was recorded six times with a duration of seven days. The weight of the individual animal in all treatment groups were measured and recorded in the morning prior to feeding.

Average Daily Gain (ADG)

Average daily gain was calculated using the following formula:

$$ADG = \frac{(\text{Final weight} - \text{Initial weight})}{\text{Duration of experiment}}$$

Feed Conversion Ratio (FCR)

It was calculated using the following formula:

$$FCR = \frac{\text{(Amount of feed consumed)}}{\text{Weight gain}}$$

**2.4 Feeding regime**

Five percent of their body weight was considered while feeding the animals. It was divided into two equal parts and fed twice a day. Dry yeast (*Saccharomyces cerevisiae)* was supplemented 2-6% mixed with concentrate feed in accordance with the study of Kim (2008). Ad libitum water was fed to the animals in all groups throughout the study period.

**2.5 Data analysis**

Data were compiled in Microsoft Excel and analyzed with the statistical tool SPSS version 23.0. Data were subjected for normality test. Descriptive statistics was applied for weight gain, ADG and FCR and analyzed using Shapiro-Wilk's test and One-Way Analysis of Variance (ANOVA). Significance among the treatments was interpreted based on Tukey HSD *post hoc test.*

## 3. RESULTS AND DISCUSSION

**3.1 Nutrient composition of Yeast and Concentrate feed**

The laboratory findings of nutrient composition for yeast and commercial feed conducted by College of Natural Resources (CNR) are presented in Table 1. The moisture content of yeast is in concurrence with the findings of Joseph and Bachhawat (2014) who reported 4-8.5% in his study. The dry yeast contains 41.84% Crude Protein (CP) and 2.3% Crude Fiber (CF) as reported by (Boontiam et al. 2022). However, in the current study, the yeast contained 66.76 % CP which is higher than the finding of (Boontiam et al. 2022). The Dry Matter (DM) in the yeast was recorded as 91.35% which is similar to the finding of Noblet (2021) where it was reported as 92.8%. Similarly, the nutrient contents of concentrate feed were 4.26% Total Ash (TA), 2% Ether Extract (EE), 11.75% (CP), 87.74% (DM) and 12.26% (Moisture). It is in line to the findings of Penjor et al. (2019) who reported 88.06% DM and 18.95% CP. Based on the current finding, it is indicative that Yeast meets the nutrient requirement and can be a valuable source of feed additives to the weaner piglet.

**3.2 Effect of yeast (*Saccharomyces cerevisiae*) on mean weight of piglets**

The results on average weekly body weight of the experimental animals from different treatments recorded during the study period of 6 weeks are provided in Table 2. The initial mean weight of weaned piglets were 9.97 ± 1.46 kg, 9.97 ± 1.14 kg, 9.83 ± 0.94 kg and 9.84 ± 0.90 kg for control group, treatment 1, treatment 2 and treatment 3 respectively. The final mean body weight of weaned piglets was higher for treatment 1 (17.23 ± 2.50 kg) when compared to other treatment groups as shown in Table 2.

**Table 1**: Nutrient composition of feeds

| Feed | TA% | EE% | CP% | DM% | M% |
|---|---|---|---|---|---|
| Concentrate (Dhejung starter) | 4.26 | 2 | 11.75 | 87.74 | 12.26 |
| *Saccharomyces cerevisiae* | 11.09 | 0.93 | 66.76 | 91.35 | 8.65 |

*TA= Total Ash, EE= Ether Extract, CP= Crude Protein, DM= Dry Matter, M= Moisture

**Table 2**: Mean comparison of weekly weights of weaned piglets in kg (M ± SD)

| Weeks | Control | Treatment 1 | Treatment 2 | Treatment 3 |
|---|---|---|---|---|
| Week 0 | 9.97 ± 1.46 | 9.97 ± 1.14 | 9.83 ± 0.94 | 9.84 ± 0.90 |
| Week 1 | 9.97 ± 1.34 | 10.72 ± 1.65 | 10.67 ± 1.04 | 10.21 ± 0.71 |
| Week 2 | 10.6 ± 1.34 | 11.44 ± 1.66 | 11.1 ± 1.12 | 10.61 ± 0.86 |
| Week 3 | 11.77 ± 1.13 | 12.99 ± 1.91 | 12.41 ± 1.36 | 11.97 ± 1.00 |
| Week 4 | 12.97 ± 1.21 | 14.64 ± 2.08 | 13.98 ± 1.68 | 13.53 ± 1.07 |
| Week 5 | 13.8 ± 1.22 | 15.77 ± 2.12 | 15.14 ± 1.89 | 14.66 ± 1.18 |
| Week 6 | 14.75 ± 1.15 | 17.23 ± 2.50 | 16.62 ± 2.17 | 16.18 ± 1.49 |

**Table 3**: Pair-wise comparison of weekly weight gains of weaned piglets in Kg (M ± SD)

| **Weeks** | **Control** | **Treatment 1** | **Treatment 2** | **Treatment 3** |
|---|---|---|---|---|
| Week 1 | -.002 ± 0.15$^{a}$ | 0.76 ± 0.84$^{b}$ | 0.85 ± 0.38$^{bc}$ | 0.38 ± 0.42$^{abc}$ |
| Week 2 | 0.64 ± 0.18$^{a}$ | 0.72 ± 0.26$^{a}$ | 0.43 ± 0.31$^{a}$ | 0.39 ± 0.31$^{a}$ |
| Week 3 | 1.17 ± 0.31$^{a}$ | 1.54 ± 0.33$^{a}$ | 1.31 ± 0.33$^{a}$ | 1.36 ± 0.26$^{a}$ |
| Week 4 | 1.22 ± 0.20$^{a}$ | 1.65 ± 0.334$^{b}$ | 1.56 ± 0.39$^{ab}$ | 1.56 ± 0.08$^{ab}$ |
| Week 5 | 0.85 ± 0.21$^{a}$ | 1.13 ± 0.35$^{a}$ | 1.17 ± 0.55$^{a}$ | 1.13 ± 0.23$^{a}$ |
| Week 6 | 0.89 ± 0.36$^{a}$ | 1.46 ± 0.45$^{ab}$ | 1.47 ± 0.45$^{ab}$ | 1.51 ± 0.38$^{b}$ |
| Overall wt. gain | 4.78 ± 0.69$^{a}$ | 7.27 ± 1.87$^{b}$ | 6.80 ± 1.63$^{b}$ | 6.34 ± 0.90$^{ab}$ |

*Values with different superscripts in the same row differ significantly at p<.05

### 3.3 Weekly weight gain of weaned piglets

There was a significant difference in the overall weight gains of weaned piglets between the four treatment groups, where, F (3, 24) = 4.36, $p$ = .014 (Table 3). This study is in line with the findings of Boontiam et al. (2022) who claimed that there was significant difference with difference in yeast inclusion rate in the feed. The overall weight gain for the weaned piglets supplemented with 2% yeast was noted more (7.27 ± 1.87 kg) when compared to the control group (4.78 ± 0.69 kg), weaned piglets supplemented with 4% (6.80 ± 1.63 kg) and weaned piglets fed with 6% yeast (6.34 ± 0.90 kg) in the diet (Table 3). The overall weight gain of the weaned piglets supplemented with 4% and 6% yeast respectively was found to be lower as higher rate of yeast inclusion in diet could have disrupted the balance of beneficial bacteria in their gut leading to weakened immumity (Heugten et al. 2003).

### 3.4 Average daily gain

The overall ADG (Table 4) differed significantly, where F (3,24) = 4.20, $p$ = .016, between the treatment groups, where treatment 1 had the highest ADG (0.17 ± 0.05 kg) and control group with the lowest ADG (0.11 ± 0.02 kg). The study shows that there is a significant difference ($p$ = .016) in ADG between the groups fed with different dosage of yeast and the control group, which align well with the analysis of Hu et al. (2014). The improved ADG is associated with dry yeast, which has a positive impact on palatability and helps secrete a number of enzymes for greater hydrolysis of nutrient to maximize the growth of weaning piglets (Dan 2021).

### 3.4 **Feed conversion ratio**

The study showed that the weaned piglets in control group had the highest FCR (5.16 ± 0.76 kg) while the animals in the group supplemented with 2% yeast had the lowest FCR (3.91 ± 0.91 kg) followed by group

**Table 4**: Mean comparison of ADG in Kg (M ± SD)

| Weeks | Control | Treatment 1 | Treatment 2 | Treatment 3 |
|---|---|---|---|---|
| Week 1 | -.0004 ± 0.02$^{a}$ | 0.12 ± 0.11$^{b}$ | 0.12 ± 0.05$^{c}$ | 0.05 ± 0.06$^{abc}$ |
| Week 2 | 0.09 ± 0.03$^{a}$ | 0.10 ± 0.04$^{a}$ | 0.06 ± 0.04$^{a}$ | 0.06 ± 0.05$^{a}$ |
| Week 3 | 0.17 ± 0.04$^{a}$ | 0.22 ± 0.05$^{a}$ | 0.19 ± 0.05$^{a}$ | 0.19 ± 0.04$^{a}$ |
| Week 4 | 0.17 ± 0.03$^{a}$ | 0.24 ± .048$^{b}$ | 0.22 ± 0.06$^{ab}$ | 0.22 ± 0.01$^{ab}$ |
| Week 5 | 0.12 ± 0.03$^{a}$ | 0.16 ± 0.05$^{a}$ | 0.17 ± 0.08$^{a}$ | 0.16 ± 0.03$^{a}$ |
| Week 6 | 0.13 ± 0.05$^{ab}$ | 0.21 ± 0.06$^{ab}$ | 0.30 ± 0.06$^{ab}$ | 0.22 ± 0.05$^{b}$ |
| Overall ADG | 0.11 ± 0.02$^{a}$ | 0.17 ± 0.05$^{b}$ | 0.16 ± 0.04$^{ab}$ | 0.15 ± 0.02$^{ab}$ |

* Values with different superscripts within the same row differ significantly at $p < .05$.

**Table 5**: Mean comparison of FCR (M ± SD)

| Weeks | Control | Tretament 1 | Treatment 2 | Treatment 3 |
|---|---|---|---|---|
| Week 1 | 0.94 ± 4.67 $^{a}$ | 1.8 ± 2.11 $^{a}$ | 0.71 ± 0.29 $^{a}$ | 1.10 ± 4.69 $^{a}$ |
| Week 2 | 0.83 ± 0.21 $^{a}$ | 0.85 ± 0.32 $^{a}$ | 3.85 ± 5.11 $^{a}$ | 0.71 ± 1.48 $^{a}$ |
| Week 3 | 1.05 ± 1.60 $^{a}$ | 0.39 ± 0.93 $^{a}$ | 0.47 ± 0.15 $^{a}$ | 0.42 ± 0.08 $^{a}$ |
| Week 4 | 0.82 ± 0.82 $^{a}$ | 0.41 ± 0.08 $^{a}$ | 0.44 ± 0.13 $^{a}$ | 0.40 ± 0.20 $^{a}$ |
| Week 5 | 1.35 ± 1.34 $^{a}$ | 0.73 ± 0.28 $^{a}$ | 0.81 ± 0.52 $^{a}$ | 0.66 ± 0.17 $^{a}$ |
| Week 6 | 1.63 ± 1.77 $^{a}$ | 0.59 ± 0.15 $^{a}$ | 0.58 ± 0.20 $^{a}$ | 0.54 ± 0.15 $^{a}$ |
| Overall FCR | 5. 16 ± 0.76 $^{a}$ | 3.91 ± 0.91 $^{a}$ | 4.15 ± 1.13 $^{a}$ | 4.22 ± 0.61 $^{a}$ |

* Values with different superscripts within the same row differ significantly at $p < .05$.

supplemented with 4 % and 6% yeast respectively as shown in Table 5. As reported by Pickard (2017) the yeast derived protein source stimulates feed intake and nutrient utilisation due to rapid weight gain, and attend market weight early with less feed required improving profitability in the yeast reduces FCR in nursery pigs, which indicates that yeast is probiotic for enhancing performance in pigs. However, there was no significant difference ($p = 0.063$) among the treatment groups during the entire study period. The finding is in line with the result of Boontiam et al. (2020) who reported that there was no significance difference between the control group and the animals fed with yeast in treatment groups.

## 4. CONCLUSION

This study indicates that growth performance and overall FCR of the weaned piglets was found better when the diet was supplemented with 2% yeast (S*accharomyces cerevisiae*) when compared to animals in other treatment groups. The current finding also suggests that to obtain higher growth rate and better FCR in weaner piglets, the inclusion of yeast in lower quantity is desirable. However, the present study did not consider the effect of less than 2% yeast supplementation in diet vis-à-vis the growth performance of weaned piglets. On the other hand, the sample size was relatively small and the duration of the study was short to draw any substantive conclusion. Thus, it is suggested to undertake an in-depth study considering the appropriate percent use of yeast in the diet, higher sample size and the longer duration of experimental period to assess yeast digestibility, gut health of animals and draw a definitive conclusion and recommendations.

## REFERENCES

Boontiam W, Bunchasak C, Kim YY, Kitipongpysan, and Hong J. (2022).

Hydrolyzed Yeast Supplementation to Newly Weaned Piglets: Growth Performance, Gut Health and Microbial Fermentation. Animal (Basel). 12(3): 350.

Boontiam W, Wachirapakorn C, and Phaengphairee P. (2020). Effects of hydrolyzed yeast supplementation on growth performance, immunity, antioxidant capacity, and microbial shedding in weaning pigs. Veterinary World. 13(9): 1902-1909.

Dan WM. (2021). Puerarin enhances intestinal function in piglets infected with porcine epidemic diarrhea virus. Retrieved from https://www.nature.com/articles/s41598-021-85880-5.

Dietze K. (2011). Pigs for Prosperity. Rural Infrastructure and Agro-Industries Division, FAO, Rome.

Heugten E, Funderburke DW, and Dorton KL. (2003). Growth performance, nurteint digestibility, and fecal microflora in weanling pigs fed with live yeast. Journal of Animal Science. 8(4): 1004-1012.

Hu L, Che L, Su G, Xuan Y, Luo G, Han F, Wu Y, Tian G, Wu C, Fang Z, Lin Y, Xu S, and Wu D. (2014). Inclusion of yeast-derived protein in weanling diet improves growth performance, intestinal health and anti-oxidative capability of piglets. Czech Journal of Animal Science. 59(7): 327-336.

Joseph R, and Bachhawat AK. (2014). Yeasts: Active Dry Yeast. Encyclopedia of Food Microbiology (Second Edition).

Kabugo S, Mutetikka D, Mwesigwa R, Beyihayo GA, and Kugonza DR. (2014). Utilization of spent brewer's yeast as a protein substitute for fish meal in diets of growing pigs. African Journal of Agricultural Science and Technology. 2(5):116-121.

Kim S. (2008, November 27). Yeast added to sow diet impeoves piglet performace . Retrieved from https://www.thepigsite.com/articles/yeast-added-to-sow-diet-improves-piglet performance

Mathew AG, Chattin SE, Robbins CM, and Golden DA. (1998). Effects of a direct-fed yeast culture on enteric microbial populations, fermentation acids, and performance of weanling pigs. Journal Animal Science, 76(8) : 2138-2145.

Nidup K. (2011). Farming and biodiversity of pigs in Bhutan. Retrieved from https://www.researchgate.net/publication/259409099_Farming_and_biodiversity_of_pigs_in_Bhutan.

Noblet J. (2021). Brewers yeast, dried. Retrieved from Brewers yeast: https://www.feedtables.com/content/brewers-yeast-dried

Nogueira B. (2021). Effects of autolyzed yeast on performance, blood parameters, intestinal morphometry.

NSB (2022). Statistical Yearbook of Bhutan 2022. National Statistics Bureau, Thimphu.

Patience FJ. (2012 April). The importance of water in pork production. Animal Frontiers, 2(2), 28-35.

Penjor T, Tsheten G, and Sherab P. (2019). Effects of Different Feeds on Body Weight Gain and Profitability of Pig Production in Subtropical Bhutan. Bhutan Journal of Animal Science, 3(1):1-6.

Pickard T. (2017, April 5). Yeast derived proteins promote health performance. Retrieved from https://www.pigprogress.net/health-nutrition/yeast-derived-proteins-promote-health-performance.

Willing BP, Malik G, and Kessel AG. (2012). Nutrition and Gut Health in Swine.

Sustainable Swine Nutrition, 85(8):197-213.