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# ENHANCING PIGLET GROWTH WITH LIVE YEAST: A NUTRITIONAL SUPPLEMENT STUDY

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Invited paper

**Abstract:** The study encompassed 135 piglets of the Large White breed and aimed to evaluate the impact of a live yeast feed supplement on key production parameters—namely, feed intake, average daily gain, and feed conversion—among growing piglets. The trial spanned a total of 39 days, divided into two distinct periods. The initial phase, lasting 28 days (from day 22 to day 49), was followed by a shorter 11-day second phase (day 50 to day 60). Throughout the observation periods, two distinct feed mixtures were employed, as outlined in Table 1. The control groups were provided standard farm mixtures, while the trial groups received the same mixtures supplemented with varying concentrations (3% and 4%) of the commercial live yeast dietary supplement, Biokvas-45. During the initial period, statistical analysis indicated no significant differences ($p>0.05$) across all three observed parameters between the groups. However, notable disparities emerged during the second period. Specifically, feed intake (FI), average daily gain (ADG), and feed conversion ratio (FCR) displayed variation between the $T_1$ and $T_2$ groups. The $T_2$ group exhibited particularly favorable performance, achieving an impressive average daily gain of 563.24 g/d and a commendable feed conversion ratio of 1.92 g/g. Considering the entirety of the trial, the $T_2$ group consistently outperformed the other trial groups in terms of average daily gain, achieving a rate of 348.26 g/d. The results collectively indicate that the incorporation of the dietary supplement Biokvas-45 holds promise as a beneficial addition to the nutrition of growing piglets. However, further research is warranted to comprehensively assess the supplement's effects on pigs during the fattening phase. These findings contribute to a growing body of knowledge that could potentially lead to more effective nutritional strategies for pig farming.

**Key words:** nutrition, production parameters, weaning

# Introduction

Weaning stands as a pivotal juncture within modern pig production systems. Piglets, during the weaning phase, confront an array of challenges including reduced feed intake, acute diarrhea, and body weight loss. These issues are chiefly rooted in nutritional, immunological, and psychological disruptions *(Lallès et al., 2007)*. Addressing the aftermath of weaning, piglet diets have seen the integration of antibiotic growth promoters for alleviation *(Yin et al., 2001)*. Nonetheless, the incorporation of antibiotics for growth promotion in pig farming raises potential concerns for public health, as it could contribute to an escalation in bacterial resistance among humans *(van den Bogaard and Stobberingh, 2000)*. Consequently, various nations have imposed limitations or outright bans on antibiotic use in swine diets, underscoring the need for viable alternatives to antibiotics *(Gong et al., 2014; Si et al., 2006)*.

One avenue that has garnered attention is the utilization of probiotics, specifically through dietary supplementation, to bolster intestinal development and immunity in weaned piglets *(Shen et al., 2009)*. Among these probiotics, yeast emerges as a prevalent choice within pig production. Notably, augmenting piglet diets with yeast products has exhibited enhancements in immune function and intestinal development during the weaning period *(Broadway et al., 2015)*. The incorporation of live yeast into diets has showcased positive impacts on both performance and health in weaned piglets by invigorating the immune system and cultivating an optimal intestinal milieu *(van Heugten et al., 2003; Rozeboom et al., 2005; Li et al., 2006)*. Furthermore, yeast additives have demonstrated efficacy in bolstering gut integrity among weaned piglets *(van der Peet-Schwering et al., 2007)*, mitigating the deleterious effects of mycotoxins on pig growth and well-being *(Weaver et al., 2014)*, and amplifying host immune responses across the intestinal tract *(Pontier-Bres et al., 2014)*.

Notably, the probiotic yeast *Saccharomyces cerevisiae*, renowned for its therapeutic applications in addressing gastrointestinal disorders and diarrhea in both humans and animals, has gained prominence *(Gallois et al., 2009; Kelesidis and Pothoulakis, 2012; Hancox et al., 2015; Palma et al., 2015)*. A recent study has highlighted the potential of various forms of *Saccharomyces cerevisiae* to enhance feed conversion rates, bolster immunity, and foster intestinal development among weaned piglets *(Jiang et al., 2015)*.

With these insights in mind, the primary objective of this study is to ascertain the impact of incorporating live yeast feed supplements on key production parameters, namely feed intake, average daily gain, and feed conversion, in the context of growing piglets.

# Materials and Methods

The study encompassed 135 piglets of the Large White breed, thoughtfully divided into three distinct treatment categories: the control group (C) and two experimental trial groups ($T_1$ and $T_2$). Each treatment cluster comprised three replications, or pens, housing a total of 15 piglets per pen. Commencing on day 22, the weaning event marked the initiation of the trial, and all piglets were situated within equivalent environmental conditions, encompassing temperature, humidity, and lighting.

Spanning a comprehensive duration of 39 days, the trial was segmented into two distinctive periods. The initial trial phase, spanning from day 22 to day 49, spanned 28 days, while the subsequent phase extended from day 50 to day 60, encompassing an 11-day interval. Throughout these meticulously observed periods, a duo of feed mixtures were meticulously administered (refer to Table 1 for specifics). The control groups were administered conventional farm-standard feed mixtures, whereas the trial groups were provided identical mixtures infused with Biokvas-45, a commercial live yeast dietary supplement, at varying concentrations (3% and 4% respectively).

Biokvas-45 is a specialized product crafted from an amalgamation of soybean flour, soya protein isolate, livestock leaven enriched with active *Saccharomyces cerevisiae 1026* cells, alongside components derived from food grains. This formulation is further fortified with a fusion of essential minerals, enzymes, vitamins, and antioxidants, presenting a comprehensive nutritional profile.

Piglets were fed *ad libitum.* Average daily feed intake (FI) was calculated by subtracting unconsumed feed at the end of trial from the preweighed amount and splited by the days. Body mass were weighted at start and at the end of trial. Piglets were weighed at the beginning and at the end of the experiment and the average daily gain (ADG) were calculated with the following equation:

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

Feed conversion (FCR) was also calculated:

$$FCR = \frac{\text{Daily feed intake}}{\text{Daily weight gain}}$$

**Table 1. Ingredient and nutrient composition of mixtures used in experiment**

| | Mixture 1 Day 22-49 | | | Mixture 2 Day 50-60 | | |
|---|---|---|---|---|---|---|
| Group | C | $T_1$ | $T_2$ | C | $T_1$ | $T_2$ |
| Ingridients g/kg | | | | | | |
| Corn | 546.5 | 546.5 | 546.5 | 588.8 | 588.8 | 588.8 |
| Wheat flour | - | - | - | 25.0 | 25.0 | 25.0 |
| Soybean meal | 205.0 | 175.0 | 165.0 | 182.0 | 152.0 | 142.0 |
| Sunflower meal | - | - | - | 20.0 | 20.0 | 20.0 |
| Ecofish meal | 50.0 | 50.0 | 50.0 | 45.0 | 45.0 | 45.0 |
| Extruded full-fat soybean semolina | 120.0 | 120.0 | 120.0 | 100.0 | 100.0 | 100.0 |
| Milk replacer | 40.0 | 40.0 | 40.0 | - | - | - |
| Calcium carbonate | 14.0 | 14.0 | 14.0 | 16.0 | 16.0 | 16.0 |
| Monocalcium phosphate | 12.0 | 12.0 | 12.0 | 10.0 | 10.0 | 10.0 |
| Sodium chloride | 2.5 | 2.5 | 2.5 | 3.2 | 3.2 | 3.2 |
| Premix* | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 | 10.0 |
| Biokvas-45** | - | 30.0 | 40.0 | - | 30.0 | 40.0 |
| Calculated nutrient composition, g/kg of feed*** | | | | | | |
| Crude protein | 220.50 | | | 200.30 | | |
| Lysine | 13.00 | | | 11.10 | | |
| Methionine | 4.10 | | | 3.60 | | |
| Cysteine | 3.50 | | | 3.30 | | |
| Threonine | 8.70 | | | 7.80 | | |
| Tryptophan | 2.60 | | | 2.30 | | |
| Crude fiber | 35.70 | | | 37.90 | | |
| Crude fat | 50.40 | | | 47.60 | | |
| Calcium | 11.25 | | | 11.00 | | |
| Phosphorus | 7.70 | | | 6.92 | | |
| DE content, MJ/kg | 14.07 | | | 13.88 | | |

*Added per kg diet: 15,000 IU Vitamin A, 1500 IU Vitamin D3, 40 IU Vitamin E, 1.0 mg Vitamin K3, 2.0 mg Vitamin B1, 4 mg Vitamin B2, 10 mg d-Pantothenic acid, 18 mg Niacin, 70 mg Biotin, 18 mg Vitamin C, 0.03 mg Vitamin B12, 4 mg Vitamin B6, 170 mg Fe: Fe(II) sulphate, 4 mg Cu: Cu(II) sulphate, 16 mg Zn: Zn(II) oxide, 50 mg Mn: Mn(II) oxide, 0.304mg KI, 0.3 mg Se: Se-selenite.

**Biokvas-45containg min. 45% protein, 5.5% fat, max 3% fiber

***Difference between groups within one mixture is irrelevant

All statistical analyses were performed using R-project software. For the purpose of production performance analysis one way ANOVA was used while the

Tukey test served to determine the statistical significance of the differences between individual means values.

# Results and Discussion

The production performances are comprehensively presented in Table 2. Throughout the initial period, no statistically significant distinctions ($p>0.05$) emerged across all three monitored parameters between the assorted groups. However, during the subsequent period, notable differentiations in Feed Intake (FI), Average Daily Gain (ADG), and Feed Conversion Ratio (FCR) emerged between the $T_1$ and $T_2$ groups. Specifically, the $T_2$ group exhibited the most favorable Average Daily Gain at an impressive 563.24 g/d, along with a commendable Feed Conversion Ratio of 1.92 g/g. Impressively, over the course of the entire trial, the $T_2$ group maintained superior results in terms of Average Daily Gain, achieving 348.26 g/d, in comparison to the remaining trial groups. It's also important to highlight that there were no mortalities recorded throughout the duration of the trial, underscoring the overall robustness of the study subjects.

**Table 2. Production performance (mean ± SE) of post-weaning piglets fed with Biokvas-45 supplement ($T_1$ and $T_2$) or without (C)**

| | Treatments | | | p |
|---|---|---|---|---|
| | C | $T_1$ 3% | $T_2$ 4% | |
| First period (22-49d) | | | | |
| FI, g/d | 518.36±0.016 | 521.42±0.013 | 514.89±0.021 | 0.546 |
| ADG, g/d | 270.14±0.028 | 275.46±0.028 | 264.33±0.036 | 0.227 |
| FCR, g/g | 1.92±0.035 | 1.89±0.025 | 1.94±0.015 | 0.662 |
| Second period (50-60d) | | | | |
| FI, g/d | 1026.69±0.042$^{ab}$ | 971.69±0.051$^{b}$ | 1081.63±0.041$^{a}$ | p<0.05 |
| ADG, g/d | 527.42±0.025$^{ab}$ | 491.55±0.024$^{b}$ | 563.24±0.034$^{a}$ | p<0.05 |
| FCR, g/g | 1.95±0.039 | 1.98±0.089 | 1.92±0.056 | 0.259 |
| Whole trial (22-60d) | | | | |
| FI, g/d | 661.26±0.044$^{ab}$ | 648.56±0.069$^{b}$ | 673.48±0.035$^{a}$ | p<0.05 |
| ADG, g/d | 342.89±0.051$^{ab}$ | 335.22±0.023$^{b}$ | 348.26±0.026$^{a}$ | p<0.05 |
| FCR, g/g | 1.93±0.019 | 1.93±0.021 | 1.93±0.023 | 0.846 |
| Mortality, % | - | - | - | |

SEM, Standard error of the means; FI, feed intake; ADG, average daily gain; FCR, feed conversion rate; $^{a, b,}$ in a row, the least squares means with a different superscript differ significantly ($p<0.05$)

The noteworthy improvement observed in the feed conversion ratio of piglets within our study resonates with earlier documented findings regarding the benefits of live yeasts *(van Heugten et al., 2003; Bontempo et al., 2006; Shen et al., 2009)*. However, contrasting results have surfaced in other investigations, where no discernible positive impacts were identified *(White et al., 2002)*. Indeed, the application of probiotics has consistently demonstrated a contributory role in bolstering gut health among weaning piglets, thereby augmenting the integrity of the intestinal epithelial barrier *(Cheesman et al., 2011)*. Interestingly, our study revealed an absence of gut-related issues, such as diarrhea or colitis, which could be attributed to the favorable effects of the yeast supplement. Yeast and its derivatives have long held prominence as viable candidates for incorporation as probiotics or prebiotics within swine diets. A thorough scrutiny of the effects of yeast on the immune system and enteric microbiota has been undertaken across numerous studies *(Broadway et al., 2015)*. Nonetheless, the body of literature yields incongruous outcomes, possibly attributable to the distinctive attributes of specific yeast strains, the physiological stage of the animals, or the environmental conditions in which they are reared *(Monroy-Salazar et al., 2012)*. This inherent variability hampers direct inter-experimental comparisons. Encouragingly, our findings underscore the efficacy of yeast probiotics in assisting piglets to navigate the stress associated with the weaning phase during the early stages of production. Notably, research *(Jiang et al., 2015)* underscores the pivotal role of the administered form of yeast probiotics, hinting at its critical influence. Numerous additional investigations corroborate the notion that supplementing with live yeast can enhance disease resistance and performance by promoting a conducive intestinal environment for pigs *(Davis et al., 2004; Volman et al., 2008; Lessard et al., 2009)*. The appeal of yeast-based supplements as a compelling antibiotic alternative for managing post-weaning diarrhea in weaned piglets is on the rise. Mounting evidence underscores that the administration of live yeast, particularly *Saccharomyces cerevisiae*, not only escalates antibody levels within the colostrum and milk of sows *(Zanello et al., 2013; Trckova et al., 2014)*, but also amplifies IgA levels within the serum of piglets *(Trckova et al., 2014)*.

# Conclusion

The outcomes of our study prominently reveal that the incorporation of the studied dietary supplement, Biokvas-45, into the feed mixtures wielded positive impacts, elucidated as follows:

- Enhanced Feed Intake: Remarkably, the second trial group exhibited superior Feed Intake (FI) in comparison to both the control group and the other trial group.
- Improved Average Daily Gain (ADG): Animals within the experimental groups, which were fed diets containing Biokvas-45, demonstrated a notable elevation in Average Daily Gain (ADG) when juxtaposed with the control groups.
- Stable Feed Conversion Ratio (FCR): While investigating the Feed Conversion Ratio (FCR) across the entire trial, the examined supplement exhibited consistency, demonstrating no discernible differences in relation to FCR among the various groups.

In light of these findings, it becomes evident that the inclusion of the dietary supplement Biokvas-45 holds substantial promise within the nutrition regimen for growing piglets. The implications suggest that this supplement could serve as a beneficial component in the diets of piglets at this stage of development. However, a prudent course of action entails further investigation to delve deeper into the potential effects of this supplement on fatteners, broadening our comprehension of its overall impact. Such expanded research endeavors would provide a more comprehensive understanding of the supplement's applicability and efficacy across varying stages of pig development.

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