



## A Research on the Comparative Effect of Active Dry Yeast and Inactivated-Stabilized Probiotic Yeast (Thepax) Added at Different Levels to Diets on Broiler Performance

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### ABSTRACT

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This experiment was conducted to determine the effect of active yeast (AY) and inactive-stabilized yeast (Thepax) supplementation to the rations in different levels on broiler performance. In the experiment carried out according to the randomized plot design, there were 5 different treatment groups as control group (Group 1), 0.1% Thepax (Group 2), 0.2% Thepax (Group 3), 0.1% AY (Group 4) and 0.2% AY (Group 5). In the experiment, the effects of active and inactive yeasts on body weight gain (BWG), feed consumption, feed conversion rate, carcass weight (CW), carcass yield (CY), abdominal fat amount and mortality were investigated. In the present experiment, the final live weight, the cumulative feed consumption and feed conversion were insignificant. The statistical difference between the groups in the experiment was significant in carcass weight, but insignificant in the amount of abdominal fat and mortality rate. Inactive-stabilized yeast (Thepax 0.1%) was more effective than 0.2% AY on BWG. Only 0.1% Thepax increased the CW besides CY was high in 0.1%, 0.2% Thepax and 0.1% AY groups. It has been observed that active and inactive yeasts are used in broiler chickens without any problem.

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## Introduction

Growth promoters and some antibiotics have been used for many years in order to obtain higher yields from animals. However, in recent years, the use of some antibiotics in animal nutrition has been banned due to the adverse effects on the health of people who consume such animal products (Salim et al., 2018). Studies on finding alternative and natural resources to replace these banned products have intensified.

Feeding with high protein and energy-containing feeds adversely affects the stability of the intestinal microflora of poultry, and especially the chicks become much more susceptible to pathogenic organisms. In such cases, the use of probiotic products ensures the stabilization of the intestinal microflora ecosystem and prevents the development of pathogenic microorganisms (Thongsong et al., 2008).

It is thought that yeasts, which are produced from beneficial microorganisms by biotechnological methods and also known as single cell proteins, can promote growth and be an alternative to some antibiotics (Gong et al., 2002;

Fathi et al., 2012). Therefore, products containing yeast and yeast, which have both prebiotic and probiotic effects, have recently begun to be preferred in poultry feeding.

Dry yeast is a rich source of protein and contains 47% crude protein, 33% carbohydrate, 8% mineral, 8% nucleic acid and 4% lipid. Also, yeast is a very good source of B complex vitamins. However, it is poor in vitamins A, D, and C (Reed and Tilak, 1991; Reed, 2012).

Live yeast cultures provide digestion of food since they contain digestive enzymes such as amylase, maltase, sucrose, lactate dehydrogenase, proteinase, polypeptides, dipeptidase, deaminase, transaminase, lipase, phospholipase, phosphatase and phytase (Stanley et al., 1993). Without the enzymes contained in yeast, sugars cannot be fermented to form fermentation products such as carbon dioxide and ethyl alcohol (Elgün and Ertugay, 1990). Yeasts with probiotic effects affect growth positively by inhibiting harmful bacteria in the intestinal mucosa (Hassanein and Soliman, 2010).

Yeast culture is a nutrient-rich and complex micro-ecological fermentation product containing a variety of metabolites. Glycine, fructose, inositol, galactose and sucrose are potentially effective main metabolites obtained from yeast culture as a result of fermentation. However, the specific effective components of yeast culture and their importance in poultry nutrition are not fully known (Sun et al., 2019).

Because the yeast added to the food provides an environment that prevents the development of pathogenic microflora in poultry (Ogbuewu et al., 2019), the production of digestive enzymes, the provision of immunity (Wang et al., 2017) and the detoxification of pathogen toxins (Martinez et al., 2004) has been found to have a positive effect on the yield performance of broilers (Santin et al., 2001).

The yeast added to the feed had a positive effect on the growth performance and body weight gain of 6-week-old chickens (Suzer et al., 2015). The addition of yeast to the feed reduced the amount of abdominal fat in broilers (Afsharmanesh et al., 2010). *Saccharomyces cerevisiae* has a positive effect on meat quality and carcass characteristics in broilers (Gao et al., 2008).

Yeast cells are generally in spiral, oval or cylindrical shapes (Brock et al., 1984) and can operate within a wide pH range (3-7.5) (Köşker and Çakmakçı, 1985). Live *Saccharomyces cerevisiae* cells usually break down and degrade in a hot or even warm environment. Since inactivated-stable yeast is protected due to inactivation and stabilization processes, it is not affected by antibiotics, temperature and gastric acid. Containing nucleotides, amino acids and vitamins, inactivated-stable yeast encourages the growth of beneficial microorganisms, especially lactobacilli, allowing them to discharge their bioactive content into the intestinal area. Therefore, inactivated-stable yeast has a direct effect on the animal's metabolism in terms of accelerating morphological development and stimulating growth (Anonymous, 1983).

Inactivated-stable yeast is a completely natural probiotic based product produced by inactivating and stabilizing selected ellipsoidal strains of *Saccharomyces cerevisiae* with

a patented technology (Rose and Harrison, 1971). These commercially produced yeasts are used in many areas such as food, beverage, medicine, industrial enzyme production and animal feeding (Vohra et al., 2016).

In this study, the effects of active-dry baker's yeast (AY) added to the ration at different levels and natural active-stable based yeast on the yield performance of broiler chickens were investigated comparatively.

## Materials and Methods

### Animal

A total of 300 broiler chicks (Avian) used as trial material were obtained from the private sector. The chicks were randomly distributed by weighing them into the trial sections prepared at the end of the first week.

### Feed

The active dry yeast added to the experimental rations was obtained from the market and Thepax from a commercial company (Doxal Co., Italy). Chemical compositions of inactive-stabilized yeast and AY used in this study are given (Table 1).

The formulation of the different rations used in the experiment was pre-calculated to be isonitrogenic and isocaloric, and trial rations were produced in a commercial feed factory in accordance with these calculations (Table 2 and Table 3; NRC, 1994).

### Trial Design and Treatment Groups

The trial was designed according to the coincidence plot pattern. In the experiment, chicks were fed with adaptation feed collectively in the first week. At the beginning of the 2nd week, the trial chicks, which were weighed on a sensitive scale, were placed in trial chambers made of wooden material. Chicks 8-21. 1st period feed (broiler chick) was given between days and 2nd period feed (broiler chick) between 22-49 days. Feed and water were given to the chicks ad-libitum.

Table 1. Chemical composition of Thepax and active dry baker's yeast

Thepax's nutritional content (Anonyomus, 1983)				Nutritional content of active dry baker's yeast**	
Nutrients	%	Nutrients	%	Nutrients	%
Dry matter	92.0	Histidine	0.64	Dry matter	91.24
Protein	28.9	Lysine	1.39	Protein	46.18
Cellulose	8.13	Leucine	1.66	Fat	0.77
Fat	2.57	Methionine	0.41	Cellulose	0.37
Ash	7.80	Phenylalanine	0.93	Ash	4.64
P <sub>2</sub> O <sub>5</sub>	3.60	Threonine	1.06	NFE	39.28
Na <sub>2</sub> O	0.50	Tryptophan	0.22	Calcium	0.23
MgO	0.90	Tyrosine	0.88	Phosphorus	1.02
CaO	0.23	Valine	1.21	ME (kcal / kg)	2600
SO <sub>3</sub>	0.57	Vitamin B1	13.2	-	-
FeO	0.71	Vitamin B2	43.4	-	-
Glutamic acid	1.11	Inositol	1330	-	-
Arginine	1.02	Biotin	0.00	-	-
Cystine	0.39	Pantothenic acid	0.84	-	-
Isoleucine	1.10	Nicotinic acid	210	-	-
Minimum final concentration			12.000.000.000	* Minimum final concentration	11.600.000.000
			cell/gram		cell/gram

P<sub>2</sub>O<sub>5</sub>: Phosphorus pentoxide. Na<sub>2</sub>O= Sodium oxide. MgO= Magnesium oxide. CaO= Calcium oxide. SO<sub>3</sub>= Sulfur trioxide. FeO= Iron oxide. ME: Metabolic Energy. NFE: Nitrogen-free extracts. \* Minimum final concentration (analyzed) contained in each gram of yeast, \*\* (Yağcı et al., 1993).

Table 2. The rations used in the first period of the trial (7-21 days) and their composition (g/kg)

Ingredients	Control (Group 1)	0.1% Thepax (Group 2)	0.2% Thepax (Group 3)	0.1% AY (Group 4)	0.2% AY (Group 5)
Corn	314.6	313.6	312.6	313.6	312.6
Soybean meal (% 44.5)	260.0	260.0	260.0	260.0	260.0
Wheat	250.0	250.0	250.0	250.0	250.0
Meat-bone meal	78.0	78.0	78.0	78.0	78.0
Fish meal	42.0	42.0	42.0	42.0	42.0
Sunflower acid oil	24.0	24.0	24.0	24.0	24.0
Crude soy oil	22.0	22.0	22.0	22.0	22.0
Inactive-stabile yeast (Thepax)	0.00	1.00	2.00	0.00	0.00
Active dried yeast (AY)	0.00	0.00	0.00	1.00	2.00
Methionine	2.00	2.00	2.00	2.00	2.00
Lysine	0.40	0.40	0.40	0.40	0.40
Sodium chloride	2.5 0	2.50	2.50	2.50	2.50
Vitamin premix	2.00	2.00	2.00	2.00	2.00
Mineral premix	1.50	1.50	1.50	1.50	1.50
Anticoccidial	1.00	1.00	1.00	1.00	1.00
Total (kg)	1000	1000	1000	1000	1000
Nutrients, %	Calculated nutrient composition				
Dry matter	92.99	92.99	92.99	92.99	92.99
Crude protein	22.65	22.65	22.65	22.65	22.65
Metabolic energy, kcal/kg	3060	3060	3060	3060	3060
Crude cellulose	3.19	3.19	3.19	3.19	3.19
Crude ash	5.81	5.81	5.81	5.81	5.81
Crude fat	8.80	8.80	8.80	8.80	8.80
Calcium	1.20	1.20	1.20	1.20	1.20
Phosphorus	0.62	0.62	0.62	0.62	0.62

2 kg vitamin content: Vitamin A 15000000 IU. Vitamin D3 1500000 IU. Vitamin E 40000 mg. Vitamin K3 5000 IU. Vitamin B1 300 0mg. Vitamin B2 7000 mg. Vitamin B6 5000 mg. Vitamin B12 20 mg. Vitamin C 50000 mg. D-Biotin 70 mg. Niacin 25000 mg. Calcium D Pantothenate 10000 mg. Folic Acid 750 mg. Choline Chloride 200000 mg. Ascorbic acid 15000 mg. 1.5 kg mineral content: Manganese 80000 mg. Iron 60000 mg. Zinc 60000 mg. Copper 5000 mg. Iodine 1000 mg. Cobalt 200 mg. Selenium 150 mg. Calcium 446925 mg.

Table 3. The rations used in the second period of the trial (22-49 days) and their composition (g/kg)

Ingredients	Control (Group 1)	0.1% Thepax (Group 2)	0.2% Thepax (Group 3)	0.1% AY (Group 4)	0.2% AY (Group5)
Corn	316.0	315.0	314.0	315.0	314.0
Soybean meal (% 44.5)	250.0	250.0	250.0	250.0	250.0
Wheat	250.0	250.0	250.0	250.0	250.0
Meat-bone meal	80.0	80.0	80.0	80.0	80.0
Fish meal	32.0	32.0	32.0	32.0	32.0
Sunflower acid oil	32.0	32.0	32.0	32.0	32.0
Crude soy oil	31.0	31.0	31.0	31.0	31.0
Inactive-stabile yeast (Thepax)	0.00	1.00	2.00	0.00	0.00
Active dried yeast (AY)	0.00	0.00	0.00	1.00	2.00
Methionine	1.90	1.90	1.90	1.90	1.90
Lysine	0.10	0.10	0.10	0.10	0.10
Sodium chloride	2.50	2.50	2.50	2.50	2.50
Vitamin premix	2.00	2.00	2.00	2.00	2.00
Mineral premix	1.50	1.50	1.50	1.50	1.5 0
Anticoccidial	1.00	1.0 0	1.00	1.00	1.00
Total (kg)	1000	1000	1000	1000	1000
Nutrients, %	Calculated nutrient composition				
Dry matter	92.99	92.99	92.99	92.99	92.99
Crude protein	21.62	21.62	21.62	21.62	21.62
Metabolic energy, kcal/kg	3158	3158	3158	3158	3158
Crude cellulose	3.14	3.14	3.14	3.14	3.14
Crude ash	6.33	6.33	6.33	6.33	6.33
Crude fat	9.76	9.76	9.76	9.76	9.76
Calcium	1.39	1.39	1.39	1.39	1.39
Phosphorus	0.60	0.60	0.60	0.60	0.60

2 kg vitamin content: Vitamin A 15000000 IU. Vitamin D3 1500000 IU. Vitamin E 40000 mg. Vitamin K3 5000 IU. Vitamin B1 300 0mg. Vitamin B2 7000 mg. Vitamin B6 5000 mg. Vitamin B12 20 mg. Vitamin C 50000 mg. D-Biotin 70 mg. Niacin 25000 mg. Calcium D Pantothenate 10000 mg. Folic Acid 750 mg. Choline Chloride 200000 mg. Ascorbic acid 15000 mg. 1.5 kg mineral content: Manganese 80000 mg. Iron 60000 mg. Zinc 60000 mg. Copper 5000 mg. Iodine 1000 mg. Cobalt 200 mg. Selenium 150 mg. Calcium 446925 mg.

Active dry and inactive-stable yeast (Thepax) was added to the experimental rations at the rates of 0, 0.1, and 0.2%. Accordingly, in the study, mainly the control group (Group 1), 0.1% Thepax (Group 2) and 0.2% Thepax (Group 3), 0.1% AY (Group 4) and 0.2% AY (Group). There were 5 different treatment groups. Each treatment group consisted of 3 replications and the study was conducted with a total of 300 chicks, with 20 birds in each repetition.

**Determination of Trial Data**

The chicks in the experiment were weighed routinely at the end of each week and their body weight and performance data were recorded regularly. Since adaptation feeding was applied, the first week weights were accepted as the starting weight of the trial and accordingly, the other weightings were determined weekly.

In the study, the amount of feed consumed by the experimental chickens was determined on the basis of the repetition groups since the group feeding was done. The determined feed amounts were divided by the number of animals present in each repetition and the feed amounts of each treatment group were recorded weekly.

Slaughter weight, carcass, yield and abdominal fat amount were determined in the experimental chickens that

were slaughtered. For this, 5 chickens closest to the average live weight from each repetition of the groups were selected and the slaughter and carcass data of these selected chickens were determined. Accordingly, a total of 15 broilers from each group were used. The belly fat of the chickens was determined by taking the fat layer around the abdomen, cloaca and gizzard (Kubena et al., 1974).

**Statistical Analysis**

The statistical package program was used for statistical analysis of the data obtained in the experiment. The data were evaluated according to Duncan test.

**Results**

In this study, weekly results of feed consumption, body weight, body weight gain and feed conversion ratio values throughout the trial (2-7 weeks) are given in Table 4.

The effects of treatments on feed conversion rates at the third week of age and on feed intake at the seventh week of age were found to be significant (P <0.05; Table 4). The effects of the treatments on IBW, FLW, BWG, FI and FCR in weeks other than this (second, fourth, fifth and sixth) were insignificant.

Table 4. The effect of feeding with rations containing Thepax and active yeast on some yield parameters of broilers

Parameters	Treatment groups (8-14 d)					P value
	Control (Group 1)	0.1% Thepax (Group 2)	0.2% Thepax (Group 3)	0.1% AY (Group 4)	0.2% AY (Group 5)	
IBW	146.96	133.83	136.50	147.83	142.23	NS
BW	320.96	313.66	324.30	346.83	315.73	NS
BWG	174.00	179.83	187.80	199.00	173.50	NS
FI	273.43	268.60	270.63	291.66	277.00	NS
FCR	1.57	1.49	1.45	1.46	1.60	NS
15-21 d						
BW	710.36	679.13	666.46	703.00	677.10	NS
BWG	389.40	365.46	324.16	356.16	361.36	NS
FI	539.00	524.33	532.93	502.16	517.13	NS
FCR	1.39b	1.43ab	1.65a	1.40b	1.43b	0.05
22-28 d						
BW, g	1115.53	1088.06	1075.23	1087.00	1064.93	NS
BWG, g	405.17	408.93	408.77	384.00	387.83	NS
FI, g	639.10	649.83	673.56	643.83	651.00	NS
FCR, g/g	1.58	1.58	1.65	1.67	1.67	NS
29-35 d						
BW, g	1550.43	1536.73	1485.20	1482.56	1464.83	NS
BWG, g	434.90	448.73	409.97	395.56	399.90	NS
FI, g	821.50	814.76	770.66	813.40	805.26	NS
FCR, g	1.89	1.82	1.88	2.06	2.01	NS
36-42 d						
BW, g	1884.10	1883.66	1794.73	1826.63	1737.36	NS
BWG, g	333.67	349.93	309.53	344.06	272.532	NS
FI, g	867.60	944.70	867.26	883.03	854.23	NS
FCR, g/g	2.60	2.70	2.80	2.56	3.14	NS
43-49 d						
BW, g	2237.23	2291.00	2180.26	2214.63	2075.33	NS
BWG, g	353.13	407.33	385.53	388.00	337.96	NS
FI, g	823.40b	920.53a	840.56ab	818.80b	792.66b	0.05
FCR, g/g	2.33	2.26	2.18	2.12	2.35	NS

AY: Active yeast. IBW: Initial body weight. BW: Body weight. BWG= Body weight gain. FI= Feed intake. FCR= Feed conversion ratio. P= Probability. NS: None significant., <sup>a,b</sup> Means within a column with no common superscripts differ significantly.

Table 5- The effects of feeding with diets containing inactive and active yeast on general performance results of broiler chickens (n = 60)

Parameters	Treatment groups (8-49 d)					P value
	Control (Group 1)	0.1% Thepax (Group 2)	0.2% Thepax (Group 3)	0.1% AY (Group 4)	0.2% AY (Group 5)	
IBW, g	146.96	133.83	136.50	147.83	142.23	NS
∑FBW, g	2237.23	2291.00	2180.26	2214.63	2075.33	NS
∑BWG, g	2090.26 <sup>ab</sup>	2157.23 <sup>a</sup>	2043.80 <sup>ab</sup>	2066.80 <sup>ab</sup>	1933.10 <sup>b</sup>	0.05
∑FI, g	3963.90	4122.76	3955.56	3952.90	3897.30	NS
∑FCR, g/g	1.89	1.91	1.93	1.91	2.01	NS
Mortality	0.046	0.097	0.033	0.033	0.067	NS

IBW= Initial body weight. ∑FBW= Final body weight. ∑BWG= Body weight gain. ∑FI= Feed intake. ∑FCR= Feed conversion ratio. P= Probability. NS: None significant, <sup>ab</sup> Means within a column with no common superscripts differ significantly.

Table 6. The effects of feeding with diets containing inactive and active yeast on the results of slaughter and carcass parameters of broiler chickens (n = 15)

Parameters	Treatment groups (8-49 d)					P value
	Control (Group 1)	0.1% Thepax (Group 2)	0.2% Thepax (Group 3)	0.1% AY (Group 4)	0.2% AY (Group 5)	
SW, g	2277.46	2327.33	2273.73	2262.73	2276.22	NS
CW, g	1629.33 <sup>b</sup>	1710.00 <sup>a</sup>	1664.00 <sup>b</sup>	1660.80 <sup>b</sup>	1633.57 <sup>b</sup>	0.05
CY, %	71.5 <sup>b</sup>	73.4 <sup>a</sup>	73.2 <sup>a</sup>	73.4 <sup>a</sup>	71.7 <sup>b</sup>	0.01
ABF, g	16.36	14.80	12.52	16.24	16.11	NS

SW=Slaughter weight. CW= Carcass weight. CY= Carcass yield. ABF= Abdominal fat, <sup>ab</sup> Means within a column with no common superscripts differ significantly.

### General Performance Results

In this study, the general results of the total feed consumption, total live weight gain and total feed utilization values of the trial are given in Table 5. According to these general performance data, the effects of the treatments on the initial live weight, final live weight, feed consumption, feed conversion and mortality rates in broiler chickens were insignificant (P>0.05), but the effect on total body weight gain was found significant (P<0.05). The highest weight gain was 2157.23 g in group 2 (Thepax 0.1%), while the lowest weight gain was in group 5 (AY 0.2%) with 1933.10 g.

The data of the slaughter and carcass parameters in the study are given in Table 6. The effects of the treatments on the slaughter weight and abdominal fat weight of the broilers were insignificant (P>0.05), while the effect on the carcass weight and carcass yield was significant (P<0.05). Group 2 ranked first in terms of carcass weight and carcass yield. However, in terms of carcass weight, the difference was only between the 2nd group and the other groups. Carcass yields of the 2nd, 3rd, and 4th groups were higher (P<0.05) compared to the control and 5th groups. It was noteworthy that the group containing 0.1% Thepax ranked first in terms of both carcass weight and carcass yield. Accordingly, it can be said that 0.1% Thepax dose is the most appropriate in terms of carcass weight and carcass yield.

### Discussion

In this study, 0.1% Thepax were found to be significant (P<0.05) only on body weight gain in respect to performance parameters according to 0.2% AY. Results of studies showing that baker's yeast increases live weight in broiler chickens (Yalçın et al., 1993; Nabila et al., 2017) and that yeast has a significant effect on live weight gain of broiler chickens (Santin et al., 2001; Suzer et al., 2015; Mohamed et al., 2015; Sun et al., 2019;) with the result of

this study was not similar. In addition, the results of the study (Boostani et al., 2013) in which Thepax had a significant effect on the body weight gain of broilers were not similar to the results of this study.

In this study, the effect of treatments on feed intake was insignificant. This finding was not similar to the findings of the studies (Yalçın et al., 1993; Gao et al., 2008; Nabila et al., 2017) in which yeast increased feed consumption in broilers. However, the finding of this study were similar to the findings of the study (Zhang et al., 2005) that *Saccharomyces cerevisiae* supplementation did not affect the feed consumption of broiler chickens.

In this study, the effect of the treatments on the feed efficiency value was insignificant. The results of the study in which baker's yeast worsen the FCR value in broiler chickens (Yalçın et al., 1993) and the study finding that Thepax has a significant effect (P <0.05) on the FCR value of broilers (Boostani et al., 2013) with the findings of this study were not similar. The findings of the study in which the effect of different levels of yeast culture on the FCR value in broiler chickens were significant (Santin et al., 2001) were not similar to the finding of this study. It is thought that yeast, which has the feature of increasing water consumption, causes watery stool, and thus affects the FCR value in broiler chickens negatively.

In this study, 0.1% Thepax had an important effect (P<0.05) on carcass weight whereas 0.1% Thepax, 0.2% Thepax and 0.1% AY were increased (P<0.01) carcass yield. The findings of the study in which Thepax has a significant effect on the carcass weight and carcass yield of broilers (Boostani et al., 2013) and the finding of the study in which yeast affects the carcass weight of broilers (25) with the findings of this study were similar. On the other hand, the results of this study did not show similarities with the results of the study, in which they reported that the addition of yeast to the diet had no effect on the carcass weight and carcass yield of broilers (Rezaeipour et al., 2012).

In this study, abdominal fat weights were not affected by the treatment ( $P>0.05$ ). This result was not similar to the results of the study in which the addition of yeast affected the abdominal fat content of broilers ( $P<0.05$ ) (Boostani et al., 2013; Mohamed et al., 2015).

In this study, the effect of the treatments on the mortality rate of the groups was insignificant ( $P>0.05$ ). This result was similar to the result of the study (Silva et al., 2010) in which the effect of yeast addition on the mortality rate in broiler chickens was insignificant.

## Conclusion

The diets containing yeast had no any adverse effect on the performance parameters of broiler chickens compared to the control group. It was observed that feeding with rations added 0.1% Thepax especially compared to the control groups had a higher effect on the carcass weight and carcass yield of broilers. The numerical amount of abdominal fat in the group containing 0.2% Thepax was the lowest.

In this study, it was observed that Thepax had a more pronounced effect only on the It is thought that this effect may have arisen from the inactive-stable feature of Thepax. Accordingly, it is possible to claim that it is more appropriate to prefer inactive-stable yeasts in the feeding of broilers.

Inactive-stable yeast (Thepax) may be more effective in feeding broilers than active yeast because it is more resistant to environmental and digestive conditions. Therefore, it is thought that it may be more beneficial to prefer inactive-stable yeasts in cases where ration changes are made more frequently and feeding time is necessarily extended.

## Disclosure

No potential conflict of interest was reported by the authors.

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