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The effect of yeast (*Saccharomyces cerevisiae*) on fattening performances of growing cattle

Abstract

The aim of this experiment was to evaluate the yeast on fattening performances of the growing cattle. The experiment was carried out with 179 imported 12-14 months old growing different breed bulls (Hereford, Angus, Brangus, and some other crossbreds) that were allocated to control and yeast group according to the breeds and body weight. Experimental diet was formulated with 19 % roughages (alfalfa and wheat straw) containing 13% crude protein. Yeast group was supplemented 40g d^{-1} live yeast containing 1.23×10^{11} CFU/g. The study lasted 62 days from May to July. Initial body weight were 393.91±4,43 for control and 395.56±4.45kg for yeast group. After test period, daily gain was similar (1465.85±26.76 *vs.* 1451.42±34.05g d^{-1}, P>0.05) for the bull receiving the diet without yeast compared to the bulls receiving yeast. Similar results were obtained for feed to gain ratio (P>0.05) as well. In conclusion, under present experimental condition (high concentrate, buffer usage and better total mixed ration management) the yeast (*Saccharomyces cerevisiae*) did not improve fattening performance of growing cattle.

Keywords: growing cattle, bull, yeast, *Saccharomyces cerevisiae*, fattening performance

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Introduction

The main purpose of activity in all type of animal husbandry is to make profit. Numerous research over the years have successfully led to substantial improvements in growth rate, days on feed, carcass weight and feed to gain in cattle fattening operations. Last 30 years, marked improvements were due to studies on diet, management and growth promoters. Profitability depends on the performance of the animals. Ruminant performances mainly depend on rumen fermentation conditions. Many applications (buffer, prebiotics, probiotics, synchronous nutrient supply, roughage particle size and diet moisture content, essential oil etc.) are available on the practice for better rumen activity and better performances.[1] The studies interested in ruminant feeding focused on manipulation of rumen fermentation and the rumen ecosystem in order to increase the efficiency of nutrient utilization in the ruminally and postruminally. Fattening diets contain high concentrate and it may decrease rumen pH resulting in decrease in cellulose digestion, increasing diarrhea, bloat, laminitis risk and interfering microbial growth in the rumen. All these effects may decrease fattening performance of growing cattle.

Direct fed microorganisms have been used in recent years to improve the efficiency of rumen fermentation and to increase the efficiency of nutrient utilization in ruminants. The yeast usage is one of the most applicable and safest feed additives in the ruminant nutrition for better performances.[2] This idea suggested that the yeast cultures encouraged the growth of helpful bacteria (e.g. cellulolytic, acid utilizing bacteria, Chaucheyras et al.[3]), which improve rumen condition and nutrient utilization efficiency. In recent studies with different yeast species, it has been emphasized that the increase in the number of viable microorganisms in the rumen is caused by the respiratory activities of the yeast in the rumen, thus removing the oxygen present in the rumen and providing an anaerobic environment for strictly anaerobic microorganisms in the rumen. *Aspergillus oryzae* group is used both live and dead with fermentation medium and can contribute to the rapid proliferation of rumen microorganisms[4,5] as well. Some authors investigated the effect of adding live yeast in ruminant diet and found no positive results while other positive. Krehbiel et al.,[6] indicated that feeding of direct-fed microbials (DFM) to feedlot cattle generally results in increase feed intake and daily weight gain and improvement in feed efficiency. However, Brashears et al.[7] reported that supplementation of DFM resulted in no measurable impact on growth rate in finishing cattle.

The aim of this experiment was to evaluate the live yeast supplementation effects at intensive fattening performances of different breed growing bulls.

Materials and methods

This study was conducted with Angus, Hereford, Brangus and different crossbreed 10-14 months of age bulls during the 62 days period from May and July. The experiment was carried out a Şanal Agricultural Enterprises intensive fattening farm is located 30 km from Adana which is located between 35-38 latitude and 34-46 eastern longitude and in Mediterranean Region with a total 179 head growing cattle. The farm had 9 pen sized 18×12 m and 4 pens were used to test supplemental yeast on fattening performance of growing cattle. Each pen had 18 m feeding space. The intensive fattening farm has a capacity of 400 heads and is designed free semi-open barn.

The total mixed ration (TMR) was formulated to get 1700g/day[8] with barley, corn flake, protein concentrate, wheat straw and alfalfa hay with 19.53 % roughage, 13.03 % crude protein (Table 1). The same TMR was offered three times a day at 06:00, 14:00 and 22:00 according to animal number and size in each pen ad libitum for two experimental groups, control and yeast groups. Yeast group was supplemented with 40g yeast containing 1.23×10^{11} CFU active yeast and 215mg inactive yeast culture (cell wall extract) per gram.

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Table 1 The total mixed ration used throughout study

Feeds	%DM
Barley	31,33
Corn Flake	30,30
Protein concentrate**	19,13
Alfalfa	15,66
Wheat Straw	3,57
Total	100,00
Nutrient compositions	
Dry matter (% As fed)*	62,34
Roughage (% DM)	19,53
Crude protein (% DM)	13,03
Fat(%DM)	2,70
Ash(%DM)	8,73
NDF(%DM)	23,40

*TMR dry matter content adjusted 62, 34 % by adding water to mixer wagon

** protein concentrate contains 4% limestone, 4% sodium bicarbonate and %2 magnesium oxide, 1% salt and 0.3 % vitamin mineral premix

Feed intake was and feed was determined in pen based and feed to gain ratio was calculated from pen average dry matter intake and individual daily gains. In order to meet the salt needs of bulls, licking stones were kept in the feeders continuously. The fresh water was supplied to the bulls in the waterer in each paddock. Daily gain was determined with 4 week period by weighing all animal before feeding.

Feed analysis was determined according to methods described in AOAC.[9] Body weight, daily gains and feed to gain ratio were analyzed statistically with completely randomized design using the SPSS statistical package program.[10]

Results and discussion

Overall fattening performances of the experimental groups are presented in Table 2. Daily gain, feed intake and feed to gain were not affected from yeast (*Sacchoromyces cerevisia*). Dry matter intake, daily gain and feed to gain were 11.36kg *vs.* 11.46kg d^{-1}; 1465, 85±26,76 *vs.* 1451,842±34.05 and 8.04±0.18 *vs.* 8.33±0.24 for control and yeast supplemented bulls respectively. Ovinge et al.[11] revealed that growth performance of steers fed steam-flaked corn-based finishing diets. Similar results were observed in cattle,[12,13] sheep[14] and lambs.[15–17]

Table 2 Overall fattening performances data of the experimental groups

Fattening performance parameters	Control group			Treatment (Yeast) group			Sig.
	$\bar{x}\pm S_{\bar{x}}$	Min	Max	$\bar{x}\pm S_{\bar{x}}$	Min	Max	P<
Number of animal	94			85			
Initial body weight (kg)	393,91±4,43	261	519	395,56±4,45	306	497	0,75
Final body weight (kg)	484,80±5.00	365	639	485,55±5,35	368	600	0,92
Daily gain (g d-1)	1465,85±26,76	693,55	2000	1451,42±34.05	596.77	2274,19	0,74
Dry matter intake (kg d-1)*	11,36	11,01	11,66	11,46	11,02	11,93	
Feed to Gain**	8,04±0,18	5,69	15,87	8,33±0,24	5.25	18.47	0,32

* Two pen feed intake exist for each treatment as group basis, thus statistic analysis was not performed for dry matter intake

** The feed to gain ratio was calculated by the amount of dry matter intake per kg daily gain for each bull

However some other studies reported that *Saccharomyces cerevisiae* supplemented to ruminants can affect dry matter intake, rumen pH and overall nutrient digestibility.[18–21] Finck et al.[22] reported increases in dry matter intake in cattle during the receiving period at the feedlot when cattle were supplemented with yeast products. Other studies utilizing supplementation with yeast products have also reported increases in dry matter intake and average daily gain of feeder cattle.[11] Lack of response to yeast supplementation in the present study may be attributed to no improvement in nutrient digestibility. The diet based on alfalfa hay as main forage which has high pectin content of alfalfa hay with high buffering capacity,[23] protein concentrate used in the study supplied about 100g d^{-1} and 50 g d^{-1} sodium bicarbonate and magnesium oxide as buffer. Additionally good feed bunk management with optimum particle size supplying enough effective NDF and TMR moisture to prevent sorting behavior of bull in the present study may prevent advantages of yeast supplementation over control.

As reported before, the studies in literature with live yeast supplementation have inconsistent results for ruminants due to differences in animal material, diet, yeast culture, feeding management, other feed additives usage together with yeast.[4,15] Furthermore, the modes of action of yeast products that directly or indirectly affecting metabolic and performance changes have not been fully elucidated.[24–27]

Conclusion

Yeast *(Saccharomyces cerevisiae)* supplementation did not improve fattening performance of bull in the present study. Lack of response to yeast supplementation to TMR of fattening bull may be attributed to forage source, buffer supply ($NaHCO_3$, MgO), good feed bunk management (ad libitum feeding, proper particle size and diet moisture for preventing sorting behavior).

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Conflicts of interest

The authors declare there are no conflicts of interest.

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