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# EFFECT OF PROBIOTICS AND YEAST CULTURE ON THE PERFORMANCE OF PIGS AND DAIRY COWS

# DJELOVANJE PROBIOTIKA I KULTURE KVASACA NA PERFORMANCE SVINJA I MLIJEČNIH KRAVA

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Original scientific papers
Izvorni znanstveni članak
UDK: 636.4.2.;636.087.7.73
Primljeno - received: 10. lipanj - june 1994.

## SUMMARY

In the first experiment, effect of the Yea-Sacc$^{1026}$ additive in the quantity of 10 g/day on fermentation (pH, lactic acid, NH3, acetic acid, propionic acid, acetic: propionic acid ratio), digestibility of the feed nutrients (dry matter, crude protein, cellulose, hemicellulose) in the rumen, and on productivity and composition of the milk (quantity, butter fat and protein) of the diary cows have been researched. Yea-Sacc$^{1026}$ positively affected fermentation at the feed nutrients as well as the ratio of the digested feed nutrients in the rumen. Reaction in the rumen, in the presence of the yeast culture, depends on the type of the feed, and on the ratio of the roughage and concentrates. Supplementation of the rations for the high-production cows with the Yea-Sacc$^{1026}$ had a positive impact on the production, so it can be expected additional 100 kg of the milk, 4 kg of the butter fat, and 3 kg of the proteins by using 1 kg of the Yea-Sacc $^{1026}$ during the 100 days lactation. In the second experiment, effect of the Lacto-Sacc aditive, in the quantity of the 1 kg/t of the grower mixture, on the producing of the pigs (live weight on 29th and 51st day, daily gain, feed conversion) have been researched. Inclusion of the Lacto-Sacc in the pig diets have enhanced daily gain and improved feed conversion.

## 1. INTRODUCTION

In recent decades, the widespread use of additives with different biological effects have become commonplace in the development of the animal production. These additives were used partly in the prevention of various diseases partly to increase diesease resistance and decrease negative performance due to stress of intensive farming.

These additives were also administered to increase economic productivity, effectiveness of nutrient utilization and efficiency of feed utilization. At the same time, some consumers demanding excellent quality animal products distrusted the use of some additives because of their possible negative effects on food quality or residue production.

To allay consumer concern attention was paid to natural biological additives which are well-known and researchers with many years experience with these additives were not afraid to recommend them in animal production. The best-known additives in this group are

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the Saccharomyces cerevisiae and various Lactobacillus and Streptococcus species.

In recent years, the biotechnological industry has selected and produced species which have favourable effects on the microbial population present in the digestive system (Lyons, 1990). Being an agricultural country Hungary's industry is export-oriented, with about 30 to 35 % of the agricultural production exported annually, the export market consumer demands and stipulations of EC feed additive regulations made it necessary to carry out experiments and adopt the use of consumer friendly biological additives.

## 2. EFFECT OF YEA-SACC $^{1026}$ ON THE RUMEN FERMENTATION AND RUMINAL DIGESTION OF FEED NUTRIENTS

In the first experiment rumen-fistulated cows were offered a diet consisting of 70 % roughages and 30 % concentrates on dry matter basis which was supplemented with Yea-Sacc$^{1026}$ at 10 g/day.

**2.1. Rumen Fermentation**. Investigations were carried out on the composition of the rumen fluid and on the breakdown of the feedstuffs (maize silage, alfalfa hay and concentrate) in the rumen using the nylon bag technique. Details of the technique were described previously (Gombos and Henics, 1990).

The rumen fluid study showed that the composition of the rumen fluid was definitely enhanced by the addition of 10 g/day of Yea-Sacc $^{1026}$ to the diet increasing the pH values of the rumen fluid, while the lactic acid conentration and the $NH_3$ concentration decreased.

The reduction in pH values obtained due to Yea-Sacc $^{1026}$ (Table 1) were significant, although lower than those obtained by Dawson and Newman (1987) using an artifical rumen to evaluate roughage diets. This was probably due to the high level of roughages in the ration.

The yeast culture inclusion caused rumen lactic acid concentration to drastically decrease 8 hours after feeding; it is suggested, therefore, that the sugars produced from the fermentation of carbohydrates are utilized by the Saccharomyces and at the same time the activity of the lactic acid bacteria is decreased. Similarly, the NH3 was very low due to the increased activity of the cellulolytic bacteria.

Yea-Sacc $^{1026}$ did not affect the proportions of volatile fatty acids observed,however, the ratio of acetic acid and propionic acid was increased. In the case of cows eating high roughage diets, the change in the proportion of acetic acid and propionic acid due to Yea-Sacc$^{1026}$ was smaller than that reported by Dawson and Newman (1987) with animals eating more concentrates.

**Table 1. The effect of Yea-Sacc $^{1026}$ on the rumen fermentation parameters in dairy cows**
**Tablica 1. Utjecaj Yea-Sacc$^{1026}$ na parametre fermentacije u buragu mliječnih krava**

| | Time after feeding Vrijeme nakon hranjenja | | | |
|---|---|---|---|---|
| | 2 hrs - 2 sata | 4 hrs - 4 sata | 8 hrs - 8 sati | Average - prosjek |
| pH | | | | |
| Control - kontrola | 6.28$^b$ | 6.17$^b$ | 6.38$^b$ | 6.28$^b$ |
| Yea-Sacc$^{1026}$ | 6.66$^a$ | 6.38$^a$ | 6.74$^a$ | 6.59$^a$ |
| Lactic acid,% - mliječna kiselina | | | | |
| Control - kontrola | 0.017 | 0.015 | 0.020$^b$ | 0.0173$^b$ |
| Yea-Sacc$^{1026}$ | 0.016 | 1.015 | 0.002$^a$ | 0.0110$^a$ |
| NH3 mg/dl | | | | |
| Control - kontrola | 30.0 | 15.1. | 14.8$^b$ | 20.0$^b$ |
| Yea-Sacc$^{1026}$ | 33.5 | 14.6 | 8.6$^a$ | 18.9$^a$ |
| Acetic acid,mol/mol - octena kiselina | | | | |
| Control - kontrola | 0.670 | 0.680 | 0.700 | 0.683 |
| Yea-Sacc$^{1026}$ | 0.655 | 0.680 | 0.700 | 0.678 |
| Propionic acid,mol/mol - propionska kiselina | | | | |
| Control - kontrola | 0.180 | 0.170 | 0.150 | 0.167 |
| Yea-Sacc$^{1026}$ | 0.185 | 0.170 | 0.160 | 0.172 |
| Acetic/propionic ratio - Odnos octena/propionska kiselina | | | | |
| Control - kontrola | 3.72$^b$ | 4.00 | 4.67$^b$ | 4.13$^b$ |
| Yea-Sacc$^{1026}$ | 3.54$^a$ | 4.00 | 4.38$^a$ | 3.97$^a$ |

ab Values within the same column with different superscripts differ significantly $P \leq 0.5$
ab Vrijednosti u istom redu s različitim natpisima značajno se razlikuju ($P \leq 0.5$)

**2.2. Feed Digestibility**. Yea-Sacc $^{1026}$ affected digestibility of the feed nutrients in the rumen during a 48 hour incubation period as follows: disappearance of dry matter in maize silage and concentrate decreased, but was unaffected in alfalfa hay.

There was a consistent increase in the breakdown of cellulose in both roughages, however, an increase in the degradation of hemicellulose could be observed only in the case of alfalfa hay (Table 2).

**Table 2. The effect of Yea-Sacc[1026] on rumen digestibility in dairy cows**
**Tablica 2. Utjecaj Yea-Sacc[1026] na probavljivost u buragu kod mliječnih krava**

| | Rumen digestibility (%) - Probavljivost u buragu | |
|---|---|---|
| | Control - kontrola | Yea-Sacc [1026] |
| Maize silage - kukuruzna silaža | | |
| Dry matter - suha tvar | 70.4 | 71.2 |
| Crude protein - sirove bjelančevine | 67.9 | 63.1 |
| Cellulose - vlaknina | 53.7[b] | 58.7[a] |
| Hemicellulose - hemiceluloza | 58.0 | 57.0 |
| Alfalfa hay - sijeno lucerne | | |
| Dry matter - suha tvar | 53.7 | 53.4 |
| Crude protein - sirove bjelančevine | 72.4 | 72.9 |
| Cellulose - vlaknina | 37.0[b] | 47.0[a] |
| Hemicellulose - hemiceluloza | 13.0[b] | 29.0[a] |
| Concentrate - koncentrat | | |
| Dry matter - suha tvar | 87.6 | 88.3 |
| Crude protein - sirove bjelančevine | 88.6 | 84.8 |

ab Values within the same row with different superscripts difer significantly $P \leq 0.5$
ab Vrijednosti u istom redu s različitim natpisima značajno se razlikuju ($P \leq 0,5$)

## 3. THE EFFECT OF YEA-SACC [1026] IN DAIRY COWS

Two hundred and ninety dairy cows (mainly Holstein-Friesians) given a normal Hungarian feed ration supplemented with a daily allowance of 10 grams Yea-Sacc[1026] were compared to a unsupplemented control group of 290 dairy cows. Milk yield, butterfat and protein content were recorded for both the control and the supplemented group.

Both groups were selected from high-producing cows in the herd. The average production of the herd was 7600 kg milk with 3.6 % butterfat and 3.25 % protein.

The experiment was undertaken in the period of 70 to 153 days following calving. Four times during this test period milk yield (corrected for initial output), butterfat and protein content in the milk were individually recorded for each cow and the results are presented in Table 3.

**Table 3. Effect of Yea-Sacc[1026] on the milk production and composition of milk**
**Tablica 3. Učinak Yea-Sacc[1026] na proizvodnju i sastav mlijeka**

| | Control kontrola | | | Yea-Sacc[1026] | | |
|---|---|---|---|---|---|---|
| | Milk mlijeko (kg/d) | Fat mast (%) | Protein bjelanč evine (%) | Milk mlijeko (kg/d) | Fat mast (%) | Protein bjelanč evine (%) |
| Ist control - 1. kontrola | 32.26 | 3.60 | 3.07 | 32.26 | 3.85 | 3.13 |
| 2nd control - 2. kontrola | 33.26 | 3.74 | 3.22 | 33.76 | 3.66 | 3.26 |
| 3rd control - 3. kontrola | 28.10 | 3.47 | 3.32 | 30.28 | 3.83 | 3.27 |
| 4th control - 4. kontrola | 28.43 | 3.71 | 3.25 | 29.37 | 3.99 | 3.32 |
| Total change - ukupna promjena | -3.83 | +0.11 | +0.18 | -2.89 | +0.14 | +0.19 |

It was established that the milk production decreased in both groups, but to a lesser degree in the case of the experimental group. The increase in daily milk production due to Yea-Sacc [1026] was 0.94 kg/cow/day. The Yea-Sacc[1026] supplemented group produced 78 kg more milk during the 83 day test period.

An increase in fat content of the milk was observed (+0.14 %). The increase in butterfat production was 40 g/day for the experimental animals compared with the control group. Protein content of the milk increased (+0.19 %) due to Yea-Sacc [1026] supplementation during the test period.

The result was 2490 g protein production advantage in favor of the Yea-Sacc [1026] fed animals during the 83 day experimental period.

The above results on the positive changes to milk composition show very good agreement with experimental data relating to Yea-Sacc [1026] supplemntation of dairy in various countries (Dildey, 1988).

## 4. THE EFFECT OF LACTO-SACC ON PIG PRODUCTION

Lacto-Sacc was added at 1 kg per tonne of standard pig grower feed and was compared with the standard grower feed without added Lacto-Sacc. Liveweight gain and feed conversion were measured using 28 pigs (14 males and 14 females) per treatment (Table 4).

**Table 4. Effect of Lacto-Sacc on production of fattening pigs**
**Tablica 4. Utjecaj Lacto-Sacc-a na proizvodna svojstva svinja u tovu**

| | Control - kontrola | | Lacto-Sacc | |
|---|---|---|---|---|
| | Males Mužjaci | Females Ženke | Males Mužjaci | Females Ženke |
| Number of pigs Broj svinja | 14 | 14 | 14 | 14 |
| Initial weight,(kg) Početna težina | 34.2 | 34.2 | 31.7 | 33.1 |
| Weight after 29 days,(kg) Težina nakon 29 dana | 54.2 | 54.8 | 54.6 | 56.5 |
| Weight after 51 days,(kg) Težina nakon 51 dan | 74.2 | 74.0 | 74.2 | 75.1 |
| Fed intake,(kg) Utrošak hrane | | | | |
| 0 to do 29 days dana | 54.5 | 55.7 | 56.0 | 57.7 |
| 0 to do 51 days dana | 121.5 | 119.8 | 119.3 | 123.2 |
| Weight gain,/g/day) Prirast težine | | | | |
| 0 to do 29 days dana | $690^b$ | $710^b$ | $790^a$ | $807^a$ |
| 0 to do 51 days dana | $784^b$ | $780^b$ | $833^a$ | $825^a$ |
| F.C.R. - iskorištenje hrane | | | | |
| 0 to do 29 days dana | 2.72 | 2.70 | 2.44 | 2.47 |
| 0 to do 51 days dana | 3.04 | 3.01 | 2.81 | 2.93 |

ab Values within the same row with different superscripts differ significantly ($P \leq 0.5$)
ab Vrijednosti u istom redu s različitim oznakama značajno se razlikuju ($P \leq 0.5$)

The performance data for the males and females were examined separately. Lacto-Sacc singificantly increased daily liveweight gain in both sexes with the greatest response to feed conversion efficiency among the male pigs.

The Lacto-Sacc enhances gut function, digestion and metabolism in pigs. Lacto-Sacc contributes to lactic acid production reducing the pH value in the gut thereby improving the absorption of nutrients. This increased level of absorbed nutrients has a positive effect on the liveweight gain and feed efficiency.

Other effects of probiotics include detoxification, antibacterial activity and imunostimulation (Fuller and Cole, 1988) Lacto-Sacc is effective as a feed additive (1 kg per tonne of feed) in fattening pigs as it improved the ileal digestibility of the nutrients (proteins and amino acids) resulting in a positive effect on the liveweight gain and feed efficiency.

## 5. CONCLUTION

1. In can be concluded that Yea-Sacc $^{1026}$ has a positive influence on the fermentation of nutrients in the rumen as well as on the rate and proportion of the degradation of nutrients in the rumen. The level of response in the rumen due to yeast culture is influenced by type of feed, the proportion of roughages and concentrate.

2. The Yea-Sacc $^{1026}$ supplementation (10 g/d) to the diets of high yielding dairy cows resulted in a positive response and we can expect an extra 100 kg milk, 4 kg butterfat, 3 kg milk protein from 1 kg Yea-Sacc$^{1026}$ supplementation during 100 days of lactation.

3. The increeased liveweight gain in pigs due to Lacto-Sacc inclusion in the diet was confirmed in a pig fattening trial with feed conversion efficiency also improved.

### 6. References


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## SAŽETAK

U prvom pokusu istraživan je utjecaj aditiva Yea-Sacc $^{1026}$ u količini 10 g/dan, na fermentaciju (pH, mliječna kiselina, NH3, octena kiselina, propionska kiselina, odnos octene i propionske kiseline) i probavljivost hranjivih tvari (suha tvar, sirove bjelančevine, celuloza, hemiceluloza) u buragu, te proizvodnost i sastav mlijeka (količina mlijeka, mliječne masti i bjelančevina) u mliječnih krava. Yea-Sacc $^{1026}$ pozitivno je utjecao na fermentaciju hranjivih tvari i omjer razgrađenih hranjivih tvari u buragu. Reakcija u buragu, uz prisustvo kulture kvasaca, ovisi o tipu hrane, te omjeru voluminoznog dijela i koncentrata. Obogaćivanje obroka visokoproizvodnih krava s Yea-Sacc $^{1026}$ za vrijeme laktacije od 100 dana. U drugom pokusu istraživan je utjecaj aditiva Lacto-Sacc, u količini od 1 kg/t smjese u porastu, na proizvodnost svinja (tjelesna masa 29. i 51. dana, dnevni prirast, konverzija hrane). Uključivanjem Lacto-Sacca u obrok svinja povećan je dnevni prirast i poboljšana kovnerzija hrane.

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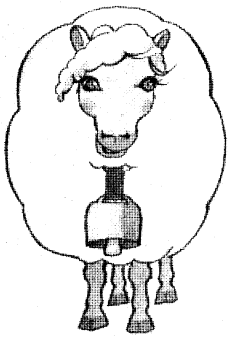

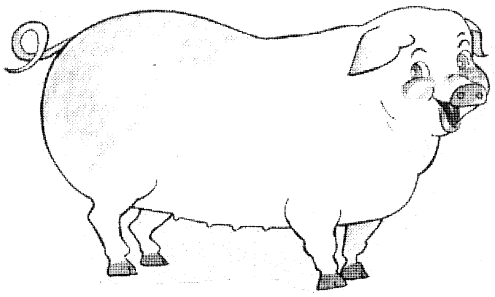

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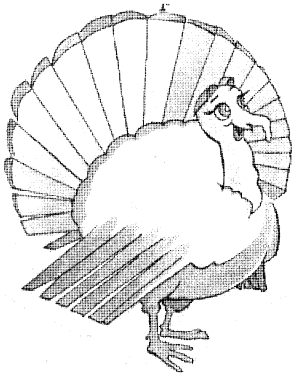

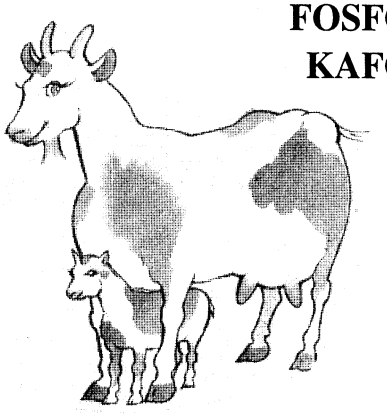

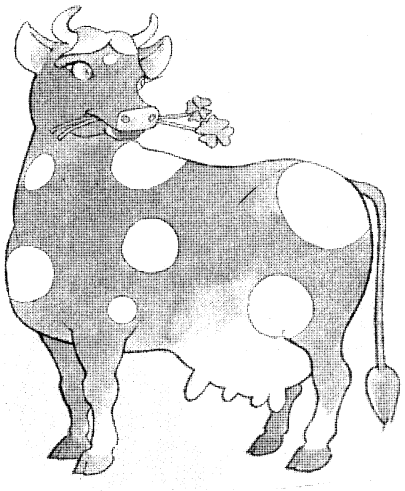

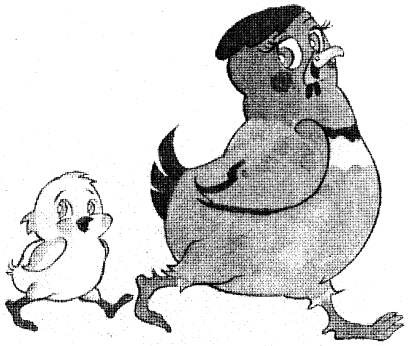

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