*VETERINARSKI ARHIV 83* (2), 245-252, 2013

# Use of brewer's yeast in feeding capons

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**MAS, N., V. ŠERMAN, Ž. HORVAT, E. STRAKOVA, H. VALPOTIĆ, Ž. MIKULEC, T. MAŠEK, P. SUCHY, S. VINCE: Use of brewer's yeast in feeding capons. Vet. arhiv 83, 245-252, 2013.**

**ABSTRACT**

The use of yeast in feeding capons was investigated. An Investigation was carried out on 40 capons of the hybrid line Ross 308, caponized at 28 days. For 22 weeks the capons were given feed and water *ad libitum* and kept in controlled zoo-hygienic conditions. The experimental capons obtained yeast in feed mixtures as protein feed, while the control capons were given commercial feed mixtures for fattening chickens with fish meal in the starter and oil grits in finisher 1 and finisher 2. The results of the study showed no statistically significant differences ($P<0.05$) between the final body weights of the capons, feed conversion, growth performance and share of breast weight in the carcass weight, which supports the conclusion that fish meal proteins can be successfully substituted with yeast proteins for feeding capons.

**Key words:** capon, production results, yeast

## Introduction

A castrated male chicken is a capon. In caponization, the surgical castration of a male chicken, the testes are completely removed. The testes of male birds are internal, so the operation requires surgical removal of the reproductive organs through an incision between the last two ribs. The surgery is typically performed on fully conscious animals that have not been anesthetized nor provided with any pain relief (STROMBERG, 1998).

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ISSN 0372-5480
Printed in Croatia

While castrations of dogs and cats are performed by trained veterinary professionals in special aseptic surgeries, there are no regulations to prevent chickens, pheasants (JACOB et al., 2000) and quail (STROMBERG, 1998) from being castrated by unskilled individuals in unsterile conditions (HSUS Report).

Although cockerels as young as ten days of age may be castrated (STROMBERG, 1998), caponization is usually performed when the birds are two or four weeks old. The cockerels are taken off feed and water 12-24 hours prior to surgery. An antibiotic is injected into the cockerels at the time of caponization, or one is fed for a week prior to the operation and for a week after (JACOB and MATHER, 2000)

Any breed of chickens can be caponized, but commercial producers use Cornish and Plymouth Rock cross-bred birds (HSUS Report), the same crosses typically used in the broiler chicken industry (JACOB and MATHER, 2000). The same authors report that caponized cockerels grow more slowly than normal male chickens and accumulate more body fat. The capon meat is more tender, juicier and more flavored than that of a common chicken.

Some breeds, such as Cornish, Plymouth Rock, New Hampshire or Rhode Island Red are used for farm flock meat production, but they generally do not grow as rapidly as the cross-breeds and take more feed per kg of weight gained. The males can be caponized at 3-4 weeks and marketed as capons after 18 weeks (HAMRE, 1991).

The effects of caponization on growth performance, carcass composition and meat quality were investigated (CASON et al., 1988; ETCHES, 1996; MANDIĆ et al., 2006; MAST et al., 1981; SYMEON et al., 2010; RIKIMARU et al., 2011). However, in the literature quoted and available to us there is no information on feeding methods and feed composition for capons. Thus the aim of our investigation was to determine how feeding commercial mixtures for fattening chickens and mixtures based on individual recipes affect the production of capons at the end of the investigation (from the 1$^{st}$ to the 150$^{th}$ day of life).

**Materials and methods**

The trial included 40 male chickens of the fattening line Ross 308, caponized on the 28$^{th}$ day at the Surgery Clinic of the Veterinary Faculty, University of Zagreb. Prior to caponization, the chickens fasted for 24 hours. All the chickens were kept in the same, controlled conditions, on litter on the floor, and feeding and drinking from automatic feeders and drinkers was *ad libitum.* The trial was carried out in the trial rooms of the Department of Animal Nutrition and Dietetics. The capons were kept in two groups. Each group (the control and the trial) consisted of 20 birds. The feed of the control and the trial group differed in the origin of the protein in the mixtures. The control group had fish meal in the starter commercial feed mixture and soybean meal in the finisher mixture. The trial group had yeast in all the mixtures used. Chickens were fed starter feed mixtures for fattening chickens until the 21$^{st}$ day (Tables 1 and 2). After those, mixtures for fattening

chickens F1 (Tables 3 and 4) were used for 2 weeks. From the 5th to the 12th week (Tables 5 and 6) finisher 2 mixtures were used. From the 12th week to the end of the trial (the 22nd week of fattening) oats were gradually added to the mixtures (2% - 15%).

Table 1. Starter mixture for chicken fattening - ingredient composition

| | Control | Trial |
|---|---|---|
| Maize | 54.00 | 50.00 |
| Soybean meal | 26.24 | 27.00 |
| NaCl | 0.36 | 0.36 |
| Limestone | 2.20 | 2.20 |
| Fosfonal forte | 1.70 | 1.70 |
| DL methionine | 0.10 | 0.10 |
| Wheat bran | 7.00 | 7.00 |
| Premix | 0.50 | 0.50 |
| Sunflower meal | 4.00 | 4.14 |
| Yeast | - | 7.00 |
| Fish meal | 3.90 | - |

Table 2. Starter mixture for chicken fattening - chemical composition

| | Ash | Fat | Crude fiber | Protein | Ca | P |
|---|---|---|---|---|---|---|
| Control | 7.89 | 2.81 | 5.70 | 24.19 | 1.24 | 0.68 |
| Trial | 8.33 | 2.87 | 7.34 | 24.22 | 1.16 | 0.80 |

Table 3. Mixtures F1 for chicken fattening - ingredient composition

| | Control | Trial |
|---|---|---|
| Maize | 50.50 | 50.50 |
| Soybean meal | 21.00 | 11.00 |
| NaCl | 0.34 | 0.34 |
| Limestone | 2.40 | 2.40 |
| Fosfonal forte | 1.20 | 1.20 |
| DL methionine | 0.06 | 0.06 |
| Wheat bran | 14.00 | 14.00 |
| Premix | 0.50 | 0.50 |
| Alfalfa meal | 4.00 | 4.00 |
| Sunflower meal | 2.00 | 5.00 |
| Yeast | - | 7.00 |
| Oil | 4.00 | 4.00 |

Table 4. Mixtures F1 for chicken fattening - chemical composition

| | Ash | Fat | Crude fiber | Protein | Ca | P |
|---|---|---|---|---|---|---|
| Control | 5.07 | 6.44 | 3.82 | 18.48 | 1.30 | 0.38 |
| Trial | 6.12 | 7.24 | 5.77 | 18.76 | 1.26 | 0.38 |

Table 5. Mixtures F2 for chicken fattening - ingredient composition

| | Control | Trial |
|---|---|---|
| Maize | 49.60 | 49.60 |
| Soybean meal | 13.50 | 8.50 |
| NaCl | 0.34 | 0.34 |
| Limestone | 2.50 | 2.50 |
| Fosfonal forte | 1.50 | 1.50 |
| DL methionine | 0.06 | 0.06 |
| Wheat bran | 19.00 | 17.00 |
| Premix | 0.50 | 0.50 |
| Alfalfa | 9.00 | 7.00 |
| Sunflower meal | 2.00 | 4.00 |
| Yeast | - | 7.00 |
| Oil | 2.00 | 2.00 |

Table 6. Mixtures F2 for chicken fattening - chemical composition

| | Ash | Fat | Crude fiber | Protein | Ca | P |
|---|---|---|---|---|---|---|
| Control | 5.92 | 5.68 | 7.01 | 15.96 | 1.04 | 0.29 |
| Trial | 5.70 | 5.59 | 8.15 | 16.98 | 1.10 | 0.32 |

At the end of the trial, the capons were killed in a licensed slaughter house. By random selection, 10 capons were taken from each trial and selection group. The weight of live capons was compared with the weight of the killed and cleaned capons. The weight of breasts was compared with the weight of the carcass.

The body weight was checked every two weeks. Feed consumption was measured and feed consumption per unit of gain (feed conversion) was calculated. The health of the birds was checked daily. The microclimate conditions were also monitored during the whole investigation period.

Statistical analyses were performed using SAS 9.1.3. software (SAS Institute Inc., 2002-2003).

**Results**

The average body weight of chickens on the first day in both groups ranged from 40.60 g to 42.75 g per chick. By comparing the groups statistically no significant difference was recorded ($P<0.05$).

At the end of the trial average body weight of capons in the control group was 7086.50 g, and in trial group was 7136.10 g (Tables 7 and 8). No statistically significant difference was determined ($P<0.05$).

Table 7. Feed consumption and body weight gain in the control group

| | 1st day | 3rd week | 5th week | 11th week | 22th week | Total conversion |
|---|---|---|---|---|---|---|
| Feed conversion | | 1.82 | 1.92 | 3.47 | 4.99 | 3.86 |
| Average weight/g | 40.60 | 502.95 | 1262.70 | 3993.20 | 7086.50 | |
| Average gain/g | | 462.35 | 759.75 | 2730.50 | 3093.30 | |

Table 8. Feed consumption and body weight gain in the trial group

| | 1st day | 3rd week | 5th week | 11th week | 22th week | Total conversion |
|---|---|---|---|---|---|---|
| Feed conversion | | 1.64 | 1.95 | 3.13 | 5.29 | 3.76 |
| Average weight/g | 42.75 | 524.00 | 1244.80 | 4332.15 | 7136.10 | |
| Average gain/g | | 481.25 | 720.80 | 3087.35 | 2803.95 | |

Comparing the growth performance in the control group (83.41) with the growth performance in the trial group (82.59) it is obvious that there is almost no difference. The breast share (Tables 9 and 10) in the carcass in the control group was 33.70 % and in the trial group 33.71 %. There is no significant difference ($P<0.05$).

From the monitoring of the health of the birds during the trial no health disturbances were observed. No mortalities were recorded in the whole investigation period.

Based on the results of our investigation (final body weight, feed consumption per unit of gain, growth performance and breast share in carcass) it may be concluded that yeast is an adequate protein feed in feeding capons. It can be a full substitute for fish meal thus reducing the use of protein feeds of animal origin. Likewise, according to the results obtained in our investigations yeast can reduce use of protein feeds of plant origin (oil cakes or meal).

Table 9. Results of slaughter processing in the control group

| | Live mass | Body mass | Breast mass |
|---|---|---|---|
| Average weight /g | 7069.1 | 5896.5 | 1987.1 |
| Rendiment /% | 83.41% | | |
| Breast rendiment /% | 33.70% | | |

Table 10. Results of slaughter processing in trial group

| | Live mass | Body mass | Breast mass |
|---|---|---|---|
| Average weight /g | 7252.4 | 5990 | 2019.4 |
| Rendiment /% | 82.59% | | |
| Breast rendiment /% | 33.71% | | |

**Discussion**

ETCHES (1996) reports that the body weight of 17 week old caponized New Hampshire male chickens was 5.69 kg and that of 18.5 week old caponized Hubbard male broiler chickens was 3.96 kg. In our investigation, the capon body weight of 19 weeks old Ross 308 was 6.10 kg.

RIKIMARU et al. (2011) investigated the effect of early caponization on growth. Cockerels were caponized aged 2, 4 and 8 weeks. Those caponized aged 4 weeks were significantly heavier than those caponized at 8 weeks. These results agree with the results of our investigation.

Feed conversion (kg/kg) of New Hampshire caponized male chickens aged 0 - 13 weeks was 2.97 kg and of those aged 1 - 24 weeks 5.09 kg. The feed efficiency of caponized Hubbard male broiler chickens aged 18.5 weeks was 3.96 kg and of those aged 5 - 18 weeks it was 4.14 kg (ETCHES, 1996). In our investigation feed conversion during the first three weeks was 1.63 kg/kg. Total feed conversion in the control group was 3.86 kg/kg and in the trial group it was 3.76 kg/kg. MAST et al. (1981) report that partial or complete caponization of Hubbard White Mountain cockerels has a favourable effect on feed conversion as compared with noncaponized cockerels. The authors also report that meat quality is best in completely caponized cockerels.

MIKULEC et al. (2003, 2004) obtained similar results (supplementing fish meal with proteins of plant origin) when investigating fattening chickens. The authors decided that soybean meal could not completely replace fish meal. BABIDIS et al. (2002) substituted fish meal with maize gluten in fattening chickens. The authors did not obtain significant differences in their investigation. In a trial carried out on chickens MAS et al. (2008) substituted fish meal in starter mixtures by fattening with yeast. They did not find significant differences in final body weights, feed conversion and slaughter processing.

It could be concluded that in feeding fattening chickens yeast could be a successful substitute for fish meal.

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Received: 10 February 2012
Accepted: 17 April 2012

**MAS, N., V. ŠERMAN, Ž. HORVAT, E. STRAKOVA, H. VALPOTIĆ, Ž. MIKULEC, T. MAŠEK, P. SUCHY, S. VINCE: Upotreba pivskoga kvasca u hranidbi kopuna. Vet. arhiv 83, 245-252, 2013.**

**SAŽETAK**

Istražena je upotreba pivskoga kvasca u hranidbi kopuna. Istraživanje je provedeno na 40 kopuna hibridne linije Ross 308 kopuniziranih u dobi od 28 dana. Tijekom 22 tjedna kopuni su hranjeni i napajani po volji te držani u kontroliranim zoohigijenskim uvjetima. Pokusni kopuni u krmnim su smjesama kao bjelančevinasto krmivo dobivali pivski kvasac dok su kontrolni kopuni u komercijalnim smjesama za tov pilića dobivali u starteru riblje brašno, a u finišeru 1 i finišeru 2 sačme uljarica. Rezultati istraživanja pokazali su da nema ststistički značajnih razlika ($P<0,05$) između završnih tjelesnih masa kopuna, konverzije hrane, randmana i udjela mase prsa u masi trupa što govori u prilog zaključku da se u hranidbi kopuna bjelančevine ribljeg brašna mogu uspješno zamijeniti bjelančevinama pivskog kvasca.

**Ključne riječi**: kopun, proizvodni rezultati, pivski kvasac