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# Effect of feeds with different crude fiber content on the performance of meat goose

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***SUMMARY***

*In the last 50 years, poultry meat production has increased dynamically. The role of crude fiber content in feed is unclear based on a small amount of literature about goose feeding.*

*The aim of theis experiment was to determine how various crude fiber content (55; 60; 65g crude fiber/kg feed) influences the performance of meat geese in the second phase of the rearing period. 150 goslings (3 treatments, 5 cages/treatment, 10 birds/cage) were included in the test. The experiment started and finished at the age of 21st and 63rd day, respectively.*

*The obtained results suggest that various crude fiber content did not influence the performance of meat geese significantly; however, a feed of 55g crude fiber/kg resulted in better fattening results (final body weight, body weight gain, specific feed protein and energy conversion rate). In addition, compound feed of 65g crude fiber/kg proved more favourable with respect to cost-efficiency. Based on the obtained results so far, further models and farm experiments are required.*

**Keywords:** *goose, feeding, crude fiber, performance*

## *INTRODUCTION*

Poultry meat production has increased worldwide in the last half century. Progress in genetics, feeding, breeding and technology in husbandry has resulted in dramatic productivity improvement (Hetland et al., 2004). China accounts for 95% of global goose meat production these days followed by Egypt, Hungary and Poland. Hungary is among the greatest exporters (FAO, 2015).

In feeding, substances forming the cell wall are collectively called fiber regardless of the histologic classification of the particular cell (Fekete, 1993).

There are various definitions of crude fiber according to different authors. According to Henneberg and Stohmann (1859), crude fiber means the organic matter content remaining after the destruction of the plant in dilute (1.25%) sulphuric acid solution and then in potassium hydroxide solution (1.25%). According to McDonald et al. (2002), fiber is a cell wall of plant tissues consisting of lignin, cellulose and hemicellulose. Crude fiber contains 50–80% of total cellulose, 10–15% of lignin, and only 20% of hemicellulose (Southgate et al., 1986). Feed components of plant origin contain a significant amount of fiber, most of which are insoluble. Fiber, including insoluble fiber fraction, plays a significant role in feeding monogastric animals (Bach-Knudsen, 1997).

The age and health of the animal and the microbial population of the intestinal tract are crucial factors as the digestive and fermentation capacity increase with age (Noy and Sklan, 1995) and the viscosity of the intestinal contents decreases (Petersen et al., 1999).

In case of farm animals, crude fiber can only be broken down by microorganisms at each stage of the gastrointestinal tract, as these animals do not have the necessary enzymes. In the gastrointestinal tract of monogastric animals, there are only conditions in the appendix and in the colon that allow the breakdown of cellulose by bacteria. This is the reason why monogastric animals can break down or utilize less crude fiber in the digestive tract than ruminants (Schmidt, 2015). In the gastrointestinal tract of poultry species, only a few percent of the crude fiber is broken down.

The supply of sufficient crude fiber with structural efficiency is important not only for ruminants, but also for feeding monogastric animals. The latter animals require less structural fiber than ruminants as they need fiber to maintain normal functioning of the stomach and intestine. Feed with higher crude fiber remains longer in the stomach, increasing the sensation of satiety. This effect is also utilized in several areas of feeding. During fattening pigs, feed with higher fiber content reduces the lipidosis of rearing pigs. This effect is also beneficial when attempting to slow down the growth of pullets with a fiber-rich compound feed (Schmidt, 2015).

At the same time, higher crude fiber content accelerates gastrointestinal motility, increases passage, i.e. the passage of intestinal content through the intestine is accelerated. Enhanced passage reduces intestinal obstruction, which has a beneficial effect on intestinal function and digestive processes (Schmidt, 2015; Hetland et al., 2004).

However, the fermentation capacity of poultry even in case of feeding with compound feed with high fiber content is very low compared to pig due to the rapid passage of the intestinal contents and the short intestinal canal (Jorgensen et al., 1996; Hallsworth and Coates, 1962; Clemens, 1975). Jamroz et al. (1992) suggest that it is the goose that can best digest the fiber content of the feed. Wiliczkiewicz et al. (1995), Jamroz et al. (1996), Buckland and Guy (2002) share common grounds in this matter. In their experiments, higher digestibility was found regarding structural nutrients.

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Studying the relevant literature, it can be concluded that there is still little literature available about the ideal fiber content of goose feed, in addition, these are unclear since data are based on experience gained in broiler feeding in several cases.

Therefore, the aim of this research is to determine how various crude fiber content of feed affects the performance of meat geese.

## *MATERIALS AND METHODS*

### Experimental animals and housing

A total of 150 Golden Goose W (1:1 gander:female ratio), was used in the study which started at the age of 21st day and ended at the age of 63 day of geese.

Ten animals were placed in one pen (with the size of 3.2m$^2$/pen), and five pen was used for one treatment (15 pen altogether).

### Treatments, experimental feeds

In our study, feeds of three different crude fiber content (55, 60; 65g fiber/kg) were consumed by birds from the age of 21st day to the age of 63rd day. In the experiment a diet based on wheat, corn and triticale was fed *(Table 1).*

*Table 1*

**Composition of the experimental diets (21st-63rd day)**

| Treatments/ Composition (%) | Corn | Wheat | Triticale | Full-fat soy-bean meal | Extractet sunflower sead meal | Extracted sunflower pellet | Others |
|---|---|---|---|---|---|---|---|
| K1 (control) | 23.79 | 25.0 | 20.0 | 8.85 | 0 | 19.54 | 2.82* |
| K2 | 22.05 | 25.0 | 20.0 | 9.05 | 7.64 | 12.93 | 3.32* |
| K3 | 19.98 | 25.0 | 20.0 | 9.63 | 16.88 | 4.69 | 3.82* |

Note: * Amino Acid supplementation: L-Lysine, DL-Methionine, L-Threonine; Sunflower oil; Limestone; MCP; Salt; $NaHCO_3$; premix

Crude fiber, energy, protein and lysine content of the compound feed, digestible LYS/AMEn ratio of the feed and the price of compound feed are shown in *Table 2.* In the experiment, K1 (55g crude fiber/kg feed) was the control group, which is regularly used in the sites of Tranzit-Ker Zrt.

*Table 2*

**Calculated nutrient contents of the experimental diets**

| Treatments | AMEn (MJ/kg) | Crude protein (g/kg) | Digestible LYS (g/kg) | Digestible LYS (g)/AMEn (MJ) | Crude fiber (g/kg) | Feed price (HUF/kg) |
|---|---|---|---|---|---|---|
| K1 (control) | 12.02 | 181 | 10.2 | 0.85 | 55 | 63.33 |
| K2 | 12.04 | 182 | 10.3 | 0.85 | 60 | 62.35 |
| K3 | 12.06 | 182 | 10.3 | 0.85 | 65 | 61.95 |

These nutrient parameters differ from previous recommendations as the company used them (Gippert, 2005; Codex Pabularis Hungaricus, 2004). Recommendation by several previous Chinese publication ranges from 3.5% to 5.1% (Jin et al., 2014). According to the latest results, crude fiber content of poultry feed may be 3–4%. There are exceptions, but in general, poultry feed manufacturers and users are of the opinion that the fiber content of compound feed is necessary to be kept below 7% (Varastegani and Dahlan, 2014). The experimental feeds were mixed at the same plant where the feed was mixed for non-experimental livestock. Feeding during the experiment was consistent with the technology used at the site, i.e. ad libitum. Drinking water was also available ad libitum.

### Data recording (parameters measured in experiment)

In the experiment, the following data were recorded: feed intake, initial weight, final weight, mortality. In the study the following data were calculated: weight gain, daily weight gain, feed-, energy- and protein conversion ratio, and specific feed cost (HUF/kg). The initial and final weights were individually recorded and for other data groups were calculated.

### Laboratory analysis

The nutrient content of the compound feeds (dry matter, crude protein, crude fat, crude fiber, crude ash) was determined according to AOAC (2012).

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**Statistical analysis**

The difference between the mean values of the experimental groups was examined at $P<0.05$ level by one-way analysis of variance (Tukey test) (SAS, 2010).

## *RESULTS AND DISCUSSION*

When installing the experiment, we strived to create groups that did not differ significantly in their initial weight. Due to the same pre-breeding, this condition was easily achieved (*Table 3*). The results of the experiment were evaluated by statistical analysis after each test parameter.

The number of animals changed minimally by the end of the experiment. A total mortality of 10 occurred during the experiment of 6 weeks. The distribution of mortality was almost the same among treatments. The mortality was not due to the treatments (for example: bacterial problem, cardiac failure).

There were no significant differences between treatments in terms of final weights. This means that if the crude fiber content of the feed is between 5.5% and 6.5%, we can achieve the same final weight.

*Table 3*

**Body weights in the experiment (initial, final) (mean+standard deviation)**

| Treatments | Body weight at beginning of experiment (g/bird) | Body weight at the end of experiment (g/bird) |
|---|---|---|
| K1 (control) | 1998±48 | 5694±213 |
| K2 | 1994±31 | 5528±136 |
| K3 | 2026±45 | 5538±230 |

P>5%: No significant differences among treatment at P=5% level.

Jin et al. (2014) reported that the crude fiber content of 4% is ideal for white Sichuan goose in the pre-breeding. An experiment with older goose (42 days old) was carried out by Liu et al. (2009), who, based on the results, came to the conclusion that the most beneficial weight gain may achieved with feed with crude fiber content of 5.5 %. It is consistent with the results obtained in our experiment, that is, we achieved a more favourable final weight at crude fiber level of 5.5 %, but it’s not significant.

*Table 4*

**Effect of the different crude fiber level on performance of geese ($21^{st}$-$63^{rd}$ day) (mean+standard deviation)**

| Treatments | Feed intake (kg/goose) | Body weight gain (g/goose) | Daily body weight gain (g/day/goose) | Feed conversion rate (kg diet/ kg body weight gain) | Protein conversion rate (g/ kg body weight gain) | Energy conversion rate (MJ energy/kg body weight gain) |
|---|---|---|---|---|---|---|
| K1 (control) | 14.82±1.56 | 3714±203 | 88.4±4.8 | 3.99±0,36 | 725±64 | 48±4.3 |
| K2 | 14.92±1.60 | 3662±268 | 87.2±6.4 | 4.08±0,44 | 743±80 | 49.15±5.3 |
| K3 | 14.72±1.73 | 3628±162 | 86.4±3.9 | 4.05±0,34 | 741±62 | 48.91±4.1 |

P>5%: No significant differences among treatment at P=5% level.

There was no significant difference between the parameters tested during the experiment. In terms of feed intake, three treatments had nearly the same results. In all the weight gain and daily weight gain indicators, K1 (55g fiber/kg feed) treatment achieved better results, but these differences were not significant. Consequently, the increasing fiber content of the feed does not impair the growth of the geese. Sklan et al. (2003) found similar results when the fiber content of the feed was increased to 6% after the age of 6 weeks. Chen et al. (1992) concluded based on their experiments with young geese that they were able to achieve better weight gain with increasing fiber content.

There was no significant difference between treatments regarding feed conversion ratio. A similar trend was observed in protein- and energy conversion ratio. This is due to the fact that the protein and metabolized energy content of the experimental feeds were the same.

*Table 5*

**The change of feeding cost per treatments ($21^{st}$-$63^{rd}$ days) (mean+standard deviation)**

| Treatments | Feed cost (HUF/goose) | Specific feed cost (HUF/ kg body weight gain) |
|---|---|---|
| K1 (control) | 938±98.6 | 252±22.6 |
| K2 | 930±99.6 | 254±27.5 |
| K3 | 913±107.3 | 251±21.2 |

P>5%: No significant differences among treatment at P=5% level.

With regard to the specific feed cost *(Table 5)*, data show that lower cost may be achieved per goose if feed with higher crude fiber is fed. Specific feed cost is the lowest in treatment K3 (65g crude fiber/kg feed). K3 treatment is cheaper with 17- and 25 HUF/goose than the other two treatments However, there is no significant difference between the results obtained. The same can be concluded for specific feed cost per

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kilogram of weight gain. However, this indicator did not reach the highest cost level with feed K1 (55g crude fiber/kg feed), but with the experimental feed K2 (60g crude fiber/kg diet).

## *CONCLUSION*

Based on the results of our model study, it can be concluded that the crude fiber content of the goose feed between the 55–65 g/kg range do not affect the performance of the birds. However, since the cost of feed with higher fiber content is lower, the 65 g/kg crude fiber content feed is more favourable from economical point of view. Further studies are needed to evaluate the level of dietary fiber, which already has depressive effect on the growth performance of goose.

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