# COMPARATIVE EVALUATION OF NUTRITIONAL VALUE OF COMPOUND FEEDS FOR CHICKEN BROILERS USING THERMAL TREATED PEAS AND SUPPLEMENT OF ENZYME PREPARATION *ROVABIO EXCEL AP*

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**Summary.** By analysing the influence of heat-treated peas and supplement of enzyme preparation on broiler chickens productivity and digestibility of nutrients, 1 feeding and 1 nutrients digestibility experiments were performed. Using 20 % of thermal-treated peas in feed mixtures, during all feeding experiment the average weight of birds increased 2 % (P>0.05) and feed conversion ratio decreased 2 % (P>0.05). The supplementation of feed mixtures with enzyme preparation increased the average weight of broilers 7 % (P<0.001) and decreased feed conversion ratio 3 % (P>0.05), in comparison with control group. The using of 20 % thermally treated peas and addition of enzyme preparation with xylanase, β-glucanase and cellulase activities statistically non significant improved the digestibility of organic mater, crude protein and crude fat.

**Keywords:** thermally treated peas, non-treated peas, enzyme preparation, chicken broilers, productivity, digestibility.

# FERMENTINIO PREPARATO *ROVABIO EXCEL AP* ĮTAKA VIŠČIUKŲ BROILERIŲ PRODUKTYVUMUI, LESALUOSE NAUDOJANT TERMIŠKAI APDOROTUS IR NEAPDOROTUS ŽIRNIUS

**Santrauka.** Analizuojant termiškai apdorotų žirnių ir fermentinio preparato priedo įtaką viščiukų broilerių produktyvumui bei maistinių medžiagų virškinamumui, buvo atlikti vienas lesinimo ir vienas medžiagų apykaitos bandymai. Į lesalus įdėjus 20% termiškai apdorotų žirnių, viščiukų broilerių svoris padidėjo 2% (p>0,05), lesalų sąnaudos 1 kg priesvorio gauti sumažėjo 2% (p>0,05). Fermentinio preparato priedas lesaluose per visą bandymo periodą viščiukų broilerių vidutinį svorį padidino 7% (p<0,001), o lesalų sąnaudas 1 kg priesvorio sumažino 3% (p>0,05) palyginti su kontroline grupe. Terminis žirnių apdorojimas bei fermentinio preparato, pasižyminčio ksilanaziniu, beta gliukanaziniu ir celiulaziniu aktyvumu, priedas statistiškai nepatikimai pagerino organinių medžiagų, riebalų ir baltymų virškinamumą, kai į viščiukų broilerių lesalus buvo įdėta 20% žirnių.

**Raktažodžiai:** termiškai apdoroti žirniai, neapdoroti žirniai, fermentinis preparatas, viščiukai broileriai, produktyvumas, virškinamumas.

**Introduction.** Legumes are very important source of proteins and amino acids, therefore it is important to use them for poultry feeding. The peas crop area in Lithuania occupies 20,300 ha containing more than a half of all legume crops (Statistic Lithuania, 2001). Using of this local feedstuff would enable to replace imported protein sources in the poultry feeds (Keller et al., 1996). However, nutritional value of peas and their use for poultry nutrition is limited by anti-nutritional factors (tannines, lectines, vicines, and trypsin inhibitors), which also reduce protein quality and digestibility (Koide et al., 1973; Richter et al., 2000). Furthermore, oligosaccharides which are almost non-digestible and could cause disorders of the digestive tract are found in the composition of peas. (Saini, 1989). Also a high amount of fibre matters reduces digestibility of organic substance of peas (Jeroch, 1999). Mechanical, thermal and hydraulic treatment methods are used to improve feeding value of peas. Supplements of enzyme preparations with β-glucanase activity could be used to reduce the influence of anti-nutritional factors and to improve nutritional value of peas.

Therefore the aim of present work is to determine the improvement of nutritional value of feeds by using thermally treated peas and supplement of enzyme preparation with xylanase, β-glucanase and cellulase activities.

**Materials and methods.** The scientific investigation has been made following the provisions of Law of Republic of Lithuania N$^0$ 8-500 on Protection, Keeping and Use of Animals of November 6, 1997 ("Valstybės žinios", N$^0$ 108, 1997. 11. 28) and of the by-laws, i.e. orders of State Veterinary Service of Republic of Lithuania: On Breeding, Care, Transportation of Laboratory Animals (N$^0$ 4-361, 1998. 12. 31) and Use of Laboratory Animals for Scientific tests (N$^0$ 4-16, 1999. 01. 18).

Design of experiments is shown in Table 1.

Male, a day-old Hybro G broiler chickens (n=600) were used in a 35-d feeding experiment to determine the influence of thermally treated peas and enzyme preparation supplement on the growth and feed efficiency. The birds were divided into 3 groups containing 2 replicates of 100 birds each. Chickens were housed on a deep litter, and water was provided in stationary waterers. All diets containing 12.9 MJ of metabolic energy and 22.9 % crude protein were provided for *ad libitum* access in crumbled form. Body weights and feed consumption were recorded on 21 and 35 day of age. The feed composition and sustenance is shown in Table 2.

Table 1. **Design of feeding experiment**

| | Group I (control) | Group II | Group III |
|---|---|---|---|
| Quantity of peas in the diet, % | 20.0 (*non-treated)* | 20.0 (*thermally treated*) | 20.0 (*non-treated*) |
| Enzyme preparation | - | – | Rovabio Excel AP[1] 50 g/t feeds |

[1]Rovabio Excel AP – xylanase, β-glucanase, cellulase activities. Obtained from Aventis Animal Nutrition, Rhodia GmbH, Städelstraße 10 (60596 Frankfurt / Main, Germany)

Table 2. **Feed mixture components and nutritional value (%)**

| Ingredient | Feed components % | | |
|---|---|---|---|
| | Group I (control) | Group II (experimental) | Group III (experimental) |
| Wheat | 30.0 | 30.0 | 30.0 |
| Corn | 9.7 | 9.7 | 9.7 |
| Fish meal 64 | 4.0 | 4.0 | 4.0 |
| Peas | 20.0 (non-treated) | 20.0 (thermally treated) | 20.0 (non-treated) |
| Soya bean cake 44 | 22.0 | 22.0 | 22.0 |
| Monocalcium phosphate | 1.0 | 1.0 | 1.0 |
| Limestone | 1.0 | 1.0 | 1.0 |
| Sodium chloride | 0.3 | 0.3 | 0.3 |
| Methionine | 0.19 | 0.19 | 0.19 |
| Rape oil | 6.0 | 6.0 | 6.0 |
| Soya bean | 5.0 | 5.0 | 5.0 |
| Enzyme preparation | - | - | + |
| Premix[1, 2] | 1.0 | 1.0 | 1.0 |
| ME (MJ / kg) | 12.88 | 12.88 | 12.88 |
| Crude protein | 22.89 | 22.89 | 22.89 |
| Crude fat | 8.93 | 8.93 | 8.93 |
| Crude fiber | 4.10 | 4.10 | 4.10 |
| Lysine | 1.34 | 1.34 | 1.34 |
| Methionine/ Cystine | 0.90 | 0.90 | 0.90 |
| Methionine | 0.54 | 0.54 | 0.54 |
| Threonine | 0.84 | 0.84 | 0.84 |
| Tryptophan | 0.25 | 0.25 | 0.25 |
| Ca | 0.87 | 0.87 | 0.87 |
| P | 0.72 | 0.72 | 0.72 |
| Na | 0.17 | 0.17 | 0.17 |

[1]Premix components (per 1 kg of feed):

vitamins: A – 10000 IU; $D_3$ – 2000 IU; E – 20 mg; $K_3$ – 3 mg; $B_1$ – 0.5 mg; $B_2$ – 5 mg; $B_6$ – 2 mg; biotin – 0.05 mg; pantothenic acid – 7 mg; nicotinic acid – 30 mg; choline chloride – 500 mg; $B_{12}$ – 0.015 mg; folic acid – 1.0 mg;

minerals: Zn – 50 mg; Cu – 6 mg; Fe – 40 mg; Mn – 70 mg; J – 0.3 mg; Se – 0.15 mg; antioxidant – 125 mg; antibiotic (Flavomicyn) – 5 mg; coccidiostatic: Sacox – 50 mg.

[2]Methionine and enzyme preparation was mixed in with the premix.

In order to estimate the digestibility of nutrients, *the experiment of digestibility of nutrients* was performed. This experiment was conducted using 15 broiler chicks of the strain of Hybro G (10 to 22 d old). The birds were divided into 3 groups containing 5 chicks. Birds were kept in individual cages with individual feeding and water supply equipment. The diet composition and design of experiment were the same like in the feeding experiment (Table 1, Table 2). From the 18 to 22 day of age excrements from each bird were collected and frozen twice a day. Throughout the whole collecting period feed intake and quantities of excrements were measured. After finishing the collecting period, the excrements were thawed and samples were dried in an oven at 65 °C. Excrements along with diet samples were ground to pass 1 mm sieve. The experiment was conducted according to the methodical direction of Schieman (Schiemann, 1981). Nutrients in the feeds and excrements were determined according to Wender analysis methods (Naumann, Bassler, 1993). The digestibility of the crude protein in the excrements was determined according to T. Pahle method (Pahle at al., 1983). Data were analysed with computer program "Statistica for Windows" (StatSoft Inc., 1995).

**Results.** According to analysed parameters, the mean results of feeding experiment were calculated (Fig. 1 and Fig. 2).

Using 20 % of thermal treated peas in the diets, the mean weight of 21 to 35-d-old chickens was by 1–2 % ($P>0.05$) higher than in the control group I. The mean

weight of 21-d-old and 35-d-old birds group III (experimental) fed diets containing 20 % non-treated peas with enzyme preparation was respectively 8 % and 7 % higher (P<0.05) in comparison with group I (control).

Feed conversion ratio in the group II was 2 % lower (P>0.05), in comparison with group I (control). Feed containing 20 % non-treated peas and supplemented with enzyme preparation non significantly reduced (3 %) feed conversion ratio in comparison with group I (control).

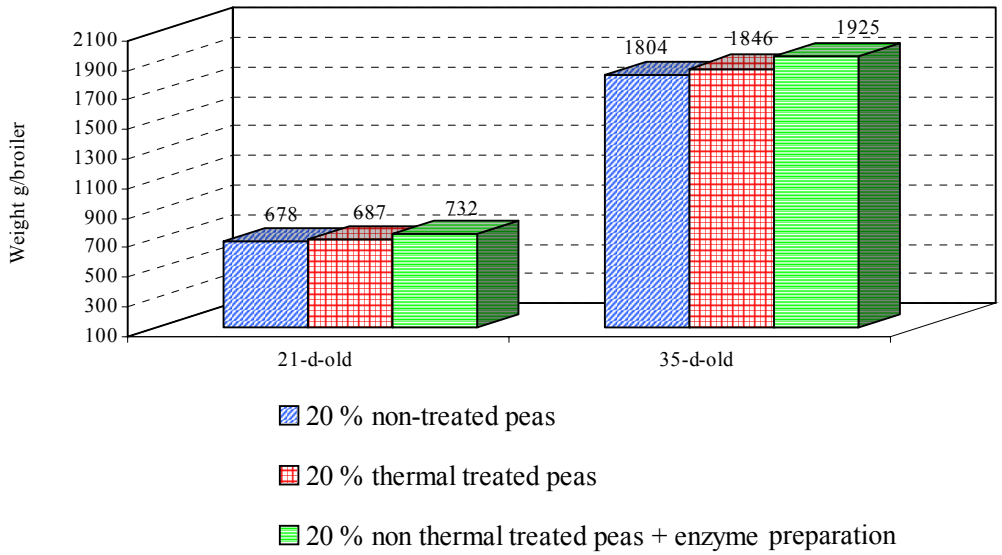


Fig. 1. **Body weight gain of chickens fed diets with thermal treated and non-treated peas with and without enzyme preparation**

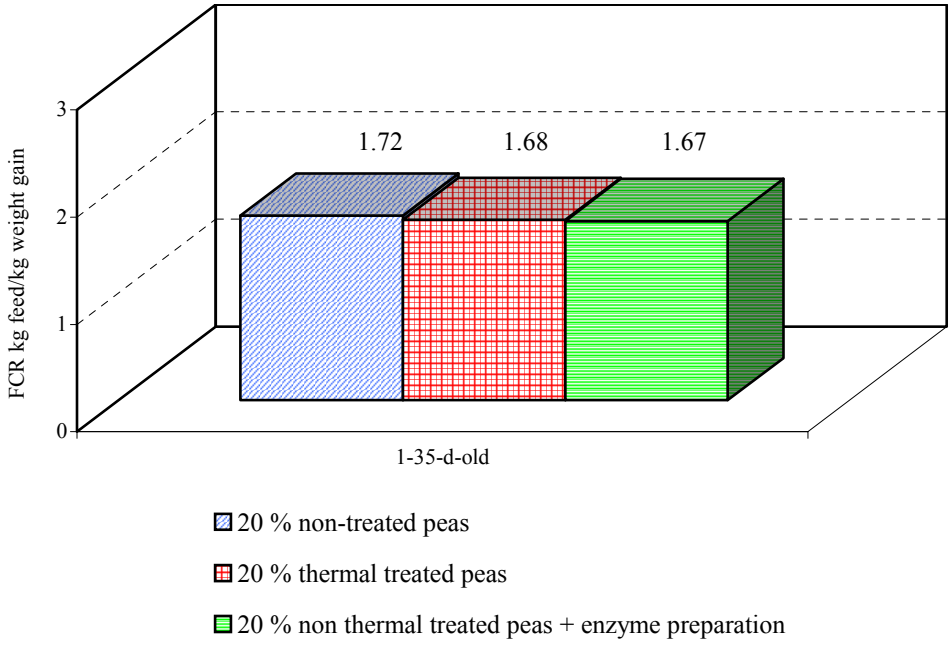


Fig. 2. **FCR of chickens fed diets with thermal treated and non treated peas with and without enzyme preparation**

Results of the experiment of nutrients digestibility are presented in Table 3.

Table 3. **Coefficients of nutrients digestibility (%)**

| Nutrient | Group | | |
|---|---|---|---|
| | I (control) | II | III |
| Organic matters | 70.5±2.7 | 71.7±0.5 | 72.4±0.5 |
| Crude protein | 81.3±1.7 | 83.6±3.3 | 85.3±2.8 |
| Crude fat | 87.1±0.7 | 88.3±0.2 | 89.6±1.5 |

After performing the experiment of nutrients digestibility (Table 3), it was estimated that the birds of group II (experimental), fed diets containing 20 % thermally treated peas, non significantly better digested organic matter – 1.2 %, crude protein – 2.3 %, crude fat – 1.2 %. As much as 20 % of non-treated peas and supplement of enzyme preparation in the diet of chicks of group III (experimental) had no significant effect on digestibility of analysed nutrients.

**Discussion and conclusions.** The results of the present study clearly support the findings by G. Richter (Richter, 1999), demonstrating that 35 day-old broiler chickens, given feed containing 20 % of peas, weighed 1813 g, and feed conversion ratio was 1.73 kg. The results of numerous studies showed that dehulling, thermal treatment and autoclaving of peas improved the quality of feeds. So, the weight of birds was increasing, the feed conversion ratio was decreasing; the utilisation of protein and starch were also better (Longstaff et. al., 1987; Jeroch et al., 1995; Ingelmann et al., 1993). According to Conan and Carre (Conan, Carre, 1989), autoclaved peas contain approximately 80 % less trypsin inhibitors than non-treated ones.

By evaluating several studies, it was estimated that enzyme preparations positively affected the digestibility of feed nutrients and increased metabolic energy (Jeroch et al., 1995). It was also estimated that the effect of xylanase activity was more remarkable in the feeds containing higher amount of non-starch polysaccharides and saturated fatty acids (Dänicke, 1999).

Results of conducted experiments showed that using 20 % of thermally treated peas in the diets, during all feeding experiment, the mean weight of chicken broilers increased by 2 % ($P>0.05$), and feed conversion ratio decreased by 2 % ($P>0.05$). The supplement of enzyme preparation significantly (7 %) improved mean weight of birds, and non-significantly (3 %) decreased feed conversion ratio.

After the performing of the experiment of nutrients digestibility, it was estimated that thermal treatment of peas and supplement of enzyme preparation had no significant effect on analysed nutrients digestibility.

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