Effectiveness of using treated rapeseed cakes in laying hens – Magdalena Anna Orlich

SUMMARY

The aim of the study was to determine the effects of 20% raw rapeseed cake (RRC) and hydrobarothermally treated (HRC) and fermented (FRC) in diets for laying hens, on production performance, selected egg quality indicators, fatty acid profile and antioxidant status of egg yolks, as well as blood biochemical parameters and intestinal function in birds. A total of 304 Hy-Line Brown laying hens at 36 weeks of age were distributed in a completely randomized arrangement to four study groups with 38 replicates per group and 2 hens per cage. The birds had free access to feed and water throughout the experiment. During the experiment, the birds were fed isobrotein and isocaloric diets that varied in protein source. In the control group C, the main source of protein in the diet was post-extraction soybean meal (PSS), while the experimental groups were fed diets containing 20% RRC, HRC or FRC. Hydrobaric treatment and fermentation reduced the content of glucosinolates (GLS), fermentation further reduced the concentration of phytic phosphorus (FF) in rapeseed cake. Compared to the RRC group, layers from the HRC and FRC groups had higher laying performance, comparable to the C group. Regardless of the form, RRC added to diets of laying hens adversely affected eggshell quality, while protein quality was highest in the FRC group. Compared to group C, diets containing RRC, HRC and HRC led to a significant decrease in saturated fatty acids, an increase in the proportion of n-3 and n-6 polyunsaturated fatty acids (PUFAs) in the total fatty acid pool in egg yolks, and a decrease in the PUFA n-6/n-3 ratio. The inclusion of RRC, HRC and FRC in the diets of laying hens decreased superoxide dismutase (SOD) activity in egg yolks, compared to group C. Eggs from the FRC group had the highest catalase (CAT) activity and the lowest lipid peroxides (LOOH) concentration, compared to the other groups. The addition of RRC did not adversely affect the sensory quality of the eggs, and those obtained from the FRC group received the highest overall score. Both HRC and FRC increased serum total protein (TP) and globulin (GLB) concentrations, compared to the C group. Hens in the HRC group had the desirable lowest blood triacylglycerol (TAG) levels and aspartate aminotransferase (AST) activity. Hens in the FRC group had the lowest alkaline phosphatase (ALP) activity and the highest concentrations of phosphorus (P) and triiodothyronine (T3). Regardless of form, RRC improved ether extract digestibility (EE) and reduced dry matter digestibility (SM) and calcium retention (Ca). Compared to the C group, RRC, HRC and FRC reduced the mass of cecal contents and increased the activity of bacterial α-galactosidase and ß-galactosidase. HRC also increased the concentration of ammonia in the cecum and decreased the activity of β-xylosidase.

The activity of α-glucosidase and α-arabinopyranosidase was the highest, and the activity of bacterial β-glucuronidase was the lowest in the cecum of hens in the FRC group. The concentration of acetic acid, propionic acid, and short-chain fatty acids (SCFAs) in the cecum was highest in the birds of the RRC group, and lowest in the HRC group. It can be concluded that the inclusion of 20% RRC, HRC and FRC in the diets of laying hens does not negatively affect the sensory quality of eggs and has a beneficial effect on the fatty acid profile and antioxidant potential of yolks. In conclusion, hydrobaric treatment and, above all, fermentation improves the nutritional value of rapeseed feed by reducing the concentration of antinutritional compounds in it. Consequently, both hydrobarothermally treated and fermented rapeseed cake can be valuable components of feed mixtures for laying hens, but fermented rapeseed cake seems to be the most useful, as it achieves the best laying performance and has the most beneficial effect on the health status and function of the digestive tract of the birds.

Keywords: laying hen, rapeseed cake, fermentation, hydrobarothermal treatment, digestibility, gastrointestinal tract, nutrition, egg quality