Triticale varieties in broiler chickens diets

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Abstract

This experiment was undertaken to evaluate the nutritional potential of triticale varieties grown in Lithuania. In experiment 400 Ross 308 broiler chickens were distributed in an entirely randomized design, with two treatments with four replications per group and 50 broilers in each group. Broilers were fed for 5 wk. a pelleted wheat–soybean meal based diets (control group C, 13.08 MJ/kg ME, 21% CP) in treatment group 15% of wheat (pentosans 6.48 % DM, beta glucans 0.40% DM) were replaced by triticale of the variety 'SU Agendus' (experimental group T), having the lowest quantity of pentosans (4.92 %) and beta-glucans (0.45 % DM). Diet was formulated to meet the nutrient and energy requirement for broiler chickens (NRC, 1994). The development of GIT's organs and blood biochemical parameters were analysed. In diet of broilers the replacement of wheat by triticale 'SU Agendus' the FCR increased 2.6% and BW were decreased 0.4% ($P>0.05$). In addition of 15% triticale in the compound feed of broiler chickens, the blood biochemical parameters – cholesterol and high-density lipoprotein concentration decreased by 7.4% and 11.9%, respectively ($P<0.05$). The internal organs weight in group T were increased compared to the group C ($P<0.05$). The results of the trial confirmed that triticale 15% with a lower pentosans and beta-glucans contents can be used for broiler chickens diets.

Key words: beta-glucans, broiler chickens, nutrition, pentosans, triticale.

Introduction

Triticale (*X Trificosecule Wittmack*) is the hybrid of wheat (*Triticum aestivum L*) and rye (*Secale cereale L*) that has been under intensive development as a new cereal grain crop plant (KORVER, 2004). Triticale has a lower susceptibility to diseases and pests which attack rye and wheat and this reduces the necessity of chemical protection against harmful agents (OETTLER, 2005). Winter triticale cultivars show higher yields and good adaptation to northern environments. Triticale flour is rich in proteins (average 14–15%), suggesting a promising use for the animal feeds (VARUGHESE et al., 1996). The nutritional value of triticale is close to that of wheat and rye. Triticale endosperm has higher proportion of pentosans and other wall polysaccharides than wheat also genotypic variability exists. NSP – arabinoxylans, β-glucans increases the digesta viscosity in broilers.

This experiment was undertaken to evaluate the nutritional potential of triticale varieties grown in Lithuania and best of variety application in nutrition of broiler chickens.

Material and methods

Variety of triticale were collected from the Kaunas Plant Variety Testing Station (PVTS). Grain samples with three subsamples for chemical analyses were ground in an Ultra Centrifugal Mill model ZM 100 (Retsch GmbH, Germany) with 1.0 mm sieve. The β-glucans was determined using a *Megazyme* test kit which uses the specific enzymes and follows the method of MCCLEARY and GLENNIE-HOLMES (1985) and MCCLEARY and CODD (1991). Fermented β-glucans detection kit (K-BGLU 11/07) obtained from *Megazyme*

(Ireland). The monosaccharides were separated using a CarboPac PA1 precolumn and a CarboPac PA1 analytical column (Dionex, USA). Monosaccharides were detected using a HPAEC/PAD detector with a 3 mm gold working electrode. The potential of the electrode was programmed from +0,05 V (E_1, t_1 = 400 ms), +0,75 V (E_2, t_2 = 200 ms) ir – 0,40 V (E_3, t_3 = 400 ms)(HOUBEN et al., 1997).

Four hundred one-day-old Ross 308 broiler chicks were randomly allocated to 2 treatments with four replications per group and 50 broilers in each group. All chickens had *ad libitum* access to compound feed and clean water throughout the experiment. The birds were fed for 5 weeks with wheat–soybean meal compound diet in control group (group C). In the compound feed of experimental diet the wheat was replaced by 15% triticale of the variety 'SU Agendus' in experimental group (Group T). The composition and calculated values of the basal diet. Basal diet was formulated to meet the nutrient and energy requirement for broiler chickens (NRC, 1994).

Records for live body weight (BW) and feed consumption were obtained at the end of each period and feed conversion ratio (FCR) was calculated. At the end of the trial (35 days) from each group broiler chickens were selected and euthanised according to the recommendations for euthanasia of experimental animals (CLOSE et al., 1997). The intestinal length was measured with a flexible tape on the glass surface (LENTLE et.al., 1998). The intestinal wall were washed with saline, drained filter paper and weighed. The weight glandular and muscular gizzard, pancreas, heart, liver were recorded. Blood samples were collected from the ulnar vein was punctured with disposable syringes containing heparin, and the blood was transferred to sterilized tubes. All parameters were determined in Cobas Integra 400/700/800 (Biochemical Analysis System, Germany).

Statistical analysis. Statistical significance was established using one-way analysis of variance ANOVA (statistical package SPSS 22), and data were reported as a mean of standard deviation. Mean comparison and separation were done using Duncan's *t*-test ($P<0.05$).

Results and discussion

The concentration of pentosans in analysed triticale varieties varied from 4.92% to 6.73% dry matter (DM) (Table 1). The lowest levels of pentosans were determined in *'SU Agendus'* (4.92%) DM and *'Adverdo'* (6.27%) DM varieties and the lowest levels of beta-glucans were determined in *'SU Agendus'* and *'Remiko'* (0.45%) DM varieties. RAKHA et al. (2012) reported that beta-glucan content is higher than in our study. Pentosans results are fairly typical for triticale are comparable to those determined by RAKHA et al. (2012), however KLISEVICIUTE et al. (2014) found smaller quantities of pentosans.

Table 1. **Quantity of pentosants and beta-glucans in grains of triticale (87% dry matter)**

Varieites	**Parameters**	
	Pentosans	**Beta-glucans**
'Adverdo'	6.27	0.58
'Grenado'	6.45	0.46
'Remiko'	6.73	0.45
'Sequenz'	6.71	0.59
'SU Agendus'	4.92	0.45
'SW Talentro'	6.53	0.50
'Toledo'	6.45	0.47
Mean	**6.29±0.63**	**0.50±0.06**

Table 2 shows the data of body weight and feed conversion ratio (FCR) during the overall (1–35 days) experimental period. The results of the present study showed that FCR did not

differ statistically significantly among treatment groups (P>0.05). The livability was almost similar in all dietary treatments groups - in control – 98%, in experimental – 99%.

Table 2. **The effect of triticale inclusion in compound feed on productivity of broiler chickens**

Broiler chickens age in days	***Groups***	
	C (Control) group	**T (15% triticale) group**
	Body weight (g)	
35	2658.79±286.34	2647.63±234.53
	Feed conversion ratio (kg/kg)	
1–35	1.51±0.03	1.55±0.03

Table 3 presents cholesterol HDL, LDL and triglycerides concentration. In this study reported that experimental group a significantly increased all biochemical blood parameters. ZARGHI et al. (2010) reported that poultry fed triticale diet did not have a significant effect on serum cholesterol concentration, HDL concentration was reduced, but did not have any negative effect on triglycerides concentration.

Table 3. **Effect of triticale inclusion in compound feed on blood biochemical parameters of broiler chickens (mmol/l)**

Parameters	**C (Control) group**	**T (15% triticale) group**
Cholesterol, mmol/l	4.35±0.09[a]	4.03±0.15[b]
High-density lipoprotein (HDL), mmol/l	3.36±0.13[a]	2.96±0.17[b]
Low-density lipoprotein (LDL), mmol/l	1.26±0.23[a]	0.65±0.25[a]
Triglycerides, mmol/l	0.68±0.26[a]	1.22±0.41[a]

[a, b] Means within a row with different superscripts differ significantly (P<0.05)

Intestinal length and weight the means of the absolute weights of organs for dietary treatments are presented in Table 4. The weight of intestinal weight with chymus was increased (P>0.05) for the triticale-supplemented group compared with the control group and wheat-supplemented group. Moreover, the triticale-supplemented group showed a increase (P<0.05) in muscular gizzard (7.53%) compared with the control group. The weight of liver, pancreas, muscular gizzard was greater in the triticale-supplemented group than in the control group. A higher weight of intestinal organs was reported by ZARGHI et al. (2010).

Table 4. **Effect of triticale inclusion in compound feed on intestinal organs and intestinal length of broiler chickens**

Parameters	**C (Control) group**	**T (15% triticale) group**
Intestinal weight with chymus, g	105.26±23.18[a]	145.58±24.13[a]
Intestinal weight without chymus, g	52.51±5.50[a]	61.92±4.76[a]
Intestinal length, cm	234.80±19.52[a]	252.20±19.17[a]
Weight of the heart, g	9.14±0.38[a]	13.42±0.93[a]
Weight of the liver, g	56.06±5.14[a]	62.55±6.57[a]
Weight of the pancreas, g	3.81±0.39[a]	4.79±0.39[b]
Weight of the muscular gizzard, g	17.21±0.57[a]	18.61±1.07[b]
Weight of the glandular gizzard, g	11.65±2.02[a]	11.58±0.56[a]

[a, b] Means within a row with different superscripts differ significantly (P<0.05)

Conclusions

It was found that, wheat replacement by 15% of triticale in compound feed of broiler chickens had no significant influence. The results of the trial confirmed that triticale 15% with a lower pentosans and beta-glucans contents can be used for broiler chickens diets.

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