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Effect of Diet Dilution with Whole Triticale Grain on Body Weight, Carcass Composition, Physicochemical and Sensory Properties of Meat in Common Pheasants

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Abstract

Background: Considerable attention has recently been given to increasing the use of triticale as an ingredient of poultry diets. The application of whole cereal (including triticale) grain in poultry nutrition allows using cheaper farm-produced feeds, which significantly reduces feeding costs. The potential improvements in carcass composition and the physicochemical and sensory properties of pheasant meat may be an additional incentive to introduce triticale grain to pheasant farming.

Objective: The effect of partial replacement of a complete diet with whole triticale grain on body weight, carcass weight, dressing percentage, carcass composition, physicochemical (pH_{15}, WHC, L*, a*, b*) and sensory properties (aroma, tenderness, juiciness, taste) of meat in common pheasants aged 112 d was investigated.

Methods: Pheasants were assigned to two dietary treatments (n = 40) at 71 d of age. Throughout the rearing (112 d), control pheasants were fed complete commercial diets for meat pheasants. Experimental birds received complete diets (1-70 d) followed (71-112 d) by a diet containing 50% whole triticale grain and 50% commercial diet. At the age of 112 d, all pheasants were individually weighed and 32 pheasants (8 males and 8 females per treatment) were selected for slaughter. The pH of breast and leg muscles was measured 15 min postmortem. After carcass dissection, breast and leg muscles were sampled to determine water holding capacity (WHC) and sensory properties, and samples of breast muscle were collected to determine the colour coordinates of L* (lightness), a* (redness) and b* (yellowness).

Results: The addition of whole triticale grain to the ration caused a non-significant decrease in body weight, carcass weight, dressing percentage, and percentage of leg muscle and skin with subcutaneous fat in eviscerated carcass with neck, while increasing the percentage of breast muscle, wings (significantly) and the remainder of the carcass. The whole triticale grain diet had no significant effect on the pH_{15} and WHC of breast and leg muscles. The breast muscles of experimental pheasants showed significantly ($p \leq 0.05$) higher redness, yellowness, tenderness, juiciness and taste desirability, whereas the leg muscles received significantly higher scores for aroma intensity and desirability, tenderness and juiciness compared to the muscles of control birds.

Conclusions: The partial replacement of a commercial complete diet with whole triticale grain did not have any detrimental effect on the slaughter traits of game pheasants and positively affected the sensory properties, which may be an additional incentive to feed triticale grain diets to pheasants reared for meat.

Keywords: Pheasant, Triticale Grain, Body Weight, Carcass, Meat Quality.

Introduction

Originally from Asia, pheasant is now widespread in different regions of the world as a game or ornamental bird. According to Council Directive 92/65/EEC, pheasants raised on-farm for meat or hatching eggs and those intended to be kept under natural conditions, are a poultry species.

Different farming systems are used depending on the intended use of pheasants. Meat pheasant farming requires high-level feeding of mainly complete diets for meat pheasants, and birds are kept in confinement buildings on the floor or in cage batteries. Pheasants intended to be kept under natural conditions are reared based on low-level feeding of lower nutrient density diets. These birds are usually kept in a confinement facility (rearing house) up to 8-10 wk of age and later on in an aviary system with an outdoor area grown with green forage (including rape, sunflower, Jerusalem artichoke, and nettle); they receive farm-produced feeds, cereal grain mixtures, legume seeds, oil seeds, cabbage, beet, etc. [1].

The date on which rearing ends is determined by the body weight of meat pheasants (around 1.2 kg in males and 1.0 kg in females) and the attainment of full plumage. According to Mróz [2], meat pheasants should be reared for 11 to 24 weeks depending on diet composition, management system, and genotype. Pheasants intended for meat production are most often slaughtered between 16 and 18 wk of age. Faster growing Mongolian pheasants can be slaughtered at the age of 13 wk, while Caucasus pheasants at 15 wk of age. In pheasants intended to be kept under natural conditions, livability and adaptability rather than body weight are the desired characteristics. Pheasants raised under extensive conditions become independent and well adapted to natural conditions by the age of 12 weeks.

Pheasant research conducted in the 1970s [3-5], which aimed to determine the nutrient requirement, including the optimum dietary protein level, has led to the formulation of diets accounting for the meat and laying performance of pheasants.

However, it is expensive to feed poultry, including meat pheasants, with complete diets. As a result, meat pheasant farmers are constantly looking for cheaper feeding methods. The considerable difference between the price of cereal grain and commercial diets provided incentive to partially replace complete diets with whole cereal grain. This feeding system is particularly suitable when rearing pheasants intended to be kept under natural conditions, because it makes them better adapted to consuming food present in the natural environment.

The diet of farm-raised pheasants is based on feeds of plant origin. Cereal grains are the main group of plant feeds, accounting for 60-80% of the dietary components for pheasants. Among cereals, wheat and maize are the most suitable in poultry nutrition, mainly due to their superior nutrient digestibility and low level of antinutritional compounds [6,7]. Considerable attention has recently been given to increasing the use of triticale in poultry nutrition [8-12].

The objective of the study was to determine the effect of diet dilution with whole triticale grain on body weight, carcass weight, dressing percentage, carcass composition, physicochemical and sensory properties of meat in common pheasants.

Methods

Birds and housing

The experiment used common pheasants (*Phasianus colchicus colchicus* L.). Throughout the rearing period (112 d), all birds were kept in an environmentally controlled confinement facility, without access to the free range (aviary). Incandescent light was used during rearing. Infrared heaters were used up to 28 d of age as a local source of heat and light. From 0 to 21 d, birds were kept in two boxes (each with an area of 1.05 m^2) on plastic mesh floor, and later on in 8 pens (12 m^2 each) on straw-covered floor. At 71 d of rearing, birds were assigned to 2 dietary treatments. Each treatment of 40 birds was divided into four replicates, each having 5 males and 5 females. Birds from each replicate were kept in a separate pen. A total of 80 pheasants (40 males and 40 females) were used. The study was conducted with the approval of the Local Ethics Committee for Animal Experimentation at the UTP University of Science and Technology in Bydgoszcz, Poland.

Feeding programme and experimental diets

From 1 to 70 d, all birds were fed *ad libitum* commercial starter diet (1-28 d) in crumble form and grower diet (29-70 d) in pellet form for meat pheasants. From 71 to 112 d, pheasants from the control treatment (40 birds) were fed *ad libitum* a complete commercial diet for meat pheasants, and experimental pheasants received a diet containing 50% whole triticale grain and 50% of the same commercial finisher diet as control pheasants. The ingredient composition of the diets fed to pheasants is shown in Table 1. Basic chemical composition of the feeds (Table 2) was determined at the Animal Nutrition Laboratory of the Department of Animal Sciences, UTP University of Science and Technology in Bydgoszcz (Poland).

Analysis of slaughter traits

At 70 and 112 d of age, birds were individually weighed to the nearest 5 g using an electronic hook scale (Axis BD 15S, Axis, Gdańsk, Poland). At first weighing, pheasants were tagged with padlock tags and their sex was identified by plumage colour. At 112 d, 2 males and 2 females whose body weight was close to arithmetic mean for a given sex in the pen, were selected for carcass dissection. A total of 32 birds, 8 males and 8 females (16 birds) from each dietary treatment, were chosen for slaughter. Pheasants were fasted for 12 h before slaughter with free access to water. The birds selected for dissection were slaughtered, defeathered and eviscerated at an experimental farm of the Faculty of Animal Sciences.

Before dissection, pH of breast and leg muscles was determined 15 min. post-mortem (pH_{15}) using a pH meter (pH-Star CPU, Ingenieurbüro R. Matthäus, Nobitz, Germany) fitted with a glass electrode for meat pH determinations. The pH meter was calibrated in standard buffers (pH 5.5 and 7.0) and then adjusted to the meat temperature.

During evisceration, the digestive tract and other internal organs (including the heart, gizzard, provetriculus, liver, spleen, and lungs) were removed from body cavity. Eviscerated carcasses with neck were chilled for 18 h at 4°C, weighed on a Medicat 5/12 electronic balance (Medicat, Switzerland) accurate to 0.1 g, and their percentage proportions in the weight of eviscerated carcass with neck were calculated. After weighing, whole carcasses were dissected according to the method developed by Ziołecki and Doruchowski [13]. Each carcass was dissected into breast muscles (superficial pectoral muscle plus deep pectoral muscle), leg muscles (all thigh and drumstick muscles), neck without skin, wings with skin, skin with subcutaneous fat (from the whole carcass, without skin from wings), abdominal fat, and

Table 1: Composition of the diets for common pheasants

Ingredient (%)	Starter	Grower	Finisher	Experimental diet[A]
	1-28 d	29-70 d	71-112 d	71-112 d
Maize	20.1	26.98	20.0	10.0
Ground wheat	25.0	25.00	35.0	17.5
Wheat meal	2.5	3.0	15.0	7.5
Barley			5.0	2.5
Triticale grain	-	-	-	50.0
Rice bran	3.0	2.0	-	-
Soybean meal (454 g CP/kg)	33.73	21.24	2.2	1.1
Rapeseed meal (357 g CP/kg)	4.0	7.5	8.0	4.0
Sunflower seed meal (395 g CP/kg)	-	5.0	5.0	2.5
Corn DDGS (280 g CP/kg)	-	3.0	3.62	1.81
Fish meal	3.0	-	-	-
Soybean oil	0.9	0.9	0.84	0.42
Lauric oil	0.5	0.7	0.7	0.35
Pszenmix (190 g CP/kg)	1.5	-	-	-
Lipofish	0.4	-	-	-
Limesterine	1.34	1.0	0.96	0.48
Monocalcium phosphate	1,02	0.8	0.81	0.405
Sodium chloride	1.34	1.34	1.34	0.67
Sodium bicarbonate	0.22	0.24	0.24	0.12
DL-methionine	0.145	0.035	0.03	0.015
L-lysine	0.055	0.015	0.01	0.005
Avatec	0.75	0.75	0.75	0.375
Vitamin-mineral premix[B]	0.5	0.5	0.5	0.25

[A]Experimental diet used only for the Whole Triticale group

[B]1 kg of vitamin-mineral premix provided: retinol 10 000 IU, cholecalciferol 2500 IU, α- tocopherol 20 mg, thiamine 0.5 mg, riboflavin 5.00 mg, niacinamide 20.00 mg, pyridoxine 1.0 mg, cobalamine 0.02 mg, folic acid 0.5 mg, pantothenic acid 7.00 mg, menadione 2.5 mg, choline chloride 200.00 mg, Fe 45.00 mg, Mg 62.5 mg, Zn 50.00 mg, Se 0.25 mg, I 1.3 mg

the remainder of the carcass. The remainder of the carcass was a bony structure with a certain amount of small skeletal muscles (intercostal, dorsal and other) including kidneys, without lungs. The dissected carcass components were weighed accurate to 0.1 g on a Medicat 5/12 electronic balance and their percentage in eviscerated carcass with neck was calculated.

After carcass dissection, breast and leg muscles were sampled to determine sensory properties and water holding capacity, and samples of breast muscle were collected to determine meat colour coordinates.

Water holding capacity of the meat was determined according to a modified version of the method described by Grau and Hamm [14], in which samples of 280-320 mg (weighed on a Medicat 160M balance, accurate to 0.001 g) were placed on Whatman No. 1 filter paper. Next, the analysed samples were inserted between 2 glass plates and weighed down with a 2 kg weight for 5 min. After this time, the sample was re-weighed. Water holding capacity (WHC) of the meat was calculated from the ratio between sample weight after and before squeezing (mg), multiplied by 100%.

Meat colour was determined via the CIE (Commision Internationale de l'Éclairage) system [15] on the inner surface of raw breast muscles. The colour coordinates L* – lightness, a* – redness (on red-green axis) and b* – yellowness (on yellow-blue axis) were measured using a Minolta chroma meter CR-310 (Konica Minolta, Japan). The measured area was 50 mm in diameter. The meter was calibrated against a CR310 white reference tile (Y = 92.80, x = 0.3175, y = 0.3333).

Sensory properties were evaluated using heat-treated meat. The sensory evaluation determined tenderness, juiciness, aroma and taste intensity and desirability of the breast and leg muscles of 112-d-old pheasants from the compared dietary treatments. Heat treatment of breast or leg muscle samples was conducted in 0.6% NaCl. 200 ml of water was added per 100 g of meat. The samples were heated until the temperature of 80°C. After thermal treatment, the samples were cooled to 60°C, and subjected to sensory assessment [16]. The assessment was performed by a

Table 2: Chemical composition of the diets for common pheasants

Chemical analysis (%)	Starter 1-28 d	Grower 29-70 d	Finisher 71-112 d	Experimental diet[A] 71-112 d
DM	91.4	91.3	91.3	89.9
CP	25.47	22.07	17.52	14.55
Crude fat	3.91	3.86	2.39	1.83
Crude fibre	3.49	4.16	4.70	3.73
Crude ash	6.89	5.63	5.55	3.41
N-free extracts	51.64	55.58	61.14	66.38
ME[B] (MJ/kg)	11.46	11.63	11.26	11.96
Calculated composition (%)				
Lysine	1.46	1.21	0.83	0.62
Methionine	0.57	0.41	0.36	0.28
Threonine	0.93	0.80	0.59	0.36
Tryptophan	0.33	0.27	0.21	0.30
Calcium	1.22	0.91	0.88	0.46
Phosphorus soluble	0.75	0.66	0.67	0.51

[A]Experimental diet used only for the Whole Triticale group

[B]The values are calculated from ingredient AME values

panel of 6 trained judges according to a 5-point scale provided by Baryłko-Pikielna and Matuszewska [17]. The assessment scale for intensity of aroma and taste was as follows: 1 points – imperceptible, 2 points – perceptible, 3 points – weakly distinct, 4 points – distinct, 5 points – very distinct. Aroma and taste desirability was assessed using the scale as follows: 1 point – very undesirable, 2 points – desirable, 3 points – neutral, 4 points – desirable, 5 points – very desirable. Meat tenderness was determined based on the following scale of assessment: 1 point – very hard, 2 points – hard, 3 points – slightly tender, 4 points – tender, 5 points – very tender. Juiciness of meat was determined using the following scale: 1 point – clearly dry, 2 points – slightly dry, 3 points – weakly juicy, 4 points – juicy, 5 points – very juicy.

Statistical analysis

For the numerical data on body weight, carcass weight, dressing percentage, carcass components, and physicochemical and sensory properties, the arithmetic mean and coefficients of variation (cv) were calculated for each trait under analysis. The statistics were calculated with SAS ver. 9.4 software [18]. Significant differences between the dietary treatments were determined with Tukey's test.

Results

The compared groups of differently fed common pheasants did not differ significantly ($p > 0.05$) in the mean body weight at 112 d of age (Table 3). Control pheasants had higher body weight.

Table 3: Effect of diet on body weight, dressing percentage and share (%) of carcass components in 112-d-old common pheasants (mean±cv)

Trait	Treatment	
	Control	Whole Triticale
BW – all birds (g)	1096±16.7	1050±18.6
BW – birds selected for dissection (g)	1090±14.3	1059±17.9
Weight of eviscerated carcass with neck (g)	797±5.1	767±18.9
Dressing percentage (%)	73.1±2.0	72.4±1.9
Proportion of neck (%)	4.4±11.9	4.4±10.6
Proportion of wings (%)	10.6±6.2[a]	11.3±4.8[b]
Proportion of breast muscles (%)	31.0±8.4	31.4±5.3
Proportion of leg muscles (%)	23.6±5.9	22.9±6.7
Proportion of skin with subcutaneous fat (%)	6.9±18.8	6.4±18.0
Proportion of remainder of the carcass (%)	23.5±16.3	23.6±10.6

a,b– mean values of traits in rows, marked with different letters, differ significantly between dietary groups ($p < 0.05$)

The replacement of the complete diet for meat pheasants with the same amount of whole triticale grain from 71 d of rearing caused non-significant changes in carcass weight. Dressing percentage was high. The proportion of eviscerated carcass with neck in the body weight of the pheasants selected for slaughter at 112 d exceeded 72%. Higher dressing percentage was observed in the control birds. The carcasses of 112-d-old pheasants fed the whole triticale grain diet had a higher percentage of wings, breast muscles and the remainder of the carcass, and a lower percentage of leg muscles and skin with subcutaneous fat (Table 3). Significant differences were only found for the wings percentage, which was higher in the experimental pheasants.

Dilution of the pheasant diet with whole triticale grain had no significant effect on the pH of breast and leg muscles measured 15 min. postmortem (pH_{15}) and on their water holding capacity. Higher pH_{15} values were noted for the breast and leg muscles of the experimental birds. Water holding capacity of breast muscles was higher in experimental pheasants, and lower for leg muscles in control birds. The wheat grain diet caused a significant increase in the redness and yellowness of breast muscles from 112-d-old pheasants compared to the muscles of control pheasants (Table 4).

The breast muscles of experimental pheasants received significantly ($p \leq 0.05$) higher scores for sensory properties except for aroma intensity and desirability, and taste intensity (Table 5). The experimental pheasants at the age of 112 d surpassed the control birds of the same age for all sensory scores of the leg muscles. During the assessment of sensory properties, the leg muscles of experimental pheasants received significanthigher scores for aroma intensity and desirability, juiciness, and tenderness.

Discussion

Triticale, a relatively new cereal, was developed in the late 19th century by crossing wheat (*Triticum*) with rye (*Secale*). Commercial triticale varieties were introduced into agricultural production as late as the 1960s. This also gave rise to numerous research studies aimed to determine the suitability of triticale for feeding to livestock, including poultry. As reported by Osek et al. [19], many results of the studies conducted in the 1980s and 1990s showed that triticale is of little use as a poultry feed as it reduced their weight gain and adversely affected the feed conversion ratio (higher FCR). The results of studies performed over the last 15 years with newer triticale varieties (octo- or hexaploid) are more favourable, which increases the chance for feeding this cereal type to poultry, in particular to broiler chickens and laying hens. Enhanced production performance (BW, FCR, survival rate) in Ross 308 broiler chickens fed compound feed with triticale was reported by Djekic et al. [20]. Ross 308 chickens, which received compound feeds supplemented with 7.5% (starter), 12% (grower I), 15% (grower II) and 18% (finisher) triticale were characterized by significantly higher BW at the age of 49 d (by 46 g, 2.0%), lower FCR (by 239 g, 1.6%) and better survival (by 2% pts) compared to the control birds fed the diet without triticale. In a study by Kokoszynski et al. [21], common pheasants fed from 71 to 112 d with a diet containing 50% whole triticale grain and 50% compound feeds had only 8 g higher BW (birds of both sexes) at 112 d compared to control birds receiving commercial complete diets for meat pheasants throughout the study. Contrary research results were recorded e.g. by Ozek et al. [22] in broiler chickens and by Krystianiak and Torgowski [23] in pheasants. In the study by Ozek et al. [22], triticale grain fed to Ross 308 broilers from 1 d of age reduced the BW of the chickens at 42 d by 132 g (5.4%, without supplemental dietary xylanase) to 191 g (7.9%, supplemental dietary xylanase) compared to the control birds. The feed intake value increased by 4.8 to 7.3%, and FCR value by as much as 11.9 to 14.1%. Krystianiak and Torgowski [23] reported that replacing 10 (13 wk) to 25% (16 wk) ground triticale with whole triticale grain caused reduced body weight gain (BWG, g/d) and poorer feathering in pheasants. In our study, 112-d-old pheasants had lower body weight compared to 98-d-old pheasants kept in aviaries or conventional fowl house [24] and 119-d-old pheasants [25]. Lower body weight of pheasants at 112 d of age compared to our study was obtained by Biesiada-Drzazga et al. [26] and Ipek and Dickmen [27], which may indicate that the level of nutrients has a large effect on their

Table 4: Effect of diet on physicochemical characteristics in 112-d-old common pheasants (mean±cv)

Trait		Treatment	
Control		Whole Triticale	
pH_{15}	BM	5.76±2.2	5.78±2.4
	LM	6.57±2.1	6.61±3.6
WHC	BM	57.6±7.5	58.5±5.4
	LM	71.3±5.9	70.2±6.5
L* – lightness	BM	51.7±3.7	52.1±5.0
a*– redness	BM	17.6±9.5^{a}	19.5±8.8^{b}
b*– yellowness	BM	6.0±34.5^{a}	7.4±35.2^{b}

BM– breast muscles, LM – leg muscles

a,b– mean values of traits in rows, marked with different letters, differ significantly between dietary groups ($p < 0.05$)

Table 5: Effect of diet on sensory properties characteristics in 112-d-old common pheasants (mean±cv)

Trait		Treatment	
Control		Whole triticale	
Aroma intensity, pts.	BM	3.8±10.0	3.8±8.6
	LM	3.7±15.6[a]	4.1±7.8[b]
Aroma desirability, pts.	BM	3.9±8.5	3.9±9.7
	LM	3.7±14.6[a]	4.1±6.9[b]
Juiciness, pts	BM	3.7±11.9[a]	4.0±7.2[b]
	LM	3.7±18.3[a]	4.1±7.0[b]
Tenderness, pts.	BM	3.7±10.7[a]	4.0±7.7[b]
	LM	3.8±16.4[a]	4.1±7.9[b]
Taste intensity, pts.	BM	3.8±9.8	3.9±6.5
	LM	3.8±13.5	4.0±9.2
Taste desirability, pts.	BM	3.8±10.2[a]	4.0±6.1[b]
	LM	3.9±13.2	4.0±8.6

BM- breast muscles, LM - leg muscles

a,b– mean values of traits in rows, marked with different letters, differ significantly between dietary groups ($p < 0.05$

BW at slaughter age.

When fed to poultry, including meat pheasants, a diet diluted with triticale grain may upset the balance between the amount of dietary energy and protein, which may widen the energy-protein ratio and increase fatness of poultry carcasses. Partial replacement of complete diet with whole triticale grain reduces the amount of dietary minerals and vitamins, as well as coccidiostats in gallinaceous poultry. These components may be deficient especially when a poultry ration has a high proportion of whole triticale grain [28]. Shortages of amino acids, in particular lysine, have an adverse influence on the development of breast muscles [11,21,29].

In an earlier study [21], the replacement of 50% complete diet with 50% whole triticale grain from 71 to 112 d of age significantly reduced the content of breast muscles (superficial pectoral muscle plus deep pectoral muscle) in eviscerated carcass with neck in 112-d-old pheasants while significantly increasing the content of skin with subcutaneous fat and the remainder of the carcass compared to control birds which received only commercial complete diets for meat pheasants (112 d) throughout rearing. Contrary results were obtained by Klisevicíute et al. [10], who fed Ross 308 broiler chickens with a diet containing a fixed amount of 2% (1-35 d) or different amounts of whole triticale grain (1-7 d – 8%, 8-21 d – 16%, 22-35 d – 15-25%) and observed no significant decrease in the breast muscle content (%) of carcass from 35-d-old chickens, The same authors also found that the triticale grain diet had no significant effect on percentage of leg muscle and abdominal fat in chickens aged 35 d.

The present research has demonstrated significantly higher redness and yellowness of breast muscle in common pheasants fed the diet with whole triticale grain, as compared with the control birds (commercial diets). Contrary results were reported by Kliseviciuteet al. [10] for Ross 308 broilers. Colour characteristics of raw breast muscle were not affected by feed composition. Dilution of the chicken diet with whole triticale grain did not have a significant effect on L*, a*, b* values, although when the level of triticale grain was higher (20-25%), lightness (L*), redness (a*) and yellowness (b*) values were higher than in control birds.

The diet with whole triticale grain had a positive effect on most sensory traits of heat-treated breast and leg muscles in pheasants aged 112 d. In a study with Ross chickens, Al-Hajo et al. [9] found higher juiciness, flavour, texture, overall acceptance and general appearance values for breast muscles in 42-d-old chickens when 100% of maize grain was replaced with triticale grain; this supports the beneficial effect of triticale on meat sensory characteristics obtained in our study. The values of sensory traits obtained for the meat of analysed pheasants were similar [30] or higher [31] compared to the earlier results of studies with the meat of game pheasants.

Conclusion

The addition of whole triticale grain to the diet of common pheasants caused a slight reduction in body weight, carcass weight and dressing percentage of slaughter-age pheasants, as well as non-significant changes in the content of carcass components, except for the wings percentage. The whole triticale grain diet had a positive effect on the tenderness, juiciness and taste desirability of breast muscles, and on the tenderness, juiciness and aroma of leg muscles subjected to heat treatment.

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References

1. Smulikowska S. Nutrient requirements of poultry (in Polish). IFiZZJablonna near Warsaw. 2005:93.
2. Mroz E. Pheasants. Hoza, editor. Warszawa; 1998. p. 140.
3. Znaniecka H, Sobina I. Influence of DKA-finisher and Ph1 feed nutrients on the rate of growth and quality of broiler meat. Zesz. Nauk ART. Olsztyn, Zoot. 1977; 2:147-152.
4. Znaniecka H, Wajda S. Research on the usefulness of DKA standard mixtures and S mixtures in feeding pheasants. Zesz. Nauk. ART. Olsztyn, Zoot. 1977; 13:95-102.
5. Woodard AE, Vohra P, Snyder RL. Effect of protein levels in the diet on the growth of pheasants. Poult. Sci. 1977; 56:1492-1500.
6. Bochenek M, Rutkowski A. Whole wheat in poultry feeding. Polish Poultry. 2008; 10:6-12.
7. Boruta A. Poultry feeding. In Poultry farming. Swierczewska E, editor. SGGW Warsaw; 2008. p. 108-151.
8. Jozefiak D, Rutkowski A, Jensen BB, Engberg R. Effects of dietary inclusion of triticale, rye and wheat and xylanase supplementation on growth performance of broiler chickens and fermentation in the gastrointestinal tract. Anim. Feed Sci. Technol. 2007; 132:79-93.
9. Al Hajo NNA, Janabi LAF, Al Khalani FMH, Al Ani IA. Use triticale grains replacing of corn in broiler chick diets and their effect on some quality characteristics of breast meat. Intern. J. Sci& Res. 2013; 5:1618-1623.
10. Kliseviciute V, Gruzauskas R, Raceviciute-Stupeliene A, Dauksine A, Svirmickas GJ, Miezeliene A, et al. Influence of different amount of whole triticale on productivity and meat quality of broiler chickens. Vet. Med. Zoot. 2014; 66:20-27.
11. Kokoszynski D, Kotowicz M, Brudnicki A, Bernacki Z, Wasilewski PD, Wasilewski R. Carcass composition and quality of meat from Pekin ducks finished on diets with varying levels of whole wheat grain. Anim. Prod. Sci. 2017; 10:2117-2124. doi: http://dx.doi.org/10.1071/AN15810.
12. Alijosius S, Sasyte V, Miezeliene A, Alencikiene G, Bliznikas S, Receviciute-Stupeliene A, et al. Effect of triticale and non-starch polysaccharides (NSP) degrading enzymes on colour and sensory characteristics of broiler meat. Vet. Med. Zoot. 2018; 76(98):3-8.
13. Ziolecki J, Doruchowski W. Evaluation methods of poultry slaughter value. Poultry Research Center Poznan (Poland). 1989:1-22.
14. Grau R, Hamm I. EineeinfacheMethodezurBestimmung der WasserbindungimFleisch. Fleischwirtschaft 1952; 4:295-297.
15. CIE – Commission Internationale de l'Ecleirage. 18 th Session, 1975. CIE Publication 36.
16. Krelowska-Kulas M. Testing of food products quality. PWE Warsaw; 1997. p. 400.
17. Barylko-Pikielna N, Matuszewska I. Outline of food analysis; PTTŻ Warsaw; 2009. p. 367.
18. SAS Institute Inc. SAS/STAT User's Guide, version 9.4. 2014. SAS Institute Inc, Gary, NC.
19. Osek M, Milczarek A., Janocha A, Swinarska R. Effect of triticale as a partial or complete wheat and maize substitute in broiler chicken diets on growth performance, slaughter value and meat quality. Ann. Anim. Sci. 2010; 10:275-283.
20. Djekic V, Pandurevic T, Mitrovic S, Radovic V, Miliovojevic J, Djermanovic V. Nutritional value of triticale (Trijumf) for broiler diets. Third Intern. Scientific Symp. "AgrosymJahorina 2012". 2012:548-553.
21. Kokoszynski D, Kotowicz M, Piwczynski D, Bernacki Z, Podkowka Z, Dorszewski P, et al. Effects of feeding whole-grain triticale and sex on carcass and meat characteristics of common pheasants. Italian J. Anim. Sci. 2018; 19(4):1-11.doi: http//doi.org/10.1080/1828051X.2018.1443028.
22. Ozek K, Konca Y, Catli AU, Wellmann KT. The effect of free choice feeding based on whole triticale on growth, meat quality, carcass characteristics and gastrointestinal traits in broilers. Revue Med. Vet. 2012; 163:621-627.
23. Krystianiak S, Torgowski J. The effect of two feeding systems on rearing results of pheasants (Phasianuscolchicus L.) of Polish and French varieties. Anim. Prod. Rev. Appl. Sci. Rep. 1998; 36:201-209.
24. Ricard FH, Petitjean MJ. A comparison of the composition of game-type pheasant and broiler chickens with similar body weights. Ann. Zootech. 1989; 38:11-18.
25. Yovchev D, Dimitrov R, Kostov D, Vladova D. Age morphometry of some internal organs in common pheasant (Phasianuscolchicuscolchicus) Trakia J. Sci. 2012; 10(3):48-52.
26. Biesiada-Drzazga B, Socha A, Janocha A, Banaszkiewicz T, Koncerewicz A. Assessment of slaugher value and quality of meat in common "game" pheasant (Phasianuscolchicus). Zywnosc. Nauka. Technologia. Jakosc 2011; 74:79-86.
27. Ipek A, Dikmen BY. The relationship between growth traits and egg weight in pheasants (P. colchicus). J. Biol. Environ. Sci. 2007; 1:117-120.
28. Rachwal A. Triticale in poultry feed. Poultry Breeding. 2010; 5:6-11.
29. Cholocinska A, Wezyk S. Effect of feeding system on broiler chicken productivity.Rocz. Nauk. Zoot. 1999; 26(1):243-253.
30. Kokoszynski D, Bernacki Z, Duszynski L. Body conformation, carcass composition and physicochemical and sensory properties of meat from pheasants of different origin. Czech J. Anim. Sci. 2012; 57(3):115-124.
31. Torgowski J, Potkanski A, Musial K. Effect of different feeding and housing system on rearing results of pheasant. Rocz. AR Poznan, Zoot. 1990; 39:99-109.