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HISTOPATHOLOGICAL CHANGES OF THE PECTORAL MUSCLE IN PHEASANTS (*PHASINUS COLCHICUS*; *PHASINUS C. MONGOLICUS*)

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ABSTRACT

The aim of investigation was the frequency of histopathological changes of the *m. pectoralis superficialis* of game and Mongolian pheasants of different ages. The samples for analyze from pectoral muscle were taken after bird slaughter immediately at 12, 16 and 20 weeks of age. Then with from the samples made the histological slides and stained with H + E coloring method to visualize of the muscle tissue structure. The muscle structure analysis was conducted per area 1.5 mm^2 with the following histopathological changes: atrophy, shape changes, giant fibers, necrosis, hyaline degeneration, splitting, connective tissue hypertrophy and inflammatory. There was a small frequency of histopathological changes in both pheasant varieties. The most histopathological changes ware observed atrophy and changes of fiber shape. Other changes were sporadic. The connective tissue hypertrophy and inflammatory infiltration were not observed in any individuals. Mongolian pheasants found slightly higher frequency of histopathological changes, but these differences were not statistically significant. Considering the above facts, it can be stated that *m. pectoralis superficialis* both varieties of pheasants because of the small number of histopathological changes observed in their structure and their nutritional value are valuable raw materials for the high-quality food production.

Key words: breast muscle, changes of muscle structure, pheasants

INTRODUCTION

High demand for poultry meat has lead to a significant intensification of farming methods, which is associated with deterioration in the quality of meat [Gilewski and Wężyk 2015]. The raw poultry meat of a higher value may be sourced from other species recognized as alternative sources. As for the highly nutritious raw meat, it may be sourced from the carcasses of hunted pheasants. Such a meat is rich in good quality protein (24.6–26,0%) and is low in fat [Kuźniacka et al. 2007]. Compared to other livestock avian species, the meat of 16- and 10-weeks-old pheasants is rich in essential unsaturated fatty acids [Kuźniacka et al. 2006]. Moreover, the pheasant meat is of high nutritive and dietetic value [Straková et al. 2011], which makes it an excellent raw ingredient for gourmet meals. The specific dark color, fat content, structure and acidity make additional functional qualities of the meat [Kotowicz et al. 2012]. According to Mróz [2003] or Dzierżyńska-Cybulko and Fruziński [1997], additional advantages are the levels of thiamine (vitamin B1), riboflavin (vitamin B2), nicotinamide (vitamin B3) and some minerals (S, Fe, P, Ca), which were found higher in a pheasant meat compared to that of a chicken. In parti-

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cular, the pheasant breast muscles, due to a high content of magnesium and iron, are valued as a raw food material [Kokoszyński et al. 2014]. One should also take into account a progressively growing group of consumers, who select for a healthy food.

Currently the pheasants are kept under two types of farming systems: intensive and semi-intensive, the latter one being used more often [Nowaczewski 2000, Maciołek and Bąkowska 2005]. Artificial hatches, large scale farming and feeding commercial mixtures has contributed to an increased body mass of the animals. Nevertheless, such a farming system leads to a number of negative effects. The birds grown in a controlled condition lose their abilities to adapt to a natural environment [Nowaczewski et al. 2000]. In animal farming, the keeping conditions play a crucial role, i.e.: overstocking, intensive feeding and adverse environmental conditions lead to such changes in a muscle structure, which reduce the quality of a meat product. This refers, in particular to fast growing animals [Kłosowska et al. 1998, Kłosowska et al. 1999, Kłosowska et al. 2000, Elminowska-Wenda et al. 2004 a]. The microscopic images of a transversely striated tissue revealed the following histopathological changes: atrophy of fibers, giant fibers, changes in a fiber shape, fiber necrosis with phagocytosis, fiber splitting, hyaline degeneration as well as hypertrophy of connective tissue and leukocyte infiltration of a tissue [Kłosowska et al. 1998, Hausmanowa-Petrusewicz 2005]. According to Kłosowska [1984], understanding the microstructure of a muscle tissue in a linkage with its biochemical characteristics, may serve for evaluation of qualitative traits of the meat sourced from animals for slaughter.

Therefore, the aim of this study was to evaluate the frequency of histopathological changes in a *m. pectoralis superficialis* in two types of pheasants at different ages: game-type pheasant and Mongolian pheasant.

MATERIAL AND METHODS

Birds keeping

The biological material were 12-, 16- and 20-weeks old game-type pheasants (30 individuals per each age group) and Mongolian pheasants (30 individuals per each age group). The birds originated from Hunting Bird Farm in Sokolowo, under The Agricultural Property Agency in Golub-Dobrzyń, Cuyavian-Pomeranian region. For the first 4 weeks of life, the pheasants were kept entirely in a brooder house, under controlled conditions, with no access to run. Starting from the 5th week of life, the birds were kept in partially roofed aviaries with a sandy gravel floor, sown with Jerusalem artichoke and lucerne. The stocking density accounted for 1 bird/m^2. For 1–4 weeks of life, the pheasants were fed the complete R-301 starter feed mixture (25% protein, 2800 kcal of ME), from 5–16 weeks they were fed the R-302 grower feed mixture (21.5% protein, 2765 kcal of ME) and from 17 weeks on, the pheasants were fed the R-303 feed mixture (17% protein, 2750 kcal of ME). Additionally, starting from the 5th week of life, the pheasants were offered ad libitum cabbage and fodder beet. The dietary treatment was in line with the Dietary Recommendations for Poultry [Smulikowska and Rutkowski 2005].

In the 12th, 17th and 20th weeks of life, males (n = 5) and females (n = 5) of each type (game and Mongolian pheasant) were randomly selected and slaughtered.

Histopathological analyses

Immediately after slaughter, the sections of a left side breast Pectoralis superficialis muscle were sampled at 2/3 of a brisket height, close to its spina [Baumel 1993]. The muscle samples were placed in designated vials, frozen in a liquid nitrogen (–196°C) and stored until used. For analyses, the muscle samples were cut into 10 µm thick sections, in a cryostat. The preparations were stained with topographic H + E to show the normal structure of muscle fibers, histopathological changes within the fibers and the presence of connective tissue [Dubowitz et al. 1973].

The analysis of a microstructure of the Pectoralis superficialis muscle was performed with MultiScan v. 14.02., an automated system for microscopic image analysis (Computer Scanning System, Warszawa). The histopathological changes were evaluated on a surface of 1.5 mm^2, including determination of the following: muscle fibers atrophy, giant fibers, changes in a fiber shape (elongated, triangular and trapezoid fibers), necrosis, inflammatory infiltrates and hypertrophy of connective tissue [Hausmanowa-Petrusewicz 2005].

Statistical verification of the results

Statistical verification of the results (mean values, standard deviation, significance of results calculated with Student's t-test) was performed with the Statistica 8.0 PL software. Separate criteria were applied to histopathological changes, which were unsuitable for statistical analysis (like inflammatory infiltrates or connective tissue hypertrophy). Those histopathological changes were analyzed in terms of the extent of occurrence:

0 – no histopathological change,
+ – histopathological change to a small extent,
++ – extensive histopathological change.

RESULTS

The aim of this study was to investigate both the frequency and the extent, to which histopathological changes occurred. The following features were considered: atro-

phy, change in fiber shape, giant fibers, necrosis, hyaline degeneration, fiber splitting, as well as connective tissue hypertrophy and inflammatory infiltrates. The Figure 1 shows a normal structure of tightly packed muscle fibers. The frequency of occurrence of histopathological changes in 12-weeks old pheasants is shown in the Table 1. Among the examined birds, the most frequent histopathological change for both types of pheasants was the atrophy (6.7%), followed by changes in fibers shape (game type – 1.2%; Mongolian – 1.3%), giant fibers (game type – 0.1%; Mongolian – 0.3%), necrosis (Mongolian – 0; game type – 0.1%), hyaline degeneration (game type – 0.06%; Mongolian – 0.08%) and fiber splitting (game type – 0%; Mongolian – 0.08%).

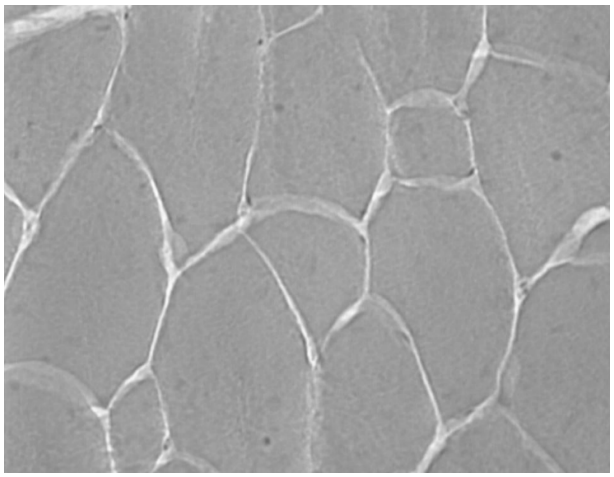

Fig. 1. Cross section of *m. pectoralis superficialis* in pheasant. Normal muscle structure. Mag. 250x

Rys. 1. Przekrój poprzeczny *m. pectoralis superficialis*. Prawidłowa struktura. Pow. 250x

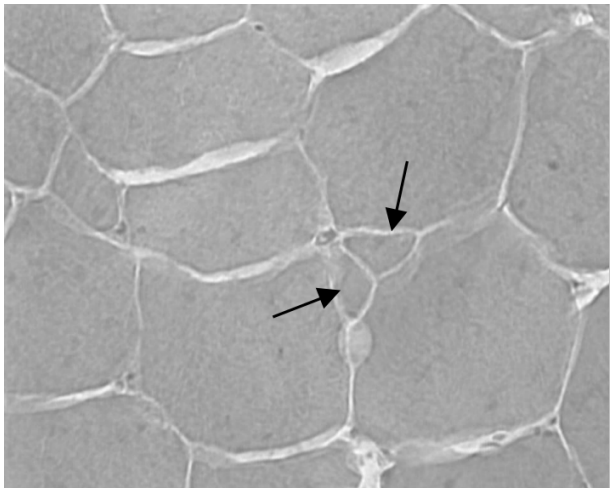

Fig. 2. Cross section of *m. pectoralis superficialis* pheasant. Atrophic fibers (arrows). Mag. 250x

Rys. 2. Przekrój poprzeczny *m. pectoralis superficialis*. Włókna atroficzne (strzałki). Pow. 250x

The results of histopathological analysis in 16-weeks old pheasants are shown in the Table 2. As for 12-weeks old pheasants, the most frequent histopathological change observed was the atrophy (game type – 6.4%; Mongolian – 7.5%), followed by changes in fibers shape (game type – 1.2%; Mongolian – 2.2%), giant fibers (game type – 0%; Mongolian – 0.1%), hyaline degeneration (game type – 0%; Mongolian – 0.1%) and fiber splitting (Mongolian – 0; game type – 0.07%). Necrosis was not found in any individual.

The results of histopathological analysis in 20-weeks old birds are shown in the Table 3. Again, the most frequent histopathological change observed was the atrophy (Mongolian – 4.0%; game type – 4.1%) followed by changes in fibers shape (Mongolian – 1.5%; game type – 1.6%), giant fibers (game type – 0.1%; Mongolian – 1.7%), hyaline degeneration (game type – 0%; Mongolian – 0.08%) and fiber splitting (Mongolian – 0%; game type – 0.1%). As for 16-weeks old pheasants, necrosis was not found in any individual.

Hypertrophy of connective tissue or inflammatory infiltrates were not found in any examined sample. All the histopathological changes but hypertrophy of connective tissue and inflammatory infiltrates were observed in the 12 weeks old pheasants. Nevertheless, those changes were observed at low frequency. The Mongolian pheasants showed a slightly greater frequency of histopathological changes, except for necrosis. Alike tendencies were found in 16-weeks old birds, among which all the histopathological changes but fiber splitting were more frequent in the Mongolian type. Instead, among the 20-weeks old birds, the histopathological changes happened to be more frequent in the game type, except for the giant fibers and hyaline degeneration.

Statistical verification of the results showed no significant differences for any histopathological change.

DISCUSSION

There is a lack of published data on issue of histopathological changes in the muscles, in pheasants. The previous studies were focused on histopathological changes in the muscles of other avian species and livestock animals. Comparing the results of this study with the information provided by other authors, it may be concluded that atrophy is one of the most common changes to happen. The atrophy manifests itself with tiny, multangular or triangular fibers (Fig. 2). A reduction in muscle fiber diameter may be a part of disease progression in some myopathies or may result from degenerative changes in a muscle tissue. Atrophic fibers may also be produced as resulting from the oppression with adjacent hypertrophic fibers [Hausmanowa-Petrusewicz 2005]. In the study on the Pectoralis superficialis muscle of a quail,

Table 1. Percentage content of histopathological changes ($\bar{x}$; SD) in *m. pectoralis superficialis* of 12-week pheasants by variety

Tabela 1. Procentowy udział zmian patologicznych ($\bar{x}$; SD) w *m. pectoralis superficialis* 12-tygodniowych bażantów poszczególnych odmian

Variety		Atrophic Atrofia	Shape change Zmiana kształtu	Giant fibres Włókna olbrzymie	Necrosis Martwica	Hyaline degeneration Zeszkliwienie	Splitting Rozszczepienie
Game Łowny	$\bar{x}$	6.7	1.2	0.1	0.1	0.06	0
	SD	3.1	0.8	0.1	0.8	0.04	0
Mongolian Mongolski	$\bar{x}$	6.7	1.3	0.3	0	0.08	0.08
	SD	2.6	0.6	0.4	0	0.06	0.09

Table 2. Percentage content histopathological changes ($\bar{x}$; SD) in *m. pectoralis superficialis* of 16-week pheasants by variety

Tabela 2. Procentowy udział zmian patologicznych ($\bar{x}$; SD) w *m. pectoralis superficialis* 16-tygodniowych bażantów poszczególnych odmian

Variety		Atrophic Atrofia	Shape change Zmiana kształtu	Giant fibres Włókna olbrzymie	Necrosis Martwica	Hyaline degeneration Zeszkliwienie	Splitting Rozszczepienie
Game Łowny	$\bar{x}$	6.4	1.2	0	0	0	0.07
	SD	2.8	0.7	0	0	0	0.1
Mongolian Mongolski	$\bar{x}$	7.5	2.2	0.1	0	0.1	0
	SD	1.8	1.3	0.5	0	0.2	0

Table 3. Percentage content of histopathological changes ($\bar{x}$; SD) in *m. pectoralis superficialis* of 20-week pheasants by variety

Tabela 3. Procentowy udział zmian patologicznych ($\bar{x}$; SD) w *m. pectoralis superficialis* 20-tygodniowych bażantów poszczególnych odmian

Variety		Atrophic Atrofia	Shape change Zmiana kształtu	Giant fibres Włókna olbrzymie	Necrosis Martwica	Hyaline degeneration Zeszkliwienie	Splitting Rozszczepienie
Game Łowny	$\bar{x}$	4.1	1.6	0.1	0	0	0.1
	SD	2.5	1.1	0.5	0	0	0.8
Mongolian Mongolski	$\bar{x}$	4.0	1.5	1.7	0	0.08	0
	SD	2.9	0.9	1.0	0	0.06	0

the atrophy accounted for 17.35% of all the histopathological changes [Walasik et al. 2006]. Also, according to Elminowska-Wenda et al. [2004 a], the most frequent change found in *m. pectoralis superficialis* of intensively fed Landaise geese, was the fiber atrophy. Similarly, Walasik and Ryszewska [2007] found the highest number of atrophic fibers in the Pectoralis superficialis muscle of goose crossbreds shared with the greylag goose gene. Also, Bogucka and Kapelański [2004] showed fiber atrophy to be the most frequent change in Longissimus lumborum muscle in different breeds of swine as well as in the wild board/domestic pig hybrids [Bogucka et al. 2007]. Whereas, the study of Hejnowska et al. [1997] on two strains of hens showed less frequent atrophy, while increased frequency of giant fibers.

In this study, the second most frequent was the histopathological change in fibers shape. Elimowska-Wenda et al. [2004 a] showed that the change in fibers shape accounted for 4.53% in intensively fed Landaise geese. Similarly, Walasik et al. [2006] showed this change to occur at 3.66% in meat type quails. Whereas, it happened only at 0.91% in goose crossbreds [Walasik and Ryszewska 2007].

The giant fibers occurred with low frequency. The giant fibers are characterized by round or oval cross-section, larger diameter homogenous cytoplasm structure and increased stainability as compared to other fibers [Kłosowska 1984, Kłosowska et al. 1998]. The presence of giant fibers indicates the focal myopathic changes. Those changes are found in fast-growing animals of a high body mass and of elevated susceptibility to stress. The numbers of giant fibers observed in this study were definitely lower compared to those, which were reported by Hejnowska et al. [1997] in hens or found by Elminowska-Wenda et al. [2004 b] in 3 conservative flocks of ducks. Likewise, the studies of a quail in Pectoralis superficialis muscle [Walasik et al. 2006] showed for a definitely higher (5.85%) number of giant fi-

bers as compared with the pheasant breast muscle discussed above. The histopathological changes which happen to occur with low frequency in the animal muscles are the following: necrosis, hyaline degeneration, fiber splitting, hypertrophy of connective tissue and inflammatory infiltrates [Bogucka and Kapelański 2004, Elminowska-Wenda et al. 2004 a, Walasik et al. 2006, Bogucka et al. 2007, Walasik and Ryszewska 2007]. On a contrary, the increased quantity of inflammatory infiltrates and necrosis was shown in the waterfowl, in particular among ducks, which may be affected by housing and rearing systems [Brodecki et al. 1997, Elminowska-Wenda 2004 b].

Intensification of meat production has provided fast growing animals of large muscularity (broiler chickens, turkeys). It does, however, lead to major changes in a structure of muscle tissue (myopathies) and defects in meat quality [Elminowska-Wenda et al. 2014, Bailey et al. 2015, Mazzoni et al. 2015]. Current farming systems and low amount of histopathological changes found in Pectoralis superficialis muscle of both types of pheasants may favor these birds for production of a high-quality meat.

CONCLUSION

The Pectoralis superficialis muscle of pheasants, due to a low amount of structural histopathological changes and their nutritional properties, make an excellent raw meat material for a high-quality food.

REFERENCES

Bailey, R.A., Watson, K.A., Bilgili, S.F., Avendano, S. (2015). The genetic basis of pectoralis major myopathies in modern broiler chicken lines. Poult. Sci., 94, 2870–2879.

Baumel, J.J. (1993). Handbook of Avian Anatomy: Nomina Anatomica Avium (Second Edition). Publications of the Nuttall Ornithological Club, No. 23, Cambridge, England.

Bogucka, J., Elminowska-Wenda, G., Walasik, K., Kapelański, W. (2007). Incidence of histopathological changes in longissimus lumborum muscle of wild boar/domestic pig hybrids. Pol. J. Food Nutr. Sci., 57, 4A, 49–52.

Bogucka, J., Kapelański, W. (2004). Microstructure traits of longissimus lumborum muscle in Polish Landrace and crossbred Stamboek and Torhyb pigs. Anim. Sci. Pap. Rep., 22, 4, 419–427.

Brodecki, J., Kłosowska, D., Elminowska-Wenda, G., Bernacki Z. (1997). Występowanie zmian histopatologicznych w *m. pectoralis superficialis* kaczek rodowych i grupy syntetycznej w typie pekin [Incidence of histopathological changes in m. pectorais superficialis of the drakes of different strains and of Pekin type synthetic group]. Zesz. Nauk. Prz. Hod., 32, 27–33 [in Polish].

Dubowitz, W., Brooke, M., Neville, H.E. (1973). Muscle Biopsy: A Modern Approach. W. B. Saunders Company LTD London, Philadelphia, Toronto.

Dzierżyńska-Cybulko, B., Fruziński, B. (1997). Dziczyzna jako źródło żywności [Venison as a food source]. PWRiL, Poznań [in Polish].

Elminowska-Wenda, G., Bogucka, J., Sobolewska, A., Paruszewska-Achtel M. (2014). Występowanie miopatii typu syndrom "białych włókien"w mięśniu piersiowym brojlerów [The occurrence of myopathy syndrome type „white fibers" in the pectoral muscle of broilers]. XXVI Międzynarodowe Sympozjum Drobiarskie Ńauka praktyce drobiarskiej – praktyka drobiarska nauce", 08–10 września 2014, Kazimierz Dolny nad Wisłą, Mat. Konf., 176–177 [in Polish].

Elminowska-Wenda, G., Rosiński, A., Baeza E. (2004 a). Zmiany histopatologiczne w mięśniu piersiowym gęsi landejskich utrzymywanych w różnych systemach żywienia [Histopathological changes in pectoralis muscle of Landaise geese kept in different feeding system]. Zesz. Nauk. Akad. Rol. Wroc., Zootech. L, 488, 97–102 [in Polish].

Elminowska-Wenda, G., Wasiluk, A., Książkiewicz, J., Kisiel, T. (2004 b). Histopathological changes in musculus pectoralis superficialis and musculus biceps femoris of ducks from three conservative flocks. International Conference „Pig and poultry meat quality – genetic and non-genetic factors", 14–15 October 2004, Kraków, Proceed. of the Br. Soc. Anim. Sci., 65.

Gilewski, R., Wężyk, S. (2015). Wady mięsa kurcząt brojlerów [Disadvantages of broiler chicken meat]. Ogólnopolski Informator Drobiarski (OID), 283, 4/2015, 8–16 [in Polish].

Hausmanowa-Petrusewicz, I. (2005). Choroby nerwowo-mięśniowe [Neuromuscular diseases]. Wyd. Nauk., PWN, Warszawa [in Polish].

Hejnowska, M., Kłosowska, D., Barnecki, Z. (1997). Występowanie zmian histopatologicznych w m.pectoralis superficialis kur leghorn i plymouth rock [Incidence of histopathological changes in *m. pectoralis superficialis* of the Leghorn and Plymouth Rock hens]. Zesz. Nauk. Prz. Hod., 32, 61–67 [in Polish].

Kłosowska, D. (1984). Cechy histologiczne i histochemiczne mięśni świń, bydła i drobiu, a jakość mięsa [Histological and histochemical characteristics of muscles in pigs, cattle and poultry and their relationship with meat quality]. Pr. Wydz. Nauk Przyr. BTN, Seria B, Rozprawa habilitacyjna, 31, 1–129 [in Polish].

Kłosowska, D., Kluczek, J.P., Kapelański, W. (1998). Zmiany histologiczne tkanki mięśniowej determinowane warunkami środowiskowymi [Histological changes in muscle tissue determined by environmental conditions]. Pr. Wydz. Nauk Przyr. BTN, Seria B, 44, 91–102 [in Polish].

Kłosowska, D., Lewandowska, M., Puchajda, H. (1999). Zmiany histopatologiczne w mięśniu piersiowym powierzchownym (*m. pectoralis superficialis*) i mięśniu dwugłowym uda (m. biceps femoris) indyczek z różnych grup genetycznych [Appearance of histopathological changes in *m. pectoralis superficialis* and biceps femoris in turkey hens of different genetic groups]. Zesz. Nauk. Prz. Hod., 45, 73–81 [in Polish].

Kłosowska, D., Lewandowska, M., Walasik, K., Puchajda, H. (2000). Występowanie zmian patologicznych w mięśniu

piersiowym powierzchownym i dwugłowym uda indyczek i indorów rzeźnych typu ciężkiego [Occurrence of pathological changes in *m. pectoralis superficialis* and biceps femoris in turkey hens and toms of the heavy type]. Rocz. Nauk. Zootech., Supl., 8, 156–159 [in Polish].

Kokoszyński, D., Bernacki, Z., Pieczewski, W. (2014). Carcass composition and quality of meat game pheasants (P. colchicus) depending on age and sex. Eur. Poult. Sci., 78, DOI: 10.1399/eps.2014.16.

Kotowicz, M., Lachowicz, K., Lisiecki, S., Szczygielski, M., Żych, A. (2012). Characteristics of common pheasant (Phasianus colchicus) meat. Arch. Geflügelk., 67(4), 270–276.

Kuźniacka, J., Adamski, M., Bernacki, Z. (2007). Effect of age and sex of pheasants (Phasianus colchicus) on selected physical properties and chemical composition of meat. Anim. Sci., 7, 1, 45–53.

Kuźniacka, J., Bernacki, Z., Adamski, M. (2006). Effect of the sex on the composition of fatty acids in breast and leg muscles of pheasant. Anim. Sci., Supl., 1, 78–79.

Maciołek, H., Bąkowska, N. (2005). Fermowy odchów brojlerów-bażantów, przystosowany do warunków środowiska naturalnego [The farm breeding system of broiler pheasants, adapted to the natural environment conditions]. Cz. I, Pol. Drob., 4, 48–50 [in Polish].

Mazzoni, M., Petracci, M., Meluzzi, A., Cavani, C., Clavenzani, P., Sirri, F. (2015). Relationship between pectoralis major muscle histology and quality traits of chicken meat. Poult. Sci., 94, 12–130.

Mróz, E. (2003). Bażanty [The pheasants]. Oficyna Wyd. „Hoża", Warszawa [in Polish].

Nowaczewski, S. (2000). Bażant łowny – ptak godny uwagi [The game pheasant – a bird worth attention]. Porad. Gospod., 7/8, 44–45 [in Polish].

Nowaczewski, S., Krystianiak, S., Kontecka, H., Torgowski J. (2000). Próba określenia możliwości wykorzystania odłowionych bażantów do celów reprodukcyjnych [An attempt to determine the possibility of using catched pheasants for reproductive purposes]. Zesz. Nauk. Prz. Hod., 49, 510–511 [in Polish].

Smulikowska, S., Rutkowski, A. (2005). Zalecenia żywieniowe i wartość pokarmowa pasz [Nutritional recommendations and feed nutritive value]. Normy Żywienia Drobiu, IF i ŻZ PAN [in Polish].

Straková, E., Suchý, P., Karásková, K., Jámbor, M., Navrátil, P. (2011). Comparison of nutritional values of pheasant and broiler chicken meats. Acta Vet. Brno, 80, 373–377.

Walasik, K., Adamski, M., Bogucka, J., Kubicki, J. (2006). Obraz zmian histopatologicznych w mięśniu piersiowym powierzchownym przepiórek dwóch typów użytkowych [Histopathological changes in superficial pectoral muscle of meat and egg type quails]. Rocz. Nauk. Pol. Tow. Zootech., 2, 3, 119–126 [in Polish].

Walasik, K., Ryszewska, A. (2007). Zmiany histopatologiczne mięśnia piersiowego powierzchownego trójrasowych krzyżówek gęsi z udziałem dzikiej gęsi gęgawej [Histopathological changes in the superficial pectoral muscle of triple race goose crossbreeds with Greylag goose gene shares]. Med. Weter., 63(5), 586–589 [in Polish].

ZMIANY HISTOPATOLOGICZNE W MIĘŚNIU PIERSIOWYM POWIERZCHOWNYM BAŻANTÓW (*PHASINUS COLCHICUS*; *PHASINUS C. MONGOLICUS*)

STRESZCZENIE

Przedmiotem badań była ocena częstotliwości występowania zmian histopatologicznych w mięśniu piersiowym powierzchownym *m. pectoralis superficialis* bażantów łownych i mongolskich. Próby do analiz pobierane były po uboju ptaków w wieku 12., 16. i 20 tygodni. Z poprawnych prób sporządzono preparaty histologiczne i poddano je barwieniu H+E celem zobrazowania struktury tkanki mięśniowej. Analizę struktury mięśnia przeprowadzono na powierzchni 1.5 mm^2 z uwzględnieniem następujących zmian histopatologicznych: atrofia, zmiany kształtu włókien, włókna olbrzymie, martwica, zeszkliwienie, rozszczepienie, przerost tkanki łącznej i nacieki zapalne. U obydwu odmian bażantów stwierdzono niewielką częstotliwość występowania zmian histopatologicznych. Najczęstszą zmianą była atrofia oraz zmiany kształtu włókien. Pozostałe zmiany występowały sporadycznie. U żadnego osobnika nie zaobserwowano przerostu tkanki łącznej i nacieków zapalnych. U bażantów mongolskich stwierdzono nieznacznie większa częstotliwość występowania zmian histopatologicznych, jednak różnice te nie były istotne statystycznie. Biorąc pod uwagę powyższe fakty można stwierdzić, że mięsień piersiowy powierzchowny bażantów obydwu odmian z racji niewielkiej ilości zmian histopatologicznych obserwowanych w ich strukturze oraz swoich walorów odżywczych stanowi cenny surowiec do produkcji żywności o wysokiej jakości.

Słowa kluczowe: mięsień piersiowy, zmiany histopatlogiczne stuktury mięśnia, bażanty