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ASSESSMENT OF EGG QUALITY AND HATCH RESULTS OF DIFFERENT ORIGIN HENS

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Abstract. Growing interest in fancy hen breeding motivates people undertake more research into assessment of their production traits. The purpose of this research is to assess the quality of eggs and results of hatch of three hen breeds: partridge italian, silver brahma, and salmon faverolle. Eggs were assessed in three periods of laying. Hatching was carried out with the use of eggs from the period of production peak. The qualities of eggs changed according to the period of the production. The biggest differences were found in terms of the color and height of yolk, the weight of albumen and yolk and the eggshell thickness. Among the considered breeds of hens were found statistically significant differences for the egg shape index and the albumen and shell weight. Eggs of italian partridge were characterized by the highest statistically significant weight of albumen and index of shape (35.99 g and 75.58%), whereas the smallest were observed for brahms (33.33 g and 72.21%). Fertilization of italian hen eggs was 97.8% and of feverolle 100%. Also a high percentage share of healthy hatched chickens from fertilized and set eggs was observed. In case of brahma breed there were no fertilized eggs found.

Key words: brahma, egg quality, faverolle, hatch, hen, italian

INTRODUCTION

Many breeds of chickens which used to be of big economic importance, have been eliminated for economic reasons as they were not adjusted to current requirements due to their low egg production or other characteristics, which determine profitability of the breed. They were characterized by significant variability mostly in terms of color, feathers, and morphological features. Fortunately, many of those

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once kept breeds are still being raised for fancy by people who appreciate them for their beautiful appearance, not attaching importance to their production traits [Świerczewska et al. 2008].

Italian hens were bred in Italy and they belong to the group of Mediterranean breeds [Pudyszak 2004]. Italian hens occur in 19 colors and the most common are italian partridge hens whose feather color and shape resemble the ancestors of our hens – bankiwa hen. The rooster weighs from 2.2 kg to 3.0 kg, whereas a hen from 1.7 kg to 2.5 kg. A hen lays more than 200 eggs yearly, these eggs have white shell and weight exceeding 55 g. [Schiffer and Hotze 2011].

According to Roszkowski and Wysocki [2007] brahma hens derive from Asia, however, there are several contradictory theories as to from where they originate. The body mass of a cock is 3.5–5.0 kg, and a hen 3.0–4.5 kg, yearly egg production was nearly 150 eggs.

The ancestors of today's faverolle are, undoubtedly, rural hens from France. However, today's hens of faverolle breed are the effect of work mainly of German breeders. Body mass of the cock is 3.0–4.0 kg whereas of a hen it should be 2.5 kg to 3.2 kg [Zniszczyńska 2004]. They can lay 120–140 cream colored eggs yearly [Świerczewska et al. 2008].

Morphological composition and the quality of eggs depend on the birds origin, age, feed and environmental factors [Kuźniacka et al. 2004].

Nowadays there is not much research being done in the field of production traits assessment of fancy breeding of show hens, kept in an extensive system. It seems to be advisable to do this kind of research. The purpose of this research is to estimate the quality of eggs and egg hatch results of the following breeds: partridge italian, silver brahma and salmon faverolle.

MATERIAL AND METHODS

The research was conducted in 2011, on a private farm in Rzadkwin, Strzelno commune, kujawsko-pomorskie province and in the Department of Poultry Breeding of the University of Technology and Life Sciences in Bydgoszcz. The experimental material were eggs of hens of three breeds in the second year of their being in use, classified as fancy breeds: italian partridge, silver brahma and salmon faverolle.

Abundance of birds in particular flocks was: partridge italians – 1 cock and 8 hens, brahma – 1 rooster and 7 hens, faverolle – 1 cock and 7 hens. The birds were kept in brick hen houses on a bedding with access to walks. Hens and roosters were fed *ad libitum* with a full portion mix designed for layer hens of backyard breeding of De Heus company with protein content 16% and metabolic energy

2600 kcal. Additionally, during the research, the birds used little crake out in the walks. Birds were exposed to natural sunlight.

The first stage of the research involved assessment of the morphological composition and physical traits of eggs in three egg laying periods: early (58th week of hens life, 3th week of laying), peak (65th week of life, 10th week of laying) and the end (84th week of life, 29th week of laying). The assessment of the egg quality was made during 24 hours after laying an egg. The number of the assessed eggs in particular periods has been presented in Table 1. The weight of eggs (g) was marked on an electronic scales of Steinberg company. Electronic caliper was used for measurement of the long axis (length) and short axis (width) of the egg. The percentage ratio of width to length was the egg shape index. The surface of the shell (cm^2) was calculated by means of [Paganelli et al. 1974] formula:

$$P_s = 4.835 \times W^{0.662}$$

where: W – weight of egg.

After being emptied the shell was dried for 24 hours, then its weight (g) was measured with the use of an electronic scales. A micrometric screw was used for measurement of the shell thickness at its blunt end (mm).

After emptying the egg and putting its content onto a tray, the height of (mm) and diameter of yolk (mm) was measured along the chalazae line of by electronic caliber. The ratio of the height of yolk to its diameter was its yolk index. The color of yolk was described by means of 15-degree La Roche's scale, its weight was marked on an electronic scales produced by Steinberg company. The albumen weight was calculated from the difference between the egg weight and the yolk and the shell weight. Percentage share of the yolk, albumen and shell in the egg weight was calculated as well.

The second stage of the study involved estimating the results of fancy hens hatch. Eggs from the peak laying period, designed for hatch were not more than 7 days old. The number of eggs hens designed for hatch is presented in Table 1. Right before setting the eggs they were disinfected with 0.5% solution of Virkon S. The hatch was carried out in a brooder of Bios Midi in the Department of Poultry Breeding at the UTP in Bydgoszcz.

The brooder was provided with temperature of 37.7°C, with humidity 55–60%, and for the time of hatch the temperature was 37.4°C, with relative humidity 70–80%. Eggs were rayed two times, after 7 and 18 days in order to eliminate unfertilized eggs and those with dead embryos. In the end, quantities of fertilized eggs and healthy hatched chickens from fertilized and set eggs were compared and converted into %. Also the share of unhatched eggs, weak or lame chickens and dead embryos was calculated in relation to the number of set eggs.

The obtained data was characterized statistically by means of a spreadsheet of Excel program and SAS system. Mean values of the analyzed traits ($\bar{x}$) and their standard errors were calculated (SEM). Significance of differences the examined traits was verified between successive periods of egg yield for particular breeds and for the whole period of yield breed with the use of Univariate Analysis of Variance and Duncan's test.

Table 1. Number of eggs evaluated in terms of quality and designed for hatch

Tabela 1. Liczba jaj poddanych ocenie jakości i przeznaczonych do lęgów

	Date of laying Termin nieśności	Hen breed – Rasa kur		
		Partridge Italian Włoszka kuropatwiana	Silver Brahma Brahma srebrzysta	Salmon Faverolle Faverolla łososiowa
Number of the eggs evaluated in terms of quality Liczba jaj poddanych ocenie jakości	early – początek	30	20	20
	peak – szczyt	20	15	15
	end – koniec	15	15	15
	total – ogółem	65	50	50
Number of eggs designed for hatch Liczba jaj przeznaczonych do lęgów	peak – szczyt	45	40	35

RESULTS AND DISCUSSION

In the carried out research it was found that italian partridge hens as well as salmon feverolle laid eggs with the highest weight at the beginning of their egg production period (Table 2). Silver brahmas laid the heaviest eggs in the peak period of their egg production period – 58.06 g. The egg weight observed in different periods of egg laying could be affected by changing atmospheric conditions on the birds walks. Having analyzed the whole period of laying it was observed that the eggs of silver brahmas were the lightest – 57.18 g and the heaviest ones were those of italian partridge hens – 61.67 g.

According to the author's own research, the average egg weight of italian partridge hens, throughout the egg laying period, was greater than that eggs silver italian – 50.0 g and gold italian – 50.3 g, the evaluated by Adamski and Bernacki [2001]. The difference can be caused by the fact that the eggs were analyzed in different time periods. The average egg weight of italian partridge hens was also higher than that of golden – 57.0 g and silver italian hens – 50.8 g, though it was lower than the egg weight of minorca breed – 68.0 g, studied by Adamski [2004].

In the author's own research, italian hens had heavier eggs than hamburg hens (47.5 g), like italian hens classified as belonging to the group of laying

hens [Pudyszak 2004]. Italian partridge hens laid lighter eggs than minorca hens (65.3 g) evaluated by Andres et al. [2008].

Table 2. Physical traits of eggs of three decorative hens breeds in dependence on the yield period

Tabela 2. Cechy fizyczne jaj trzech ras kur ozdobnych w zależności od okresu nieśności

Trait – Cecha	Date of laying Termin nieśności	Hen breed – Rasa kur					
		Partridge Italian Włoszka kuropatwiana		Silver Brahma Brahma srebrzysta		Salmon Faverolle Faverolla łososiowa	
		$\bar{x}$	SEM	$\bar{x}$	SEM	$\bar{x}$	SEM
Egg weight, g Masa jaja, g	early – początek	62.97^{a}	0.51	56.79^{a}	0.79	62.40^{a}	0.73
	peak – szczyt	59.27^{b}	1.04	58.06^{a}	0.91	61.81^{a}	0.96
	end – koniec	61.49^{ab}	1.44	57.01^{a}	1.25	57.66^{b}	0.82
	total – ogółem	61.67^{A}	0.52	57.18^{B}	0.54	60.73^{A}	0.60
Egg width, mm Szerokość jaja, mm	early – początek	44.12^{a}	0.14	41.64^{a}	0.25	43.69^{a}	0,24
	peak – szczyt	43.26^{b}	0.25	41.93^{a}	0.31	43.63^{a}	0,26
	end – koniec	43.14^{b}	0.37	41.63^{a}	0.27	41.55^{b}	0.19
	total – ogółem	43.70^{A}	0.14	41.71^{B}	0.16	43.00^{C}	0.22
Egg length, mm Długość jaja, mm	early – początek	58.01^{ab}	0.22	58.11^{a}	0.17	58.64^{a}	0.33
	peak – szczyt	56.82^{b}	0.50	58.24^{a}	0.28	58.08^{a}	0.52
	end – koniec	58.93^{a}	0.69	56.73^{b}	0.49	58.98^{a}	0.37
	total – ogółem	57.85^{A}	0.24	57.78^{A}	0.19	58.57^{B}	0.24
Egg shape index, % Indeks kształtu jaja, %	early – początek	76.07^{a}	0.31	71.66^{a}	0.44	74.53^{a}	0.52
	peak – szczyt	76.19^{a}	0.41	72.01^{ab}	0.68	75.17^{a}	0.80
	end – koniec	73.24^{b}	0.55	73.41^{b}	0.44	70.46^{b}	0.46
	total – ogółem	75.58^{A}	0.27	72.21^{B}	0.31	73.46^{C}	0.50
Eggshell area, cm^2 Powierzchnia skorupy, cm^2	early – początek	75.05^{a}	0.40	70.07^{a}	0.64	74.60^{a}	0.58
	peak – szczyt	72.08^{b}	0.84	71.12^{a}	0.74	74.13^{a}	0.76
	end – koniec	73.85^{ab}	1.14	70.24^{a}	1.02	70.79^{b}	0.67
	total – ogółem	74.00^{A}	0.41	70.39^{B}	0.44	73.26^{A}	0.48
Eggshell, thickness, mm Grubość skorupy, mm	early – początek	0.36^{a}	0.00	0.35^{a}	0.01	0.42^{a}	0.00
	peak – szczyt	0.33^{b}	0.00	0.34^{a}	0.01	0.36^{b}	0.01
	end – koniec	0.35^{c}	0.01	0.34^{a}	0.01	0.34^{c}	0.01
	total – ogółem	0.35^{A}	0.00	0.35^{A}	0.00	0.37^{B}	0.01

Explanatory notes: a, b, c – mean values in columns within of traits with different letters differ significantly ($P \leq 0.05$).
Objaśnienia: a, b, c – wartości średnie w kolumnach w obrębie cechy oznaczone różnymi literami różnią się istotnie ($P \leq 0,05$).
Explanatory notes: A, B, C – mean values of traits in lines for the whole period of the egg laying with different letters differ significantly ($P \leq 0.05$).
Objaśnienia: A, B, C – wartości średnie cech w wierszach za cały okres nieśności oznaczone różnymi literami różnią się istotnie ($P \leq 0,05$).

Generally, the eggs of salmon faverolle and silver brahms were lighter than those of hens of the so called rural heavy breeds and they were evaluated in other works [Andres et al. 2008, Lis and Andres 2007], though heavier than eggs of brahma fair columbia hens (55.0–57.0 g), described by Pudyszak [2004].

In case of italian partridge and salmon faverolle hens, only a statistically insignificant increase in the egg shape index was observed in the peak of the production period as compared to its initial stage, whereas a statistically significant decrease in values of this index were observed at the end of egg laying as compa-

red to the previous periods. The shape of silver brahmas eggs was more spherical at the end of the production period than in its early and peak periods (Table 2).

Among the studied breeds the most sphere shaped eggs were laid by italian partridge hens, the shape index – 75.58%, and the most oblong shape of eggs was characteristic for silver brahmas – 72.21%. The differences in the egg shape between the three considered breeds were statistically significant. Gold italian (66.2%) and silver (73.4%) hens evaluated by Adamski and Bernacki [2001] laid more oblong eggs than italian hens from the author's own research.

The egg shape index of hamburg hens was 70.9% and 73–74% [Pudyszak 2004]. The eggs of italian partridge hens were more sphere-shaped throughout the whole production cycle than those of hamburg hens. Silver brahmas and salmon faverolle (Table 2) laid eggs more oblong than barred plymouth rock hens (P–55) in the 26th and 50th week of life which were examined by Dudek and Rabsztyn [2011].

The surface and weight of the egg shell of silver brahms did not differ significantly statistically in the successive production periods (Table 2 and 3). The largest shell surface at the beginning of the laying period was found for salmon faverolle and italian partridge hens. The shell weight was the biggest at the beginning of the laying period in salmon faverolle hens and in italian partridge it was at the end of the production period.

In the course of egg laying, the thickness of eggshells of brahms and faverolles was decreasing. The medium thickness of salmon faverolle egg is of special interest as, at the beginning of the production period, hens of this breed laid eggs with very thick shell (0.42 mm). In case of italian hens the shells were the thickest at the beginning of the production period (0.36 mm) and the thinnest in the peak of the laying period (0.33 mm). The same dependence as for brahms and feverolles was observed by Calik [2011]. Along with the duration of the laying period the thickness of shell of the examined by the above mentioned author breeds such as: rhode island red (K–44, K–66), new hampshire (N–11) and barred rock (P–11) decreased.

In the author's own research, italian hens laid eggs with thicker shell (0.35 mm) than silver italian (0.32 mm) and gold hens (0.27 mm), examined by Bernacki and Adamski [2001] and hamburg hens (0.30 mm), whose shell thickness is given by Pudyszak [2004]. In turn minorca, the so called rural light hens, according to the research of Andres et al. [2008], laid eggs with thicker shells in the 46th week of life than the evaluated italian partridge hens.

In case of salmon faverolle the percentage share of yolk in the egg was statistically significantly smaller at the beginning of the production period, and the share of albumen did not vary significantly between the periods of laying. Percentage share of yolk in italian partridge and brahm hens was statistically significantly

higher in the peak of the production period than at the beginning and the end. In turn the content of albumen in the peak production period was lower than in the other periods of assessment (Table 3).

Table 3. Morphological composition of eggs of three decorative hens breeds in dependence on the yield period

Tabela 3. Skład morfologiczny jaj trzech ras kur ozdobnych w zależności od okresu nieśności

Trait – Cecha	Date of laying Termin nieśności	Hen breed – Rasa kur					
		Partridge Italian Włoszka kuropatwiana		Silver Brahma Brahma srebrzysta		Salmon Faverolle Faverolla łososiowa	
		$\bar{x}$	SEM	$\bar{x}$	SEM	$\bar{x}$	SEM
Yolk weight, g Masa żółtka, g	early – początek	20.13^{a}	0.20	17.75^{a}	0.38	19.91^{ab}	0.31
	peak – szczyt	20.43^{a}	0.51	19.89^{b}	0.55	20.32^{a}	0.41
	end – koniec	18.98^{b}	0.30	18.40^{a}	0.49	19.00^{b}	0.24
	total – ogółem	20.00^{A}	0.19	18.48^{B}	0.29	19.76^{A}	0.21
Yolk proportion, % Udział żółtka, %	early – początek	31.96^{a}	0.20	31.24^{a}	0.47	31.91^{a}	0.30
	peak – szczyt	34.44^{b}	0.42	34.30^{b}	0.97	32.87^{b}	0.28
	end – koniec	30.96^{a}	0.59	32.29^{a}	0.56	32.98^{b}	0.32
	total – ogółem	32.46^{A}	0.26	32.32^{A}	0.41	32.54^{A}	0.19
Albumen weight, g Masa białka, g	early – początek	37.12^{a}	0.35	33.78^{a}	0.48	35.78^{a}	0.50
	peak – szczyt	33.38^{b}	0.62	32.75^{a}	0.96	35.28^{a}	0.52
	end – koniec	36.61^{a}	1.17	33.10^{a}	0.90	33.04^{b}	0.53
	total – ogółem	35.99^{A}	0.39	33.33^{B}	0.41	34.77^{C}	0.36
Albumen proportion, % Udział białka, %	early – początek	58.94^{a}	0.19	59.51^{a}	0.48	57.33^{a}	0.33
	peak – szczyt	56.34^{b}	0.40	56.36^{b}	1.13	57.09^{a}	0.33
	end – koniec	59.43^{a}	0.62	58.02^{ab}	0.61	57.29^{a}	0.24
	total – ogółem	58.31^{A}	0.25	58.29^{A}	0.45	57.24^{B}	0.17
Eggshell weight, g Masa skorupy, g	early – początek	5.72^{a}	0.05	5.26^{a}	0.11	6.71^{a}	0.08
	peak – szczyt	5.45^{b}	0.07	5.43^{a}	0.18	6.21^{b}	0.15
	end – koniec	5.90^{a}	0.11	5.51^{a}	0.06	5.62^{c}	0.15
	total – ogółem	5.68^{A}	0.04	5.37^{B}	0.07	6.21^{C}	0.11
Eggshell proportion, % Udział skorupy, %	early – początek	9.10^{a}	0.07	9.25^{a}	0.10	10.76^{a}	0.15
	peak – szczyt	9.23^{a}	0.19	9.34^{a}	0.23	10.04^{b}	0.16
	end – koniec	9.61^{b}	0.13	9.69^{a}	0.17	9.74^{b}	0.17
	total – ogółem	9.23^{A}	0.07	9.39^{A}	0.09	10.22^{B}	0.12

Explanations, see Table 1.
Objaśnienia jak w tabeli 1.

Taking into consideration the whole production period there were found no statistically significant differences between the examined breeds as regards the percentage share of yolk in the egg. The lowest content of albumen was found for eggs of faverolle hens (57.24%).

Pudyszak [2004] observed that the percentage share of yolk in eggs of hamburg hens was 31.16% and percentage share of albumen 59.16%. In case of italian hens, in own research, found a higher percentage share of yolk and lower share of albumen in eggs as compared to eggs of hens of hamburg breed.

Hens of breeds such as: minorca, leghorn, rhode island red, the so called rural hens light and heavy in the 46th week of life, in the research of Andres et al. [2008], laid eggs with a smaller percentage share of yolk and bigger share of albumen in the egg than hens of italian partridge, brahma and faverolle breeds in the author's own research (Table 3).

In the course of the production period, italian partridge and silver brahma hens laid eggs with a bigger percentage share of the shell (Table 3). Eggs laid by hens of barred plymouth rock (P–55) in the 26th week of life, examined by Dudek and Rabsztyn [2011], were characterized by a higher percentage share of the shell – 10.3%, and in the 50th week of life – 9.6%. The share of shells of eggs of salmon faverolle was getting smaller along duration of the production cycle.

Table 4. Traits of the egg content of three decorative hens breeds in dependence on the yield period

Tabela 4. Cechy treści jaj trzech ras kur ozdobnych w zależności od okresu nieśności

Trait – Cecha	Date of laying Termin nieśności	Hen breed – Rasa kur					
		Partridge Italian Włoszka kuropatwiana		Silver Brahma Brahma srebrzysta		Salmon Faverolle Faverolla łososiowa	
		$\overline{x}$	SEM	$\overline{x}$	SEM	$\overline{x}$	SEM
Yolk color (la Roche) Barwa żółtka (la Roche)	early – początek	10.97^{a}	0.15	10.83^{a}	0.19	10.33^{a}	0.14
	peak – szczyt	7.53^{b}	0.45	9.00^{b}	0.33	8.00^{b}	0.21
	end – koniec	5.90^{c}	0.31	7.60^{c}	0.40	6.80^{c}	0.20
	total – ogółem	9.07^{AB}	0.33	9.50^{A}	0.27	8.50^{B}	0.29
Yolk height, mm Wysokość żółtka, mm	early – początek	21.86^{a}	0.16	20.94^{a}	0.22	22.00^{a}	0.21
	peak – szczyt	20.53^{b}	0.13	20.30^{ab}	0.21	20.70^{b}	0.21
	end – koniec	20.50^{b}	0.31	19.70^{b}	0.15	19.20^{c}	0.13
	total – ogółem	21.24^{A}	0.14	20.45^{B}	0.15	20.72^{B}	0.23
Yolk diameter, mm Średnica żółtka, mm	early – początek	43.01^{a}	0.28	40.84^{a}	0.35	43.04^{a}	0.27
	peak – szczyt	42.16^{a}	0.34	41.32^{a}	0.51	41.88^{b}	0.36
	end – koniec	40.54^{b}	0.51	38.78^{b}	0.32	40.74^{c}	0.11
	total – ogółem	42.32^{A}	0.24	40.42^{B}	0.28	41.96^{A}	0.23
Yolk index, % Indeks żółtka, %	early – początek	50.90^{a}	0.53	51.33^{a}	0.60	51.14^{a}	0.58
	peak – szczyt	48.72^{b}	0.30	49.20^{b}	0.82	49.47^{a}	0.77
	end – koniec	50.62^{a}	0.86	50.82^{ab}	0.38	47.12^{b}	0.24
	total – ogółem	50.24^{AB}	0.35	50.63^{A}	0.39	49.36^{B}	0.44

Explanations, see Table 1.
Objaśnienia jak w tabeli 1.

Among the examined breeds it was salmon faverolle hens which had eggs with the highest statistically significant percentage share of the shell (Table 3). Pudyszak [2004] found that the share of shell in the egg of hamburg hens was 9.68%, that is more than for italian partridge hens in the author's own research. However, the eggs of silver brahmas and salmon faverolle were characterized by a bigger share of the shell than in brahmas described by Pudyszak [2004] – 9.20%.

The considered breeds laid eggs with the largest average yolk weight in the peak of the production cycle. The average weight of albumen of silver brahms did not differ statistically significantly for the successive periods of laying (Table 3). Eggs with the lowest content of albumen at the end of the laying period were found for salmon faverolles (33.04 g), whereas in the peak of the production period for italian hens (33.38 g). Those differences were statistically significant.

After having analyzed the whole production cycle, it was found that the smallest statistically significant weight of yolk and albumen was characteristic for eggs of silver brahms (respectively 18.48 g and 33.33 g). Brahms from the author's own research had eggs with larger average yolk weight and value of albumen weight similar to those given for the same breed by Pudyszak [2004]. Eggs of italian partridge and salmon faverolle hens were characterized by a similar yolk weight, in turn the albumen weight in eggs of italian hens was larger than in eggs of faverolles (Table 3).

Table 5. Reproduction indexes of three decorative breed hens

Tabela 5. Wskaźniki reprodukcyjne trzech ras kur ozdobnych

	Hen breed – Rasa kur		
	Partridge Italian Włoszka kuropatwiana	Silver Brahma Brahma srebrzysta	Salmon Faverolle Faverolla łososiowa
Number of set eggs Liczba jaj nałożonych	45	40	35
Egg fertility, % Zapłodnienie jaj, %	97.8	0.0	100.0
Hatchability from fertilized eggs, % Wylęgowość z jaj zapłodnionych, %	97.7	0.0	97.1
Hatchability from set eggs, % Wylęgowość z jaj nałożonych, %	95.6	0.0	97.1
Unhatched, crippled and weak chicks, % Pisklęta niewyklute, kalekie i słabe, %	2.2	0.0	2.9
Dead embryos, % Zarodki zamarłe, %	0.0	0.0	0.0

Yolks of all the examined breeds were becoming more pale along with the duration of the production period, and the differences were statistically significant (Table 4). The yolk color changing along with the production period can mean that birds may have got tired of egg laying.

The studied breeds laid eggs with the highest index of yolk at the beginning of the laying period, which is connected with its big height. Italian, brahma and faverolle hens laid eggs with higher index of yolk throughout the whole production cycle as compared to those evaluated by Bernacki et al. [2004], after forced

molting hens Hy-Line and Tetra SL and hens Hy-Line examined by Kuźniacka et al. [2004].

Fertilization of eggs of the analyzed flocks of hens of italian and faverolle breeds was high (97.8–100%) which reflects their good biological quality. In case of silver brahmas, no fertilized eggs were found. It was probably caused by hormonal disorders or a defective reproductive system of the rooster which was matched with the hens.

According to the author's own research, italian partridge hens had better results of fertilization and hatch than, evaluated by Adamski and Bernacki [2001], silver and gold italian hens. In case of italian hens the author's own research provided 10% higher better hatch results from set and fertilized eggs than those examined by Adamski [2004]. Italian partridge hens also achieved 29.9% higher hatch results from set eggs and 25.8% higher from fertilized eggs as compared to minorca hens, examined by the above mentioned author.

Hens of plymouth rock (P–11) breed evaluated by Bernacki et al. [1998] had 12.6% higher share of unhatched, lame and weak chickens and 4.3% more of dead embryos, for set eggs, than salmon faverolle from the author's own research.

CONCLUSIONS

1. Egg quality traits were changing along with the hens age. The highest diversity was characteristic for such traits as: color, height of the yolk, weight of the yolk and albumen, weight and thickness of the shell and percentage share of the yolk and albumen in the egg.
2. Among the considered breeds of hens, the biggest statistically significant differences were found for the index of the egg shape and the weight of albumen and eggshell.
3. Eggs of italian partridge and faverolle were characterized by high biological value which was reflected by high indexes of hatching.

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OCENA JAKOŚCI JAJ I WYNIKÓW LĘGU KUR O RÓŻNYM POCHODZENIU

Streszczenie. Coraz większe zainteresowanie chowem kur ras amatorskich skłania do prowadzenia badań z zakresu oceny ich cech użytkowych. Celem badań była ocena jakości jaj i wyników lęgu trzech ras kur: włoszki kuropatwianej, brahmy srebrzystej

i faverolli łososiowej. Jaja poddano ocenie w trzech terminach nieśności. Lęgi przeprowadzono na jajach pochodzących ze szczytu produkcji. Cechy jakości jaj zmieniały się w zależności od terminu nieśności. Największe różnice zaobserwowano w przypadku barwy i wysokości żółtka, masy białka i żółtka oraz grubości skorupy. Między badanymi rasami stwierdzono statystycznie istotne różnice dla indeksu kształtu jaja oraz masy białka i skorupy. Największą statystycznie istotną masą białka i indeksem kształtu cechowały się jaja włoszek (35,99 g i 75,58%), a najmniejszą brahm (33,33 g i 72,21%). Zapłodnienie jaj kur włoszek wynosiło 97,8%, a kur faverolli 100%. Stwierdzono także duży procentowy udział piskląt zdrowych z jaj zapłodnionych i nałożonych. W przypadku kur rasy brahma nie stwierdzono zapłodnionych jaj.

Słowa kluczowe: brahma, faverolla, jakość jaj, kura, lęgi, włoszka

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