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INFLUENCE OF THE WEIGHT OF HATCHING EGGS ON THE HATCHABILITY INDICES AND ON THE BODY WEIGHT OF GEESE IN REARING AND AFTER FATTENING WITH OATS

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Abstract. Goose husbandry is characterized by considerable diversity of goslings in terms of body weight. These discrepancies result from a long laying performance. During different reproductive seasons females lay eggs of different weight. Due to a positive correlation, egg weight influences body weight of goslings. The influence of egg weight on body weight of geese after rearing and fattening has been investigated. The influence of egg weight on the final body weight of geese as well as egg weight loss during incubation and hatchability indices of chicks have been determined. The research was carried out on 896 hatching eggs of White Kołuda® geese. 160 birds were used for rearing and fattening. The experiment showed a significant influence of egg weight on egg weight loss in percentage terms during hatching. The biggest loss was recorded in the smallest eggs. Egg weight also influenced the mortality of embryos during incubation. By day 25, the highest mortality was in lighter eggs (below 180 g), whereas, in the last 4 days, the biggest number of unhatched chicks was observed in eggs with more than 181 g. The lowest weight was obtained in chicks from group I (89 g), and the highest in IV (133 g). Despite significant differences in the weight of one-day-old chicks in week 16, after the end of fattening, no statistically significant differences in weight between the groups were shown. The time of the occurrence of the phenomenon of growth compensation of birds in rearing was determined for the period between weeks 10 and 16 of life.

Key words: goose, egg weight, incubation, weight loss, rearing

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INTRODUCTION

Due to a specific nature of laying eggs and goose chicks production, there is a very considerable diversity in body weight of one-day-old chicks in production flocks. Reproductive geese are kept for 4 years. Therefore, the weight of hatching eggs qualified for incubation ranges from 130 to 220 g. Not only the age of females or the season of production are factors which contribute to the differences in egg size. The differences in egg weight also result from genetic differences between males and the way of feeding [Lundberg and Väisänen 1979, Rhymer 1988, Suarez et al. 1997, Michel et al. 2003]. A difference in the weight of goslings occurs in all species of poultry, however, from among commercial species, the highest variability characterizes gosling flocks. Goose keepers believe that such significant differences contribute to a lower body weight.

Undoubtedly, body weight is one of the most important economic characteristics and it is an indicator of growth and development of birds. It has to be pointed out that body weight of one-day-old chicks is determined mostly by the weight hatching eggs [Adamski 2008]. This relationship results from existence of a strong correlation between egg weight and weight of one-day-old goslings [Kołodziej 1991]. In case of water poultry, the weight of goslings normally constitutes between 59 and 63% of the initial weight of eggs. If there is a positive correlation between egg weight and weight of chicks, then, all the factors which determine egg weight have a direct influence on the weight of chicks. It is a general statement. However, the existing research has precisely explained why bigger chicks are produced from bigger eggs. Embryonic growth is stable and the difference in weight of chicks occurs as late as at the end of incubation [Mazanowski 2012]. It is related to resorption of the yolk sac and availability of oxygen, which contributes to limitation of growth, since yolk weight, circulation and eggshell conductance are lower in eggs with lower weight [Hoiby et al. 1983, Tazawa et al. 1992, Szdzuy et al. 2008].

In practice, for goose producers, it is important to determine to what extent individual weight of one-day-old chicks influences the final body weight. The undertaken research aimed to determine the influence of egg weight on body weight of geese after rearing and fattening. A better understanding of this issue will enable solving the problem of rearing of goslings varied in terms of their body weight.

MATERIAL AND METHODS

The research was undertaken in Poultry Hatchery in the village of Barany (Poland). The research material were 896 hatching eggs of White Kołuda® geese.

Eggs were from a private farm in Barany near the city of Lipno in the Kujawsko-Pomorskie Province. The experimental material was collected at the final stage of laying. Eggs were divided into four groups based on their weight. Group I were eggs with the weight of 141–160 g, group II – 161–180 g, group III – 181–200 and group IV – 201–220 g. During hatching egg weight was recorded after laying, before placing in an incubator, during incubation and after hatching. Measurements of egg weight were carried out on the following days: 6th, 12th, 18th and 26th. Egg weight was measured with the use of an RADWAG 750 weighing machine.

Egg incubation

Eggs intended for hatching were produced by geese in different years of exploitation. The experimental material was collected two days before setting. Egg were disinfected and stored in a temperature of 10°C and humidity of 70%. Then, eggs were incubated according to a hatching method created in the hatchery, adjusted to the incubators in operation. Incubation was performed in multi-setting incubators. It lasted 31 days. Eggs were placed on metal trays. Then, they were disinfected and placed in a hatching compartment. The temperature in the setting chamber was 37.7°C and relative humidity 55%, whereas in the hatching compartment: 37.4°C and 75%, respectively. From day 2 of hatching, cooling of the compartment was started, which involved opening the incubator for 20 minutes every day. From day 9, airing and watering of eggs were performed outside the setting compartment in a well-aired hall, two times a day. From day 14, eggs were turned by 180° along their axis. Turning was performed once a day during cooling. On day 27 eggs were moved into the incubator. For the last 4 days of incubation eggs were aired twice a day for 20 minutes. Candling was performed twice on days 6 and 26 of hatching. Eggs were weighed before storing, then before placing in the incubator and during incubation (days 6, 12, 18 and 26). After the end of hatching the following indices were also determined: percentage of fertilized eggs, dead embryos as well as healthy, crippled and weak goslings.

Rearing

After hatching, chicks from every group were marked individually with tags, and then destined for rearing and fattening. Four groups were formed based on the four weight categories of eggs. Rearing of geese from every group (20 females and 20 males) lasted for 16 weeks. During this time, birds were kept in the same farm conditions and according to the accepted QFP animal science recommendations. During rearing body weight was measured on days 5, 10 and 16 week of life. The

weight was measured with the use of a KERN scales with the accuracy of 0.01. After fattening, the growth rate was determined.

Statistical analyses

The numerical data collected were statistically treated, calculating mean values and their standard errors, whereas the assessment of the significance of the differences was verified with the ANOVA module, Duncan's multiple range test, with the use of the Statistica 9.0. program.

RESULTS

Egg weight loss during incubation

Throughout the whole period of hatching, irrespective of the day of the check, the average egg weight in particular groups differed significantly (Table 1). Eggs from group II had the biggest weight loss during incubation 14.70%. The smallest loss was observed in group IV (13.52%). The results differed significantly statistically. No differences between groups IV and III as well as I, II and III were observed.

Table 1. Egg weight and its loss in percentage terms during incubation

Tabela 1. Masa jaja i jej procentowe ubytki w czasie inkubacji

Group Grupa		Weight before setting – Masa przed nakładem	Egg weight and its losses during incubation Masa jaja i jego ubytki w czasie inkubacji								Goslings weight Masa piskląt	
			Dni inkubacji – Days of incubation									
			6		12		18		26			
			g	%	g	%	g	%	g	%	g	%
I	$\bar{x}$	151^{d}	147^{d}	2.65^{ab}	140^{d}	7.29^{c}	136^{d}	9.93^{a}	129^{d}	14.57^{a}	89^{d}	59.00^{c}
	SD	0.53	0.49	0.11	0.94	0.54	0.49	0.19	0.54	0.27	0.45	0.36
II	$\bar{x}$	170^{c}	165^{c}	2.94^{a}	159^{c}	6.47^{b}	153^{c}	10.00^{a}	145^{c}	14.70^{a}	102^{c}	60.00^{c}
	SD	0.54	0.56	0.09	0.58	0.13	0.62	0.21	0.74	0.31	0.58	0.37
III	$\bar{x}$	188^{b}	183^{b}	2.65^{ab}	176^{b}	6.38^{b}	169^{b}	10.11^{ab}	161^{b}	14.36^{ab}	115^{b}	61.17^{b}
	SD	0.53	0.51	0.09	0.53	0.16	0.58	0.2	0.71	0.29	0.73	0.43
IV	$\bar{x}$	207^{a}	201^{a}	2.89^{b}	193^{a}	6.76^{a}	188^{a}	9.18^{b}	179^{a}	13.52^{b}	132^{a}	63.76^{a}
	SD	0.53	0.55	0.11	1.02	0.42	0.58	0.19	0.68	0.27	0.72	0.38
Total Łącznie	$\bar{x}$	179	17.3	3.35	166	7.26	161	10.05	153	14.52	109	60.89
	SD	0.99	0.97	0.05	0.99	0.19	0.93	0.1	0.92	0.15	0.79	0.21

a, b… means marked with different letters in columns differ significantly statistically ($P \leq 0.05$).
a, b… wartości średnie oznaczone różnymi literami różnią się statystycznie ($P \leq 0,05$).

The weight of chicks in particular experimental groups differed significantly statistically (Table 1). The lowest weight was observed in chicks from group I (89 g), which represented 59% of egg weight before setting, whereas the highest body weight was shown in chicks from group IV (132 g). Chicks weight from group IV as compared to the weight before setting was 63.76%.

Hatchability indices analysis

The analysis of the results of hatching (Table 2) showed that the highest fertilization characterized eggs from the smallest weight group (75.50%). The lowest percentage of fertilized eggs was obtained in groups II and IV (65.60–66.10%), whereas in group III fertilized eggs were 67.90%. Egg weight also influenced the mortality of embryos. Eggs with a weight of less than 181 g (groups I and II) had a higher percentage of dead embryos as compared to eggs with a weight of more than 181 g (group III and IV). Consequently, the lowest mortality of embryos from eggs set (11.30%) was observed in group III, whereas the highest in group II – 13.90%.

Table 2. Hatchability results of geese eggs

Tabela 2. Wyniki lęgu jaj i wylęgu piskląt gęsi

Group Grupa	Eggs set, pcs Jaja nałożone, szt.	Eggs fertilized, % Jaja zapłodnione, %	Dead embryos, % Zarodki zamarłe, %		Unhatched goslings, % Pisklęta nie wyklute, %		Crippled and weak goslings, % pisklęta kalekie i słabe, %		Healthy goslings, % Pisklęta zdrowe, %	
			S	F	S	F	S	F	S	F
I	224	75.5	13.4	17.8	2.3	2.9	0	0	59.8	79.3
II	224	66.1	13.9	20.9	1.8	2.7	0	0	50.4	76.4
III	224	67.9	11.3	16.5	4.9	7.2	0	0	51.7	76.3
IV	224	65.6	11.6	17.6	5.8	8.7	0	0	48.2	73.7

S – from set eggs; F – from fertilized eggs.
S – z jaj nałożonych; F – z jaj zapłodnionych.

During hatching, also the distribution of mortality of geese embryos depending on their weight was analyzed. As shown in Figure 1, irrespective of the weight category, two distinct peaks of mortality may be seen. The first peak took place between days 1 and 6, the second between days 18 and 26.

The highest percentage of unhatched chicks was observed in group IV, both from eggs set (5.80%) and eggs fertilized (8.70%). Similar values were obtained in group III, 4.90% and 7.20% respectively. A significantly lower percentage of the index was observed in groups with eggs between 140 and 180 g. In group I, unhatched eggs constituted 2.30% of eggs set and 2.90% of eggs fertilized. Group II had a reduced percentage share of unhatched eggs (1.80) from eggs set, whereas from eggs fertilized 2.70%. It has also been shown that there is a significant

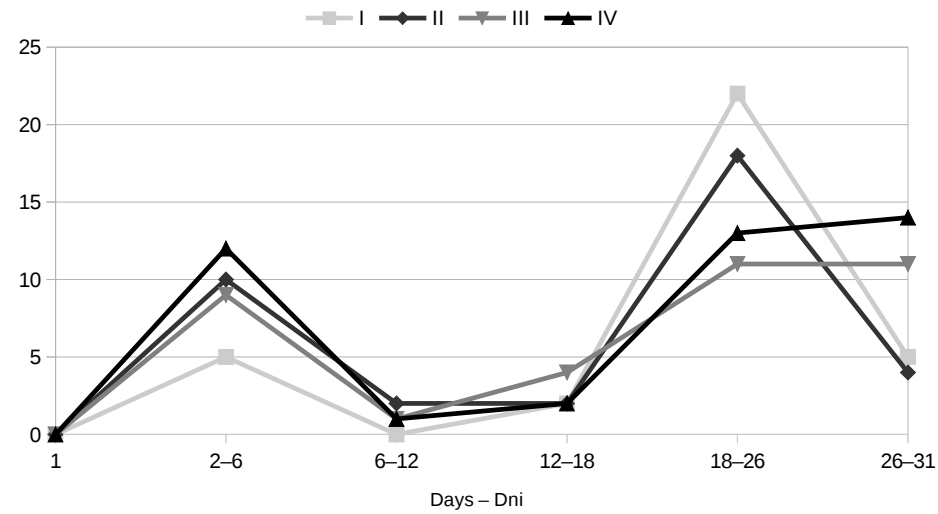

Fig. 1. Mortality of goose embryos depending on egg weight, pcs

Rys. 1. Śmiertelność zarodków gęsi w zależności od masy jaj, szt.

influence of egg weight on the number of dead chicks in the last 3 days of incubation. Eggs from groups III and IV had, on average, a 3.4 higher percentage of unhatched goslings as compared to groups I and II.

Despite a high number of unfertilized and dead eggs in the 1st period of hatching the highest percentage of healthy chicks was observed in group I 59.80% from eggs set and 79.30% from eggs fertilized. The weakest results were obtained in group II, 50.40% and 76.40% respectively. In case of this group, the results of hatching were influenced by fertilization and high number of dead embryos in the first stage of hatching. In group IV 48.21% from eggs set and 73.70% from eggs fertilized were achieved, whereas in group III 51.70% and 76.30% respectively.

Rearing and fattening with oats

The weight of one-day-old goslings, selected for rearing (Table 3) differed significantly statistically. Chicks with a lower weight came from group I – 89 g, while the highest weight was recorded in group IV – 133 g. The difference between groups was 44 g. Group II comprised chicks with the weight of 103 g, while group III of 118 g. From week 5 of rearing the differences between groups decreased. No statistically significant differences between groups I, II and III as well as between groups II, III and IV were shown. The difference (0.33) between group I and IV was significant statistically. During the next measurement of body

weight (week 10), a statistically significant difference was shown between groups I and IV. In week 16, that is, after the end of the 3-week-long fattening with oats, no statistically significant differences were observed in the body weight of geese between the groups.

Table 3. Body weight of geese in rearing

Tabela 3. Masa ciała gęsi w odchowie

Group Grupa		Body weight – Masa ciała			
		1-day-olds, g jednodniowych, g	in week 5, kg w 5. tyg., kg	in week 10, kg w 10. tyg., kg	in week16, kg w 16. tyg., kg
I	$\bar{x}$	89 [d]	2.49 [b]	4.20 [b]	6.00
	SD	0.69	0.07	0.09	0.12
II	$\bar{x}$	103 [c]	2.61 [ab]	4.34 [ab]	6.17
	SD	0.86	0.06	0.09	0.12
III	$\bar{x}$	118 [b]	2.73 [ab]	4.49 [ab]	6.10
	SD	0.73	0.04	0.06	0.12
IV	$\bar{x}$	133 [a]	2.82 [a]	4.59 [a]	6.21
	SD	1.00	0.07	0.10	0.14
Total Łącznie	$\bar{x}$	111	2.66	4.40	6.12
	SD	1.42	0.03	0.04	0.06

a, b… means marked with different letters in columns differ significantly statistically ($P \leq 0.05$).
a, b… wartości średnie oznaczone różnymi literami różnią się statystycznie ($P \leq 0{,}05$).

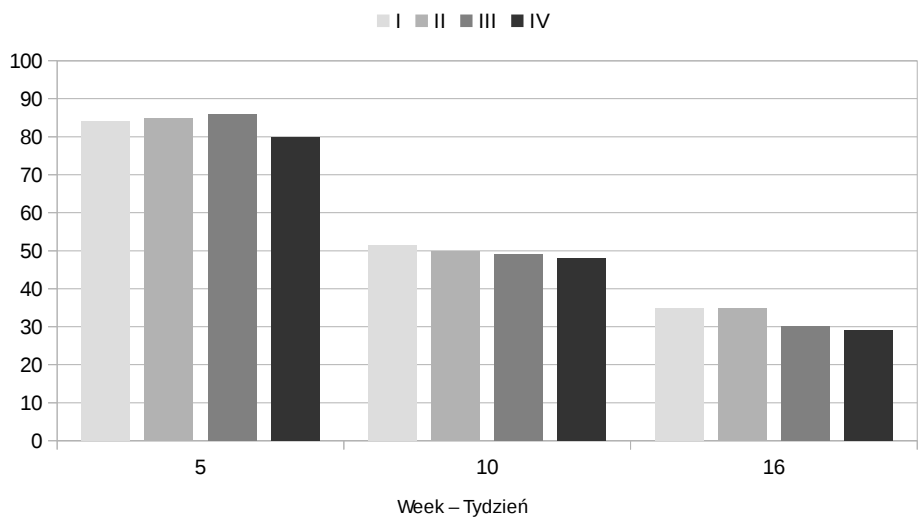

Fig. 2. Growth rate of W31 goslings, %

Rys. 2. Tempo wzrostu gąsiąt W31, %

The course of the growth of geese was shown in Figure 2. It was observed that the growth rate in the first stage of rearing (0–5 weeks) on average amounted

to 84%. The highest growth rate characterized group III and amounted to 86%. The slowest rate was observed in geese from group IV. In successive weeks, the growth rate systematically decreased and in week 10 it fell to, on average, 50.0%. The value of the rate differs in particular groups. Ageing was accompanied by systematically decreasing growth rate in all groups. During the last measurement, the lowest rate was observed in group IV, only 29%, the highest in group I – 35%.

DISCUSSION

Egg weight loss during incubation

The present research showed that during hatching the biggest water loss was in eggs with the smaller weight. A similar result was obtained by Bobko and Svetlik [2002], where it was shown, that weight loss in goose eggs depends on the weight category and is smaller in case of bigger eggs. Similar values were also obtained during incubation of duck eggs, where eggs from the group with the lowest weight lost, on average, 1.6% less water as compared to eggs with the biggest weight [Weis et al. 2011]. The authors [2011] suggested that the excess of water is lost as a result of bigger movement of water from the allantoic liquid. This phenomenon is related to an increasingly active transport of Na+ ions through CAM membranes.

Irrespective of the weight category, the average weight loss of eggs in proportion to egg weight before setting amounted to, on average, 3.35% on day 6 of incubation, 7.26% on day 12 and 14.52% on day 26. The results obtained differ slightly from the data published to date [Mazanowski 2012]. It has been shown that body weight loss of geese should range from 2 to 3% on day 6 of incubation, from 4.5 to 6% on 12, from 8 to 9% on 18, from 10.5–12% on 21 and from 13.5 to 14% on 28. Minor differences in the obtained results may be caused by a different microclimate inside the incubator and even by the type of the incubator itself. Mazanowski [2012] suggested that weight checks and appropriate distribution of its loss on particular days of hatching are indicators which inform about a correctly performed incubation. A bigger weight loss of eggs in the current research may be also connected with the time of the performance of the research. Meir and Ar [2008] showed that ageing is accompanied by a rise in the shell conductance, which contributes to a higher water loss. Proper evaporation of water from goose eggs should amount to 10.5 to 13%, which ensures proper development of an embryo [Meir and Ar 1991]. However, in a research on osmoregulation [Thomas et al. 1988], it was observed that water loss within the range of 6 to 20% does not endanger chicks life. Even, as a result of the occurrence of osmotic stress, chickens on day 7 of life eliminate water body deficit and their further growth and

development goes without any disturbance. Taking into account the above, water loss in group I and IV (where statistically significant differences were shown) had no influence on the results of rearing.

Based on the results obtained in the current study it may be stated that eggs were characterized by a different daily weight loss in particular weeks of embryonic development. During an analysis of the all 4 groups the lowest daily water loss was observed in the first 6 days of hatching – 0.56%. The biggest water loss, amounting to 0.74%, was observed between days 18 and 26 of incubation. Based on these results it can be stated that, together with the embryonic development, the daily water loss increases. A similar relationship was suggested by Mróz [2012] in her research, who claimed that daily water loss increases as an embryo ages. The lowest is from the 1st to the 20th days of hatching. The most intense water evaporation, in turn, took place between the 21st and 25th days of incubation, which is a natural physiological process related to an increasing metabolism of an embryo. The evaporation process may, however, be disturbed by the dried shell membranes. This, in turn, can lead to a decrease in conductance of gases.

Hatchability indices analysis

Analyzing the influence of egg weight on the results of hatching in particular experimental groups, it can be stated that egg weight influences the incubation of goose eggs. A higher percentage of dead chicks from smaller eggs was also obtained by Rachwał [2008]. Other authors [Borzemska and Kosowska 1997, Gawęcka 2005] have suggested that not only weight determines the level of mortality of embryos. There are many factors and interactions between them which directly and indirectly influence the mortality of embryos.

A low rate of fertilization in the experiment was caused by the fact of collecting eggs in the final stage of reproduction. As the end of the laying period nears egg weight and its dimensions generally decrease. It results in changes in the proportion of yolk, white and shell, which, in turn, influences the rates of laying and hatching of chicks [Książkiewicz et al. 2006].

Two periods of dying of embryos can be observed in the experiment. Pudyszak et al. [1997] has suggested that dying of embryos over a similar period of time is related to the presence of two critical phases in the development of embryos. The first period is related to formation of all organs and allantois, and the second to the transition to lung breathing and a change of the position of an embryo preparing for hatching. Mortality analysis has a practical significance. It is used for diagnosing correctly performed hatchings. In case when there are 3 periods of mortality, a relatively higher mortality of embryos in the period between the peaks indicates that mistakes had been made during incubation. Other authors claim that

dying of embryos is related not only to anatomic and physiological development of an embryo, but also suggest a negative influence of environmental conditions in the poultry house on the body of a layer, as well as on the biological value of eggs [Borzemska and Kossowska 1997].

Goslings hatch better from smaller and medium eggs as compared to biggest eggs. These results have been confirmed by Rosiński and Bednarczyk [1996], who showed that the number of dead embryos in the last period of hatching of goose eggs grows from 4.5 to 8.6% in case of big eggs (more than 190 g). Egg weight is a significant factor influencing the process of hatching in all species of poultry. Shatohkina [1975] suggested that hatchability of hen eggs with weight between 46 and 50 g and between 66 and 74 g was lower by 8 to 10.5% than in eggs with weight between 50 and 66 g. The best hatchability is achieved in eggs with an average weight [Wilson 1991, Brah et al. 1999]. This data were also confirmed by Nordskog and Hassan [1971], who determined that hatchability is at its maximum when the egg weight is 50 g. An increase in weight by 10 g above the optimum value reduces hatchability even by 10.7%. Reduction of weight, in turn, by 10 g results in a drop in hatchability by 3.9%.

Pakulska et al. [2003] suggested that chick hatch rate from eggs set is 61.1%. A slightly higher percentage of hatching from eggs set was observed during assessment of parent flocks of White Kołuda® goose within the area of the country, where it amounted to 62.2% [Poultry Utilitarian Value Assessment in 2013 and 2014]. Previously obtained results differ from these obtained in the current research. It has been suggested that medium-sized eggs have better hatchability as compared to eggs with too low or too big weight, which is confirmed by a positive correlation between egg weight and time of incubation [Wilson 1990].

In the present research, egg weight influenced also the process of hatching of goslings. Chicks from medium eggs hatched in the I stage of hatching, whereas chicks from big eggs, especially goslings from group IV, had a prolonged process of hatching (6 hours on average). Such a distribution of hatching in time suggests a lack of synchronization, which is consistent with the state of the art. Chicks from eggs with a bigger weight, hatch even 8 hours later. Eggs with too big weight are difficult to hatch due to technological and organizational reasons, they are most often too wide for the trays, and thus may suffer mechanical damage.

Statistically different chick weight in particular groups in the presented research was related to weight before setting. This relationship proves existence of a positive correlation coefficient between body weight of one-day-old goslings and weight of hatching eggs. Mazanowski [2012] suggested that the correlation coefficient between these properties ranges from 0.532 to 0.789. The higher weight of chicks from bigger eggs results from the co-existence of many factors. The number of absorbed yolk during hatching contributes to a difference in the achieved

weight. Furthermore, there are different trajectories of growth in embryos from small and big eggs. The weight of embryos is not correlated with egg weight in the first half of the period of incubation. This correlation, however, strengthens and reaches its maximum during hatching (0.5–0.95), which influences the final size of chicks. It was confirmed by Wilson's research [1991]. These differences can be reflected by a genetic relationship between the embryonic growth rate and the size of eggs. What's more, the conductance in bigger eggs is lower, thus a smaller water loss. Therefore, an increased amount of water (excess of water) and yolk in the body cause bigger weight of chicks [Tullett and Burton 1982, Xu and Mortola 1988, Mortola and Awam 2010].

Rearing and fattening with oats

Goslings with the lowest initial weight from group I matched other groups in terms of body weight only after the period of fattening. Mazanowski [2012] defines this phenomenon as weight compensation of the lightest chicks in husbandry. The author suggested that as the goslings grow the difference decreases, and between weeks 10 and 22 it declines. Pakulska et al. [2003] claim that as early as in the 4 week body weight of goslings equalizes irrespective of the initial weight, which can suggest a great ability to compensate the growth and development in smaller chicks. In his research, Wilson [1991] shows that correlation between the weight of hatching eggs and weight of chicks decreases with ageing. Based on numerous research, it has been shown that the initial influence of egg weight is short-term and has no significant influence on further development [Merritt and Gowe 1965]. The analysis of data in Gardiner's experiment [1973] showed that the influence of egg weight on weight of chicks can be different, and the ability to compensate depends on the sex of the chicks. In the aforementioned research no differences in body weight of chickens in mixed groups (50% males and 50% females) were found. Significant differences in the final body weight were observed only in these groups where females were kept. It can suggest weaker body weight compensation ability of females. In groups with males, in turn, no statistically significant differences were observed. In numerous research, however, inconsistent results were obtained [Morris et al. 1968, Wyatt et al. 1985, Ipek and Dikmen 2007]. Chicks hatched from smaller eggs weighed less on days 28 and 48 of rearing as compared to chickens hatched from bigger eggs. Differences between the groups were significant. Broilers from big eggs were heavier (2080 g) than broilers from small eggs 1889 g on day 49 of life.

In the current research, the average weight of geese after fattening in all groups was 6.12 kg. The average body weight of a 17-week goose was 6.40 kg [Mazanowski 2012]. The difference between the weight of geese obtained in the

present research and the results of other authors may result from a longer period of fattening, a different system of keeping or other environmental conditions, but also the laying period. Hatching eggs used in the experiment were from the end of laying. Mazanowski [2012] and Potemkowska [1975] suggested that in the final weeks of a long-term laying period in the body of a reproductive goose occurs vitamin A deficiency, which causes a worse development of goslings.

In husbandry and breeding, a significant influence of egg weight on the chick weight as well as on the growth and development of birds during rearing is emphasized. However, the influence of this factor on the final body weight after the period of fattening was confirmed in the present research. Egg weight influences the course of the process of hatching, and thus determines the level of mortality or the synchronization of hatching.

CONCLUSION

The research showed a significant influence of the mass of an egg on the level of loss of the mass of an egg in percentage terms during breeding. Eggs from group I showed the biggest weight loss during incubation, whereas the lowest weight loss was recorded in group IV. The lowest weight was observed in group I and the highest in group IV. Despite significant differences in weight of one-day-old goslings in the 16th week, no statistically significant body weight differences were recorded in different groups. The compensation of geese body weight from group I results from intensive gains.

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WPŁYW MASY JAJA WYLĘGOWEGO NA MASĘ CIAŁA GĘSI W OCHOWIE I PO TUCZU OWSEM

Streszczenie. Chów gęsi wyróżnia duże zróżnicowanie gąsiąt pod względem masy ciała. Rozbieżności te wynikają z długiego okresu użytkowania nieśnego. W zależności od sezonu reprodukcji samice składają jaja o różnej masie. Z uwagi na dodatnią korelacje, masa jaja wpływa na masę ciała pisklęcia. Badano wpływ masy jaja na masę ciała gęsi po odchowie i tuczu. Określano różny wpływ masy jaja na końcową masę ciała gęsi, a także ubytki masy jaja w czasie inkubacji i wskaźniki wylęgowości piskląt. Badania przeprowadzono na 896 jajach wylęgowych gęsi Białej Kołudzkiej®. Do odchowu i tuczu przeznaczono 160 ptaków. W doświadczeniu potwierdzono istotny wpływ masy jaja na kształtowanie się procentowych ubytków masy jaja w czasie lęgu. Największy ubytek masy odnotowano w jajach najmniejszych. Masa jaja wpłynęła również na zamieranie zarodków w czasie inkubacji. Do 25. doby najwyższa śmiertelność charakteryzowała jaja lżejsze – poniżej 180 g, natomiast w 4. ostatnich dobach największy udział piskląt niewyklutych uzyskano z jaj powyżej 181 g. Najmniejszą masę uzyskały pisklęta z grupy i (89 g), a największą z IV (133 g). Pomimo istotnych różnic w masie jednodniowych piskląt w 16. tyg., po zakończeniu tuczu, nie wykazano istotnych statystycznie różnic w masie ciała między grupami. Określono czas występowania zjawiska rekompensacji wzrostu ptaków w odchowie między 10. a 16. tygodniem życia.

Słowa kluczowe: gęś, masa jaja, inkubacja, ubytki masy, odchów

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