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Assesment of slaughter value of three broiler chicken genotypes*

JULIA RIEDEL, MONIKA MICHALCZUK,
ŻANETA ZDANOWSKA-SĄSIADEK
Department of Animal Breeding and Production, Warsaw University of Life Science – SGGW

Abstract: *Assesment of slaughter value of three broiler chicken genotypes.* The study was conducted to examine slaughter parameters of three genotypes of meat type chicken: F_1 crossbred derived from crossing of light hen of indigenous breed Greenleg Partridge with heavy meat type cocks, F_2 crossbred being an effect of re-crossing obtained crossbred C×GP with meat type males and medium growing Hubbard JA 957, designed for a longer, 9-week production. Chicken were reared till 63rd day of age. Examined parameters were: dressing percentage, breast and leg meat yield and fatness. F_1 crossbred (C×GP) were characterized by rather low body weight, typical for slow growing chicken and good musculature, especially breast. Re-crossing with meat type cocks affected significant ($P < 0.01$) improvement of the slaughter parameters. F_2 crossbred (C×(C×GP) reached high body weight, typical for medium growing chicken. In comparison with Hubbard JA 957 F_2 crossbred had lower body weight, the same dressing percentage, better breast and worse leg musculature, and less abdominal fat. High breast meat percentage in carcass and less fatness suggested, that these chickens can be used in meat production, as a medium growing material designed for a longer fattening period (9 weeks).

Key words: meat chicken, genotype, carcass traits

INTRODUCTION

The European market for live poultry production is dominated by the broiler production using fast growing genetic material. But actually the demand for alternative product increases. Consumer are more interesting in chicken meat from longer fattening system, characterized by better physical and chemical properties and better taste, as compared to the classic broiler. These birds are often kept in outdoor system with the access to pasture, what increases their attractiveness to the consumers. For the longer, 9-week, fattening alternative genetic material is used, characterized by slower growing rate and better adaptation to different environmental conditions and feeding them diets, which improve meat quality and taste and health-promoting qualities (Fanatico et al. 2005, Chen et al. 2013).

On the other hand increased interest in using an indigenous breeds or their hybrids, which are often better adapted to local climatic and/or consumer requirements is observed (Jaturasitha et al. 2008, Zanetti et al. 2010, Zhao et al. 2011, Dal Bosco et al. 2012, Wang et al. 2013). Also in Poland scientists are interested in possibility of using local heritage breeds in organic or free range meat production (Brodacki et al. 2011, Brodacki i Batkowska 2011, Gornowicz

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2011, Muchacka et al. 2011). In Poland actually the popularity of Greenleg Partridge breed grows. It is an indigenous breed, designed for outdoor laying production, because of its low weight and lightweight construction. However the some of the Polish farms succesfully use males of Greenleg Partridge to produce capons (http.kaplony.pl; http.www.kaplon.eu). It suggests the possibility to use this breed as a maternal material to produce hybrids suitable for the meat production. These crossbreds obtained by single or double crossing with other chicken breeds or lines can be a good material for the longer fattening.

The purpose of this study was to examine slaughter analysis parameters of crossbred chicken C×(C×GP) derived from double crossing of hen of Polish indigenous breed Greenleg Partridge with heavy meat type cocks and to compare them with the maternal breed C×GP and with commercial medium growing Hubbard JA 957 chicken.

MATERIAL AND METHODS

Hens of the Polish indigenous Greenleg Partridge (GP) light breed were crossed with the heavy meat type cocks (C) and the obtained F_1 crossbreds were examined for slaughter analysis parameters. Hens from this crossing were used as a maternal material in next crossing, again with the heavy meat type cocks (C). The chicken from the second generation (F_2) of crossbred (C×(C×GP)) were also examined for slaughter analysis parameters and compared with commercial medium growing Hubbard JA 957 broilers, designed for a longer, 9-week production.

Total 3,300 meat type chicken derived from three genotypes: F_1 crossbred derived from crossing Greenleg Partridge hen with meat type cocks; F_2 crossbred, an effect of re-crossing F_1 crossbred with meat type males; commercial medium growing Hubbard JA 957, were used in the study. One-day chickens were placed to 30 pens (110 birds per pen), 10 pens of each genotype. Chicken were kept in the same chicken house on litter under controlled environment conditions till 63rd day of age. All birds were provided the same diets included Starter – till 14th day, Grower 1–15––28th days, Grower 2 – 29–35th day, and Finisher – from 36th day. Access to feed and water was freely available. At the 63rd day, 96 males and 96 females from each genotype were taken according to mean body weight for the group and sex. After 4 hour fastening chicken were weighted individually and slaughtered in a professional slaughterhouse. Obtained chilled carcasses were dissected after 12 hour storage in 4°C. Carcass dissection was carried out by removing of breast, thigh and drumstick meat and abdominal fat pad. Carcass dressing percentage was expressed as percentage of live body weight. Abdominal fat and the breast and leg muscles were removed and weighed to determine their percentage share in the carcass.

The obtained results were analysed statistically by one-way analysis of variance as least square means (GLM procedure, SPSS 14.0 PL Software for Windows), separately for each sex.

RESULTS

The F_1 generation of crossbred (C×GP) characterized by worse slaughter parameters than other birds (Table 1). Chicken had much lower body weight and muscle weight and also lower dressing percentage, what limited their usefulness for meat production. Live body weight and carcass weight C×GP chickens were similar to medium growing Hubbard ISA Red JA at the age of 56 days (Aksoy et al. 2010) and to slow growing chickens at 81st day of age (Fanatico et al. 2005), and the dressing percentage – likewise slow growing and medium growing chickens from Fanatico et al. (2005) and Wang et al. (2009) studies. However meat content in carcass of F_1 crossbred was equall to Hubbard JA 957 commercial chicken. Obtained results allow to consider C×GP crossbred as slow growing chickens. They can be used as maternal breed in commercial crossing rather than as chickens for broiler production. The usefulness this crossbreds hens in a broiler parent stock was confirmed by the results obtained in F_2 generation.

In comparison with maternal breed CxGP, double crossbred C×(C×GP) had higher body weight ($P < 0.01$), and consistently much higher carcass weight and were better muscled ($P < 0.01$). There was improved dressing percentage, increased breast meat percentage in the carcass ($P < 0.01$). In the contrary leg meat percentage was lower ($P < 0.01$), although leg weight was much higher ($P < 0.01$). It indicates positive effect of re-crossing with meat type cocks. A similar characteristic both crossbred types was much worse musculature of legs than breast (Table 1).

Slaughter results show, that C×(C×GP) crossbred F_2 are typical medium growing chicken characterized by high body weight, and good musculature of breast and leg. They can be suitable, like Hubbard JA 957, for meat production in 9-week fattening system.

Data presented in Table 1 indicate significant ($P < 0.01$) differences among genotypes in most of slaughter traits. F_2 crossbred was characterized by lower body weight and, in effect, also lower carcass weight. However, regardless of these differences, both Hubbard JA 957 and crossbred C×(C×GP) chicken had the same dressing percentage, similar to six-weeks Cobb 500 broilers (Beg et al. 2011). Higher breast meat weight and breast meat yield was found in the crossbred ($P < 0.01$). Similar high value (25%) was obtained in fast growing broilers at 56^{th} day of age in Aksoy et al. (2010) study, and also in Arbo Acres chicken at the age of 42 days in Liu et al. (2011) study. Romero at al. (2009) suggested maternal effect on a chicken breast meat yield. On the contrary, leg meat weight and leg meat yield were significantly lower than in Hubbard JA 957 chickens. C×(C×GP) crossbred chicken had lower abdominal fat weight and abdominal fat percentage.

DISCUSSION

Studies of Fanatico et al. (2005) and Aksoy et al. (2010) indicated genotype effect on dressing percentage – fast growing chickens has higher dressing percentage than slow growing and medium growing ones. Body weight of fast growing broilers Cobb (Aksoy et al. 2010) at the age of

TABLE 1. Comparison of slaughter analysis of the crossbred chickens C×(C×GP) with maternal breed C×GP and with Hubbard JA 957 commercial chicken

Trait	Sex	Crossbred F_1 C×GP			Crossbred F_2 C×(C×GP)			Hubbard JA 957			P_1	P_2	P_3
		N	LSM	SE	*N*	LSM	SE	*N*	LSM	SE			
Live body weight, g	males	96	2 142	6	96	3 131	21	96	3 346	16	0.001	0.001	0.001
	females	96	1 689	5	96	2 437	10	96	2 700	6	0.001	0.001	0.001
Carcass weight, g	males	96	1 494	6	96	2 304	16	96	2 472	12	0.001	0.001	0.001
	females	96	1 184	5	96	1 819	10	96	2 014	8	0.001	0.001	0.001
Breast meat, g	males	96	319	2.6	96	588	7.0	96	538	4.8	0.001	0.001	0.020
	females	96	267	2.5	96	476	4.2	96	459	3.8	0.001	0.001	0.036
Leg meat, g	males	96	305	2.2	96	455	5.7	96	510	4.1	0.001	0.001	0.001
	females	96	226	1.6	96	330	2.9	96	385	3.4	0.001	0.001	0.001
Abdominal fat, g	males	96	45.6	1.13	96	45.0	2.28	96	75.3	2.30	0.824	0.001	0.001
	females	96	45.3	1.12	96	52.6	2.02	96	84.9	2.79	0.002	0.001	0.001
Dressing percentage, %	males	96	69.7	0.19	96	73.6	0.26	96	73.9	0.27	0.001	0.001	0.402
	females	96	70.1	0.22	96	74.6	0.23	96	74.6	0.30	0.001	0.001	0.790
Breast meat, % of carcass	males	96	21.3	0.15	96	25.5	0.21	96	21.8	0.31	0.001	0.239	0.001
	females	96	22.5	0.18	96	26.2	0.18	96	22.8	0.21	0.001	0.404	0.001
Leg meat, % of carcass	males	96	20.4	0.14	96	19.7	0.17	96	20.6	0.18	0.001	0.590	0.001
	females	96	19.1	0.12	96	18.2	0.13	96	19.1	0.21	0.001	0.699	0.001
Abdominal fat, % of carcass	males	96	2.1	0.05	96	1.6	0.04	96	3.0	0.09	0.001	0.001	0.001
	females	96	2.7	0.06	96	2.3	0.05	96	4.2	0.13	0.001	0.001	0.001

P_1 – significance of differences between crossbreds of F_1 and F_2 generations, P_2 – significance of differences between crossbreds of F_1 generations and Hubbard JA 957, P_3 – significance of differences between crossbreds of F_2 generations and Hubbard JA 957.

56 days amounted 3.4 kg, while the slow growing Hubbard ISA Red JA weighted only 2.2 kg. Body weight of chicken in Fanatico et al. (2005) study ranged from 2.1–2.2 kg in medium growing chicken at the age of 81 day to 2.4–2.5 kg in fast growing ones at the age of 53 day. Also Wang et al. (2013) comparing slaughter yield and meat quality of fast growing and slow growing chickens found, that genotype had the large effect on these features. Gornowicz et al. (2009) pay attention to significant differences in the quality of carcass and meat among Cobb 500, Hybro G+ and Ross 308 broiler chickens, while Janisch et al. (2011) did not found significant differences in body weight or meat yield of Ross 308, Ross 708 and Cobb 700 broilers.

A very good breast meat yield characterized fast growing broilers Cobb 308, whose muscles at 56 day of age weighed 648 g (Aksoy et al. 2010). In the same experiment breast muscles of Hubbard ISA JA weighted only 288 g. Breast muscles of Ross 308 chicken weight was 450–500 g, breast meat percent in carcass amounted to 22–23% (Berri et al. 2008, Janish et al. 2011), and leg meat percent – 26% (Janish et al. 2011). Arbo Acres chickens slaughtered at 42nd day of age characterized very good musculature, both of breast 25–26% and 27.7%, and leg 23–24% and 20.6%, respectively in Liu et al. (2011) and Wu et al. (2011) studies.

Guo et al. (2011) indicates genotype and selection direct impact on fatness. Fat weight in Arbo Acres chickens differed significantly according to line – carcasses of chicken selected on lowering of fat deposition contained 20 g of fat while carcasses from fatty line – 115 g. Also Dal Bosco et al. (2012) found that chicken fatness is related to their genotype and is higher in fast growing broilers, because of the combination of age, low kinetic activity, and the high feed intake. Fat content in carcasses of slow growing chicken at the age of 112 days ranged from 3 to 6.5% according to different raising system (Wang et al. 2009). Fat percentage in six-week Arbo Acres broilers amounted to 1.2–1.5% (Liu et al. 2011, Wu et al. 2011), Hubbard 1.3–1.8% (Mahmood et al. 2007), Cobb 500 from 1.2–2.2% (Beg et al. 2011) to 2–2.5% (Hajati et al. 2009).

CONCLUSION

Crossbred of F_1 generation derived from Greenleg Partridge had much lower body weight, compared to commercial broilers, and consistently also lower carcass and meat. But slaughter analysis results were not different so much from values obtained for most slow growing and medium growing chickens. Hens from this breed can be used as maternal breed in a broiler parent stock.

Crossbred of F_2 generation (C×(C×GP)), obtained after re-crossing F_1 with meat type males, were characterized by very good slaughter results, especially high percentage of breast meat and low content of abdominal fat in carcass. It suggests the possibility to use these chickens for longer fattening period (9 weeks) to produce lighter, but good muscled carcasses.

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Streszczenie: *Ocena wartości rzeźnej kurcząt z trzech materiałów genetycznych.* W badaniach porównano kurczęta z trzech grup genetycznych: mieszańce F_1 powstałe ze skrzyżowania lekkich kur rasy Zielononóżka kuropatwiana z ciężkimi kogutami typu mięsnego, mieszańce F_2, efekt powtórnego krzyżowania powstałego mieszańca Cobb×Zk z kogutami typu mięsnego oraz Hubbard JA 957, przeznaczone do dłuższego chowu (9 tygodni). Kurczęta odchowywano do wieku 63 dni. Oceniano wydajność rzeźną, umięśnienie i otłuszczenie tuszek. Mieszańce F_1 (C×Zk) charakteryzowała dość mała masa ciała, typowa dla kurcząt wolno rosnących, oraz dobre umięśnienie, zwłaszcza piersi. Ponowne skrzyżowanie z kogutami typu mięsnego wpłynęło na istotną ($P < 0,01$) poprawę parametrów oceny poubojowej. Mieszańce F_2 (C×(C×Zk)) uzyskały dużą masę ciała, typową dla kurcząt średniorosnących. W porównaniu do kurcząt Hubbard JA 957 mieszańce F_2 miały małą masę ciała, taką samą wydajność rzeźną, lepsze umięśnienie piersi, gorsze nóg i mniejsze otłuszczenie. Duży udział mięśni piersiowych w tuszce oraz małe otłuszczenie wskazują na przydatność tych kurcząt w użytkowaniu mięsnym jako materiał średnio rosnący, przeznaczony do dłuższego, 9-tygodniowego chowu.

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Authors' address:
Julia Riedel
Wydział Nauk o Zwierzętach SGGW
Katedra Szczegółowej Hodowli Zwierząt
ul. Ciszewskiego 8, 02-786 Warszawa
Poland
e-mail: julia_riedel@sggw.pl