FATTENING PERFORMANCE FOR THE HYPLUS BROILER RABBIT DEPENDENCE ON THE INITIAL FATTENING BODY WEIGHT AT THE WEANING*

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Two final crossbreds of the broiler rabbit HYPLUS were fattened during the interval from 42 to 84 days of age. The following traits were recorded weekly: body weight, average daily gains, average daily consumption of feed and feed conversion with regard to the effect of the initial fattening body weight. The highest difference in body weight between both crossbreds was found at the age of 70 days, where the difference was 5.6%. The initial fattening body weight had impact on the body weight during the fattening period ($P < 0.0001$). Rabbits with the average body weight 1248 g at the beginning of the fattening period had at the end of fattening 2655 g and the rabbits with the average body weight 1464 g at the beginning of the fattening period had the final one of 2892 g. No growth compensation during the fattening period showed the rabbits with lower body weight. The initial fattening body weight is an important factor for the age or body weight at the end of fattening respectively.

rabbit; growth; feed conversion; final hybrid

INTRODUCTION

The annual rabbit meat production in the World is about 1 300 000 tons. 60% of the whole meat production is realized on specialized farms, where the so called „broiler rabbit" is produced (M a c h et al., 2001). The broiler rabbits are mostly two- and four way crossbreds. The knowledge of the growth and development patterns of defined genotype is the presumption of a successful profitable production of meat animals. The performance of meat type rabbits (purebreds and crossbreds) were analyzed by K r o g m e i e r, D z a p o (1991), M a c h (1992), S k ř i v a n o v á et al. (1997), N o f a l et al. (1997), P l a et al. (1998) and D ě d k o v á et al. (2002). The final crossbreds descend from medium-sized parental lines. The fattening period begins about the age of 30 days and ends at the period from 80 to 100 days. The demanded traits are: final body weight 2500–3000 g, average daily gains 20–40 g and feed consumption per day 2500–4500 g. The inflection point reaches the crossbreds at the age from 7 to 10 weeks (D ě d k o v á et al., 1999). The differences in the fattening traits between the crossbreds are caused by the crossbred, environment and management.

The objective of the paper was to analyse of the effect of crossbred, replication, interaction between the crossbred and replication and the body weight at the start test on the growth, feed consumption and conversion of the final crossbreds of broiler rabbits HYPLUS (♂PS59 × ♀PS19 and ♂PS119 × ♀PS19).

MATERIAL AND METHODS

Animals and experimental design

Final crossbreds (66 heads) of the broiler rabbit HYPLUS (product of the company Grimaud Frères) were fattened during the interval from 42 to 84 days of age. The following traits were recorded: body weight, average daily gains, average daily consumption of feed and feed conversion with regard to the effect of the two crossbreds ♂PS59 × ♀PS19; ♂PS119 × ♀PS19 (further only crossbred 59 × 19, 119 × 19), replication, interaction crossbred × replication and initial fattening body weight (final weight to 1350 g and over 1350 g). Rabbits from ten multiple litters of one commercial farm were weaned at the age of 34–35 days and fattened in a wire cage (67 cm × 45 cm × 100 cm) on the experimental and demonstration stable of the Czech University of Life Sciences. The replicate fattening was carried out within the month. The average temperature was approximately 17 °C and the relative humidity was about 65%. The rabbits were fed with a granulated fattening mixture. The content of the nutrients per 1 kg feeding mixture is shown in Table 1. Food and water were supplied ad libitum. The feeding mixture contained anticoccidica only in the first week of fattening.

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Table 1. The composition of the experimental diet

Composition	g/kg
Dry matter	904
Crude protein	171
Fat	42
Crude roughage	156
Calcium	11.5
Phosphor	7.5
Salt (NaCl)	6
Natrium (converted)	2.4

Statistical analysis

The growth traits were analyzed by the least-squares analysis using the GLM procedure (SAS, 2005). The following linear model was used:

$$y_{ijkl} = \mu + CROSS_i + REPL_j + GROUP_k + (CROSS \times REPL)_{ij} + e_{ijkl}$$

where: y_{ijkl} – observation
μ – overall mean
$CROSS_i$ – fixed effect of the i-th crossbred
$REPL_j$ – fixed effect of the j-th replication
$GROUP_k$ – fixed effect of the k-th group
$(CROSS \times REPL)_{ij}$ – fixed effect of the ij-th interaction crossbred × replication
e_{ijkl} – random residual error

The differences between the least squares means were tested at the significance level (error probability) of * $P < 0.05$, ** $P < 0.01$ and *** $P < 0.001$. The effect of sex was not included into the model due to the fact that the sex dimorphism was not proved yet in the rabbit (Krogmeier, Dzapo, 1991).

The body weight at weaning was estimated by means of approximation using the asymptotic growth function, which was found as the most suitable one (Vostrý et al., 2008).

$$W = \alpha - \beta\rho^X$$

where: W – estimated trait (body weight, feed consumption and conversion)
α – asymptotic value
β – parameter characterizing the onset of curve at birth ($X = 0$)
ρ – parameter characterizing the shape of curve ($0 < \rho < 1$)
X – age

As input values for the approximation of the body weight at weaning of crossbreds estimated values adjusted by systematic effect were used.

RESULTS AND DISCUSSION

Tables 2 and 3 include the LSM and SE for body weight and feed consumption of crossbreds, replication and interaction crossbred × replication and groups due to the initial fattening body weight.

ANALYSIS OF THE EFFECTS

Crossbred

From Table 2 it is visible that the difference between the crossbreds was significant for the body weight at 70 days of age ($P < 0.05$). The other differences between the crossbreds were non-significant. During the whole fattening period the crossbred 59 × 19 showed a lower feed conversion, higher body weight and higher average daily gains. The highest significant difference between both crossbreds was found for the body weight at 70 days (3.6%). From this time the differences between the crossbreds declined. Similar values of body weights published Metzeger et al. (2006) for the crossbred 59 ×19. The results showed a significant lower feed consumption in the crossbred 59 × 19 than in the crossbred 119 × 19 for the time intervals 42–49, 70–77, 77–84 days of age ($P < 0.0001$, $P < 0.001$ and $P < 0.05$). On the contrary, the crossbred 119 ×19 had a significant lower feed consumption in the interval 63–70 days of age ($P < 0.05$). The differences between the crossbreds in the most average daily gains were non-significant. Only in the interval from 49–56 days of age and 63–70 days of age were the differences significant in favour of the crossbred 59 ×19 ($P < 0.01$). A lower feed conversion per kilogram of gain was recorded by the crossbred 59 × 19 in comparison with the crossbred 119 × 19 at the age of 42–49 days ($P < 0.05$) and 49–56 days ($P < 0.001$). The crossbred 59 ×19 had a lower total feed consumption ($P < 0.001$) and a higher total gain ($P < 0.05$). The differences between the crossbreds in the feed conversion were during the whole fattening period non-significant. Similar results for the crossbred 59 × 19 found Dědková et al. (2002) and Vostrý et al. (2008).

Replications

The differences between the replication were almost non-significant for all body weights (Table 2) despite the fact that the second replication showed during the whole fattening period higher values of the body weight, significant for 49 days of age ($P<0.05$), with the exception of 70 and 77 days of age ($P < 0.05$). In contrary, the replication first recorded a lower average feed consumption at the age of 77–84 days. At the age of 49–56, 56–63 and 63–70 days was found a lower feed consumption in the second replication. The differences between both crossbreds for the average feed consumption were significant at 56–63 days of age ($P < 0.0001$), 49–56, 63–70 and 77–80 days of age ($P < 0.01$). The differences between the replication at 42–49 and 70–77 days of age were non-significant. Similarly for average daily gains as for the feed consumption were found significant differences between

Table 2. Least squares means (LSM) and standard errors (SE) for the crossbreds, the replications and the significance of interaction crossbred × replication

Trait	Crossbred				Significance	Replication				Significance	Significance of the interaction crossbred × replication
	59 × 19		119 × 19			1		2			
	66					66					
	LSM	SE	LSM	SE		LSM	SE	LSM	SE		
BW 42	1347.75	14.17	1365.82	13.34	0.3593	1337.41	16.06	1376.16	14.02	0.0988	0.1808
BW 49	1580.38	20.82	1596.26	19.60	0.5826	1552.66	23.59	1623.98	20.60	0.0398*	0.9822
BW 56	1843.40	22.97	1799.93	21.62	0.1754	1815.97	26.03	1827.36	22.73	0.7622	0.1078
BW 63	2111.08	24.49	2062.68	23.06	0.1573	2125.91	27.75	2047.85	24.24	0.0553	0.0604
BW 70	2375.30	27.46	2292.15	25.85	0.0321*	2380.40	31.12	2287.05	27.17	0.0413*	0.0749
BW 77	2606.07	30.48	2532.78	28.69	0.0865	2627.54	34.53	2511.30	30.16	0.0226*	0.2978
BW 84	2809.89	32.10	2738.72	30.21	0.1134	2803.58	36.37	2745.02	31.76	0.2676	0.6006
ADG 42-49	33.23	2.22	32.92	2.10	0.9192	30.75	2.52	35.40	2.20	0.2052	0.2124
ADG 49-56	37.57	1.92	29.09	1.81	0.0022**	37.61	2.18	29.06	1.90	0.0083**	0.0065**
ADG 56-63	38.24	2.30	37.53	2.16	0.8244	44.28	2.60	31.49	2.27	0.0011**	0.5617
ADG 63-70	37.74	1.32	32.78	1.25	0.0088**	36.36	1.50	34.17	1.31	0.3164	0.7564
ADG 70-77	32.97	1.66	34.37	1.57	0.5423	35.30	1.88	32.03	1.64	0.2327	0.1320
ADG 77-84	29.11	1.51	29.42	1.43	0.8853	25.14	33.38	1.72	1.50	0.0015**	0.1594
ADF 42-49	122.37	4.35	148.89	4.09	<0.0001***	137.21	4.93	134.05	4.30	0.6567	0.0003***
ADF 49-56	157.43	5.44	153.36	5.12	0.5907	169.69	6.17	141.10	5.39	0.0021**	0.0712
ADF 56-63	178.65	5.07	170.49	4.77	0.2487	189.74	5.74	159.40	5.02	0.0005**	0.0159*
ADF 63-70	185.59	4.18	173.61	3.93	0.0419*	188.68	4.73	170.53	4.13	0.0099**	0.3532
ADF 70-77	163.57	4.21	179.67	3.97	0.0075**	173.68	4.78	169.56	4.17	0.5507	0.0013**
ADF 77-84	161.09	4.12	173.46	3.88	0.0337*	157.16	4.67	177.40	4.08	0.0038**	0.0001***
FC 42-49	3.78	0.20	4.50	0.18	0.0103*	4.33	0.22	3.94	0.19	0.2301	0.5189
FC 49-56	4.44	0.21	5.39	0.20	0.0022**	4.87	0.24	4.96	0.21	0.7887	0.2518
FC 56-63	4.60	0.21	4.86	0.20	0.3737	4.68	0.24	4.78	0.21	0.7666	0.0988
FC 63-70	4.89	0.16	5.27	0.15	0.0940	5.25	0.18	4.91	0.16	0.1909	0.9890
FC 70-77	5.04	0.22	5.39	0.21	0.2470	5.02	0.25	5.41	0.22	0.2869	0.4029
FC 77-84	5.91	0.29	5.89	0.28	0.9457	6.28	0.33	5.52	0.29	0.1189	0.8515
AFC	4.67	0.08	5.13	0.08	0.0001**	4.84	0.09	4.96	0.07	0.8308	0.3635
TDG	1463.18	29.54	1371.58	27.72	0.0343*	1460.80	30.76	1373.97	26.37	0.0502	0.9391
TDF	6800.68	118.3	6971.83	111.05	0.1846	7011.80	123.20	6760.72	105.6	0.0212*	0.2002

* $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$, BW – body weight, ADG – average daily gains, ADF – average daily feed consumption, FC – feed conversion, AFC – average feed conversion, TDG – total gain, TDF – total feed consumption

replications at the intervals of 49–56 and 77–84 days of age ($P < 0.01$). The differences between replications for the rest of intervals were non-significant. No differences between replications were found for the feed conversion per 1 kg gain as it was mentioned by D e L e o n et al. (2002) in their paper. For the whole fattening period the difference for the total feed consumption between replications was significant ($P < 0.05$) in favour of the second replication. Differences among replications for the other fattening traits were non-significant.

Interaction crossbred × replication (Table 2)

The interaction crossbred × replication in the body weight was during the whole fattening period non-significant. The interaction for the average daily gain was only significant at the interval of 49 –56 days of age ($P < 0.01$). The interaction for the average daily feed consumption was with the exception of the interval from 63–70 days for all intervals significant (70–77 and 77–84 days of age – $P < 0.01$; 42–49, 49–56 and 56–63 days of age – $P < 0.001$). Our results are in contradiction with the results of D e L e o n et al. (2002), who did not find any interactions of crossbred × replication for the average daily feed consumption. No interactions were found for feed conversion, average feed conversion, total gain and total feed consumption.

Initial fattening body weight

Between both groups with different initial fattening body weight (low, high) were found highly significant dif-

Table 3. Least squares means (LSM) and standard errors (SE) for groups (Group 1 – lower initial fattening body weight, Group 2 – higher initial fattening body weight)

Trait	Group				Significance
	1		2		
	66				
	LSM	SE	LSM	SE	
BW 42	1248.74	15.13	1464.83	15.13	< 0.0001***
BW 49	1492.63	22.23	1684.00	22.59	< 0.0001***
BW 56	1724.10	24.53	1919.22	24.53	< 0.0001***
BW 63	1973.68	26.16	2200.08	26.57	< 0.0001***
BW 70	2216.96	29.33	2450.49	29.80	< 0.0001***
BW 77	2450.49	32.54	2688.37	33.06	< 0.0001***
BW 84	2656.46	34.28	2892.14	34.82	0.0001***
ADG 42-49	34.84	2.38	31.31	2.42	0.3447
ADG 49-56	33.07	2.05	33.60	2.09	0.8677
ADG 56-63	35.65	2.45	35.65	2.49	0.2465
ADG 63-70	34.75	1.42	35.77	1.44	0.6462
ADG 70-77	33.36	1.78	33.98	1.80	0.8231
ADG 77-84	29.43	1.62	29.11	1.64	0.9006
ADF 42-49	127.91	143.36	143.36	4.72	0.0368*
ADF 49-56	152.70	5.82	158.09	5.91	0.5538
ADF 56-63	174.49	5.42	174.66	5.50	0.9848
ADF 63-70	173.63	4.46	185.57	4.53	0.0911
ADF 70-77	164.80	4.50	178.44	4.57	0.0563
ADF 77-84	164.17	4.40	170.38	4.47	0.3694
FC 42-49	3.89	0.21	4.39	0.21	0.1374
FC 49-56	3.89	0.23	4.39	0.23	0.5010
FC 56-63	4.76	4.70	4.70	0.23	0.8545
FC 63-70	4.95	5.22	5.22	0.18	0.3171
FC 70-77	5.16	0.23	5.16	0.24	0.7477
FC 77-84	5.67	0.31	6.13	0.32	0.3424
AFC	4.81	0.09	4.98	0.09	0.2299
TDG	1407.72	31.89	1427.31	32.40	0.6948
TDF	6703.94	124.24	7073.48	126.23	0.0610

* $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$, BW – body weight, ADG – average daily gains, ADF – average daily feed consumption, FC – feed conversion, AFC – average feed conversion, TDG – total gain, TDF – total feed consumption

ferences between the body weights during the total test (Table 3). Contrary to the body weight non-significant differences were found for the average daily gains during the whole period of fattening. Significant differences were recorded only for the average daily consumption at the beginning of the fattening period from 42 to 49 days of age. Non-significant differences were discovered for the rest of traits (feed conversion, average feed conversion, total gain, and total feed consumption). From Fig. 1, in which an approximation on the age at weaning was made it is evident that both age groups show a parallel growth trend during the fattening period in favour of animals with a higher initial fattening body weight. No growth compensation during the fattening period showed the rabbits (crossbreds HYPLUS) with a lower initial fattening body weight. The rabbits with higher weaning weight are of specially interest of farmers due to higher intensity of growth, lower feed consumptions and the shorter fattening period to the constant slaughter weight. Our results are inconsistent with other papers (R o m m e r s et al., 2001). These authors found a growth compensation of rabbits with a lower weight at the beginning of fattening. The growth compensation was found also in other species of livestock. For instance growth compensation found P ř i b y l o v á et al. (2004) in breeding bulls of beef breeds in rearing houses and B a r a b a s z and Ł a p i ń s k i (2007) in the Chinchilla. The initial fattening body weight is an important factor for the age or body weight at the end of fattening, respectively. The growth of rabbits can be influenced by the age at weaning (F e r g u t s o n et al., 1997; Z i t a et al., 2007). On the other hand, T ů m o v á et al. (2002) and X i c c a t o et al. (2003) mentioned that

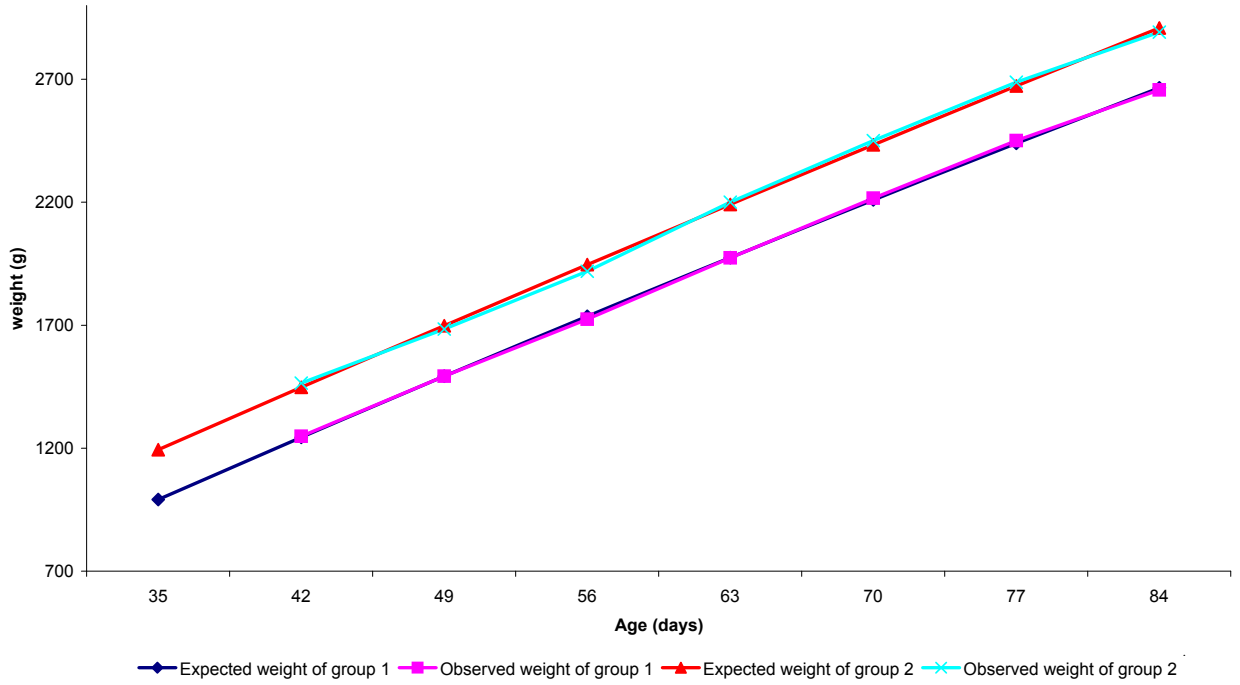

Fig. 1. Approximation of the weaning weight and age (days)

the different age at weaning did not affect the growth of rabbits. Our results show that we should focus our attention to higher weaning weights of rabbits, which give higher and matched weight of animals at slaughter.

The results demonstrated that the initial fattening body weight of rabbits can be an important factor for the age or body weight at the end of fattening, respectively. The group of rabbits with a lower weight (group 1) with an average body weight of 1248.74 g at the beginning of the fattening period achieved a body weight at 84 days of age of 2656.46 g. The group of rabbits with a higher initial fattening body weight (group 2) with an average body weight of 1464.83 g achieved a body weight at 84 days of age of 2892.14 g. From the results follows a high variability of body weights during the total period of fattening, which is affected by the weaning weight. The weaned rabbits should show the highest weaning weight with minimum of variability.

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Výkrmnost finálních hybridů brojlerového králíka HYPLUS v závislosti na hmotnosti při začátku výkrmu.

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Při výkrmu dvou finálních hybridů brojlerového králíka HYPLUS byla v týdenních intervalech od 42. do 84. dne věku sledována živá hmotnost, průměrné denní přírůstky, průměrná denní spotřeba krmiva a konverze krmiva, a to s ohledem na vliv živé hmotnosti na začátku výkrmu. Nejvyšší statisticky významná diference v živé hmotnosti mezi oběma hybridy byla zjištěna v 70. dni věku, kdy rozdíl činil 5,6 %. Živá hmotnost na začátku testu měla signifikantní vliv na živou hmotnost v průběhu celého výkrmu ($P < 0{,}0001$). Králíci, kteří na začátku testu měli v průměru živou hmotnost 1 248 g, dosáhli na konci výkrmu průměrné živé hmotnosti 2 656 g. Králíci s průměrnou živou hmotností na začátku výkrmu 1 464 g dosáhli na konci výkrmu živé hmotnosti 2 892 g. Pokus prokázal, že u králíků s nižší hmotností nedochází v průběhu výkrmu ke kompenzaci růstu. Živá hmotnost na začátku výkrmu je významným kritériem pro věk, resp. hmotnost při ukončení výkrmu.

králíci; růst; konverze krmiva; finální hybrid

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