ACTA UNIVERSITATIS AGRICULTURAE ET SILVICULTURAE MENDELIANAE BRUNENSIS

Volume 64 158 Number 5, 2016
http://dx.doi.org/10.11118/actaun201664051435

THE EFFECT OF GRASS PASTURE ON THE PERFORMANCE OF SLOWLY GROWING CHICKENS

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Abstract

ANDERLE VOJTĚCH, LICHOVNÍKOVÁ MARTINA, NEVRKLA PAVEL, KUPČÍKOVÁ LUCIE. 2016. The Effect of Grass Pasture on the Performance of Slowly Growing Chickens. *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis,* 64(5): 1435–1439.

The aim of the study was to evaluate the effect of grass pasture on the performance of slowly growing chickens. Both sexes (72 chickens) of the slowly growing hybrid Hubbard JA 757 were used in the experiment, which was carried out in the summer 2015. The chickens were divided into two groups with six replications. After 34 days of age, half of the chickens were transferred to outdoor fields to the transferable cages (EXP). The second half of chickens stayed in the house in a controlled microclimate condition. The live weight of chickens at 63 days of age was 2.93 kg in the EXP and 3.14 kg in the CON, and there was no significant difference between the groups ($P > 0.05$). However, the live body gain between 34 and 63 days of ages was significantly affected by the pasture ($P \leq 0.01$), and it was 2.02 kg in EXP and 2.45 kg in CON. Feed conversion ratio during the experimental period was also significantly different in the groups ($P \leq 0.01$), 2.60 in EXP and 1.97 in CON. High average daily temperature 28.7 °C had a main negative effect on the performance of chickens.

Keywords: live body weight, feed conversion ratio, green fodder

INTRODUCTION

In general, consumers interest is not only in organic, but also in the free range of poultry production (Fanatico *et al*., 2005). They believe that the products from alternative technologies are of better quality in comparison with the products originated from conventional technologies. Also, higher level of poultry welfare in alternative technologies is very important for some of these consumers (Skrivan, 2015).

In the Czech Republic, concerning alternative technologies for chicken meat production, only two systems are currently used. One of the system has been the just prolongation of the fattening during the period between 49–56 days of ages. However, the conditions for the chickens during this period are the same as in intensive conventional system. It means that chickens are kept without access to the free range, although hybrids with lowered growth intensity are used for this kind of fattening. According to an organic system of chickens production, there is annually produced only several thousand of chickens in the Czech Republic. The lower interest of consumers in the organic chickens is caused mainly its higher prices relative to the conventional chickens. On the other hand, the demand for certified (Label Rouge, free range) chickens has increased in the global markets. For instance, more than 20 % of chickens is produced through certified systems, both in France and Great Britain, which is in contrast with organic production. Breeding companies also offer a lot of slowly growing hybrids for these alternative technologies. The popularity of free range production increases in Germany, the Netherlands and Hungary. The free range has a positive impact from the welfare point of view. Nevertheless, the quality of pasture can also improve the sensory quality of chicken (Horsted and Hermansen 2007; Michiels *et al*., 2014; Ponte *et al*., 2008; Rodriguez-Aurrekoetxea *et al*., 2015).

On the other hand, it is very difficult to keep the free range of good quality, mainly because the survival instinct prevents poultry from going far away from the shelter-providing housing. Consequently, the vegetation near the barn is heavily degraded (Hughes and Dun, 1983). There are also a lot of issues concerning the use of outdoor areas as a major activity of the flock would be in a radius of 10 to 20 m (Bassler *et al*., 2000). This suggests that the dynamic systems using mobile houses may be better tools to uniformly distribute the excreted nutrients over a larger area, resulting in a lower negative impact on the environment (Rivera-Ferre *et al*., 2007). However, intake of plant particles can be regarded as a valuable feed supplement (Ponte *et al*., 2008). Lorenz *et al*. (2013) estimated that, green fodder could cover about 10–15 % of total daily dry matter intake in broilers. Similarly, Fanatico (1998) stated that, keeping broilers at pasture, and then, allowing the birds to forage on plants, seeds, insects and worms, can reduce the costs of concentrating by 30 %.

The aim of the study was to find the effect of grass pasture on the performance of slowly growing chickens. This is partly because they are the most suitable for alternative or organic chicken production.

MATERIALS AND METHODS

Eighty one-day old slowly growing hybrid Hubbard JA 757, both sexes, were housed for 34 days in a climatized house. They were housed in two cages, and equipped with nipple drinkers with cups, mechanical tube feeders and wood shavings as a litter material. The birds were provided with one hour of darkness following a period of 23 h light during the first week of age. The light regime was changed to 8 hours of darkness in the second week of age, and then, followed by 16 hours of light. The environmental conditions were in accordance with Ordinance 208/2004 Sb. and 464/2009 Sb. Starter, BR1 (crumble pellets), was fed till 12 days of ages, grower (BR2 – pellets) was fed from 12 to 34 days of ages. Finisher (BR3 – pellets) was fed from 34 to 63 days of age. The composition of the diets is shown in the Table I and the content of nutrients in the diets is shown in the Table II. Both the water and feed were available *ad libitum*. From 12 days of age, green fodder was submitted to the chickens in the first cage to accustom the feed. Fresh green fodder was provided *ad libitum* each day.

When the birds were 34 days old, chickens of each cage were divided into six cages, six chickens in each one, 3 males and 3 females. All chickens in each cage were weighted. Half of the chickens, those which fed green fodder (EXP), were transferred to outdoor fields. During the day, each replication of EXP was put in transferable cages 1.5 × 1.5 m, per 6 birds, which means 0.375 m^2/chicken. One third of the cage was covered by a roof. The chickens had free access to the feed (BR3) and water. Daily outdoor period lasted 13h, the rest of the day chickens were housed in the barns with free access to the feed and water and the light period was prolonged to 16 h. The fields consisted of a pasture of grass, with high vegetation ± 15 cm. Also, the botanic composition was as follow: 17 % *Trifolium repens,* 16 % *Plantago lanceolata*, 10 % *Poa pratensis*, 10 % *Festuca pratensis*,

I: *Composition of the diets*

Component	[%]		
	BR1	BR2	BR3
Wheat	36.9	48.4	48.7
Corn	20.0	20.0	20.0
Soybean meal⁺	29.4	15.9	12.6
Soybeans	5.0	4.0	4.0
Rapeseed meal	1.5	1.5	2.0
DDGS*	0.0	2.5	4.0
Soybean oil	1.3	0.0	0.0
Limestone	1.3	1.0	0.9
MCP**	1.0	0.7	0.6
Fish meal	1.0	0.0	0.0
Animal fat	0.9	4.1	1.0
Lysine	0.4	0.6	0.4
Methionine	0.3	0.3	1.0
NaCl	0.3	0.3	0.3

*DDGS – Dried Distillers Grains with Solubles
**MCP – monocalcium phosphate
⁺processed soybean meal

II: *Content of nutrients in the diets*

Content nutrients [g.kg^{-1}]	BR1	BR2	BR3
Crude protein	229.0	180.0	171.7
ME_N [MJ]	11.98	12.89	13.13
Fat	55.0	72.2	80.7
Fiber	35.8	34.9	36.2
Lysine	13.7	11.1	9.51
Methionine	6.1	5.2	4.33
Ca	8.3	6.4	6.0
Na	1.7	1.6	1.6
P	6.58	5.2	5.0

8 % *Phleum pratense*, 8 % *Festuca rubra*, 5 % *Taraxacum officinale*, 5 % *Ajuga reptans*, 5 % *Dactylis glomerata*, 4 % *Trifolium pratense*, 3 % *Trifolium hybridum*, 3 % *Bellis perennis*, 2 % *Nardus stricta*, 2 % *Glechoma hederacea*, 2 %, *Lolium perenne*, 2 % *Festuca arundinacea*. The average outdoor temperature was 28.7 °C, with maximum 39 °C, and minimum 16 °C. There was no any rain during the period. The cages were moved each day to fresh vegetation. The second half of chickens (6 × 6) stayed in the house without access to free range (CON). The experimental period lasted from 34 to 63 days of age. All chickens were weighted between 34 and 63 days of age. Feed intake and mortality were recorded, and feed conversion ratio (FCR) was calculated for the period the experiment was carried out, the intake of pasture was not included in the calculation . Data were analyzed using t-test using software package Unistat 5.1 (Unistat Ltd, England).

RESULTS AND DISCUSSION

The results of the experiment are shown in the Table III. There was no significant difference between CON and EXP in live body weight (LBW) of the chickens at the beginning of the experiment at 34 days of age (CON 1.37 kg, EXP 1.31 kg, $P > 0.05$). Neither at 63 days, after 29 days on pasture of EXP, there was no significant difference in LBW (EXP 2.93 kg, CON 3.14 kg, $P > 0.05$). On the other hand, the difference in gain of LBW (0.43 kg) was significantly different between the groups ($P \leq 0.01$, EXP 2.02 kg, CON 2.45 kg).

Cumulative feed consumption from 34 to 63 days was in EXP significantly higher ($P \leq 0.01$, 5.23 kg/chicken) in comparison with CON (4.80 kg/chicken). Consequently, the FCR was significantly higher in EXP too ($P \leq 0.01$, 2.60, and CON 1.97). Mortality was the same in both groups (5.56 %). The experiment was carried out during summer with high daily temperature, which could affect the performance of the birds.

Similar studies by Ponte *et al*. (2008), did not observe a significant effect ($P > 0.05$) of pasture on LBW between 36 and 64 days of age. On the other hand, they found a significant positive effect of pasture on both LBW gain ($P \leq 0.01$) and FCR ($P \leq 0.05$) from 36 to 64 days in contrast with the results of this study. They also used the slowly growing chickens even though the nutritional quality of their pasture was probably higher, although they provided a smaller area of pasture per birds (0.255 m^2) than in this study (0.375 m^2). They used *Trifolium subterraneum*-based pasture, but only 17 % of pasture *Trifolium* represented in this present study. The high difference between Ponte's and this study were in average daily mean temperature, which was 9.5 °C in Ponte's and 28.7 °C in our study. The detrimental effect of high temperature on the performance of broiler chickens is already well documented, principally through reducing feed intake, growth rate and feed conversion.

Skrivan (2015) also reported a positive effect of pasture on FCR. In the experiment with hybrid Ross 308, pasture decreased FCR till 42 days of age from 1.85 to 1.80. The researcher also observed null mortality on pasture. On the other hand, Sun *et al*. (2014) evaluated the effect of pasture on LBW and they found lower live body weight in chickens on pasture in comparison with the live body weight of chickens without pasture 2.21 vs. 2.63 kg ($P \leq 0.01$). It is necessary to stress that, chickens on the pasture had access only to the corn, except the pasture, however, the control group fed on a commercial diet. Similarly, Połtowicz and Doktor (2011) evaluated the effect of pasture in Ross 308 on LBW. Their results showed a significant negative effect of pasture only in male ($P \leq 0.05$), but not in female. In the same direction, Wang *et al*. (2009) also found a negative effect of pasture ($P < 0.05$) on LBW, weight gain or FCR in slowly growing chickens. On the other hand, Mikulski *et al*. (2011) did not observe a significant effect ($P > 0.05$) of pasture on both LBW and FCR in slowly growing chickens JA 957. Several studies concluded that rearing slowly growing chickens by the free-range system seems to be a possible alternative to the conventional method, but average daily temperature can significantly affect the performance of chickens.

III: *The effect of grass pasture on slow growing chickens performance*

Parameter	Experiment		Control		
	mean ± SE	v_x	mean ± SE	v_x	P
LBW 34 (kg)	1.31 ± 0.024	0.11	1.37 ± 0.025	0.11	NS
LBW 63 (kg)	2.93 ± 0.061	0.12	3.14 ± 0.102	0.15	NS
LBG (kg/chicken)	2.02 ± 0.052	0.06	2.45 ± 0.055	0.06	**
FC (kg/chicken)	5.23 ± 0.168	0.08	4.80 ± 0.054	0.03	**
FCR	2.60 ± 0.128	0.12	1.97 ± 0.063	0.08	**
Mortality (%)*	5.56		5.56		

LBW 34 – Live body weight 34th day (kg)
LBW 63 – Live body weight 63st day (kg)
LBG – Live body gain (kg/chicken)
FC – Feed consumpiton (kg/chicken)
FCR – Feed conversion ratio
** $P \leq 0.01$
*Mortality form 34 to 63 days of age

CONCLUSION

The grass pasture of slowly growing chickens JA 757 from 34 to 63 days of age had a significantly negative effect ($P \leq 0.01$) on both live body weight gain and feed conversion ratio. There was no significant effect of outdoor on the mortality of chickens. High average daily temperature 28.7 °C had the main negative effect on the performance of chickens.

Acknowledgements

This work was supported by the Internal Grant Agency at the Mendel University in Brno, Faculty of AgriSciences, under Grant IP 26/2016.

REFERENCES

BASSLER, A., CISZUK, P. and SJELIN, K. 2000. Management of laying hens in mobile houses – A review of experiences. In*: Ecological Animal Husbandries in the Nordic Countries. Proceedings of Seminar No 303 of the Noridc Association of Agricultural Scientists*. 45–50.

FANATICO, A. 1998. *Sustainable chicken production: Livestock production guide. Appropriate technology transfer for rural areas (ATTRA)*. Arkansas: Fayetteville.

FANATICO, A. C., PILLAI, P. B., CAVITT, L. C., OWENS, C. M., EMMERT, J. L. 2005. Evaluation of Slower-Growing Broiler Genotypes Grown with and Without Outdoor Access: Growth Performance and Carcass Yield. *Poultry Sci.*, 84(8): 1321–1327.

HORSTED, K. and HERMANSEN, J. E. 2007. Whole wheat versus mixed layer diet as supplementary feed to layers foraging a sequence of different forage crops. *Animal*, 1(2): 575–585.

HUGHES, B. O. and DUN, P. 1983. Production and behaviour of laying domestic fowls in outside pens. *Appl. Anim. Ethol.*, 11(2): 201.

LORENZ, C., KANY, T. and GRASHORN, M. A. 2013. Method to estimate feed intake from pasture in broilers and laying hens. *Arch. Geflugelkd.*, 77(3): 160–165.

MICHIELS, J., TAGLIABUE, M. M. and AKBARIAN, J. M. 2014. Oxidative status, meat quality and fatty acid profile of broiler chickens reared under free-range and severely feed-restricted conditions compared with conventional indoor rearing. *Avian Biol. Res.*, 7(2): 74–82.

MIKULSKI, D., CELEJ, J., JANKOWSKI, J., MAJEWSKA, T., MIKULSKA, M. 2011. Growth Performance, Carcass Traits and Meat Quality of Slower-growing and Fast-growing Chickens Raisedwith and without Outdoor Access. *Asian-Aust. J. Anim. Sci.*, 24(10): 1407–1416.

POŁTOWICZ, K. and DOKTOR, J. 2011. Effect of free-range raising on performance, carcass attributes and meat quality of broiler chickens. *Anim. Sci. Pap. Rep.*, 29(2): 139–149.

PONTE, P. I. P., PRATES, J. A. M., CRESPO, J. P., CRESPO, D. G., MOURAO, J. L., ALVES, S. P., BESSA, R. J. B., CHAVEIRO-SOARES, M. A., GAMA, L. T., FERREIRA, L. M. A., FONTES C. M. G. A. 2008. Restricting the Intake of a Cereal-Based Feed in Free-Range-Pastured Poultry: Effects on Performance and Meat Quality. *Poultry Sci.*, 87(1): 2032–2042.

RIVERA-FERRE, M. G., LANTINGA, E. A. and KWAKKEL, R. P. 2007. Herbage intake and use of outdoor area by organic broilers: effects of vegetation type and shelter addition. *NJAS Wagen. J. Life Sc.*, 53(3–4): 279–291.

RODRIGUEZ-AURREKOETXEA, A., LEONE, E. H. and ESTEVEZ, I. 2015. Effects of panels and perches on the behaviour of commercialslow-growing

free-range meat chickens. *Appl. Anim. Behav. Sci.*, 165(2): 103–111.
SKRIVAN, M. 2015. Pasture breeding meat chicken. *Our breeding* [in Czech: *Náš Chov*], 4(1): 38–41.
SUN, T., LONG, R. J. and LUI, Z. Y. 2015. The effect of a diet containing grasshoppers and access to free-range on carcase and meat physicochemical and sensory characteristics in broilers. *Br. Poul. Sci.*, 54(1): 130–137.
WANG, K. H., SHI, S. R., DOU, T. C. and SUN, H. J. 2009. Effect of a free-range raising system on growth performance, carcass yield and meat quality of slow-growing chicken. *Poultry Sci.*, 88(10): 2219–2223.

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