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THE EFFECT OF WEIGHT LOAD ON THE LEGS OF BROILERS BEHAVIOUR

M. Đukić-Stojčić[1], W. Bessei[2]

[1]Faculty of Agriculture, 21000, Novi Sad, Republic of Serbia
[2]Faculty of Agriculture, University of Hohenheim, 70599, Stuttgart, Germany
Corresponding author: djukic@polj.ns.ac.rs
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Abstract: The aim of the experiment was to study the behaviour of fast growing (FG) and slow growing (SG) broilers under the same weight load. For this purpose a harness and a suspension device were developed which alleviate a part of the weight load on the legs. The weight load in the SG birds was increased by fitting pieces of lead on the back and the breast. Using these methods the weight load of both lines was adjusted to the average weight of both lines. A total of 24 male broilers, 12 ISA S257 and 12 ROSS 308, were assigned to 4 groups of three birds each. One bird was weight adjusted, one was wearing the harness without weight adjustment and one was without harness. Duration and frequency of walking and resting behaviour were recorded. The torsional and angular deformity of tibiae were measured according to *Leterrier (1992).* The amount and thickness of the corticalis, bone density and area were measured at the middle tibia by computer tomography. The weight-reduced FG broilers showed higher activity in the 6th week of age. The weight-increased SG broilers showed less activity than the SG broilers without harness. The weight-reduced FG broilers showed similar activity as the SG broilers without harness. Total density and corticalis area were higher for the weight-reduced FG broilers than for the FG broilers without harness. The results show that weight load is the main influencing factor for differences in locomotor activity and resting behaviour of SG and FG broiler strains.

Key words: broilers, activity, resting, bone characteristics

Introduction

It is generally known, that slow growing (SG) chickens show higher locomotor activity and less resting behaviour as compared to fast growing (FG) chickens. The question whether this difference is caused by a difference in weight load or in motivation is not clear so far. The aim of the experiment was to study the behaviour of FG and SG broilers under the same weight load.

Within the last 50 years, an intensive selection took place in broilers on high growth and therefore there exists a clear reduction of the age at slaughter. Side effects of the selection of faster and higher growth are leg disorders. Up to 30% of the animals under commercial conditions have been reported to show leg disorders of different degree. In the development of leg problems, both genetic and environmental factors are involved.

Since high growth rate, low locomotor activity and leg problems appear simultaneously, it is difficult to determine the causal relationships among these traits. Fast growth can reduce the locomotor activity through the physical load. It is also assumed that, through the genetic selection for growth, the motivation of locomotor activity has been reduced. Is has further to be considered that disturbances in the development of bones and joints may cause pain and impair the locomotor activity.

Rutten et al. (2002) tried to reveal the causal relations between weight load, activity and leg disorders by reducing the weight load on legs of fast growing broilers (FB) by a special device. The weight reduced FB showed higher locomotor activity and better bone quality. However, the harness used for the reduction of weight load on the legs impaired the growth rate. Therefore it could not be clearly shown whether the increased activity was based upon the weight load reduction or on the diminished body weight. In the present study, the experiment of *Rutten et al. (2002)* was repeated with an improved device for reduction of weight load of FB. In addition, slow growing broilers (SB) were used, and were brought to the same weight load as weight reduced FB by additional load.

Materials and Methods

For this purpose a harness and a suspension device were developed which alleviate a part of the weight load on the legs. The weight load in the SG birds was increased by fitting pieces of lead on the back and the vent. Using these methods the weight load of both lines was adjusted to the average weight of both lines. The weight adjustment was made on a daily basis from 3 to 6 weeks. A total of 24 male broilers, 12 ISA S257 and 12 ROSS 308, were assigned to 4 groups of three birds each. One bird was weight adjusted, one was wearing the harness without weight adjustment and one was without harness. Observation of the broilers was performed using the "focus sampling" method in the age of six week. Duration and frequency of walking and resting were recorded and analysis was performed with the program Observer 5.0" *(NOLDUS, 2004)*. The torsional and angular deformity of tibiae and femora were measured according to *Leterrier (1992)*. The amount and thickness of the corticalis, bone density and area were measured at the proximal and distal end of tibia by computer tomography. Data was analyzed by

ANOVA using general linear models, followed by student T- test. Statistical calculations were made using program JMP, Version 5.0 (SAS Institute Inc., 2003).

Results and Discussion

Table 1. Duration of walking and resting (%), total density (TD - mg/cm3), corticalis area (CA - mm2), angular deformity of proximal and distal tibiae (TPA, TDA - °) calculated on the middle of the left tibiae in the sixth week of age

	walkin	resting	TD	CA	TPA	TDA
ISA increased weight	0,4 b	84 b	533	18	30	7
ISA with harness	1,5 a	73 a	541	22	27	4
ISA without harness	1,6 a	70 a	544	21	26	5
ROSS reduced weight	1,8 a	65 a	592	32 a	24 a	1 a
ROSS with harness	0,7 b	81 b	555	28 b	31 b	5 b
ROSS without harness	0,6 b	81 b	551	26 b	30 b	5 b

$^{a-b}$ Values within column and week with no common superscript are significantly different (P<0.05)

In the present study, the values for the locomotor activity are in the range of 0.7 to 1.6% and this is in the lower range of values reported in the literature (the time for walking of FG broilers, only 1.6% -1.8% of daylight *(Newberry and Hall, 1990)*. *Bizeray et al. (2000)* observed that in the first 3 weeks of life, walking of FG is 5%; *Bokkers (2004)* observed that from the 6th week of life, the time for the locomotor activity was only 1%). The duration of the locomotor activity of individual animals using a computer-controlled program was recorded accurately. It is therefore assumed that the reported lower levels of locomotor activity are more reliable than data from those experiments, which recorded the locomotor activity with rougher methods.

The SG broilers showed no difference in behaviour during the 6 th week of age. The weight-reduced FG broilers showed higher activity in the 6 th week of age. The weight-increased SG broilers showed less activity than the SG broilers with and without harness. The weight-reduced FG broilers showed similar activity as the SG broilers without harness.

The resting lies in areas that have been reported by other authors *(Weeks et al., 2000; Bizeray et al., 2000; Reiter and Kutritz, 2001; Bokkers, 2004)*.
Total density and corticalis area were higher for the weight-reduced FG broilers than for the FG broilers without harness. All parameters were less for the weight-increased SG broilers than for the FG broilers without harness.

These results are in compliance with results from *Rutten (2000),* who had trained animals on a treadmill, which later showed a higher cortical bone density than the untrained. Studies of fast growing broilers showed that the running training has a positive effect on the bone and bone development.
The angular deformity of tibiae was less in the weight-reduced FG broilers than at the FG broilers without harness, which coincides with results from *Reiter and Bessei (1998),* and *Rutten (2000),* where the proximal angular deformity of tibiotarsus was reduced by training in fast growing broilers.

No significant difference in angular deformity was noticed between the weight-increased SG broilers and the SG broilers without harness.

Conclusion

The results show that weight load is the main influencing factor for differences in locomotor and resting behaviour of SG and FG broiler strains.

FG broilers with reduced weight load showed more activity and better bone characteristics. SG broilers with increased weight load showed less activity but no negative influence on bone characteristic. Further experiments are necessary, to evaluate the inter relationships between locomotor activity, weight load and bone characteristics.

Efekat opterećenja nogu na ponašanje brojlerskih pilića

M. Đukić-Stojčić, W. Bessei

Rezime

Cilj eksperimenta je bio da se prouči efekat opterećenja nogu na ponašanje brzo (FG) i sporo rastućih brojlera (SG). Za tu svrhu konstruisan je specijalan uređaj kojim je moguće olakšati brzo rastuće piliće. Težina tela kod sporo rastućih brojlera povećana je ugradnjom komada olova u specijalno napravljen ranac na leđima i grudima. Koristeći ovu metodu težina opterećenja obe linije bila je prilagođena prosečnoj težini obe linije. Ukupno 24 muška brojlera, 12 ISA S257 i 12 ROSS 308, bili su podeljeni u 4 grupe od po tri ptice. Jedan brojler je nosio ranac sa opterećenjem ili olakšanjem, drugi je nosio ranac bez težine podešavanja, a treći je bio kontrola bez ranca i opterećenja ili olakšanja. Vršeno je posmatranje pilića u šestoj nedelji života i beleženo trajanje mirovanja i kretanja pilića. Torzioni i ugaoni deformitet tibije su mereni na osnovu *Leterrier (1992)*. Debljina kortikalisa i gustina kostiju su mereni pomoću kompjuterizovane tomografije (CT). Brojleri smanjene težine tela pokazali su veću aktivnost u šestoj nedelji života.

Povećanje težine SG brojlera dovelo je do manje aktivnosti nego SG brojlera bez ranca sa opterećenjem. Ukupna gustina kosti i kortikalis oblasti su bile veće kod olakšanih FG brojlera nego kontrolnih FG brojlera. Rezultati pokazuju da je masa tela glavni faktor koji utiče na razlike u aktivnosti između SB i FB.

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