



Productivity and Tonic Immobility Duration of Thai Crossbred Chickens Raised at Different Stocking Densities

Pongchan Na-Lampang

School of Animal Production Technology, Institute of Agricultural Technology, Suranaree University of Technology, Thailand

ARTICLE INFO

Corresponding Author:

Pongchan Na-Lampang
pongchan@sut.ac.th

How to cite this article:

Pongchan, N.L. 2014. Productivity and Tonic Immobility Duration of Thai Crossbred Chickens Raised at Different Stocking Densities. *Global Journal of Animal Scientific Research*. 2(2): 72-75.

Article History:

Received: 6 March 2014
Accepted: 5 April 2014

ABSTRACT

The objective of this study was to investigate the effects of stocking density (8, 12 and 16 birds/m²) on productivity and tonic immobility duration (a measure of fearfulness) of Thai crossbred chickens (n=900 birds) kept at 100 birds per pen. The results showed that stocking density had no significant (P>0.05) effect on body weight, body weight gain, feed intake, feed conversion ratio and mortality of chickens from the wk2 to 12. When stocking density was increased from 8 birds/m² to 16 birds/m², tonic immobility (TI) duration of the chickens increased significantly (P<0.05). However, the TI duration of chickens at a density of 12 birds/m² was not significantly different from those of both the lower and the higher densities. In conclusion, Thai crossbred chickens could be stocked up to 12 birds/m² without adverse effect on productivity and welfare when compared to those kept at 8 birds/m².

Key words: Thai crossbred chicken, stocking density, productivity, tonic immobility

Copyright © 2014, World Science and Research Publishing. All rights reserved.

INTRODUCTION

Meat of native chickens is preferred by Thai people over the same products from commercial poultry because of their taste, leanness, and suitability to Thai special dishes (Wattanachantet *et al.*, 2004). Thus, native chicken meat is more highly valued than that coming from commercial poultry. The domestic market for Thai native chickens has increased significantly and overseas markets also have strong potential. This has led to a change of practice in raising native chickens in Thailand. Cross breeding of Thai native males with egg type females, rather than pure breeding of Thai native chickens, is used to obtain higher chick production. It is recommended by the Department of Livestock Development, Thailand, that

stocking density used for open houses should be 8birds/m².However, some producers rear their chickens at higher stocking densities in order to reduce the fixed costs of production and produce more kilograms of chickens per unit area. As it is known the at reduction in space per bird generally results in poorer productivity and welfare of the chickens (Estevez, 2007).The objective of this study was to investigate the effect of rearing at higher than recommended stocking density on production and tonic immobility duration, a measure of fearfulness (Marin *et al.*, 2001), in Thai crossbred chickens.

MATERIALS AND METHODS

A total of 900mixed sex Thai crossbred chicks(Thai native males and ISA Brown commercial layer type females), supplied by Suranaree University of Technology poultry farm (Thailand), were reared from one day old to 13 wk of age without the use of beak trimming. The experiment lasted from February to April, 2011.

The pen sizes were 12.5 m², 8.33 m², and 6.25 m² in area. There were 100 birds per pen. This resulted in treatment densities of 8, 12 and 16 birds/m², respectively. The pens were bedded with approximately 5 cm of rice hulls.

Chicks were brooded for 2 wk before being randomly assigned to the treatments. At the end of the second wk, the chicks were vaccinated according to the recommendation of the Department of Livestock Development, Thailand. The chickens were fed a standard commercial three phase broiler diet. Feed and water were fed ad libitum throughout the rearing period. During the first 3wk, feed was added 3 to 4 times a day. After that the feed was added twice per day (0800 h and 1630 h). The ratio of birds per feeder cup (diameter×high: 40 cm×30 cm) or water bottle (4L capacity) was 25 to one.

Natural lighting was used after the brooding period until 13 wk old. The chicken house was protected from the wind and rain with plastic sheeting, which was also used to adjust the ventilation. Before stocking the birds, the house was sprayed with disinfectant. Temperature and relative humidity in the chicken house were recorded continuously.

Data on average body weight (BW), body weight gain (BWG), feed intake (FI) and feed conversion ratio (FCR) and mortality rate were determined at the end of the experimentwhen they chickens were 12 wk old.

During wk 13 (from 85 to 88 d old), 7 birds, randomly chosen from each pen, were evaluated in the tonic immobility (TI) testin a separate area of the chicken house. TI was induced as soon as the bird was caught by placing the animal on its back, with the head hanging, in a V-shaped plastic cradle (length×width×height: 30×24×20 cm). The method was similar to that described by Campo *et al.* (2008). The bird was restrained for 10 s. The observer sat in full view of the bird, about 1 m away, and fixed his eyes on the bird to cause the fear-inducing properties of eye contact. If the bird remained immobile for 10 s after the researcher removed his hands, a stopwatch was started to record latencies until the bird righted itself. If the bird righted itself in less than 10 s, and the restraint procedure was repeated (3 times maximum), then it was considered that tonic immobility had not been induced, so a 0 s score was given. If the bird did not show a righting response over the 10 min test period, a maximum score of 600 s was given for righting time.

The experimental unit considered was the pen. The experimental design used was a completely randomized design with three replicates per treatment. The data were subjected to analysis of variance with the General Linear Model procedure of SPSS 16.0. TI duration data were logarithmically transformed prior to analysis. When significance was indicated, differences among treatment means were tested by Duncan's multiple range tests.

RESULTS

During the experiment, average temperature and relative humidity in the chicken house in the morning (0700 h) and the afternoon (1430 h) were (Means \pm SE) 24.06 \pm 0.29°C, 30.30 \pm 0.46°C, 88.09 \pm 0.99% and 67.05 \pm 1.46%, respectively. Different levels of stocking density did not affect BW, BWG, FI, FCR or mortality (Table 1).

Table 1 Effects of stocking density on body weight (BW), body weight gain (BWG), feed intake (FI) and mortality of Thai crossbred chickens (Means \pm SE)

Density (Birds/m ²)	BW(g)	BWG(g)	Feed Intake (g)	FCR	Mortality (%)
8	1293.30 \pm 43.33	1187.70 \pm 43.67	3367.60 \pm 66.67	2.85 \pm 0.14	1.67 \pm 0.02
12	1242.20 \pm 70.35	1137.60 \pm 67.57	3348.20 \pm 54.54	2.96 \pm 0.14	1.00 \pm 0.01
16	1275.00 \pm 72.86	1164.50 \pm 73.28	3423.90 \pm 26.51	2.95 \pm 0.17	0.33 \pm 0.01

Stocking density affected TI duration of the chickens (Table 2). The TI duration of chickens at 16 birds/m² was higher ($P < 0.05$) than that for 8 birds/m², while that at 12 birds/m² density was not significantly different from either the higher or lower densities.

Table 2: Effects of stocking density on TI duration of Thai crossbred chickens

Density (Birds/m ²)	TI duration(s)
8	284 \pm 48 ^a
12	327 \pm 48 ^{ab}
16	432 \pm 45 ^b

^{a,b} means within the same column with different superscripts were significantly different ($P < 0.05$)

DISCUSSION

Temperature and relative humidity recorded during the experiment were normal for Thailand and did not cause any adverse effects on the chickens. The final BW of the chickens (at 12 wk of age) was sufficient to reach the marketable live weight of 1.2 kg which is normal for Thai chickens (Haitook *et al.*, 2003).

The results of this experiment agreed with those of Feddes *et al.* (2002) and Ravindran *et al.* (2006) who reported similar BW and BWG for chickens reared at three levels of low, middle, and high densities. The results also agreed with those of Thomas *et al.* (2004) who reported that stocking density had no effect on broiler mortality. However, Hall (2001) reported a significant increase of mortality in high stocking density in commercial farms. Dawkins *et al.* (2004) and Jones *et al.* (2005) argued that stocking density itself was less important to the physical health and mortality rates of the chickens than other environmental factors. Dawkins *et al.* (2004) showed that the differences between producers in terms of the environment they provide to the animals had more impact on their welfare than stocking density per se.

The longer TI duration observed at the highest stocking density indicates that the chickens were more fearful. These results are similar to the findings of Andrews *et al.* (1997) and Onbařilar *et al.* (2008). The duration of TI response to manual restraint is widely considered to be a useful behavioral index of fear and thus welfare (Marin *et al.*, 2001). This indicates that raising Thai cross breed chickens at 16 birds/m² can compromise one measure of chickens' welfare when compared to those raised at 8 birds/m².

In conclusion, the results of this experiment suggest that Thai crossbred chickens could be kept at a stocking density of 12 birds/m² and maintain the same level of productivity and welfare status as those kept at the suggested 8 birds/m² by the Department of Livestock Development, Thailand.

REFERENCE

- Andrews, S.M., H.M. Omed, and C.J.C. Phillips. 1997. The effect of a single or repeated period of high stocking density on the behavior and response to stimuli in broiler chickens. *Poult. Sci.* 76:1655-1660.
- Campo, J.L., M.T. Teresa, and S.G. Dávila. 2008. Association between vent pecking and fluctuating asymmetry, heterophil to lymphocyte ratio, and tonic immobility duration in chickens. *Appl. Anim. Behav. Sci.* 113:87-97.
- Dawkins, M.S., C.A. Donnelly, and T.A. Jones. 2004. Chicken welfare is influenced more by housing conditions than by stocking density. *Nature*. 427:342-344.
- Estevez, I. 2007. Dynamics of aggression in the domestic fowl. *Appl. Anim. Behav. Sci.* 76:307-325.
- Feddes, J.J.R., E.J. Emmanuel, and M.J. Zuidhof. 2002. Broiler performance, body weight variance, feed and water intake, and carcass quality at different stocking densities. *Poult. Sci.* 81:774-779.
- Haitook, T., E. Tawfik, and M.Zöbisch. 2003. Options for native chicken (*Gallus domesticus*) production in northeastern Thailand. In: Proc. The Conference on International Agricultural Research for Development. pp: 146-151.
- Hall, A. L. 2001. The effect of stocking density on the welfare and behaviour of broiler chickens reared commercially. *Anim. Welfare*. 10:23-40.
- Jones, T.A., C.A. Donnelly, and M.S. Dawkins. 2005. Environmental and management factors affecting the welfare of chickens on commercial farms in the United Kingdom and Denmark stocked at five densities. *Poult. Sci.* 84:1-11.
- Marin, R.H., P. Freytes, D. Guzman, and J.R. Bryan. 2001. Effects of an acute stressor on fear and on the social reinstatement responses of domestic chicks to cagemates and strangers. *Appl. Anim. Behav. Sci.* 71:57-66.
- Onbaşilar, E.E., Ö. Poyraz, E. Erdem, and H. Öztürk. 2008. Influence of lighting periods and stocking densities on performance, carcass characteristics and some stress parameters in broilers. *Arch. Geflügelk.* 72:193-200.
- Ravindran, V., D.V. Thomas, D.G. Thomas, P.C.H. Morel. 2006. Performance and welfare of broilers as affected by stocking density and zinc bacitracin supplementation. *Anim. Sci. J.* 77:110-116.
- Thomas, D., V. Ravindran, D. Thomas, B. Camden, Y. Cottam, P. Morel, and C. Cook. 2004. Influence of stocking density on the performance, carcass characteristics and selected welfare indicators of broiler chickens. *New Zealand Vet. J.* 52:76-81.
- Wattanachant, S., S.Benjakul, D. Ledward. 2004. Composition, color, and texture of Thai indigenous and broiler chicken muscles. *Poult. Sci.* 83:123-128.