Asian Journal of Poultry Science

ISSN 1819-3609

Academic Journals Inc.

www.academicjournals.com

Asian Journal of Poultry Science 6 (4): 146-151, 2012
ISSN 1819-3609 / DOI: 10.3923/ajpsaj.2012.146.151
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Thai Crossbred Chickens Can Be Raised in a High Stocking Density

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ABSTRACT

The purpose of this study was to assess whether the Thai crossbred chickens can be raised at a higher stocking density than that recommended in Thailand. A total 900 day-old mixed sex Thai crossbred chickens (crossbred between Thai native males and the ISA Brown commercial layer type females) were assigned as 3 replicates of 100 birds per pen, to stocking densities of 8, 12 and 16 birds m^{-2}, respectively. Body Weight (BW), Body Weight Gain (BWG), Feed Intake (FI), Feed Conversion Ratio (FCR) and mortality rate of birds were recorded at weekly intervals. Data on welfare indicators (leg condition, feather damage scores, tonic immobility) were obtained at the 13 weeks of age. The results showed that in this study stocking density had no significant effects on BW, BWG, FI, FCR and mortality rate of chickens at 12 weeks of age. No leg problems of chickens were found in any treatment at 13 weeks of age. Although, no perfect feather of primaries and tail were found, the total body feather damage scores were similar in all treatments. Stocking density did not significantly affect tonic immobility duration of the chickens when stocking density was increased from 8 to 16 birds m^{-2}. It is thus concluded that Thai crossbred chickens could be raised up to 12 weeks of age in as high density as 16 birds m^{-2} without any adverse effects.

Key words: Thai crossbred chickens, productivity, feather damage, tonic immobility

INTRODUCTION

The meat of Thai chicken has been very popular among Thai consumers because of its unique taste and texture which is regarded as a greater delicacy than that of the commercial broiler (Choprakarn and Wongpichet, 2007; Puttaraksa *et al*., 2012; Wattanachant *et al*., 2004, 2005). The domestic market for Thai chickens has increased significantly. They also have strong potential for sales in overseas markets. Therefore, changing the raising system of Thai native chickens from the extensive backyard to intensive industry scale could increase the incomes for Thai smallholder farmers (Na-Lampang, 2012). Cross breeding of Thai males with commercial layers, rather than pure breeding, is used to obtain higher chick production. The Department of Livestock Development (DLD) of Thailand recommends that stocking density for Thai chickens is 8 birds m^{-2} for the group of 100-200 birds. However, the farmers need to raise their chickens in higher density to reduce the cost of housing. Since Thai chickens have high aggressiveness (Jaturasitha *et al*., 2002), it is suspected that when they are raised in high density their productivity and welfare would be compromised. This research was aimed to assess whether the Thai crossbred chickens can

be raised at a higher stocking density than that recommended. This research hypothesis was if raising Thai crossbred chickens in higher stocking density than 8 birds m^{-2} could cause adverse effects on productivity and welfare of chickens.

MATERIALS AND METHODS

Animals and housing: The chickens used in this experiment were a cross between Thai native males (Luang Hang Khao or white-tailed yellow breed) and the ISA Brown commercial layer type females. Nine-hundred mixed sex Thai crossbred chicks, supplied by Suranaree University of Technology poultry farm, were reared from one day old to 13 weeks of age without the use of beak trimming. The group size was 100 birds in every treatment. The experiment lasted from February to April, 2011.

The experimental pens were bedded with approximately 5 cm of rice husk. Natural lighting was used after the brooding period until the end of the experiment. The chicken house was protected from wind and rain with plastic sheeting, which also affected the ventilation. A bamboo perch and plastic pecking materials were placed in every pen as enrichment. Before stocking, the housing was sprayed with a disinfectant. The pen sizes were 12.5, 8.33 and 6.25 m^2. This resulted in treatment densities of 8, 12 and 16 birds m^{-2}, respectively.

Chicks were brooded for 2 weeks before being randomly assigned to the treatments. At the end of week 2, the chicks were vaccinated according to the recommendations of DLD. The birds were fed a standard commercial three phase broiler diet. Feed and water were given *ad libitum* throughout the experimental period. During the first 3 weeks, feed was added 3-4 times a day. After that feed was added 2 times a day (08:00 and 16:30 h). The ratio of birds per feeder cup (diameter×height: 40×30 cm) or water bottle (4 L capacity) was 25 to 1.

Measurements

Productivity: Body Weight (BW) and Body Weight Gain (BWG) of 20 randomly selected chickens per treatment were measured when they were 12 weeks old. FCR was determined from FI of all birds in each pen. Mortality rate was determined daily.

Leg condition: Ten randomly selected chickens per pen were assessed for leg health at the end of the experiment. The method used followed that of Jones *et al*. (2005).

Feather damage score: After the leg conditions assessment, 15 birds per pen were randomly chosen to be scored for feather damage in breast, legs, vent, back, rump, wings, tail and primaries areas. The method used followed the scoring system of Wechsler and Huber-Eicher (1998). That is using a scoring system of 1 point (perfect plumage), 2 points (feathers damaged, no skin area denuded), 3 points (denuded area up to 3×3 cm) or 4 points (denuded area greater than 3×3 cm) for six individual parts of the body: breast, legs, vent, back, rump, wings. In addition, the tail and the primaries were given a score of 1 (perfect) and 2 (damaged). In the analysis, a total 'feather loss' score range (6 to 24) was calculated for each bird by adding the scores of breast, legs, vent, back, rump and wings.

Tonic immobility duration: During the 13th week of age, 7 randomly chosen chickens from each pen were tested for the duration of tonic immobility duration in a separate place of the chicken house. Tonic immobility was induced as soon as the bird was caught, by placing the animal on its back in a V-shaped plastic cradle (length×width×height: 30×24×20 cm), with the head hanging. The

method was similar to that described by Campo *et al.* (2008). The bird was restrained for 10 sec. The observer sat in full view of the bird, about 1 m away and fixed her eyes on the bird to cause the fear inducing properties of eye contact. If the bird remained immobile for 10 sec after the observer removed her hands, a stopwatch was started to record the time until the bird righted itself. If the bird righted itself in less than 10 sec and the restraint procedure was repeated for up to a maximum of 3 times, then it was considered that tonic immobility had not been induced, so a 0 sec score was given. If the bird did not show a righting response over a 10 min test period, a maximum score of 600 sec was given.

Statistical analyses: SPSS 16.0 was used in statistical analysis. Measurements of productivity and welfare parameters were analyzed by ANOVA for completely randomized design with 3 replicates per treatment. The feather damage scores were analyzed by Kruskal-Wallis nonparametric test. Prior to analysis, TI duration data were logarithmically transformed. Treatment means were significantly different were compared using Duncan's multiple range tests at $p<0.05$.

RESULTS AND DISCUSSION

Productivity: It was found that different levels of stocking density did not significantly affect BW and BWG of Thai crossbred chickens (Table 1), although the highest BW was in the treatment of 8 birds m^{-2} density, followed by 16 and 12 birds m^{-2} densities. The final BW of Thai crossbred chickens were sufficient to reach the marketable live weight of 1.2 kg (Haitook *et al.*, 2003). Our findings were in agreement with those of Feddes *et al.* (2002) and Ravindran *et al.* (2006) who reported the similar BW and BWG of birds reared at three density levels. In another evaluation involving stocking density ranges of 10 to 24 birds per m^2, increasing population density had no influence on feed per gain (Ravindran *et al.*, 2006).

The highest mortality rate was found in the lowest density level in this research. However, we did not find the significant difference in mortality of chickens in each treatment (Table 1). Our results agreed with Thomas *et al.* (2004) who found stocking density had no effect on broiler mortality. On the contrary, Hall (2001) established a significant increase of mortality in high stocking density in commercial farms.

Although, the highest FI was in the density of 8 birds m^{-2}, the FI of Thai crossbred chickens in different treatments was not significantly different (Table 1), possibly because of the feed and water were given *ad libitum* throughout the experimental period. Some researchers found that stocking density did not affect FI of broiler for example Ravindran *et al.* (2006). On the contrary, Shanawany (1988) found that reducing stocking density, food consumption and body weight gain increased.

Leg conditions: All the sample birds in our study had a gait score of 0, i.e., there were no health problems were found for the legs, such as discoloration, hock burn, or pad dermatitis in any of the

Table 1: Effects of stocking density on productivity of Thai crossbred chickens from week 2 to 12 of age

Density (birds m^{-2})	Body weight (g)	Body weight gain (g)	Feed intake (g)	Feed conversion ratio (g)	Mortality (%)
8	1293.30±43.33	1187.70±43.67	3367.60±66.67	2.85±0.14	1.67±0.33
12	1242.20±70.35	1137.60±67.57	3348.20±54.55	2.96±0.14	1.00±0.58
16	1275.00±72.86	1164.50±73.28	3423.90±26.51	2.95±0.17	0.33±0.33

Values are Mean±SE

pens. Even though it was found in broilers that higher stocking densities caused more leg problems (Dawkins *et al*., 2004), Thai crossbred chickens in different stocking densities showed no leg problems. One reason for this is that the body weight of these birds was not heavy enough to cause any leg problems at week 12. Another reason might have been the exemplary raising management used during the growth period, for example, the litter was shoveled daily in order to decrease pad dermatitis in these chickens. Provision of perches can reduce the impact of leg problems in broiler chickens (Tablante *et al*., 2003; Ventura *et al*., 2010). Moreover, perching and stepping onto and over perches exercised the leg muscles and joints (Simsek *et al*., 2009), in order to improve leg conditions (Tablante *et al*., 2003).

Feather damage score: Although, the total body damage score of chickens in 16 birds m^{-2} density was the highest among all treatments, it was not significantly different from that of 8 or 12 birds m^{-2} densities. It was found that the primaries feather damage score in 12 birds m^{-2} density was the highest among all treatments. It was significantly higher than that in 8 and 16 birds m^{-2} densities ($p<0.05$). There was no different primaries feather damage score between 8 and 16 birds m^{-2} densities. The highest tail feather damage score of chickens was in 8 birds m^{-2} density, however, it was not significantly different from 12 birds m^{-2} density. The lowest tail feather damage score of chickens in 16 birds m^{-2} density was significantly lower than that in 8 and 12 birds m^{-2} densities ($p<0.05$) (Table 2).

It is possible that the small group size of 100 birds was not large enough to cause severe feather damage (Bilcik and Keeling, 1999; Mench and Keeling, 2001) in our experimental chickens. Moreover, the plastic pecking materials provided as appropriate foraging substrates might have reduced the incidence of feather pecking (Huber-Eicher and Wechsler, 1998).

Tonic immobility (TI) duration: It was found that the TI duration of birds in different stocking density treatments were not statistically different (Table 3). This result was in line with Campo *et al*. (2005) who found the density of birds had not significant effect on the tonic immobility duration. This agrees with the results that increasing bird density did not significantly increase fearfulness of hens as measured by tonic immobility reaction in floor pens (Lee, 1989) or in the cages (Lee and Moss, 1995). On the contrary Andrews *et al*. (1997) and Onbasilar *et al*. (2008) reported that the increase in stocking density caused the chickens more fearful which showed in

Table 2: Effects of stocking density on feather damage score in Thai crossbred chickens at the 12 weeks of age

Density (birds m^{-2})	Total body damage	Primaries feather damage	Tail feather damage
8	10.07±0.33	1.80± 0.40^{a}	1.80±0.06^{a}
12	10.93±0.41	1.95±0.21^{b}	1.64±0.07^{a}
16	10.47±0.42	1.90±0.31^{a}	1.58±0.07^{b}

Values are Means±SE, Means within the same column with different superscripts showed a significantly difference compared with the first row of results ($p<0.05$)

Table 3: Mean duration of tonic immobility (TI) for Thai crossbred chickens from different stocking densities

Density (birds m^{-2})	TI duration (sec)
8	266.94±44.21
12	316.80±48.64
16	340.70±41.60

Values are Means±SE

longer TI duration. This was the first time the TI duration of Thai crossbred chickens was measured. It probably should consider the breeds of chickens have different TI duration (Campo *et al*., 2006).

CONCLUSION

Stocking density of 16 birds m^{-2} did not cause any adverse effects on productivity of Thai crossbred chickens over 8 or 12 birds m^{-2} densities. In addition, leg condition, feather damage condition and tonic immobility duration of chickens were not influenced by the high stocking density. This may be caused by the enrichment with perches, rice husk bedding and pecking materials.

ACKNOWLEDGMENTS

This work was supported by Suranaree University of Technology (SUT) and the project "Establishment of 'Korat Meat Chicken' Strain for Small and Micro Community Enterprise (SMCE) Production." The project was financed by The Thailand Research Fund (TRF), DLD and SUT. The authors wish to thank graduate students in the School of Animal Production Technology at SUT for their kind help with this study.

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