



UNIVERSITI PUTRA MALAYSIA

**GROWTH PERFORMANCE, INTESTINAL MICROFLORA, INCIDENCE OF
PODODERMATITIS AND LEG WEAKNESS IN BROILER CHICKENS
REARED ON LITTER FLOOR OR IN CAGES**

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BY

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A project report submitted to Faculty of Agriculture, Universiti Putra Malaysia, in
fulfillment of the requirement of SHW 4999 (Final Year Project) for the award of the
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CERTIFICATION

This project report entitled **Growth Performance, Intestinal Microflora, and Incidence of Pododermatitis & Leg Weakness in Broiler Chickens Reared on Litter Floor or in Cages** is prepared by **Muhammad Zulfahmi Bin Silahuddin** and submitted to the Faculty of Agriculture in fulfillment of the requirement of SHW 4999 (Final Year Project) for the award of the degree of Bachelor of Agriculture (Animal Science).

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LIST OF ABBREVIATIONS

°C	Celcius
g	Gram
kg	Kilograms
s	Seconds
min	Minutes
%	percentage
CRS	Cage rearing system
FRS	Floor rearing system
FCR	Feed conversion ratios
LTL	Latency to lie
FPD	Pododermatitis/Footpad dermatitis

ABSTRACT

The study was conducted to determine the effects of different rearing systems on growth performance, intestinal microflora, incidence of pododermatitis (FPD) and leg weakness in male broiler chickens under the hot and humid tropical environment. A total of 200 day-old male broiler chicks (Cobb 500) were equally allocated to either multilayer battery cages with wire floors (CRS) or floor pens (FRS) with wood shavings. Both cages and floor pens were in a naturally-ventilated house. The body weights on day 42 and feed intake from day 1 – 42 of CRS broilers were significantly lower than the FRS group. However, the CRS broilers had significantly better overall (day 1- 42) FCR than those of FRS. On day 42, the incidence of pododermatitis (FPD) was higher in FRS, while in CRS there was no incidence of FPD recorded. The FRS birds had significantly higher counts of cecal *Escherichia coli* and significantly lesser *Salmonella* spp than CRS at 42 days of age. However, rearing system had negligible effect on cecal populations of *Campylobacter* spp and *Clostridium* spp. The FRS birds showed a significantly longer duration of latency to lie than their CRS counterparts which suggested that the former had lower incidence of leg weakness. In conclusion, cage rearing system appeared to benefit performance, lower incidence of pododermatitis and intestinal *E. coli* population in broiler chickens. However, cage system may have adverse effect on leg strength and intestinal *Salmonella* spp population. Thus, a bigger floor space should be allowed for caged broilers to improve leg strength and biosecurity should be reinforced to reduce intestinal *Salmonella* population.

ABSTRAK

Kajian ini dijalankan untuk menentukan kesan sistem penternakan yang berbeza terhadap prestasi pertumbuhan, mikroflora usus, insiden pododermatitis (FPD) dan lemah kaki dalam ayam daging di bawah persekitaran tropika yang panas dan lembap. Sebanyak 200 anak ayam daging jantan berumur sehari (Cobb 500) telah dibahagi kepada sangkar bateri bertingkat dengan lantai wayar (CRS) atau pen lantai (FRS) dengan ketaman kayu Kedua-dua sangkar dan pen lantai berada dalam rumah yang mempunyai pengudaraan semula jadi. Berat badan pada hari 42 dan pengambilan makanan dari hari 1-42 ayam daging CRS adalah jauh lebih rendah daripada kumpulan FRS. Walau bagaimanapun, ayam daging CRS mempunyai keseluruhan (hari 1- 42) FCR jauh lebih baik berbanding dengan FRS. Pada hari 42, insiden pododermatitis (FPD) adalah lebih tinggi pada FRS, manakala CRS tidak ada insiden FPD direkodkan. Populasi Escherichia coli untuk burung FRS jauh lebih tinggi dan Salmonella spp kurang daripada CRS pada 42 hari umur. Walau bagaimanapun, sistem penternakan mempunyai kesan yang boleh diabaikan pada populasi spp Campylobacter dan Clostridium spp. Burung FRS menunjukkan tempoh yang lama untuk ujian LTL berbanding CRS dan mempunyai insiden yang lebih rendah dalam ujian kelemahan kaki. Kesimpulannya, sistem ternakan sangkar memberi manfaat kepada prestasi, insiden pododermatitis yang rendah dan populasi E. coli dalam ayam daging. Walau bagaimanapun, sistem sangkar mungkin mempunyai kesan yang buruk kepada kekuatan kaki dan populasi Salmonella spp. Oleh itu, ruang lantai yang lebih besar harus diberi untuk ayam daging sangkar bagi meningkatkan kekuatan kaki dan keselamatan bio perlu diperkukuhkan untuk mengurangkan populasi Salmonella di usus.

CHAPTER 1

INTRODUCTION

Rearing system may have a profound influence on production efficiency, welfare, and chick's health. In many Asian countries, the two primary rearing systems for broiler chicken production are litter floor and cage rearing systems. Even though cage system for rearing broiler chickens has been available in the industry for many decades, it is less popular mainly because of the problems associated with leg weakness. 'Leg weakness' in broiler chicken is a general term that refers to joint problems in hips, knees or intertarsal joints. There are different causes of leg problems such as skeletal and other forms of deformities or joint infections (Lynch *et al.*, 1992; Thorp *et al.*, 1993; Butterworth, 1999). According to Rennie and Whitehead (1996), Kestin *et al.* (1999), Su *et al.* (1999, 2000), and Sanotra *et al.* (2001), leg problems, displayed as decreased walking ability is also associated to the rapid growth of the birds. On the contrary, Akpobome and Fanguy (1992) showed no significant differences in the incidences of leg and wing breakages between cages and floor reared broilers. Another possible disadvantage with cage system is the labour cost to move chickens into and out of cages as broiler chickens are only been reared for short period before they reach market weight (Reece *et al.*, 1971).

The effects of cage and litter floor rearing systems on performance of broilers have been inconsistent. Wang *et al.* (1997) and Thanga *et al.* (2001) showed cage rearing system improved performance and survivability of broilers and profitability compared to litter floor. On the contrary, Turkyilmaz *et al.* (2002) indicated that raising broilers on litter floor was more profitable than in cages. Negligible

differences in weight gain, feed intake and carcass traits between broilers in cages and on floor pens were reported by Swain *et al.* (2002).

Earlier work comparing different rearing systems in broilers were mainly conducted under temperate condition. The hot and humid tropical environment will increase water intake in broiler chickens and thus the droppings produced is wet and the moisture content of litter is high. Wet litter enhances microbial activity and cause increase in temperature and ammonia in broiler houses and hence, high incidence of pododermatitis, breast blisters, leg weakness and soiled plumage (Weaver and Meijerhof, 1991). Thus, cage rearing system could be suitable for broilers in the tropics. Rearing broilers in cages may reduce cost of production through elimination of litter cost, reduction of cost of medication, reduction of housing cost by increasing bird density, and reduction of labour cost (Akpobome and Fanguy, 1992). Chickens raised in cages are also kept away from excreta, therefore reducing the occurrence of diseases (Mariam *et al.*, 2012).

Environmental conditions may influence gut microflora. The phenomenon was related to the variability of animal responses, particularly to immune-related stimuli in different environmental/microbiological conditions (Terán-Ventura *et al.*, 2010). Gut morphology of broilers is also a good indicator of variations in nutrient digestion and absorption capacity of the small intestine, which could be affected by gut microbiota and immunity (Guarner & Malagelada, 2003). However, reports on intestinal microbiota or morphology of broilers raised in different rearing systems are few. The effect of rearing system on food-borne pathogens is a major concern in the egg industry. Caged layers have been associated with Salmonella due to larger flock sizes, higher stocking densities, more rodent and insect disease vectors (Shields and

Greger, 2013). Santos *et al.* (2008) reported that access to faecal matter may decrease the threat of Salmonella by serving as a seeding agent for competitive exclusion microorganisms. However, Willis *et al.* (2002) indicated that cage housing may reduce Campylobacter flock persistence. This study was conducted to determine growth performance, intestinal microflora, incidence of pododermatitis and leg strength in broilers raised in cages and on floor pens under the hot, humid tropical condition.



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