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INFLUENCE OF HOUSING SYSTEM (INDOOR VERSUS OUTDOOR) ON BEHAVIOR, PRODUCTIVE PERFORMANCE AND IMMUNE RESPONSE OF DUCKS

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A B S T R A C T

300 ducklings one-old (100 Cherry valley ducks (CVD), 100 Moulard and 100 Pekin) were allotted into indoor group (until they were slaughtered) and outdoor group (from 3rd week of age). The obtained results showed the total confinement of ducks resulted in much feeding (2.16±0.38), drinking (5.79±0.67), standing (24.62±2.53), preening, wing stretching, wing and leg stretch, panting, total body care (25.59±1.78), floor exploration and total exploratory behavior (2.02±0.35) and aggressive behavior (0.34±0.12). Rearing ducks in closed housed resulted in significantly higher body weight and weight gain at 4th week of age than those under outdoor system (1275.88±11.95 and 870.97±8.72 g vs. 1223.98±11.67 and 803.72±8.44 g, respectively). On contrary rearing of ducks in outdoor system resulted in higher body weight and total weight gain at 6th and 8th weeks. Keeping ducks in closed system significantly increase phagocytic activity after 3rd day of vaccination (19.64±0.26 vs. 18.89±0.20) and 7th day for phagocytic index (1.62±0.03 vs. 1.48±0.02). It could be concluded that the suitable breed of ducks for broiler production under farmer's condition was affected by management systems as CVD can perform well by the outdoor system. In contrast for Moulard ducks its performance was improved by indoor system, while Pekin duck performance was less affected by system of rearing. Higher cellular immune response was observed for confinement over outdoor system of rearing.

KEY WORDS: Behavior, Ducks, Housing System, Immune Response, Productive Performance.

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1. INTRODUCTIO

Egypt is an over populated country. Among poultry, ducks can be more easily brooded, needless care and are less subjected to diseases than the chicken [17]. As such, the people of some areas are more interested in raising ducks than chicken. Exotic ducks like Pekin, Muscovy and Cherry valley White ducks are very much popular for commercial meat production under ideal farm condition. But their production performances are not known to us when they are kept in conventional system (farmer's condition).

One reason why ducks are able to tolerate high temperature is that they have a small esophagus with no crop and so they have only limited ability to store feed. This reduces heat arising from digestion and subsequent metabolic activity, preventing hyperthermia when daytime temperature increases [5].

Controlling the ducks' environment, particularly temperature, humidity, litter moisture and ammonia is crucial to duck welfare. Effective ventilation systems, high quality straw and access to some form of open water were considered important for duck welfare [11].

There is much potential to raise the level of duck production; however, the emphasis must shift from free-range system to semi-intensive systems with improvement in

nutrition and health. More intensive research into nutrition, health and other management practices is required in order to maximize the potentials of the duck [7].
This study was designed to compare the welfare and performances of three breeds of ducks (Pekin, Moulard and Cherry valley White ducks) under two housing systems (outdoor and indoor system) to find out the suitable breed of ducks for broiler production under farmer's condition.

2. MATERIAL AND METHODS

This study was conducted at duck farm of faculty of veterinary medicine, Damanhur University. The experimental designs and procedures were approved by the Committee for Animal Care and faculty of veterinary medicine of Damanhur University.

2.1. *Birds*:
A total of 300 birds represent three different genotypes of ducks were used in this study, Pekin (French strain stare 53), cherry valley duck (The world's first hybrid egg-type duck known as CV2000 was developed at Cherry Valley Farms, England) and Moulard duck (cross between female Pekin and Muscovy male). The birds were obtained from the French company, El Sadat city, Al Menofia province, Egypt.

2.2. *Experimental design*:
One hundred wing banded day old ducklings from each genotype were used in the experiment; they were housed and brooded in an open-sided house until 3 weeks of age. At three weeks of age birds within each breed were randomly divided into two groups according to housing system as:

1. Indoor group; which represented by 150 birds (50 birds from each breed) were brooded and reared in the same house without any outdoor access until they were slaughtered (floor space allowance 15 kg of life weight /m^2).
2. Outdoor group; which represented by 150 birds (50 birds from each breed) were allowed to an outdoor access (a yard supplied with a tunnel of running water) from the third week of age (floor space allowance in yard is 5 kg of life weight /m^2).

2.3. *Flock management*:
The birds were housed in a clean and well-ventilated house that had been previously disinfected by fumigation using formaldehyde gas produced by mixing formalin 40% with potassium permanganate powder at a ratio of (2:1).
The house was provided with a gas heater, in addition to incandescent lamps. Birds were bedding with a fresh and clean wheat straw litter, and equipped with a suitable waterier and feeder. Feed and clean water were supplied *ad libitum*. Ducklings of all breeds were fed the same ration as starter ration containing 21% crude protein for the first three weeks of age then grower feed of 16% crude protein until marketing. The starter and grower basal diets were obtained from a commercial feed company in Al Behaira Province, Egypt.
Ducklings were floor brooded starting with a temperature of 33 ^{O}C at the birds' level from 1 to 3 days of age, and then it was reduced gradually to room temperature (21°C) at 14 days of age [8]. All birds were healthy fed their requirements of feed according to NRC and were vaccinated with Avian Influenza (AI) vaccine at 14 days of age with 0.5 ml /dose /bird by intramuscular in the muscles of thigh.

2.4. *Behavioral observation*:
The behavioral observations were carried out one day through the week for each group from 7:00 a.m. till 5:00 p.m. A scanning observation was utilized in this study according to Martin and Frs [16] four times per day, early morning (7:00-8:00 a.m.), late morning (10:00-11:00 a.m.), early afternoon (1:00-2:00 p.m.) and late afternoon (4:00-5:00 p.m.).

2.5. *Productive performance*:
Average body weight of ducks was determined at 0 day (the beginning of the trial) and then biweekly until the end of the experiment. Feed was withdrawn for 12^{th} h with water being provided *ad libitum* before each weighing of ducks. The gain in body weight was calculated biweekly by finding the difference in weight between two successive weighing. Individual body weight gains were totalled and divided by the number of birds in each group to obtain the average body weight gain.

2.6. *Cellular immune response*:
Twenty blood samples were collected by puncture from wing vein from each group. Whole blood was collected (Heparinized tubes) after three and seven days of Avian Influenza (AI) vaccine injection to investigate the cellular immune response as follows:
2.6.1. *Phagocytic activity*:
Phagocytic activity was determined according to Kawahara et al. [13]. Phagocytic activity (PA) = Percentage of Phagocytic cells containing yeast cells.

2.6.2. *Phagocytic index*:
The number of phagocytized organisms was counted in the Phagocytic cells and called Phagocytic index (PI).

$$\text{Phagocytic index (PI)} = \frac{\text{Number of yeast cells phagocytized}}{\text{Number of Phagocytic cells}}$$

2.7. *Statistical analyses*:
The statistical analyses of the data were carried out by SAS [22]. Three way analysis of variances for behavioral observations, two way analysis of co-variance for productive performance traits and two way analysis of variances for cellular immune response data.

3. RESULTS AND DISCUSSION

3.1. *Behavioral observations*:
Birds usually rest in large groups on litter to reduce metabolic heat loss and take advantage of composted litter temperature. Birds rest with legs and feet drawn under their body to reduce both radiant and convicted heat loss and commonly place their head under a wing to reduce heat Loss from the bill [5]. The data presented in tables (1-5) showed that Cherry valley ducks exhibited much feeding, drinking panting and total body care behavior (2.11±0.54; 5.89±0.94; 8.00±1.27 and 27.79±2.22, respectively) than Moulard (1.45±0.47; 3.54±0.65; 3.39±0.69 and 16.71±1.66, respectively) and Pekin (1.99±0.44; 4.95±0.86; 3.08±0.71 and 25.63±2.64, respectively). Moreover, Moulard duck exhibited much lying; wall, floor and total exploration (83.65±3.09, 0.16±0.11, 2.21±0.45 and 2.69±0.49, respectively), while, Pekin ducks exhibited much standing idle than Cherry valley and Moulard ducks (30.94±3.93 vs. 26.15±3.49 and 16.35±3.09, respectively) and swimming activity (1.69±0.62 vs. 1.06±0.051 and 0.28±0.14, respectively). This could be attributed to little effect of commercial production system on duck behavior while, duck behavior influenced more by environment, age and physical condition. Activity at an older age incorporated more of the behaviors associated with thermal comfort (panting) and maintenance of plumage condition (dry and wet preening) [10].
The total confinement of ducks resulted in much feeding (2.16±0.38 vs. 1.22±0.32), drinking (5.79±0.67 vs. 2.80±0.41), standing (24.62±2.53 vs. 24.19±3.66), preening (18.94±1.81 vs. 14.03±1.69), wing stretching (0.34±0.13 vs. 0.08±0.06), wing and leg stretch (1.35±0.24 vs. 0.32±0.13), panting (4.97±0.77 vs. 4.53±0.69), total body care (25.59±1.78 vs. 18.95±1.63), floor exploration (1.77±0.31 vs. 0.63±0.24) and total exploratory behavior (2.02±0.35 vs. 1.02±0.32) and total aggressive behavior (0.34±0.12 vs. 0.04±0.04). Similarly, Cherry and Morris [5] mentioned that, when resting in rafts, individual birds can occasionally be seen panting to lose heat via respiration. Above

about 22°C birds start panting intermittently, increasing their rate of respiration and evaporating moisture from the trachea to lose heat and maintain homeostasis. When the temperature exceeds 32°C, birds become increasingly lethargic and reluctant to move, with no social or feeding activity and little 'duck noise'. In the study aggressive pecking was much higher indoor than outdoor and feather pecking is damaging behavior that reduces the welfare of poultry. Having feathers pulled out is painful [9], and injury and death due to cannibalism in flocks can be high [2]. These behaviors also cause economic losses for producers, since birds with fewer feathers lose heat faster and therefore consume more feed than fully feathered birds

3.2. *Productive performance*:

The analysis of covariance of the effect of breed on body weight showed that Cherry valley ducks had much initial and final body weight although they had the same age (65.58±0.71 and 3049±40.86 g) than Moulard and Pekin (52.78±0.72 and 2629.18±32.20 vs. 55.86±0.72 and 2898.92 g, respectively) although, Pekin ducks had heavier weight during the 2nd week of age (478.86±6.94), 4th week (1362.32±14.42 g) and 6th week (2273.45±22.80 g), while, the Moulard duck had an intermediate body weight, that could be attributed to the genetic difference in slaughter age between breeds as 7 weeks in Pekin ducks and Cherry valley,10 to 12 weeks in Muscovy ducks and 10 weeks in Moulard ducks [20].

With respect to body weight gain the Pekin ducks gain significantly heavier weight gain at age of 2 weeks (422.95±6.67 g) than Cherry valley (373.09±6.93 g) and Moulard (279.87±7.18 g) while, after 4th week of age the Cherry valley gained significantly heavier weight gain (898.18±10.48 g) than Moulard and Pekin (724.52±10.82 and 889.35±10.24 g, respectively); at 6th week of age (922.93±16.35 vs. 792.60±15.33 and 912.21±15.30 g, respectively); at 8th week of age (832.97±24.86 vs. 784.73±19.55 and 629.02±22.61 g, respectively) as well as the total body weight gain was significantly higher in Cherry valley ducks than Moulard and Pekin ducks (2978.80±41.50 vs. 2577.94±32.97 and 2848.83±38.40 g, respectively). From this results it could be observed that Cherry valley and Pekin ducks (Anas platyrhynochos) were of greater weight than Mule ducks (hybrids of male Muscovy ducks and female Pekin ducks) throughout the experimental period these significant differences could be attributed to the high genetic potential of common ducks (Cherry valley and Pekin ducks) for extrahepatic fattening of abdominal and subcutaneous adipose tissues than mule ducks [1].

The total confinement of ducks resulted in resulted in non-significant reduction in the body weight of ducks during the 8th week of age, while during the 4th week of age the ducks in total confinement or closed system had significantly higher body weight and weight gain than those under outdoor system (1275.88±11.95 and 870.97±8.72 g vs. 1223.98±11.67 and 803.72±8.44 g, respectively). Though several other factors also differed among the treatments (e.g., outdoor birds experienced not only different levels of light, but also differences in temperature, humidity, etc.), which limits our ability to ascribe precise relationships between particular environmental variables and phenotypic expression**.** Finally, we predicted that body mass would be larger in low-intensity light birds, as lower light intensities have resulted in larger body weights in chickens due to some unidentified mechanism [15]. Wang et al. [23] also concluded that slow-growing Gushi chickens kept only indoors characterized by significantly higher body weight compared to birds kept on free range. In general free-range access caused a reduction in body weight in chickens [3, 12].

Table 1 Effect of breed, housing system and periods of day on ingestive behavior, lying and movement activities of ducks.

Item	Ingestive behavior		Lying	Movement activities	
	Feeding	Drinking		Walking	Standing
	---------- Breed ----------				
Cherry valley	2.11±0.54	5.89±0.94	73.85±3.49^{b}	1.99±0.37	26.15±3.49^{a}
Moulard	1.45±0.47	3.54±0.65	83.65±3.09^{a}	1.81±0.36	16.35±3.09^{b}
Peckin	1.99±0.44	4.95±0.86	69.06±3.93^{b}	1.58±0.39	30.94±3.93^{a}
	---------- Housing ----------				
Indoor	2.16±0.38	5.79±0.67^{a}	75.38±2.53	1.71±0.26	24.62±2.53
Outdoor	1.22±0.32	2.80±0.41^{b}	75.81±3.66	1.93±0.38	24.19±3.66

Means within the same column under the same category carry different superscripts are significantly differ.

Table 2 Effect of breed, housing system and periods of day on body care behavior of ducks.

Item	Preening	Wing stretch	Wing & leg stretch	Panting	Total body care
	---------- Breed ----------				
Cherry valley	18.42±2.42^{a}	0.12±0.09	1.25±0.30	8.00±1.27^{a}	27.79±2.22^{a}
Moulard	11.98±1.72^{b}	0.25±0.19	1.09±0.29	3.39±0.69^{b}	16.71±1.66^{b}
Peckin	21.51±2.58^{a}	0.38±0.17	0.67±0.30	3.08±0.71^{b}	25.63±2.64^{a}
	---------- Housing ----------				
Indoor	18.94±1.81	0.34±0.13	1.35±0.24^{a}	4.97±0.77	25.59±1.78^{a}
Outdoor	14.03±1.69	0.08±0.06	0.32±0.13^{b}	4.53±0.69	18.95±1.63^{b}

Means within the same column under the same category carry different superscripts are significantly differ.

Table 3 Effect of breed, housing system and periods of day on exploratory behavior and aggressive pecking of ducks.

Item	Exploratory behavior				Swimming	Aggressive pecking
	Wall	Other	Floor	Total		
	---------- Breed ----------					
Cherry valley	0.08±0.08	0.34±0.20	1.41±0.43^{a}	1.83±0.51^{a}	1.06±0.51	0.17±0.12^{b}
Moulard	0.16±0.11	0.32±0.22	2.21±0.45^{a}	2.69±0.49^{a}	0.28±0.14	0.38±0.17^{a}
Peckin	0.00±0.00	0.00±0.00	0.54±0.23^{b}	0.54±0.23^{b}	1.69±0.62	0.18±0.12^{b}
	---------- Housing ----------					
Indoor	0.08±0.06	0.17±0.10	1.77±0.31^{a}	2.02±0.35^{a}	0.00±0.00^{b}	0.34±0.12^{a}
Outdoor	0.08±0.08	0.32±0.22	0.63±0.24^{b}	1.02±0.32^{b}	3.03±0.75^{a}	0.04±0.04^{b}

Means within the same column under the same category carry different superscripts are significantly differ.

The rearing of ducks in outdoor system resulted in an increment in body weight gain from 6th week of age (897.49±12.64vs. 854.33±12.95g), 8th week (774.35±17.73vs. 723.46±18.91 g) and total weight gain (2829.03±29.70 vs. 2774.68±31.97g). O'Driscoll and Broom [19] found that access to open water is considered good for the welfare of ducks. Provision of open water, particularly over a properly constructed drainage area, improved some aspects of duck health (improved feather hygiene and BW, and fewer dirty and blocked nostrils). The interaction between breed and housing system showed that housing of Cherry valley ducks in outdoor system resulted in significantly heavier body weight and weight gain during all weeks of experimental period (table 4&5), while, rearing Moulard in closed system resulted in the lighter body weights and weight gain during all weeks of experiment. Similarly, Katarzyna and Doktor [12] who stated that free-range rearing contributed to an increase in their body weight.

Table 4 Effect of breed, housing system and their interaction on body weight (g) of ducks.

Item		Initial	2nd week	4th week	6th week	8th week
Breed						
Cherry valley		65.58±0.71[a]	439.66±7.09[b]	1339.93±14.83[a]	2268.40±24.03[a]	3049.15±40.86[a]
Moulard		52.78±0.72[c]	332.00±7.46[c]	1047.55±14.13[b]	1843.52±22.88[b]	2629.18±32.20[c]
Peckin		55.86±0.72[b]	478.86±6.94[a]	1362.32±14.42[a]	2273.45±22.80[a]	2898.92±37.92[b]
Housing						
Indoor		57.82±0.59	415.18±5.93	1275.88±11.95[a]	2133.56±19.27	2831.03±31.17
Outdoor		58.33±0.57	418.5±5.77	1223.98±11.67[b]	2123.35±18.68	2887.13±29.50
Breed * Housing						
Cherry valley	Indoor	65.23±0.97[a]	430.80±10.03[b]	1365.93±20.86[a]	2197.68±33.77[b]	2969.38±59.96[b]
	Outdoor	65.94±1.02[a]	448.52±10.03[b]	1313.93±21.10[a]	2339.13±34.19[a]	3128.93±55.51[a]
Moulard	Indoor	52.45±1.06[d]	337.03±10.94[c]	1093.64±20.62[b]	1924.49±33.77[c]	2632.89±47.65[c]
	Outdoor	53.11±0.96[cd]	326.98±10.14[c]	1001.46±19.34[c]	1762.55±30.89[d]	2625.46±43.31[c]
Peckin	Indoor	55.78±1.03[bc]	477.72±9.81[a]	1368.07±20.62[a]	2278.52±32.60[ab]	2890.83±53.63[b]
	Outdoor	55.94±0.99[b]	480.00±9.81[a]	1356.57±20.16[a]	2268.37±31.88[ab]	2907.00±53.63[b]

Means within the same column under the same category carry different superscripts are significantly differ.

Table 5 Effect of breed, housing system and their interaction on body weight gain (g) of ducks.

Item		2nd week	4th week	6th week	8th week	Total gain
Breed						
Cherry valley		373.09±6.83[b]	898.18±10.48[a]	922.93±16.35[a]	832.97±24.86[a]	2978.80±41.50[a]
Moulard		279.87±7.18[c]	724.52±10.82[b]	792.60±15.33[b]	784.73±19.55[a]	2577.94±32.97[c]
Peckin		422.95±6.67[a]	889.35±10.24[a]	912.21±15.30[a]	629.02±22.61[b]	2848.83±38.40[b]
Housing						
Indoor		356.73±5.71	870.97±8.72[a]	854.33±12.95[b]	723.46±18.91	2774.68±31.97
Outdoor		360.53±5.55	803.72±8.44[b]	897.49±12.64[a]	774.35±17.73	2829.03±29.70
Breed * Housing						
Cherry valley	Indoor	363.47±9.71[b]	931.71±14.90[a]	827.69±22.98[c]	844.13±35.89[a]	2893.13±61.49[b]
	Outdoor	382.70±9.60[b]	864.64±14.73[b]	1018.16±23.28[a]	821.80±34.42[a]	3064.46±55.73[a]
Moulard	Indoor	284.73±10.47[c]	778.11±15.69[c]	827.17±22.41[c]	703.21±29.52[b]	2584.19±49.15[c]
	Outdoor	275.00±9.82[c]	670.93±14.90[d]	758.02±20.93[d]	866.24±25.66[a]	2571.69±43.96[c]
Peckin	Indoor	422.00±9.49[a]	903.10±14.73[a]	908.14±21.88[b]	623.04±32.53[b]	2846.72±54.76[b]
	Outdoor	423.89±9.39[a]	875.60±14.23[b]	916.29±21.39[b]	635.00±31.42[b]	2850.93±53.84[b]

Means within the same column under the same category carry different superscripts are significantly differ.

Rearing Pekin under different systems of rearing has no significant effect on both body weight or body weight gain. In turn, Knust et al. [14] reported that free-range Peking ducks achieved lower body weight compared to ducks reared indoors.

3.3. *Cellular immune response*:

The cellular immune response of the ducks to Avian influenza vaccine (table 6) showed that there no significant differences between the three ducks breed for the Phagocytic activity after the 3rd and 7th day of vaccination and Phagocytic index although however, the Pekin ducks had significantly higher Phagocytic index after 7th day of vaccination (1.59±0.04) than Cherry valley and Moulard ducks (1.57±0.04 and 1.49±0.04, respectively). These results confirmed that the immune responses varied according to breed of ducks [21].

Keeping ducks in complete confinement condition resulted in significantly higher Phagocytic activity after 3rd day of vaccination (19.64±0.26 vs. 18.89) and 7th

day for Phagocytic index (1.62±0.03 vs. 1.48±0.02). Moreover, the interaction between breed and housing system showed that keeping all breeds of ducks in closed system improve their Phagocytic activity and Phagocytic index with significantly higher Phagocytic activity and Phagocytic index in Moulard ducks kept in closed system 3 days after vaccination (20.09±0.43 and 1.74±0.09, respectively). Flocks allowed outdoor access had an increase in the susceptibility to diseases [6], and subsequently increased mortality [3, 12].

Table 6 Effect of breed, housing system and their interaction on cellular immune response of ducks.

Item		Phagocytic activity		Phagocytic index	
		3rd day	7th day	3rd day	7th day
Breed					
Cherry valley		19.11±0.27	20.2±0.53	1.68±0.06	1.57±0.04^{ab}
Moulard		19.40±0.27	19.49±0.50	1.61±0.06	1.49±0.04^{b}
Peckin		19.29±0.29	20.05±0.52	1.68±0.06	1.59±0.04^{a}
Housing					
Indoor		19.64±0.26^{a}	19.6±0.49	1.71±0.05	1.62±0.03^{a}
Outdoor		18.89±0.20^{b}	20.22±0.34	1.60±0.04	1.48±0.02^{b}
Breed * Housing					
Cherry valley	Indoor	19.27±0.43^{ab}	19.94±0.91	1.65±0.09^{ab}	1.69±0.06^{a}
	Outdoor	18.94±0.33^{b}	20.45±0.55	1.71±0.07^{a}	1.45±0.04^{b}
Moulard	Indoor	20.09±0.43^{a}	19.68±0.78	1.74±0.09^{a}	1.56±0.05^{ab}
	Outdoor	18.71±0.34^{b}	19.29±0.62	1.49±0.07^{b}	1.42±0.04^{b}
Peckin	Indoor	19.56±0.47^{ab}	19.17±0.86	1.74±0.10^{a}	1.61±0.06^{a}
	Outdoor	19.03±0.34^{ab}	20.93±0.57	1.62±0.07^{ab}	1.58±0.04^{a}

Means within the same column under the same category carry different superscripts are significantly differ

4. CONCLUSION

It was concluded that the suitable breed of ducks for broiler production under farmer's condition was affected by management systems. Modification of the environment of captive animals leads to improvements in animal welfare. Thus, water-based enrichments have to be effective in reducing feather pecking.

5. REFERENCES

1. André, J. M., Guy G., Gontier-Latonnelle K., Bernadet M. D., Davail B, Hoo-Paris R., Davail S. 2007. Influence of lipoprotein-lipase activity on plasma triacylglycerol concentration and lipid storage in three genotypes of ducks. Comp. Biochem. *Physiol. A Mol. Integr. Physiol.* **148**:899-902.
2. Appleby, M.C., Mench, J.A., Hughes, B.O. 2004. Poultry Behaviour and Welfare. CAB International,Wallingford, UK.
3. Baeza E., Lessire M., Berri C., Juin H., 2001. Compared carcass and meat characteristics of label and standard guinea fowl. Proceedings of XV European Symposium on the Quality of Poultry Meat, Kusadasi, Turkey. Pp. 73-78.
4. Batta, S.S. 2004. A study of some productive traits and their relationships in three breeds of ducks. *Al-Azhar J. Agric. Res.* **40**: 92- 109.
5. Cherry P. and Morris, T.R. 2008. Domestic Duck Production. A catalogue record for this book is available from the British Library, London, UK.
6. Christensen, J.P., Dietz, H.H. and Bisgaard, M. 1998. Phenotypic and genotypic characters of isolates of P. multocida obtained from backyard poultry and from two outbreaks of avian

cholera in avifauna in Denmark. *Avian Pathol.* **27**: 373–381.
7. Duru, S.G. Akpa N., Sai'du, L., Olugbemi, T.S. and Jokthan, G.E. 2006. A preliminary study on duck management under peri-urban system. *Livest. Res. Rural. Dev.* **18** (3) (online: http://www.lrrd.org/lrrd18/3/duru18036.htm)**}**
8. Fan, H.P., Xie, M., Wang, W.W., Hou, S.S. and Huang, W. 2008. Effect of dietary energy on growth performance and carcass quality of white growing Pekin ducks from two to six weeks of age. *Poult. Sci.* **87**: 1162-1164.
9. Gentle, M.J., Hunter, L.N.,Waddington, D. 1991. The onset of pain related behaviours following partial beak amputation in the chicken. *Neurosci. Lett.* **128**: 113–116.
10. Jones, T.A., Dawkins M.S. 2010a. Effect of environment on Pekin duck behaviour and its correlation with body condition on commercial farms in the UK. *Br Poult. Sci.* **51**: 319-325.
11. Jones, T.A., Dawkins M.S. 2010b. Environment and management factors affecting Pekin duck production and welfare on commercial farms in the UK. *Br Poult. Sci.* **51**: 12-21.
12. Katarzyna, P. and Doktor, J. 2011. Effect of free-range raising on performance, carcass attributes and meat quality of broiler chickens. *Animal Science Papers and Reports* **29**: 139-149.
13. Kawahara, E., Ueda, T. and Nomura, S. 1991. In vitro phagocytic activity of white-spotted shark cells after injection with Aermonas salmonicida extracellular products. *Gyobyo Kenkyu* **26**: 213-214.
14. Knust, U., Wicke, M., Pingel H., Lengerken, G.V., Salomon V`. 1995. Muscle structure and meat quality of ducks reared on pasture and under intensive conditions respectively. Proceedings of XII European Symposium on the Quality of Poultry Meat. Zaragoza. Pp. 189-193.
15. Lien, R.J., Hess, J.B., McKee, S.R., Bilgili, S.F. and Townsend, J.C. 2007. Effect of light intensity and photoperiod on live performance, heterophil-to-lymphocyte ratio, and processing yields of broilers. *Poult. Sci.* **86**: 1287– 1293.
16. Martin, P. and Frs, P.B. 1986. Measuring behaviour an introductory guide. Cambridge university press. Cambridge, London. Pp. 48-49.
17. Modak, M.K. 1996. Meat yield performances of Pekin × Pekin, Pekin × Desi and Pekin× Khaki Campbell. MS Thesis, Bangladesh Agricultural University, Mymensingh.
18. Muriel, A., Pascual M.R. 1995. Carcass and meat characteristics from free range chickens. Proceedings of XII European Symposium on Quality of Poultry Meat, Zaragoza. Pp. 219-222.
19. O'Driscoll, K.K., Broom D.M. 2011. Does access to open water affect the health of Pekin ducks (*Anas platyrhynochos*)? *Poult. Sci.* **90**: 299-307.
20. Pingel, H. 1999. Influence of breeding and management on the efficiency of duck production. Lohmann information, Halle, Germany No. 22 / 1999. Pp. 7
21. Rana, M., Hossain, M.T., Islam, M.A., Rahman, M.M., Alam, M.K. and Dutta, U.K 2010. Comparative immunogenicity study in ducks of different breeds available at coastal regions of Bangladesh against duck plague and duck cholera vaccines. *Int. J. Bio. Res*. **2**: 23-27.
22. Statistical analysis system (SAS) 2002. User's Guide, Institute, Carry, North Carolina. Library of Congress Cataloging-in-Publication Data.
23. Wang, K. H., Shi S.R., Dou T.C., Sun H.J. 2009. Effect of a free-raising system on growth performance, carcass yield, and meat quality of slow-growing chicken. *Poult. Sci.* **88**: 2219-2223

مجلة بنها للعلوم الطبية البيطرية
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تأثير نظام الأسكان (المغلقة مقارنة بالمفتوحة) على سلوكيات، الأداء الأنتاجى، والأستجابة المناعية للبط

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الملخص العربى

تم تقسيم عدد 300 بطة عمر يوم (100 بطة شيرى فالى، 100 بطة بغالى و 100 بطة بكينى) الى مجموعتين الأولى تم تربيتها تربية داخلية فى مساكن مغلقة والأخرى تم تربيتها فى المساكن حتى الأسبوع الثالث ثم تم فتح باب الى خارج العنبر حيث يوجد بركة مياة حتى عمر الذبح (8 أسابيع). أظهرت النتائج المتحصل عليها أن بط الشيرى فالى كان أكثر معدلات تناول غذاء، شرب، لهث، وعاية بالجسم عن البط البغالى والبط البيكينى. أدى تربية البط فى المساكن دون ملاعب الى زيادة معدلات تناول الغذاء (0.38±2.16)، الشرب (0.67±5.79)، الوقوف (2.53±24.62)، تطمير الجسم، فرد الجناح، فرد الجناح والرجل، اللهث، الرعاية الكلية للجسم، أستكشاف الأرضية، المعدل الأجمالى لسلوك الأستكشاف(0.35±2.02) وكذلك للنقر العدائى (0.12±0.34). كان لبط الشيرى فالى أعلى وزن فى بداية التجربة على الرغم من تساوى الأعمار وأستمرت هذه الزيادة حتى الأسبوع الثامن بينما أزداد وزن البط البكينى عند الأسبوع الثانى وارابع والسادس. كذلك أكتسب البط البكينى وزنآ عالى المعنوية عن باقى المجموعات فى الأسبوع الثانى بينما من الأسبوع الرابع وحتى نهاية التجربة أكتسب البط الشيرى فالى وزنآ عالى المعنوية عن المجموعات الأخرى. أكتسب البط فى النظام التسكين المغلق وزنآ أعلى فى الأسبوع الرابع(11.95±1275.88جم) بمعدل زيادة وزن (8.72±870.97 جم) بينما أكتسب البط فى النظام المفتوح وزنآ أعلى فى الأسبوع السادس والثامن وكذلك أجمالى الوزن المكتسب (29.70±2829.03جم). لم تكن هناك اختلافات كبيرة بين سلالة البط الثلاث فى نشاط الخلايا الأكولة بعد اليوم 3 و 7 من التطعيم، وكذلك مؤشر الخلايا الأكولة ومع ذلك، فإن البط بكينى كان أعلى معنويا فى مؤشر الخلايا الأكولة بعد اليوم 7 من التطعيم من البط الشيرى فالى والمولر. وعلاوة على ذلك، فإن تربية البط في النظام المحتبس يؤدى إلى زيادة كبيرة في نشاط الخلايا الأكولة بعد يوم 3 من التطعيم (19.64 ±0.26 مقابل 18.89 ±0.20) ويوم 7 للمؤشر أكلة (1.62 ± 0.03 مقابل 1.48 ±0.02). من ذلك نستخلص أن سلالة البط المناسبة لإنتاج اللحم تتأثر بواسطة نظم التربية المختلفة وتمثل ذلك فى أن البط الشيرى فالى يمكن أن يؤدي بشكل جيد فى نظام التربة فى النظام المفتوح. وعلى العكس فإن البط المولر يتحسين أدائه بالتربية المحبوسة داخل العنبر ، في حين كان البط البكينى الأقل تأثرا من حيث الأداء بنظم التربية المختلفه. وقد لوحظ إرتفاع الاستجابة المناعية الخلوية فى التربية المغلقة عن التربية الحرة فى الهواء الطلق.

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