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The Effect of High Environmental Temperature on Growth Performance of Japanese Quails with Different Body Weights

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Abstract: In this study, it was aimed to determine the effect of high environmental temperature on live weight, feed consumption, feed efficiency, survivality and some carcass features of Japanese quails with different body weights. During such research, total 550 quail chicks were used in addition, two different temperature groups as being the control (18-24°C) and experiment (35°C) groups and two different body weight groups consisting of heavy (live weight > 27 g) and light (live weight < 27 g) groups were identified. As the result of the research, the live weight, feed consumption, feed efficiency and survivality were found less at 35°C compared with 18-24°C in both heavy and light weight groups. Such decrease was noted as more efficiently in heavy group.

Key words: Japanese quail, environmental temperature, body weight

Introduction

The negative effects of the stress of high temperature on poultry are a widely known problem for a long time. This high temperature has the negative effects on poultry such as an increase on body temperature; a decrease on feed consumption, feed efficiency, live weight and growth speed in addition to a decrease on productivity and quality of the eggs. If the environmental temperature becomes higher in significant rate and the cooling becomes insufficient, the mortality shall also be observed in animals (Ahmad *et al*., 1974; Alarslan and Karadas, 1999; Al-Fataftah, 1987; Bohren *et al*., 1981; Bohren *et al*., 1982; Donkoh, 1989; El Boushy and Van Marle, 1978; Horst and Becker, 1992; Komiyama and Ueno, 1977; Leeson, 1986; Parker *et al*., 1972; Poyraz *et al*., 1991; Salman *et al*., 1985; Smith and Oliver, 1971; Ueno *et al*., 1978).

The small size animals are affected with such high environmental temperatures less than the other big size ones. The reason of this fact is that the size of body surface is playing a significant role in temperature loss through particularly radiation and convection ways. While the size of the animal becomes bigger, the body surface per unit weight becomes smaller. Since the body surface per live weight in big size animals is smaller, those animals have the significant difficulty to lose the temperature (Komiyama and Ueno, 1977; Yalcin, 1981). In respect of poultry breeding, optimum environmental temperature varies depending on the different periods of such breeding as of the moment after incubation. Even if a great care is given to the required temperature arrangement compared with the breeding periods during the intensive breeding performance, the required measures should be taken to ensure the cooling inside the coop when the outside temperature reached to the extreme values. The most of the problems occurred in breeding period is related to those insufficiently taken measures. Such mentioned problems have been noticed at the top level in countries and the regions taking part at tropical climate zones and those measures are mostly requiring the highest expenditures to be included in significant investments. Therefore, the researches regarding to the effects of the high environmental temperatures on poultry and the relevant solutions have gained a definite importance in such concerns (Poyraz *et al*., 1991).

In this research, it is aimed to identify the effects of the high environmental temperatures (35°C) on live weight, feed consumption and feed efficiency, survivality and some carcass features of the quails with different body weights.

Materials and Methods

The animal material of the research is constituted by total 550 quails, which passed from the incubation at the same day. The chicks have placed into motherhood machine for 1 week. During such period, it was tried to ensure an environmental temperature at 35°C for the chicks. After the first week, the rest 528 chicks were separated to the temperature groups as being the control (18-24°C) and experiment (35°C) groups. In both temperature groups, two body weight groups were constituted as being heavy (live weight > 27g) and light (live weight <27g) groups. 132 quails were also included in each body weight group (66 males + 66 females).

The heating process was achieved through the electrical thermostat adjusted radians in divisions of experiment group. The quails were placed equally (3 quails) into the cages consisting of four floors and each floor was considered as the repetition. The live weight measures were done with the electronic scale in basis of 0.01 g. Such measures were done on the day and at the time equal to the day of the birth.

Table 1: The results of statistical analysis related to weekly live weights (g), feed consumption (g), feed efficiency and survivality (%)

Features		Control (18-24°C)			Experiment (35°C)			P		
		n	$\bar{x}$	$S_{\bar{x}}$	n	$\bar{x}$	$S_{\bar{x}}$	W	T	WXT
1st week	heavy									
	light	132	29.68	2.08	132	28.98	3.24	***	-	-
2nd week	heavy	132	25.82	2.13	132	25.40	3.75			
	light	121	68.11	3.76	120	66.54	2.48	***	**	**
	heavy	121	56.51	3.96	122	56.42	3.64			
3rd week	light	116	96.01	3.19	113	95.00	2.65	***	-	-
	heavy	115	84.00	5.27	117	83.78	4.40			
4th week	light	113	126.17	5.98	110	124.35	4.18	***	*	*
	heavy	112	119.14	7.38	111	118.07	6.36			
5th week	light	109	157.44	9.37	105	155.15	6.35	**	*	*
	heavy	109	150.52	10.18	106	148.86	8.97			
6th week	heavy	107	174.95	11.56	102	170.58	9.80	**	**	-
	light	109	170.26	12.35	103	166.42	10.08			
feed	heavy		570.43	9.33	538.49	12.87				
cons.	light		512.40	11.90	489.53	13.03		***	***	***
feed	heavy		3.35	0.25	3.83	0.29				
eff.	light		3.73	0.25	4.01	0.38		**	**	*
surv.	heavy		88.14	6.44	86.36	7.90				
eff.	light		88.13	6.25	87.27	7.47		-	*	*

W: Weight T: Temperature W X T: The interaction of weight and temperature
*** : P<0.001 ** : P<0.01 * : P<0.05 - : P>0.05

Group feeding was applied to the quails and the feed consumption was identified once 7 days. By deducting the rest feed from the total feed given for one week then dividing into the numbers of the chicks, the average of daily feed consumption was found per animal. The feed efficiency was calculated by the proportion of the total feed consumed per quail until the 6th week regarding to the gained live weight compared with the 1st week weight.

Subject to record the death quails, the numbers of living quails per week were determined at the end of the application period. The survivality of the quails was founded by the proportional calculation of the numbers lived until the 6th week as to the numbers of the living chicks at the beginning of the 1st week. By the purpose of identifying the carcass features, 20 quails from each group (10 males + 10 females) were slaughtered at the end of the 6th week.

Regarding to the statistical evaluations, multi functional variance analysis was made to determine the effects of temperature and weight factors on investigated features. Such mentioned statistical analysis were achieved with SPSS 10 set program (Ozdamar, 1997).

Results and Discussion

The weekly live weights, feed consumption, feed efficiency, survivality and some carcass features which were investigated up to the end of the 6th week in quails with different weights included in both control (18-24°C) and experiment (35°C) groups in addition to the results of multi functional variance analysis including standard errors are given in Table 1 and 2.

From the point of view of the weekly live weights, the effect of the temperature was identified as important on the 2nd, 4th , 5th and 6th week but the weight X temperature interaction is important only on the 2nd and 4th weeks (P<0.05-0.001). In research, the live weights from the 1st week up to 6th week, were identified as the smaller at 35°C than the ones at 18-24°C in both heavy and light groups. Such result is also fitting into many findings of the researches, because it was noted that the high temperatures have the negative effects on live weight and the growth speed on poultry, by many researchers (Ahmad *et al.*, 1974; Bohren *et al.*, 1981; Donkoh, 1989; El Boushy and Van Marle, 1978; Horst and Becker, 1992; Poyraz *et al.*, 1991; Salman *et al.*, 1985; Smith and Oliver, 1971). Such reductions, which were shaped on live weights depending on the high temperatures in this study were observed generally as the greater in heavy group compared with the light group.

The feed consumption in control and experiment groups, respectively was identified as 570.43 and 538.49 g in heavy group and 512.40 and 489.53 g in light group and the numbers of feed efficiency as 3.35 and 3.83 in heavy group and 3.73 and 4.01 in light group; Besides, the effect of the weight, temperature and weight X temperature interaction in both groups was found as important at different levels (P<0.05-0.001). In research, it was found that the high temperature (35°C) reduced the feed consumption and the feed efficiency in both weight groups significantly from the point of view of statistically. Such obtained result is also in conformity with the findings indicating that the high temperature reduces the feed consumption and the feed efficiency

Table 2: The results of statistical analysis related to some carcass features in weight and temperature groups

Features		Control (18-24°C)			Experiment (35°C)			P		
		n	$\bar{x}$	$S_{\bar{x}}$	n	$\bar{x}$	$S_{\bar{x}}$	W	T	W X T
slaughter	heavy	20	182.05	11.36	20	182.31	9.35			
weight (g)	light	20	167.80	12.36	20	167.35	8.58	***	-	-
carcass	heavy	20	115.00	10.35	20	117.55	8.38			
yield (g)	light	20	101.44	9.38	20	102.29	8.36	***	-	-
carcass	heavy	20	61.75	4.36	20	63.10	4.65			
yield (%)	light	20	59.02	4.25	20	59.53	4.37	**	-	-

W: Weight, T: Temperature, W X T: The interaction of weight and temperature, *** : P<0.001, ** : P<0.01, - : P>0.05

(Al-Fataftah, 1987; Bohren *et al*., 1982; Donkoh, 1989; El Boushy and Van Marle, 1978; Leeson, 1986; Parker *et al*., 1972; Poyraz *et al*., 1991; Salman *et al*.,1985).

Just as similar with the weekly live weights, such decrease depending on the high temperature in respect of the feed consumption and the feed efficiency becomes higher in heavy group. Depending on such result, it was observed that the weight X temperature interaction is an important concern regarding to such features. Such interaction may be related to the size of the body surface (Komiyama and Ueno, 1977; Yalcin, 1981).

The survivality decreased at high temperatures and such decrease became higher in heavy quails (P<0.05). Those findings have also showed that the high temperature effected the survivality negatively just as the similar with the other various physiological function and productivity concerns (Al-Fataftah, 1987; Bohren *et al*., 1982; El Boushy and Van Marle, 1978; Leeson, 1986; Salman *et al*.,1985) and such negative effect also became more significantly in big size animals (Komiyama and Ueno, 1977; Yalcin, 1981).

From the point of the view of the carcass weight and carcass productivity from the carcass features which were investigated in this research, the effect of the high temperature in both weight groups has not been found as important statistically.

As a result of this research, it was concluded that the high temperature has affected the live weight gain and the survivality negatively by decreasing the feed consumption and the feed efficiency and such negative result became higher depending on the increase of the body weight.

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