ISSN 1682-8356
ansinet.org/ijps

INTERNATIONAL JOURNAL OF

POULTRY SCIENCE

ANSInet
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International Journal of Poultry Science 3 (7): 463-467, 2004

The Effect of High Temperatures on Breeding and Survival of Japanese Quails That Are Bred under Different Temperatures

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Abstract: The aim of this study was to determine the effect of higher temperatures on the weight, feed consumption, capacity of benefiting from feed, some carcass features and the survival rates of the Japanese quails placed in different ambiences. Two groups were arranged in this research according to temperature as the control (18-24°C) and trial (35°C) groups, and the quails were placed close together in 120, 90 and 72 cm^2 cages for each temperature group. It was observed that the values of the live weight, feed consumption, capacity of benefiting from the feed, and carcass features decreased due to the increase in placement temperature under higher temperatures. In order to minimize the stress that might occur related to the quails under higher temperatures and to ensure the growth performance not to be reduced, it should considered not to place more than 3 quails in an area of 120 cm^2.

Key words: Japanese quail, heat stress, density stocking, growing characteristics

Introduction

The success of quail breeding mostly depends on the environmental conditions. Therefore, the environmental conditions should be arranged as required. The fundamental factors to be considered in such arrangement are feed, water, temperature, illumination, ventilation and the placement density (Yazgan *et al*., 1996).

The winged animals under higher temperature stress limit the physical activities and since they lose excessive moisture their water consumption also increases through evaporation due to increase of respiration frequency. On the other hand, the feed consumption is affected negatively resulting weakness and regression of development, thus decrease is observed in the increase of live weight, capacity of benefiting from the feed and the survival rate (Leeson, 1986; Altan *et al*., 1995; Teeter *et al*., 1985). In addition, purins that were intake with the diet may decrease since feed consumption reduces due to the higher temperature. Furthermore, the purines derive from the feeds in diet (i.e glutamic acid and glycerin) may be less produced and accordingly the quantity of uric acid may reduce. The defects on the way of purin synthesis may cause immune deficiency and the sensitiveness to the infections (Tufft and Nockles, 1991; Griffin, 1989; Fillion *et al*., 1984; Rodwel, 1991).

Likewise, the researches that were carried out in this respect have indicated that the values of the live weight; carcass weight, carcass output, feed consumption and the living strength were affected negatively because of the higher temperatures and less living spaces for the quails. (Özbey and Ekmen, 2000; Ozcelik *et al*., 1999; Nagarajan *et al*., 1991; Baumgartner *et al*., 1990; Singh and Panda, 1987, Wilson *et al*., 1965; Das *et al*., 1990). In most of the researches that were carried out to indicate the effects of the higher temperatures on the winged animals, it was noted that the said stress became obvious in particularly reduction of feed consumption and increase in water consumption. Furthermore, it was observed that the constant and the most important effect of higher environmental temperature occurred in reduction of feed intake that was considered as the most important factor in change of the live weight values. (Baumgartner *et al*., 1990; Wilson *et al*., 1965; Das *et al*., 1990). It has an inevitable effect on various productivity features that were arisen under the formation of some fundamental physiological changes or a contribution partially or entirely of the said physiological features such as reduction of feed consumption, increase of water consumption, increase of body heat and increase of respiration frequency due to the stress of higher temperature as well as even on the survival rates (Baumgartner *et al*., 1990).

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 study, it was researched to find out the effects of the higher temperature (35°C) on the live weight, survival rate, feed consumption, capacity of benefiting from the feed and the carcass values among the breeding features of Japanese quails that were bred in various placement temperatures.

Materials and Methods

The animal material of the research is constituted by total of 600 quails, which passed from the incubation at the same day. The chicks that were taken from the hatching machine were put into the main machine to keep them for 1 week after the releasing weight of the broilers was noted. In this period, the broilers were provided with the temperature of 35°C.

Following the first week, 264 chicks (66 male + 198 female) from total 528 chicks, which were weighed previously, were placed into the room under the variable temperature (18-24°C degree) for the control group; and the other rest of 264 chicks (66 male + 198 female) were put into the breeding cages (19x19x19 cm) under fully controlled constant temperature of (35°C degree) for the trial group.

The placement density groups were arranged in the manner of placing the quails as 3 (120 cm^2), 4 (90 cm^2) and 5 quails (72 cm^2) from both temperature groups. Each layer involved in the cages consisting of 4 layers and ten divisions was considered as a repeat.

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.

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, 30 quails from each group(15 males + 15 females) were slaughtered at the end of the 6th week.

In the statistical evaluations, the multi-factorial variance analysis was applied to find out the effects of the temperature and the placement density factors on the researched features (Özdamar, 1997). The said statistical analyses were done with SPSS 10 Package Program.

Results

The average findings of the weekly live weights, some carcass features, feed consumption and the capacity of benefiting from the feed as well as the living strength, which were researched until the end of 6th week, of the quails under various placement temperatures in both control (18-24°C degree) and trial (35 ℃) groups that were arranged due to the environmental temperatures in the research and the results of the multi-factorial variance analysis were given in the Table 1.

Even if the effect of the placement density and the temperature was found important ($P<0.001$) statistically for every week except 1 week in respect of the weekly live weights, the weight x temperature interaction was important for only 2nd and 5th weeks ($P<0.01$). It is possible to say that the differences between the placement density and the temperature groups in respect of the carcass weight ($P<0.001$) and the difference only among the placement density groups in respect of the carcass output were found important statistically ($P< 0.01$).

In the course of the growth period, the feed consumption and the capacity of benefiting from the feed per animal were found in control group as 585,09g and 3,88g at the placement density of 120 cm^2; as 555,21g and 3,85 at 90 cm^2 ; as 512,30 g and 3,60 at 72 cm^2 ; in trial group as 553,09 g and 3,78 at 120 cm^2; as 517,07 g and 3,73 at 90 cm^2 ; as 509,19 g and 3,57 at 72 cm^2 thus, the effect of placement density and the temperature on both features was found important ($P<0.01$). The effect of the placement density X temperature interaction on the feed consumption ($P<0.05$) and the capacity of benefiting from the feed ($P<0.01$) was found important.

The average living strength (%) in the periods until the sixth week was found as 86.61% at 120 cm^2; as 89.02% at 90 cm^2 ; as 88.26% at 72 cm^2 under 18-24°C ; as 85.27% at 120 cm^2 ; as 86.93% at 90 cm^2; as 86.97% at 72 cm^2 under 35°C. The effect of the placement density, the interaction of the temperature and placement density x temperature was not considered important statistically.

Discussion

In the end of the period when high temperature (35°C) was applied to the quails, the live weight values became less in various placement density. This conclusion was conforming to many research findings because it was noted by many researchers that high temperature and the placement density had negative effect on the live weight and growing up speed of the winged animals

Table 1: The results of statistical analysis relating to weights, carcass features, feed consumption, feed efficiency and survivality

Features	Control (18-24°C)			Experiment (35°C)			P
	n	$\bar{x}$	$S_{\bar{x}}$	n	$\bar{x}$	$S_{\bar{x}}$	
1st week	282	28.64	2.92	282	27.93	2.48	-
2nd week	263	63.25	2.51	260	61.30	2.46	*
3rd week	251	91.75	2.64	247	87.73	2.57	*
4th week	242	126.01	5.39	237	120.61	2.52	**
5th week	234	159.69	5.57	228	148.90	5.41	**
6th week	229	177.61	2.61	220	167.78	2.57	**
Slaughter weight (g)	40	178.23	2.53	40	168.32	2.89	**
Carcass yield (g)	40	123.92	2.58	40	109.40	5.28	**
Carcass yield (%)	40	69.57	3.65	40	65.02	2.89	*
Feed consumption (g/hy)		589.47	5.11		489.68	4.96	**
Feed efficiency (%)		3.52	0.24		3.93	0.25	*
Survivality (%) (1-6th week)		81.12	0.62		78.03	0.56	-

-: P>0.05 * : P<0.05 ** : P<0.01

(Salman *et al.*, 1985; El Baushy and Van Marle, 1978; Bohren *et al.*, 1981; Smith and Oliver, 1971; Poyraz *et al.*, 1991; Donkoh, 1989; Horst and Becker, 1992, Okan, 1999; Özbey and Ekmen, 2000; Özçelik *et al.*, 1999; Nagarajan *et al.*, 1991). On the 6th week of growing, the differences between the live weight values in the temperature groups and the placement density were found important (P<0.001).

In the research, it was observed that the reduction occurred in the live weights became higher in the general placement density depending on the higher temperature. As it is seen, the values of live weight reduced as the cage space of the quails narrowed, that is to say the density increased, with respect to the high temperature in the growing period.

As a consequence of the ongoing growth, the placement crowds in 120, 90 and 72 cm^2 spaces, temperature groups and the differences between the values of the carcass weights (P<0.001) were found significant. The carcass weight and carcass values of the quails that were applied high temperature have decreased in different placement density in the growth period. The values indicated by lots of scientists are conformant with the fact that high temperature and placement density affected the carcass weight and carcass output negatively (Baumgartner *et al.*, 1990; Caron *et al.*, 1990; Özbey and Ekmen, 2000).

In the research, it has been statistically found that high temperature (35°C) decreased feed consumption and capacity of benefiting from feed at significant rates (P<0.01). In addition to high temperature, the narrowing space reserved for the quails has negative effect on feed consumption (P<0.05) and capacity of benefiting from feed (P<0.01). This finding is conformant with the findings indicating that high temperature decreases feed consumption and capacity of benefiting from feed at significant rates (Salman *et al.*, 1985; El Baushy and Van Marle, 1978; Poyraz *et al.*, 1991; Donkoh, 1989; Al-Fataftah, 1987; Bohren *et al.*, 1982; Leeson, 1986; Okan, 1999; Özbey and Ekmen, 2000; Das *et al.*, 1990; Sahin *et al.*, 2001).

As in weekly live weights, the reduction in feed consumption and capacity of benefiting from feed due to high temperatures got more with the increasing density in the placements. It is obvious that the increase in the ambience temperature and the increasing narrowness of the place decrease the feed consumption of the quails. Because reduction of feed consumption due to high temperatures might result in defects in the ways of Purin synthesis (Rodwel, 1991; Tufft and Nocles, 1991), this will also result in immune deficiencies as well as sensitivities against infections in the quails. Consequently, the quails placed in large spaces in the control group that consume more feed and acquire more nutriments. The increased consumption of feed results in productivity. Previous studies support these findings as well (Bohren *et al.*, 1982; El Baushy and Van Marle, 1978; Özbey and Ekmen, 2000; Teeter *et al.*, 1985; Wilson *et al.*, 1972).

According to one of the researches, Muiruri and Harrison (1991) determined that even if the food consumption was 143.1 gr under the room temperature of 35°C, it became 163.1 g under the room temperature of 25°C. Hurwitz *et al.* (1980) pointed out that a stable temperature between 12 and 20°C had no negative effect on the live weight, however the live weight decreased by 2% for each 1°C after the temperature of 20°C.

High temperature and density of placement affect live weight and growth process negatively as well as reducing carcass weight and carcass output. These findings are similar to the scientific studies (Bohren *et al.*, 1981; Bohren *et al.*, 1982; El Baushy and Van Marle, 1978; Huston, 1965; Okan, 1999; Özbey and Ekmen, 2000; Poyraz *et al.*, 1991; Smith and Oliver, 1971; Teeter *et al.*, 1985; Wilson *et al.*, 1965; Wilson *et al.*, 1972).

In the breeding period (1-6 weeks), no significant changes were determined in the survival rates as a result of high temperature application and density of the placement per quail. The obtained survival rates are similar to the rates in the study of Muiruri and Harrison, (1991); As temperature stress negatively affects breeding period in the studied period, the adaptation of the quails to the high temperature and narrowing placement from the 1st week (Donaldson *et al.*, 1991; Donkoh, 1989; Freeman, 1985) can be considered as a reason for why it has no negative effect on the survival rates.

As a result, the stress factors caused by an increase in temperature and narrowing placements during breeding period shall negatively affect the metabolism and growing as well as reducing feed consumption, carcass weight and carcass output.

It was pointed out that the temperature increase results in immune deficiency and sensitivity against infections in the quails. No significant result was obtained statistically in the survival rates of the quails, as the quails were adapted to the temperature varieties when they were still chicks in the first week of breeding.

In order to minimize the stress and prevent decrease of growth performance in the high temperature ambiences, it must be noticed to allow 360 cm^2 space per 3 quails in the placement area.

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