Journal of Animal and Veterinary Advances 8 (12): 2608-2612, 2009
ISSN: 1680-5593

Effects of Some Climates Parameters of Environmentally Uncontrollable Broiler Houses on Broiler Performance

Adil Akyuz
Department of Biosystem Engineering, Faculty of Agriculture,
Kahramanmaras Sutcu Imam University, Kahramanmaras, Turkey

Abstract: Environmental conditions of commercial broiler house, such as temperature, relative humidity and lightening, on the performance of broiler in winter and summer months in Kahramanmaras province was determined in this experiment. After 42 days of rearing period average of temperature, relative humidity and light intensity of poultry house were measured in summer months 30.56-26.60°C, 32.22-49.33% and 55.1 wat m^{-2} in winter months 29.5-13.93°C, 67.55-79.15% and 49.33 watt m^{-2}, respectively. Lost of live weight was found to be 23 and 58.9% in summer and in winter months, respectively. As a result insufficient poultry house environmental conditions were detected in broiler enterprise which reduces the economic efficiency of enterprise.

Key words: Temperature, relative humidity, light intensity, broiler performance, poultry house and environmental conditions

INTRODUCTION

Improvement in commercial broiler performance started from 1950's together with selection of genetically superior birds and improvement in ambient factors such as feeding and housing, which resulted in decrease slaughtering age to 42 days and increase body weight to 2 kg (Havenstein *et al*., 1994; Leterrier *et al*., 1998).

In animal production genotype and environment are two main factors that affect output. Output lost during the broiler production stage is might be due to genotype, ambient factors and defect of management. Another macro factor in the broiler production is climate (Cahaner and Leenstra, 1992). High environmental temperatures during summer months significantly reduce feed intake and causes slower growth rates of broilers (Bonnet *et al*., 1997). After feed intake by animals due to metabolic utilization of nutrients, heat production increases. In order to decrease danger increased heat from the body, animals reduce the feed intake, which cause significant reduction in feed efficiency and live body weigh gain (May and Lott, 1992; Howlider and Rose, 1989; Leenstra and Cahaner, 1992).

For many years, researchers have been investigating the effect of high environmental temperature on the performance of different poultry species and they have found that high environmental temperatures have deleterious effects on productive performance (Mashsly *et al*., 2004). Heat stress depresses body weight and is generally accompanied by suppression of feed in take, which could be the cause of the decline in production. In addition, chronic heat exposure significantly decreased protein digestion (Larbier *et al*., 1993) and feed digestibility of the different components of the diet decreased with exposure of broiler chickens to high temperatures (Bonnet *et al*., 1997).

Broiler chickens have usually been kept on a continuous or nearly Continuous Lighting (CL) schedule so as to maximize feed intake and growth rate. However, it has been reported that performance of broiler chickens is improved by Intermittent Lighting (IL) schedules compared with such CL (Rahimi *et al*., 2005). The broiler chickens reared under IL schedules showed a temporary growth delay after change at an early age from CL to IL (Rahimi *et al*., 2005). As birds under IL will be quiet during a dark period, it is assumed that the reduction of activity during darkness may result in lower heat production, higher feed efficiency or both.

Few studies are available that address the effects of climate parameters such as heat, lighting and humidity on production parameters of broilers. Therefore, the present study was conducted in order to determine the effects of Mediterranean climates (heat, lighting and humidity) and poultry house conditions on production performance of broilers from commercial reared broiler in Kahramanmaras province, Turkey.

MATERIALS AND METHODS

Research was full filed into the commercial poultry house which has 11.25×18.28 m outside dimension and floor area was divided into 20 pens (each of 4.20×1.80 m).

Long side of poultry house was positioned at West-East direction. Side wall height is 2.40 m and floor area is 188.77 m^2.

In winter 600, in summer 920 one-day old broiler chicks (Ross 308) were obtained from a local commercial hatchery. Chicks were randomly distributed in poultry house which containing 20 floor pens after weigh out broiler chicks at 2 weeks of age. Along the experiment (42 days) temperature, humidity and lighting in poultry house was measured by 12 data recorder. Data recorders were settled into middle of the each pen which 1.25 m height from floor and programmed to collect data from each 30 min during the 42 days rearing period. Also feed consumption and died chicks were daily recorded. Data were analyzed using stepwise method.

RESULTS AND DISCUSSION

Results obtained from experimental poultry house during the summer and winter seasons were summarized in Table 1-2 and Fig. 1-7.

Temperature: In summer months, measured average inside poultry house temperature for 1-2 weeks was 30.56°C, which was acceptable, however, average temperature 26.60°C for 3-7 weeks was found high (Table 1) (Reece and Lott, 1982). Obtaining high temperature in summer might be due to insufficient natural ventilation by window. Uncontrolled high temperature resulted in extreme breathing, gathering in quite and secluded places and death in broilers.

In winter months, measured average inside poultry house temperature for 1-2 weeks was 29.5°C and for 3-7 weeks was 13.93°C (Table 1), which is too low (Reece and Lott, 1982). To catch up optimum temperature additional heating was done in the poultry house. However, due to low capacity, non heat insulation of poultry house and high costs of heating prevent to reach optimum temperature during the production. Insufficient heating resulted in gathering of chicks under the heater which increased in crushed and death of broilers.

Relative humidity: Relative humidity of poultry house was found 32.22 and 49.33% for 1-2 and 3-7 weeks respectively in summer which are relatively low. Dry and dusty air observed in the poultry house due to low humidity.

In winter relative humidity of poultry house was found 67.55 and 79.15% for 1-2 and 3-7 weeks, respectively which are relatively higher than desired levels. Weakness and difficulties in breathing of broilers was observed which thought to be due to high humidity. In addition, extreme moisture was intensified from the windows and doors of the poultry house which flows through the wall to floor. Due to this situation wet and moldy litter was observed in the poultry house. Ineffective ventilation during the winter months failed to balance humidity and heat in the poultry house, which is the important matter producer meet.

Lightening: Measured average of 42 days light intensity for summer months was 55.1 whatt m^{-2} and for winter months was 49.33 whatt m^{-2}, which are very higher from optimal conditions (Rahimi *et al*., 2005). Due to position of poultry house at the direction of West-East sun light entered the poultry house through the windows along the day. Therefore high light intensity measured and cannibalism observed among broilers in poultry house.

Table 1: Summer

Weeks	Poultry house conditions Temperature (°C)	Humidity (%)	Light (whatt m^{-2})	Mortality (Number)	Live weight (g)	Feed consumption (g)	Feed convertionratio (%)
1	32.55	27.81	63.93	3.00	172.19	161.82	0.94
2	28.57	36.62	56.90	2.00	405.45	531..23	1.31
3	27.18	43.07	45.05	2.00	780.59	1007.29	1.29
4	25.83	46.99	67.51	3.00	1235.12	1681.84	1.36
5	26.26	59.53	52.47	4.00	1630.47	2463.26	1.51
6	27.12	47.71	44.74	6.00	2042.08	3387.72	1.66

Table 2: Winter

Weeks	Poultry house conditions Temperature (°C)	Humidity (%)	Light (whatt m^{-2})	Mortality (Number)	Live weight (g)	Feed consumption (g)	Feed convertionratio (%)
1	29.03	68.28	52.20	8.00	106.43	203.00	1.91
2	29.97	66.81	41.72	72.00	244.81	525.00	2.14
3	13.52	76.42	39.55	64.00	449.30	875.00	1.95
4	9.73	79.55	45.71	88.00	590.26	1225.00	2.08
5	16.24	80.14	64.90	49.00	778.25	1673.00	2.15
6	16.21	80.47	51.87	49.00	1088.83	2338.00	2.15

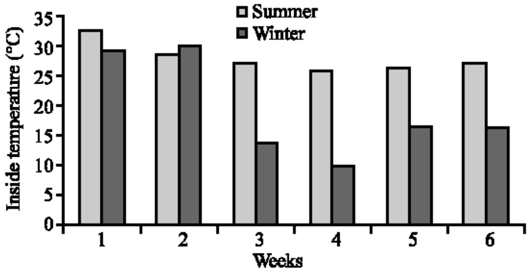

Fig. 1: In poultry house temperature change in the summer and winter months

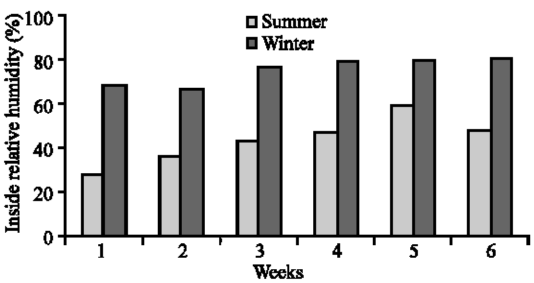

Fig. 2: In poultry house relative humidity change in the summer and winter months

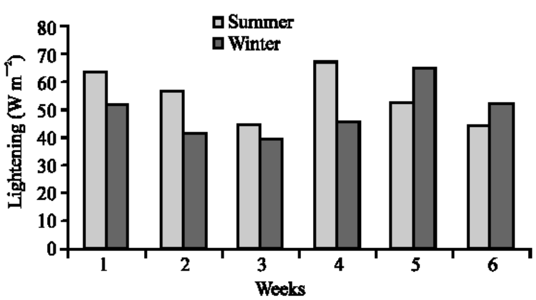

Fig. 3: In poultry house lightening change in the summer and winter months

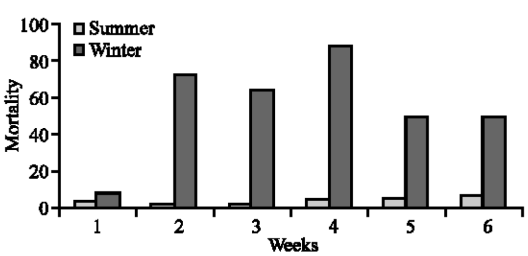

Fig. 4: In poultry house mortality change in the summer and winter months

Mortality: Relationship among the number of death and poultry house temperature and relative humidity in summer was found statistically very significant ($p<0.01$). However, relationship among the number of death and poultry house temperature and relative humidity in winter was found insignificant ($p>0.05$). Death ratio in summer and winter found to be 2.18 and 5.5%, respectively. In order to reduce the increasing of the death ratio balance of the temperature and humidity must be achieved.

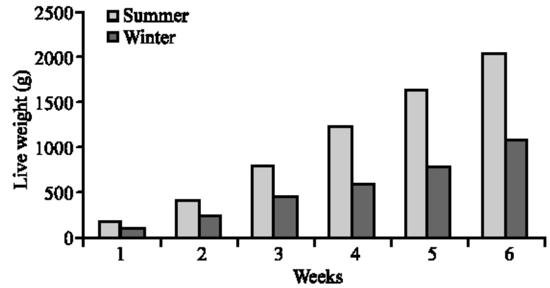

Fig. 5: In poultry house live weight change in the summer and winter months

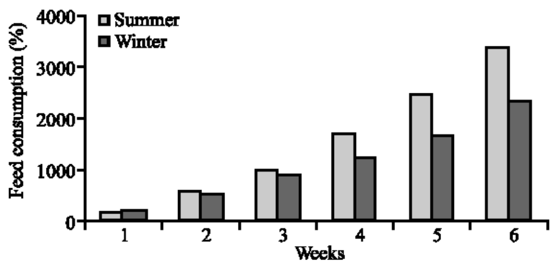

Fig. 6: In poultry house feed consumption change in the summer and winter months

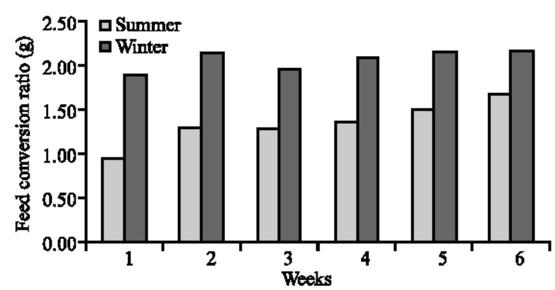

Fig. 7: In poultry house feed conversion ratio change in the summer and winter months

Live weight: Relationship among live weight and poultry house temperature and relative humidity was found statistically very significant ($p<0.01$) in both summer and winter months. Effect of the lightening on live weight was found insignificant ($p>0.05$) in both summer and winter months. At the end of the 42 days trail the live weight of broilers was found to be 2042 and 1088 grams in summer and winter months respectively (Fig. 1-7), which is below the expected weights. Lost of live weight was found to be 23 and 58.9% in summer and in winter months, respectively. Obtaining low live weight might be due to insufficient poultry house environmental conditions, while the broiler chicks (Ross 308) used in experiment has high genetic capacity to gain live weight.

Feed consumption and feed conversion ratio: A negative correlation between daily feed consumption and temperature in poultry houses was detected. As the temperature of poultry house increased, feed consumption reduced. In addition to, feed conversion ratio also decreased (Fig. 1-7). A negative correlation between temperature and feed consumption was also reported by Kocaman *et al*. (2006).

Relationship between feed consumption and poultry house temperature and relationship between feed consumption and relative humidity was found very significant ($p<0.01$) in both summer and winter months. Effect of the lightening on feed consumption was found insignificant ($p>0.05$) in both summer and winter months. Depend on the animal age, thermo-neutral environmental temperature from the 4th week for broilers use of 20-24°C. However, in Kahramanmaras province during the summer average temperature is between 30-40°C which cause heat stress in broilers.

Heat stress depresses body weight (Scott and Balnave, 1988) and is generally accompanied by suppression of feed consumption, which could be the cause of the decline in production and increase in death ratio. In addition, Bonnet *et al*. (1997) reported that the feed digestibility of the different components of the diet) decreased with exposure of broiler chickens to high temperatures.

Feed conversion ratio was found to be 1.66 and 2.15 in summer and in winter respectively. Relationship between feed conversion ratio and relative humidity was found very significant ($p<0.01$) in summer months. However, relationship between feed conversion ratio and poultry house temperature and lightening was found insignificant ($p>0.05$). Relationship between feed conversion ratio and poultry house temperature was found very significant ($p<0.01$) in winter months.

It has been reported that (Abu-Dieyeh, 2006) the reduction in feed intake of heat-exposed broilers results in a decrease in daily intake of nutrients in order to reduce metabolic heat production and maintain homothermy. Dale and Fuller (1980) indicated that reduced feed intake is not the only factor responsible for slower growth rate of heat exposed birds, they found that growth rate depression of broilers reared at hot environment (24-35°C) was 25%, while it was 16% for the broilers maintained at cool environment (13-24°C) and fed the same amount of feed consumed by heat exposed birds. In addition, it has been also concluded that the direct effect of high ambient temperature is thus a decrease of growth rate and feed efficiency at the same feed intake level (Hacina *et al*., 1996). This finding is conformant with the findings indicating that high temperature decreases feed consumption and capacity of benefiting from feed at significant rates (Ozbey *et al*., 2004) 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 also, pointed out that the temperature increase results in immune deficiency and sensitivity against infections.

As a result insufficient poultry house environmental conditions were detected in broiler enterprise which reduces the economic efficiency of enterprise. In discussion, the important way to improve quality, productivity and economic efficiency in broiler rearing is building the broiler houses, which environmental conditions controlled and suitable for the province climate.

REFERENCES

Abu-Dieyeh, Z.H.M., 2006. Effect of high temperature per se on growth performance of broilers. Int. J. Poult. Sci., 5 (1): 19-21. http://www.pjbs.org/ijps/fin489.pdf.

Bonnet, S., P.A. Greraert, M. Lessire, B. Carre and S. Gullaumin, 1997. Effect of high ambient temperature on feed digestibility in broiler. Poult. Sci., 76: 857-863. PMID: 9181619.

Cahaner, A. and F. Leenstra, 1992. Effects of high temperature on growth and efficiency of male and female broilers from lines selected for high weight gain, favorable feed conversion and high or low fat content. Poult. Sci., 71: 1237-1250. PMID: 1523174.

Dale, N.M. and H.L. Fuller, 1980. Effect of diet composition on feed intake and growth of chicks under heat stress. Poult. Sci., 59: 1434-1441. PMID: 7393854.

Hacina, A.B., P.A. Geraert, J.C. Padilha and G. Solanage, 1996. Chronic heat exposure enhances fat deposition and modifies muscle and fat partition in Broiler carcasses. Poult. Sci., 75: 505-513. PMID: 8786940.

Havenstein, G.B., P.R. Ferket, S.E. Scheideler and B.T. Larson, 1994. Growth, livability and feed conversion of 1991 vs. 1957 broilers when fed typical 1957 and 1991 broiler diets. Poult. Sci., 73: 1785-1794. PMID: 7877934.

Howlider, M.A.R. and S.P. Rose, 1989. Rearing Temperature and the Meat Yield of Broilers. Br. Poult. Sci. J., 30: 61-67. DOI: 10.1080/00071668908417125.

Kocaman, B., N. Esenbuga, A. Yildiz, E. Lacin and M. Macit, 2006. Effect of Environmental Conditions in Poultry Houses on the Performance of Laying Hens. Int. J. Poult. Sci., (1): 26-30. http://www.pjbs.org/ijps/fin496.pdf.

Larbier, Z.M., A.M. Chagneau and P.A. Geraert, 1993. Influence of ambient temperature on true digestibility of proteinand amino acids of rapeseed and soybean meals in broilers. Poult. Sci., 72: 289-295. http://www.psa.uiuc.edu.

Leenstra, F. and A. Cahaner, 1992. Effect of Low, Normal and High Temperatues on Slaughter Yield of Broilers From Lines Selected for High Weight Gain, Favorable Feed Conversion and High or Low Fat Content. Poult. Sci., 71: 1994-2006. PMID: 1470585.

Leterrier, C., N. Rose, P. Constantin and Y. Nys, 1998. Reducing growth rate of broiler chickens with a low energy diet does not improve cortical bone quality. Br. Poult. Sci., 39: 24-30. DOI: 10.1080/00071669889349.

Mashsly, M.M., M.A. Kalama, G.L. Hendrcks and A.E. Gehad, 2004. Effect of heat stress on production parameters and immune responses of commercial laying hens. Poult. Sci., 83: 889-894. http://ps.fass.org/cgi/reprint/83/6/889.pdf.

May, J.D. and B.D. Lott, 1992. Feed and water consumption patterns of broilers at high environmental temperatures. Poult. Sci., 71: 331-336. PMID: 1546044.

Rahimi, G., M. Rezaei, Hafezian and H. Saiyahzadeh, 2005. The effect of intermittent lighting schedule on broiler performance. Int. J. Poult. Sci., 4 (6): 396-398. DOI: 10.3923/ijps.2005.396.398.

Reece, F.N. and B.D. Lott, 1982. Heat and moisture production of broiler chickens during brooding. Poult. Sci., 61: 661-666.

Scott, T.A. and D. Balnave, 1988. Comparison between concentrated complete diets and self-selection for feeding sexually maturing pullets at hot and cold temperatures. Br. Poult. Sci., 29: 613-625. DOI: 10.1080/00071668808417088.

Ozbey, O., Z. Erisir, M.H. Aysondu and O. Ozmen, 2004. The effect of high temperatures on breeding and survival of japanese quails that are bred under different temperatures. Int. J. Poult. Sci., 3 (7): 463-467. DOI: 10.3923/ijps.2004.463.467. http://www.pjbs.org/ijps/fin223.pdf.