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Effect of temperature and managemental practices on the performance of broilers under field conditions of mid-hill region of Himalayas

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Abstract

Effect of different ranges of temperature and managemental practices on the performance of commercial broilers upto 6 weeks of age was evaluated under field conditions. The trial was conducted at three different sites of Kangra district, Himachal Pradesh, with three ranges of temperature i.e. 8-12°C (T_1), 14-18°C (T_2) and 20-24°C (T_3).The manage mental conditions were altogether different at different sites. All the birds were offered similar feed throughout the experimental period. Gain in weight (GIW) and Feed conversion ratio (FCR) values were 1250g & 2.10 (T_1), 1306g & 1.91 (T_2) and 1520g & 1.59 (T_3), with mortality of 3.96%, 3.06% and 0.99% in the respective treatments. The incidence of various diseases in T_3 group was lower as compared to T_1 &T_2.These results revealed that both the parameters were affected by the temperature and manage mental practices. The commercial broilers gave the highest body weight along with better FCR and low mortality at a temperature range of 20-24°C .

Introduction

Despite of cyclic booms and busts, poultry industry in India is growing by 10-15% in broiler and 6-7% in layer. During the last three decades, there has been a tremendous development in poultry sector in general and broiler production in particular, and as a result India is ranking 4th in egg and 6th in broiler production in the world (Roy, 2004). However, broiler farming has not undergone much change technically during the last decade in India. Broiler chicken meat is becoming popular throughout the world by virtue of its low fat content and high nutritive value. In order to decrease the cost of production, proper environmental and manage mental practices for broiler rearing are the prerequisites. Proper cleaning of sheds, maintenance of ambient temperature, ventilation facilities and hygienic conditions are specially required for broilers to protect them from various diseases (Prahraj *et al.* 2004). Management of optimum temperature is very essential as it is essential for proper feed intake and feed conversion ratio and ultimately better growth rates of broilers. Although the chickens are homoeothermic, they cannot adjust to extremes of temperatures. The birds are comfortable so long as there is a thermal balance between the body heat production and heat loss from the body (Nagra, 2004). The higher range of temperature results in lower feed intake than the required as the birds come under stress, while lower range of temperature induces higher feed intake to maintain the required body temperature(Kadam *et al.* 2004). In both the cases, the growth rate is reduced resulting in increased cost of production and decrease in cost-benefit ratio. Thus, it is essential to take proper care of all the environmental and managemental practices during broiler rearing under field conditions to make the poultry farming economically viable.

Material and Methods

The present study was conducted at three different sites in Kangra district at three ranges of temperature i.e. 8-12°C (T_1), 14-16°C (T_2) and 20-24°C (T_3). At each site, day-old broiler chicks (N=102) of Vancob strain were reared. The chicks were wing banded, weighed and reared on deep litter system during the first week and thereafter shifted in the poultry pens, made from locally available materials. During the starter and finisher phase, these chicks were fed starter and finisher mashes as per BIS standards. The composition and chemical composition of the starter and finisher mashes is given in Table 1 and 2, respectively. The different feed ingredients were analyzed for their chemical composition (Table 3) and cell and cell wall components (Table 4) according to

the method of AOAC (1985) & Goering & VanSoest (1970), respectively. The birds had free access to clean drinking water during the entire experimental period. Temperature of the poultry pens was recorded daily in the early morning, afternoon and night. Poultry sheds were cleaned daily once in the morning in T_1 and T_2 and twice i.e. in the morning and evening in T_3. Body weight and feed intake was recorded at fortnightly interval. Incidence of any abnormality, disease and mortality was also recorded.

Table 1. Per cent composition of broiler diets (on dry matter basis)

Ingredients	Starter mash (Parts/100kg)	Finisher mash (Parts/100kg)
Maize	25.00	54.705
Wheat	24.86	-
Groundnut extraction	12..00	10.00
Sunflower extraction	06.00	04.00
Mustard oil cake	04.00	04.00
Soya flakes	16.00	04.00
Fish meal	05.00	15.00
Lime powder	01.00	5.00
Dicalcium phosphate	01.00	01.00
Molasses	05.00	01.00
Choline chloride	-	01.00
Premix*	+	+

*Premix was prepared by mixing the followings in 200 g maize flour:

1) Ventrimix DS: 20 g
(Vit.A, 82,500 i.u, B_2, 50 mg, D_3, 12,000 i.u.Vit.K, 10mg/g)

2) Ventri bee plus: 25g
(Vit. B_1,25 mg, B_6, 35 mg, B_{12}, 250ug, E, 225 mg
Panto-thenate. 225 mg, Niacinamide, 300 mg
Folic acid, 20mg/mg)

3) Trace minerals (per 100 g):
Ferrous oxide, 2 g,
Copper sulphate, 2g,
Zinc oxide, 2.5 g,
Ferrous sulphate, 10 g,
Zinc sulphate, 0.6 g,
Dicalcium phosphate, 53g,
Manganese sulphate, 3 g,
Magnesium sulphate, 25 g,
Potassium iodide, 2 g,

Table 2. Chemical composition of feed ingredients (percent on dry matter basis)

Ingredients	DM (%)	CP (%)	EE (%)	CF (%)	Ash (%)	NFE (%)	Ca (%)	P (%)
Maize	87.70	9.00	3.01	1.59	5.31	79.60	0.03	0.24
Wheat	88.00	12.50	3.00	1.60	3.20	79.00	0.09	0.66
Groundnut extraction	91.46	40.20	2.12	8.90	6.88	41.85	0.24	0.54
Sunflower extraction	91.50	32.23	9.04	8.22	9.04	41.50	0.80	0.30
Soya flakes	85.20	42.50	1.01	3.90	7.04	45.44	0.20	0.39
Fish meal	86.40	51.38	4.55	2.01	6.06	35.95	6.71	3.47
DORB	90.28	16.87	1.15	14.04	13.60	54.33	0.20	1.18

Each value is a mean of duplicate determinations.

Table 3. Cell and cell wall components of feed ingredients (percent on dry matter basis)

Ingredients	Cell contents (%)	NDF (%)	ADF (%)	Hemicellulose (%)	Cellulose (%)	Lignin (%)
Maize	80.56	19.73	4.83	14.49	3.82	1.10
Wheat	84.02	15.90	5.20	10.79	4.06	1.11
Groundnut extraction	80.70	19.31	8.71	10.59	6.67	2.02
Sunflower extraction	61.85	38.20	27.01	11.10	19.82	7.20
Soya flakes	74.51	25.50	8.61	16.88	6.48	2.12
De-oiled rice bran	34.02	66.00	34.97	31.00	26.72	8.25

Each value is a mean of duplicate determinations.

Results and Discussion

In the present study, the data collected regarding all the parameters i.e. GIW, Feed Intake, FCR, disease incidence, cost benefit ratio during the experimental period i.e. from 1-6 weeks of age showed comparatively better results at the sites having higher range of temperature i.e. 20-24°C (Table 4). Average gain in body weight (GIW), average feed intake, FCR and rate of mortality were 1250 g ± 13.81g, 2.10±0.03 & 3.96% ; 1306 g ±6.77, 1.91±0.01 & 3.06% and 1520 g ±21.80, 1.59±0.02 & 0.99% in the respective groups (Table 5). These results suggest that the broilers reared at the sites having higher range of temperature i.e 20-24°C might be feeling comfortable as the temperature is optimum for their proper growth and other activities resulting in proper intake of feed, feed efficiency ratio and better growth rates(Kumar, 2004). Likewise, the broilers reared at the sites having lower range of temperature i.e. 8-12°C could not achieve higher body weight, perhaps, as a part of their energy derived from feed might have been utilized in maintaining the body temperature, thus sparing less energy for the gain of body weight (Dey,2004 and Kadam *et al.* 2004).The rate of mortality was also low in T_3 (0.99) while it was 3.06% and 3.96% in other treatments. The cost benefit ratio also showed the maximum return in T_3 group (1:1.70) followed by T_2 (1:1.43) and T_1 (1:1.36), respectively.

Table 4. Chemical composition of experimental diets (% on dry matter basis)

S. No.	Nutrient	Starter mash	Finisher mash
1	Dry matter (DM)	89.38	88.42
2	Crude protein (CP)	23.06	20.05
3	Crude fibre (CF)	3.48	3.06
4	Ether extract (EE)	2.50	2.57
5	Total ash (TA)	5.84	5.38
6	Nitrogen free extract (NFE)	65.15	68.94
7	Acid insoluble ash	2.58	2.13
8	Calcium	1.48	2.37
9	Phosphorous	0.77	1.16
10	Neutral detergent fibre (NDF)	18.24	17.85
11	Acid detergent fibre (ADF)	7.40	6.38
12	Cellulose	5.74	4.84
13	Lignin	1.64	1.54
14	Hemicellulose	10.85	11.47
15	ME (k cal/kg)	2825.00	2956.56

Table 5. Biological performances of broilers at different sites

Treatments	Temperature range (^{0}C)	Initial weight (g)	Final weight (g)	Gain in weight (g)	Average Feed Intake (g)	Feed conversion ratio (FI/GIW)	Mortality (%)	Cost benefit ratio
T_1	8-12 ± 1	48.70 ± 0.45	1298.70^a ± 13.72	1250^a ± 13.81	2625^a ± 14.10	2.10^a ± 0.03	3.96	1:1.36
T_2	14-18 ± 1	48.60 ± 0.52	1354.60^b ± 6.64	1306^b ± 6.77	2505^b ± 15.45	1.91^b ± 0.01	3.06	1:1.43
T_3	20-24 ± 1	47.80 ± 0.61	1567.90^c ± 21.80	1520^c ± 21.80	2418^c ± 10.60	1.59^c ± 0.02	0.99	1:1.70
P Value	<0.0001	NS	<0.0001	<0.0001	<0.0001	<0.0001	—	—

Conclusion

The commercial broilers gave the highest body weight gain i.e. 1520g along with better feed conversion ratio i.e. 1.59 and 0.99% mortality at a temperature range of 20-24°C followed by 14-18°C and 8-12°C under field conditions. The cost benefit ratio also showed the maximum return in T_3 group (1:1.70) followed by T_2 (1:1.43) and T_1 (1:1.36), respectively. Therefore the temperature range of 20-24°C improves the returns compared to lower temperature than this. The farmers should therefore try to maintain the temperature of broiler house as close to this temperature as possible, especially in winter months, by using suitable indigenous low cost devices such as *bukharies* etc.

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