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Effect of Different Brooding Techniques on Production Performance and Physiological Parameters of Broiler

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Abstract

This study was conducted to compare the effect of different brooding techniques on production performance and physiological parameters of broilers. One hundred eighty day-old broiler chicks were purchased from a local hatchery and were randomly divided into 9 experimental units (replicate) of 20 chicks each. These units were further allotted to three treatments (A, B, & C) having three replicates each. Brooding in treatment A, B and C was conducted by using Electric heating, Gas and Wood respectively as fuel sources in three separate rooms of same specifications. All the experimental birds were provided standard husbandry conditions like light, space, ventilation and relative humidity, the data regarding body weight, feed consumption, feed conversion ratio, mortality and incidence of ascites and other pathological conditions was recorded. Respiration rate, rectal temperature and room temperature were recorded daily. At the end of experiment two birds from each replicate were randomly picked up and slaughtered for dressing percentage and relative weights of liver, lungs, heart, gizzard and spleen. Blood serum samples were collected to check, glucose, cholesterol and antibody titer against Newcastle and Gumboro diseases. Analysis of variance showed a highly significant difference with respect to weight gain, feed consumption and feed conversion ratio, respiration rate (morning and evening), antibody titer against ND and IBD at 21 & 42 days of the chicks. Statistical analysis of the data also revealed non-significant effect of treatments on the average values of dressing %age, liver, heart, gizzard, spleen and lungs weight, rectal temperature (morning & evening), serum cholesterol and glucose level at 42-days of age. The production cost per broiler was 98.02, 93.32, and 101.5 Rs. in birds kept under A (Electric), B (Gas) and C (Wood) brooding systems, respectively. The net profit per bird was found to be 18.98 (Electric), 23.08 (Gas) and 12.3 Rs. in (Wood) brooding system respectively.

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Introduction

Poultry production has emerged as a good and rapid substitute of beef and mutton. Total broiler production in Pakistan, in year 2007-08 was 407 million while poultry meat production in the same year was 601,000 tons (Anonymous, 2007). Broiler production is one of the shortest and efficient mean of getting income and supplying good quality protein for human consumption. Provision of adequate environmental temperature during the brooding period is very much important for the future performance of broilers (Malheiros *et al*., 2000). Farmers often lose a suitable proportion of their day old chicks during the brooding period as a result of inadequate brooding temperature (Okonkwo 1998). There are several brooders available in our country. Brooders on the basis of fuel source can be classified as electric, gas and wood or coal brooders. Electric and Gas brooders are not quiet common to small flock owners.

Most of the farmers in Pakistan are small flock holder (1500-2000) and all other sources are costly and not common as small flock owner hesitate to adopt new technology due to unavailability of equipments and monetary reasons (Haq and Akhtar 2004).So, most of the farmers in Pakistan use wood for brooding purpose. As wood is available abundantly through out the country around the entire year and wood furnace is also cheaper and can be built locally by using iron drum. But practically using such type of brooder results in many problems as it is tedious, laborious and during extreme winter it is very difficult to maintain uniform temperature throughout the shed and smoke is another problem which is mostly produced inside the shed. This fluctuation in temperature and smoke disturbs bird

physiology and causes permanent stress to these young chicks which leads towards decrease in production performance, increase in mortality due to carbon dioxide and carbonmonooxide gas emissions and ascites are also reported due to mismanagement of brooding temperature (Deaton *et al.,* 1996). Electric brooding may be another alternate source of heat provision to the chicks that ensures quiet uniform temperature through out the shed but it also has certain problems i.e its high cost. Moreover, in our country load shedding is a main problem and its alternate is generator. For small scale farmers installation of generator and its maintenance is uneconomical and not feasible.

While gas brooder may be another alternate source of heat for brooding of day old chicks, which might provide quiet uniform temperature through out the shed. Gas may be a good source of fuel for brooding day old chicks as it is less costly, easy to handle and may have less hazards effects on the chick performance. Various types of gas furnaces are also used. Keeping in view the above discussion a study was planned to find out the most efficient brooding technique and its impact on production performance of the broilers.

Materials and Methods

This research project was conducted at Poultry Research Center, University of Agriculture, Faisalabad. One hundred eighty (180) day old broiler chicks were purchased from local market and were divided into 9 experimental units of 20 chicks each. Each group was kept in separate brooding rooms of similar specification.. Each experimental unit of the chicks were separated by using fence. In treatment A electric heaters of 1500 watts was used. While in treatment B locally made gas brooder of 1000 chicks capacity was used and in treatment C local made wood furnace of an iron drum of 1000 chicks capacity was used. Room thermometers were placed in all 3 rooms. The birds were kept under same managemental conditions like space, light, ventilation and relative humidity. Fresh and clean water along with ration were available *ad-libitum* all the time. The birds were vaccinated against ND and Gumboro disease according to standard vaccination schedule. Data regarding rectal temperature was recorded using digital thermometer. Whereas, respiration rate of experimental birds were recorded by observing expansion of rib cage using stop watch. Initial body weight, weekly feed consumption, weekly body weight was measured using electric balance and then feed conversion ratio was calculated. Mortality was also recorded. At the end of experiment, two birds from each replicate were randomly picked up, individually weighed. Blood serum was used to observed titer against Newcastle (ND) and Gumboro diseases at 21 day and 42 day (Buxton and Fraser, 1977) and GMT of titer values was calculated (Thrusfield, 1999). Finally economics of these three treatments was calculated.

The performance data thus collected was analyzed by analysis of variance technique using Completely Randomized Design (Steel *et al.*, 1997) using general linear model (MINITAB, 2000).The differences in means of the treatments were compared by Duncan's Multiple Range test.

Results and Discussion

Weight Gain

The results showed that the birds of treatment A (Electric) gained the maximum weight followed by those of treatment group B (Gas) and C (Wood) Table 1. The lowest weight gain was recorded in treatment C (wood). Analysis of variance revealed that there was highly significant difference ($P<0.01$) between treatments on weight gain. Comparison by Duncan's Multiple Range Test showed there was non-significant difference between electric and gas brooding. The results of present study in line with the findings of Gill *et al*. (1993) who reported that low brooding temperature results in significantly decreased weight gain. Similar results have been reported by Renwick and Washburn (1982); Buys *et al*. (1999); Malheiros *et al*. (2000) who stated that low brooding temperature depresses weight gain. Similar to the findings of present study Harris *et al*. (1975); Orban and Roland (1990) also stated that high brooding temperature also triggers weight gain in broilers. Contrary to present study May and Lott (2000) reported there is no effect of temperature on weight gain. But the temperature regimes they used in their study were with in the range of bird i.e 28,29,30,31,32 ^{0}C.

Improvement in weight gain due to the brooding technique has also observed by Buys *et al.* (1999). Based upon the findings of present study it may be inferred that decreased weight gain in treatment C (Wood) may be due to the fluctuation in brooding temperature because it was very difficult to maintain uniform temperature during brooding and high or low brooding temperature or more smoke inside the shed may results in stress to the bird and energy is wasted to overcome this stress instead of useful purpose i.e body weight gain. And more weight gain in treatment A (Electric) & B (Gas) might be due to less stress and healthy birds as there was more uniform temperature in these treatments. The differences in the results of the present study than those observed in the above mentioned trials might be due to the differences in the experimental conditions used in these studies.

Table 1: Weight gain, feed consumption and feed conversion ratio of broilers kept under Electric, Gas and Wood Brooding.

Parameters	Treatments		
	A Electric	B Gas	C Wood
Initial body weight (g)	40.0	41.0	41.0
Final body weight (g)	1956	1948	1900
Weight gain (g)	1916[a]	1907[a]	1859[b]
Feed consumption (g)	3520[a]	3526[a]	3590[b]
Feed conversion ratio	1.83[a]	1.84[a]	1.93[b]
Mortality (%)	0.0[a]	1.66[a]	11.66[b]
Net profit per bird (Rs.)	18.98[b]	23.08[a]	12.3[c]

Feed Consumption

The chicks under treatment C (wood) consumed more feed as compared to those under treatments A (Electric), and B (Gas), respectively, which consumed almost same amount of feed Table 1. Analysis of variance of the data showed highly significant difference ($P<0.01$) of treatment effect on feed consumption. However, there was non-significant difference between electric and gas brooders. Fluctuation in brooding temperature resulted in low feed intake in broilers under treatment C. The results of present study are in line with the findings of Orban and Roland (1990) who stated that low brooding temperature results in less feed consumption. Contrary to the findings of present study Harris *et al.* (1975) stated that fluctuation in brooding temperature also disturbs feed intake in broilers and particularly low feed intake at high brooding temperature. Consumption of more feed in present study may be due to more fluctuation in temperature and required brooding temperature in C (Wood) treatment might have not been maintained and resulted more cold temperature inside the shed and birds consumed more feed. And same amount of feed consumed by the birds of other two treatments might be due to more uniform temperature inside the shed and feed intake remained same.

Feed Conversion Ratio

The average values of feed conversion ratio of the birds under treatments A (Electric), B (Gas) and C (Wood) was 1.83, 1.84 and 1.94, respectively Table 1. Statistical analysis of the data in the present study revealed that feed conversion ratio was highly significantly influenced ($P<0.01$) by experimental treatments. Comparison of the mean values indicated that feed conversion ratio was same in the broilers under treatments A and B in comparison to that under treatment C. The use of different brooding techniques exhibited a significant effect on the feed conversion ratio of the broilers. The results are in line with the findings of Renwick and Washburn (1982); Buys *et al.* (1999) who stated low brooding temperature results into more feed intake and hence poor FCR. Contrary to the findings of the present study Reece and Lott (1980); May and Lott (2000) reported there is no significant effect of ambient temperature on Feed conversion ratio of broilers. The difference in results of present study to above mentioned study might be due to the differences in the experimental conditions used in these studies. An other reason was the temperature regimes used in those studies were with in tolerance level of the birds i.e. 29,30,31,32 ^{o}C The improvement in feed conversion ratio of broilers in treatment A (Electric) and B (Gas) may be due to more uniform temperature, less stress to the birds and since healthy birds improved feed conversion ratio. On the other hand more brooding temperature fluctuation and smoke resulted in stress to the birds of this treatment (C) and as a result birds could not get appropriate weight and all the energy, which should be converted in to weight gain wasted to overcome stress.

Mortality

The total numbers of birds died during the study were seven and total mortality in groups B (Gas) and C (wood) were 1.6 and 11.66 % respectively. There was no mortality in Group A during the trial. The results of present study are in line with the findings of Renwick and Washburn (1982) who reported low brooding temperature results in high mortality during brooding. The main cause of mortality in treatment C (Wood) may be due to more fluctuation in temperature during brooding and as a result birds go in stress and their immunity was not developed and hence more prone to diseases and death of the birds as any pathogen strikes.

Immune Response Against Newcastle and IBD at 21 and 42 days of age

The maximum immune response against ND and IBD at 21 and 42 was recorded in treatment A (Electric), followed by B (Gas) and C (Wood) Table 2 and 3. Treatment C showed the lowest antibody titer against ND and IBD. The high antibody titer in treatment A and B may be due to more uniform temperature inside the shed. And in treatment C cause of lower antibody titer might be more smoke, fluctuation in

temperature and stress to the birds and according to Beker *et al.* 1995 stress decreases their immune response against ND and IBD.

Table 2: Geometric Mean values of antibody titer against ND and IBD at 21 days of age:

Parameters	*Treatments*		
	A	B	C
NDanti body titer	64	52	32
IBD antibody titer	73	64	32

Table 3: Geomatric Mean values of antibody titer against ND and IBD at 42 days of age:

Parameters	*Treatments*		
	A	B	C
ND antibody titer	512	415	128
IBD antibody titer	415	388	184

Respiration rate during Morning and Evening

The maximum value for respiration rate during morning and evening was recorded in-group C (Wood) followed by groups B (Gas), and A (Electric), respectively Table 4. Analysis of variance of the data showed significant differences ($P<0.01$) between groups with respect to respiration rate during evening time till 6 weeks. The results of present study are in agreement with the findings of Reece and Lott (1980) who reported that more fluctuation in temperature results in more respiration rate. This increase in respiration might be due to more working of lungs of the birds under the treatment C (Wood) where more fluctuation in temperature and smoke was produced which was a major problem during wood brooding and due to more shortage of oxygen bird lungs have to struggle more for respiration.

Table 4: Average values of respiration rate and rectal temperature in morning and evening during the trial in broilers kept under Electric, Gas and Wood brooding.

Parameters	Treatments		
	A	B	C
Respiration rate Morning /min	65.98^{b}	66.12^{b}	71.17^{a}
Respiration rate Evening /min	65.17^{b}	65.18^{b}	70.21^{a}
Rectal Temp. Morning (^{0}F)	102.59	102.64	102.64
Rectal Temp. Evening (^{0}F)	102.39	102.42	102.41

Two means not sharing a letter are significantly different from each other

Statistical analysis of the data on various treatments revealed significant effect on weight gain, feed consumption and FCR. Statistical analysis of the data further revealed non-significant effect of treatments on rectal temperature during morning & evening but significant effect on, respiration rate during morning and evening, antibody titer against ND and IBD at 21 & 42 days. The net profit per bird was found to be 18.98 (Electric), 23.08 (Gas) and 12.3 Rs. in (Wood) brooding system respectively. The lowest profit in treatment C was due to mortality in this group as mortality in group A, B and C was (0%), (1.66%) and (11.66%) respectively. Wood brooding system was found to be more laborious as well as there was more mortality of the birds kept under this brooding system as compared to electric and gas brooding. While comparing Electric and Gas brooder both systems exhibited almost similar production performance but high cost of installation and more chances of load shedding in case of electric brooding makes it uneconomical when compared with gas brooding system.

Recommendation

Gas brooding may be an economical system to enhance the production performance of the birds.

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