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Effect of different sources of water on the performance of broilers in Mizoram

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Abstract
The study was done with 135 numbers commercial broiler chicks which were randomly divided into three groups of 45 numbers of birds in each group and reared on three different waters sources i.e. stream, harvested rain and spring water to observe the effect of different water sources on the performance of broiler. The average day-old body weight was 38.28±0.39 gm, 38.63±0.43 gm and 37.81±0.31 gm for stream, harvested rain and spring water respectively. The drinking stream water contains Faecal Coliform count of approximately 2000 MPN/100 ml, total chloride was 12.5 mg/l, pH values was 6.8 and trace iron content. The drinking harvested rain water contains Faecal Coliform count of approximately 2400 MPN/100 ml, total chloride was 18 mg/l, pH values was 7.1 and trace iron content. The drinking spring water contains Faecal Coliform count of approximately 2400 MPN/100 ml, total chloride was 10 mg/l, pH values was 7.2 and trace iron content. The average daily feed consumption per bird provided with drinking water under different water sources was observed to be highest for the group with drinking stream water with 18.00±0.32 gm in 1st week and 180.02±2.28 gm in 6th week and statistical analysis showed significant difference during 5th week ($p<0.01$). At 5th week feed intake was significantly higher at stream sources of drinking water group than harvested rain and spring sources of drinking water groups. The daily water consumption was significantly highest at spring water group in 3rd week (164.84±2.85 ml/day) and 4th week (261.69±2.37 ml/day); and stream drinking water group at 5th week (336.27±3.15 ml/day) and 6th week (392.38±4.37 ml/day) respectively. The average weekly body weight per bird (gm/wk) during 1st and 6th week under different water sources was highest for stream water group and ranging from 131.77±0.95 gm in the 1st week to 2011.89±28.00 gm in 6th week, followed by spring water group from 126.6±2.43 gm to 1936.02±26.19 gm and harvested rain water group with 130.55±2.20 gm to 1886.75±22.56 gm respectively. FCR under different water sources were significantly better for stream water group and spring water group during 2nd ($p<0.05$), 4th and 6th ($p<0.01$) week than harvested rain water group. The overall FCR of broiler birds were better in stream water group i.e. 1.82±0.02 gm/gm than for harvested rain water group and spring water group i.e. 1.88±0.02 and 1.83±0.02 gm/gm respectively. The overall mortality rate was found to be 8 birds (i.e. 5.92%) from a total of 135 numbers reared. Lower mortality rate and percentage was observed in stream drinking water group with 2 (4.44%) followed by 3 (6.67%) each for harvested rain water and spring water group.

Keywords: broilers, water, sources

Introduction
Water is an essential nutrient and is vital for all living beings. Birds can survive without food for few weeks, but will die in few days if water is not available. Water is suspected to be one of the major causes of high mortality rate in broiler farming in the state as the farmers use natural stream water, springs or harvested rain water. Drinking water is of concern to poultry producers due to its great variability in quality and its potential for contamination. Bacteria present in water were typically a result of surface contamination by organic materials. The two groups that are most commonly used as primary indicators of fecal pollution are the coliforms and faecal coliforms (*E. coli*). Abbas *et al.* (2008) [18] had reported that reduced water consumption and water/feed consumption ratio of broiler chicks which were given commercial water could be due to higher level of chloride in the water. They also reported improved feed conversion ratio of broiler chicks that consumed Nile water when compared to those which consumed well or commercial water. This appeared to be due to the increased Mg content of well water and sulphate content of commercial water. Thus, considering the importance of water in broiler productions, the following objective was studied in this experiment:

Materials and Methods

The experiment was carried out with 135 numbers commercial broiler chicks which were procured from the local market. The chicks were randomly divided into three groups of 45 birds each and were reared under three different waters sources to observe the effect of different water sources on the performance of broiler. The three different groups of broiler were provided with stream water to the first group T1 at Selesih, harvested rain water to the second group T2 at Durtlang and springs from underground water to the third group T3 at Sihphir villages.

The birds were reared under deep litter system and were provided uniformly with broiler pre-starter, starter and finisher ration available in the local market.

The birds were weighed at 0'day and then on weekly basis the body weight were recorded which were also useful for calculating the weekly body weight gain. The daily feed consumption was recorded for calculating the weekly FCR of broilers. The daily water consumption and mortality rate were also recorded.

(a): Day old body weight of chicks: The day-old chicks were wing banded and the weight of each bird was recorded using a 300 gm digital electronic weighing balance, i.e. Runner (Model FF, Max. 300 gm).

(b): Daily feed consumption: The daily feed intake was recorded from the difference between the amount of feed offered and residue left in the feeding trough in a day.

(c): Water consumption: The water was analysed for faecal Coliform count, content of Chloride (Cl), Iron (Fe) and pH level. The daily water consumption was recorded from the difference between the water offered and amount left in the watering trough in a day.

(d): Weekly body weight of birds: The weekly body weight of birds was recorded by weighing. The body weight gain was also recorded weekly up to 6 weeks both at Farm and farmer's place using a 5 kg weighing balance.

$$\text{Weekly Body weight gain (gm)} = \frac{W_2 - W_1}{t_2 - t_1}$$

Where, W_1 and W_2 are the initial and final body weight of the chicks for time unit between t_1 and t_2.

(e): Feed conversion ratio (FCR): Weekly average feed conversion ratio was calculated on group basis by using the following formula:

$$\text{FCR} = \frac{\text{Feed Consumption (gm)}}{\text{Body weight gain (gm).}}$$

(f): Mortality rate / percentage: The mortality rate or percentage was calculated according to the formula given below:

$$\text{Mortality \%} = \frac{\text{Number of dead birds in a group}}{\text{Initial number of birds in the group}} \times 100$$

Results and Discussions

The average day-old body weights of the experimental broiler chicks were found to be 38.28±0.39 gm, 38.63±0.43 gm and 37.81±0.31 gm respectively at T1, T2 and T3. Statistical analysis showed no significant difference ($p<0.05$ or $p<0.01$) in day-old body weight of broiler chicks for different experimental groups.

Average daily feed consumption (gm/day)

The average daily feed consumption per broiler bird provided with different water sources was observed to be highest for T1, followed by T2 and T3 respectively. The results obtained were comparable with the findings by Katouli *et al.* (2010) [10], but was lower than the findings of Santin *et al.* (2003) [14], and was comparatively much higher than the findings of Singh *et al.* (2003) [16], Meenalochani *et al.* (2003) [10], Banday and Risam (2001) [2], Ladukar *et al.* (2001) [9], Panda *et al.* (1999) [11] and Brake *et al.* (1992) [3].

Table 1: Average daily feed consumption (gm/day).

Age	Average daily feed consumption (gm/day)		
	Stream water group (T1)	Rain water group (T2)	Spring water group (T3)
1st week	18.00±0.32	17.67±0.00	17.60±0.00
2nd week	33.47±0.25	33.33±0.00	32.67±0.00
3rd week	84.70±0.61	74.56±2.92	74.50±1.18
4th week	109.13±1.62	107.27±1.71	104.80±1.37
5th week	150.14±4.09^{B}	135.30±2.83^{A}	136.20±8.54^{A}
6th week	180.02±2.28	177.40±1.91	174.91±1.57

Means bearing different superscript ($^{A, B \& C}$) in a row differ significantly ($p<0.01$)

The statistical analysis for average daily feed consumption per broiler bird under different water sources showed significant difference during 5th week ($p<0.01$). At 5th week feed intake was significantly higher for T1 than at T2 and T3 groups. Disturbed health with mortality in the later may be the probable cause for significantly lower feed intake.

Average daily water consumption (ml/day)

The different water sources shows microbiological quality of drinking water for stream, harvested rain and spring were found to have a faecal Coliform count of approximately 2000, 2400 and 2400 MPN/100 ml respectively. The chemical quality of drinking water for stream, harvested rain and spring were found to have a total chloride with 12.5 mg/l, 18 mg/l and 10 mg/l respectively, and pH values were 6.8, 7.1 and 7.2 respectively. The iron concentration was found to be trace for all the three different water sources.

Table 2: Average daily water consumption (ml/day).

Age	Average daily water consumption (ml/day)		
	Stream water group **(T1)**	Rain water group **(T2)**	Spring water group **(T3)**
1st week	24.73±0.00	21.27±0.00	24.20±0.00
2nd week	50.73±0.00	51.73±0.00	52.27±0.00
3rd week	133.95±4.65^{a}	139.00±12.50^{a}	164.84±2.85^{b}
4th week	257.31±2.70^{B}	236.87±2.02^{A}	261.69±2.37^{B}
5th week	336.27±3.15^{B}	312.38±2.18^{A}	329.22±3.06^{B}
6th week	392.38±4.37^{B}	370.09±3.04^{A}	386.40±2.31^{B}

Means bearing different superscript ($^{a, b \& c / A, B \& C}$) in a row differ significantly ($P<0.05$/ $p<0.01$)

The average daily water consumption per bird during the experimental period was highest for Stream water group, followed by spring water group and Rain water group respectively. The weekly water consumption per broiler bird were comparable only up to 2nd week with the findings of Kumar *et al.* (2004) [8], Brake *et al.* (1992) [3] and Pesti *et al.* (1985), but from 3rd week onward the water consumption rate was much higher compared to various workers which might be due to the suitable climatic conditions of the region leading

to higher water consumption which was proportional with the higher feed intake and higher body weight. The daily water consumption was significantly highest for T3 in 3rd week (164.84±2.85 ml/day) and 4th week (261.69±2.37 ml/day); and for T1 in 5th week (336.27±3.15 ml/day) and 6th week (392.38±4.37 ml/day) respectively. However, no significant differences were observed during 1st and 2nd week of age. The water consumption was higher during the whole study period in T1 group than T2 and T3 group which might be due to higher concentration of Coliform and water pH level in T2 and T3.

Average weekly body weight per bird (gm/wk)

The average weekly body weight per broiler bird (gm/wk) during 1st and 6th week under different water sources was highest for T1 followed by T3 and T2 respectively. The significantly higher final body weight at 6th week in T1 than at T2 and T3 could be ascribed to a higher feed consumption, water consumption and scientific management.

Table 3: Average weekly body weight per bird (gm/wk).

Age	Average Weekly Body weight per Bird (gm/wk)		
	Stream water group (T1)	Rain water group (T2)	Spring water group (T3)
0' day	38.28±0.39	38.63±0.43	37.81±0.31
1st week	131.77±0.95	130.55±2.20	126.6±2.43
2nd week	310.76±0.31	304.06±2.74	303.92±3.27
3rd week	660.34±1.87^{B}	609.61±3.91^{A}	606.30±4.38^{A}
4th week	1049.56±4.33^{B}	977.42±14.53^{A}	990.35±6.96^{A}
5th week	1501.56±55.50^{C}	1407.75±5.51^{A}	1430.02±10.74^{B}
6th week	2011.89±28.00^{C}	1886.75±22.56^{A}	1936.02±26.19^{B}

Means bearing different superscript ($^{A, B \& C}$) in a row differ significantly ($p<0.01$)

Statistical analysis showed significant variation in the average weekly body weight of birds during 3rd to 6th week ($p<0.01$). The body weight of broiler birds at 6th week was comparable with the findings of Kroliczewska *et al.* (2005) [7]. But, the result was higher than the findings of Shendare *et al.* (2007) [15], Kalita *et al.* (2004) [5], Patro *et al.* (2002) [2], Jain *et al.* (2002) [2] and Banday and Risam (2001) [2] which could be due to variation in region and climatic conditions.

Weekly feed conversion ratio per bird (gm/gm)

The average weekly feed conversion ratio per broiler bird under different water sources was observed to be 1.82±0.02, 1.88±0.02 and 1.83±0.02 for T1, T2 and T3 respectively.

Table 4: Weekly Feed Conversion Ratio per Bird (gm/gm).

Age	Weekly Feed Conversion Ratio per Bird (gm/gm)		
	Stream water group (T1)	Rain water group (T2)	Spring water group (T3)
1st week	1.35±0.02	1.36±0.01	1.39±0.01
2nd week	1.30±0.01^{a}	1.35±0.01^{b}	1.30±0.01^{a}
3rd week	1.70±0.01	1.71±0.01	1.72±0.01
4th week	1.95±0.01^{A}	2.04±0.01^{B}	1.95±0.01^{A}
5th week	2.16±0.05	2.20±0.05	2.18±0.05
6th week	2.46±0.02^{A}	2.60±0.02^{B}	2.43±0.02^{A}
overall	1.82±0.02	1.88±0.02	1.83±0.02

Means bearing different superscript ($^{a, b \& c}$/ $^{A, B \& C}$) in a row differ significantly ($P<0.05$/ $p<0.01$)

The results were comparable with the findings of Katouli *et al.* (2010) [6] and Subapriya *et al.* (2007) [17]. FCR under different water sources were significantly better at T1 and T3 during 2nd ($p<0.05$), 4th and 6th ($p<0.01$) week than T2. The overall FCR of broiler birds were better in T1 than for T2 and T3 which might be due to significantly less body weight gain in T2 and T3 groups during those periods, lesser FCR were obtained as affected by higher mortality rate. Water quality might be the probable cause for not only mortality but also feed and water consumption and overall health of the flocks.

Mortality rate and Percentage

The overall mortality rate was found to be 8 birds (i.e. 5.92%) from a total of 135 numbers reared. Lower mortality rate and percentage was observed at T1 with 2 (4.44%) followed by 3 (6.67%) each at T2 and T3. The total mortality percentage was comparable with the findings of Awobajo *et al.* (2007), Kalita *et al.* (2004) [5] and Singh *et al.* (2003) [16].

Table 5: Mortality rate and Mortality Percentage.

Sources (Locations)	Total No. of Birds	Total Mortality (%)
Stream water group (T1)	45	2 (4.44%)
Rain water group (T2)	45	3 (6.67%)
Spring water group (T3)	45	3 (6.67%)
Total	135	8 (5.92%)

The mortality percentage was lower for broiler birds provided with stream water than harvested rain water and spring water which might be due to better drinking water quality in respect of faecal Coliform, Chloride and pH level, as well as better health and overall better managemental condition for T1.

Conclusions

Based on the above experiment conclusion could be drawn that broiler birds provided with different water sources might showed significant difference in growth performance and rate of water consumption depending on the water sources and also improves the feed consumption rates and FCR when the sources of water was found to have better water quality. Thus, water sources used for providing the broiler birds needs to be considered selectively importance as different water sources of drinking water might showed significantly different effects on broiler performance under farm condition.

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