JOURNAL OF POULTRY SCIENCE AND TECHNOLOGY
Journal homepage: www.jakraya.com/journal/jpst

ORIGINAL ARTICLE

Moderately lower pH of drinking water proves beneficial to poultry

Azmat Alam Khan*, M. T. Banday, S. Shahnaz, and Syed Tanveer.

Division of Livestock Production and Management, Sher-e-Kashmir University of Agricultural Sciences of Technology of Kashmir, Shuhama, Alusteng, Srinagar 190006 J&K., India.

*Corresponding author:

Azmat Alam Khan (PhD)
E-mail:azmatalamkhan@gmail.com

Received: 07/06/2013
Revised: 19/12/2013
Accepted: 19/12/2013

Abstract

A study was carried out to asses the effect of varying pH on performance and economics of broiler production. The results revealed that moderately lower pH of drinking water was beneficial to fast growing poultry in terms of better performance and economic returns however too much lowering of pH was not desirable.

Keywords: Drinking water, pH, vanraja

Introduction

Good quality water is very important for good digestion and to create a healthy gut flora, which will help the bird to absorb all the essential nutrients. Better broiler performance upon acidification of drinking water through use of organic acids like lactic acid stands reported by various workers (Prasad and Sen, 1992; Veermani *et al.,* 2003; Philipsen, 2006; Shendare *et al.,* 2007). However, too much lowering of pH does not provide significant improvements in broiler performance. Overuse of organic acids such as acetic and citric acids can lead to reductions in water and feed consumption and lead to a depression in growth rate which is due to the strong taste that acids can give to water. More over low pH water is aggressive and can actually dissolve metal pipes releasing lead, copper and other minerals into the water (Watkins *et al.,* 2006). Carter (1987) claimed that water of pH less than 5.9 was harmful to bird performance. Literature is replete with references on effect of different levels of different organic acids on poultry performance (Giesen, 2005; Moharrery, 2005; Celik *et al*., 2008). Present study reports the effect of acidic and alkaline water on the performance of commercial broiler chicks reared in deep litter during winter season.

Materials and Methods

Total 180 straight run, commercial broilers of one week age were randomly distributed into four groups (control + three treatments) having three replicates of 15 chicks each and housed in deep litter pens providing a floor-space of 1sqft / chick. The chicks were offered standard commercial broiler mash (starter and finisher) and clean drinking water *ad lib*. The control group (T_1) was offered water routinely available at the poultry farm (pH=8.2), T_2, T_3 and T_4 were offered drinking water of pH 8.5, 7.5 and 6.7 respectively. The required increase or decrease of pH of water was achieved by adding measured quantities of 0.01M Calcium Oxide (CaO) solution and 1.0 M glacial acetic acid to the water available at poultry farm. The initial (7^{th} day) and final (36^{th} day) body weight on individual basis, feed consumption and mortality on group basis was recorded and weight gain and feed conversion ratio (FCR) calculated for each of the four groups. The economics in terms of feed cost was also worked out for all the four groups and relative cost advantage/disadvantage of each treatment group *vis-a-vis* control was also determined. The data was analysed through one way ANOVA and difference between means was compared by Duncan's Multiple Range Test using statistical software SPSS 15.0

Results and Discussion

The initial and final body weight, weight gain, feed consumption and FCR along with cost benefit analysis are depicted in Table 1. The group T_3 that was offered drinking water having pH 7.5 showed highest body weight and body weight gain (1179.67±7.53 and1087.49±7.56g, respectively) at 36 days of age which was significantly higher ($P<0.05$) than that of the control group (1096.13±17.73 and 1006.46±9.31g, respectively) that was offered drinking water routinely available at the university poultry farm (pH=8.2). The other two groups T_2 (pH= 8.5) and T_4 (pH=6.7) had final body weight of 1100.63±12.89 and 1133.73±13.38g and body weight gain of 1007.81±13.48 and 1044.11±11.57g, respectively and both did not differ significantly from T_1. Similarly, the best FCR of 1.71±0.05 was obtained in T_3 group which

was significantly lower (P<0.05) than that control (1.87±0.01). There was no mortality in any of the groups during the period of study. The better performance of broilers offered acidified drinking water using organic acids has also been reported by (Prasad and Sen, 1992; Philipsen, 2006; Shendare *et al.,* 2007). The overall perusal of the results indicated that decreased pH of drinking water (upto 7.5 in our study) led to better performance of broilers however on further decrease of pH to 6.7 the better performance could not be sustained. The depressed growth of broilers on too much lowering of pH has also been reported by Grizzle *et al.* (1996). Veeramani *et al.* (2003) reported better performance of broilers offered drinking water with acidic pH and poor performance on offering alkaline drinking water. In our study also T_1 (control) and T_2 groups where in birds were offered drinking water with pH which was more alkaline as compared to T_3 group showed poor performance both in terms of body weight gain and FCR. The economic analysis of the trail (table- 1) revealed that feed cost per kg live weight was least (Rs 46.17) in T_3 thereby conferring a relative cost benefit advantage of Rs 4.32 to this group with respect to control. Further decreasing the pH to 6.5 or increasing it to 8.5 adversely affected the cost benefit ratio. Decrease in feed cost per Kg weight gain upon acidification of drinking water using different levels (0.5 and 1.0%) of lactic acid, along with an increase in the feed cost/Kg weight gain upon further increasing the lactic acid level to 1.5% has also been reported by Prasad and Sen (1992) which lends support to our findings that too much lowering of pH towards acidic side did not continue the advantage conferred by acidification of drinking water. Similar studies carried out by us on broiler (Khan *et al.,* 2011), Vanraja (Khan *et al.,* 2013) chicks during summer season revealed almost similar results.

Conclusion

It could therefore be concluded that pH of drinking water equivalent to 7.5 resulted into best performance and better economics. Both too low (acidic) or too high (alkaline) pH of drinking water was not found to be desirable as far as the performance as well as the economics was concerned.

Table 1: Effect of pH of drinking water on the performance and economics of broilers during winter season.

Parameters	T_1 Control (pH 8.2)	T_2 (pH 8.5)	T_3 (pH 7.5)	T_4 (pH 6.7)
Performance				
Initial body weight(g) (7^{th} day)	89.67±1.58	92.82±0.64	92.18±2.16	89.22±2.28
Final body weight (g) (36^{th} day)	1096.13±17.73^{a}	1100.63±12.89^{a}	1179.67±7.53^{b}	1133.73±13.38^{ab}
Weight gain (g)	1006.46±9.31^{a}	1007.81±13.48^{a}	1087.49±7.56^{b}	1044.11±11.57^{ab}
Feed Consumption (g)	1866.78±14.04^{a}	1931.65±10.26^{b}	1862.64±18.54^{a}	1950.17±135.17^{b}
FCR	1.87±0.01^{b}	1.93±0.04^{c}	1.71±0.05^{a}	1.86±0.05^{b}
Economic analysis				
Feed cost/Kg live weight gain (Rs)	50.49	52.11	46.17	50.22
Difference in the feeding cost / Kg live weight with respect to control (Rs)		-1.62	+Rs. 4.32	+Rs. 0.27

Cost of feed = Rs 2700/ quintal
Means with different superscripts across the row differ significantly (P<0.05)

References

Carter Thomas (1987). Drinking Water Quality for Poultry, Poultry Science and Technology Guide. *North Carolina Co-operative Extension Service North Carolina State University College of Agriculture and Life Science*.

Celik K, Ugur K and Uzatici (2008). Effect of supplementing broiler diets with organic acid and whole grain. *Asian Journal of Animal and Veterinary Advances*, 3(5): 328-333.

Giesen A 2005. The value of organic acids in drinking water. *World Poultry*, 21(12): 15-17.

Grizzle J, Armbrust T, Bryan M and Saxton A (1996). Water quality I: The effect of water nitrate and pH on broiler growth performance. *The Journal of Applied Poultry Research*, 5(4):530-536.

Khan AA, Bhat GA, Banday MT and Raquib M (2011). Performance of commercial broilers offered drinking water with different pH. *Indian Journal of Poultry Science*, 46(3): 418-420.

Khan AA, Shahnaz S and Banday MT (2013). Effect of Variable pH of Drinking Water on Performance of Vanraja Birds. *Indian Journal of Veterinary Research, (Communicated).*

Moharrery A (2005). Effect of malic acid on growth performance, carcass characteristic and feed efficiency in the broiler chickens. *Poultry Science*, 10:781-786.

Prasad J and Sen D (1992). Effect of different levels of acidification of drinking water on performance of Broilers. *Indian Journal of Poultry Science*, 27(1): 66-67.

Philipsen PLJ (2006). Acidifying drinking water supports performance. *World Poultry*, 22(5): 20-21.

Shendare R, Mandlekar S, Khati B, Rajput A, Gongle M and Deshmukh S (2007). Effect of acidic and alkaline water on body weight gain and feed efficiency of commercial broilers. *Indian Veterinary Journal*, 84(3): 317.

Veermani P, Selvan ST and Vishwanath K (2003). Effect of acidic and alkaline drinking water on body weight gain and feed efficiency in commercial broilers. *Indian Journal of Poultry Science*, 38(1): 42-44

Watkins S, Cornelison J, Tillery C, Wilson M and Hubbard R (2006). Effects of water acidification on broiler performance. Poultry Science and Technology Guide. *North Carolina Co-operative Extension Service North Carolina State University College of Agriculture and Life Science*.