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# Effect of Ascorbic Acid Supplementation on Nutrient Digestibility and Carcass Traits in Broiler Chicks in Arid Zone of Rajasthan

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**Abstract** An experiment was conducted to evaluate the effect of ascorbic acid supplementation on nutient digestibility, body weight and carcass traits of broiler chickens. Three hundred thirty chicks were divided into 2 groups of 75 each comprising 2 replicates. Ascorbic acid was supplementation in their diet, respectively for a period of 6 weeks. A feeding trials of six weeks followed by metabolic trial was conducted, using ascorbic acid 200 ppm level. The nutrient digestibility, body weight and carcass traits revealed significant ($p$<0.01) higher in the supplemental groups as compared with control. Looking to the digestibility of nutrients, carcass traits and feed utilization recorded in present investigation, it could be concluded that acid supplementation 200 ppm level has beneficial effects on the responses of broilers without any adverse effect on digestibility.

**Keywords** Ascorbic acid, Broiler, Feed conversion ratio, Performance.

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## Introduction

The desire of every poultry farmer is to produce large quantity of meat throughout the year irrespective of the environmental temperature. However this can only be achieved in a stress free condition. The poultry production as practiced today is a specialized one and concentrating more on the use og high performance birds. The major factors for successful poultry production are high genetic potential, balanced nutrition and health maintenance. To produce high quality meat and eggs at the shortest possible time and at the lowest possible cost, various feed additives and supplement can be incorporated in the ration for promoting their growth and performance. The addition of ascorbic acid to the diet improves the immune response of birds during heat stress [1]. Several researchers observed significant improvement in growth of chicks by the addition of vitamin-C under high temperature. Substantial reports are available that show under field conditions feeding

Vitamin-C enhanced growth rate, productivity, immune response, disease resistance and survivability under stressful environment. Ascorbic acid and acetylsaicylic acid supplementation during heat stress had beneficial effects on feed conversion ratio [2]. Heat stressed birds that supplemented with vitamin-C and zinc showed greater body weight, higher daily gain, better feed conversion ratio and less mortality [3]. A possible approach to counteracting the negative effects of heat stress among chickens could be the supplementation of birds with Vitamin-C . Several researchers have reported beneficial effects of Vitamin-C supplements given either in diets and in drinking water. Tuleun et al. [4] found that inclusion of ascorbic acid in the diet significantly reduced feed cost per kilogram weight gain and ascorbic acid in the diet may improve weight gain, feed : gain ratio, reduced feed cost per kilogram weight gain and reduction in the severity of leg abnormality. Therefore, this study was conducted to evaluate the effect of supplementation of ascorbic acid in the broiler ration on nutrient digestibility , body weight and carcass traits.

## Materials and Methods

The study was conducted for a period of 6 weeks to study the efficiency of ascorbic acid supplementation in the ration of 300 broiler chicks. Three hundred day-old, unsexed, apparently healthy broiler chicks (Cob-400 strain) procured from commercial hatchery were used in the present experiment. Routine vaccination against Ranikhet disease ($F_1$ strain) and Infectious Bursal Disease was carried out on 7$^{th}$ and 14$^{th}$ day of procurement of chicks. All the chicks were wing banded, individually weighed and randomly divided into two groups of 150 chicks each having almost similar average body weight. Each group of 150 chicks was further subdivided randomly into 2 replicates of 75 chicks. Each replicate of 75 chicks were reared in separate, clean, disinfected deep litter brooder houses. Commercial broiler starter and broiler finisher rations were used for the study and ascorbic acid was supplemented in the broiler rations. In the present experiment, commercial ascorbic acid feed supplement preparation i. e. asorbic acid (manufactured by Titan Boitech Ltd., Bhiwadi, Rajasthan) was included in the ration @ 200 ppm per kg of feed. In treatment group Al, no supplementation of commercially available feed grade ascorbic acid preparation was done whereas, in group $A_2$, ration was supplemented with ascorbic acid at 200 ppm per per kg of feed, respectively. The parts composition of broiler starter and finisher rations has been presented in Table 1. At the end of feeding trial, dry matter metabolizability and nitrogen balance study was conducted using 6 chicks from each group for 7 days. Daily feed intake was calculated after deducting the left over from the feed offered. Representative feed samples were drawn from the bulk, finally ground and stored in sample bottles for dry matter percentage and chemical analysis. To study the effect of different treatments on carcass traits viz., dressed weight percentage and eviscreated weight percentage, three representative birds from each group were sacrificed for carcass study at the end of 6$^{th}$ week.

**Table 1.** Parts composition of experimental rations.

| Ingredients | Starter (0-3 weeks) | Finisher (4-6 weeks) |
|---|---|---|
| Maize | 50% | 45% |
| Rice bram | 10% | 15% |
| Soybean cake (Deoiled) | 12% | 12% |
| Groundnut cake (Expeller) | 25% | 25% |
| Groundnut oil | 3% | 3% |
| Mineral mixture | 2% | 2% |
| Calcite power | 1% | 1% |
| Maridot | 50 g | 50 g |
| Naftin | 25 g | 25 g |
| Vitamin A, B2, D3 + K | 20 g | 20 g |

## Results and Discussion

Besides the physiological farm, quantitative and qualitative attributes of feed, the dry matter metabolizability is essential parameter to assesss the nutritional worth of the ascorbic acid used to improve feed utilization in living system. The metabolizability of dry matter was determined in various treatment groups to determine the effect of supplementation of ascorbic acid in ration of broilers on digestibility of feed. The mean values of metabolizability of dry matter for varius treatment groups have

**Table 2.** Effect of ascorbic acid on dry matter metabolizability and nitrogen balance. Note : Mean with different superscripts in a column differ significantly from each other.

| Main effect | Dry matter metabolizability (%) | Total N intake (g/d/chick) | N-voided (g/d/chick) | N-balance (g/d/chick) |
|---|---|---|---|---|
| $A_1$ | 61.34[a] | 4.13[a] | 2.21[b] | 1.93[a] |
| $A_2$ | 66.68[b] | 4.22[b] | 1.77[a] | 2.45[b] |
| SEM | 0.03 | 0.04 | 0.02 | 0.04 |

**Table 3.** Effect of ascorbic acid on live body weight and carcass traits in broiler chicks. Note : Mean with different superscripts in a column differ significantly from each other.

| Main effect | Live body weight (g) | Dressed weight (%) | Eviscerated weight (%) |
|---|---|---|---|
| $A_1$ | 2175.26[a] | 77.81[a] | 68.43[a] |
| $A_2$ | 2285.64[b] | 79.35[b] | 70.70[b] |
| SEM | 8.65 | 0.12 | 0.06 |

been presented in Table 2 effect of ascorbic acid supplementation, the mean values were recoded to be 61.34% in $A_1$ and 66.68% in $A_2$. The dry matter metabolizability was significantly higher in ascorbic acid supplemented group ($A_2$) as compared to un-supplemennted group ($A_1$). The results are in agreement as reviewed previously by Lohakare et al. [5].

The overall intake and balance of nitrogen , which could be considered as the indices of overall well-being of the animal were estimated in all the treatment groups as g/d and the mean values have been depicted in Table 3. In $A_1$ and $A_2$ group the respective values were found to be 4.13, 2.21 and 1.93 as well as 4.22,1.77 and 2.45 (g/d). All broilers in various treatment groups were found to have positive nitrogen balance. The effect of ascorbic acid supplementation highly significant effect on nitrogen intake and nitrogen voided were observed. In respect of nitrogen balance (g/d/chick) which must be important for overall well being of broilers, the results revealed significantly higher retention in $A_2$ treatment group. These results of study in term of nitrogen balance suggested that 200 ppm level of supplementation of ascorbic acid in broilers ration, the retention of nitrogen increased. These findings of study in text attest well with the earlier finding of the results as reviewed previously [5—7].

The average pooled body weight of broiler chicks subjected to various treatment grups recorded at the end of trial have been presented in Table 3. Significant effect of ascorbic acid supplementation on body weight recorded in the present study corroborated well with the earlier results [5,8, 9] observed improvement in body weight due to ascorbic acid supplementation. Effect of ascorbic acid the increase was noticed to be 44.94 to 2175.26 g in $A_1$ and 46.20 to 2285.64 in $A_2$ in six weeks period of experiment.

The data pertaining to dressed weight and eviscerated weight were recorded by slaughtering two representative birds from each replicate group at the end of six week and analyzed. The mean values of dressed weight and eviscerated weight for various treatment groups have been presented in Table 3. In $A_1$ and $A_2$ groups the same were found to be 77.81 and 68.43% in $A_1$ and 79.35 and 70.70% in $A_2$. Ascorbic acid supplementation in diet of broiler chicks also showed highly significant ($p$<0.01) effect on dressed weight and eviscerated weight. Supplementation of ascorbic acid showed a highly significant improvement in per cent dressed weight and eviscerated weight. Improvement observed due to effect of ascorbic acid supplementation attest well the earlier reports [5—10].

Broilers reared in arid zone of Rajasthan respond favorably to ascorbic acid supplementation. The results of the study also suggest that 200 ppm of ascorbic acid gave the best result in turm of performance and therefore, should be encouraged in broiler diet in Arid Zone of Rajasthan.

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