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## Effects of dietary phytochemicals supplementation on water and feed consumption in broiler chickens

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### Abstract

Drinking water consumption is a good measure of feed intake and broiler performance. To measure this, 250 day old VENCOB chicks were equally divided into five groups (T<sub>0</sub>-T<sub>4</sub>). Five replicates of 10 chicks each were arranged in a completely randomized design. The five treatment groups were supplemented with as follows: T<sub>0</sub>-Control (Basal diet), T<sub>1</sub>,-0.2% Neem leaf powder + 0.2% Amla fruit powder + Basal diet T<sub>2</sub>,-0.2% Neem leaf powder + 0.5% Black cumin powder + Basal diet T<sub>3</sub>,-0.2% Amla fruit powder + 0.5% Black cumin powder + Basal diet T<sub>4</sub>-0.2% Neem leaf powder + 0.2% Amla fruit powder + 0.5% Black cumin powder + Basal diet. There was significant difference in drinking ability of birds among the treatment groups in all the weeks on the trial. The highest drinking ability was observed in T<sub>3</sub> followed by T<sub>1</sub>, T<sub>2</sub>, T<sub>0</sub> and T<sub>4</sub> groups in the whole experiment period. The highest average daily feed intake was observed in T<sub>3</sub> group of birds. From the present study it may be concluded that amla fruit powder (0.2%) and black cumin powder (0.5%) supplemented diets might enhance the drinking and feeding ability of broiler chickens significantly.

**Keywords:** Phytochemicals, neem leaves powder, black cumin powder, amla fruit powder, water consumption, feed consumption, broiler chicken

### Introduction

Drinking water consumption in the broiler is an effective management tool to monitor flock progress as it is directly correlated to feed intake. The correlation is estimated to be 0.98 (Lott *et al.* 2003) <sup>[5]</sup> which means that water consumption changes 98% of the time food consumption will change correspondingly. By accurately monitoring water intake the farmer can get a good idea of food consumption. Birds consume 1.6 -2 times as much water as food. There are many interacting factors like bird types, water and feed quality, air temperature inside poultry house etc. which affect drinking ability (Manning 2007) <sup>[6]</sup>. Daily feed ingestion can be established by monitoring daily water intake. Herbal supplementation in the diet of broiler may affect the drinking activity of birds. Hence, the trial was undertaken to measure the drinking ability of broiler chickens supplemented with neem leaves, black cumin and amla.

### Materials methods

A total number of 250 one -day-old "VENCOB" broilers were randomly distributed in five groups (T<sub>0</sub>-T<sub>4</sub>) with fifty chicks each. Each group has five replicates having 10 chicks each. The birds were reared upto 42 days of age in the same environment with continuous ad-lib drinking water. The treatment groups were like: Control (T<sub>0</sub>) with basal diet, T<sub>1</sub> with Neem leaves powder (0.2%) and Amla fruit powder (0.2%), T<sub>2</sub>-Neem leaves powder (0.2%)+ Black cumin powder (0.5%), T<sub>3</sub>-Amla fruit powder (0.2%)+ Black cumin powder (0.5%), T<sub>4</sub>-Neem leaves powder (0.2%)+ Amla fruit powder (0.2%)+ Black cumin powder (0.5%). During the trial period (Oct-Nov) the air temperature (°C) ranged from 27.5±0.30 to 11.3±0.72 with average temperature 19.4±0.50. The normal drinking water (av. temp. 21.06±0.35 °C) were provided to the birds and the range of water temperature were 26.5±0.83 °C to 16.40±0.83 °C. Water was filled manually in the conical fountain waterer of 1 liter capacity for first two weeks and then 2.5 liter capacity for rest of the period. For each 50 birds, three small and two large waterers were used.

### Processing of neem leaf powder

Fresh mature leaves of the neem trees surrounding the college premises were harvested and washed with clean water to remove dirt.

The leaves were sun-dried for 3-4 days until they become crispy while retaining the greenish color. The leaves were turned regularly to prevent uneven drying and decay. The dried leaves then were pulverized with a blender. A 2 mm mesh diameter sieve was used to obtain fine dust which was stored in air tight container until they were used.

### Processing of Amla fruit powder

Fresh mature amla fruits were collected from amla trees from Pratapgarh amla farms. And processed it in laboratory to make these amla fruits in fine particles and dry it in sun light and hot air oven to remove moisture for avoid decay and growth of mould and it will reduce its nutritional value.

### Processing of Black Cumin powder

Black Cumin seeds are commercially available in the market, collect it from there and clean it properly and then slightly grind it in the grinder and its ready.

### Water consumption

Daily drinking water consumption in term of intake (ml) was measured. The volume of drinking water (ml) was noted daily before offering to the waterer. The left over volume of drinking water was recorded daily. The water intake was obtained by deducting the water offered & water refused. The water intake data were summed up and divided by no. of birds / replicate for weekly average. The obtained data were again

divided by seven for average water intake/birds/ day.

### Feed consumption

Ad-lib feeding of pre-starter, starter, and finisher ration of commercial feed was provided according to their age. Feed was provided in morning, afternoon and night hours in each group after proper weighing. A calculated amount of feed was provided in each group and total daily feed consumption was calculated by reducing the refused amount of feed from given amount of feed. Total feed consumption was recorded in gram.

### Analysis of data

The data obtained from the trial were subjected to statistical analysis using SPSS 20.0 software package. The least squares mean obtained from analysis of variance were compared by Duncan's Multiple Range Test.

## Results and Discussion

### Drinking ability

The measures of drinking ability of water (ml/week/bird) of broiler birds have been presented in Tabel.-1. The table showed that birds of all treatment groups were differed significantly during the study period. The highest water intake (219.97 ml) was observed in T<sub>3</sub> followed by T<sub>4</sub>, T<sub>2</sub>, T<sub>1</sub> and T<sub>0</sub> groups in first week. Almost same trends were also noted in drinking ability of birds throughout the whole trial period.

**Table 1:** Weekly water intake (ml/week/bird) of broiler chickens fed diet supplemented Neem Leaf Powder (NLP), Amla Fruit Powder (AFP) and Black Cumin Powder (BCP)

Attributes	Control T <sub>0</sub>	NLP + AFP T <sub>1</sub>	NLP + BCP T <sub>2</sub>	AFP + BCP T <sub>3</sub>	NLP + AFP + BCP T <sub>4</sub>	SEM	P-value
First week	202.87	210.63	213.84	219.97	215.86	1.172	<0.001
Second week	526.24 <sup>e</sup>	545.48 <sup>d</sup>	546.03 <sup>c</sup>	554.94 <sup>b</sup>	593.21 <sup>a</sup>	4.511	<0.001
Third week	1108.14 <sup>b</sup>	1114.26 <sup>a</sup>	1089.90 <sup>c</sup>	1118.53 <sup>a</sup>	1028.16 <sup>d</sup>	6.797	<0.001
Fourth week	1629.36 <sup>e</sup>	1679.92 <sup>d</sup>	1705.01 <sup>c</sup>	1730.23 <sup>b</sup>	1797.10 <sup>a</sup>	11.333	<0.001
Fifth week	2225.24 <sup>a</sup>	2185.34 <sup>c</sup>	2199.96 <sup>b</sup>	2145.63 <sup>d</sup>	2146.64 <sup>d</sup>	6.304	<0.001
Sixth week	3193.38 <sup>d</sup>	3504.58 <sup>b</sup>	3367.35 <sup>c</sup>	3795.74 <sup>a</sup>	3197.26 <sup>d</sup>	14.821	<0.001
Overall (0-42 day)	8885.29 <sup>e</sup>	9240.23 <sup>b</sup>	9121.09 <sup>c</sup>	9565.06 <sup>a</sup>	8978.25 <sup>d</sup>	28.34	<0.001

Values with different small letter subscripts in a row differ between groups significantly ( $p < 0.05$ )

The water consumption of broiler chickens increased progressively in all the four treatment diets with the increase in age of the birds. The data depicted here (Table 1) were more than the mean water intake value of 182.244 ml/bird/day given by NRC 1994. This might be due to the effect of herbal supplementation in the diet. The present results clearly showed that the broilers chickens of T<sub>3</sub> diet obtained the highest drinking water consumption value (9565.06 ml) which varied significantly ( $p < 0.05$ ) from the broilers chickens on

other diets. The broilers on control diets ingested the least volume of water. In general the chickens on 0.2% Amla fruit powder + 0.5% Black cumin powder + Basal diet took statistically ( $p < 0.05$ ) more volume of water than the birds of other groups. The difference in drinking ability between the birds on control diets and those on the treatment diet might be due to the variation in feed intake and body weight gain by the birds.

**Table 2:** Performance of broiler chickens fed diet supplemented Neem Leaf Powder (NLP), Amla Fruit Powder (AFP) and Black Cumin Powder (BCP)

Parameters	Control T <sub>0</sub>	NLP + AFP T <sub>1</sub>	NLP + BCP T <sub>2</sub>	AFP + BCP T <sub>3</sub>	NLP + AFP + BCP T <sub>4</sub>	SEM	P value
Average daily feed intake (g/bird/day)	117.57 <sup>c</sup>	122.11 <sup>a</sup>	120.62 <sup>b</sup>	123.24 <sup>a</sup>	118.88 <sup>c</sup>	0.756	<0.001
Average daily water intake (ml/bird)	211.55 <sup>c</sup>	220.00 <sup>b</sup>	217.16 <sup>b</sup>	227.73 <sup>a</sup>	213.76 <sup>c</sup>	0.424	<0.001
Feed / Water intake ratio	1.83 <sup>a</sup>	1.80 <sup>b</sup>	1.80 <sup>b</sup>	1.84 <sup>a</sup>	1.79 <sup>b</sup>	0.078	<0.001

Values with different small letter subscripts in a row differ between groups significantly ( $p < 0.05$ ).

The average daily feed intake of broiler chickens fed diet supplemented with Neem Leaf Powder, Amla Fruit Powder and Black Cumin Powder have been shown in Table 2. There

was significant difference among the groups in average daily feed intake and the highest daily feed intake was observed in T<sub>3</sub> groups of birds. Similarly average daily water intake

(ml/bird) was also significantly differed among the groups of birds. And the highest daily water intake (227.73 ml) was recorded in T<sub>3</sub> groups. The water and feed intake ratio was also recorded highest in T<sub>3</sub>, group from rest of other groups. According to (Ferket *et al.* 2006) [3], the amount of water required by poultry depends on the animal's size, growth stage, environmental temperature and relative humidity, feed composition, rate of growth or egg production, and efficiency of kidney re-absorption of water in individual birds. James *et al.* (2009) [4] also indicated that there is a close correlation between feed intake and water consumption. Thus, with higher feed intake, poultry would consume relatively higher amount of water to facilitate digestion to meet other physiological needs. The significantly higher water intake by T<sub>3</sub> groups may be due to the diuretic activity of black cumin seed powder which was also supported by Abdelkader *et al.* (2016) [1] who reported diuretic activity in rats treated with black cumin seeds. (Carter *et al.* 1997) [2] also indicated that there is a close correlation between feed intake and water consumption. Thus, with higher feed intake, poultry would consume relatively higher amount of water to facilitate digestion to meet other physiological needs. This finding confirms what is reported by (Uko and Kamlu 2006) [7]. From the present trial it might be suggested that drinking water consumption has been affected significantly by inclusion of dietary phytonics (herbal mixture) supplementation in broiler chickens.

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