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Original Research Article

Effect of Dry Neem Leaves (DNL) in the Reduction of Ammonia, pH and Moisture Level of Poultry Litter and its Effect on the Broiler Performance

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A B S T R A C T

The experiment was conducted at the nearby poultry farm of the College of Veterinary Science and Animal Husbandry, NDUAT, Kumarganj, Faizabad, UP, India. A total of 200 unsexed Vencob commercial broiler chicks were distributed to four treatment groups each made of 50 chicks in a 4-brooder rooms. All the fifty chicks from each treatment were divided to form 5 replicates of 10 chicks each in a Completely Randomized Design (CRD). Drinking water and broiler diet for the four respective treatments were offered ad libitum. The litter of each treatment group was mixed weekly with dry neem leaves @ 0g, 2g, 4g and 6g / sqft area. The nitrogen%, moisture% and pH of litter from each treatment groups were analyzed to determine quality of litter at the end of experiment. The performance index was calculated at 7th, 21st and 42nd day. The application of 4g dry neem leaves in the poultry litter significantly ($p<0.05$) reduced the values of pH, moisture % and nitrogen % than those of other treatment and control group of birds. The highest PI value was obtained in the birds of T_2 group followed by T_0, T_1 and T_3 in a descending manner at 42nd day.

Keywords

Neem leaf powder, pH, Nitrogen, Moisture, Litter, Performance Index

Introduction

There is a saying "As the litter goes, so goes the flock!" This saying has a lot of truth as it relates to managing litter and the subsequent effect it has on air quality. For the most part, litter management has often more to do with managing the systems that influence litter quality rather than managing the litter. Litter conditions are often a reflection of how well one has done in managing litter. So, the litter management is very important in case of poultry because bad litter can create a lot of problems. Improper litter management leads to NH3 gas accumulation in the poultry shed. NH3 is a toxic, color, odorous and corrosive gas which pollutes the air. In addition, it creates few diseases such as conjunctivitis, immune suppression, lung congestation, impaired kidney function leading to problems like nephritis & urolithiasis. Neem (*Azadirachta indica*) a large evergreen fast growing perennial tree, is native to India and inhabitant of South Asian countries. Among the all plant parts the processed leaves play the most significant role inlivestock health (Sharma and Reddy. 2002). Neem leaves have some medicinal properties like antibacterial, antifungal, antimalarial, antiviral, anti

cancer, etc. (Agarwal. 2002; Subapriya and Naigin. 2005). To author's knowledge a number of research has been done with poultry litter, but the use of DNL on poultry littermay be the first. Therefore, an attempt was under taken in this study to investigate the effect of DNL in reducing of NH3 level on poultry litter. The present work was, therefore, undertaken with the objective to determine the effect of neem leaves on the quality of litter in relation to performance index of broiler chicken.

Materials and Methods

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.

Experimental animals

To carry out the present investigation, 200 day old straight run, commercial broiler strain "VENCOB" chicks were procured from a commercial hatchery. These 200 chicks were divided in four groups, i.e. Group 1, 2, 3, 4, each group having 50 chicks. All the chicks from each group were divided equally to form 5 replicates of 10 chicks each in a completely randomized design (CRD). Drinking water and starter diet for the four respective treatments were offered *ad libitum*. The litter of each treatment group was mixed weekly with dry neem leaves @ 0g, 2g, 4g and 6g/sq. ft. area.

Analysis of litter material

At the end of rearing of the birds, subsample of litter was collected from five locations in each pen.The proximate analysis of litter materials was performed as per the method of Association of Official Analytical Chemist (AOAC, 2000).

pH

The pH was determined with a 1: 5 to de-ionized water ratio by pH paper.

Moisture %

Moisture level of litter material was determined by dried weighed amount of sample in a moisture cup overnight at 100 ± 2^{0}C to a constant weight and calculated as

Moisture% = 100 – DM%

$$\text{Where DM\%} = \frac{\textit{Weight of dried smple}}{\text{Weight of fresh sample}} \times 100$$

Nitrogen %

The nitrogen level in litter material were analysed by kelplus nitrogen estimation system (Model: CLASSIC –DX VATSE).This instrument is based on Kjeldahl method (AOAC, 1990) for nitrogen analysis and consists of 3 phases Digestion, Distillation and Titration. The nitrogen content was obtained by the formula.

$$\text{Nitrogen\%} = \frac{14.01 \times (\text{ml titran} - \text{ml blank}) \times N \times 100}{\text{Sample weight (g)} \times 1000}$$

Performance Index (PI)

Performance Index (PI) was calculated using the following formula:

$$\text{PI} = \frac{\text{Live body weight(kg)}}{\text{Feed conversion ratio}} \times 100$$

Live body weight

Weekly recording of live body weights of 10 selected birds from each group was done by using electronic weighing machine. Body weights of selected birds were recorded in gram.

Feed conversion ratio

Growth and feed consumption rate were calculated at weekly interval. Feed gain ratio was determined according to the following formula:

$$\text{Feed conversion ratio} = \frac{\text{Total feed consumed (g)}}{\text{Total weight gain (g)}}$$

Statistical analysis

Statistical analysis of data was done by using SPSS 20.0 software. The data obtained were subjected to variance (ANOVA) and means were compared using Duncan's Multiple Range Test (DMRT).

Results and Discussion

Analysis of litter material

The pH, moisture % and nitrogen % of litter materials under different groups have been analyzed at the end of the experiment and was presented in the Table 1.

pH

The Table 1 showed that there was significant difference in pH of the litter on the different groups. The lowest pH (8.21) was observed in T_2 group and was significantly differed from other three groups. There was no significant difference between T_1 and T_3 groups, but pH of T_1 (8.51) significantly ($p<0.05$) differed from that of control group. However, there was no significant difference between control and T_3 groups in pH of litter.

Moisture %

The moisture % of litter materials under different treatment groups were significantly different at the end of the experiment (Table 1). The lowest (30.11) moisture % was observed in the litter of T_2 group birds and that of highest (35.93) was recorded in the litter of control group birds. The moisture % of T_1 group also significantly differed from that of T_3 group.

Nitrogen %

The nitrogen % of litter materials of different group of treatments have been presented in the Table 1 and it was observed that there was statistically significant difference. The lowest nitrogen % of litter was observed in T_2 group followed by T_1, T_3 and control groups. The lowest least mean nitrogen % of T_2 group was 3.05 where as that of highest mean was 4.25 in control group of birds.

Performance index (PI)

The performance index of broiler chicken in this experiment has been tabulated in Table 2. The data revealed that the performance indices of control, T_1, and T_2 were comparable but these differed significantly from T_3 group during initial week. During 8 to 21 days of trial PI of T_2 was significantly higher than rest of the groups. Almost similar trends were also observed during 22 to 42 days of period. Overall performance index was significantly higher in T_2 group followed by T_1, control and T_3 groups.

Table.1 pH , moisture %, nitrogen % of litter under different treatment groups

Attributes	Control	NLP T1	NLP T2	NLP T3	SEM	P value
pH	8.82^{a}	8.51^{b}	8.21^{c}	8.55^{ab}	.068	0.003
Moisture %	35.93^{a}	32.25^{b}	30.11^{d}	31.42^{c}	.510	<0.001
Nitrogen %	4.25^{a}	3.49^{c}	3.05^{d}	3.88^{b}	.474	<0.001

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

Table.2 Performance index of broiler chickens fed diet supplemented with neem leaf powder (NLP)

Attributes	Control	NLP T1	NLP T2	NLP T3	SEM	P-Value
Zero to 7 day	9.67^{a}	9.81^{a}	9.85^{a}	8.87^{b}	0.148	0.047
8 to 21 day	44.67^{c}	49.02^{b}	55.40^{a}	45.13^{c}	0.994	<0.001
22 to 42 day	75.27^{c}	85.03^{b}	92.85^{a}	73.42^{d}	1.797	<0.001
0 to 42 day	129.05^{c}	143.63^{b}	157.68^{a}	126.99^{d}	2.842	<0.001

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

In the Indian tradition, the beneficial properties of neem have been recognized since ancient era. Each part of the neem tree have some meditational values and various parts of neem had already used in chicken production but very few references are available on dry neem leaves tested in broiler litter to see any beneficial effects such as reduction of ammonia, microbial load etc. from the litter. In the present study, the litter of T_2 group of birds recorded the lowest pH (8.1), the lowest moisture (30.11%) and the lowest nitrogen (3.05%) as compared to other three groups under study. This indicated comparatively lower level of ammonia release from the poultry litter of group T_2 birds (4g dry neem leaves/sqft area). Shishir *et al*., (2013) reported in their investigation that maximum reduction of NH_3 level (93%) in the poultry litter was found when applied 100g of dry neem leaves /16 sqft area in the saw dust litter; i.e. 32.95 ppm NH_3 gas level reduced into 2.06 ppm where as Moore *et al*., (2008) found a result reduction about 75% by using alum.

From the present study it might be concluded that the pH, Moisture % and N % of litter of T2 group recorded significantly lower value than those of T1 and T3 groups. Overall performance index values was significantly higher in T_2 group than other

three groups. Therefore, neem leaf powder @ 4g /sq. ft. area of litter per week might improved the performance index of broiler chicken.

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