Effect of Neem (*Azadirachta indica*) leaf powder on the growth performance and carcass quality of Broiler Chicken - A Review

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Abstract

The goal of this review was to see how feeding Azadirachta indica leaf powder to broilers altered their growth and carcass characteristics. The diverse activity of neem leaves on intestinal micro flora, which avoids stressful conditions, could explain why broiler hens' body weight and body weight gain improved after NLP was added to their diets. The feed consumption of the control and neem leaf fed broiler chicken groups differs significantly. Its hunger and digestion stimulating, antimicrobial, and hepatoprotective effects may account for the increased feed intake. The enhanced feed intake could be explained by its appetite and digestion stimulating, antibacterial, and hepatoprotective properties, which help to lessen the microbial burden of birds and boost feed consumption. To increase overall performance, in commercial broiler chicken diets, neem leaf powder can be employed as a cost-effective natural feed supplement. To fully leverage the neem plant's potential benefits as a broiler feed, more research is needed in these areas.

Key words: *Azadirachta indica;* Supplementation; Growth; Broiler; Carcass Quality.

Introduction

The poultry sector has evolved to include egg producers, broiler producers, hatcheries, poultry equipment makers, and feed mills, among others (Padhi, 2016). Because of its short generation interval, rapid turnover rate, and low capital investment, poultry is one of the quickest ways to enhance the nutritional standard of the people (Ani and Okeke, 2011). Broiler production is the fastest-growing agricultural business in emerging countries, making it both necessary and profitable. Broiler production is the process of raising heavy meat breed chickens for the goal of producing high-quality meat (Ufele et al., 2020). Poultry and other animal sources of protein are excellent sources of high-quality protein (AOAC, 1980). As a result, the worldwide poultry sector has been steadily expanding for years, and it currently contributes significantly to filling the gap created by global protein deficiency by boosting meat and egg output annually (Aouacheri et al., 2009).

One of the most intensive forms of animal husbandry is the production of meat and eggs from chickens (FAO, 2020). It is a global industry that has met its principal goal of supplying a low-cost source of animal protein (Augère-Granier, 2019). This success could be attributed to a variety of factors, including high-quality feed and illness control, which is aided in part by antibiotic use.

Several herbal plants are used as growth promoters, antibacterial, antiparasitic, anti-coocidial, anti-fungal, anti-tumor, and immune-boosters in chicken diets (Subapriya and Nagini, 2005). *Allium sativum*, *Zingiber officinale*, *Mentha piperita*, *Azadirachta indica*, *Moringa oleifera*, *Cichorium intybus*, Turmeric, fennel, fenugreek and black cumin are among these plants (Ansari et al., 2008 and Nidullah et al., 2010, Sethy et al 2017, Yesuf et al 2017 and Gharehsheikhlou et al 2018).

In neem leaves, crude protein is 15.8%, crude fiber is 14.6%, Ether Extract is 8.5 percent, Ash is 4.5 percent, Moisture is 13.0%, and NFE is 56.6 percent (Bonsu et al., 2012). Bonsu et al. (Bonsu et al., 2012). More than a hundred and thirty-five bioactive chemicals, including azadichtin, meliacin, gedunin, salanin, nimbin, valassin, sodium nimbolide, cyclic trisulphides, and others, have been discovered in various areas of neem trees. The pharmacological properties of the neem leaf include anti-inflammatory, anti-hyperglycaemic, anti-ulcer, anti-malarial, anti-fungal, anti-bacterial, anti-viral, anti-oxidant, anti-mutagenic, immunomodulatory, and other properties (Subapriya and Nagini, 2005).

Neem (Azadirachta indica) is an antibacterial, antiviral, antibiotic, and antifungal plant that also boosts the immune system (Subapriya and Nagini, 2005). As a growth stimulator, Azadirachta indica has the potential to replace antibiotics. However, there is currently a scarcity of empirical data on their effects on broiler performance. As a result, researchers conducted research to see how Azadirachta indica leaf powder affected broiler chicken growth and carcass qualities.

Body weight gains of broiler chicken in different treatment groups (g/bird/week)

The average body weight of broilers differed significantly ($p<0.05$) across treatment groups (P. D. Mali et al., 2020). (1928.35 16.45) received NLP 10g per kg supper and had a significantly ($p<0.05$) increased body weight (P. D. Mali et al., 2020). Supplementing neem leaf powder @ 1-2 gm/kg feed resulted in a considerable rise in the live body weight of broilers as compared to the control group, according to Manwar et al., (2007). Broilers fed 1 percent neem seed cake exhibited significantly higher body weights at six weeks of age than those in the control group ($p<0.05$), according to Khan et al. (2014). Khatun et al., (2013) discovered that feeding 1-3 ml of tulsi and neem leave extract per kg poultry meal boosted live body weight and improved weekly weight gain and feed efficiency when compared to a control group of poultry.

During the first week of life, the mean (SE) weekly body weight of the four treatment groups did not differ substantially ($P>0.05$). During the second, third, fourth, fifth, and sixth weeks of life, broiler chicken body weight varied significantly ($P>0.05$) (J Deka et al., 2019). According to the same source, the body weight of broiler chicks differed significantly ($P<0.01$) during the second, third, fourth, fifth, and sixth weeks of life. (0.3%) and (0.2%) groups acquired significantly more body weight ($p<0.05$) than the control and (0.1%) groups during the second, third, fourth, fifth, and sixth weeks of life. This finding similar with the finding of Manwar et al. (2005), Onyimonyi et al. (2005), Zanu and his colleagues (2011), Shihab et al. (2012) and Ansari et al (2017).

The diverse activity of neem leaves on intestinal microbiota, thereby avoiding stressful conditions, could explain why broiler hens' body weight and body weight gain improved after NLP was added to their diets (Durrani et al. 2008). Furthermore, an active component in neem leaves, including as Nimbin, Nimbidin, and Azadirachtin (Brahmachari, 2004), reduce host pathogen activity (Amandioha, 2000) and can thus be used as an antibacterial in broiler production (Brahmachari, 2004). When compared to broilers fed a basal diet without neem leaf powder, dietary supplementation of neem leaf powder at levels of 0.2 and 0.3 percent in the broiler ration increased body

weight and body weight gain. Manwar et al. (2005), Ansari et al. (2012), Ali et al. (2015), and Alam et al. (2015) all reported similar findings.

According to studies, broilers fed diets supplemented with 2.5 g/kg neem leaf meal at 28 and 42 days of age had considerably increased body weight, dressing percentage, and feed efficiency (Ansari et al., 2012). After 42 days, broilers fed a diet supplemented with leaf meal acquired 8.96% more weight per day than those given antibiotics (Ansari et al., 2012).

Over the duration of the experiment (35 days), the influence of neem powder on the rate of body weight gain in chicks (Ihsan Mohammad Shihab et al, 2017). The same authors identified significant changes between the treatments over the weeks-long investigation. When compared to the control treatment, the results show that treatment (2g) is significantly superior ($p<0.01$), followed by subsequent treatments (1g), (3g), and so on (Ihsan Mohammad Shihab et al, 2017).

As neem leaf powder (1-3 gm/kg) was added to the I1, I2, and I3 broiler groups, mean live body weights increased significantly ($p<0.01$) when compared to the control (I0) group. The weekly weight gains for I0, I1, I2, and I3 groups were 279.2049.04, 306.315.633, 311.8050.70, and 310.3051.71, respectively.

Feed intake and feed consumption of broiler chicken

There were no significant differences in the overall feed consumption of the birds in any of the treatment groups during the course of the experiment (P. D. Mali et al., 2020). (10gm NLP/kg feed) consumed the least amount of feed, while control consumed the most (P. D. Mali et al., 2020). The same author discovered that supplementing neem leaf powder with an increase in the level up to 15gm per kg of feed resulted in a decrease in feed consumption during the trial. This could be due to the presence of miliacin, a compound found in the leaves that produce bitter flavors (National Research Council, 1994). According to Khan et al., (2014), broilers in the control group ate a lot of feed, whereas group C birds fed a 1% neem seed cake ate a lot less.

The first week of life, (the control group) had the lowest feed consumption, while (NLP-0.3%) had the highest. During the second week, feed intake was highest in the (0.2%) and lowest in (NLP-0.1%) (Deka et al. 2019). A similar pattern was observed in the third week of life, with the exception that feed consumption was lowest in the T0 group. During the fourth week, (NLP-0.3 percent) had the highest feed intake and the (NLP-0.1 percent) had the lowest, whereas the (NLP-0.3 percent) had the highest and the (NLP-0.3 percent) had the lowest (J Deka et al. 2019). At the conclusion of the sixth week of life, the (NLP-0.3%) had the highest feed intake (994.40 g), whereas (NLP-0.2%) had the lowest (839.24 g). In comparison to the control group (0.0 percent), supplementation of neem leaf powder at 0.2 and 0.3 percent enhanced feed intake for all weeks except the fifth week of age (J Deka et al. 2019).

Its appetite and digestion stimulant, antibacterial, and hepatoprotective actions (Wanker et al., 2009), which serve to minimize bird microbial burden and boost feed consumption, could explain the increased feed intake. Neem leaves also have a carminative action and aid digestion (Durrani et al., 2008). In terms of increased feed consumption, other workers reported comparable findings (Onyimonyi et al., 2009). Unlike Zanu et al. (2011), Adeyemo and Akanmu (2012), Bonsu et al. (2012), Nnenna and Okey (2013), and Ali et al. (2015), who found no significant difference in feed intake between the control and neem leaf fed broiler chicken groups, Ali et al. (2015) found a significant difference in feed intake between the control and neem leaf fed broiler chicken groups.

Overall feed consumption per broiler was highest in (NLP-0.3%) (3593.86 g), followed by (NLP-0.2%) (3504.96 g), (3247.58 g), and (NLP-0.1%) (3222.67g). Adding NLP at 0.2 and 0.3 percent boosted overall feed consumption by 8.05 and 9.63 percent, respectively, when compared to the control group (Deka et al., 2019). Shihab et al. (2017) found that the 0.2 percent NLP supplemented group had the highest overall feed consumption (3281.6 g) over a five-week period, whereas the control group had the lowest (2592.6 g). According to Onyimonyi et al., 2009), Adeyemo and Akanmu, 2012, and Bonsu et al., 2012, supplementing broiler hens with high levels of NLP at dosages of 0.5 percent and above significantly reduced feed consumption.

Feed conversion ratio (FCR) of broiler chicken in different treatment groups

Shihab et al. (2017) discovered that during a five-week period, the 0.2 percent NLP supplemented group had the highest overall feed consumption (3281.6 g), whereas the control group had the lowest (2592.6 g). According to Onyimonyi et al., 2009), Adeyemo and Akanmu, 2012, and Bonsu et al., 2012, supplementing broiler hens with high levels of NLP at dosages of 0.5 percent and above significantly reduced feed consumption. A baseline diet supplemented with probiotic + garlic + neem leaf @ 1 kg per ton of feed showed the highest outcomes ($P< 0.05$) in final body weight, weekly growth, weekly feed intake, and feed conversion ratio, according to

Abujradah et al., (2018). When compared to the control broiler group, all neem-treated groups had the same non-significant FCR, unlike Alam et al., (2015).

A (30ml/liter of drinking water), B (40ml/liter of drinking water), and C (50ml/liter of drinking water) had lower feed conversion ratios ($P<0.05$) than the control groups, demonstrating cost savings from reduced feed consumption boosted by neem leaves infusion (Durrani et al., 2008). According to Chakeravarty and Prasad (1991) broilers given commercial diet and water with neem (A. indica) infusion exhibited a greater feed conversion ratio than others.

Adding 1-2g/kg of neem leaf powder to the ration significantly improved body weight increase and feed conversion ratio in broilers. The incorporation of macro and micro nutrients in A. indica leaf meal helps to promote weight gain. The increased body weight gain in broilers fed leaf meal may be due to its appetite and digestion stimulating, antibacterial, and hepatoprotective properties, which help to reduce the birds' microbial load and increase feed consumption and feed efficiency, implying that neem is a good alternative to antibiotic growth promoters (Ansari, et al., 2008).

According to Nemade et al. (1993), neem-fed groups showed higher feed efficiency. Broilers fed Azadirachta indica (Neem) exhibited a significantly greater feed conversion ratio than those fed other treatments ($P < 0.05$), according to Ansari et al. (2008). On the other hand, Wankar et al. (2009) and Nidaullah et al. (2010) revealed that dietary NLP supplementation did not significantly improve feed efficiency in broilers.

The average feed conversion ratio of the broilers was statistically significant ($P<0.01$) (Imran Ahmed et al., 2014). Birds in (1 percent/kg) broilers, according to the same author, had a substantially higher average feed conversion ratio (1.94). Birds in (0.5 percent /kg) and (1.5 percent /kg) had feed conversion ratios of 2.08 and 2.06, respectively. The feed efficiency of the birds in Control group was the lowest, at 2.13 (Ahmed et al 2014).

The carcass characteristics and cut-up part of broiler chickens

Among the four treatment groups, the average dressing percentage ranged from 67.22 1.35 to 69.94 0.45 percent (Mali et al., 2020). The (base ration + 10gm NLP/kg of feed) had the maximum breast yield. However, there was no significant difference between all of the treated groups. Although there was a statistically insignificant difference in giblet and drum stick per cent of carcass weight between treatment groups, there was a modest difference in giblet and drum stick per cent of carcass weight between treatment groups (Mali et al., 2020). According to the same author, (Basal ration + 10gm NLP/ kg of feed) had the highest thigh yield. The difference between all therapy, on the other hand, was not significant. Kharde et al., (2014) showed no significant ($p>0.05$) effect of garlic and neem leaf powder (NLP) supplementation on carcass parameters like dressing yield and giblet yield (heart, gizzard, and liver) in all treatment groups. Between the dietary interventions, there were no statistically significant differences ($p>0.05$). This demonstrated that increasing NLM had no effect on broiler chicken carcass properties across treatments (Ubua et al., 2019). Bonsu et al. discovered that NLM in broiler diets had no effect on overall carcass characteristics in a previous investigation.

Breast (19.67-22.33 percent), drumstick (12.33-12.67 percent), thigh (14.00-14.33 percent), and back (17.00-19.33 percent) were found to have no significant ($p>0.05$) influence of dietary therapies (Ubua et al., 2019). Obun et al (2013) found a substantial ($p <0.05$) effect, which contradicted this conclusion. This could be due to the lack of a negative effect of NLM in the trial, as greater quantities of NLM in the meals had no effect on the birds. The results of the internal organs followed the same pattern as the cut-up portions. There was no statistically significant difference ($p>0.05$), which could be attributable to the broiler chickens' effective use of the diets.

In neem-treated groups, Elangovan et al. (2001) reported no variations in carcass characteristics. With the exception of breast weight, which was greater ($p<0.05$) in group C (given neem infusion 50ml/liter of drinking water) than in the other groups, the weight of major body organs remained unaffected in both treated and untreated groups (Durrani et al., 2008). According to the same source, the mean weights of giblets, intestines, and abdominal fat were also the same for all groups. Alkali-treated neem meal treatment had no effect on the liver, heart, gizzard, stomach, or abdominal fat, according to Elangovan et al. (1996). In broilers fed two herbal plant extracts, Hernandez et al. (2004) showed no differences in the mean weight of the proventriculus, gizzard, gut, liver, or pancreas.

Elangovan et al. (2000) discovered that feeding growing Japanese quails a neem kernel meal-based diet had no influence on carcass characteristics or organoleptic meat testing. According to Kaushal, (2012) NLP supplementation had no influence on the drumstick, back, neck, or wing weights of Japanese quails.

The live body weight of broilers in the neem fed groups increased significantly when compared to the control group because neem leaf powder was supplemented at 1-2 gm/kg feed. The diverse action of neem leaves on intestinal microbiota, which avoids stressful situations, could explain why broiler hens' body weight and weight gain improved after eating neem leaf powder. Neem leaf powder supplementation at 0.2 and 0.3 percent increased feed intake until the fifth week of age, compared to the control group. The enhanced feed intake could be explained by its

appetite and digestion stimulating, antibacterial, and hepatoprotective properties, which help to lessen the microbial burden of birds and boost feed consumption. Adding 1-2g/kg of neem leaf powder to the ration significantly improved body weight increase and feed conversion ratio in broilers. To increase overall performance, neem leaf powder can be used as a cost-effective natural feed addition in commercial broiler chicken diets.

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