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Effect of Ashwagandha (*Withania somnifera*) root powder supplementation on the production performance in broilers: A review

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Abstract

Ashwagandha (*Withania somnifera*) is a well-known herb possessing several health benefits. Steroidal alkaloids and lactones are the main active constituents of the plant. It consists of following properties viz. adaptogenic, antidepressant, liver- tonic, antioxidant, immune modulator, immunoadjuvant, anti-carcinogenic, anti-metastatic. Supplementation of Ashwagandha in diet of poultry birds improves feed intake, body weight gain, feed conversion ratio, hematological profile, immunological status, neuro-protective, rejuvenate muscles, lipid profile, gut microflora and intestinal morphometry. The effect of birds fed ration supplemented with Ashwagandha at different levels gradually improved feed intake, body weight, feed efficiency and nutrient metabolizability.

Keywords: Ashwagandha, poultry, growth, metabolizability

Introduction

The poultry industry in the country in present era has grown rapidly on account of its low capital investment, early assured returns, short generation intervals and limited land requirements (Singh *et al.*, 2014) [30]. Use of synthetic growth promoters like antibiotics has led to success in limiting most of the prevalent bacterial diseases which affected man and animals in epidemic proportions. At the same time, inadvertent and overuse of antibiotics resulted in disadvantages like high cost of production, toxicity and development of resistance and environmental and health hazards. The emergence of drug-resistant organisms necessitates the search for an alternative source of antimicrobial agents that has necessitated a study of the effect of herbal plants. WHO has recommended development and use of environment-friendly alternative methods to control diseases in poultry and other food producing animals (WHO, 2001) [33]. To eliminate antibiotics, several studies has focused on the development of alternative strategies to maintain poultry health and enhance performance within intensive systems, and numerous substances, commonly known as natural growth promoters (NGPs) have been identified as effective alternatives to antibiotics. Commonly used growth promoters are prebiotics, probiotics, synbiotics, enzymes, acidifiers and phytobiotics.

Phytobiotics are NGPs, which have been growing in popularity as feed additives, due to their beneficial effect on gut health and immunity and growth performance. Various herbs contain growth promoter, antimicrobial, coccidiostats, antioxidants, enzymes, hormones, probiotics, buffers; organic acids and mould inhibitors and thus can be used as feed additive. Herbal preparations are widely used as feed additives for enhancing growth, reducing feed cost by improving feed conversion ratio and for building better immunity in broiler production (Biswas *et al.*, 2012 and Pandey *et al.*, 2013) [8, 20]. Furthermore, these herbal feed additives have no side effects on the health of birds and increase the performance of broiler by increasing live weight gain, feed conversion ratio (Samarth *et al.*, 2002) [25] and immunity (Bhardwaj *et al.*, 2011 and Kumari *et al.*, 2012) [7, 14].

Ashwagandha

India with its rich traditional heritage is well known for Ayurvedic medicine system due to its therapeutic potential, which has been now practiced for human as well as animal health care. *Withania somnifera* (Ashwagandha) holds a celebrated position in the Indian *materia medica*. Ashwagandha (*Withania somnifera*) is a plant of Solanaceae family. This plant is cultivated and also found as natural herb in many dry and hilly areas in India and Pakistan. *Withania somnifera* root powder contain 8.0% moisture, 2.0% crude protein, 5.05% crude fibre, 1.15%

ether extract and 4.92% total ash along with macrominerals (in %): calcium (0.156), phosphorus (0.13), magnesium (0.185), sodium (0.55), and potassium (2.25); and microminerals (in ppm) copper (25.0), zinc (37.55), iron (647.25), and manganese (42.5). The root has a strong pungent smell and bitter to taste and contains several alkaloids (0.13 to 4.30%), which offer medicinal usages. Ashwagandha plant constitutes alkaloids and steroidal lactones, but the withanine, the main alkaloid found in its roots and leaves is thought to be responsible for its biological activity. Other constituents include saponins containing an additional acyl group (sitoindoside VII and VIII). It consists of following properties viz. adaptogenic, antidepressant, liver- tonic, antioxidant, immune modulator, immune adjuvant (Ziauddin *et al.*, 1996)^[34] and also improve feed intake, body weight gain, FCR, hematological profile and immunological status, neuro-protective and rejuvenate muscles (Ansari *et al.*, 2008)^[4]. The extract of this plant is a potent immune stimulator, antioxidant, anticarcinogenic, antimetastatic (Davis and Kuttan, 2000; Mishra *et al.*, 2000 and Sharma *et al.*, 2010)^[9, 17, 27] and antibacterial (Owais *et al.*, 2005)^[19]. It has been reported that Ashwagandha significantly increases the white blood cell and erythrocyte counts (Manish *et al.*, 2004 and Senthilnathan *et al.*, 2006)^[16, 26]. Preparations obtained from this plant have been shown to enhance circulating antibody titer, increase the activity of lysosomal enzymes and increase phagocytosis (Agarwal *et al.*, 1999)^[1]. The present review describes effect of Ashwagandha supplementation as feed additive on different parameters of poultry birds like growth performance, nutrient metabolizability and its relevance with the results of the conducted study.

Growth Performance

An experiment was conducted on 300 day old chicks divided into six treatments with five replicate each having ten birds per replicate. The control group (T₁) was fed with standard diet, while T₂ was fed with antibiotic. Remaining four groups i.e. T₃, T₄, T₅ and T₆ were fed Ashwagandha @ 0.25%, 0.50%, 0.75% and 1.0%. Over all feed intake in the study conducted ranged between 3166.80 g/bird (T₃) to 3506.20 g/bird (T₆) and highest was found in 1.0% (T₆) followed by 0.75% (T₅) and 0.50% (T₄) Ashwagandha supplemented groups. The feed intake was significantly ($P < 0.05$) high among groups fed with higher levels of Ashwagandha root powder as compared to control. Body weight gain from day 0 to 42 ranged from 1707.76 g (T₃) to 1997.42 g (T₆) and significantly ($P < 0.05$) higher body weight gain was found in 1.0% (T₆) Ashwagandha supplemented group followed by 0.75% (T₅), 0.50% (T₄) Ashwagandha supplemented groups as compared to antibiotic supplemented and control group. At the end of feeding trial, T₁ (control) showed significantly ($P < 0.05$) highest FCR in comparison to Ashwagandha supplemented groups at higher level and significantly ($P < 0.05$) lowest FCR was found in 0.75% followed by 1.0% Ashwagandha supplemented groups. This increase in the body weight gain, feed intake and feed conversion ratio of the broilers in the present study was found relevant with work done many researchers. Pedulwar *et al.* (2007)^[21] conducted a study to determine the effect of supplementation of Ashwagandha root powder on the growth performance and carcass characteristics of broilers. The control group was reared on standard broiler diet while the treatment groups were fed on Ashwagandha supplemented diet at 0.5 and 1%

levels up to six weeks of age. It was concluded that dietary supplementation of Ashwagandha root powder increased the body weight of broiler chicks. Another study conducted by Ansari *et al.* (2008)^[4] to determine the comparative efficacy of six medicinal plants including *Nigella sativa*, *Boerhavia diffusa*, *Withania somnifera*, *Ipomea digitata*, *Azadirachta indica* and *Corylus avellana* at the rate of 4 g per kg of feed as growth promoter and their subsequent influence on the performance of broilers. Two hundred ten day old chicks were randomly divided into 21 experimental units of 10 chicks each. Maximum gain in weight was observed with the *Withania somnifera* (1.819 kg) followed by *Nigella sativa* (1.805 kg) and *Azadirachta indica* (1.800 kg). The best cumulative FCR at the end of sixth week of age was for that of *Withania somnifera* (2.038) followed by *Nigella sativa* (2.054) and *Azadirachta indica* (2.083). The lowest results as regards FCR were recorded for *Ipomea digitata* (2.394) and *Boerhavia diffusa* (2.396). The results of the *Corylus avellana* (2.209) and control (2.235) were statistically similar. They concluded from this study that medicinal plants especially *Withania somnifera*, *Nigella sativa* and *Azadirachta indica* can be used as growth promoters in the poultry diets with better production performance. Jadhav *et al.* (2008)^[10] concluded from their study that dietary supplementation of Ashwagandha root powder and ascorbic acid as anti-stress agents during hot weather improved the growth performance and immune status of birds. Shisodiya *et al.* (2008)^[28] advocated that supplementation of Ashwagandha and commercial synthetic compound resulted in significant improvements in all the growth parameters (live body weight, weekly gain in body weight and feed conversion ratio) for all the supplemented groups compared to the control group. However, no significant difference in feed intake between treatment groups of broilers fed *Withania somnifera* root powder as herbal feed supplement. Muhammad *et al.* (2009)^[18] studied the effect of *Zingiber officinale*, *Carum apticum*, *Withania somnifera*, *Trigonella foenum Graecum*, *Silybum marianum*, *Allium sativum* and *Berberis lyceum*, on the growth performance of broiler chicks. A total of 240 day old chicks were divided into four groups (A, B, C and D) each having 60 chicks. Each group was further subdivided into three groups (replicates) each having 20 chicks. Aqueous extract of these plants was mixed at the rate of 5, 10 and 15 ml/lit with water offered to group B, C and D, respectively while group A served as a control. Mean weight gain, dressing percentage, breast weight and leg weight were significantly higher ($P < 0.05$) in group C with lower FCR (Feed Conversion Ratio) while mean feed intake was significantly high in control group. It was concluded from this study that these locally available plants if offered as supplement to broiler diet may result in improvement of feed efficiency. Bhardwaj and Gangwar (2011)^[6] also found that cumulative feed intake (g/b) for 8- 23 weeks feeding period was significantly ($P < 0.05$) higher in control and lower in the entire Ashwagandha treated groups; FCR (feed intake/egg mass) and net FCR were significantly ($P < 0.05$) poorer in T₁ group than other supplemented group. There was a significant increase in body weight in the group of birds supplemented with 2 percent *Withania somnifera* root powder (Saleem *et al.*, 2011)^[24]. Biswas *et al.* (2012)^[8] studied the effect of Ashwagandha powder alone or with ascorbic acid on production performance of broilers. The treatment groups were control (C), T₁ (1% Ashwagandha powder), T₂ (0.05% ascorbic acid) and T₃ (0.5% Ashwagandha powder and

0.025% ascorbic acid). Supplementation of Ashwagandha, ascorbic acid and their combination in broiler diet showed significant effect on feed intake and feed conversion ratio than control group. T₁ had higher body weight gain followed by T₂, T₃ and control group. Ansari *et al.* (2013) [3] observed that feed efficiency (weight gain/feed intake) was influenced by the 2.5% and 5% levels of *Withania somnifera* root used at both 28 and 42 days of age, improving the feed efficiency compared with the diets at lower (1.25%) level of *Withania somnifera* roots and control.

Srivastava *et al.* (2013) [31] conducted an experiment to find out the effect of Indigenous herbal drug and market herbal drug (Livkey) on the performance efficiency of broiler chicks. They took 50 ml market herbal drug (Livkey) per kg feed and Indigenous herbal drug (*Withania somnifera*, *Asparagus racemosus* and *Mucuna pruriens* in the ratio of 50:25:25 respectively) @ 2%/kg diet in T₂ and T₃ treated groups respectively, while T₁ as control. The result showed that the cumulative feed conversion efficiency and cumulative performance efficiency factor in group T₃ at the end of experiment was greater than group T₂ followed by group T₁. Joshi *et al.* (2015) [11] conducted experiments to evaluate the effect of dietary addition of Ashwagandha (*Withania somnifera*) and Guduchi (*Tinospora cordifolia*) powder on broiler performance. Supplementation of Ashwagandha (*Withania somnifera*) and Guduchi (*Tinospora cordifolia*) significantly increased overall body weights, weekly gain in body weight of broilers as compared to the control group. They also found that supplementation of Ashwagandha at 1% and 2% level of the feed had no significant difference on the overall feed intake.

Vasanthakumar *et al.* (2015) [32] reported that the feed intake (g) was significantly ($P < 0.05$) more in 1% Ashwagandha root powder in T₂ (4580.64±94.86) and 0.15% root extract in T₃ (4423.52±76.23) supplemented groups as compared to the T₁ (3954.22±83.24) control group. Kale *et al.* (2016) [12] who found that broiler chicks fed *Withania somnifera* root powder at the rate of 2.5% and 5% of feed attained significantly ($P < 0.05$) higher body weight in T₁ (567.00 g) and T₂ (581.67 g) as compared to those in T₀ (424.17 g) in six weeks of age. Also, the broilers in group T₁ and T₂ showed significantly ($P < 0.05$) better FCR than T₀ indicating better utilization of feed. A significant ($P < 0.05$) increase was reported in final body weight and decrease in feed conversion ratio when broiler diet was supplemented with 250 mg/kg Ashwagandha and 0.20 mg/kg Selenium, respectively (Singh *et al.*, 2017) [29]. Kumar *et al.* (2018) [13] study revealed a significant ($P < 0.05$) increase in body weight gain, feed efficiency and feed intake when fed diet supplemented with 100 mg/kg *Withania somnifera* extract to broiler birds.

This improved performance in broilers fed *Withania somnifera* root might be due to the improved nutrient digestibility as observed by Lilija (1983) [15], which was associated with the development of digestive tract and digestive organs. The improvement in body weight and FCR might be related to main active constituent withanine and withanolide of *Withania somnifera* root powder that could act not only as antibacterials and antioxidants but as a stimulant of digestive enzymes in the intestinal mucosa and pancreas that improved the digestion of dietary nutrients and feed efficiency, subsequently increasing the growth rate (Ali, 2011) [2].

Nutrient Metabolizability

Results of the study conducted by Attia *et al.* (2017) [5] revealed that apparent digestibility coefficient of dry matter, crude protein and ether extract were significantly ($P < 0.01$) increased by an average of 4.5%, 3.3% and 5.7% due to inclusion of plant extract blend at levels ranged from 100 to 2000 ppm, 500 to 2000 ppm and 500 to 2000 ppm, respectively when compared to control. These results are in consistent with the findings of Saini *et al.* (2017) [23] who observed that dry matter digestibility of broiler ration increased with increase in level of *Withania somnifera* up to 1.0% and thereafter decreased. Further, he also suggested that inclusion of *Withania somnifera* as feed additive at the rate of 1.0% in broiler ration, exerted maximum nitrogen retention and thereafter at 0.5% level of inclusion. Similarly, Raghavan *et al.* (2011) [22] also observed significant effect on nitrogen balance due to supplementation of herbs.

The results of the study conducted are in consistent with review cited above. Supplementation at the rate of 0.75% and 1.0% Ashwagandha powder resulted in significantly ($P < 0.05$) higher dry matter (DM) metabolizability, nitrogen metabolizability and gross energy metabolizability than all other dietary treatments.

Conclusion

This review study is to draw attention towards the use of herbal plants especially Ashwagandha; as poultry feed supplement. Inclusion of Ashwagandha as herbal feed additive in poultry diet improves growth performance and nutrient metabolizability. This improvement in performance might be due to its active constituents that stimulate digestive enzymes production which in turn improves digestion, subsequently increasing growth rate. So from this study we concluded that Ashwagandha can be used effectively as herbal feed supplement in diet of poultry for better performance.

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