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Research Article

EFFECT OF SHATAVARI, GARLIC, ALOE VERA AND MORINGA SUPPLEMENTATION ON THE PERFORMANCE OF BROILERS FED WITH DISTILLERS DRIED GRAIN WITH SOLUBLE (DDGS) BASED DIET

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ABSTRACT

To evaluate the effect of herbal feed additives supplementation in DDGS based diet on the broilers production, 440 day old commercial broiler chicks were subjected to 11 dietary treatment groups. Control group (T_1) was offered maize soybean meal based diet. In groups T_2 and T_3, 15% and 30% soybean meal was replaced with DDGS. In T_4, T_5, T_6 and T_7, 15% DDGS inclusion was done with supplementation of 1, 1, 2 and 2% of shatavari root powder (SRP), garlic powder (GP), aloe vera gel (AVG) and moringa leaf meal (MOLM), respectively. Similarly, in T_8, T_9, T_{10} and T_{11} 30% DDGS inclusion was done with supplementation of 1, 1, 2 and 2% of SRP, GP, AVG and MOLM, respectively. Feed intake and weight gain (g/bird) were significantly ($P<0.05$) higher leading to improved FCR with herbal feed additive supplementation at both 15 and 30% DDGS inclusion level. It was concluded that 30% replacement of dietary soybean meal with DDGS have no negative effect on broilers' production. Further, supplementation of feed additives in DDGS based diet can significantly improve broiler performance.

Keywords: Aloe vera, Broilers, DDGS, FCR, Garlic, Moringa, Production performance, Shatavari

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Feed is the most significant cost in poultry production accounting upto 70% of the total production cost. The availability of low-priced, high-quality feeds is critical for the expansion of the poultry industry. With the development of ethanol industry, there is production of distillers dried grain with soluble (DDGS) in large quantities which has potential to partially replace soybean meal in broilers diet. Nowadays there is a need to look for natural alternatives to antibiotics due to emergence of drug resistance, residual toxicity and other side effects. The use of various herbs as dietary additives may positively affect poultry health and productivity.

Shatavari has its characteristic effects attributed to shatavarins having properties like nutritive tonic, anti-stress and immunostimulant (Sharma *et al.*, 1986). Garlic has bioactive components (Alliin, Diallylsulfides and Allicin) that act as antibacterial, antifungal, anti parasite, antiviral, antioxidant, antithrombotic and vasodilator characteristics (Amagase *et al.*, 2001). Aloe vera, saccharides, vitamins, enzymes, and low-molecular-weight compounds (Choi and Chung, 2003) which give aloe vera its anti-inflammatory, immunomodulatory, wound healing, anti-viral, anti-fungal, anti-tumour, anti-diabetic, and anti-oxidant effects (Christaki and Florou-Paneri, 2010). Moringa is a potent plant that could be used to enhance immune response and to improve intestinal health of broiler chicken (Yang *et al.*, 2006).

MATERIALS AND METHODS

The trial was conducted for a period of 6 weeks in poultry farm, Department of Animal Nutrition, College of Veterinary Sciences, LUVAS, Hisar. Four hundred and forty, commercial day-old ven-cobb broiler chicks were wing banded, weighed and distributed randomly into 11 treatment groups having two replications per treatment of 20 birds each. Birds were vaccinated against Ranikhet disease (F-strain) on 5th and Gumboro disease (IBD) vaccine on 14th day. Basal diet (T_1) was formulated as per BIS (2007) and other diets were formulated by replacing 15 and 30% of the soybean meal with DDGS and fed *ad-lib* throughout the feeding trial. Each DDGS level was supplemented with1, 1, 2 and 2% SRP, GP, AVG and MOLM, respectively as follows: T_2 having 15% of soybean meal replaced with DDGS; T_3 = 30% of soybean meal replaced with DDGS, T_4 = 15% of soybean meal replaced with DDGS+1% SRP; T_5 = 15% of soybean meal replaced with DDGS+1% GP; T_6 = 15%of soybean meal replaced with DDGS+2% AVG; T_7 = 15% of soybean meal replaced with DDGS+2 % MOLM; T_8 = 30% of soybean meal replaced with DDGS+1% SRP; T_9 = 30% of soybean meal replaced with DDGS+1% GP; T_{10} = 30% of soybean meal replaced with DDGS+2% AVG; T_{11} = 30% of soybean meal replaced with DDGS+2% MOLM. The nutrient composition (% DM basis) of feed ingredients and ingredient composition (%) in the starter and finisher rations has been presented in table1 and 2, respectively. The birds were weighed individually and the body weights were recorded to calculate body weight gain up to 6 weeks of age. The record of the feed offered and residual amount was maintained for each replicate to calculate the feed consumption per bird. Feed Conversion Ratio (FCR) for

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each replicate was calculated by dividing total feed consumed (g) with total body weight gain (g).

Data were analyzed statistically as described by Snedecor and Cochran (1994). Analysis of variance was used to study the differences among treatment means and they were compared by using Duncan's Multiple Range Test (DMRT).

RESULTS AND DISCUSSION

In this study, initial body weight did not vary significantly among different treatment groups as seen in table 3. At the end of experiment,the highest body weight was observed in T_7 treatment (2057.62) containing 15% DDGS inclusion with 2% MOLM followed by the group T_8 (1900.41) having 30% DDGS inclusion supplemented with SRP. Body weight of T_2 (1626.55)was non-significantly higher than T_1 (1536.19). T_3 had highest weight among T_1, T_2 and T_3. In groups having 15% DDGS inclusion, there was significant ($P<0.05$) increase in weight on addition of herbal feed additives. Weights of treatment groups T_4, T_5, T_6 and T_7 (1893.93, 1851.42, 1795.58 and 2057.62, respectively) were significantly ($P<0.05$) higher than the T_2. At 30% DDGS inclusion, T_8 (1900.41) and T_{10} (1858.91) showed significantly higher ($P<0.05$) average body weight as compared to T_3 (1696.82) however, average body weight was non-significantly high in T_9 (1826.96) and T_{11} (1805.83) as compared to T_3 (1696.82).

Total body weight gain (0-6 weeks) varied from 1488.44 (T_1) to 2012.32 (T_7). Among non-supplemented groups (T_1, T_2 and T_3) weight gain varied significantly in T_3 from T_1 but non-significant difference was observed between control and T_2. Among 15% DDGS groups, all herbal feed additive supplemented groups T_4, T_5, T_6 and T_7 had significantly ($P<0.05$) higher weight gain as compared to T_2 group which had weight gain of 1579.65. In 30% DDGS inclusion group, SRP supplemented group T_8 (1853.63) showed maximum weight gain while minimum weight gain was observed in group T_3 (1649.19) which was without any feed additive supplementation. At 30% DDGS inclusion, there was significantly higher ($P<0.05$) weight gain in T_8 (1853.63) and T_{10} (1813.28) treatment groups, while non-significant difference was observed in the T_9 (1780.21) and T_{11} (1759.28) treatment groups. Thus, supplementation of feed additives on DDGS based diet lead to improved body weight gain among broilers. These results are in agreement with that of Singh *et al.* (2018) who reported that 0.5% shatavari powder as feed supplement was beneficial in improving the average weekly body weight gain. Results do not support the finding of Dahale *et al.* (2014) who reported non-significant effect of SRP on body weight gain. The results are in close agreement with the findings of Kumar *et al.* (2010) who have observed significant improvements in growth of broilers fed with garlic supplement. The improvement in weight gain of the birds using garlic in their rations may probably be due to the fact that Allicin (an antibiotic substance found in garlic) inhibits growth of intestinal bacteria such as *S. aureus* and *E. coli* and inhibit aflatoxin producing fungi (Meraj, 1998). Resultantly, when the load of these bacteria in the intestine is low, birds may absorb more nutrients, thus leading to the improvement in weight gain of the birds using rations supplemented with *Allium sativum*. Mmereole (2011) observed that body weight and body weight gains were significantly higher in birds fed diet containing aloe vera supplement than birds fed control diet. Contrary to present study, finding of Yadav (2015) revealed non-significant body weight gain on supplementation of aloe vera in diet. These results are also supported by Banjo (2012) who reported that birds fed 2% MOLM recorded significantly higher ($P<0.05$) weight gain. The reason for improved weight gain can be attributed to high protein content of MOLM (Khan, 2015).

Replacement of soybean meal with DDGS at 15% level in treatment group T_2 caused no negative effects on overall feed intake (g/bird) (3251.05) as compared to the

Table 1

Nutrient composition of feed ingredients (% Dry matter basis)

S.No.	Ingredient	Crude Protein	Ether Extract	Crude Fibre	Total Ash	Metabolizable Energy*
1	Maize	9.1	3.9	2.2	1.5	3300
2	DDGS	45.0	5.5	6.1	5.2	2851
3	Soybean Meal	45.7	1.8	4.3	4.9	2230
4	Fish Meal	46.0	7.1	1.2	21.5	2210
5	Vegetable Oil	-	99.4	-	-	8800
6	Mineral Mixture	-	-	-	-	-

*Calculated values (Singh and Panda, 1992)

Table 2

Ingredient composition (%) of the starter (0-3weeks) and finisher rations (4-6 weeks)

Ingredients (%)	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8	T_9	T_{10}	T_{11}
Starter Ration											
Maize	56	56	56	56	56	56	56	56	56	56	56
DDGS	0	4.65	9.30	4.65	4.65	4.65	4.65	9.30	9.30	9.30	9.30
Soybean meal	31.00	26.35	21.70	26.35	26.35	26.35	26.35	21.70	21.70	21.70	21.70
Fish Meal	8	8	8	8	8	8	8	8	8	8	8
Vegetable Oil	3	3	3	3	3	3	3	3	3	3	3
Mineral Mixture	2	2	2	2	2	2	2	2	2	2	2
Feed Additives*	330	330	330	296	296	330	296	296	296	296	296
Herbal feed additives**	-	-	-	1	1	2	2	1	1	2	2
Finisher Ration											
Maize	61	61	61	61	61	61	61	61	61	61	61
DDGS	0	3.75	7.50	3.75	3.75	3.75	3.75	7.50	7.50	7.50	7.50
Soybean meal	25.00	21.25	17.50	21.25	21.25	21.25	21.25	17.50	17.50	17.50	17.50
Fish Meal	7	7	7	7	7	7	7	7	7	7	7
Vegetable Oil	5	5	5	5	5	5	5	5	5	5	5
Mineral Mixture	2	2	2	2	2	2	2	2	2	2	2
Feed Additives*	330	330	330	296	296	330	296	296	296	296	296
Herbal feed additives**	-	-	-	1	1	2	2	1	1	2	2

*Feed additives (g/100 kg of feed, excluding lysine): 10 g intermix; 20 g intermix DS; 66 g coxicheck, 50 g each of choline chloride and L-lysine, and 100 g methionine. 33 g CT star in T_1, T_2 and T_3 only. ** Herbal feed additives (kg/100 kg of feed): 1% shatavari root powder in T_4 and T_8, garlic powder in T_5 and T_9, aloe vera gel in T_6 and T_{10}, and Moringa leaf meal in T_7 and T_{11}

Table 3

Effect of dietary treatments on performance of broilers

Treatments		Initial weight (g)	Final weight (g)	Body weight gain (g)	Feed intake	FCR
T_1	Control	47.75±0.25	1536.19^{a}±16.58	1488.44^{a}±16.33	3215.41^{a}±5.61	2.16^{e}±0.03
T_2	15 % of soybean meal replaced with DDGS	46.90±1.50	1626.55^{ab}±52.08	1579.65^{ab}±50.58	3251.05^{ab}±90.94	2.06^{cde}±0.01
T_3	30 % of soybean meal replaced with DDGS	47.63±0.43	1696.82^{bc}±3.39	1649.19^{bc}±2.97	3453.01^{bcd}±90.85	2.09^{de}±0.06
T_4	15 % of soybean meal replaced with DDGS+1% SRP	45.55±0.50	1893.93^{d}±19.28	1848.38^{d}±18.78	3515.78^{cd}±45.68	1.90^{bc}±0.01
T_5	15 % of soybean meal replaced with DDGS+1% GP	44.90±0.45	1851.42^{d}±16.23	1806.52^{d}±16.68	3510.48^{cd}±83.60	1.94^{bcd}±0.06
T_6	15 % of soybean meal replaced with DDGS+2% AVG	45.95±1.25	1795.58^{cd}±34.48	1749.63^{cd}±33.23	3638.37^{d}±46.26	2.08^{de}±0.01
T_7	15 % of soybean meal replaced with DDGS+2% MOLM	45.30±0.05	2057.62^{e}±51.85	2012.32^{e}±51.90	3415.57^{abcd}±49.43	1.70^{a}±0.02
T_8	30 % of soybean meal replaced with DDGS+1% SRP	46.78±0.33	1900.41^{d}±65.91	1853.63^{d}±66.23	3411.13^{abc}±58.56	1.84^{ab}±0.03
T_9	30 % of soybean meal replaced with DDGS+1% GP	46.75±0.00	1826.96^{cd}±31.51	1780.21^{cd}±31.51	3472.17^{bcd}±62.59	1.95^{bcd}±0.07
T_{10}	30 % of soybean meal replaced with DDGS+2% AVG	45.63±0.28	1858.91^{d}±67.64	1813.28^{d}±67.37	3521.54^{cd}±42.74	1.95^{bcd}±0.10
T_{11}	30 % of soybean meal replaced with DDGS+2% MOLM	46.55±0.55	1805.83^{cd}±13.54	1759.28^{cd}±12.99	3367.82^{abc}±85.46	1.91^{bc}±0.03

Means bearing different superscripts in a column are significantly different ($p < 0.01$)

control group (3215.41). Supplementation of SRP, GP and AVG at 1%, 1% and 2%, respectively resulted in significant (P<0.05) higher feed intake in comparison to control group as well as group having 15% soybean replacement without any feed additives i.e. group T_2. Supplementation of 2% MOLM at 15% DDGS inclusion (T_7) had no effect on feed intake (3415.57) than control group as well as other group having 15% DDGS in place of soybean meal. 30% replacement level of soybean meal without feed additives (T_3) resulted in significant (P<0.05) increase in overall feed intake (3453.01) as compared to control group but had no effect in comparison to treatment group having 15% DDGS inclusion without feed additives. Supplementation of different feed additives at 30% soybean replacement with DDGS in feed i.e. T_8, T_9, T_{10} and T_{11} resulted in non-significant effects on overall feed intake which varied from 3367.82g in T_{11} to 3521.54 g in T_{10}. Feed additive supplemented groups (T_4, T_5, T_6, T_7, T_8, T_9, T_{10} and T_{11}) had statistically similar overall feed intake at 15% and 30% DDGS inclusion. The results are in agreement with Sihag and Sihag (2013) and Sonu (2017). They revealed that inclusion of DDGS in place of soybean meal up to 30% had no negative effect on feed intake. Similar to present study, Dwivedi (2013) reported the increase in feed intake at 1% SRP supplementation in broilers. Elagib *et al.* (2013) in their study found that the feed consumption was improved up to 3% of garlic supplementation. Darabighane (2011) found that supplementation of 2% aloe vera gel led to increase in feed intake in broilers. Results are also in agreement with Onu and Aniebo (2011) who reported that there was significant (P < 0.05) increase in feed consumption with inclusion of MOLM.

FCR did not vary significantly among non-supplemented groups. Feed conversion ratio was better in 15% DDGS inclusion group with supplementation of MOLM (T_2). FCR was affected significantly (P<0.05) by supplementation of feed additives. At 15% DDGS inclusion level, FCR was lowest in T_7 (1.70) and highest in T_6 (2.08). Among 30% DDGS inclusion groups, it varied from 1.84 (T_8) to 1.95 (T_9 and T_{10}). The overall FCR values in broilers did not differ significantly (P<0.05) up to 30% inclusion of soybean meal with DDGS as protein source. Thus, it was observed that inclusion of DDGS in diet did not affect the FCR of broilers and supplementation of herbal feed additives lead to significant improvement in FCR. These results are similar to Chikwa (2018) who observed improvement in FCR with supplementation of 1% SRP. These results are in agreements with Elagib *et al.* (2013) who reported positive effects of garlic supplementation on broiler performance. Wang *et al.* (2007) found that feed conversion ratio was significantly better in aloe vera group than control group. Dey and De (2013) found that there was a significant improvement in the feed conversion ratio of the birds fed MOLM based diets. This suggests that birds fed MOLM based diets adequately utilized the nutrients they consumed.

CONCLUSIONS

Result of this investigation concluded that soybean can be replaced with DDGS up to 30% without any negative effect on performance of broilers. Supplementation of feed additives in DDGS based diet significantly enhance performance of broilers. Among all treatments, 2% MOLM supplementations at 15% soybean meal replacement with DDGS yielded best results.

REFERANCES

Amagase, H., Petesch, B.L., Matsuura, H., Kasuga, S. and Itakura, Y. (2001). Intake of garlic and its bioactive components. *J. Nutr.* **131**: 955S–962S.

Banjo, O.S. (2012). Growth and performance as affected by inclusion of *Moringa oleifera* leaf meal in broiler chicks diet. *Growth.* **2(9)**: 35-38.

BIS. (2007). Nutrient Requirements of Poultry IS: 1374. Bureau of Indian Standards, New Delhi, India.

Chikwa, K. (2018). Effect of dietary supplementation of shatavari, ashwagandha and vitamin E on performance of colour broilers. Ph.D. Thesis submitted to Nanaji Deshmukh Veterinary Sciece University, Jabalpur, India.

Choi, S. and Chung, M.H. (2003). A review on the relationship between Aloe vera components and their biologic effects. *Semin. Integr. Med.* **1**: 53–62.

Christaki, E.V. and Florou-Paneri, P.C. (2010). Aloe vera: A plant for many uses. *J. Food Agric. Environ.* **8(2)**: 245-249.

Dahale, G.S., Wankhede, S.M. and Kale, V.R. (2014). Growth performance serum biochemical profile and carcass quality of broiler chickens fed diets supplemented with shatavari (*Aspargus recemosus*) root powder. *Indian J. Anim. Nutr.* **31(2)**: 166-171.

Darabighane, B., Zarei, A., ZareShahneh, A. and Mahdavi, A. (2011). Effects of different levels of Aloe vera gel as an alternative to antibiotic on performance and ileum morphology in broilers. *Ital. J. Anim. Sci.* **10**: 189-194.

Dey, A. and De, P.S. (2013). Influence of *Moringa oleifera* leaves as a functional feed additive on the growth performance, carcass characteristics and serum lipid profile of broiler chicken. *Indian J. Anim. Sci. Res.* **47(5)**: 449-452.

Dwivedi, A. (2013). Effect of Feeding Shatavari (*Asparagus racemosus*) and Yeast (*Saccharomyces cervisiae*) Alone and in combination on the performance of broiler chicks Ph.D. Thesis submitted to Rajasthan University of Veterinary and Animal Science, Bikaner, India.

Elagib, H.A.A., El-Amin, W.I.A., Elamin, K.M. and Malik, H.E.E. (2013). Effect of dietary garlic (*Allium sativum*) supplementation as feed additive on broiler performance and blood profile. *J. Anim. Sci. Adv.* **3(2)**: 58-64.

Khan, I., Zaneb, H., Masood, S., Rehman, H.F., Shah, M, Abbas, G., Din, S., Yasir, H., Yousaf, M.S. and Shaheen, K. (2015). Affect

of *Moringa oleifera* leaf supplementation on intestine morphology and growth performance, in broiler chickens. *Scholar's Adv. Anim. Vet. Res.* **2(1)**: 25-31.

Kumar, S., Sharadamma, K.C. and Radhakrishna, P.M. (2010). Effects of a garlic active based growth promoter on growth performance and specific pathogenic intestinal microbial counts of broiler chicks. *Int. J. Poult. Sci.* **9(3)**: 244-246.

Meraj, I.C.A. (1998). Effect of garlic and neem leaves supplementation on the performance of broiler chickens. M.Sc. Thesis submitted to Department of Poultry Science, University of Agriculture, Faisalabad, Pakistan.

Mmereole, F.U.C. (2011). Evaluation of the dietary inclusion of Aloe vera as an alternative to antibiotic growth promoter in broiler production. *Pakistan J. Nutr.* **10(1)**: 1-5.

Onu, P. and Aniebo, A. (2011). Influence of *Moringa oleifera* leaf meal on the performance and blood chemistry of starter broilers. *Int. J. Food. Agri. Vet. Sci.* **1**: 38-44.

Sharma, S., Dahanukar, S. and Karandikar, S.M. (1986). Effects of long term administration of the roots of Ashwagandha (*Withania somnifera*) and Shatavari (*Asparagus racemosus*) in rats. *Indian Drugs*. **23**: 133-139.

Sihag, Z.S. and Sihag, S. (2013). Effect of soymeal replacement with Distillers Dried Grain Solubles (DDGS) on the performance of layers. *Indian J. Anim. Nutr*. **30(2)**: 191-195.

Singh, H., Ali, N., Singh, R., Kumar, R., Sahu, D.S., Siddique, R.A., and Bharti, M.K. (2018). Effect of different herbal feed additives in live weight of broiler chicken. *IJCS*. **6(4)**: 1580-1583.

Singh, K.S. and Panda, B. (1992). Feed additives. *Poult. Nutr.* pp. 134-143.

Snedecor, G.W. and Cochran. W.G. (1994). Statistical Methods. Iowa State University Press, Ames, Iowa.

Sonu (2017). Effect of exogenous enzymes on the performance of broilers fed with distillers dried grain solubles (DDGS) based diet. M.V.Sc. Thesis submitted to LUVAS, Hisar, India.

Wang, C.K., Jia, H.Q., Tong, G.M., Gao, W.W., Sa, R.N. and Zhang, Q. (2007). Effect of aloe powder and extract on production performance and immune function of broiler chicken. *J. Fujian Agri. Forestry.* **36(6)**: 614-617.

Yadav, D.C. (2015). Effect of supplementation of aloe vera (*Aloe barbadensis*) on the performance of broilers. M.V.Sc. Thesis submitted to LUVAS, Hisar, India.

Yang, R.Y., Chang, L.C., Hsu, J.C., Weng, B.B., Palada, M.C., Chadha, M.L. and Levasseur, V. (2006). Nutritional and functional properties of moringa leaves - from germplasm, to plant, to food, to health. In: Moringa Leaves: Strategies, Standards and Markets for Better Impact on Nutrition in Africa (Paris: Moringa News. Moringa and Plant Resources Network).