



Feeding Spice Mixtures in Broiler Chicken
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Effect of Spice Mixtures on Performance and Economics of Broiler Chicken

S.K. Chakara, V.K. Singh, D. Tewari*, S. Gautam, Nidhi Verma and Sandeep Upadhyay

Department of Animal Nutrition, College of Veterinary Science & Animal Husbandry

Narendra Dev University of Agriculture & Technology

Kumarganj, Faizabad-224229 (U.P.)

*Correspondence: dharmesh.tewari@rediff.com

ABSTRACT

To investigate the effect of spice mixture (turmeric, fenugreek, cinnamon, cumin and ajwain) on the performance and economics, 250 broiler chicks (Vencobb-400Y) were randomly distributed into five dietary treatment groups- basal diet without supplement (NCG) or with antibiotic (PCG), spice mixture at 0.5% (SMG-0.5), spice mixture at 1.0% (SMG-1.0) and spice mixture at 1.5% (SMG-1.5) levels for five weeks. The effect of spice mixture on body weight gain, feed intake, feed conversion ratio, production indices and economics was assessed. After five weeks experiment, body weight gain in all SMG groups as well as PCG group had significantly ($P < 0.05$) higher than NCG group. The feed intake of PCG group was significantly lower than other treatment groups except SMG-1.5. FCR value of NCG group was significantly ($P < 0.05$) higher than PCG and SMG-1.5 while similar to SMG-0.5 and SMG-1.0 group birds. The net profit per bird of NCG and SMG groups was significantly ($P < 0.05$) lower from PCG birds. It can be concluded that spice mixture at 1.5% improved weight gain, FCR and production indices in broilers.

KEY WORDS: AGPs, Broilers, Performance, Spices

Article received: 24 February 2023; Article accepted: 03 April 2023

INTRODUCTION

Ban or reduction of antibiotics usage in poultry feed forced researchers to search for an alternative to AGPs. Spices are important part of human diet and have also been used for centuries in traditional medicine (Rivlin, 2001). In addition to boosting flavour, herbs and spices are known for their preservatives, antioxidative and antimicrobial roles. Spice herbs have been used therapeutically to improve health and wellbeing of animals, mostly for prophylactic purposes and to improve growth and feed utilization (Simon, 2005). Turmeric (*Curcuma longa*) is a medicinal plant widely used and cultivated in tropical regions. Curcumin isolated from the rhizome of turmeric is the main bioactive ingredient of *C. longa*, which was found to have antioxidant (Karami et al., 2011), antiviral (Liu et al., 2013a) and antibacterial activities (Liu et al., 2013b). Beside these, turmeric can improve digestion and nutrient utilization by improving the function of digestive enzymes production by atrisi oil and curcumin present in turmeric (Al-Sultan and Gameel, 2004). Fenugreek

(*Trigonella foenum graecum*), locally known as methi, used in functional food, traditional food, nutraceutical as well as in physiological utilization such as antibacterial, anticancer, anti helmentic, hypocholesterolemic, hypoglycemic, antioxidant, anti diabetic agent and ability to modify food texture. It also has neurin, biotin, trimethylamine which tends to stimulate the appetite by their action on nervous system (Michael and Kumawat, 2003). It has a role in improving the performance of poultry birds by their antibacterial activity and positive effect on gut morphology (Adil et al., 2015).

In Ayurvedic and ethno medicine various parts of the cinnamon are widely used. *Cinnamomum zeylanicum* (Dalchini) main compounds cinnamaldehyde has antioxidant properties that react with lipid and hydroxyl radicals converting them into stable products through their hydrogen donating ability (Symeon et al., 2014). Earlier studies showed cinnamon powder, cinnamaldehyde alone or in combination with other essential oils have a beneficial effects in poultry which include increased

feed intake, improved performance and feed efficiency, increased pancreatic and intestinal lipase activity, improvement in health status, protection against pathogens (Sampath and Atapattu, 2013).

Ajwain (*Trachyspermum copticum*) seeds contain health benefiting essential oils such as thymol and small amount of other phytochemicals like pinene, limonene and terpinene. The active principles in the ajwain may help to increase the digestive function through facilitating release of gastrointestinal secretions. Furthermore, thymol has local anesthetic, antibacterial and antifungal properties. Ajwain antioxidative activities play an important role in biological system by suppressing the formation of active oxygen species like hydrogen peroxide (Zahin et al., 2010). Shruti et al. (2005)

reported that aflatoxicosis can potentially be treated by using ajwain in diet. This study was conducted to test the effect of spices in diet of broiler chicken.

MATERIALS AND METHODS

250 Vencobb-400Y DOC were randomly divided into five dietary groups - NCG (Basal diet without antibiotic growth promoter); PCG (Basal diet + 0.05% Salinomycin+ 0.02% Noseheptide); SMG-0.5 (Basal diet + 0.5% spice mixture); SMG-1.0 (Basal diet + 1.0% spice mixture) and SMG-1.5 (Basal diet + 1.5% spice mixture) with 5 replications with ten chicks in each group. Diets were formulated for pre-starter (1-7 days), starter (8-21 days) and finisher phase (22-42 days) separately as per BIS (2007) requirements for 35 days and their nutrient composition are presented in Table 1.

Table 1. Ingredient and nutrient composition of basal diet (%)

Ingredient (%)	Pre-starter	Starter	Finisher
Maize	50.42	55.52	59.82
Soybean meal	42.00	36.40	27.40
Rice polish	-	-	5.00
Vegetable fat	4.48	5.18	5.43
Dicalcium phosphate	1.15	0.97	0.80
Limestone powder	0.90	1.04	0.75
Common salt	0.40	0.38	0.36
DL-Methionine	0.25	0.18	0.16
Lysine	0.15	0.08	0.03
Choline chloride	0.10	0.10	0.10
Vitamin premix*	0.05	0.05	0.05
Mineral premix*	0.10	0.10	0.10
Nutrient composition:			
Dry Matter (%)	87.15	87.77	89.22
Crude protein (%)	23.1	22.0	20.3
Metabolizable energy [#] (Kcal/kg)	3003	3107	3203
Calorie Protein ratio [#]	129.7	140.6	157.8

*Supplies per kg diet: Vitamin A, 16,500IU; Vitamin D₃, 3200IU; Vitamin E, 12mg; Vitamin K, 2 mg; Vitamin B₂, 10mg; Vitamin B₆, 2.4 mg; Vitamin B₁₂, 12µg; Niacin, 18 mg; Pantothenic acid, 12 mg; Mn, 90mg; Zn, 72mg; Fe, 60mg; Cu, 10 mg; I, 1.2 mg.

[#]Calculated value

A spices mixture was prepared by using haldi, methi, jeera, dalchini and ajwain in definite proportion. The mixture of spices powder were premixed and then added successively to the whole lot. Fresh and clean drinking water was made available throughout the experimental period. The birds were vaccinated against prevailing diseases adopting a standard

protocol. The chicks were weighed at the start of experiment and thereafter at the end of experimental period to calculate body weight gain. The feed consumption was recorded to calculate the feed conversion ratio (FCR). Performance Index (PI), Energy efficiency ratio (EER), Protein efficiency ratio (PER), European Production Efficiency Factor

(EPEF), European broiler index (EBI) was calculated (Nasr et al., 2011; Chacrabati et al., 2013; Marcu et al., 2013). Relative economics of feeding under different dietary treatments were calculated at the end of fifth week. The cost of production included the cost of chick and cost of feed consumed. Profit per bird was calculated by subtracting the production cost from the gross return. The managemental costs were not included in the calculation of gross profit as it was same for all

dietary treatments. The relative economics were compared among treatments. Data was analysed by using SPSS, version-20 software. The data obtained were subjected to variance (ANOVA) and mean were compared using Duncan's multiples range test.

RESULTS AND DISCUSSION

The body weight gain of all SMG groups were comparable to PCG group while significantly ($P<0.05$) higher than NCG group (Table 2).

Table 2. Effect of dietary supplementation of spice mixture on the performance of broilers

Attributes	NCG	PCG	SMG-0.5	SMG-1.0	SMG-1.5	SEM	P-value
Final body weight (g/bird)	1897 ^c	2056 ^{ab}	2015 ^b	2038 ^{ab}	2124 ^a	19.90	0.001
Feed intake (g/bird)	3104 ^b	2911 ^c	3284 ^a	3287 ^a	3264 ^{ab}	37.23	0.001
Feed conversion ratio (FCR)	1.66 ^a	1.44 ^c	1.66 ^a	1.64 ^a	1.56 ^b	0.02	0.001
Energy efficiency ratio (EER)	18.9 ^c	21.8 ^a	19.0 ^c	19.2 ^c	20.2 ^b	0.24	0.001
Protein efficiency ratio (PER)	2.88 ^c	3.34 ^a	2.91 ^c	2.94 ^c	3.08 ^b	0.03	0.001
Performance index (PI)	113 ^c	142 ^a	121 ^{bc}	124 ^b	135 ^a	2.43	0.001
European Production Efficiency Factor (EPEF)	243 ^b	344 ^a	303 ^a	301 ^a	330 ^a	9.52	0.002
European Broiler Index (EBI)	238 ^b	338 ^a	297 ^a	296 ^a	324 ^a	9.37	0.002

^{abc}Means with different superscripts in a row differ between groups significantly ($P<0.05$)

Improved growth performance during the different age could be attributed to the presence of antibiotic or active component of spices in diet, which improves the gut ecosystem, gut health and encourages secretions of endogenous digestive enzymes, which then enhance nutrient digestion and gut passage rate in chickens (Lee et al., 2004). The total feed intake was significantly ($P<0.05$) higher in SMG-0.5 and SMG-1.0 groups than NCG and PCG groups, while SMG-1.5 was analogous ($P>0.05$) to NCG group. The lower feed consumption in PCG group than NCG might be due to better utilization of nutrients that help to fulfill the energy requirement of birds by lesser amount of feeds because the feed intake of poultry birds depends mainly on energy

requirements. The FCR value of SMG-1.5 and PCG group birds were significantly ($P<0.05$) lower than NCG group. The positive result in spices supplemented groups was concurrence with the findings of Al-Kassie et al. (2011) and Weerasigha et al. (2013). The EER, PER, PI, EPEF and EBI of SMG-1.5 groups were significantly ($P<0.05$) higher than NCG group. The improvement in performance indices i.e. PI, EPEF and EBI may probably be due to the fact that active principles of spices helps in suppressing growth of intestinal harmful bacteria such as *S.aureus* and *E. coli* and promoting the beneficial bacteria of GI tract resulting in better digestion and absorption (Hanafy and Hatam, 1991). Beside this, antioxidant and hepato-stimulant

activities as well as better nutrient balance of spice mixture acts synergistically to improve the digestion and utilization of feeds and ultimately enhanced the performance of birds.

The nutrient retention was numerically higher in SMG groups in comparison to NCG group but not upto the significant level (Table 3).

Table 3. Effect of dietary supplementation of spice mixture on nutrient retention in Broilers(%)

Attributes	NCG	PCG	SMG-0.5	SMG-1.0	SMG-1.5	SEM	P-value
Dry matter (DM)	65.0	68.3	66.4	68.2	69.9	0.96	0.072
Ether extract (EE)	94.2	95.9	94.8	95.1	95.7	0.69	0.401
Crude protein(CP)	66.8	69.2	68.5	69.9	71.6	0.75	0.423
Crude fiber (CF)	17.9	16.1	18.6	19.2	19.7	0.87	0.358

Similar results were reported by Lee et al. (2003), who found that thymol and cinnamaldehyde had no positive effect on macronutrient digestibility, while Sanjyal et al. (2011) found that nutrient digestibility was higher in herbal mixture supplemented groups.

The production cost per kilogram live weight data revealed that SMG-0.5, SMG-1.0, SMG-1.5 and NCG was significantly (P<0.05) higher than PCG group birds (Table 4).

Table 4. Effect of dietary supplementation of spice mixtures on the economics of broiler production

Attributes	NCG	PCG	SMG-0.5	SMG-1.0	SMG-1.5	SEM	P-value
Chick cost (Rs.)	20.0	20.0	20.0	20.0	20.0	0.00	0.001
Feed cost (Rs.)	88.5 ^b	83.0 ^c	93.5 ^a	93.6 ^a	93.0 ^{ab}	1.05	0.001
Miscellaneous cost (Rs.)	10.0 ^c	10.8 ^c	13.4 ^{bc}	16.8 ^b	20.6 ^a	0.87	0.001
Total expenditure (Rs.)	118.5 ^c	113.9 ^c	127.0 ^b	130.5 ^{ab}	133.7 ^a	1.65	0.001
Total return/broiler (Rs.)	129.0 ^c	139.8 ^{ab}	137.0 ^b	138.5 ^{ab}	144.4 ^a	1.35	0.001
Net profit/kg live wt. (Rs)	5.53 ^b	12.52 ^a	4.96 ^b	3.97 ^b	5.06 ^b	1.66	0.001

Values with different small letter superscripts in a row differ between groups significantly (P<0.05)

The net profit per bird and net profit per kg live weight of the birds were analogous (P>0.05) in SMGs and NGP groups, while significantly (P<0.05) lower from PSG group. The present findings were in the line of Singh (2015) and Dwivedi (2015), who reported that supplementation of an herbal product “NARGROPHYT” in the broiler chickens feed was not economical in comparison to the birds reared on without any additive or antibiotic supplement. Contrary, Mehala and Moorthy (2008) reported that inclusion of *Curcuma longa* at 0.1 per cent in broiler feed improved return over feed cost per kilogram live weight of broiler at sixth week of age. Similarly Namagirilakshmi (2005) observed that the cost of production broiler chicken was lowest with 0.50% turmeric supplementation in diet.

CONCLUSION

It can be concluded that the dietary supplementation of spice mixture at the level of 1.5% in diet may be beneficial for the performance of broiler chicken.

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