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Effect of Phytobiotic Feed Additives Garlic (*Allium sativum*), Ashwagandha (*Withania somnifera*) and Shatavari (*Asparagus racemosus*) on Carcass Quality in Broiler Chicks

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ABSTRACT

Background: The poultry production systems have led to marked increase in the production of poultry meat and eggs worldwide. The use of various phytobiotic feed additives as dietary supplements may have positive effect on poultry performance, carcass quality and economic benefit in poultry birds.

Methods: A feeding trial of 42 days was conducted at Veterinary College, Navania, Udaipur in the year 2021 using 300, day-old broiler chicks (Cobb-400) randomly distributed in completely randomized design. The broiler chicks were divided randomly into ten treatment groups with three replicates under each treatment. The T_1 *i.e.* control group was fed on basal diet, while T_2 was supplemented with Oxytetracycline (OTC) powder @ 0.1g/kg feed. T_3 and T_4 were served as Basal diet supplemented with Garlic powder @ 0.75% and @ 1.50%. T_5 and T_6 were served as Basal diet supplemented with Ashwagandha root powder @ 0.75% and @ 1.50%. T_7 and T_8 were served as Basal diet supplemented with Shatavari root powder @ 0.75% and @ 1.50%. T_9 was served as Basal diet supplemented with Garlic powder @ 0.25%, Ashwagandha root powder @ 0.25% and Shatavari root powder @ 0.25%. T_{10} was served as Basal diet supplemented with Garlic powder @ 0.50%, Ashwagandha root powder @ 0.50% and Shatavari root powder @ 0.50%.

Result: The supplementation of Garlic powder, Ashwagandha root powder and Shatavari root powder alone and in combination had highly significant ($P<0.01$) effect on body weight, dressing percentage, weight of liver, heart, Gizzard and Giblet but significant ($P<0.05$) effect was observed on eviscerated yield. The net return per bird profit was found higher in T_9 group.

Key words: Ashwagandha, Broiler chicks, Garlic, Oxytetracycline, Shatavari.

INTRODUCTION

From several decades till now, poultry industry has been recognized as an important subsector of agricultural and veterinary fields due to increasing demand for meat and eggs as low cost protein sources. Feed is the major constituent in the poultry production accounts for 65-75% of total recurring expenditure (Dinani *et al*., 2022). Antibiotic growth promoter as feed additives have widely used in poultry production; this may result in to development of antibiotic resistance and residue in poultry products (Jadhav *et al*., 2021). Continues feeding by sub-therapeutic levels of antimicrobials as growth promoter agents or antimicrobial compounds have had a negative impact on gut microflora, accumulation of antibiotic tissues residues as well as developing new strains of drug-resistant pathogenic bacteria (Castanon, 2007). Therefore, in 2006, the European Union Commission banned using of antibiotics in animal feeds as a growth promoter in different countries (Europe Union Commission, 2005). It has triggered the discovery and widespread use of a number of Phytobiotics. Phytobiotics are defined as natural, less toxic and residue free plant-derived compounds that have been used as feed additives for livestock production (Wang *et al*., 2008). The use of various phytobiotic feed additive as dietary supplements may have positive effect on poultry performance by increasing their growth rate, better feed conversion efficiency, greater livability and lowered mortality in poultry birds. Use of phytobiotic is considered safe without side effects to improve bird's performance due to their suitability and choice, lower production costs, lower toxicity risk, minimal health hazards, environmental friendliness and could be used as feed additives (Devegowda, 1996).

Garlic (*Allium sativum*) has been used as spice and folk medicine since antiquity, mostly because of its antibacterial, antifungal and antioxidant activities. Bioactive components of garlic, including several sulphur-containing

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compounds such as alliin, diallylsulfides and allicin, may partly account for some of these effects of garlic (Bampidis *et al*. 2005). Garlic having active ingredient alicine, diallyldisulfide has been considered as a wonder drug in herbal world and used as growth promoter. Garlic acts as only a mild antibiotic in comparison to modern antibiotics, but added advantage of its use as antibiotic is that the microorganisms do not develop a resistance against garlic as they do against the conventional antibiotics.

Ashwagandha (*Withania somnifera*) is commonly known as "Indian Winter Cherry" or "Indian Ginseng". It contains many active principles such as with anolides, somnitalglucose, inorganic salt, with anone, dihydroxykaempferol-3 and rutinosides (Murthy *et al.,* 2009 and Pal *et al.,* 2012). These active principles have been reported to possess immuno modulatory, general tonic, hepato-protective, anti-stress, growth promoter and antioxidant properties (Kushwaha *et al.* 2012 and Varma *et al.,* 2012) beside antibacterial and anti-fungal properties (Punetha *et al.,* 2010).

Shatavari (*Asparagus racemosus)* is also a herbal plant known as the "Queen of herbs" having properties like nutritive tonic, anti-stress (Kamat *et al.* 2000). "It possesses adaptogenic, immunomodulatory, galactogogue, anabolic and performance enhancing properties Shatavari augment the appetite and stimulates the liver function.

MATERIALS AND METHODS

Present research work was conducted at Veterinary College, Navania, Udaipur during the year 2021.

Experimental feed

The ISO certified basal mash feed in the form of broiler pre- starter, broiler starter and broiler finisher was procured from feed distributer. The broiler Pre starter feed contained 23.09% crude protein, 2.93% ether extract, 4.57% crude fiber, 4.47% total ash, 64.94% nitrogen free extract. The broiler Starter feed and broiler finisher feed contained 22.38% and 20.29% crude protein, 4.26% and 4.68% ether extract, 3.74 % and 3.79% crude fiber, 6.77% and 6.72% total ash, 62.85% and 64.52% nitrogen free extract, respectively. Garlic (*Allium sativum*), Ashwagandha (*Withania somnifera*) Shatavari (*Asparagus racemosus*) powders and Oxytetracycline were purchased from local market and medical store.

Experimental birds and design

This experiment was done on 300, day old chicks. Each bird was weighed individually on arrival and randomly distributed in Ten different dietary treatment groups (T_1 - T_{10}) using completely randomized design (CRD). The body weight of chicks has kept similar in all the groups. Each random treatment has three replicates (R_1-R_3) having 10 birds in each replicate.

Feeding regimen

The feeding was done in three phases, broiler pre starter (0-7 days), broiler starter (8-21days) and broiler finisher (22-42 days). Diet T_1 served as control while diet T_2 was supplemented with Oxytetracycline (OTC) powder @ 0.1g/ kg feed. T_3 and T_4 were served as Basal diet supplemented with Garlic powder @ 0.75% and @ 1.50%. T_5 and T_6 were served as Basal diet supplemented with Ashwagandha root powder @ 0.75% and @ 1.50%. T_7 and T_8 were served as Basal diet supplemented with Shatavari root powder @ 0.75% and @ 1.50%. T_9 was served as Basal diet supplemented with Garlic powder @ 0.25%, Ashwagandha root powder @ 0.25% and Shatavari root powder @ 0.25%. T_{10} was served as Basal diet supplemented with Garlic powder @ 0.50%, Ashwagandha root powder @ 0.50% and Shatavari root powder @ 0.50%.

Experiment

An experiment of 42 days was conducted on total 300; day old chicks at the end of the experiment, three chicks of each replication total of nine chicks per treatment are randomly selected for evaluation of carcass characteristics. The selected chicks were weighed individually and required to fast for 12 hours to clear the contents of the intestines before sacrifice. All measurements have been calculated as a percentage of live body weight. The dressing percentage of the carcass was estimated as total edible portion of the broilers including giblets such as liver, heart and gizzard. The eviscerated weight was calculated as the remaining weight of the carcass after removal of visceral organs and other offal such as feathers, head and shank. The dressed weight and eviscerated weight were also expressed as per cent of live weight.

Statistical procedures

The data obtained in the experiment were analyzed using statistical procedures as described by Snedecor and Cochran (1994) and significance of mean differences were tested by Duncan's New Multiple Range Test (DNMRT) as modified by Kramer (1957).

RESULTS AND DISCUSSION

Body weight

The average weekly body weight was highest in T10 group (2399.65g) *i.e*., broiler fed a basal diet supplemented with 0.50% garlic powder, 0.50% Ashwagandha root Powder and 0.50% Shatavari root powder and significant highly ($P<0.01$) as compared to the control group (2113.25g) (Table 1). The observation made in this study corroborate the finding of Senthilkumar *et al.* (2015), Makwana *et al.* (2019) and Singh *et al.* (2019) reported significant increase in body weight in Garlic powder supplemented group as compared to control group. Vasanthakumar *et al.* (2015); Singh *et al.* (2017); Dhenge *et al.* (2018); Kumari *et al.* (2020) reported that significantly increase in body weight in Ashwagandha powder supplemented group and Singh *et al.* (2018); Chikwa *et al.* (2018) reported that increase in body weight in Shatavari powder supplemented group as compared to control group.

Dressing and eviscerated yield

The highest dressing percentage and eviscerated yield was recorded to be (73.60% and 68.49%) in T10 group *i.e*., broiler fed a basal diet supplemented with 0.50% garlic powder, 0.50% Ashwagandha root Powder and 0.50% Shatavari root powder and lowest dressing percentage and eviscerated yield was recorded to be (71.51% and 66.94%) in T1 (Control) group *i.e*., broiler fed a basal diet (Table 2). The highly significant (P<0.01) effect was observed on dressing percentage and significant (P<0.05) effect on eviscerated yield. The Present results were in accordance with Makwana *et al.* (2018); Makwana *et al.* (2019) observed that significant increase in dressing percentage by diet supplemented with garlic powder as compared to control group. Singh *et al.* (2017); Biswas *et al.* (2020) reported that significant increase in dressing percentage by diet supplemented with Ashwagandha powder and Pandey *et al*. (2013); Gaikwad *et al*. (2015) report that significant increase in dressing percentage by diet supplemented with Shatavari powder as compared to control group.

Organ's weight

The highest weight of liver was recorded in T_9 group (74.16 g) *i.e*., broiler fed a basal diet supplemented with 0.25% garlic powder, 0.25% Ashwagandha root powder and 0.25% Shatavari root powder, while highest weight of heart (12.51 g), Gizzard (36.68 g) and Giblet (122.66 g) was recorded in T_{10} group *i.e*., broiler fed a basal diet supplemented with 0.50% garlic powder, 0.50% Ashwagandha root powder and 0.50% Shatavari root powder. The Lowest weight of liver, heart, gizzard and giblet was recorded in T_1 (Control) group *i.e*., 52.74, 10.12, 33.81 and 96.67% respectively (Table 3). The highly significant (P<0.01) effect on weight of liver, heart, Gizzard and Giblet due to supplementation of Garlic, Ashwagandha and Shatavari powder alone and in combination at different levels in broilers ration**.** Similarly, Makwana *et al.* (2018); and Islam *et al.* (2017) reported significant improvement of Giblet weight (%) by broilers fed garlic supplemented diet as compared to control. Singh *et al.* (2017) reported significant improvement of Giblet weight (%) by broilers fed Ashwagandha supplemented diet as compared to control.

Economics

The net return (Rs.) per bird was 23.60 in T_1 group, 32.86 in T_2 group, 25.94 in T_3 group, 17.97 in T_4 group, 30.28 in T_5 group, 18.21 in T_6 group, 34.90 in T_7 group, 25.50 in T_8 group, 50.08 in T_9 group and 46.62 in T_{10} group (Table 1). The net return per bird profit was found higher in T_9 group *i.e*., basal diet supplemented with Garlic powder @ 0.25%, Ashwagandha root powder @ 0.25% and Shatavari root powder @ 0.25% followed by T_{10}, T_7, T_2, T_5, T_3, T_8, T_1, T_6 and T_4 treatment groups, respectively. Similarly, Makwana *et al.* (2018); observed that dietary supplementation of Garlic group had a positive effect in net profit per bird in broiler

Table 1: Effect of Garlic powder, Ashwagandha root powder and Shatavari root powder on average body weight (g) and Net return/birds (Rs) in broiler chicks.

	T_1	T_2	T_3	T_4	T_5	T_6	T_7	T_8	T_9	T_{10}	SEM
	C	0.1 g/Kg OTC	0.75% ASP	1.5% ASP	0.75% WSP	1.5 % WSP	0.75% ARP	1.5% ARP	0.25% ASP 0.25%	0.25% ASP+ 0.50% WSP+ 0.25% ARP	0.50% ASP+ WSP+ 0.50% ARP
Body weight	211325d	2154.19cd	2159.81c	2168.13c	2199.34c	2215.19c	2214.18c	2240.58c	2364.92ab	2399.65a	40.669
Net return/	23.60	32.86	25.94	17.97	30.28	18.21	34.90	25.50	50.08	46.62	

Table 2: Effect of garlic powder, ashwagandha root powder and Shatavari root powder on carcass parameters (% of live weight) in broiler chicks.

Carcass parameters (%)	T_1 C	T_2 0.1 g/Kg OTC	T_3 0.75% ASP	T_4 1.5% ASP	T_5 0.75% WSP	T_6 1.5% WSP	T_7 0.75% ARP	T_8 1.5% ARP	T_9 0.25% ASP+ 0.25% WSP+ 0.25% ARP	T_{10} 0.50% ASP+ 0.50% WSP+ 0.50% ARP	SEM
Dressing yield	71.51^{b}	71.58^{b}	72.59^{ab}	72.81^{a}	72.52^{b}	72.93^{a}	72.98^{a}	73.44^{a}	73.19^{a}	73.60^{a}	0.916
Eviscerated yield	66.94^{b}	67.03^{b}	67.91^{a}	67.57^{ab}	67.20^{b}	67.60^{a}	67.69^{a}	68.09^{a}	68.02^{a}	68.49^{a}	1.117

Means with different superscripts in a row differ significantl.

Table 3: Effect of garlic powder, Ashwagandha root powder and Shatavari root powder on organs weight (g) in broiler chicks.

Organs weight (g)	T_1 C g/Kg	T_2 0.1 ASP OTC	T_3 0.75% ASP	T_4 1.5% WSP	T_5 0.75% WSP	T_6 1.5% ARP	T_7 0.75% ARP	T_8 1.5 %	T_9 0.25% ASP+ 0.25% WSP+ 0.25% ARP	T_{10} 0.50% ASP+ 0.50% WSP+ 0.50% ARP	SEM
Liver	52.74^{h}	54.16^{gh}	56.18^{g}	66.91^{ef}	67.69^{e}	70.63^{c}	70.61^{cd}	71.87^{bc}	74.16^{a}	73.47^{ab}	0.695
Heart	10.12^{f}	10.19^{f}	10.81^{e}	11.42^{cd}	11.47^{c}	11.87^{b}	11.59^{bc}	11.73^{b}	11.94^{b}	12.51^{a}	0.144
Gizzard	33.81^{c}	34.03^{bc}	34.46^{b}	35.34^{ab}	35.71^{a}	35.71^{a}	34.94^{b}	36.44^{a}	36.17^{a}	36.68^{a}	0.506
Giblet	96.67^{e}	98.38^{e}	101.45^{d}	113.67^{bc}	114.87^{b}	118.21^{ab}	117.14^{b}	120.04^{a}	122.27^{a}	122.66^{a}	1.733

Means with different superscripts in a row differ significantly.

chicks as compared to control group. Shisodiya *et al.* (2008); Gaikwad *et al.* (2015) and Mali *et al.* (2017) observed that dietary supplementation of Ashwagandha and Shatavari had a positive effect in net profit per bird in broiler chicks as compared to control group, respectively.

CONCLUSION

It was concluded that there was highly significant (P<0.01) effect were observed on body weight, dressing percentage, weight of liver, heart, Gizzard and Giblet and significant (P<0.05) effect on eviscerated yield. Supplementation of Garlic powder, Ashwagandha root powder and Shatavari root powder in basal died is quite effective and could be a viable proposal for profitable broiler farming for meat production.

Conflict of interest

All authors declare that they have no conflict of interest.

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