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Carcass characteristics of broiler chicken fed with Panchagavya and Phytogenic feed additives

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Abstract
An experiment was conducted to study the combined effect of panchagavya with phytogenic feed additives such as *Andrographis paniculata*, garlic and turmeric as an alternative to antibiotic growth promoter in commercial broiler chicken on carcass characteristics for a period of five weeks with two hundred and forty commercial, sex separated day-old Vencobb broiler chicks. These chicks were randomly allotted into six treatment groups with five replicates of eight chicks each. The treatment groups consisted of control-basal diet (T_1), basal diet with oxytetracycline- 50 ppm (T_2), basal diet with panchagavya -7.5 g/kg (T_3), basal diet with panchagavya - 7.5 g/kg and *Andrographis paniculata* – 2 g/kg (T_4), basal diet with panchagavya -7.5 g/kg and garlic^{-1} g/kg (T_5) and basal diet with panchagavya -7.5 g/kg and turmeric^{-1} g/kg (T_6). In this study, the results revealed dietary supplementation of panchagavya and phytogenic feed additives did not differ in carcass characteristics in broilers as compared to antibiotic.

Keywords: Panchagavya, andrographis paniculata, garlic, turmeric, carcass characteristics, phytogenic feed additives

1. Introduction
The use of antimicrobial as growth promoting factors (AGP) in sub therapeutic doses for long periods resulted in the production of antimicrobial resistance to microorganisms. The European countries banned the antimicrobial growth promoters because of the development of antimicrobial resistance and transference of resistance genes from animal to human beings. Growing concerns about antibiotic resistant bacteria and their transfer from birds to humans has led to the ban of AGPs and the subsequent quest for alternatives. The indiscriminate use of antibiotic growth promoters in the feed imparts a threat to the development of antibiotic resistance in the human beings. It has become an alarming problem in the broiler meat and egg marketing. Hence, scientists have moved their research towards non-antibiotic growth promoters in feed, especially of plant derived compounds or phytogenics (Applegate *et al.* 2010) [4] and ayurvedic preparations.

Panchagavya, an organic product has the potential to play the role of promoting growth as bioenhancer and providing immunity. In 2002, Council for Scientific Industrial Research (CSIR), India has obtained US patent (No.6896907 and 6410059) for cow urine distillate, a novel pharmaceutical composition for its synergistic properties with antibiotics, antifungal, anti-infective, anticancer agents and nutraceutic agents as bio-enhancer (Khanuja *et al.* 2002) [10].

Andrographis paniculata (Nilavembu) is well known as "king of bitters" and has wide range of medicinal pharmacological application (Dhiman Anju *et al.* 2012) [7], which has been used either single or in combination with other drugs in various Indian traditional systems of medicine. It exhibits anti-inflammatory, anti–viral, anti-bacterial, anti-oxidant, nematocidal actions.

Garlic (*Allium sativum*) has been used as a spice and a native medicine for many years (Puvaca *et al.* 2016) [15]. It has possessed antibacterial, antifungal, antiparasitic, antiviral, antioxidant, anticholesteremic, anti-cancerous, and vasodilator characteristics.

Turmeric (*Curcuma longa*), a tropical herb of *Zingiberaceae* family, is widely used in indigenous medicine in Asia as an antimicrobial, endogenous stimulant, anti-flatulent and anti-inflammatory agent (Nouzarian *et al.* 2011) [14].

The majority of the medicinal plants are used as phytogenic feed additives as an alternative to antibiotic growth promoter in the poultry industry. Panchagavya is a unique ayurvedic preparation having high medicinal and bio-enhancing properties which can be used in combination with the medicinal plants to enhance its efficacy. Hence, this present research work was undertaken to evaluate the carcass characteristics of commercial broiler chicken by dietary

supplementation of panchagavya and phytogenic feed additives.

Materials and methods

Preparation of Panchagavya

Panchagavya was prepared by using the following ingredients such as urine, dung, milk, curd and ghee collected from the indigenous cows and mixed along with the sugarcane juice, tender coconut and ripened banana as prescribed by Natarajan (2003) [13]. The ingredients used for preparation of panchagavya were cow dung -5 kg, cow urine-3 litre, milk-2 litre, curd -2 litre, ghee -1 litre, sugarcane juice-3 litre, tender coconut water-3 litre, ripened banana-12 numbers and toddy or fermented tender coconut water-2 litre. The fresh cow dung was thoroughly mixed with ghee in a plastic container then covered by muslin cloth and kept for three days and stirred daily once. On fourth day, the other ingredients were added individually to the above mixture and mixed well. Finally, ripened banana was mixed thoroughly with the prepared mixture and covered with the muslin cloth to prevent the entry of flies and mosquitoes into it. The plastic container was kept under shade and mixed thoroughly in a uniform direction for few cycles and this procedure was carried out twice in a day till its usage. The above mixture was allowed to undergo fermentation for 30 days and then it was used as feed additive.

Preparation of phytogenic feed additives

The leaves of *Andrographis paniculata* were obtained from the herbal garden located at Veterinary College and Research Institute, Orathanadu. The garlic bulbs and dry turmeric rhizomes were purchased from the local market. The taxonomical identification of the plant, turmeric rhizomes and garlic bulb were authenticated by the Botanical Survey of India, Southern Regional Centre, Coimbatore. These were shade dried, broken down into small pieces, then powdered using blender and sieved. The powdered materials were stored in air tight containers separately.

Biological experiment

Two hundred and forty commercial sex separated, day-old Vencobb broiler chicks belonging to a single hatch were purchased from the local hatchery, wing banded, weighed and randomly allotted into six treatment groups with five replicates of eight chicks each. The broiler chicks were reared under deep litter in a gable roofed, open sided house. The chicks were provided with uniform floor, feeder and waterer space and were reared under standard management conditions throughout the experimental period of five weeks of age.

The basal broiler feed was formulated according to the Vencobb standards and the experimental feeds were formulated as per the experimental design. Panchagavya and phytogenic feed additives were included in the basal diet and the experimental groups were formed and presented in Table 1.

Table 1: Experimental groups with respective experimental diet

Treatments	Experimental diets
T_1	Control (Basal diet)
T_2	Basal diet + Oxytetracycline (50 ppm)
T_3	Basal diet + Panchagavya (7.5g/kg)
T_4	Basal diet + Panchagavya (7.5g/kg) and *Andrographis paniculata* (2g/kg)
T_5	Basal diet + Panchagavya (7.5g/kg) and garlic powder (1g/kg)
T_6	Basal diet + Panchagavya (7.5g/kg) and turmeric powder (1g/kg)

The broiler pre starter, starter and finisher diets were fed *ad libitum* to the birds from 1 to 12, 13 to 24 and 25 to 35 days of age, respectively. The basal diet was subjected to proximate analysis as per AOAC (2002) [1]. The ingredients and nutrient composition of the experimental broiler pre-starter, starter and finisher ration for the experiment are presented in Table 2.

Table 2: Ingredients and nutrient composition (%) of experimental broiler ration

Ingredients	Pre-starter (kg)	Starter (kg)	Finisher (kg)
Maize	51.60	54.30	57.40
Soya	40.40	36.50	32.70
Salt	0.418	0.367	0.367
Calcite	0.850	1.100	1.000
Di-calcium phosphate	1.920	1.800	1.700
Oil	3.900	5.100	6.000
DL-Methionine	0.304	0.310	0.270
Lysine	0.200	0.140	0.120
Vitamin AB_2D_3K mix[1]	0.050	0.050	0.050
Vitamin B-complex[2]	0.050	0.050	0.050
Trace mineral mixture[3]	0.100	0.100	0.100
Choline chloride	0.050	0.050	0.100
Toxin binder	0.100	0.100	0.100
Liver tonic	0.025	0.025	0.025
Total	**100**	**100**	**100**
Nutrient composition * (on dry matter basis)			
Crude Protein (%)	22.56	21.03	19.59
ME (kcal/Kg)	2971	3090	3180
Crude Fibre (%)	3.00	3.27	3.11
Calcium (%)	0.93	0.98	0.91
Total phosphorous (%)	0.72	0.68	0.65
Available phosphorous (%)	0.45	0.42	0.40
Lysine (%)	1.23	1.10	1.00

DL-Methionine (%)	0.84	0.82	0.75

* Calculated values

[1] One gram of Vitamin AB_2D_3K supplement contained 82500 IU of Vitamin-A, 50 mg of Vitamin-B_2, 16500 IU of Vitamin-D_3 and 10 mg of Vitamin-K.

[2] One gram of B-complex supplement contained 8 mg of Vitamin-B_1, 16 mg of Vitamin-B_6, 8 mcg of Vitamin-B_{12}, 80 mg of Vitamin-E, 120 mg of Niacin, 8 mg of Folic acid, 80 mg of Calcium -D-pantothenate and 86 mg of Calcium.

[3] One gram of Trace mineral mixture contained 54 mg of Manganese, 52 mg of Zinc, 20 mg of Iron, 2 mg of Iodine and 1 mg of Cobalt.

Collection of data

Data on body weight, feed consumption were recorded at weekly intervals and from the data observed body weight gain, feed efficiency and livability were calculated. At 35th day of age, one male and one female from each replicate, totally eight birds per treatment group were randomly selected and slaughtered as per the method of Arumugam and Panda (1970) [5]. The pre-slaughter live weight, New York dressed weight, eviscerated carcass weight, giblets weight, ready-to-cook carcass weight and abdominal fat weight were recorded. Ready-to-cook yield and abdominal fat percentage were calculated on live weight basis.

Statistical analysis

All the data obtained in this study on various parameters were subjected to statistical analyses as per the methods suggested by Snedecor and Cochran (1994) [16]. All data were analyzed by ANOVA and the mean of different experimental groups were tested for statistical significance by Duncan's multiple range test (Duncan, 1955) [8]. The analysis was carried out by IBM SPSS (20.0). Angular transformation was applied to percentages wherever needed.

Results and discussion

The statistical analysis of slaughter parameters revealed no significance on carcass characteristics among the treatment groups due to dietary supplementation of panchagavya and phytogenic feed additives. The carcass characteristics such as preslaughter live weight, New York dressed carcass percentage, dressing percentage and ready-to-cook percentage did not vary significantly among the treatment groups. To our knowledge, this was the first report of using combinedly panchagavya and phytogenic feed additives in broiler chicken. Since no scientific data is available as similar to this study, related findings were compared with the present data. Kumar *et al.* (2013) [11] was the one who studied synergistic antistress activity of panchagavya and ethanolic extracts of *Aloe barbedansis* Mill using forced swimming method in swiss albino mice and confirmed that the results of the study showed antistress activity.

The present finding was in agreement with the findings of Mathivanan *et al.* (2006) [12] who reported feeding panchagavya and *Andrographis paniculata* fed separately along with basal diets to broilers in comparison with the antibiotic growth promoter (virginiamycin) recorded no significant difference on carcass characteristics.

In accordance with our results, Ali *et al.* (2016) [3] recorded no significant difference on dressing percentage in broiler by supplementation of garlic powder at various levels (0, 1, 2 and 3 per cent). Similarly, Abdullah *et al.* (2010) [2] also reported feeding broilers with garlic powder (0, 0.25, 0.50 and 1.0 per cent) had no significant effect on carcass weight or dressing percentage.

Table 3: Mean (± S.E.) Carcass characteristics of broilers as influenced by the Panchagavya and Phytogenic feed additives

Parameters	T_1 Control - Basal diet	T_2 Basal diet + Oxytetracycline (50 ppm)	T_3 Basal diet + Panchagavya (7.5g/kg)	T_4 Basal diet + Panchagavya (7.5g/kg) and *Andrographis paniculata* (2g/kg)	T_5 Basal diet + Panchagavya (7.5g/kg) and garlic powder (1g/kg)	T_6 Basal diet + Panchagavya (7.5g/kg) and turmeric powder (1g/kg)	F value
Preslaughter live weight (g)	1603.50± 58.66	1670.70± 66.19	1681.40± 56.24	1566.20± 49.10	1513.00± 60.67	1647.60± 38.78	1.388^{NS}
New York dressed carcass percentage	86.77±0.52	85.54±0.29	85.50±0.41	85.27±0.36	85.12±0.44	86.39±0.32	1.530^{NS}
Dressing percentage	75.89±0.60	76.28±0.77	75.71±0.54	76.23±0.53	75.47±0.70	76.32±0.32	0.344^{NS}
Ready-to-cook (%)	80.30±0.64	80.41±0.69	79.96±0.53	80.41±0.54	79.88±0.68	80.55±0.29	0.219^{NS}
Giblets yield (%)	4.41±0.10	4.13±0.13	4.26±0.16	4.18±0.09	4.41±0.07	4.24±0.10	1.061^{NS}
Gizzard yield (%)	1.95±0.09	1.79±0.07	1.79±0.07	1.84±0.05	2.03±0.06	1.91±0.08	1.948^{NS}
Liver yield (%)	1.87±0.04	1.83±0.07	1.95±0.14	1.84±0.07	1.86±0.04	1.82±0.05	0.432^{NS}
Heart yield (%)	0.59±0.03	0.51±0.02	0.52±0.02	0.50±0.03	0.51±0.01	0.51±0.02	2.218^{NS}
Abdominal fat yield (%)	0.66±0.05	0.71±0.07	0.59±0.05	0.74±0.05	0.64±0.04	0.72±0.06	1.116^{NS}

Furthermore, Attia *et al.* (2017) [6] reported that addition of turmeric powder (0.5, 1 and 2 g/kg feed) markedly increase the dressing percentage as compared with the antibiotic group. Urusan and Bolukbasi (2017) [17] investigated the effect of feeding turmeric powder at different levels in broiler birds (0, 2, 4, 6, 8 and 10 g/kg) on carcass characteristics and the results revealed that turmeric fed groups significantly ($P<0.01$) increased the carcass weight (1970, 1981.67, 1901.67, 2048.33 and 1800 g) in 8 g/kg turmeric group when compared with antibiotic group (2091.67 g). From these findings, phytogenic feed additives showed improved beneficial effects only at the higher level of inclusion.

From this study, low levels of phytogenic feed additives used in combination with recommended level of panchagavya in broilers showed better or on equivalent to antibiotics on carcass characteristics. The results suggested that phytogenic feed additives in combination with panchagavya can be used as alternative to antibiotic growth promoter.

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