

EFFECT OF PANCHAGAVYA AND PHYTOGENIC FEED ADDITIVES ON IMMUNE RESPONSES AND INTESTINAL MORPHOLOGY OF BROILER CHICKEN

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Abstract: Nowadays, phytogenics are increasingly used as feed additives alternative to antibiotic growth promoters. The current study was conducted to study the effect of panchagavya with phytogenic feed additives such as *Andrographis paniculata*, garlic and turmeric in commercial broiler chicken on immune responses for Newcastle Disease (ND) vaccine and intestinal morphology of broiler chicken. In this study, two hundred and forty commercial, sex separated day-old Vencobb broiler chicks were reared for a period of five weeks. These chicks were randomly allotted into six treatment groups with five replicates of eight chicks each. The treatment groups consisted of control-basal diet (T₁), basal diet with oxytetracycline- 50 ppm (T₂), basal diet with panchagavya -7.5 g/kg (T₃) and other treatment groups consisted basal diet with panchagavya -7.5 g/kg in combination with *Andrographis paniculata* – 2 g/kg, garlic -1 g/kg and turmeric-1 g/kg as T₄, T₅ and T₆, respectively. Therefore, from this study results revealed that though non significant among the treatments but the supplementation of panchagavya and phytogenic feed additives had positive effect on antibody titre and increase in villi height. Thus, the combination of panchagavya and turmeric have greater synergistic effect on immune response and intestinal morphology of broiler chicken.

Keywords: Panchagavya, *Andrographis paniculata*, Garlic, Turmeric, Immune, Villi height

Introduction

Antibiotic growth promoters (AGP) are used more frequently to enhance growth and to inhibit pathogen multiplication in birds' gut due to rising health issues. The development of antibiotic resistance in humane is threatened by indiscriminate use antibiotic growth promoters in poultry farming (Phillips *et al.*, 2023). Hence, scientists have moved their research towards non-

antibiotic growth promoters in feed, especially of plant derived compounds or phytonutrients (Applegate *et al.* 2010) and ayurvedic preparations.

Most of the medicinal plants are used as phytonutrient feed additives as an alternative to antibiotic growth promoter in the poultry industry (Wang *et al.*, 2024). Panchagavya, an organic product with antioxidant property has the potential to promote growth and provides immunity acting as bioenhancer (Khanuja *et al.*, 2002; Athavale *et al.*, 2012; Kumar *et al.*, 2013). Panchagavya is a unique ayurvedic preparation having high medicinal value and bio-enhancing properties can be used in combination with the medicinal plants for better utilization of phytonutrient additives in poultry (Mehala *et al.*, 2021). *Andrographis paniculata* (Nilavembu) has wide range of medicinal pharmacological application (Dhiman Anju *et al.* 2012), used individually or in combination with other medicinal plants in various Indian traditional systems of medicine. It exhibits higher anti-oxidant activity, anti-inflammatory, anti-viral, anti-bacterial (Nithya *et al.*, 2021), nematocidal actions. Garlic (*Allium sativum*) has been used as a spice and a native medicine for many years (Puvaca *et al.* 2016). It has possessed antibacterial, antifungal, antiparasitic, antiviral, antioxidant, anticholesteremic, anti-cancerous, and vasodilator characteristics (Eid and Iraqi, 2014; Arify *et al.*, 2019). Turmeric (*Curcuma longa*), a tropical herb of *Zingiberaceae* family, is widely used in indigenous medicine in Asia as an antimicrobial, endogenous stimulant, anti-flatulent, immunomodulatory and anti-inflammatory agent (Nouzarian *et al.*, 2011; Akosile *et al.*, 2023).

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). 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 (Mehala *et al.* 2021).

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 (PG) (7.5g/kg)
T ₄	Basal diet + Panchagavya (7.5g/kg) and <i>Andrographis paniculata</i> (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).

Ethical approval

The protocol and conduct of the study were approved by Institutional Animal Ethics Committee, Veterinary College and Research Institute, Namakkal.

Immunological study

The collected blood samples were placed in a slanting position and were allowed to clot and then they were centrifuged for 10 minutes at 2000 rpm to separate the sera. The sera samples were stored at -18°C. The stored sera samples were used to detect the antibody titre against Newcastle disease by Haemagglutination inhibition test (Alexander, 1998).

Intestinal morphology

At 35th day of age, totally eight birds per treatment group were randomly selected and slaughtered as per the method of Arumugam and Panda (1970). From the slaughtered birds, the small intestine was removed and intestinal contents were milked out. The intestine samples were incised from jejunum and preserved in ten per cent buffered formalin for morphological studies. The tissue samples were fixed in paraffin and were sectioned to 3 to 4µm thickness and stained with haematoxylin and eosin for histo-morphological studies (Bancroft and Stevens, 1996). By using ocular micrometer (Erma), each specimen was scanned in at least 10 fields and the mean value for 5 observations was a measurable unit for each specimen during subsequent calculations. Intestinal villi parameters viz., villi length and crypt depth were measured and expressed in micro meter (µm).

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). 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). The analysis was carried out by IBM SPSS (20.0). Angular transformation was applied to percentages wherever needed.

Results and discussion

Immune response

The statistical analysis of the Haemagglutination inhibition (HI) titre (log2) against Newcastle disease vaccine in commercial broiler chicken at 5 weeks of age as influenced by supplementation of panchagavya and phytogenic feed additives is presented in Figure 1. The results of the study revealed no significant difference in HI titre values against Newcastle disease in broilers at 5 weeks of age between the treatment groups as influenced by supplementation of panchagavya and phytogenic feed additives. The results of the present

study of T6 (PG and turmeric) group (4.20) for HI titre value was non significant among the other treatment groups and comparable with control (T1) group (2.90). The results of this study are in accordance with the findings of Nouzarian *et al.* (2011) who reported no significant difference in HI titre as influenced by supplementation of turmeric whereas Fallah and Mirzaei (2016) and Attia *et al.* (2017) recorded significantly higher HI titres in broiler chicken.

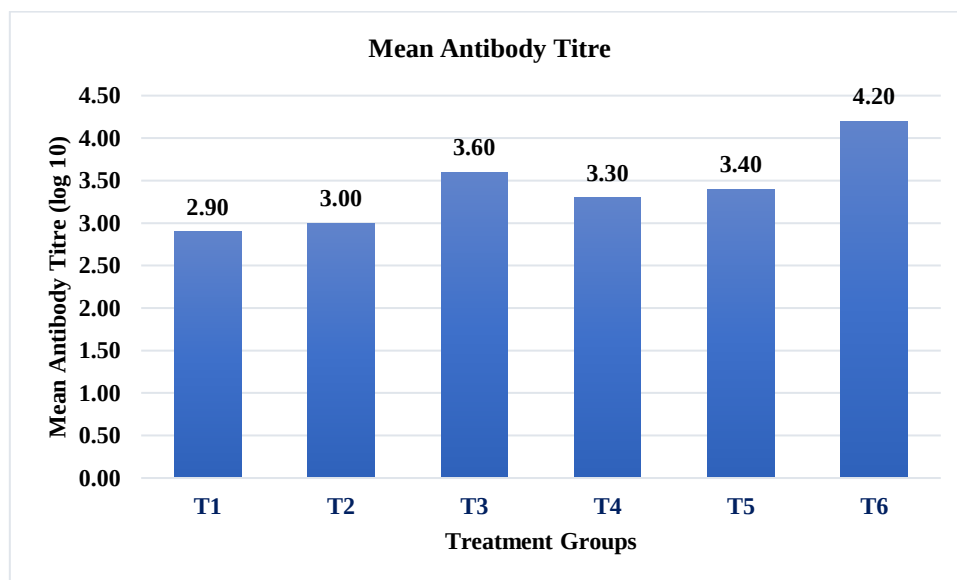


Figure 1. mean antibody titre in commercial broiler chicken at 5 weeks of age as influenced by supplementation of panchagavya and phytogenic feed additives

Intestinal morphology

Mean ($\pm$ S.E.) intestinal morphology of commercial broiler chicken at 5 weeks of age as influenced by supplementation of panchagavya and phytogenic feed additives

Treatment groups	Villi length (μ m)	Crypt depth (μ m)	Villi length: Crypt depth ratio
T ₁ -Control - Basal diet	955.90 $\pm$ 30.65	202.10 $\pm$ 4.79	4.73 $\pm$ 0.09
T ₂ -Basal diet + OTC 50 ppm	988.00 $\pm$ 21.21	206.30 $\pm$ 3.88	4.80 $\pm$ 0.13
T ₃ -Basal diet + PG -7.5 g/kg	1003.20 $\pm$ 12.39	207.00 $\pm$ 4.62	4.87 $\pm$ 0.16
T ₄ -Basal diet + PG-7.5 g/kg +A. <i>paniculata</i> -2g/kg	979.10 $\pm$ 12.53	265.90 $\pm$ 7.00	4.60 $\pm$ 0.39
T ₅ -Basal diet + PG-7.5 g/kg +Garlic-1g/kg	995.80 $\pm$ 14.45	202.10 $\pm$ 6.14	4.97 $\pm$ 0.18
T ₆ -Basal diet + PG-7.5 g/kg +Turmeric-1g/kg	1020.20 $\pm$ 16.57	206.70 $\pm$ 2.83	4.95 $\pm$ 0.13
F value	1.322 ^{NS}	0.739 ^{NS}	0.497 ^{NS}

Value given in each cell is the mean of 10 observations

NS- Non significant

The analysis of data revealed that supplementation of panchagavya and phytogenic feed additives in broilers had no significant difference on villi length, crypt depth and villi length: crypt depth ratio at 5 weeks of age. The results of this study are in contrary to the findings of Abdullah *et al.* (2010), Saeid *et al.* (2013) and Javid *et al.* (2019) reported that feeding of garlic showed higher villi length compared to control. Though the data showed no significant difference on villi length, crypt depth and villi length: crypt depth ratio, but the phytogenic feed additives have contributed higher villi height and shallower crypt depth in phytogenic feed supplemented groups and this shows that PFA has role in protecting the intestinal epithelial cells. Among the phytogenic additives, turmeric supplementation revealed better when comparison with other treatment groups. The results are in accordance with the Bondar *et al.*, (2023) who stated that supplementation of turmeric in broiler chicken diet showed increase in villi height with decrease in crypt depth.

Conclusion

From this study, it may be concluded that the combination of panchagavya and turmeric have greater synergistic effect on immune response and intestinal morphology of broiler chicken. Therefore, it is recommended that for enhancing the properties of phytogenic feed

additives supplementation of panchagavya in combination with phytogenic feed additives could provide synergistic effect in poultry.

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