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Effect of aloe vera powder (*Aloe barbadensis*) on proximate composition of Satpuda Poultry

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Abstract

The present experiment entitled “Effect of Aloe vera powder (*Aloe barbadensis*) on growth performance and meat characteristics of Satpuda poultry” was conducted at Department of Animal Husbandry and Dairy Science, College of Agriculture, Dhule, Maharashtra. One sixty, day old, Satpuda chicks were purchased from Balaji Hatcheries, Pvt. Ltd. Ahmदनगर, Maharashtra. They were randomly distributed into four groups T₀, T₁, T₂ and T₃ with 40 chicks in each group. The experimental broiler chicks were reared on deep litter system in well ventilated shed from 0- 8 weeks. The control group (T₀) was without aloe vera powder, while chicks in treatment group T₁, T₂ and T₃ were fed basal diet with Aloe vera powder @ 0.5%, 1.0% and 1.5%, respectively. The inclusion of aloe vera powder in the Satpuda diet had non-significant effect on moisture, dry matter, nitrogen free extract, protein, fat and ash content in breast and thigh tissue. However, a higher fat content was observed in the breast meat as compared to thigh meat.

Keywords: Satpuda, aloe vera powder, carcass characteristics

Introduction

The intensifying income and changing consumer preferences lead to significant market opportunities for higher-value agricultural products. India today is the one of the world’s largest producer of eggs and broiler meat. India rank 3rd in eggs production in the world. The eggs production in the country has increased from 78.48 billion in 2014-15 to 114.38 billion in 2019-20. In eggs production Andhra Pradesh is a top most state in the country. Meat production in India is estimated at 6.3 million tons annually and it is ranked 5th in the world and India is responsible for 3% of the total meat production in the world. The largest producer of meat in the country is Uttar Pradesh producing 23% of the total meat. Annual growth rate of eggs production was 4.99% during 2014-15 thereafter, there has been a significant improvement in the eggs production with 10.19% growth registered in 2019-20 over the previous year the per capita availability of eggs was 86 eggs per annum in 2019-20. (FAOSTAT-2019) [7].

The production of Satpuda-Desi synthetic hybrid prototypes, which resembles indigenous fowl in body conformation, multi coloured plumage, dull shanks, pink skin and single comb have generated new opportunity for poultry production in rural areas. The Satpuda birds attained 1.0 kg body weight in 8-9 weeks with 2.45 kg feed. Small scale poultry farmers, raising 100-2000 Satpuda-Desi chicken, have been able to capitalize on its acceptance as an indigenous breed in the local markets, which has been apparent from the sale of 0.67 million chicks in last 12 months (Khan, 2008) [9].

In recent years, the usage of herbs as natural supplements in broiler feeds has expanded due to the prohibition of antibiotic growth boosters in broiler chicken diets. Aloe vera is also a good substitute for antibiotic growth boosters and anticoccidial medicines. Since, aloe vera comes in a variety of forms, including gel, powder, ethanolic extract, aqueous extract and a polysaccharide found in aloe vera gel (Babak Darabighane *et al.*, 2011) [6]. Major ingredients of *Aloe vera* include anthraquinones, saccharides, vitamins, enzymes and low molecular weight compounds (Choi and Chung, 2003) [4] which give *Aloe vera* its anti-inflammatory, immunomodulatory, wound-healing, anti-viral, anti-fungal, anti-tumor, anti-diabetic, and anti-oxidant effects (Christaki and Florou Paneri, 2010). Numerous studies suggest that many benefits of *Aloe vera* are attributable to polysaccharides contained in *Aloe vera* gel, which compose a large part of dry matter in this gel (Hamman, 2008). In other words, almost 60% of dry matter of *Aloe vera* gel is composed of polysaccharides (McAnalley, 1989). A compound often analysed by researchers is the polysaccharide acemannan which has immunomodulatory, anti-microbial and anti-tumour effects (Choi and Chung, 2003) [4].

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Material and Methods

The present research was conducted at the poultry Unit of the Department of Animal Husbandry and Dairy Science, College of Agriculture Dhule, Maharashtra State, to study the "Effect of aloe vera powder (*Aloe barbadensis*) on growth performance and meat characteristics of Satpuda poultry". The present study was conducted during the 26th April and 20th June of 2021 at Division of Animal Husbandry and Dairy Science, College of Agriculture, Dhule, Maharashtra, India, which is located at 20.90020 N and 74.79880 E at distance 258 meter from mean sea level. Satpuda is a multicoloured feathered bird that looks like a desi fowl, with a maximum average body weight of 1 kg and 200 eggs per year. The bird is resistant to heat stress and possesses all of the necessary qualities for producing poultry in a village setting. It is a mutant multiple cross of desi, Naked Neck, Rhode Island Red (RIR), Kadaknath, and other breeds that's good for farming. The Dhule environment is hot and dry, with summer temperatures reaching 46^oC and maximum and minimum ambient temperatures ranging from 10 to 15 ^oC in winter and 35 to 40 ^oC in summer, with an annual rainfall of 612 millimetres. As a result, the birds either do not perform or fall prey to the high environmental temperature. Hence the bird that can survive such high temperatures while still performing well in rural condition was chosen for this research. Aloe vera powder was purchased at the Gulabchand Ayurvedic shop, Mundada Market, Dhule. After purchasing aloe vera powder was mixed in commercial poultry feed as per various treatment levels.

Selection of Experimental Chicks

Balaji Hatcheries Private Limited, Nagar, Maharashtra, provided 160-day old Satpuda chicks for the current study. When the chicks arrived, they were weighed and randomly distributed to one of four treatment groups: T₀, T₁, T₂ and T₃, with 40 chicks in each treatment, on equal weight basis.

Table 1: Details of Dietary Treatments and Feeding

Treatment	Treatment details
T ₀	Basal diet without aloe vera powder
T ₁	Basal diet + 0.5% aloe vera powder
T ₂	Basal diet + 1.0% aloe vera powder
T ₃	Basal diet + 1.5% aloe vera powder

Experimental Details:

1. Number of treatments : 4
2. Number of chicks per treatment : 40
3. Total number of Chicks : 160
4. Design of experiment : CRD

Proximate composition of experimental diet

It was observed that, experimental broiler rations involved adequate nutrients for growth was observed as per BIS (1992). The Satpuda starter ration contained crude protein, crude fiber, ether extract, total ash and NFE are 21.28%, 6.65%, 4.26%, 7.15% and 60.66% respectively. The finisher ration contained crude protein, crude fiber, ether extract, total ash and NFE are 19.34%, 5.63%, 4.73%, 6.8% and 63.5% respectively.

Observations Recorded

During the experimental period following observations were recorded:

Body Weight

At weekly intervals, the weight (g) of each of the experimental birds was recorded on an electronic weighing balance. The weight of birds was taken on the 7th day morning before new water and feed was given to the birds, and then every 7th day interval after that. Live weight gains were computed by subtracting the previous week's live weight from the current week's live weight.

Proximate Analysis of Aloe Vera and Experimental Ration

The proximate analysis of the experimental ration was carried out using the standard procedure of AOAC (2005)^[3].

Proximate Analysis

The birds were slaughtered at the end of 8th week of age. Meat proximate analysis was done by following standard procedure of AOAC (2005)^[3].

Moisture Content

Moisture was determined as per AOAC (1990)^[2] method gram of sample was transferred to weighed metallic dish which was then transferred to a hot air oven at 100 ± 2 ^oC and dried till a constant weight was obtained. The dish was kept in desiccator for cooling. After cooling, the loss in weight was determined to calculate moisture content and expressed as %:

$$\text{Moisture (\%)} = \frac{\text{Fresh weight (g)} - \text{Dry weight (g)}}{\text{Fresh weight (g)}} \times 100$$

Determination of Dry Matter (DM)

Representative samples were taken in previously weighed moisture cup/tin trays and kept in hot air oven at 100 ± 2 ^oC for 24 hrs (AOAC, 2005)^[3].

Dry matter was calculated as follows:

$$\text{Dry matter (\%)} = \frac{B}{A} \times 100$$

Where,

a = Fresh weight of sample (g)

b = Dry weight of sample (g)

Determination of Total Ash

Five gm of air-dried samples were taken in a previously weighed silica crucibles. The crucibles along with samples were kept on heater and burnt till smoke disappears from the charred mass of samples. With the help of metal tong, the silica crucibles were kept into Muffle furnace and ignited at 600 ^oC for 2 hrs. Allow the muffle furnace to cool down. After 12 hrs silica crucibles containing ash were removed from the furnace and transferred into desiccator, cooled and weighed. Total ash content was expressed on DM basis and calculated as follows: (AOAC, 2005)^[3].

$$\text{Total ash (\%)} = \frac{a - b}{c} \times 100$$

Where,

a = Weight of silica crucible with ash (g)

b = Weight of empty silica crucible (g)

c = Weight of dry sample taken for ash (g)

Determination of Nitrogen and Crude Protein

Nitrogen and crude protein in samples were estimated by using Kjeldahl method. The representative samples of ration were digested in Kjeldahl flask with commercial sulphuric acid in the presence of digestion mixture (CuSO₄: K₂SO₄ 1:9). The digested samples were then transferred in to a volumetric flask to make a suitable volume of 250 ml, cooled and out of which 25 ml sample was subjected to distillation in the semi-automatic Kjeltec distillation assembly. The ammonia released during distillation was collected into 30 ml of 4 per cent boric acid solution containing mixed indicator (0.2 per cent methyl red and 0.1 percent bromocresol green in equal amount in 95 per cent ethyl alcohol). The ammonia collected in boric acid solution was titrated against 0.1 N HCl (AOAC, 2005)^[3].

$$\text{Nitrogen (\%)} = \frac{V_1 - V_2 \times 0.0014}{b} \times 100$$

Where,

V₁ = Volume (ml) of 0.1 N HCl used for titration of sample

V₂ = Volume (ml) of 0.1 N HCl used for titration of blank

b = Weight sample taken for digestion on DM basis

0.0014 = Molecular weight of nitrogen (g) equivalent to Neutralize 1 ml of 0.1 N HCl.

$$\text{Crude Protein (\%)} = \text{N (\%)} \times 6.25$$

Determination of Ether Extract

Fat- and fat-soluble components of oven dried feeds and meat samples were estimated by SOCS PLUS Pelican equipment. Solvent extraction in the extraction unit was performed in two steps. 1gram oven dried samples were immersed in the boiling solvent (petroleum ether B.P. 40-60°C) for 20 minutes to dissolve the soluble materials. In the second step, which lasts for 30 minutes the samples were raised above the solvent surface to permit efficient washing with solvent from the condensers.

After the extraction, the condenser valves were closed by lifting the samples to the upper position. After few minutes most of the solvent got collected via the condenser in a collection vessel. At last, the residue of the solvent was evaporated when the air pump was started. Ether extract was collected in previously weighed extraction cups and then weighed after cooling in desiccators. The ether extract was calculated as follows: (AOAC, 2005)^[3].

$$\text{Ether extract (\%)} = \frac{c - a}{b} \times 100$$

Where,

a = Initial weight of extraction cups (g)

b = Weight of samples on DM basis (g)

c = Weight of extraction cups with ether extract (g)

Determination of Crude Fiber

The sample after defeating as mentioned above were transferred from thimbles to spoutless beakers of one liter capacity and in each beaker, 200 ml of 1.25 per cent H₂SO₄ was added. It was refluxed for 30 minutes on hot plates after the boiling started and thereafter, filtered through muslin cloth. The residue was washed 5-6 times with hot water until

it became acid free. The residual materials on the muslin cloth were again transferred to the respective beakers and in each beaker add 200 ml of 1.25% sodium hydroxide solution (NaOH) was added. It was refluxed for 30 minutes after the boiling started and thereafter filtered through muslin cloth and washed with hot water for 5-6 times until it became free from alkali. Thereafter, total residue was transferred in a clean dry silica crucible and dried in hot air oven at 100 ± 2 °C for 24 hr and then it was cooled in desiccator and weighed. The residue was then ignited in Muffle furnace at 600 °C for 2 hr. After 12 hours crucibles containing ash were removed from the furnace and kept into desiccator, cooled and weighed again. Weight loss due to ignition was recorded as the weight of crude fiber: (AOAC, 2005)^[3].

$$\text{Crude fiber (\%)} = \frac{b}{a} \times 100$$

Where,

a = weight of sample on DM basis (g)

b = weight of crude fiber (g)

Nitrogen Free Extract

$$\% \text{NFE} = 100 - (\% \text{EE} + \% \text{CP} + \% \text{Ash} + \% \text{CF})$$

Result and Discussion

The present investigation was undertaken to study "Effect of aloe vera powder (*Aloe barbadensis*) on growth performance and meat characteristics of Satpuda Poultry". Table 2 indicate the data on proximate composition of Satpuda poultry due to different dietary treatments of aloe vera powder supplementation during experimental period.

Proximate Composition of Breast Meat

The proximate composition of breast meat in different treatments in Satpuda birds is given in table no.2. The difference in proximate composition of breast meat was statistically non-significant among all treatment groups T₀, T₁, T₂ and T₃, which indicated that, the Aloe vera remains unaffected the meat quality but improved feed conversion efficiency. Present finding is similar to the Mehala and Moorthy, (2008) who found that, there was no significant difference in abdominal fat weights when aloe vera and curcuma longa were combined at varied dosages. Christaki and Florou (2010)^[5] observed that, decreased fat content in all the aloe vera treated groups support the anti-cholesterogenic property of aloe vera.

Proximate Composition of Thigh Meat

The proximate composition of thigh meat in different treatments in satpuda birds is given in table no.3. The difference in proximate composition of thigh meat was statistically non-significant ($p < 0.05$) among treatment groups, which indicated that, the Aloe vera does not affect the meat quality but improved feed conversion efficiency. Mehala and Moorthy, (2008) found that there was no significant difference in abdominal fat weights when Aloe vera and curcuma longa were combined at varied dosages. This finding is similar to present investigation. Christaki and Florou (2010)^[5] observed that, decreased fat content in all the aloe vera treated groups support the anti-cholesterogenic property of aloe vera.

Tables**Table 2:** Proximate composition of breast meat in different treatments

Parameter	Groups				SE(m)+	CD
	T ₀	T ₁	T ₂	T ₃		
Moisture	71.5	71.53	71.40	71.51	0.203	NS
DM	28.50	28.483	28.57	28.49	0.21	NS
Ash	1.225	1.25	1.23	1.25	0.017	NS
Crude Protein	19.95	19.96	19.91	19.90	0.202	NS
Crude Fat	3.27	3.14	3.22	3.26	0.03	NS
NFE	75.545	75.545	75.563	75.583	0.019	NS

Table 3: Proximate composition of thigh meat in different treatments

Parameter	Groups				SE(m)+	CD
	T ₀	T ₁	T ₂	T ₃		
Moisture	68.25	68.37	68.22	68.25	0.29	NS
DM	31.75	31.63	31.78	31.75	0.26	NS
Ash	1.37	1.40	1.35	1.36	0.01	NS
Crude Protein	20.06	20.08	20.03	20.05	0.05	NS
Crude Fat	2.80	2.82	2.81	2.84	0.03	NS
NFE	75.77	75.70	75.81	75.75	0.12	NS

NS- Non-significant

Conclusion

Analysis of proximate composition of meat and meat characteristics of Satpuda poultry concluded that, all treatment groups are statistically identical thus it can be concluded that, feeding of aloe vera powder up to 1.5% has no negative effect on meat quality.

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