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Effect of *Aloe vera* powder (*Aloe barbadensis*) on growth performance 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. Ahmadnagar, 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 average body weights at the end of 8th week of age were 719.85, 742.14, 773.20 and 856.50 g in T₀, T₁, T₂ and T₃ groups, respectively. The weekly body weight changes of chicks indicated no significant differences among various treatment groups during the first two weeks of the experiment. There was significant ($P<0.05$) difference in weekly body weights among the treatments from third weeks onwards. The average weekly body weight gain at the end of 8th week of age were 160.28, 162.49, 168.22 and 185.74 in T₀, T₁, T₂ and T₃ groups, respectively. However, at the end of the eight week, significantly higher body weight gain in the T₃ treatment group was recorded. Average total feed intake (g/birds) at the end of 8th week of study was recorded as 602.16, 606.91, 615.41 and 635.41 g for T₀, T₁, T₂ and T₃ groups, respectively. The significantly higher feed intake was observed in T₃ group followed by T₂, T₁ and T₀.

Keywords: Satpuda, *Aloe vera* powder, body weight, weekly body weight gain, feed intake

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 Utter 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) [12].

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) [5]. 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) [9]. In other words, almost 60% of dry matter of *Aloe vera* gel is composed of polysaccharides (McAnalley, 1989) [14]. A compound often analysed by researchers is the polysaccharide acemannan which has immunomodulatory, anti-microbial and anti-tumour effects (Choi and Chung, 2003) [4].

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 °C and maximum and minimum ambient temperatures ranging from 10 to 15 °C in winter and 35 to 40 °C 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 <i>Aloe vera</i> powder
T ₁	Basal diet + 0.5% <i>Aloe vera</i> powder
T ₂	Basal diet + 1.0% <i>Aloe vera</i> powder
T ₃	Basal diet + 1.5% <i>Aloe vera</i> powder

Experimental Details

- Number of treatments: 4
- Number of chicks per treatment: 40
- Total number of Chicks: 160
- 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:

Growth Trait

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 weeks live weight from the current week's live weight.

Feed Intake

The amount of feed consumed by each group in a day was used to calculate daily feed intake. The total feed offered and the feed left over the next morning were used to compute the average feed intake. The weekly feed intake was computed by adding up the daily average feed intake of the particular week. The cumulative feed intake for a given week was estimated by adding the previous weeks' weekly average feed intake to the feed intake for that week. The following values for weekly feed intake per bird were calculated:

$$\text{Weekly feed intake (g/bird)} = \frac{\text{Total feed intake by all birds in a treatment during a week.}}{\text{No. of live chicks in the treatment during that week.}}$$

Similarly, cumulative feed intake was estimated by adding these figures upto that week.

Body Weight Gain of Chicks

Body weight gain of chicks at different weeks was obtained by subtracting the body weight of chicks of previous weeks.

Statistical analysis

The data collected throughout the trial will be statistically analyzed by CRD given by Snedecor and Cochran (1994).

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" at poultry shade of Animal Husbandry and Dairy Science Department during 26st April 2021 to 20th June 2021.

Body Weight

The growth performance of experimental Satpuda chicks was determined by recording the weekly body weight of an individual bird during the experimental period. The data containing to mean (average) weekly body weight is showed in Table 2. The average (mean) initial body weight of day old Satpuda chicks for T₀, T₁, T₂, T₃ was 37.21, 36.84, 37.05 and 36.87 g respectively and average (mean) initial body weight at

the end of 8th week was 719.85, 742.14, 773.20 and 856.50 for T₀, T₁, T₂ and T₃ treatment. During the first week of age non-significant differences were observed in all treatment groups T₀, T₁, T₂ and T₃. However, from 2nd week onwards Satpuda birds in T₃ treatment group grew significantly faster than the birds in T₀, T₁ and T₂ treatment groups, resulting into higher weight gain. Therefore, from the 2nd week significant ($P < 0.01$) difference in body weight gain was recorded in T₃ and T₂ group as compared to T₀ group. The average weekly body weight of experimental birds was recorded more in T₃ group as compared to birds in T₂, T₁ and T₀ group. The present findings are similar to the findings of Jagadeeswaran (2007) [11] who discovered that, at the end of 6 weeks, broilers fed 1% *Aloe vera* observed significantly ($P < 0.05$) higher body weights than the control group. These results are similar to the observations made by Mehala and Moorthy (2008) [16] who showed that, significant ($P < 0.05$) higher body weights and body weight gains were observed as compared to control diet when the birds fed with 1% dietary supplementation of *Aloe vera* leaf meal.

Present findings are similar to the findings of Alemi *et al.* (2012) [1] who observed that, as Compared to the 0.5% *Aloe vera* gel powder group and the control group, broilers treated with 0.75% and 1% *Aloe vera* gel powder had improved growth performance. The present findings are similar to the result obtained by Gohel *et al.* (2019) [8], who observed that, the final body weight and weight gains were significantly higher in birds supplemented with either tulsi or *Aloe vera* leaves powder or both as compared to the control. Present findings are similar to the result obtained by Odo *et al.* (2010) [19] and Mmereole (2011) [17] it was also discovered that, adding AV leaves to broiler feed increased body weight when compared to a control group. These results are consistent with Kumari *et al.* (1994) [13] conducted the experiment on *Curcuma longa* (turmeric) as a feed additive in broiler and obtained numerically higher body weight in treatment groups at sixth week of age as compared to control. Changkang *et al.* (2007) [3] stated that, 600 mg of *Aloe vera* gel water extract added in broiler feed resulted in significant increase of body weight in the 3rd and 6th weeks, in comparison with the control. This finding is much similar to present investigation which make our data much effective. These results are consistent with Mmereole (2011) [17] reported the significant improvement in body weight and weight gain in bird fed on 1% *Aloe vera* powder as compare to control but the parameters were comparable with the 1% antibiotic fed groups. Yim *et al.* (2011) [22] researchers have studied potential effects of *Aloe vera* on improving growth performance in broilers with coccidiosis and found that, *Aloe vera* powder (0.1%, 0.3% and 0.5%) added to the feed of these broilers does not lead to significant difference in terms of body weight gain.

These results are concurrent with present findings. Pranab Doley *et al.* (2014) [21] concluded that, 0.50% Yeast + 0.50% *Aloe vera* powder feed has a beneficial impact on the growth performance of broilers chicks. This finding is much similar to present investigation which make our data much effective. These results are consistent with Hitesh Singh *et al.* (2017) [10] reported that, body weight gain for the entire period (up to 6 weeks) were significantly ($P < 0.05$) increased in the treatments 2, 3 and 4 when *Aloe vera* was added at a rate of 0.1, 0.2 and 0.3%, compared with the other treatments. Noor Agha Nassary *et al.* (2019) [18] reported that, daily live body weight gain of T₃ and T₁ groups broilers were significantly

($P < 0.05$) higher than control and T₂ groups in starter period and T₃ group was significantly ($P < 0.05$) higher than T₁ group broiler in finisher period. T₀, T₁, T₂ & T₃ four treatments of 0.0%, 0.1%, 0.2% & 0.3% *Aloe vera* gel respectively. These results are concurrent with present findings

Body Weight Gain

The effect of feeding of different levels of *Aloe vera* powder with diet on body weight gain of Satpuda chicks at different weekly intervals has been shown in Table 3. The average (mean) weight gain of Satpuda chicks for T₀, T₁, T₂ and T₃ treatment groups for 1st week of age was 29.02, 29.76, 29.33 and 29.20 gm respectively. According to the observations of weekly body weight gain of Satpuda chicks consuming 1.5% *Aloe vera* powder had faster weight gain than the T₂ (1% *Aloe vera*), T₁ (0.5% *Aloe vera*) and T₀ (control). Non-significant differences were observed at 1st week of age in all treatment groups T₀, T₁, T₂ and T₃. However, from 2nd week onwards birds in T₃ treatment group observed substantially more weight gain than the birds in other groups T₀, T₁ and T₂. There is possibility that improved metabolism has beneficial effect on weight gain in *Aloe vera* treated groups as compared to non-*Aloe vera* treated group (control group).

Al-Sultan (2003) [2] reported that, the higher body weight gain (1344.5 g) was observed in broiler birds fed diet contained *Curcuma longa* (turmeric) at level of 0.5% followed by birds received 0.25% (1329.8), 1% (1306) and control (1268.2). This finding is much similar to present investigation which make our data much effective. These results are consistent with Md. Mirajul Islam *et al.* (2017) [15] reported the live weight of broilers fed on 15 ml/L *Aloe vera* aqueous extract in drinking water showed significantly higher live weight gain ($P < 0.05$) than those of the broilers provided the clean water. These results are similar to the observations made by Mehala and Moorthy (2008) [16] who demonstrated that, significant ($P < 0.05$) higher body weights and body weight gains were showed as compared to control diet when the birds fed with 1% dietary supplementation of *Aloe vera* leaf meal. Present findings are similar to the result made by Kumari *et al.* (1994) [13] and Changkang *et al.* (2007) [3]. It was observed that, at the sixth week of life, they had a statistically higher body weight in the treated groups than the non-treated (control groups). Gohel *et al.* (2019) [8] found that, the final body weight and weight gains were significantly higher in birds supplemented with either tulsi, *Aloe vera* leaves powder or both as compared to the control. These results are concurrent with present findings.

Feed Intake

The effect of feeding of different levels of *Aloe vera* powder with diet on the feed intake of Satpuda chicks at different weekly intervals has been shown in Table 4. Satpuda chicks receiving 1.5% *Aloe vera* powder (T₃) consumed more quantity of total feed (2693.76g) as compared to other supplemented groups. Birds in T₂ (receiving 1% *Aloe vera* powder) group consumed 2602.27 g of feed. Birds in T₁ group (receiving 0.5% *Aloe vera* powder) consumed 2533.48 g of feed and birds of control group (T₀) consumed 2501.3 g feed during the experimental period of 8 weeks. From these results it was found that group T₃ consumed more feed as compared to rest of the groups followed by T₂, T₁ and T₀. The trend shows that as the level of *Aloe vera* powder inclusion in the feed increases the feed intake of broilers was also increased. While comparing growth performance with weight gain, T₃

treatment group was higher weight gain than other treatments. Darabighane *et al.* (2011) [6] administered nutritional supplements containing 1.5%, 2% and 2.5% *Aloe vera* gel in broilers and showed higher daily feed intake and body weight than those fed baseline diets. These results are concurrent with present findings. Olupona *et al.* (2010) [20] conducted the research on the effect of *Aloe vera* gel addition in drinking water on broiler performance, and result revealed that, higher daily feed intake improved final body weight. This finding is more similar to present investigation which make our data much effective. Hitesh Singh *et al.* (2017) [10] reported that, feed consumption was substantially ($P<0.05$) higher in treatment 1 and 4 when introduced at a rate of 0.0 and 0.3% compared to the other treatments for the full duration (up to 6 weeks). *Aloe vera* was added at a rate of 0.1 and 0.2% in steps 2 and 3. This finding is much similar to present investigation which make our data much effective. These results are consistent with Noor Agha Nassary *et al.* (2019) [18] reported that, feed intake was not significantly different among the groups whereas slightly variation observed with increased *Aloe vera* gel.

Table 2: Average weekly cumulative body weight (g) per bird of Satpuda.

Weeks	Groups				Mean	SE(m)±	CD
	T ₀	T ₁	T ₂	T ₃			
Initial weight	37.21	36.84	37.05	36.87	36.99	0.19	NS
1 st week	66.61	66.61	66.38	66.11	66.42	0.40	NS
2 nd week	98.82 ^a	103.48 ^b	107.87 ^c	112.69 ^d	105.71	0.69	2.15
3 rd week	155.15 ^a	159.57 ^b	162.62 ^b	176.03 ^b	163.34	1.492	4.64
4 th week	244.62 ^a	251.49 ^b	261.61 ^b	274.62 ^c	258.08	2.14	6.67
5 th week	331.78 ^a	337.57 ^b	351.37 ^c	377.20 ^d	349.48	1.05	3.27
6 th week	444.15 ^a	455.90 ^b	483.90 ^c	521.11 ^d	476.26	2.904	9.04
7 th week	559.57 ^a	579.65 ^b	604.98 ^c	670.79 ^d	603.74	3.211	10.002
8 th week	719.85 ^a	742.14 ^b	773.20 ^c	856.50 ^c	772.92	3.57	11.125

NS - Non-significant

Table 3: Average weekly body weight gain (g) in Satpuda.

Weeks	Groups				Weekly Mean	SE(m) ±	CD
	T ₀	T ₁	T ₂	T ₃			
1 st week	29.02	29.76	29.33	29.20	29.32	0.52	NS
2 nd week	32.58 ^a	36.86 ^b	41.41 ^c	46.58 ^d	39.35	0.63	1.99
3 rd week	56.33 ^a	56.09 ^a	54.74 ^a	62.34 ^b	57.37	1.19	3.73
4 th week	89.47 ^a	91.92 ^a	98.99 ^b	99.59 ^b	94.74	2.51	7.84
5 th week	87.15 ^a	85.32 ^a	89.75 ^a	102.57 ^b	91.19	2.35	7.32
6 th week	112.37 ^a	118.33 ^a	122.53 ^a	143.90 ^b	124.28	4.78	14.91
7 th week	115.42 ^a	123.74 ^a	131.24 ^a	149.68 ^b	130.02	4.76	14.85
8 th week	160.28 ^a	162.49 ^a	168.22 ^a	185.74 ^b	169.18	3.35	10.45

Table 4: Average of weekly feed intake (g) of Satpuda.

Weeks	Groups				Weekly Mean	SE(m)±	CD
	T ₀	T ₁	T ₂	T ₃			
1 st week	36.96	37.04	37.05	36.64	36.77	0.109	NS
2 nd week	84.49 ^a	86.1 ^a	95.74 ^b	103.44 ^c	92.25	0.82	2.55
3 rd week	164.3 ^a	168.47 ^b	160.62 ^b	169.00 ^c	164.79	1.33	4.15
4 th week	279.2 ^a	286.45 ^a	303.6 ^b	304.74 ^b	291.81	1.48	4.62
5 th week	301.32 ^b	291.53 ^a	297.53 ^b	307.3 ^c	300.58	2	4.42
6 th week	504.6 ^a	514.6 ^b	535.82 ^c	536.85 ^c	522.96	1.77	5.54
7 th week	528.27 ^a	542.38 ^b	556.50 ^c	600.38 ^d	556.88	1.78	5.55
8 th week	602.16 ^a	606.91 ^a	615.41 ^b	635.41 ^c	613.33	2.06	6.44

Conclusion

The effect of feeding *Aloe vera* powder on growth performance of Satpuda poultry concluded that, 1.5% *Aloe vera* powder was significantly higher body weight and weekly

body weight gain and weekly feed intake of Satpuda poultry at the end of 8th week. The effect of feeding *Aloe vera* powder on feed conversion ratio of Satpuda poultry concluded that, treatment group T₃ receiving 1.5% *Aloe vera* powder was better feed conversion ratio than the other treatment groups T₀, T₁ and T₂.

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