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# Effect of Herbal Aloe Vera (*Aloe barbadensis*) as Feed Additive on Body Weight and Biochemical Parameters in Tropical Buffalo Calves

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## ABSTRACT

The aim of the present study was to investigate the effect of dietary herb aloe vera (Aloe barbadensis) on body weight and biochemical parameters in buffalo calves in tropical India. The study was conducted on 15 buffalo calves (3-6 months age) that were divided into 3 groups of 5 calves each. The calves were fed different dietary treatments viz.T1 as Control (basal diet), T2 (basal diet with aloe vera leaves @ 2 g/Kg BW) and T3 (basal diet with aloe vera leaves @ 4 g/Kg BW) for 90 days according to ICAR(2013) feeding standards. At monthly interval, blood samples were collected and serum was separated to estimate different biochemical parameters and body weight was recorded at fortnightly interval. The results of study indicated that the SGOT, SGPT, total protein and globulin in serum were highest in T3 group followed by T2group and were found lowest in T1 (Control group) and differ significantly ($P<0.05$) in T3 as compared to T1. There was significant decrease ($P<0.05$) in the mean serum cholesterol and glucose values in treatment group T3 as compared to control group T1. The body weight of buffalo calves was also found significantly higher ($P<0.05$) for T3 as compared to T1.Therefore, dietary supplementation of fresh aloe vera leaves at 4g/kg BW in diet of buffalo calves resulted in improved overall health of buffalo calves.

**Key words:** Aloe vera, Buffalo calves, Cholesterol, Glucose, Protein

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## INTRODUCTION

India ranks first among the world in milk production, and produced 198.4 million tonnes of milk in 2019-20 (Economic Survey, 2020-21). Approximately 49% of total milk production of India, is produced by buffaloes. The calves form the future herd of a dairy farm (Kumar et al., 2017) and economic return can be maximized by reducing calf mortality and adopting better husbandry and management practices.The mortality around 30%(Nehru et al., 2017)in young calves is caused by the gastrointestinal infection. The use of medicinal herbs as feed additives has increased in last few years after worldwide denouncement over the use of sub-therapeutic antibiotics as growth promoters. The increasing cost of antibiotics along with problem of development of resistant bacterial strains in animals and human body, led the researchers to look forward for herbal feed additives. Realizing this, along with number of other herbal feed additives, aloe vera has also been used as feed additive and observed its reducing effect on serum cholesterol (Ghane et al., 2010) which in turn may improve the overall health status of calves.

*Aloe barbadensis* (aloe vera) is a member ofLiliaceae family and one of the most important medicinal succulent plant (Qiao et al., 2013). Aloe vera contains more than 200 biologically active substances, including minerals, proteins, enzymes, carbohydrates, vitamins, saponins and anthraquinones (Giannakoudakis et al., 2018). It is used as animmunomodulator due to its anti-inflammatory, antiviral, antifungal, antitumor, wound healing, antidiabetic and antioxidant

properties (Sharma et al., 2014; Maan et al., 2018). The values of biochemical parameters are always affected during the abnormalities in body condition (infectious disease, nutritional deficiency disease and poor growth). So, keeping the above facts in view, the present investigation was undertaken to study the effectsof two different levels of aloe vera supplementation on body weight and biochemical profile of Murrah buffalo calves.

## MATERIALS AND METHODS

### Experimental plan

The experiment was conducted at Buffalo farm, Department of Livestock Production Management, College of Veterinary Sciences, LUVAS, Hisar (Haryana) for duration of 90 days from February to May, 2021. Prior approval was taken to conduct the present study by the Institutional Animal Ethics Committee (Vide memo no. VCC/IAEC/1745-1775 dated: 29/12/2020). Fifteen Murrah buffalo calves of either sex between 3 to 6 months of age were selected and divided into three groups of five calves each based on nearness in body weight and age. All the buffalo calves were dewormed during the preliminary adjustment period of seven days before the start of experiment.

The calves were allotted to different dietary treatmentsi.e.T1 (Basal diet- Control), T2 (Basal diet + aloe vera leaves @ 2g/kg BW) and T3 (Basal diet+ aloe vera leaves @ 4g/kg BW). The aloe vera fresh leaves were purchased from Medicinal and Aromatic Plant Section, Department of Plant Breeding, College of Agriculture, CCS HAU, Hisar, Haryana. Procured fresh aloe vera leaves were subjected to thorough washing to remove dirt and then were minced in the electric operated mixer to prepare the crude extract so that loss of some active ingredients like enzymes, hormones and vitamins could be avoided and easily fed to the animals along with concentrate in form of crude extract as such, to increase the palatability of aloe vera. Procurement and processing of aloe vera were done on daily basis and fed to experimental calves according to their body weight by measuring with portable weighing balance. The different feed ingredients along with fresh aloe vera leaves were analyzed (AOAC, 2013) for proximate composition (Table 1) before formulation of basal diets for the buffalo calves.

All the experimental buffalo calves were fed with seasonal green fodder (berseem), wheat straw and concentrate mixture as per feeding standards specified by the ICAR (2013) and were also offered with fresh drinking water on ad lib. basis throughout the experiment. The experimental calves were weighed individually at the start of the experiment andthen at fortnightly intervals before feeding and watering on digital weighing balance and these body weights were utilized for adjusting quantity of different feeds given to each group at fortnightly intervals.

### Sample collection

The blood samples were collected from buffalo calves inplastic tubesfor serum analysis at monthly intervals during the experiment and after keeping in slanting position approximately for one hour centrifuged at 3300 rpm for 14 minutes to remove the erythrocytes present, if any. The clear, non-haemolysed sera were used for estimation of total protein, albumin, globulin, albumin-globulin ratio, cholesterol, glucose, SGOT, SGPT at beginning and thereafter monthly intervals during the experiment period by using Automated Random Access Clinical Chemistry Analyzer placed at Department of Veterinary Physiology and Biochemistry, LUVAS, Hisar.All the data were analyzed statistically by using SPSS, 20th Version software as per Snedecor and Cochran (1994) and comparison of means was done by calculating one way analysis of variance (ANOVA), using Duncan's multiple range tests (Duncan, 1955).

## RESULTS AND DISCUSSION

### Nutritive value and biochemical parameters

The aloe vera leaves contained dry matter 2.42% and rest was water content and on proximate analysis of aloe vera leaves on dry matter basisit was observed that aloe vera had crude protein 9.5%, crude fibre 18.5%, ether extract 2.53%, ash 19.5% and organic matter 80.5%. The mean SGPT and SGOT levels

were observed significantly (P<0.05) higher in higher aloe vera supplemented group(T3) as compared to control group T1, however, mean SGPT and SGOT values did not show significant difference (P>0.05) in lower aloe vera supplemented group T2 than control group (T1) and higher aloe vera supplemented group (T3) at the end of experiment (Table 2). This might be due to hepatic stress caused by anthroquinone and other phenolic compounds present in aloe vera. The results are in corroboration with findings of Yadav et al. (2017) who found significant increase (P<0.05) in SGOT and SGPT values in aloe vera treated groups as compared to control.

Table 1. Proximate composition (%) of feed ingredients on dry matter basis fed to experimental buffalo calves

| Ingredients | DM | CP | CF | EE | Ash | OM | NFE |
|---|---|---|---|---|---|---|---|
| Wheat straw | 90.0 | 3.0 | 35.4 | 1.02 | 12.9 | 87.0 | 47.5 |
| Berseem | 23.0 | 18.6 | 27.3 | 1.9 | 10.4 | 89.6 | 41.8 |
| Maize grain | 88.0 | 8.60 | 2.80 | 3.56 | 1.75 | 98.2 | 83.2 |
| Ground nut cake(GNC) | 91.4 | 40.7 | 9.15 | 7.68 | 7.80 | 92.2 | 34.6 |
| Mustard Cake | 91.4 | 35.6 | 8.33 | 6.25 | 8.83 | 91.1 | 40.9 |
| Wheat grain | 88.6 | 10.8 | 3.77 | 2.15 | 2.23 | 97.7 | 80.9 |
| Soyabean meal | 88.6 | 45.0 | 8.00 | 1.75 | 8.64 | 91.3 | 36.6 |
| Barley | 88.6 | 11.0 | 4.99 | 2.51 | 2.50 | 97.5 | 79.0 |
| Aloe vera | 2.42 | 9.5 | 18.5 | 2.53 | 19.5 | 80.5 | 49.9 |

At the end of experiment, the serum cholesterol and glucose weredecreased significantly (P<0.05) in treatment group T3 (Aloe vera supplemented @ 4g/kg body weight) as compared to control group T1, however T2 did not show significant difference (P>0.05) from T1 and T3 groups(Table 3).The results of present study are in agreement with the findings of Ghane et al. (2010) and Yimam et al. (2014) who observed decrease in serum cholesterol and serum glucose on supplementation of aloe vera in calves and mice, respectively. Rajasekaran et al. (2001) also observed a significant (P<0.05) decrease in blood glucose level and serum lipid profile confirming the hypoglycemic and hypolipaemic effects of aloe vera in experimental rabbits. This decrease might be due to phytosterols, one of the major constituents of aloe vera which has been found to reduce visceral fat accumulation, improve hyperlipidemia and hyperglycemia (Misawa et al., 2008). This reduction may be attributed to increased clearance and decreased production of the major transporters of endogenously synthesized cholesterol and triglycerides (Rajasekaran et al., 2006). The acemannans might be another component of aloe vera which reduces the cholesterol and glucose level by inhibiting cholesterol absorption (Sikarwar et al., 2010) and enhancing glucose metabolism respectively. The decrease in glucose level may also be due to inhibition of non-enzymatic glycosylation reaction and breakage of albumin glucose linkage on supplementation with aloe vera (Hosseini et al., 2013).

The mean values of serum total protein and globulin at the end of experiment were observed with significant increase (P<0.05) from 6.79 and 2.72 g/dl in control group T1 to 8.30 and 4.67 g/dl in treatment group T3 (Aloe vera supplemented @ 4g/kg body weight) respectively and also in T2 treatment group (Aloe vera supplemented @ 2g/kg body weight) only for total protein value (Table 2). The average serum albumin values did not show significant difference (P>0.05) between different treatment groups (Table 3). The average serum albumin to globulin ratio values at the end of experiment were observed with significant decrease (P<0.05) from 1.52 in control group T1 to 1.02 and 0.83 in treatment group T2 (Aloe vera supplemented @ 2g/kg body weight) and T3 (Aloe vera supplemented @ 4g/kg body weight) respectively (Table 2). The results of present study

are in consonance with the findings of Zhang et al. (2007) who observed significant (P<0.05) higher values of serum globulins and SGOT in broilers of aloe vera treated group. The increase in total protein and globulin might be due to acemannan constituent of aloe vera which bind on PRR (Pattern receptor recognition) receptors and led to stimulation of immune cells for Ig synthesis, which in turn stimulate more globulin production and responsible for enhanced immunity (Infascelli et al., 2010). The stimulation of cytokines and interleukins synthesis by acemannan components of aloe vera may also be another reason for enhanced globulin production.

Table 2. Effect of supplementation of aloe vera on blood biochemical profile in experimental Murrah buffalo calves

| Days Groups | Parameter | Group T1 | Group T2 | Group T3 |
|---|---|---|---|---|
| | Time interval | | | |
| SGPT (IU/L) | 0 day | 36.2±7.23 | 40.9±8.64 | 38.8±7.7 |
| | 30 day | 32.6±5.81 | 44.5±6.02 | 50.9±8.41 |
| | 60 day | 42.0±5.29$^{b}$ | 54.9±6.04$^{ab}$ | 63.9±7.27$^{a}$ |
| | 90 day | 40.7±6.24$^{b}$ | 61.2±7.52$^{ab}$ | 80.5±7.80$^{a}$ |
| SGOT (IU/L) | 0 day | 132±12.9 | 145±15.3 | 142±15.3 |
| | 30 day | 144±12.3 | 167±11.3 | 165±16.4 |
| | 60 day | 139±14.3$^{b}$ | 183±15.8$^{ab}$ | 197±17.9$^{a}$ |
| | 90 day | 154±13.1$^{b}$ | 201±18.2$^{ab}$ | 247±23.6$^{a}$ |
| Cholesterol (mg/dl) | 0 day | 82.0±6.28 | 96.0±5.70 | 85.0±6.38 |
| | 30 day | 97.4±5.05 | 97.4±4.39 | 82.2±6.27 |
| | 60 day | 83.0±5.99 | 80.2±5.48 | 75.8±5.03 |
| | 90 day | 95.8±2.87$^{a}$ | 78.6±6.71$^{ab}$ | 73.2±7.35$^{b}$ |
| Glucose (mg/dl) | 0 day | 66.52±6.25 | 68.7±5.42 | 69.3±5.05 |
| | 30 day | 63.0±4.34 | 60.9±4.52 | 60.4±5.54 |
| | 60 day | 70.2±3.65$^{a}$ | 58.9±3.31$^{ab}$ | 56.2±4.77$^{b}$ |
| | 90 day | 65.7±3.23$^{a}$ | 55.1±4.25$^{ab}$ | 50.6±3.49$^{b}$ |
| Total Protein (g/dl) | 0 day | 6.63±0.13 | 6.59±0.24 | 6.58±0.22 |
| | 30 day | 6.70±0.15 | 6.83±0.20 | 7.08±0.12 |
| | 60 day | 6.74±0.23$^{b}$ | 7.04±0.21$^{b}$ | 7.76±0.24$^{a}$ |
| | 90 day | 6.79±0.15$^{c}$ | 7.57±0.23$^{b}$ | 8.30±0.21$^{a}$ |
| Albumin (g/d | 0 day | 3.81±0.12 | 3.93±0.17 | 3.85±0.31 |
| | 30 day | 3.86±0.14 | 3.86±0.12 | 3.70±0.26 |
| | 60 day | 4.16±0.11 | 3.80±0.14 | 3.82±0.34 |
| | 90 day | 4.08±0.15 | 3.66±0.28 | 3.63±0.26 |
| Globulin (g/dl) | 0 day | 2.83±0.18 | 2.66±0.25 | 2.73±0.35 |
| | 30 day | 2.84±0.18 | 2.98±0.28 | 3.38±0.19 |
| | 60 day | 2.58±0.17$^{b}$ | 3.24±0.10a$^{b}$ | 3.94±0.54$^{a}$ |
| | 90 day | 2.72±0.12$^{b}$ | 3.92±0.47$^{a}$ | 4.67±0.43$^{a}$ |
| Albumin to Globulin Ratio | 0 day | 1.37±0.11 | 1.54±0.18 | 1.53±0.23 |
| | 30 day | 1.39±0.12 | 1.35±0.14 | 1.12±0.12 |
| | 60 day | 1.64±0.10$^{a}$ | 1.17±0.04$^{ab}$ | 1.11±0.26$^{b}$ |
| | 90 day | 1.52±0.11$^{a}$ | 1.02±0.18$^{b}$ | 0.83±0.14$^{b}$ |

Values are means ±standard errors

a,b Mean values with different superscripts in a row differ significantly (P<0.05)

SGOT- Serum glutamic-oxaloacetic transaminase; SGPT- Serum glutamic pyruvic transaminase

Table 3. Average body weight gain (kg) of experimental buffalo calves at fortnightly interval during experiment

| Fortnights | Treatments | | |
|---|---|---|---|
| | T1 | T2 | T3 |
| I | 5.40±0.24 | 5.60±0.40 | 5.80±0.20 |
| II | 5.80±0.37$^{b}$ | 6.40±0.24$^{ab}$ | 6.80±0.20$^{a}$ |
| III | 6.00±0.32$^{b}$ | 7.00±0.32$^{a}$ | 7.20±0.20$^{a}$ |
| IV | 6.40±0.24$^{b}$ | 7.20±0.37$^{b}$ | 8.40±0.40$^{a}$ |
| V | 6.60±0.40$^{b}$ | 7.80±0.37$^{a}$ | 8.60±0.24$^{a}$ |
| VI | 6.20±0.37$^{b}$ | 7.40±0.40$^{a}$ | 8.40±0.24$^{a}$ |

Values are means ±standard errors
a,b Mean values with different superscripts in a row differ significantly (P<0.05)

**Growth performance**

The average final body weight were significantly higher (P<0.05) inT3 treatment group (118±2.38) than T1 group (108±2.93) but it did not differ significantly (P>0.05) from T2 treatment group (114±2.78).The average body weight gain per fortnight from start of experiment to end of experiment for all buffalo calves under various treatments has been presented in Table 3. The table depicts that average fortnightly body weight gain showed significant increase (P<0.05) in buffalo calves of T3 treatment as compared to T1 group but it did not differ significantly (P>0.05) from T2 treatment group on third fortnight onwards.The results of present study are in agreement with the findings of Yadav et al. (2017a), who found a significant effect (P<0.05) of aloe vera supplementation @ 2g and 4g per body weight on the average body weight, overall average daily weight gain in the crossbred cattle calves. Improved nutrient utilization and better growth and health of intestinal villi as a result of aloe vera feeding might be reason for higher weight gain by facilitating better absorption of digested nutrients due to increased surface area of villi in aloe vera supplemented groups (Sujatha et al., 2017).

## CONCLUSIONS

It can be concluded from the present study that aloe vera supplementation at different levels does not impose any adverse effects on various physiological systems of calves and inclusion of the aloe vera @ 4g per kg body weight in the diet of buffalo calves has significant effect on body weight gain, reduction of cholesterol and potentiating the globulin level in serum of buffalo calves, thus improves the overall health status of buffalo calves.

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