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SHORT COMMUNICATION

Effect of Solid State Fermentation (SSF) Biomass Supplementation on Growth Performance of Kids

Rajkumar Oza*, Upendra Patel , Vikram Desai and Paresh Pandya

Animal Nutrition Research Department, College of Veterinary Science and Animal Husbandry, Anand Agricultural University, Anand, Gujarat, INDIA

**Corresponding author: R Oza; Email: dr.rajojha1987@gmail.com*

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ABSTRACT

Present study was carried out to study the effect of solid state fermentation (SSF) biomass on growth performance of Surti growing kids. Fourteen kids (4-7 months age) weighing around 9 kg, were randomly divided in two groups of 7 each. All the kids were fed rations containing 50 % jowar straw and 50% compound concentrate mixture. Animal of group 1 served as control and were offered TMR (total mixed ration) without biomass, while animals of another group were offered solid state fermentation (SSF) biomass @ 4% in the TMR, All the experimental kids were weighed at weekly intervals and body measurements (height at wither, body length and heart girth) were taken fortnightly in the morning for two consecutive days before feeding and watering for the entire experimental period of 90 days. Average total gain (ATG) during 90 days experimental period was 4.47 and 5.23 kg with average daily gain (ADG) of 46.53 and 54.42 g in control and treatment groups respectively. The results revealed an improvement of about 17% in average daily gain though remained statistically similar between the two groups.

Key words: SSF biomass, growing kids, ADG, ATG, TMR

Ruminants are well adopted for use of high fibrous diet due to their association with microbial populations (Morgavi *et al.* 2001). Thereaf er, efficient utilization of forage-based diets by ruminants depends on an active population of cellulolytic microorganisms within the rumen. Over the years, there has been a continual search for new feed additives that could enhance feed utilization efficiency so that the greater nutrient demands for ever-increasing animal productivity can be met. The availability of new enzyme products has prompted researchers to examine the potential role of exogenous enzymes in ruminant production (Beauchemin *et al.* 1995).

Solid-state fermentation (SSF) is defined as the fermentation involving solids in absence (or near absence) of free water. SSF stimulates the growth of micro-organisms in nature on moist solids and has been credited to be responsible for the beginning of fermentation technique in ancient time. Solid state fermentation (SSF) holds tremendous potential for the production of enzymes by microbial flora. It is of special interest as this process includes crude fermented products that can be used directly as enzyme source. Ideally, almost all known microbial enzymes can be produced under SSF systems. Much work has been carried out on production of enzymes like proteases, cellulases, xylanases, amylases pectinases etc (Pandey *et al.* 1999). Hence, an at empt has been made to study the effect of Solid state fermentation (SSF) bio mass on the performance of Surti kids in terms of body weight gain and body measurements.

Following the guidelines of Institutional Animal Ethics Committee, experiment was carried out at Animal Nutrition Research Department, College of Veterinary Science and Animal Husbandry, Anand Agricultural University, Anand.

Fourteen Surti kids with an average body weight of 9 kg (4-7 months) were randomly divided into two groups of 7 each. The experimental diet was composed of jowar straw and compound concentrate mixture in 50:50 ratios.

Animal of first group served as control and offered TMR (total mixed ration) without biomass, while animals of treatment group were offered solid state fermentation (SSF) biomass @ 4% in the TMR.

Individual feeding of all the kids was carried out during the study period. Quantity of TMR offered was adjusted at weekly interval according to change in body weight of kids. The quantity of TMR required each day was offered in two installments *i.e.* half in morning and half in evening. The nutrient requirements of kids in term of DCP and TDN were met as per ICAR (1998) feeding standards. The kids were housed in ideal sheds with proper ventilation, flooring and tying arrangements with facility of individual feeding. The kids were let loose daily in an open paddock, for two hours in the morning from 8.30 to 10.30 AM and two hours in the afernoon from 3.00 to 5.00 PM under controlled conditions for exercise. During these periods, all the kids had free access to fresh, clean and wholesome drinking water. The lef over of TMR for individual kid was recorded daily in the morning af er 8 AM throughout the experimental period. The kids were adopted for respective feed for a period of fif een days.

The experimental kids were weighed at weekly intervals and body measurements (height at wither, body length and heart girth) were taken fortnightly in the morning for two consecutive days before feeding and watering for the entire experimental period of 13 weeks. The growth rate of kids was calculated using the following formula:

Growth rate = Total weight gain / Number of days between the period measured

Observations of various parameters recorded during experimental period were tabulated and the data generated were analyzed statistically as per Snedecor and Cochran (1994).

The data for weekly body weight all of kids is depicted in Figure 1. ATG (average total gain) in weight during entire experimental period was 4.47 and 5.23 kg with ADG (average daily gain) of 46.53 and 54.42 g, respectively in control and treatment groups which remained about 17% higher in treatment group but differences were non-significant (P>0.05). Similarly, the observations of height at withers, body length and heart girth for both the groups were almost similar and the treatment differences were non-significant (table 2). The results indicated that supplementation of fibrolytic enzyme through SSF biomass has no effect on growth performance in Surti kids.

In accordance with the present findings, many workers have reported no effect of fibrolytic enzymes supplementation on growth rate of lambs and kids. Almaraz *et al.* (2011) reported that Enzymes (3 g/kg DM) did not have any effects on ADG and ATG variables evaluated in lambs fed a 70% concentrate diet. Muwalla *et al.* (2007) reported 255g and 219g ADG in Awassi lambs fed diet with or without fibrolytic enzymes, respectively which was statistically at par. Dominguez *et al.* (2009) reported 336, 302, 316 and 302 g/d ADG in finishing lambs offered diet with enzymes @ 0, 0.025, 0.05 and 0.1 g/kg of body weight, respectively, with non-significant treatment difference. Similarly Gad *et al.* (2011) in barki lambs observed no improvement in ADG with supplementation of fibrolytic enzymes @ 2g/h/d. Awawdeh and obeidat (2011) study effect of supplemental exogenous enzymes on performance of finishing Twenty-four Awassi lambs fed olive cake-containing diet and found no effect on growth performance. Similar results observed by Bueno *et al.* (2013) and Torres *et al.* (2013) in growing lambs fed fibrolytic enzyme.

Table 1: Proximate composition* (% on DM basis) of feeds, fodder and TMR offered to kids

Feed	Jowar straw	Concentrate Mixture	TMR
CP	4.36±0.13	18.25±0.29	11.01±0.03
EE	2.23±0.06	3.01±0.06	2.78±0.03
CF	32.48±0.29	12.31±0.05	20.78±0.10
NFE	52.79±0.51	53.48±0.15	53.22±0.64
Ash	8.11±0.35	12.61±0.12	12.19±0.58
Silica	2.75±0.10	2.72±0.06	2.79±0.04
Ca	0.56±0.02	0.66±0.01	0.67±0.01
P	0.32±0.01	1.26±0.01	0.68±0.02

* Average of four samples

Table 2: Effect of SSF biomass on body measurement of kids

Body measurements (cm) (Av. ± SE)	Total increase (cm)		Average daily increase (cm)	
	T_1	T_2	T_1	T_2
Height at withers	6.39±0.73	7.09±0.78	0.067±0.008	0.074±0.008
Body length	7.09±0.55	7.26±0.39	0.074±0.006	0.076±0.004
Heart girth	5.3±0.34	6.04±0.34	0.055±0.0036	0.063±0.003

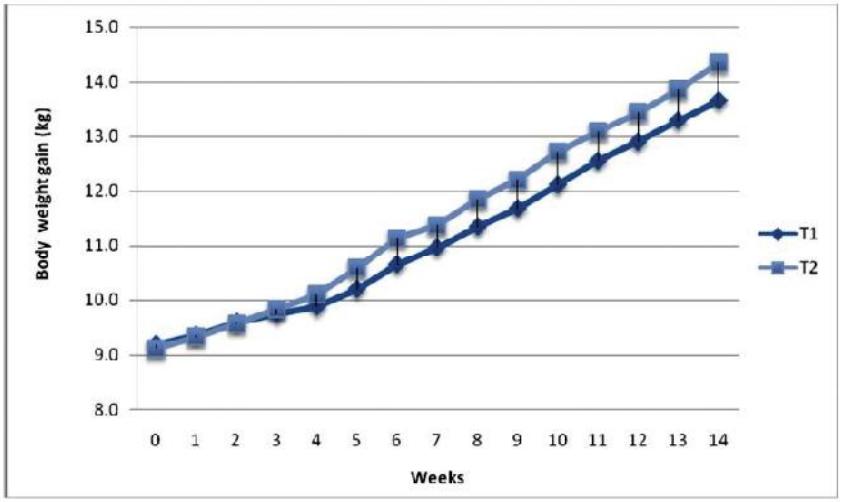

Fig. 1. Weekly average body weight gain (Av. ± SE) of kids (in Kg)

Contrary to present findings, improvement in ADG has been observed by some workers. Gado *et al.* (2011) found that total body weight increased ($P < 0.05$) in enzyme treated group (42 kg) than in control (38 kg) lambs. ADG also increased ($P < 0.05$) in enzyme treated group (250 g/d) than control (200 g/d). Rojo *et al.* (2005) reported 270 and 237 g/d ADG in lambs fed diet with or without fibrolytic enzymes, respectively which was statistically higher ($P < 0.05$) than control. Singh and Das (2009) also reported higher ADG (57.41 g/d) in kids consumed fibrolytic enzyme treated (@ 4 g/kg DM) mixed roughage diet than those of untreated diet (48.89 g/d). Malik and Bandla (2010) used enzymes cellulase and xylanase which were effective at dose rate of 4,000 and 12,500 IU/kg DM and found significantly higher ($P < 0.001$) ADG and final body weight in enzyme treated group than untreated. Sleam *et al.* (2013) reported that dietary enzyme addition increased ADG by 51 and 69% in sheep and goats, respectively. Another study of Arce-Cervantes *et al.* (2013) concluded that supplementation of a Ligno-cellulolytic Extract (LE), which was extracted from thermo-tolerant basidiomycete in lambs diet increased average daily and total body weight gain. Similarly, Hussain *et al.* (2014) witnessed that supplementation of enzyme with TMR resulted in 31.25% increase in net profit by improving the average daily weight gain significantly (83.49 g in treated group compared with 68.33 g in control). Thakur *et al.* (2010) also supplemented exogenous fibrolytic enzymes in buffalo calves and reported enhanced total and average daily gain.

CONCLUSION

Supplementation of SSF biomass (containing cellulase and xylanase) @ 4% in TMR of Surti kids had no beneficial effects on growth rate as well as body measurements.

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