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Effect of *Bhakhri* Supplementation on Biogas Production

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A B S T R A C T

The present laboratory study was laid down to find out the potential of supplementation of buffalo dung with left out *Bhakhri* as kitchen waste to produce biogas. Experiment was conducted in 5L capacity glass bottles at 5.3% Total Solids addition. Six experimental sets were prepared and all were filled with 120mL mixture of dung (40g) and tap water (80mL) daily up to 50 days. On first day 12mL fresh digested biogas slurry from running biogas plant was also added in all the digesters as inoculum. From 51st day three digesters (control) were fed with same mixture whereas other digesters (test) were fed with mixture of 20g dung, 5.0g *Bhakhri* and 95mL tap water with simultaneous withdrawn of 120mL digested slurry from the digesters to maintain the level of feeding material in them. Biogas production was measured daily from 40 days to 80 days by water displacement method. Results show that addition of *Bhakhri* from 51st day onward resulted in 2.77 times higher total biogas production during 51st to 80 days period. We can conclude that utilization of kitchen waste *Bhakhri* for biogas production may be a best option for economic and environment friendly disposal method.

Introduction

Biogas production is an old age practice. It is a method to degrade any organic waste material anaerobically with the help of groups of bacteria and generate fuel gas-methane. Generally biogas plants are fed with animal faeces and that's why they are also called *Gobar gas* plants. With time many workers (Bouallagui *et al.,* 2003; Gosavi *et al.,* 2010; Nakamura and Mtui 2003; Cho and Park, 1995; Chellapandi *et al.,* 2008) researched on addition of a variety of wastes to generate biogas successfully.

In Gujarat *Bhakhri* is a common food item. It is a kind of chappati prepared from wheat flour and edible oil. After meal the leftover *Bhakhri* is either fed to animals or put it in garbage box. Improper garbage management produces foul smell due to degradation of organic materials and resulted in environmental pollution. In view of these aspects we tried to add *Bhakhri* in biogas digester along with dung and studied its effect on biogas production. The experiment was laid down in daily feeding manner and

in triplicate. Average values of biogas production and percent increase in it are presented in this paper.

Materials and Methods

Buffalo dung and *Bhakhri* were procured locally from Sadara. Biogas production was carried out in 5L capacity glass digester bottles fitted with 2L capacity gas holder bottles which remains attached with 2L capacity water displacement bottle. Six such sets were prepared and filled daily with 120mL mixture of 40g buffalo dung and 80mL tap water up to 50 days. Biogas production was measured at 24h interval regularly from 40th day onwards to 80 days by water displacement method. Between 40th and 50th days of experimentation the biogas production becomes stable and now from 51st onward the feeding material in three test digesters was changed to 120mL mixture containing 20g dung+5.0g *Bhakhri*+95mL tap water whereas in control sets the previous feeding of 40g dung with 80mL tap water was continued. The experiment was run up to 80 days because the Hydraulic Retention Period for biogas production in Gujarat region is 40 days. This amount of feeding material was chosen to obtain 5.3% total solids concentration in feeding material because it is easy to addition through the narrow feeding tube of experimental sets.

Result and Discussion

Data presented in Table 1 show that between 40 and 50 days period of experimentation the average daily biogas production in all the digesters remains same (2100mL) because at this time the feeding material is same in all of them. From 51st day as the feeding is changed in test digesters biogas production becomes almost doubled (90.47% increase) (Table 2).

Table.1 Daily average biogas production in control and test digesters (mL/day)

Days	Biogas production (mL/day)	
	Control digesters	Test digesters
Average biogas production during 41–50 days (stable condition)	2100	2100
51	2100	4000
52	2100	4600
53	2100	5000
54	2050	5300
55	2100	5550
56	2000	5700
57	2050	5850
58	2100	6000
59	2100	6200
60	2100	6200
61	2100	6150
62	2100	6200
63	2150	6200
64	2100	6200
65	2100	6150
66	2050	6200
67	2100	6200

68	2100	6200
69	2100	6200
70	2100	6200
71	2150	6200
72	2100	6200
73	2100	6200
74	2100	6200
75	2150	6200
76	2100	6200
77	2100	6200
78	2100	6200
79	2100	6200
80	2100	6200
Total	**65000**	**180400**

Table.2 Percentage increase in biogas production in test digesters over control

Sr no.	Days	% increase in biogas production
1	51	90.48
2	52	119.05
3	53	138.09
4	54	158.54
5	55	164.29
6	56	185.00
7	57	185.37
8	58	185.71
9	59	195.24
10	60	195.24
11	61	192.86
12	62	195.24
13	63	188.37
14	64	195.24
15	65	192.86
16	66	202.44
17	67	195.54
18	68	195.24
19	69	195.24
20	70	195.54
21	71	188.37
22	72	195.24
23	73	195.24
24	74	195.24
25	75	188.33
26	76	195.24
27	77	195.24
28	78	195.24
29	79	195.24
30	80	195.24

Continue addition of *Bhakhri* gives continue increase in biogas production which reaches a maximum increase of 202.44% at 66th day of experimentation and maintained an increase in biogas production amount between 188.37% and 195.24% on incoming days till 80 days (Table 2).

This immediate increase in daily biogas production after addition of *Bhakhri* from 51st day onwards clearly shows the role of nutrients supplementation on microbial activity. We know that being a digested product in animal stomach dung supplies comparatively lower amount of nutrients than undigested *Bhakhri*. Further, after baking nutrients of *Bhakhri* becomes easily available to microorganisms which triggers their activities and ultimately increases the biogas production. Positive effects on biogas production by food supplementation was also reported by Zhang *et al.*, (2007).

Conclusion

The study concludes that addition of Bhakhri to supplement buffalo dung for biogas production is a better option for its waste management and it increases the biogas production by almost three times. Further this increase remains continuous for a longer period of time.

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References

Bouallagui, H., Ben, C.R., Marouani, L., Hamdi, M. 2003. Mesophilic biogas production from fruit and vegetable waste in a tubular digester. *Biores. Technol.*, 86: 85–89.

Chellapandi, P., Prabaharan, D., Laxmanan, U. 2008. A preliminary study on co-digestion of ossein industry waste for methane production. *Eur. Asian J. Biosci.*, 2: 110–114

Cho, J.K., Park, S.C. 1995. Biochemical methane potential and solid state anaerobic digestion of Korean food wastes. *Biores. Technol.*, 52(3): 245–253.

Gosavi, P.G., Mirashi, A.S., Waghmare, A. S., Singh, R. 2010. Biogas and marine boaed using waste green leaves. *J. Environ. Res. Dev.*, 4(3): 695–704.

Nakamura, Y., Mtui, G. 2003. Anaerobic fermentation of woody biomass treated by various methods. *Biotechnol. Bioprocess Eng.*, 8: 179–182.

Zhang, R., El-Mashad, H.M., Hartman, K., Wang, F., Liu, G., Choate, Ch., Gamble, P. 2007. Characterization of food waste as feedstock for anaerobic digestion. *Biores. Technol.*, 98: 929–925.