ment has significantly affected the varieties. The higher yield of Ponni under low light intensity was probably due to higher panicle number per square meter, number of spikelets and grain per panicle besides its ability to accumulate high dry matter.

Thus low light intensity in samba/thaladi season (monsoon season) was proved to be an important constraint for grain yield in rice since varieties with high yield potential of 5.00 to 5.84 t/ha could produce yield ranging from 3.19 to 4.28 t/ha only. The data suggest that high tillering with high panicle number per unit area, optimum LAI and spikelets per panicle besides high photosynthetic efficiency and dry matter accumulation under low light are the desirable traits for choosing rice genotypes suited for samba/thaladi season of Cauvery delta region.

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PREDIGESTION TECHNOLOGY FOR IMPROVING BIOGAS YIELD OF ANIMAL ORGANIC WASTES

P. RAJASEKARAN AND A. PALANISAMY

DEPARTMENT OF BIOENERGY / AGRICULTURAL MICROBIOLOGY,
TAMIL NADU AGRICULTURAL UNIVERSITY, COIMBATORE 641 003

ABSTRACT

Study on the effect of pre-digesting of wastes in improving microbiological activity and biogas production was conducted. Destruction of TS and VS was high in Saranai incorporated treatments and that of cellulose in saranai mixed with cowdung. Gas production was high in the pre-digested saranai and nutgrass treatments. Pre-digesting for 15 to 20 days favoured maximum gas production.

KEY WORDS : Biogas yield, Organic waste, Predigestion

In order to improve the cleavage of the most resistant waste substrates, suitable technology which is economical, efficient and less time consuming may have to be evolved. This will help in the biogas technology extension programmes, since

they might contribute in reducing the cost of digester construction. There might be a reduction in the hydraulic retention time in such of these digester fed with pre-digested substrates. Whether such a pre-digesting phenomenon can help in improving the gas output is an area that needs investigation. Hence an attempt was made to study the effect of pre-digesting of wastes at different time intervals and their incorporation for improving microbiological activity and biogas production.

MATERIALS AND METHODS:

The plant biomass used in the study includes weeds like saranai (*Trianthema portulacastrum* L) and nutgrass (*Cyperus rotandus* L) and animal waste like cowdung.

The plant material was mixed in the equal amount (1:1) with cowdung and then mixed with equal weight of water, i.e. 400 g of plant waste was mixed with 400 g of cowdung and then mixed with 800 g of water. The pre-digestion was carried out for 5 days, 10 days, 15 days, 20 days and 25 days aerobically. After the pre-digesting was completed, the material were mixed with carbonated and poured into 2.5 l capacity digesters and sealed air tight, along with a control without pre-digestion. The experiment progressed for a period of 8 weeks and the gas generated from various treatments were recorded daily by volume displacement method.

The various parameters studied include daily recording of gas output by waste displacement (Mishra, 1954), moisture, total and volatile solids contents, pH, cellulose, hemicellulose and epic constituents, volatile fatty acids at various stages of biodigestion process. The samples were also assayed for their microbiological properties like acid forming, cellulolytic and bacteria employing the standard procedures (Palanisamy, 1985). The biodigested slurry specimens were also analysed for their nitrogen, phosphorus and potassium contents at the final stage of digestion.

RESULTS AND DISCUSSION

The physico - chemical properties varied with the waste materials used (Table 1). The percent TS and VS content ranged from 18.34 (cowdung) and 31.84 (Nutgrass) and 12.43 (Nutgrass) to 19.23 (Saranai) respectively. Sathiananthan (1975) reported that the TS content in cowdung varied from 12 to 18 per cent. Similar finding in respect of VS content was also reported by Ghose *et al.* (1973) in plant wastes.

The per cent destruction of TS and VS was higher in the saranai incorporated treatments than nutgrass (Table 2). A significant positive correlation was observed between TS and VS destroyed with that of total gas produced. The per cent destruction of cellulose was observed to be maximum (28.08) in T_2 of saranai mixed with cowdung and in T_7 of nutgrass incorporated treatment (26.92). The destruction was maximum in the treatment that gave maximum gas output. Similar findings were also reported by earlier workers (Datta, 1981; Jain *et al*, 1981). The destruction of lignin was very low when compared to cellulose and hemicellulose. Reduction of lignin upto 11.1 per cent was reported by Hills and Roberts (1981).

In the pre-digested saranai and nutgrass incorporated treatments, the gas production was comparatively more than

control (Table 3). This is in agreement with the reports of Van Velsen and Lettinga (1980) who reported that alkaline and thermal pretreatments of waste considerably increased the gas production. Among the two wastes, the saranai incorporated treatment recorded higher gas output (65, 065 ml) than that of nutgrass (57, 274 ml). Relatively higher amount of lignin was present in nutgrass. The ligneous structure tends to shield the cellulose material (Carrod and Wilke, 1978), resulting in lesser gas output. The succulant nature of saranai on the contrary, might have also favoured maximum gas generation when compared to nutgrass.

The maximum acid forming (62.3 x 10^4 /g) cellulolytic (81.4 x 10^4 /g) and methanogenic bacteria (87.4 x 10^4 /g) were recorded in 10 days pre-digested saranai incorporated treatments (T_2) when compared with others. This might be due to optimum nutrient levels and other conditions that favoured the development of optimum microflora. A larger number of gram negative, rod shaped organisms were observed among the cellulolytic organisms and a few of them were tentatively identified as *Bacteroides* spp. The CO_2 content of the gas was high in the initial stage than at the final stage of digestion. The CO_2 content was less in the 10 days pre-digested wastes incorporated treatments. The pre-digesting helped in increasing the methanogenesis from acetate and thereby increased the biogas yield as well as methane content. Similar results by Kugelman and Jeris (1981) lend support to the above findings.

The studies on gas output, per cent destruction of cellulose, hemicellulose and microbiological activity revealed that the pre-digestion for a period ranging from 10 to 15 days seems to favour in maximising gas production. Prolongation of pre-digestion above 15 to 25 days resulted in lesser gas generation comparatively. Singh *et al*. (1983) reported that prolonged pre-digestion will lead to depletion of volatile fatty acids resulting in decreased gas output and this seems to be in agreement with the present findings.

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RESEARCH NOTES

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MH 179 Pearl Millet Hybrid for Punjab

Pearl millet is an important cereal crop of India. To boost its production, single cross F1 hybrids using cytoplasmic genetic male sterility have been released for general cultivation from time to time. MH 179 hybrid (Synonym ICMH 451) developed by ICRISAT was released in 1986 for general cultivation in India. It was tested for its performance in Punjab both under irrigated and rainfed conditions for its suitability from 1984 to 1988 in different trials in comparison to state checks PHB 10 and PHB 47. On the basis of performance, Punjab State Variety Approval Committee released MH 179 for general cultivation in Punjab in June 1989.

The hybrid MH 179 showed an increase of 39% over PHB 10 and 12% over PHB 47 checks in research trials conducted at Ludhiana, Faridkot, Bathinda and Hoshiarpur (Kandi Station) districts from 1984 to 1988 (Table 1). It was tested in adaptive trials on farmers' fields during 1987 and 1988 by the Department of Agriculture - Punjab State Seeds Corporation; the Director, Kandi Station, Bullowal Saunkhri and the Farm Advisory Service of Punjab Agricultural University, Ludhiana in the pearl millet growing areas of the state. MH 179 excelled PHB 10 and PHB 47 and 6 and 2% respectively in grain yield during 1988 but its yield margin over PHB 10 was 13% and nil over PHB 47 during 1987 which was a drought year. Overall, in 38 adaptive trials conducted during 1987 and 1988, MH 179 showed an increase of 11% over PHB 10 but was almost on a par with PHB 47 (Table 1).

The grain quality composition analysis performed by Dr. V. Subramaniam of ICRISAT revealed that MH 179 has slightly higher fat content of 7.5% as against 6.9 of PHB 10 and 6.4 of PHB 47. Its protein content of 10.6% was slightly less but was on a par with PHB 47