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NUTRITIVE AND MICROBIOLOGICAL EVALUATION OF PRAWN WASTE RICE BRAN SILAGE FOR RUMINANTS

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Prawn waste was successfully ensiled with rice bran in the proportion 1:1 using tapioca flour or coconut cake as additives (Annual Progress Report, 1990). The present study was planned to determine the microbial load and the feeding value in cattle by estimating the palatability, digestibility and nutritive value of the prawn waste-rice bran silage.

Materials and methods

Fresh prawn waste was collected from the prawn peeling centres and was transported in large drums. It was ensiled with rice bran (1:1 fresh basis) with 10% tapioca flour as additive. Water was added to adjust the drymatter to 50%. Prawn waste, rice bran, tapioca flour and water were mixed in the ratio 37:37:10:16. The ingredients were thoroughly mixed and was packed in six drums of 200 litre capacity lined with polythene sheets. Two samples were taken from each drum in double lined polythene bags for nutritional and microbiological analysis. The top surface was sealed airtight to ensure maximum anaerobiasis. The silos were opened after six weeks, 12 separate samples were taken in plastic bags and were immediately frozen for the analysis.

The microbiological load was determined by pour plate method using decimal dilution procedure (Reddy and Conner, 1987). The samples were first diluted with PBS to get final dilutions from 10^{-1} to 10^{-5}. The samples were tested for total aerobic count, total coliform count, the aerobic spore formers and anaerobic spore formers.

Total aerobic count was made by dispensing required amounts from various dilutions into petri dishes to which roughly 10 ml of plate agar was added, cooled down to 45° C in a water bath and were incubated at 32° C for 48 hours before colonies were counted.

Total coliform count was made by dispensing required amounts from various dilutions into petri dishes, to which Violet Red Bile (VRB) agar was poured and allowed to solidify. A second layer of VRB was then added to prevent surface growth and spreading of colonies. Plates were incubated for 24 hours at 37° C and then counted for purple colonies.

For the aerobic and anaerobic spore count, 10 ml of the sample from the first dilution was heated in a water bath at 80° C for 10 minutes and cooled immediately. Dilutions were made from this inactivated material. Brain heart infusion agar was added to the required dilutions. Plates were incubated aerobically and anaerobically for the aerobic and anaerobic spore count respectively at 32° C for 48 hours before the colonies were counted.

For the nutritional evaluation of the prawn waste-rice bran silage, four adult non-producing cows weighing on an average 263 kg were selected from the University Livestock Farm, Mannuthy. The prawn waste-rice bran silage was fed mixed with concentrate mixture in the ratio 1:1 for the first few days to make the animal adjust to the new feed. The silage was given in small quantities in the beginning (0.5 kg/day) and was increased gradually to 3 kg (fresh) and the concentrate mixture was withdrawn completely. The animals were given paddy straw *ad libitum* during the experimental period of 45 days to meet their drymatter requirement. Mineral mixture and salt were added to the silage before feeding. After a preliminary period of one month, a digestion trial was conducted which involved a collection period of seven days during which the dung was collected quantitatively. The total feed consumed and the total dung voided were weighed daily and representative samples were taken and kept in the freezer for further analysis.

The samples of dung collected daily for each animal were pooled and mixed thoroughly and sub-samples were taken for the estimation of proximate principles and fibre fractions. Proximate analysis of the silage, straw and dung samples were done as per A.O.A.C. (1990). Samples were also analyzed for the fibre fractions such as NDF (Van Soest and Wine, 1967), ADF and lignin (Van Soest, 1963). The silage samples were analyzed for the pH (electrometrically) and lactic acid (Pennington and Sutherland, 1956) after taking the water extracts by homogenizing 25 g of silage samples with 225 ml of deionized water in a waring blender for 2 minutes.

The digestibility of prawn waste-rice bran silage was determined by difference. The digestibility coefficients of drymatter, crude protein, crude fibre, ether extract and NFE of paddy straw were 44.5, 0, 62.2, 35.0 and 53.0 respectively (Ranjhan, 1977).

Results and discussion

The chemical composition of the silage, prawn waste, rice bran, paddy straw and the dung samples are given in Table 1. It was observed that the silage was well preserved as shown by lack of foul odour, absence of fungal growth and softening of the hard appendages of prawn waste. The pH of the silage was 5.2. The higher pH is a characteristic feature of the sea animal waste due to the high protein and mineral contents which act as buffers.

The results of the microbiological analysis are presented in Table 2. No pathogen could be detected in the samples. It could be seen from the table that there is considerable reduction in the total coliform count and aerobic spore count while there was a doubling of log values of acid producing bacteria in the post-ensiled than that of pre-ensiled. This fact favours the lowering of pH which might check/inhibit the common pathogens like *Salmonellae* or *Campylobactor* species.

The silage was found to be palatable as evidenced by the satisfactory consumption by the experimental animals. Further, the animals exhibited average daily drymatter consumption of 1.73% of body weight during the experimental period.

Table 1 Chemical composition of prawn waste-rice bran silage, prawn waste, rice bran, paddy straw and the dung samples[a]

Item	Prawn waste-rice bran silage	Prawn waste	Rice bran	Paddy straw	Dung
Drymatter	50.5±0.60	23.7±0.58	92.6±0.61	89.9±0.72	23.1±0.40
Crude protein	17.2±0.40	47.1±0.67	14.0±0.79	4.3±0.71	8.2±0.68
Ether extract	17.0±0.42	2.6±0.35	16.5±0.80	0.8±0.61	2.0±0.26
Crude fibre	11.0±0.11	3.9±1.1	14.0±0.62	32.8±0.52	17.8±0.61
Total ash	17.1±0.28	35.5±1.52	11.5±0.46	13.9±0.72	22.9±0.39
NFE	37.7±0.65	10.9±1.2	44.0±0.60	48.2±0.81	49.2±0.94
NDF	25.0±1.57	-	34.0±0.09	73.6±0.10	57.0±1.27
ADF	24.6±0.43	13.9±0.56	31.8±1.1	48.0±0.83	47.10±1.95
Cellulose	11.5±0.10	-	17.8±0.30	41.9±0.40	18.0±1.48
Lignin	9.3±0.20	-	9.3±0.40	6.0±0.45	19.8±0.85

[a] Mean of four observations

Table 2 Bacteriological load of prawn waste-rice bran silage (Log number of bacteria/ gram of the mixture)

Parameters	Pre-ensiled	Post-ensiled
Total aerobic count	7.25	8.95
Total coliform count	6.15	3.50
Total acid producing bacteria	4.10	8.25
Aerobic bacterial spore count	3.15	2.25
Anaerobic bacterial spore count	4.25	4.00

The digestibility coefficients of nutrients of silage plus straw and of the silage (determined by difference) are presented in Table 3. The ether extract digestibility was high. A higher ether extract digestibility was reported for all sea animal waste silage by Samuels *et al.* (1991). The DCP and TDN values of prawn waste-rice bran silage were 13.9 and 71.4 respectively.

Table 3 Average digestibility coefficients of nutrients and average drymatter consumption of animals fed prawn waste-rice bran silage and paddy straw[a]

Item	Digestibility coefficients of nutrients of	
	Prawn waste-rice bran silage + straw[a]	Prawn waste-rice bran silage[b]
Drymatter	50.4 ± 2.1	61.7 ± 5.6
Crude protein	52.5 ± 2.5	80.6 ± 3.6
Crude fibre	65.6 ± 1.1	77.8 ± 4.3
Ether extract	84.0 ± 2.3	91.4 ± 2.8
NFE	46.7 ± 2.6	36.8 ± 7.6
NDF	52.2 ± 0.8	-
ADF	42.5 ± 2.5	-
Cellulose	72.0 ± 1.9	-
DCP	-	13.9
TDN	-	71.4
DM consumption in kg per100 kg body weight	1.73 ± 0.12	-
DM consumption in kg per Kg metabolic body size ($W_{kg}^{0.75}$)	0.07 ± 0.02	-

[a] Mean of four observations
[b] Determined by difference

Summary

Fresh prawn waste was ensiled with rice bran using 10% tapioca flour as additive. On microbiological examination, the silage was found to be safe for animal feeding as evidenced by a lower total coliform and aerobic spore count. Palatability cum digestibility experiment showed that the silage was palatable for cattle and the animals did not show any digestive or other complaints during the experimental period of 45 days. The DCP and TDN values of prawn waste-rice bran silage was 13.9 and 71.4 respectively.

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