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DIGESTIBILITY AND NITROGEN BALANCE OF PRAWN WASTE INCORPORATED RATIONS IN CATTLE*

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The shortage of essential feed ingredients and the escalating prices of feed stuffs are the two main problems faced by animal feed industry today. It is the challenging need of the day to explore and to experiment all potential alternate feeds. Prawn waste is an unconventional feed source which can be exploited to a large extent as a livestock feed ingredient. Reports exist that prawn waste can be incorporated in the rations for cattle (Zikakis *et al.*, 1988; James, 1993; Ramachandran *et al.*, in press), pigs (Perez, 1932) and poultry (Chawan and Gerry, 1974; Menachery *et al.*, 1978). The effect of incorporation of dried prawn waste in the ration of adult, non-producing cattle on the digestibility of various nutrients and nitrogen balance is presented here.

Materials and methods

Six crossbred, adult, non-producing cows weighing 361 to 442 kg formed the experimental animals for the study. Large quantities of prawn waste were collected and dried in hot air oven at 60°C for 48 h. Standard concentrate mixtures (Bis specifications) were formulated incorporating dried prawn waste (PW) at 0 (T_1), 10 (T_2) and 20 (T_3) per cent levels (Tables 1&2). Paddy straw was the roughage for all treatments. The experiment was conducted in a randomised block design in a switch over trial. The three pairs of animals recieved the three rations at three different periods with an interval of two weeks between collection periods in order to avoid carry-over effect. The preliminary period for the first trial was three weeks. Each collection period was for seven days. Feeds and faeces were analysed for proximate principles and urine for nitrogen (AOAC, 1990) and the digestibility coefficients of nutrients in the whole ration and nitrogen balance were worked out. The data were analysed statistically as described by Federer (1967).

Results and Discussion

The experimental animals consumed the prawn waste incorporated concentrate mixtures readily indicating that prawn waste at 10 or 20 per cent levels in the feed did not affect the palatability of the feed. No problem regarding the palatability of prawn waste - rice bran (Ramachandran *et al.* in

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Table 1. Percentage ingredient composition of concentrate mixtures used for metabolism trials

Ingredients	Control	Concentrate mixtures	
		Experimental I (10% PW)	Experimental II (20% PW)
Yellow maize	18	39	48
Groundnut cake (expeller)	19	18	15
Coconut cake (expeller)	10	10	10
Wheat bran	50	20	4
Prawn waste (dried)	0	10	20
Mineral mixture*	2	2	2
Common salt	1	1	1
Total	100	100	100
To 100 kg of the above mixture			
add Vitamin mixture** (g)	10	10	10
Calculated composition:			
DCP	16.3	16.8	17.3
TDN	71.0	72.0	70.0

* KEYES mineral mixture (Kerala Solent Extractions Ltd., Irinjalakuda) composition per 100 g: 24 g Ca; 12 g P; 6.5 g Mg; 0.15 g Mn; 0.15 g Cu; 0.386 g Zn; 0.5 g Fe; 0.03 g I and 0.02 g Co.

** INDOMIX vitamin supplement (Piramal Health Care, Mumbai) composition per gram: Vitamin A 40,000 i.u, Vitamin D3-5,000 i.u, Vitamin B2-20 mg.

Table 2. Percentage chemical composition of concentrate mixtures and paddy straw (DM basis)

Nutrients	Concentrate mixtures			Paddy straw
	T_1 Control	T_2 Experimental	T_3 Experimental	
Dry matter	88.9	89.3	89.5	87.8
Crude protein	19.4	19.2	19.3	3.8
Ether extract	5.4	4.8	5.9	1.6
Crude fibre	8.2	7.0	7.6	30.3
Nitrogen free extract	58.7	59.8	56.2	48.9
Total ash	8.3	9.2	11.0	15.4
Calcium	0.91	2.43	3.51	0.51
Phosphorus	0.80	0.94	0.93	0.14

press) or prawn waste-paddy straw silage (James, 1993) was observed previously also.

The digestibility coefficients for dry matter (DM), crude protein (CP), ether extract (EE), crude fibre (CF) and nitrogen free extract (NFE) were in the range of 53 to 56, 52 to 55, 63 to 67, 61 to 64 and 60 to 63 per cent respectively (Table 3).

Table 3. Summarised data on digestibility coefficient of nutrients in whole ration of animals receiving various rations

Ration	Dry matter protein	Crude	Ether extract	Crude fibre extract	Nitrogen free
T_1 (Control)	53.96±0.71	54.26±1.92	64.12±5.15	61.42±1.07	60.69±1.09
T_2 (10% pw)	54.73±1.89	52.18±1.56	63.40±5.54	61.21±2.22	62.38±1.68
T_3 (20% pw)	55.81±1.31	54.81±3.10	66.92±3.20	63.82±1.65	62.45±1.27

The digestibilities of various nutrients were more or less similar, the differences among rations being marginal and statistically non-significant ($P<0.05$). There is a numerical improvement in the digestibilities of various nutrients in T_3 (20% PW) either due to better nutrient combination or due to better digestible nutrient obtained in the present study for prawn waste than expected, which became more evident when higher proportion of prawn waste was included in the diet. Digestion trials carried out in adult, non-producing cattle with prawn waste-paddy straw silage had indicated almost identical values for DM, CP and NFE digestibilities and better digestibilities for EE and CF than those obtained in the present study (James, 1993). Rations constituted with prawn waste-rice bran silage and paddy straw showed similar trend in digestibility coefficients for DM and CF while that of EE was better and NFE lower than those obtained in the present study (Ramachandran *et al.*, in press).

The animals on different rations viz., T_1 (control), T_2 (10% PW) and T_3 (20% PW) were on positive nitrogen balance, the average daily retention was 20, 14.7 and 18.5 g respectively (Table 4).

Table 4. Summarised data on nitrogen balance of animals on different treatments

Item	Treatments		
	T_1	T_2	T_3
N intake (g/d)	78.83±1.17	78.50±1.15	78.67±0.99
Extraction (g/d)			
Faecal	35.83±1.47	38.33±1.45	36.33±2.89
Urinary	23.00±2.67	25.50±1.50	23.83±2.20
Total	58.83±3.73	63.83±1.60	60.17±4.24
N balance (g/d)	20.00±3.34	14.70±1.84	18.50±3.62

There was no significant difference ($P<0.05$) in nitrogen retention by animals fed different rations. On an average, the animals gained 10 kg body weight during the experimental period of 10 weeks.

The daily digestible crude protein (DCP) and total digestible nutrient (TDN) intake of animals in the three treatments, T_1, T_2 and T_3 were 0.271, 0.262 and 0.273 kg and 3.19, 3.27 and 3.26 kg respectively (Table 5) thus satisfying the maintenance

Table 5. Average daily DCP and TDN intake by animals on various rations

Treatments	DCP (kg)	TDN (kg)
T_1	0.271 ± 0.01	3.19 ± 0.12
T_2	0.262 ± 0.01	3.27 ± 0.06
T_3	0.273 ± 0.01	3.26 ± 0.11

requirements as per recommendations (Ranjhan, 1991). It was concluded that prawn waste can be incorporated upto 20 per cent level in the concentrate mixtures of adult non-producing cattle.

Summary

An investigation was carried out to determine the effect of prawn waste incorporated rations on the digestibility of various nutrients and nitrogen balance in adult non-producing cattle. Prawn waste incorporated at 10 or 20 per cent level in the concentrate mixtures did not affect the palatability of the feed. There was no significant difference in the digestibilities of DM, CP, EE, CF and NFE in the three rations viz., T_1(control), T_2 (10% prawn waste) and T_3 (20% prawn waste). All the

animals were on positive nitrogen balance and there was no significant difference in the nitrogen retention by animals on different rations. It was concluded that prawn waste can be incorporated upto 20 per cent level in the concentrate mixtures of adult, non-producing cattle.

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