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RECYCLING OF CROP RESIDUE AND ANIMAL WASTE AS FEED STUFF

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Bagasse pith and fresh cow dung were ensiled, in laboratory type silos, for a period of 33 days. The silage was free from pathogenic bacteria, contained up to 2.94% lactic acid and showd up to 9.4% increase in protein and up to 8.3% in ether extracts. The *in vivo* increase in dry matter digestibility was up to 22 %.

Approximately 250 thousand tonnes (on dry matter basis) of animal wastes are produced in Pakistan daily and mainly used as soil fertilizer or fuel.. It can provide 120 thousand tonnes of TDN and 50 thousand tonnes of protein and substantial quantity of minerals utilizeable as feed source for the ruminants. This waste is however considered more valuable as a feed nutrient than as fertilizer. Nutritionally speaking animal waste is rich in protein, minerals and vitamins, but low in metabolisable energy content [1]. It contains 14–20% crude protein whereas the non-protein content is about 40 % of the crude protein. The ash content in the excreta is 10–19% and crude fibre 27–32% on dry matter basis.

Studies have been reported on incorporation of animal waste into the rations for livestock by ensilaging with other agroindustrial wastes [2]. Fermenting of cattle manure mixed with hay was proposed by Anthony [3]. Ensiled livestock waste appears to be nutritionally superior to dried livestock waste. The economic advantages of ensiling are obvious particularly if silos form part of the farm establishment. Ensiling is a simple process which not only prevents some losses on crude protein, but in addition it converts part of the non-protein into true protein.

The present study was conducted to recycle animal waste by ensilaging it with cellulosic waste i.e. bagasse pith.

MATERIAL AND METHODS

The composition of experimental rations are given in the Table 1. Bagasse pith and molasses were obtained from the Crescent Sugar Mill, Faisalabad, while the cow dung excreted by a lactating cow weighing 300 kg were collected for 12 hrs and was throughly mixed with the other ingredients. Six laboratory type silos per treatment, each containing 1 kg, were ensiled for 33 days at ambient temperature.

The silos after fermentation were analysed for acetic acid, butyric acid and lactic acid by the method of Reckka [4] *et. al.* Proximate analysis was done according to the methods of A.O.A.C. (1975) [5].

Coliform tests were performed according to the method of Baker [6].

In Vivo Digestibility. Digestibility of the samples were done according to the methods already mentioned [7]. The results so obtained were subjected to statistical analysis according to steel and Torrie [8].

Table. 1. Composition of experimental feed.

S. No.	% Composition	I	II	III
1.	Cow dung	30	40	45
2.	Bagasse pith	40	35	30
3.	Green grass	25	20	20
4.	Molasses	5	5	5
	Total	100	100	100

RESULT AND DISCUSSION

The fermentation characteristics, *in vivo* digestibility and coliform tests are given in Table 2. pH of the feeds I, II and II decreased from 6.7 to 3.95, 4.22 and 4.03 respectively. The decrease in pH was more in feed No. I containing 30 % cow dung and 40 % bagasse pith. This shows that lacto-bacillus grew faster on lesser amount of cow dung than the higher amount. Difference in the amount of lactic acid among treatments may be due to available carbohydrates and residual sugar in the bagasse pith. On the whole lactic acid, acetic acid, butyric acid and aroma in the feeds

Table 2. Fermentation characteristics and *in vivo* digestibility of silage before and after ensilaging.

S. No.	Characteristic	Before ensilaging			After ensilaging		
		I	II	III	I	II	III
1.	pH	6.74 ± 0.11	6.73 ± 0.13	6.71 ± 0.11	3.95 ± 0.01	4.22 ± 0.23	4.03 ± 0.17
2.	Lactic acid %	–	–	–	2.31 ± 0.07	2.25 ± 0.03	2.94 ± 0.04
3.	Acetic acid %	–	–	–	0.54 ± 0.08	0.90 ± 0.03	0.75 ± 0.21
4.	Butyric acid %	–	–	–	0.24 ± 0.13	0.45 ± 0.12	0.13 ± 0.12
5.	Coliform bacteria *E. coli,* Salmoncila Singella etc.	+ ve	+ ve	+ ve	– ve	–ve	–ve
6.	*In vivo* digestibility	33.4 ± 3.5	39.06 ± 2.7	42.69 ± 4.21	39.72 ± 3.8	47.52 ± 3.5	49.56 ± 2.3

Table 3. Proximate composition of silage before and after ensilaging.

S. No.	Parameter studied (%)	Before ensilaging			After ensilaging		
		I	II	III	I	II	III
1.	Dry matter	46.76	44.71	41.63	45.34	43.27	40.73
2.	Crude protein	5.37	7.15	7.52	5.67	7.82	7.93
3.	Ether extract	1.89	2.15	2.28	2.01	2.42	2.47
4.	Crude fibre	31.73	27.92	26.25	33.66	28.35	26.83
5.	Ash	5.06	7.15	7.92	5.03	7.02	7.97
6.	Nitrogen free extract	55.95	55.01	56.43	53.79	55.66	54.80
7.	Cellulose	39.30	38.25	33.95	39.79	38.31	35.98
8.	Organic matter	41.73	37.02	32.67	41.67	36.25	32.76

Table 4. Proximate composition of silage after rumen digestion.

S. No.	Parameter studied %	I	II	III
1.	Dry matter	96.62	95.72	94.35
2.	Crude protein	5.64	8.08	8.85
3.	Ether extract	2.23	2.55	2.70
4.	Crude fibre	43.34	36.52	35.6
5.	Ash	7.73	15.67	15.59
6.	Nitrogen free extract	35.42	37.18	37.26
7.	Cellulose	52.30	50.49	47.70
8.	Organic matter	88.89	80.06	78.77

I, II, III conformed to the standard laid down by NRC [9] for silage of good quality. The results are in accordance with the finding of Lamm *et al.* [10].

Coliform test showed negative results indicating that the fermented product was free from pathognes.

In vivo digestibility (Table 2) of feeds before and after ensilaging showed 18, 22 and 16 % increase in digestibility of feed I, II and III respectively. The digestibility of the feeds tended to increase with an increase in the amount of cow dung upto 40 %. It decreased when the amount of cow dung was increased to 45 %.

Ensilaging resulted in an increase in protein, ether extract and crude fibre, a decrease in the amount of organic matter and no detectable change in ash and cellulose. Table 3. These changes appear to be due to the gorwth of microorganisms in the feed during fermentation. Table 4.

From the finding of the experiment it is evident that animal waste and bagasse pith can be converted into good quality, pathogen free nutritious feed when ensiled.

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