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Improvement of Digestibility of Sugar Cane Baggase by Fermentation with Chicken Manure

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ABSTRACT: An experiment was conducted to study the effect of fermentation and chicken manure level on nutritive value of baggase. Five samples were made, composed of zero chicken manure (control), 3, 5, 7 and 10% chicken manure. The rations were ensiled for 21 days, the data arranged with a 2 × 5 factorial design, chemical composition, dry matter (DM), neutral detergent fibre (NDF) and organic matter (OM) digestibility and in sacco degradability for five rations before and after fermentation were carried out. pH increased with increase in chicken manure level (4.75) in 10% chicken manure. Crude protein (CP) increased before fermentation in 10% (9.069%) due to increase chicken manure. The neutral detergent fibre (NDF) content decreased (63.94%) and digestibility decreased 19.5% in 10% due to increase chicken manure level. Ash increased with increase in chicken manure level 5.982. The dry matter (DM) content decreased in 10% (89.269%) due to increase chicken manure level dry matter (DM) digestibility increased with increase in chicken manure level. Similarly dry matter (DM) degradability increased in 10% (43.662%). Organic matter (OM) digestibility was reduced significantly ($P < 0.05$) due to fermentation (56.820%). Crude protein degradability (CPD) increased in 10% after fermentation (94.4%).

Key wards: Baggase, Chicken manure, Ensilage, NDF degradability.

INTRODUCTION

Baggase is a highly fibrous residue after sugar cane is pressed to remove sucrose. One potential use of baggase is as a feedstuff for cattle[15] however its low digestibility limits its use in the raw state. Baggase is used as the basal diet, it's important to give the correct supplementation in order to obtain satisfactory physical and economic responses. The supplementation must take account of the productivity of the animals (e.g. Growing, fattening, lactating, etc.)[14]

The nutritional value of baggase can be improved by many treatments as fermentation, steam pressurization and addition of chemicals.

Poultry manure in particular, can replace most valuable protein feeds such as soybean meal, groundnut meal, cottonseed cakes … etc[6]. The feeding values of chicken manure to ruminants its nitrogen as a source of dietary crude protein which is considered as a better source of non-protein nitrogen (NPN) than urea[5].

Fermentation of baggase with chicken manure is expected to improve its digestibility and consequently its utilization by rumenants.

The objective of the this study was to improve the digestibility of baggase by fermentation with chicken manure.

MATERIALS AND METHODS

A basal diet containing 85% baggase, 10% molasses and 5% sorghum grains was formulated. Graded levels of chicken manure (0, 3, 5, 7 and 10%) were added to the basal diet as percentage of diet weight to made five dietary treatment, molasses was mixed with water at the ratio of 1:2 before being added to each dietary treatment, each diet was thoroughly mixed and put in a plastic bag which was carefully consolidated and compressed to removed air before being closed, each bag was further put into a strong large plastic bag to protect it from damage, the bags were stored for 21 days away from sun light to ferment.

At the end of the fermentation period the PH of each treatment was measured and insacco degradability was made using nylon bag technique[10].

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Invitro digestibility of each dietary treatment was also made according to Tilly and Terry[18].
The proximate composition of each dietary treatment was conducted before and after fermentation according to A.O.A.C.[1].

Statistical Analysis: The data was arranged before and after incubation to be examined by factorial design (2 × 5)[16]. Mean separation was examined by Duncan's multiple-range test[17].

RESULTS AND DISCUSSIONS

Results:
The Composition of Silage:
Ash: The 10 percent chicken manure before fermentation showed a higher value of ash 5.98 compared with after fermentation 4.54% respectively. Generally, the addition of chicken manure increase the ash content (Table 1).

Crude Protein: The 10 percent chicken manure before fermentation showed a higher crude protein content 9.06% compared with after fermentation 8.32% respectively. Control whereas (zero chicken manure) after fermentation showed the lowest percent of crude protein 3.71%. 3, 5 and 7% chicken manure before and after fermentation were more or less the same (Table 1).

Fat: The 3 percent chicken manure before fermentation showed a higher values of fat content 0.34% compared with after fermentation chicken manure 0.08% respectively. But 10 percent chicken manure after fermentation showed the lowest value of fat content 0.01% compared with before fermentation 0.04% respectively. Control (zero chicken manure), 5 and 7% before and after fermentation chicken manure was the same respectively (Table 1).

Crude Fibre: The 3 percent chicken manure after fermentation showed a higher value of crude fibre 37.79% compared with before fermentation 32.52% respectively. But control (zero chicken manure) after fermentation showed the lowest value 21.73% compared with before fermentation 32.35% respectively. 5, 7 and 10% before and after fermentation chicken manure was the same respectively (Table 1).

Table 1: Chemical composition of the different dietary treatment as dry matter basis.

	Ash%		CP%		Fat%		CF%		NDF%	
Dietary treatment	BF	AF	BF	AF	BF	AF	BF	AF	BF	AF
Control	4.87	3.25	5.21	3.71	.09	.08	32.35	21.73	78.46	70.80
3%	5.14	4.34	5.50	5.15	.34	.08	32.52	37.79	67.39	70.44
5%	3.41	5.12	5.04	6.10	.08	.13	33.25	31.32	63.94	66.56
7%	5.24	4.62	6.81	6.14	.05	.04	33.60	30.67	72.82	57.98
10%	5.98	4.54	9.06	8.32	.04	.01	31.30	32.91	63.94	52.33

Bf: before fermentation
AF: after fermentation

Table 2: The pH value after fermentation for the five level chicken manure as dry matter basis.

Dietary treatment	pH after fermentation
Control	4.60
3%	4.24
5%	4.40
7%	4.62
10%	4.75

Table 3: DM and NDF digestibility and DM degradability (%).

Dietary Treatment	DM dig%	NDF dig%	DM deg%
control	35.60^{c}	28.00^{ab}	40.54^{a}
3%	43.40^{ab}	33.40^{c}	43.10^{b}
5%	40.00^{bc}	27.60^{ab}	39.67^{a}
7%	46.20^{ab}	30.90^{c}	39.67^{a}
10%	47.20^{a}	19.50^{a}	43.66^{b}
S.E	2.21	1.40	3.69

Means in the same column having different superscripts differ significantly (P< 0.05)

Neutral Detergent Fibre Content: There was decrease in NDF content with increase level of chick manure before and after fermentation. Generally incubation with chicken manure reduce the NDF content (Table 1).

pH: The 10 percent chicken manure after fermentation showed the highest value of pH 4.75, 3 percent chicken manure showed the lowest value of pH 4.24 compared with 5 percent chicken manure 4.40 respectively. Control and 7 percent chicken manure after fermentation was the same 4.6% (Table 2).

Dry Matter Digestibility: As seen in table (3) *in vitro* dry matter digestibility progressively

increase (P< 0.05) with the increase of chicken manure level in the diet.

Neutral Detergent Fibre Digestibility: Chicken manure at 3% and 7% increased the NDF digestibility significantly (P< 0.05), but in 5 and 10% decreased NDF digestibility (Table 3).

Dry Matter Degradability: In the dry matter degradability there was a significant increase (P< 0.05) with increased level of chicken manure 43.662 (Table 3).

Organic Mater Digestibility: Organic matter digestibility there was significant increase before fermentation (P< 0.05) compared with after fermentation 46.133 / 56.820 (Table 4).

Crude Protein Degradability: As seen in Table 5 inclusion of chicken manure resulted in progressive increase in crude protein degradability before and after fermentation.

Table 4: The organic matter digestibility before and after fermentation.

Group	Mean	S.E.
Before fermentation	56.820[a]	2.905
After fermentation	46.133[b]	2.905

Means having different superscripts differ significantly (P < 0.05)

Discussion: Ash in this study was higher than that reported by Nguyen[13] who found 2.77%. Ash content was increased with increase in chicken manure level.

In this study the crude protein content was high (9.06%) in 10% chicken manure before fermentation which is expected due to higher content of nitrogen in chicken manure. This agreed with Goering and Smith[7] who found 10.1% crude protein. Ether extract was lower than that reported by Nguyen[13] who fund the ether extract content of baggase 1.13%.

Table 5: The crude protein degradability before and after fermentation for the five level of chicken manure.

Control		3%		5%		7%		10%		S.E.
B.F.	A.F.	B.F.	A.F.	B.F.	A.F.	B.F.	A.F.	B.F.	A.F.	
60.0[a]	62.1[a]	50.8[a]	74.1[b]	70.2[b]	88.7[b]	88.4[bc]	87.1[bc]	90.4[bc]	94.4[c]	4.981

Means having different superscripts differ significantly (P< 0.05)
B.F. Before fermentation
A.F. After fermentation

The crude fibre of baggase silage was higher than that reported by Nguyen[13] who found the crude fiber of baggase silage was 23.08%, which may be attributed to the varieties used or processing methods. In this study more addition of chicken manure decreased NDF content. This result agreed with Meng[12], Wukeqian[20] and Cao *et al.*[2] reduced from 84.2 to 76.4% in wheat straw and from 69.7 to 65.9% in rice straw[2] due to lower content of (NDF) in chicken manure compared to baggase.

NDF digestibility increased in 3% and 7% chicken manure, it were 33.4 and 30.9% respectively due to addition rather more chicken manure. This result agreed with Yang[21] and Griswol[8], while NDF digestibility reduced in 10% for addition more chicken manure it was (19.5%). This result agreed with Debasis[3].

The pH level at 21 days in the 10% chicken manure after fermentation was 4.7 this agreed with[9] who found 4.7 in poultry silage, also in 3% chicken after fermentation the pH was 4.2. This agreed with[7,11] who reported 4.2 in silage poultry litter, low amount of chicken manure lead to low pH because high level of chicken manure result in more ammonia production.

The dry matter digestibility in this study was lower than that reported by Goering and Smith[7] who found the dry mater digestibility 63% in 10% organic manure.

In vitro organic matter digestibility after fermentation was significantly lower (P< 0.05). This reduction may be due to insoluble matter remain after fermentation.

The dry matter and crude protein degradability increased with increase level of chicken manure. This might be due to the addition of the soluble amount of chicken manure, dolezal and Trinacty[4].

Conclusions: The result concluded that the addition of chicken manure improve the protein and mineral content, increased the dry matter digestibility and increase the dry matter and protein degradability.

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