Rumen degradability and kinetic properties of deep stack broiler litter

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Introduction:

Byproduct feedstuffs are very important in ruminant production systems throughout the world, and will continue to be so in for the future. Broiler litter is a byproduct of poultry production, is high in crude protein rapidly degraded in the rumen and variable but generally low to moderate in available energy concentration (Saleh et al 2003).

Poultry litter has a potential use as a ruminant feed in addition to its traditional use as fertilizer and more valuable as a feed ingredient than as a fertilizer. The use of poultry litter as a dietary supplement in ruminant ration could have a considerable effect on reducing costs, insufficiency of protein in diet and on solving disposal problems. The treatment of broiler litter by deep stacking was effective in the destruction of pathogens as stated by (Elemam et al 2010).

The productivity of livestock in terms of milk yield or the annual red meat off-take from an animal unit in Africa including Sudan is considerably low, when compared to other developed countries. Poor nutrition, both in quantity and quality and poor reproductive performance are recognized as major factors limiting animal production.

Objectives:

- ✓**To assess whether poultry litter was a viable and renewable protein supplement for small ruminants in Sudan.**
- ✓**To determine the effect of deep stacking treatment on chemical composition and degradability of broiler litter.**

Material and methods:

Deep stacking was prepared in underground silo pits (1.5x1.5x1.5, 1.75x1.75x1.75 and 2x2x2 m). The collected litter was spread on a plastic sheet and water was added to bring its moisture contents to about 30% using garden sprayer. Then, the sprayed litter was stacked in the underground silo pit surrounded with plastic sheet and pressed manually. The pressed litter was covered using plastic sheet. A thin layer of soil (3 – 5 cm) was placed over the covered plastic sheet. The preparation of the underground silo pit was made in two days and was opened after a period of at least one month.

Representative samples of broiler litter and deep stacked litter were taken and proximate analysis was made on dried ground samples as outlined by (AOAC 1990).

Degradability study of broiler litter and deep-stacked broiler litter was carried out in a fistulated buffalo according to the nylon bag technique described by Ørskov *et al*., (1980). The buffalo was fed at maintenance level on a balanced roughage concentrate diet with free access to water and mineral blocks. Nylon bag (80 × 140 mm; pore, size 45µ) weighing 1- 2.5 g each were used for incubation of experimental sample. The bags were incubated for different period of time 4, 8, 16, 24, 48, 72 and 96hrs.

The data were treated with the analysis of variance with the general linear model procedure of (SAS 1994).

Fistulated buffalos

Broiler litter before deep stacking

Broiler litter after deep stacking

Results:

- **The chemical composition results of raw broiler litter and deep stacked broiler litter was shown in table 1. However, according to these compositions there are no greater differences between broiler litter and three deep stacked litter silo pits.**
- ***In-situ* degradability for CP to somewhat after 12 hour increased among all three deep stack litters compared to broiler litter as shown in Figure (1). The soluble fraction (a) as shown in Table (2) increased significantly for DSBL1 compared to others, but degradable in the rumen constant (b), rate (c) of degradability, potential degradability (PD) and The effective degradability in different rate of outflow showed no significant difference among all broiler litter and deep stack litter.**
- **Broiler litter showed a relatively superior NDF degradability in the rumen at 48, 72 and 96 h figure (2).The rate of degradation (fraction c) for NDF showed no significant difference (P>0.05) among all broiler litter and deep stack litter, whereas, the soluble fraction (a), slow degradable fraction (b), potential degradability (PD) and the effective degradability in different rate of outflow showed a significant difference (P>0.05) among all broiler litter and deep stack litter. Table 3.**

Table 1. Chemical composition (%) of broiler litter and deep stacked broiler litter.

	CP	NDF	ADF	HC	Cellulose
BL	28.13	41.13	31.63	9.82	18.32
DSBL1	25.72	40.60	30.94	9.73	18.14
DSBL2	26.73	40.91	33.22	8.91	17.92
DSBL3	27.01	41.12	34.73	8.72	17.74
SEM	0.013	0.006	0.011	0.014	0.011

BL: Broiler litter. DSBL1, DSBL2 and DSBL3: Deep stacked broiler litter in silo pits at (1.5x1.5x1.5 m, 1.75x1.75x1.75m and 2x2x2 m) respectively. NDF: Neutral detergent fiber.ADF: Acid detergent fiber. HC: Hemicelluloses. *SEM: standard error of the mean. Each value represents the mean of three samples*

Table. 2 CP degradability kinetics of broiler litter and deep stack broiler litter:

	a	b	c	PD	ED		
					2%	5%	8%
BL	33.01[ab]	56.26	0.02	89.27	69.30	64.10	63.05
DSBL1	37.61[a]	54.49	0.02	92.11	69.70	64.10	63.05
DSBL2	21.70[b]	58.68	0.05	80.39	70.15	65.20	63.66
DSBL3	32.46[ab]	53.50	0.03	85.96	69.80	64.45	63.20
SEM	2.93	4.14	0.01	3.73	0.61	0.51	0.26

(a)Readily degradable fraction; (b) Slow degradable fraction; (c) Rate of degradable fraction; (PD) Potential degradability; (ED) Effective degradability; (SEM) Standard Error of The Mean;[a-b] means with different superscript in the same row were significantly different (P < 0.05). BL: Broiler litter. DSBL1, DSBL2 and DSBL3: Deep stacked broiler litter in silo pits at (1.5x1.5x1.5 m, 1.75x1.75x1.75m and 2x2x2 m) respectively.

Table. 3 NDF degradability kinetics of broiler litter and deep stack broiler litter:

	a	b	c	PD	ED		
					2%	5%	8%
BL	8.19[b]	61.84[a]	0.05	70.03[a]	65.00[a]	63.15[a]	62.05[a]
DSBL1	8.98[ab]	56.61[b]	0.06	65.59[b]	63.45[b]	62.80[b]	61.09[b]
DSBL2	9.86[b]	55.27[b]	0.05	65.13[bc]	63.25[b]	62.75[b]	61.08[b]
DSBL3	7.16[c]	56.59[b]	0.06	63.76[c]	62.90[b]	62.70[b]	61.08[b]
SEM	0.26	0.57	0.01	0.40	0.18	0.06	0.06

(a)Readily degradable fraction; (b) Slow degradable fraction; (c) Rate of degradable fraction; (PD) Potential degradability; (ED) Effective degradability; (SEM) Standard Error of The Mean;[a-c] means with different superscript in the same column were significantly

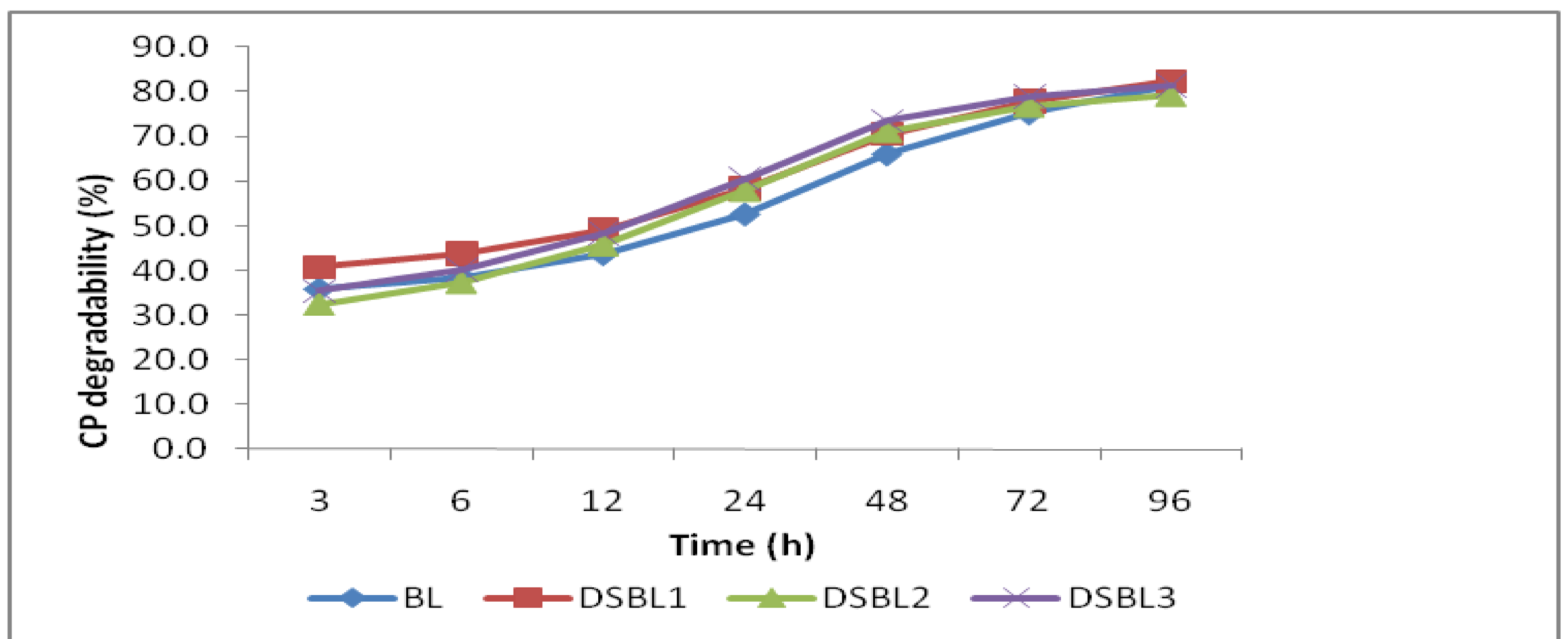

Figure. 1. Rumen degradation of CP% of broiler litter and deep stack broiler litter.

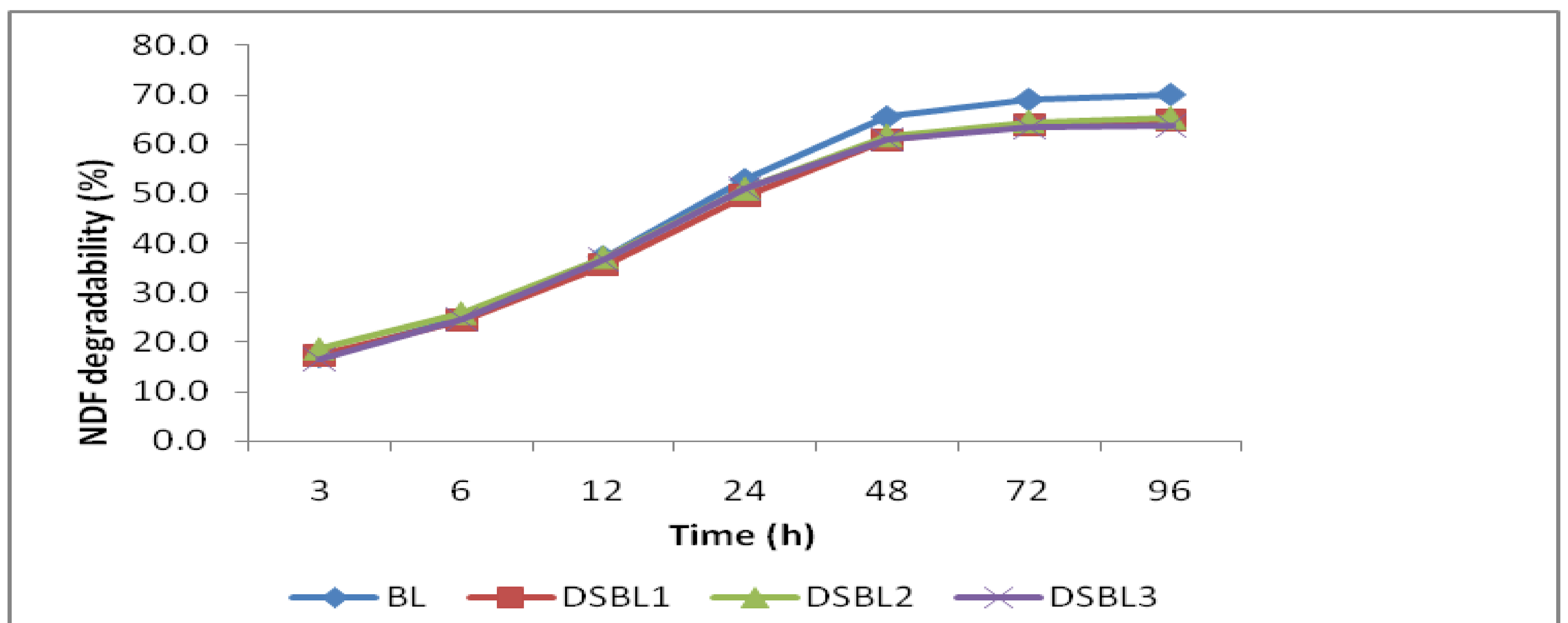

Figure. 2. Rumen degradation of NDF (%) of broiler litter and deep stack broiler litter.

Conclusion:

The study explored the practical possibility of incorporating deep stack broiler litter into animal feeds hence reducing the cost of production of feed and consequently reducing the unit cost of animal products.

References

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