Urea Treatment and Ensiling Period Effects on Physico-Chemical Value of Rice Straw and Performance of Kano Brown Buck

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ABSTRACT

Feed cost accounts about 50 – 80% of the total cost of animal production and its well-known fact that the shortage of feed in terms of quality and quantity during the dry season remains the, or among the most critical barriers facing animal agriculture in northern Nigeria and beyond. A three- month experiment was conducted at the teaching and research farm of the Department of Animal Health and Husbandry, Audu Bako College of Agriculture Danbatta, to determine the ensiling period effect(14, 28 and 42-day) and urea treatment levels (0%,2%,4% and 6%) on physico-chemical parameters of rice straw residue and its impact on performance of Kano brown bucks. The experiment was laid in a completely randomised designed (CRD) arranged in a 3x4x4 factorial experiment. Four experimental animal groups replicated thrice were offered the experimental diets for a period of 30-day feeding trial. SAS software package was used for the data analysis and least significant difference (LSD) technique was used to separate the means. The results showed that 2% urea inclusion level significantly (P<0.05) improved the physical properties(colour, odour, mouldness and temperature) and with regard to the chemical composition, CP content significantly increased at 42-day ensiling period (12.65%) and 6% urea treatment levels (13.18%), yet, the overall finding indicated that 2% urea inclusion levels yielded the best result as reflected in the liveweight gain and its therefore, 2% urea inclusion levels and 28-day ensiling period is recommended and in concluding, the research finding proved that urea above 5% level of inclusion in feed of ruminant is absolutely toxic.

INTRODUCTION

Several researches reveal that an average Nigerian is protein deficient as consumes less than 10g per day against the 35g as the minimum daily protein intake recommended by FAO and WHO, 1997. Animal protein constitutes about 17% of the total protein consumed by an average Nigerian compared to other developed nations with 60% in the United Kingdom, 67% in Denmark, 68% in New Zealand, and 71% in United States of America (World Bank, 2001). According to Ani and Adiegwu (2005), the low protein intake is attributed to the low level of animal protein production leading to high cost of animal products.

However, the high cost of feed ingredients, especially the conventional energy and protein sources like Maize, Soybean meal, Groundnut cake, Fish meal and the like, is the major factor militating against intensive livestock production in Nigeria and beyond (Grace, 2017).

In general, feed is the top most factor militating against the emergence and development of the poultry industry in Nigeria and other developing nations, accounting 50% - 80% of the production cost (Omolayo, 2018; Isaac & Charles, 2018)**.** The ever-increasing trend in human population with a projection of about 10 billion people world population by the year 2050 which is likely to create competition between man and livestock for food (Meissner *et al.*, 2013; Emi, 2019). Likewise, there is rapid growing number of poultry farms and feed compounding mills across the globe (Hassan, 2016). As protein sources, the major conventional feed ingredients are fish meal (animal source) and soybean meal or groundnut cake (plant source) which are expensive (Nana et al., 2019).

Both production and demand of livestock will be significantly increase in the near future, from 180 million birds in 2016 to 900 million birds in the poultry population alone in 2050 in Nigeria (FAO, 2019).

METHOGOLOGY

A three- month experiment was conducted at the teaching and research farm of the Department of Animal Health and Husbandry, Audu Bako College of Agriculture Danbatta, to determine the ensiling period effect (14, 28 and 42-day) and urea treatment levels (0%,2%,4% and 6%) on physico-chemical parameters of rice straw residue and its impact on performance of Kano brown bucks. The experiment was laid in a completely randomised designed (CRD) arranged in a 3x4x4 factorial experiment. Four experimental animal groups replicated thrice were offered the experimental diets for a period of 30-day feeding trial. SAS software package was used for the data analysis and least significant difference (LSD) technique was used to separate the means.

RESULTS AND DISCUSSION

Table 1 presents the physical properties of rice straw residue treated with urea. The colour observed at all the inclusive levels of urea and at all the ensiling periods were acceptable colour for good silage (Bates, 1998). The silage colour improvement as ensiling increased was normally as had been observed in colour changes and management in brown colour of maize strover silage from 20 to 50-day. The pungement smell and absence of mould observed in all the urea treated silage indicate the effect of ammoniation (Shan *et al.*, 2021).

The strong ammonia smell suggested a higher ammonia concentration in the silages which may have prevented the growth of mould by acting as a fungicide, this is in agreement with the finding of Elseed (2003). This means that urea could be used for long term preservation of rice straw residue residence silages as presence of mould in silage is undesirable as it uses silage nutrients and sometimes, enhanced the production of toxins (Nguyen & Dang, 2020).The temperature range observed in the urea treated silage was similar to the range (25 - 27.5 0C) similar to silage from guinea grass (Babayemi, 2009). Excessive heat production was reported to result in mallard or browsing reactions which can reduce digestibility of protein and fibre component (Bolsen *et al*., 1996).

Table 1. Physical properties of urea treated ensiled rice residue

Parameter	**Ensiling period**	**Urea level (%)**			
	(days)	0	2	4	6
Colour	14	Greenish-yellow	Green	Green	Green
	28	Greenish-yellow	Greenish-brown	Greenish-brown	Greenish-brown
	42	Greenish-yellow	Greenish-brown	Greenish-brown	Greenish-brown
Odour	14	Pleasant	Pungent	Pungent	Pungent (strong)
	28	Pleasant	Pungent	Pungent	Pungent (strong)
	42	Pleasant	Pungent	Pungent	Pungent(strong)
Mouldness	14	Slightly mouldy	Absent	Absent	Absent
	28	Slightly mouldy	Absent	Absent	Absent
	42	Slightly mouldy	Absent	Absent	Absent
Temperature (^{0}C)	14	26.00	26.20	26.20	26.15
	28	26.00	26.05	26.30	26.20
	42	26.00	26.05	26.30	26.50

Table 2 shows the ensiling periods and levels of urea. It indicates the chemical composition of rice straw residue at 0%, 2%, 4% and 6% level of inclusion. The chemical components of both fresh and ensiled rice straw residue analysed were dry matter, organic matter, cruid protein, ether extract, ash, neutral detergent fibre, acid detergent fibre and acid detergent lignin. Table 3: presents the dietary treatment effects of the experimental diet on goats as supplement fed at 5% percent body weight.

Table 2. Effect of ensiling period and level of urea treatment on chemical composition of rice straw residue

Parameter	DM	OM	CP	EE	Ash	NDF	ADF	ADL
Fresh	35.02	92.00	6.25	3.00	8.00	70	42.60	14.3
Ensiled (days)								
14	31.36	82.96	11.10	2.18	7.04	96.61	38.26	12.49
28	29.64	92.67	11.58	2.08	7.33	68.20	38.09	12.12
42	29.80	91.94	12.65	2.18	8.06	65.37	36.50	11.41
SEM	0.32	0.26	0.60	0.11	0.26	0.67	0.74	0.31
Urea level (%)								
0	31.09	93.84	7.71	2.13	6.16	69.50	40.76	13.04
2	30.52	92.00	12.43	2.28	8.00	65.27	34.78	10.83
4	29.49	92.03	12.93	2.18	7.97	67.60	37.56	12.24
6	28.84	92.22	13.18	1.98	7.78	68.53	38.03	11.90
SEM	0.38	0.22	0.21	0.11	0.22	0.80	0.55	0.28

Table 3: Performance of Kano brown bucks fed urea treated ensiled rice straw residue (30-day feeding trial)

Urea level (%)	Initial body weight(Kg)	Final body weight(Kg)	Weight gain(Kg)
0	30.0	32.0	2.0
2	32.0	37.0	5.0
4	31.0	34.0	3.0
6	32.6	34.8	2.2
SEM	0.48	1.03	0.7

SEM – Standard error of mean

CONCLUSION

As stated earlier, the results showed that 2% urea inclusion level significantly (P<0.05) improved the physical properties(colour, odour, mouldness and temperature) and with regard to the chemical composition, CP content significantly increased at 42-day ensiling period (12.65%) and 6% urea treatment levels (13.18%), yet, the overall finding indicated that 2% urea inclusion levels yielded the best result as reflected in the liveweight gain and its therefore, 2% urea inclusion levels and 28-day ensiling period is recommended and in concluding, the research finding proved that urea above 5% level of inclusion in feed of ruminant is absolutely toxic.

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