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Research Article

Raw Banana Peel Silage – An Alternative Livestock Feed

Arathi Salim[1*], Biju Chacko[2], Senthil Murugan S.[3], Surej Joseph Bunglavan[4], Ranjith D.[5], Sunanda C.[6], Sreeja S. J.[1] and Neenu Ouseph[1]

[1]M. V. Sc. Scholar, Department of Animal Nutrition,

[2]Assistant Professor and Head (I/c), Department of Animal Nutrition, CVAS, Pookode,

[3]Assistant Professor, Department of Animal Nutrition, CVAS, Pookode,

[4]Assistant Professor, Department of Animal Nutrition, CVAS, Mannuthy,

[5]Assistant Professor, Department of Veterinary Pharmacology and Toxicology, CVAS, Pookode,

[6]Former Assistant Professor and Head, Department of Statistics, CVAS, Pookode, Wayanad, Kerala

*Corresponding Author E-mail: arathisalim2012@gmail.com

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ABSTRACT

High feed cost and insufficient supply of forages are the major constraints for livestock farming. Ruminants can utilise wide variety of unconventional feeds. Banana peel is a common unconventional feed for ruminants in Kerala. As banana peel is available plenty in Kerala especially during onam season and since it is a highly perishable substance, ensiling can be considered as a better preservation technique. Ensiling period and method of ensiling was fixed under different sets of laboratory conditions. It was found that the ensiling period for silage prepared from raw banana peel without any additives was 28 days and that of raw banana peel with 3 per cent jaggery was 24 days. Raw banana peel silage with jaggery as additive in specified ensiling period will have desirable characteristics. Also the chemical composition of silage reveals that it can be used as a substitute for green fodder. Raw banana peel silage can be used as an alternative livestock feed.

Keywords: *Raw banana peel, Silage, Ensiling period, Additives.*

INTRODUCTION

India holds first position in the world banana (*Musa paradisiaca*) production (FAO statistics, 2019). Banana is an edible fruit produced by plants of genus *Musa* which is a herbaceous perennial that is grown mainly in the tropics. In India, *Musa paradisiaca* is commonly cultivated. Both raw and ripe forms of banana are consumed by people (Mohapatra, Mishra & Sutar, 2010). In Kerala, raw banana is mainly used for banana chips production. There will be a great demand for chips especially during festive season. As a result large amount of waste is generated from chips manufacturing units in form of banana peel which is a highly perishable product when kept in open. Vegetable and fruit wastes could be effectively incorporated in livestock ration thereby reducing environmental pollution (Bakshi, Wadhwa & Makkar, 2016).

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Banana peel is rich in fibre, vitamin B6, vitamin C, potassium, antioxidants, magnesium and low in sugar, fats and cholesterol (Dhake, Jain & Lakhawat, 2019). High contents of carbohydrate and fibre in banana peel can also produce a laxative effect in the animal. Generally banana peel is used as an unconventional feed for ruminants (Pimentel et al., 2017). Ensiling can be done to preserve the banana peel and can be used for feeding ruminants later (Elahi et al., 2018). Ruminants especially goats are considered to be better converter of fibrous feeds which enables the efficient utilisation of several unconventional feeds and roughages. Hence raw banana peel silage has the potential to be an alternative livestock feed for cattle and goats. Only limited researches had been conducted on scope of raw banana peel silage. Hence the present study was conducted to determine the method of raw banana peel silage preparation and its quality assessment.

MATERIALS AND METHODS

A preliminary study was conducted in Department of Animal Nutrition, College of Veterinary and Animal Sciences, Pookode to determine a standardised method for raw banana peel silage preparation and to analyse its quality. Raw banana peel procured from local banana chips shops was used for silage preparation. The whole study was conducted as three trials. In the first trial, raw banana peel was chopped manually to a length of 2 cm or less to ensure better packaging. This was filled compactly in plastic buckets and sealed anaerobically. Silage samples were kept in triplicates and these buckets were incubated for 45 days (Elahi et al., 2018). After the specified time the buckets were opened and assessed the silage quality (Jais & Rashid, 2017).

In the second trial, the ensiling period was fixed as 21, 28, 30, 35 and 45 days. Different sets of silage samples were prepared by filling, chopped banana peel compactly in double layer polythene covers and then kept in buckets and later these buckets were subsequently sealed anerobically. After the specified ensiling period, pH and physical characteristics were determined in triplicates (Jais & Rashid, 2017).

In the third trial, additives such as urea, salt and jaggery were added at the levels of 0.50, 1.00 and 3.00 per cent respectively along with chopped banana peel. They were filled in double layer polythene covers and kept in buckets and later these buckets were sealed anerobically. A total of four sets (banana peel without additives, banana peel with urea, banana peel with salt and banana peel with jaggery) with triplicates each were ensiled and each set opened periodically from 21st to 28th day. Later the pH and physical characteristics of silage were analysed (Jais & Rashid, 2017). From these three trials, the best method was chosen for silage preparation in bulk.

Proximate principles of silage and banana peel were analysed as per the methods of Association of Official Analytical Chemists (AOAC, 2016). Van Soest method of fibre determination (Van Soest, Robertson & Lewis, 1991) was carried out to determine neutral detergent fibre (NDF) and acid detergent fibre (ADF). The calcium and phosphorus content of samples were determined by standard procedure (AOAC, 2016).

RESULTS AND DISCUSSION

In the first trial ie, when the ensiling period was 45 days it was found that the silage got spoiled and became a blackish liquid material with a foul smell. In the second trial, it was observed that silage with an ensiling period of 35 and 45 days were spoiled, while that opened after 21, 28 and 30 days ensiling period was found to be in good condition. The pH of silage with the ensiling period of 21, 28 and 30 days were analysed in triplicates by using pH meter (EUTECH) and found as 6.66, 5.34 and 5.66 respectively. Based on the above results the maximum ensiling period for silage from banana peel without any additives was fixed as 28 days and these results were in agreement with observations of Hansson (2012) and Jais and Rashid (2017). In the third trial, it was found that banana peel with

jaggery combination gave silage of good condition and fruity odour with the lowest pH (3.90) while urea combination and salt combination got spoiled.

The characteristics of different combinations of raw banana peel silage prepared in third trial are given in Table 1. Based on the preliminary study, it was concluded that raw banana peel with 3.00 per cent jaggery combination when ensiled for 24 days gave silage of desired type and hence the same method was used for silage preparation in bulk. Table 2 represents characteristics of silage prepared in bulk. Chemical composition of banana peel and silage are indicated in Table 3.

Fig. 1: Chopped banana peel

Fig. 2: Silage filled in plastic buckets

Fig. 3: Spoiled silage from first trial

Fig. 4: Silage from banana peel –jaggery combination

Table 1: Characteristics of different combinations of silage in third trial

SILAGE	ENSILING PERIOD IN DAYS								
	21	22	23	24	25	26	27	28	COLOUR OF SILAGE
	pH								
Banana peel	6.66	6.23	6.35	6.18	5.92	5.68	5.45	5.34	Greenish brown
Banana peel + urea	8.37	8.32	8.16	7.90	6.80	5.94	6.21	Spoiled	Blackish green
Banana peel + jaggery	5.02	4.68	4.29	3.90	3.98	4.11	4.26	4.51	Yellowish brown
Banana peel + salt	5.69	5.75	5.81	5.84	5.98	6.03	Spoiled	Spoiled	Greenish black

Table 2: Characteristics of raw banana peel silage

Parameters	Characteristics
Colour	Yellowish brown
Odour	Fruity odour
Mould growth	No mould growth
pH	3.90

Table 3: Chemical composition of banana peel and silage

Parameters	Nutritive value* (%, on DM basis)	
	Banana Peel	Silage
DM	15.45 ± 0.24	10.22 ± 0.08
CP	13.20 ± 0.09	10.79 ± 0.05
CF	8.81 ± 0.18	8.00 ± 0.17
EE	4.12 ± 0.19	4.73 ± 0.05
Total ash	9.85 ± 0.06	10.37 ± 0.10
NFE	64.02 ± 0.34	66.11 ± 0.19
Acid insoluble ash	0.31 ± 0.02	0.34 ± 0.01
NDF	49.63 ± 0.29	37.91 ± 0.10
ADF	22.27 ± 0.25	15.18 ± 0.11
Hemicellulose	27.36 ± 0.51	22.73 ± 0.16
Ca	2.77 ± 0.09	2.57 ± 0.04
P	0.39 ± 0.02	0.22 ± 0

* - Average of five values with SE

CONCLUSION

Based on this pilot study it was concluded that ensiling period for banana peel with jaggery as an additive at three per cent level was 24 days. The physical characteristics as well as the chemical composition indicate that raw banana

peel silage can be used as substitute for roughage. Since raw banana peel is available plenty in Kerala it can be preserved as silage in bulk and can be used later for feeding ruminants.

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