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Introduction

Rearing of ruminant animals i.e. sheep and goats, especially is hampered by the seasonal availability of good quality and quantity of feeds such that during the dry season months, the little available forage is of low quality. The consequences are weight loss, low birth weight, low resistance to disease and reduced animal performance (Fajemisin *et al*., 2010). One potential way for increasing the quality and availability of feeds for smallholder ruminant animals in the dry season may be through the use of fodder trees and shrub legumes. Leaf protein sources obtained in leaf vegetables, legume trees, fodder trees and shrubs as feed resources to all classes of livestock offer tremendous potentials (Aye and Adegun, 2013). As foliage of leguminous trees and bushes are a major source of protein for feeding goats, they are components of pasture and grazing lands. The leaf biomass from the trees and bushes is abundant during the wet season, but the quantity and quality of green biomass declines as the dry season progresses. It can be preserved in the form of leaf meals and by pressing into blocks/briquettes with/without incorporating other concentrate feed ingredients. Keeping quality can be increased and a market value can be obtained. These legume blocks could be fed to small ruminants like sheep and goats as protein supplements would improve the nutritive value of the low quality diets and supply main nutrients to goats as possible alternatives for farmers during the dry season. The main justification for using feed blocks to provide deficient nutrients is the convenience for packaging, storage, transport and ease of feeding. Information on simple method of legume blocks production, the benefits of incorporating various ingredients, minerals, additives in the blocks and nutritive values of legume blocks over the years of storage as a feed is not available under local conditions. The present study was carried out with an objective of determining the nutritive values and keeping quality of legume blocks prepared with different ingredients using simple technology as goat feed.

Materials and Methods

The study was conducted during the period from year 2013 to 2015 at BAIF Development Research Foundation, Central Research Station, Urulikanchan, Pune 412 202 (M.S.), India. Leaves and tender twigs of trees and bushes namely subabul (*Leucaena leucocephala*), desmanthus (*Desmanthus virgatus*), sesbania (*Sesbania sesban*) were manually harvested from the coppiced growth of plants established at research farm,while the lucerne (*Medicago sativa*) was collected from the cultivated fodder plots. The biomass of each species was chaffed into small pieces with the help of chopper and sun dried up to 10-12% moisture and ground to make leaf meals. Five types of leguminous blocks were prepared *viz*. leucaena leaf block (LLB), desmanthus block (DB), sesbania block (SB), lucerne block (LB) and mix block (MB) by adding molasses, corn flour, mineral mixture and salt in different proportions to leaf meal of four species and one more mixture of all species in equal proportions. The ingredient percent composition of feed block is presented in Table 1. The mixture was poured into a metal molds and manually pressed to make the blocks. The blocks were sun dried and properly packed with polythene and stored under room temperature for 24 months. Blocks were carefully observed for any change in odour and colour.

Table 1: Ingredients composition (%) of experimental leguminous feed blocks

Ingredients	**Ingredients composition (%)**				
	LLB	**DB**	**SB**	**LB**	**MB[a]**
Leaf meal	80	80	80	80	80
Molasses	10	10	10	10	10
Corn flour	8	8	8	8	8
Mineral mixture	1	1	1	1	1
Salt	1	1	1	1	1
Total	100	100	100	100	100

LLB=Leucaena leaf block, DB=Desmanthus block, SB=Sesbania block, LB= Lucerne block, MB= Mix block of all species in equal proportions

Proximate analysis of the samples: Samples from fresh block of each type were drawn for proximate analysis and nutritive values such as dry matter (DM), crude protein (CP), crude fiber (CF), ether extract (EE), ash and silica content were determined using the methods described in AOAC (1995). Similarly the analysis was also done after 24 months of storage of blocks for same parameter.

Cost of production and feeding of leguminous blocks: Cost towards all the inputs such as labor, ingredient material and packaging etc. were recorded to study the economics of the different legume blocks. The samples of fresh and after 24 months storage of all the leguminous blocks were offered to all the five goats for feeding and their acceptance examined.

Results and Discussion

The blocks of subabul, desmanthus and sesbania leaf meal were tightly compacted as compared to those prepared from lucerne and mixture of all. Further, no deterioration in colour, odour or texture was observed in storage, or any apparent contamination with mould. Nutritional composition of fresh legume block and after 24 months storage is presented in Table 2. The nutritive values were more or less similar in fresh and stored legume blocks in all the recipes and did not vary much during storage. Among the five leguminous blocks, highest nutritive values in terms of CP, CF, EE, ash and silica were observed in sesbania legume block (22.17, 12.14, 3.52, 10.71 and 0.52%) followed by blocks of subabul (20.52, 10.61, 3.42, 10.72 and 0.81%), respectively. The crude protein (CP) values were high in legume block of both the tree species Aye and Adegun (2010) reported that Multi nutrients blocks (MNBs) were lower in fibre, but higher in crude protein than grasses and crop residues.

Table 2: Nutritional composition (%) of fresh sample and after 24 months storage of feed block

Feed block		**Nutritional composition (%)**					
		DM	**CP**	**CF**	**EE**	**ASH**	**Silica**
LLB	Fresh prepared	92.97	20.52	10.61	3.43	10.72	0.81
	After 24 months	94.22	22.52	9.18	2.34	10.77	0.74
LB	Fresh prepared	95.06	16.45	24.67	2.06	11.91	1.03
	After 24 months	96.25	12.45	19.61	2.62	10.47	0.92
DB	Fresh prepared	94.29	18.6	12.15	2.86	10.01	1.02
	After 24 months	94.51	18.4	12.71	2.00	10.56	0.89
SB	Fresh prepared	91.04	22.17	12.14	3.52	10.71	0.58
	After 24 months	93.91	23.48	12.35	2.49	10.62	0.64
MB	Fresh prepared	95.19	19.33	17.87	3.25	10.84	0.63
	After 24 months	95.15	18.49	14.8	2.87	10.56	0.78

The per kg production cost of leucaena leaf block, desmanthus block, sesbania block, lucerne block and mix block were 20, 20, 21, 29 and 24, respectively. The cost of per kg production of leguminous block of subabul and sesbania was low as compared to lucerne and mix blocks. The lowest cost of leguminous leaf meal blocks production was also reported as 30.00 by Somasiri *et al.*, (2010). All the goats offered legume blocks accepted them readily. The ease of preparation, low cost and maintenance make the blocks technologies practicable for adoption by rural small-scale farmers as goat feed.

Conclusion

Among the five leguminous blocks, sesbania block &leucaena leaf block were the best with respect to pressing ability, nutritive values and cost of production as compared to Lucerne blocks. Hence, the leguminous blocks prepared from sesbania and subabul leaf meal were selected as the best leguminous blocks as goat feed.

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