NUTRIENT COMPOSITION OF FOOD WASTES AND ITS UTILIZATION STRATEGY AS LIVESTOCK FEED TO REDUCE ENVIRONMENT POLLUTION

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ABSTRACT

The nutrient composition of food wastes from households, restaurants, bakeries, chocolate waste, maize extract, fruit wastes and ghee residues are good sources energy and poor source of protein and minerals. Proper nutrient supplements using oil cakes as protein supplements, mineral mixture as mineral supplement and bran as fibre supplement are to be formulated to utilize these wastes as a sole feed for livestock to reduce the environment pollution. Increased animal productivity and reduced methane emission by utilizing food wastes leads to decreased number of animals per unit of livestock product and thereby indirectly reduces the environment pollution.

Key words: Food wastes, nutrient composition, livestock feed

Introduction

There is a chronic shortage of feed and fodders in India and most of the developing countries, the food grains mainly produced for human consumption are also in shortage, so it became necessary to depend on unconventional feeds to sustain the feeding of livestock. Food wastes, vegetable wastes and food industrial by-products have a good potential for use of livestock feed so that the gap between the demand and supply of feeds and fodders can be shortened and as well as proper utilization of wastes reduces the environment pollution. Efforts are focused on determining the seasonal availability and nutritive value of locally available food

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wastes, fruit and vegetable by-products with a view to formulate adequate year round feeding system to bridge the gap between the demand and supply of nutrients for livestock.

Food wastes refers to food that is of good quality and fit for human consumption but that does not get consumed because it is discarded either before or after it spoils (FAO, 2013). According to Stuart (2009), a food waste expert and an activist, food waste is any product that, rather than being meant for human consumption, is deliberately given to animals, or is a sub-product resulting from the post-production of food for human use. USDA (2009) stated that food waste as losses by the consumer at home and out of the home the edible food that becomes refuse because it is not used by the final consumer (avoidable waste from eaten food), and the inedible scraps (unavoidable waste from eaten food). Waste disposal and by-product management in food processing industry pose problems in the areas of environmental protection and sustainability (Russ and Pittroff , 2004).

During the preparation of food ingredients for human consumption several by- products were obtained from the large scale industrial manufacturers as listed in the table which had nutritive value could also be used as feed for livestock. Using the wastes reduces the production cost and enhances animal performance in addition to mitigation of environment pollution. A list of wastes not commonly used as feed for animals is discussed below regarding its potential, limitations and supplementation strategies for optimum utilization to mitigate environment pollution.

MATERIALS AND METHODS

Food wastes samples were collected from livestock farms, households, restaurants, markets, educational institute, student's mess and food industries. The food waste sampled (500 g) were dried to constant weight in hot air oven at 60° C and ground to pass through 1 mm sieve. The samples were stored in airtight containers for further chemical analysis. The proximate principles were analysed as per method of AOAC (2006). The major nutrients like crude protein (CP), fat (EE), nitrogen free extract (NFE) or soluble carbohydrate, crude fibre (CF) and total ash (TA) content of food wastes were considered to utilize as livestock feed. Appropriate feeding strategies were recommended based on the nutrient composition of food wastes.

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RESULTS AND DISCUSSION

The results of analysis of food waste samples are presented in the table. The limitations and advantages of the wastes as feed for livestock are narrated in the table itself.

Nutrient composition of food waste from households, restaurants and markets

The common problem in handling these food and fruit wastes and vegetable by-products is that they contain a large amount of moisture which makes difficult to preserve them, so they have to be preserved either by sun drying or ensiling or fed immediately after collection.

Generally on an average waste from households of vegetable origin on dried basis contains slightly more crude protein (12-14% vs. 9-12%), higher fat (>10%), comparable crude fibre and minerals (<5%) and higher energy (> 4000 kcal ME/kg) when compared to cereal grains. These sources are better replacement for cereal grains as energy supplement for livestock and poultry feeds. To optimize the nutrient composition when fed as a sole concentrate feed to animals, depending on species, age and production level, supplementation of oilcakes as a source of protein (15-20%), de-oiled rice bran as a source of fibre (25-30%) and mineral mixture (2%) as a source of minerals to 50 % of waste on dry matter basis is recommended for better performance of livestock.

Sodium chloride (salt) content of food wastes was higher (2-3%) and hence additional salt is not necessary in the concentrate mixture when food wastes were included in the ration. The nutrient compositions of vegetable wastes were similar to nutrient content of grasses and non legume fodder. Hence usage as feed to pigs and poultry is limited due to its high fibre content.

Nutrient composition of food waste from industries

The biscuit waste and chocolate waste are poor source of protein and mineral. These byproducts are rich source of energy. The bakery waste had comparable protein to cereal grains but rich source of energy and very poor source of mineral. Hence protein, fibre and minerals must be added while fed to animals. Maize extract and soya bean extract had more moisture and hence dry processing is essential to store it for further feeding. These are good replacement for cereal grains in the ration of livestock.

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Distiller's grains are good source of protein, fibre, vitamins but poor source of minerals. Due to higher moisture content, it may be used within short duration period or dried to reduce moisture for easy storage. The nutrient composition dal wastes and tea waste resembles the nutrient composition of concentrate mixture for ruminant livestock and therefore these are medium sources of both protein and energy in the ration.

The ghee residue is good source of energy because of its high fat content and as well protein source. Fruit industry wastes are rich source of carbohydrates and moisture and hence these are mixed with either green fodder or dry fodder up to 10 % to prepare silage or haylage for livestock feeding and are good replacer for molasses due to their fruity odour and sour taste.

.In ruminant animals, hydrogen produced by the fermentation process in the rumen may react to produce either methane or propionate. By increasing the presence of propionate precursors such as the readily degradable carbohydrate sources (food waste, bakery waste, biscuit waste, chocolate waste), more of the hydrogen is used to produce propionate, and thereby methane production is reduced. Propionate precursors can be introduced as a feed or additive for livestock receiving roughages which contains less degradable soluble carbohydrate to increase feed efficiency and to reduce methane synthesis in the rumen. The distiller's grain and moong dal waste except kitchen waste of animal origin may be used as protein supplement for ruminants.

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Table: Nutrient composition of food waste and industrial waste available for livestock feeding

Source	% DM	% Nutrient on DM basis					Remarks
		CP	EE	CF	NFE	TA	
Food waste from households, restaurants and markets							
Kitchen waste-I	31.60	17.50	20.10	3.60	50.90	7.90	More moisture, medium level protein, energy and mineral sources
Kitchen waste-II	23.24	14.10	7.65	8.50	60.66	9.09	
Kitchen waste-III	19.62	18.01	9.35	3.62	59.74	9.28	
Garbage-I	24.60	13.60	11.9	0.82	70.43	3.25	More moisture, low protein and minerals and good source of energy. Composition depends on source of origin.
Garbage-II	21.08	9.68	6.96	3.10	76.39	3.87	
Swill feed	20.34	14.06	16.17	3.33	61.34	5.10	
Hotel waste	25.31	9.22	21.2	4.12	58.43	7.03	
Food waste-I	23.16	14.31	16.68	3.48	60.38	5.15	
Food waste-II	32.30	12.63	8.50	2.89	71.33	4.65	
Vegetable waste	17.80	9.76	9.13	19.5	55.71	5.90	More moisture, low protein and minerals.
Food waste from industries							
Biscuit waste	85.48	4.82	14.17	0.27	79.89	0.85	Poor source of protein and minerals. Rich in energy
Chocolate waste	97.3	4.70	18.6	1.10	74.10	1.5	
Bakery waste	88.0	12.22	1.32	0.18	84.45	1.83	
Soya extract-I	44.42	10.34	4.51	12.6	71.50	0.99	More moisture, Medium source of protein, poor in minerals. Good source of energy
Maize extract-I	26.85	17.89	4.67	6.52	69.93	0.99	
Maize extract-II	30.33	12.59	3.77	12.03	70.10	1.51	
Soya extract-II	18.63	27.81	15.98	15.41	36.84	3.96	Rich in moisture and protein and fibre, medium source of energy. Low in minerals
Distillers grains	24.5	24.18	8.89	17.18	45.77	3.98	
Moong dal waste	91.90	17.67	2.07	18.40	53.18	8.68	Medium source of protein, fibre, energy and minerals
Fruit waste	26.8	3.00	2.34	19.41	68.87	6.38	High moisture, low protein and as source of energy for ensiling roughages
Ghee residue	94.5	24.9	50.4	0.20	16.32	8.18	Good source of protein and energy
Tea waste	92.04	19.28	1.55	10.16	62.04	6.97	

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