

Major Non-Conventional Feed Resources of Livestock

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Abstract - This paper aims to review the major non-conventional feed resources. Limited feed supply and poor quality of the available feeds are the major constraints for optimal livestock productivity in tropical and sub-tropical countries. Non-conventional feed resources generally refer to all those feeds that have not been traditionally used for feeding livestock and are not commercially used in the production of livestock feeds. Some of the potentially available NCFR are rubber seed cake, Sal seed meal, tapioca waste, tea waste, babul seeds, slaughter house byproducts, mango seed kernels, nizger seed cake, karanj cake, guar meal, *Prosopis juliflora* pods and cassava leaf meal, Sea buckthorn leaves, cake and pomace, and animal organic wastes (bovine and poultry excreta) etc. Many of these feed materials are low in energy, protein, minerals and contain high amounts of lignin, silica and other nutritionally incriminating substances. One major constraint in the use of non-conventional feedstuffs is the anti-nutritional factors contained in them. Anti-nutritional factors may be defined as the chemical constituent of a feedstuff, which interferes in the normal digestion, absorption and metabolism of feeds, some of which may have deleterious effects on the animal's digestive system. Some inherent chemical constituents present in different kinds of feedstuffs interfere in the optimum utilization of nutrients and some are also toxic in high concentrations. Although anti-nutritional factors are present in many conventional feeds, these are more common in most of the non-conventional feeds. These anti-nutritional factors need to be removed or inactivated by various procedures before the use of the ingredients in the diet.

Keywords: Feeds, livestock, major, non-conventional, resource

I. INTRODUCTION

Limited feed supply and poor quality of the available feeds are the major constraints for optimal livestock productivity in tropical and sub-tropical countries [1]. These regions are characterized by irregular rainfall and thus livestock have to survive on persistent shortage of feed resources of low nutritional value for most part of the year [17].

Non-conventional feed resources (NCFR) generally refer to all those feeds that have not been traditionally used for feeding livestock and are not commercially used in the production of livestock feeds [9]. Several known examples include palm leaf meals, palm press fiber, cassava foliage, spent brewer's grains, sugar cane bagasse, rubber seed meal and some aquatic plants. Defined in this manner non-conventional feed resources can be looked at as covering a wide diversity of feeds and their nutrient contents. A common feature about feeds is that the traditional feeds of tropical origin tend to be mainly from annual crops and feeds of animal and industrial origin. In this sense, the term NCFR could really be more appropriately referred to as "new feeds", and this term is increasingly being used. Thus the term NCFR has been frequently used to describe sources such as oil palm by-products, single-cell proteins and feed materials derived from agro-industrial by-products of plant and animal origin, poor-quality cellulosic roughages from farm residues and other agro-industrial by-products such as slaughter-house by-products and those from the processing of sugar, cereal grains, citrus fruits and vegetables from the processing of food for human consumption. This list can be extended to include derivatives from chemical or microbial processes as in the production of single cell proteins. However it is sometimes difficult to draw a distinct line between traditional feeds and NCFR. In some countries such as India and Pakistan, what may now be classified as NCFR may in fact be conventional/traditional owing to the fact that it may have been in use as livestock feed over a long time, an example is wheat straw which is very widely used in these two countries, in addition, the availability of NCFR, especially of plant origin, is dependent to a large extent on the type of crops being cultivated and the prevailing degree of application of the crop technology [18]. Therefore, this paper aims to review the major non-conventional feed resources.

II. LITERATURE REVIEW

i. Non-Conventional Feeds

A major gap exists between the demand and supply of concentrates and green and dry fodders for feeding livestock in the world. To overcome this shortage, it is essential to increase the availability of feed and fodder for the different productions and functions of the animals. One of the solutions is also to exploit the use NCFR in the animal feeding system. Some of the potentially available NCFR are rubber seed cake, Sal seed meal, tapioca waste, tea waste, *babul* seeds, slaughter house byproducts, mango seed kernels, *nizger* seed cake, *karanj* cake, *guar* meal, *Prosopis juliflora* pods and cassava leaf meal, Sea buckthorn leaves, cake and pomace, and animal organic wastes (bovine and poultry excreta) etc. Many of these feed materials are low in energy, protein, minerals and contain high amounts of lignin, silica and other nutritionally incriminating substances. The main constraints to the use of non-conventional feed resources are collection, dehydration for high moisture content and

detoxification processes. Processing technologies that are economic and practical are urgently required. Some of the materials like Sal seed meal; neem seed cake, mahua seed cake, and galas seed cake are available in large quantities but due to the presence of potent toxic substances, have limited value as animal feeds. Many of the forest tree seeds contain 15-35% oil and are used for the extraction of oil, after which the cake is valuable as animal feeds. Animal organic wastes such as dung and poultry excreta are also potentially available as a part of animal feeds.

During the dry periods, poor quality feeds and inadequate nutrition has been reported to be one of the most important constraints for livestock production Ethiopia across all ecological zones. In addition, degradation of lands due to uncontrolled and excessive use of communal grazing lands of undulated topography in the highlands and erratic rainfall in semi-arid areas has further reduced the availability of feed resources [17].

Essential or indispensable amino acids (EAAs) cannot be synthesised by fish and often remain inadequate but are needed for growth and tissue development [19]. Fishmeal is known to contain complete EAA profile that is needed to meet the protein requirement of most fish species. Since fishmeal is expensive as a feed ingredient, the use of non-conventional feedstuffs has been reported with good growth and better cost benefit values.

The utilization of non-conventional feedstuffs of plant origin had been limited as a result of the presence of alkaloids, glycosides, oxalic acids, phytates, protease inhibitors, haematoglutinin, saponin, momosine, cyanoglycosides, linamarin to mention a few despite their nutrient values and low cost implications [11] [16]. These anti-nutritional factors negate growth and other physiological activities at higher inclusion levels [13].

NCFRs are credited for being non competitive in terms of human consumption, very cheap to purchase, by-products or waste products from agriculture, farm made feeds and processing industries and are able to serve as a form of waste management in enhancing good sanitation. These include all types of feedstuffs from animal (silkworm, maggot, termite, grub, earthworm, snail, tadpoles etc.), plant wastes (jack bean, cottonseed meal, soybean meal, cajanus, chaya, duckweed, maize bran, rice bran, palm kernel cake, groundnut cake, brewers waste etc.) and wastes from animal sources and processing of food for human consumption such as animal dung, offal, visceral, feathers, fish silage, bone, blood) [3] [14] [6] [12]. All these can be recycled to improve their value if there are economically justifiable and technological means for converting them into useable products.

ii. Sources of non-conventional feeds

The generation of non-conventional feed resources is essentially from agriculture and various agro based industries and is a function of many factors. Such factors include the quantity and quality of the materials produced which is dependent on the prevailing agro-climatic conditions and cropping patterns, the type of raw materials, the production process, the production rate, the type of inputs used, the regulations affecting product quality use and the constraints imposed upon effluent discharge [2].

Most non-conventional resources are usually regarded as waste which is an inaccurate description of this group of materials. They can be regarded as waste when they have not been shown to have economic value. When such waste can be utilized and can be converted by livestock to valuable products which are beneficial to man, they become new feed materials of importance. In addition, they can be used to supplement the existing limited feed resources. Recycling, reprocessing and utilization of all or a portion of the wastes, offers the possibility of returning these materials to beneficial use as opposed to the traditional methods of disposal and relocation of the same residues.

Defined in this manner the NCFR embrace a wide diversity of feeds and its nutrients contents. A feature about feeds is that the traditional feeds of tropical origin tend to be mainly from annual crops whereas, the NCFR include commonly, a variety of feeds from perennial crops and feeds of animal and industrial origin. In this sense, the NCFR could really be more appropriately termed "new feeds", and this term is being increasingly used. Thus, the term NCFR has been frequently used to describe such new sources of feedstuffs as palm oil mill effluent and palm press fiber (oil palm by-products), single cell proteins, and feed material derived from agro-industrial by-products of plant and animal origin, poor-quality cellulosic roughages from farm residues such as stubbles, haulms, vines and from other agro-industrial by-products such as slaughter-house by-products and those from the processing of sugar, cereal grains, citrus fruits and vegetables from the processing of food for human consumption.

III. CHARACTERISTICS OF NON-CONVENTIONAL FEEDS

According to reports [5], non-conventional feed resources like conventional feed resources have several characteristics worthy of note.

- They are the end products of production processes and consumption that have not been used, recycled or salvaged.
- They are mostly of organic origin and can be obtained either in a solid, slurry or liquid form.
- The economic value of these non-conventional feed resources is usually less than the cost of their collection and transformation for use and consequently, they are discharged as wastes.
- Feed crops which generate valuable NCFR are usually excellent sources of fermentable nutrient molecules such as cassava and sweet potato and this is an advantage to livestock especially ruminants due to their ability to utilize inorganic nitrogen and non-protein nitrogenous sources.
- Fruit wastes such as banana rejects and pineapple pulp by comparison have sugars which are energetically beneficial.
- The majority of feeds of crop origin are bulky poor-quality cellulosic roughages with high crude fiber and low nitrogenous content which are suitable for feeding mostly ruminants.
- Some of these feeds contain anti-nutritional components which have deleterious effects on the animals and not enough is known about the nature of the activity of these components and ways of alleviating their effects.
- Non-conventional feed resources have considerable potential as feed materials and for some; their value can be increased if there were economically viable technological means for converting them into some useable products.

- Substantial information is required on chemical composition, nutritive value, the presence of anti-nutritional components and value in feeding systems.

IV. ANTI- NUTRITIONAL FACTORS

One major constraint in the use of non-conventional feedstuffs is the anti-nutritional factors contained in them. Anti-nutritional factors may be defined as the chemical constituent of a feedstuff, which interferes in the normal digestion, absorption and metabolism of feeds, some of which may have deleterious effects on the animal's digestive system. Some inherent chemical constituents present in different kinds of feedstuffs interfere in the optimum utilization of nutrients and some are also toxic in high concentrations. Although anti-nutritional factors are present in many conventional feeds, these are more common in most of the non-conventional feeds [15].

These anti-nutritional factors need to be removed or inactivated by various procedures before the use of the ingredients in the diet. Many seeds, which were once used in traditional human and animal diets, have now fallen into disuse as agricultural and nutritional needs are re-assessed [8]. Seeds often contain factors such as lectins, which are deleterious or toxic to animal or man [9]. Seed lectins present major problems as they are resistant to heat treatment and some seeds such as kidney bean, have to be heated for several hours at temperatures above 80°C or boiled for 10-20 minutes to ensure the elimination of their lectin activity. Great caution should therefore be taken in the use of these seeds as dietary materials. This is particularly important since recent studies suggest that long-term exposure to relatively low levels of some anti-nutritional or toxic factors may have deleterious effects on body metabolism [7].

V. CONCLUSION

Non-conventional feed resources (NCFR) generally refer to all those feeds that have not been traditionally used for feeding livestock and are not commercially used in the production of livestock feeds. The shortage of feed resources for livestock and poultry feeding diverted majority of research in the field of animal nutrition to look into all possibilities to overcome this nutritional crisis. The most viable proposition could be the inclusion new NCFR in ration with suitable complete feed technology, so as to utilize the feed resources with maximum efficiency.

A major gap exists between the demand and supply of concentrates and green and dry fodders for feeding livestock in the world. To overcome this shortage, it is essential to increase the availability of feed and fodder for the different productions and functions of the animals. One of the solutions is also to exploit the use NCFR in the animal feeding system. Some of the potentially available NCFR are rubber seed cake, Sal seed meal, tapioca waste, tea waste, *babul* seeds, slaughter house byproducts, mango seed kernels, *nizger* seed cake, *karanj* cake, *guar* meal, *Prosopis juliflora* pods and cassava leaf meal, Sea buckthorn leaves, cake and pomace, and animal organic wastes (bovine and poultry excreta) etc. Many of these feed materials are low in energy, protein, minerals and contain high amounts of lignin, silica and other nutritionally incriminating substances. The main constraints to the use of non-conventional feed resources are collection, dehydration for high moisture content and detoxification processes. Processing technologies that are economic and practical are urgently required.

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VII. REFERENCES

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