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# Review article on use of waste fruits and vegetables peels powder with incorporation of De-Oiled cakes and bran

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## Abstract

India is a leading producer of fruits & vegetables; fruit juice vendors produce large amounts of fruit peels across India. Not only fruit vendors, but also the fruit & vegetables processing industry produce large amounts of solid waste such as (peels, seeds). Currently Eighteen per cent of India's fruit and vegetable production is wasted annually, according to data from the Central Institute of Post-Harvest Engineering and Technology (CIPHET). Peels which are a good source of Carbohydrate, Protein, Fibers etc. Each peels having different nutritional value and good source of minerals and vitamins.

This waste can be utilized for the production of animal feed. As consumption of animal feed, fruits waste is an alternate substrate for the production of feed. The nutrition value, feed management, & guidance on the levels at which these unfamiliar feed resources can be used in the diets of dairy species. To improve the nutritional value of animal feed, fruit peels powder is incorporated with De-oiled cake & Brans. The results will be useful for the design of animal feed.

Livestock are a global asset of significant benefits to the people in the form of food, income, nutrients, employment, and others.

**Keywords:** Animal feed, waste utilization, Fruits peels powder

**Introduction**

India is the world's second largest producer of fruits and vegetables. It is well-known that huge quantities of lignocellulosic biomass are produced every year during cultivation, harvesting, processing and consumption of agricultural products. This biomass generated can be utilized for different applications such as (i) a low-cost bio sorbent, (ii) feedstock for producing biochemical and biofuels, and (iii) a substrate for production of various enzymes and metabolites. Besides, using these residues to produce value-added products will eliminate them from the environment and avoid solid-waste handling [1].

Banana (Musa sp., family Musaceae) develops in hanging clusters, with nearly 20 fruits/hand (tier) and 3–20 hands in each cluster. The average fruit weight is about 125 g with nearly 25% dry matter and 75% water. Banana peel (BP) comprises about 30–40% (w/w) of fresh banana. The composition of ripe BP is as follows: crude protein (8%), ether extract (6.2%), soluble sugars (13.8%) and total phenolic compounds (4.8%). The main components of BP are cellulose, hemicellulose, chlorophyll, pectin and other low-molecular weight compounds. Banana is the second largest produced fruit, accounting for 16% of the total fruit production worldwide. India is the largest producer of banana, accounting for 27% of the world's total banana production. Orange (Citrus sinesis, family Rutaceae) contains orange peel (OP) which is an important by product. OP comprises cellulose, hemicellulose, lignin, pectin (galacturonic acid), chlorophyll pigments and other low-molecular weight compounds (e.g., limonene). Traditionally, OP is treated to obtain volatile and non-volatile fractions of essential oils and flavouring compounds. In addition, OP has been reported to have germicidal, antioxidant, and anticarcinogenic properties, and thus may be effective against breast and colon cancers, skin inflammation, muscle pain, stomach upset and ringworm.

Livestock, as part of global ecological and food production systems, are a key commodity for human well-being. Their importance in the provisioning of food, incomes, employment, nutrients and risk insurance to mankind is widely recognized.

Livestock systems, especially in developing countries, are changing rapidly in response to a variety of drivers. Globally, the human population is expected to increase from around 6.5 billion today to 8.2 billion by 2050.

More than 1 billion of this increase will occur in Africa. Rapid urbanization and increases in income are expected to continue in developing countries, and as a consequence the global demand for livestock products will continue to increase significantly in the coming decades. Livestock systems have often been the subject of substantial public debate, because in the process of providing societal benefits, some systems use large quantities of natural resources and also emit significant amounts of greenhouse gases. Considering that the

demand for meat and milk is increasing, and that livestock is only one of many sectors that will need to grow to satisfy human demands, more trade-offs in the use of natural resources can be expected. This report examines the key global trade-offs arising between livestock rearing, human well-being and environmental sustainability. These trade-offs not only have global consequences but also have local impacts on livelihoods and the environment. We use this information to formulate research questions that require significant attention to develop options for ensuring that livestock can continue to provide important livelihood benefits while improving the sustainability of agroecosystems.

**Different Fruits Peels Solid Waste**

**Pomegranate Waste**

After extraction of pomegranate (Punica granatum) juice (Table 1) for human utilization, the leftover material is called pomegranate waste. It contains 8.97% protein, 19.41% fiber, 0.85% fat, 4.22% ash, 6.95% moisture, 59.60% total carbohydrates, 11.2% cellulose, 7.0% hemicellulose, 6.70% pectin, 11.52% lignin and many more. It concluded that pomegranate peel extracts can be used in various fields for being rich in natural antioxidants that have a medicinal and therapeutic impact, and did not show any adverse effects in the vital body organs and biochemical parameters of the blood.

**Papaya Waste**

India leads the world in papaya (Carica papaya) production with an annual output of about 3 million tonnes. It is used in food industries for the production of jams, jellies, etc. As a result, it generates huge amounts of papaya peel (PP) and seed products, which are typically considered a waste, and thus discarded. It contains 8.04% moisture, 7.56% ash, 2.27% fat, 5.31% protein, 64.65% carbohydrates, 3.61 mg/100g sodium, 79.34 mg/100g potassium, the significant high content of potassium signifies that if peel is taken, it can regulate the body fluids and maintain normal blood pressure.

**Sweet Lime Waste**

Mosambi (Citrus limetta) is a species of citrus that belongs to the family Rutaceae. It is extremely valued throughout the world for its exceptional nutritional and medicinal properties. Mosambi fruits are mostly used by juice processing industries, whereas the peel and seeds are usually thrown as waste. Every year a very large number of by-products such as peels and seeds are generated every year. It contains 11.2% moisture, 15.2% crude fiber (CF), 5.7% ash, 9.5% crude protein (CP), 6.7% Fat, 95.98% limonene, 1.79% camphene and many more.

**Pineapple Waste**

Pineapple (Ananas comosus) is one of the main agricultural commodities from Subang, West Java, Indonesia. The impact of pineapple food industries, pineapple peel waste (PPW) is important for waste management which urgently need to be overcome. It contains 6.78% moisture, 6.93% protein, 1.17% fat, 4.57% ash, 4.92% crude fiber (CF), 75.63% carbohydrates, catechin (58.51 mg/100 g dry extracts), ferulic acid (19.50 mg/100 g), 11.2% cellulose, 7.0% hemicellulose, and many more. Results of polyphenolics interactions indicated no synergistic effects. Pineapple wastage can replace the roughage portion in the diet partly or completely and is highly palatable and digestible (73-75% OM digestibility) in cattle. Use of pineapple wastes in total mixed rations for dairy cows was more low cost.

**Orange Waste**

Orange (Citrus sinensis, family Rutaceae) contains orange peel (OP) which is an important by product. It contains 3.16% moisture (db), 8.12% protein, 3.17% ash, 0.80% fat, 0.105% vitamins C, 5.67 PH, 17.5% cellulose, 6.4% lignin, and many more. OP is treated to obtain volatile and nonvolatile fractions of essential oils and flavoring compounds, in addition, OP has been reported to have germicidal, antioxidant, and anticarcinogenic properties, and thus may be effective against breast and colon cancers, skin inflammation, muscle pain, stomach upset and ringworm.

**Animal Feed**

Livestock systems occupy 45% of the global surface area [4] and are a significant global asset with a value of at least $1.4 trillion. Livestock industries are also a significant source of livelihoods globally. They are organized in long market chains that employ at least 1.3 billion people globally and directly support the livelihoods of 600 million poor smallholder farmers in the developing world [1, 2]. Keeping livestock is an important risk reduction strategy for vulnerable communities, as animals can act as insurance when required.

From future aspects to meet this demand, fruit peels powder as an ingredient (minor 40%) contribute for the developments of livestock, & (major 60%) contribution of De-oiled cake, barns etc. Combining both the nutrition value, minerals & vitamins contents in feed have been increased. It will help the dairy species which have insufficient intake of minerals & vitamins. Our product is cost effective, no harm to the environment, easy to digest by dairy specie.

**Different De-oiled Cake**

**Mustard cake**

India manufactures about 5.7 million metric tons annually. Mustard (Brassica) seed contains about 30-35% oil, 34-39% protein, 3.5% crude fiber (CF), 9.9% ash, and 89.8% dry matter. After extracting the oil from the seed, about 60% of residue is left as cake which is available to the livestock industry. Mustard cake (MOC) has good stability of amino acids and relatively high methionine content. Lower in price than peanut cake and soybean meal, it is used in the feeding of dairy species.

**Soybean cake**

India's soybean (Glycine max) production in MY 2021-22 is expected to be around 10.8 million MT, Soybean meal is the most essential protein source used to feed farm species. It contains 9.17% moisture, 3.23% ash, 30.58% crude protein (CP), 24.60% crude fat (CF), 4.92% crude fiber (CF), 27.50% carbohydrates, 19.68% fatty acids and many more. Its feeding value is unsurpassed by any other plant protein source and it is the standard to which other protein sources are compared.

**Rice Bran**

Rice bran is a by-product of the milling industry and constitutes about 10% total weight of rough rice. Rice bran has a highly nutritious chemical composition, it contains 9.1% moisture, 12.7% protein, 7.3% fiber, 20.2% total oil, 8-18% ash, and 50.7% other. Delivers a powerhouse of health supporting nutrients which is either thrown away or used for low-level animal feed. It has a potential to be used as a food ingredient, since it has good amounts of nutrients. The nutritional composition of rice bran has led to the discovery of varied health benefits. Also rice bran is used for the enrichment of foods, due to its high nutrient content.

**Wheat Bran**

The wheat bran (Tritium aestivum L.) fraction is a by-product of milling and has food and non-food applications. The bran fractions consist of the pericarp, testa, and hyaline and aleurone layers. It contains 12.5-13.1% moisture, 13.1-13.8% protein, 3.7-4.0% lipids, 57.0-58.5% carbohydrates, 20.3-22.5% starch, and many more present. Wheat production for human consumption (total supply minus wheat produced for animal feeding, seed or wasted) was estimated to be 456 million tons in 2007.

Wheat bran is suitable for livestock feeding and very palatable to most classes of animals (Fuller, 2004; Piccioni, 1965). Wheat bran is a bulky feed that can be used to lighten dense, heavy feed mixtures.

**Concluding Remarks**

The increasing consumption of animal products will give rise to a huge demand for animal feed. Meeting this demand will be a challenge, given the scarcity of natural resources such as land and water. Currently approximately 1.3 billion tons of food is lost and wasted annually, and fruit and vegetables (FV) form a substantial part of this loss. Use of FV waste, as animal feed, can contribute to meeting the feed deficiency existing in most developing countries. A concerted research and commercial efforts are needed to realise the full potential of such wastes and by-products for animal agriculture.

Fruits and vegetable processing industries produce huge waste in the form of peels, seeds, liquid, and molasses which are a good source of carbohydrates, proteins, fibers, vitamins, and minerals. This waste can be utilized for the production of bio colors using fermentation. Utilization of this waste not only validates waste disposal problems but also eliminates environmental pollution. The aim of the present work was to extract and optimize environmental factors for production of β-carotene from fruits and vegetable waste (orange, carrot, and papaya peels) using microbial strain.

Taking into account individual variability while feeding a group of sows allows feed cost reductions and therefore improves animal efficiency. This precision feeding strategy is based on 1) nutritional models, which are able to predict daily individual nutrient requirements; 2) automatons, that can deliver individual rations; and 3) new technologies such as sensors which provide real-time information on the animal performance and life conditions that should be integrated into the estimation of requirements.

Although much has been said about livestock's role in achieving food security, in reality, the subject has been only partially addressed and no current document fully covers the topic. This report is an attempt to fill the gap. It expands the 2009 State of Food and Agriculture (SOFA) (FAO, 2009) section which examined the multiple roles played by livestock in the food security of the poor and advocated for support of smallholders, both in responding to opportunities in livestock production and in finding other opportunities within a broad rural development strategy etc. There is a need to focus on waste consumption in huge amounts in the view of future demand.

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