Foods and Nutrition News

Acharya N.G. Ranga Agricultural University

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UTILIZATION OF FRUITS & VEGETABLES PROCESSING WASTE

India is the second major producer of fruits and vegetables in the world and ranks next to Brazil and China respectively for the production of fruits and vegetables. It contributes 10% to world's fruit production and 14% to world vegetable production. Fruits and vegetables are more prone to spoilage than cereals due to their nature and composition. Spoilage occurs at the time of harvesting, handling, storage, transportation, processing and marketing resulting in waste. Efficient management of these wastes can help in preserving vital nutrients of our food & brings down the cost of production of processed foods, besides minimizing pollution hazards. According to India Agricultural Research data book 2004, the losses in fruits & vegetables are to the tune of 30%. Taking estimated production of fruits & vegetables in India as 150 million tons, the total waste generated comes to 50 million tones per annum.

Processing of fruits and vegetables produces two types of waste, a solid waste of peel, stones etc & liquid waste of juices & wash water (Table 1).

Table 1. Residuals from fruit and vegetable processing

Raw	Residuals (1000 tons)	Liquid (million gallons)	Solid (1000 tons)
Apple	1000	5000	320
Citrus	7800	23000	3390
Pineapple	1000	500	450
Tomato	5000	10000	400
White Potato	2400	9600	610

Source *J. Food Science:69,3,CRH 104-107,2004*

In some fruits, the discarded portion can be very high such as in mango and orange (30-50%), banana (20-25%) and pineapple (40-50%). For the processing industry, byproducts utilization helps in recovering value added useful material which increases the profit margin through the added income. The food processing wastes contain principally biodegradable organic matter and improper disposal of the materials can have detrimental effect on the environment. The byproducts of food industry have great unique nutritive value and their utilization becomes important for overall production economics.

The concept of utilization of food waste has assumed great interest within the last few years, as a result of increasingly frequent food shortages and price rise. A variety of processes have been developed for converting the waste materials into biofuels, food ingredients and other valuable byproducts.

In the recent years, attempts have been made to convert these wastes into a variety of valuable products which are of commercial importance and include antioxidants, carbohydrates (sugars, oligo and poly saccharides), fats and oils, pigments, protein and starch. Gravinol, a commercial grape seed extract contains natural antioxidants capable of prevention of oxidative deterioration of lipids, vitamins and other valuable components. Gravinol is more potent than vitamin C and E. Grape seeds contain about 15% oil that can be recovered by mechanical pressing or solvent extraction. Beet and grape residuals are a good source of natural pigments such as anthocyanins that have been commercially extracted for food industrial uses. Pine

apple stems are the raw material for commercial production of bromelin in Taiwan. This proteolytic enzyme has application in meat tenderization and haze prevention in beverages like beer. Cull potatoes and other starchy residuals are potential sources of renewable biomass that can be used for production of lactic acid and poly lactic acid.

In spite of many intervention programs implemented in the country during the last 50 years, the nutritional disorders due to inadequate intake of nutrients is still rampant among vulnerable section of population. By utilizing food wastes which is edible & nutritious, a viable solution to this problem, to some extent, can be achieved.

Waste management is a problem faced by every housewife, industry & nation at large. Hence keeping in view the myriad beneficial effects of utilizing food waste, efforts of food scientists & nutritionists should be directed towards popularization & use of food waste at domestic and industrial level to prevent load on garbageing and diverting it for nutritional purpose.

Considering the excellent Nutritive Value of some of these products, it is worth encouraging the use of food waste for culinary & industrial purpose.

Utilization of fruit waste for product development

Watermelon rind

The outer rind portion of water melon fruit which is usually discarded was used for development of preserved products giving value addition to the water melon fruit waste. Two types of pickles, vadiyams, cheese and tutti-frutti were developed and tested for acceptability. Products were subjected to sensory evaluation by trained panelists & it was observed that mean scores for all attributes were high. The products were stored for one month at room temperature and evaluated for sensory attributes. No change in mean scores for all attributes was observed after storage for one month which indicates that certain fruit wastes can be exploited for production of commercial value products.

Fig. 1. Watermelon rind

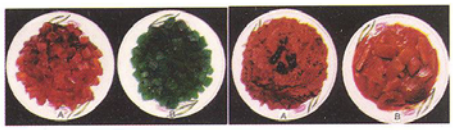

Fig 2. Watermelon rind candy and pickles

P. Madhuri & Kamini Devi (1999)

Mango peel

The waste obtained during manufacture of mango products comprises mostly stones, peel and fibrous pulp accounting to 40 to 60% of mangoes depending on the variety. The peel which itself constitutes 15% of fruit by weight is a source of high quality pectin. An attempt was made to utilize mango peel for human consumption by its incorporation into certain products. Mango peel powder was prepared from blanched and sun dried peel.

Two aceeptable recipes namely noodles and biscuits were developed by incorporating mango peel powder at 10% level to the cereal flour. The effect of feeding these products and control recipes was tested on healthy subjects whose fasting plasma glucose was in the range of 70-110 mg/dl. The mean percentage peak rise, area under plasma glucose curve & glycaemic index of recipes were calculated based on plasma glucose response of each subject. Though not statistically significant, the test recipes gave lower mean percentage peak rise area under glucose curve & glycemic index as compared to the respective control recipes. Among the two test recipes, the decrease in glycemic index was more prominent with experimental noodles (90.65 ± 15.11) than with biscuits (80.97 ± 25.7). Hence the mango peel powder obtained from industrial waste can be recommended for effective utilization as a fibre source for diabeties.

A. Surekha & K. Krishna Kumari (1998)

The suggested daily intake of dietary fibre is 20 to 35 g/day from food sources but due to various processing methods, the fibre requirement is never met thereby leading to increased demand for high fibre products & fibre concentrates. In this context, a high

fibre mix was developed using dietary source such as fenugreek seeds,mango peel and wheat bran in the ratio of 20:40:40. The high fibre mix was incorporated into two recipes i.e missiroti and dhokla and one beverage preparation at 20% levels for testing their hypoglycemic effect. Consumption of the test recipes resulted in significantly lower ($P<0.05$) plasma glucose levels in both normal and NIDDM patients when compared to consumption of control recipes. Beverage showed the lowest glycemic response among the subjects,dhokla depicted the intermediate and missiroti the highest glycemic response. This study made an attempt to develop a high fibre mix using waste dietary sources such as mango peel and wheat bran.

S. Sangeet & V. Vimala (1998)

Mango processing waste

Mango processing wastes such as peel wash & stone wash from two cultivars *cvs*. Neelum and Totapuri were used for the preparation of vinegar. These wastes were homogenized separately and used for 12 treatments viz., T1 (mango peel), T2 (mango peel + ginger). T3 (mango peel + cinnamon), T4 (mango peel + artificial mango flavor), T5 (mango stone), T6 (mango stone + ginger), T7 (mango stone + cinnamon), T8 (mango stone + artificial mango flavor),T9 (mango peel + mango stone), T10 (mango peel + mango stone + ginger),T11 (mango peel + mango stone + cinnamon), T12 (mango peel + mango stone + artificial mango flavor). All these treatments were inoculated with wine yeast for the production of wine after adjusting TSS of 8° Brix for *cv* Neelum and 10° Brix for *cv* Totapuri. After completion of fermentation, the prepared wine contained 3.3 – 3.5 per cent alcohol and these were fortified with alcohol to get 5 per cent alcohol. The acetifying bacteria in the form of mother vinegar were added to wine in all treatments at 1:3 for the production of vinegar. Spices like ginger (100g/L), cinnamon (100g/L) and artificial mango flavor (1g/L) were added to the vinegar produced from all these treatments with two varieties to reduce non enzymatic browning and flavor loss during storage and for value addition to vinegar. The flavoured vinegar prepared from peel + cinnamon in case of *cv*. Neelum and peel + stone wash + ginger, peel wash + cinnamon in case of *cv*. Totapuri were found to be qualitatively good and economically feasible.

V. Srilakshmi & K. Malla Reddy (2004)

Utilization of green leafy vegetable waste

Green leafy vegetables occupy an important place among the food crops as they provide vitamins & minerals in abundance. They are valuable source of vitamins like β-carotene, riboflavin, vitamin C, folic acid & minerals like calcium and iron. An attempt was made to utilize vegetable waste like radish & cauliflower leaves for product preparation as they are a good source of β-carotene, iron & calcium.

Cauliflower and radish leaves were incorporated at 70% level in preparations like dhal, missiroti, vada, bajji etc., and at 100% level in pugath and karampodi. Spinach was used in control sample. Cauliflower leaf incorporated recipes were well accepted compared to radish leaf incorporated products and control sample. Dehydrated products were stored for one month and evaluated by the same panel for acceptability. After storage, control sample was more acceptable followed by cauliflower and radish leaf incorporated products. Quality deterioration was observed as the storage period increased in all the samples.

M. Jyothisree & Kanwaljith Kaur (2001)

Table 2 Nutritive Value of Cauliflower & radish leaves mg/100g

Food	β Carotenes mg/100g	Iron mg/100g	Calcium mg/100g
Cauliflower leaves	1.5	38.9	615.0
Radish leaves	2.2	16.2	307.5

A. Spinach leaves Missiroti /Control
B. Cauliflower leaves missiroti
C. Radish leaves

Fig 3. Missi Roti

APPOINTMENTS

Dr. (Mrs) P. Rajyalakshmi, Professor and Head, Department of Foods and Nutrition, Director, Centre of Advanced Studies and Programme Director, Food Science and Technology, Post Graduate and Research Centre, Rajendranagar has assumed charge as **Dean, Faculty of Home Science** on 15th February 2007.

Dr. (Mrs) S. Sumathi has taken overcharge as **Professor and Head**, Department of Foods and Nutrition, Director, Centre of Advanced Studies and Programme Director, Food Science and Technology, Post Graduate and Research Centre, Rajendranagar on15th February, 2007.

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