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Utilization of vegetable waste as a source of dietary fibre rich muffins and biscuits for old age

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Abstract
Dietary fibre is that part of plant material in the diet which is resistant to enzymatic digestion which includes cellulose, noncellulosic polysaccharides such as hemicellulose, pectic substances, gums, mucilages and a non-carbohydrate component lignin. Dietary fibre is mainly needed to keep the digestive system healthy. It also contributes to other processes, such as stabilizing glucose and cholesterol levels. The aim of this study to evaluate nutritional properties of cauliflower stem and potato peel powder and its utilization as partially substituted of wheat flour in muffins and biscuits making for old age. Cauliflower stem and leaves are a good source of minerals such as calcium, copper, iron, manganese and potassium. It is a rich source of dietary fibre about 5% of the total fresh weight or about 50% of the total dry weight and it posses both antioxidant and anti-carcinogenic properties. Potato peels is a rich source of fibres, it contains an array of nutritionally and pharmacologically interesting components such as phenolic compound, glycol alkaloids and cell wall polysaccharides, which may be used as natural precursors of steroid hormones and dietary fibre. The nutrient quantity of biscuit and muffins is increased – Protein value from 6.13 to 8.60% and dietary fibre 2.02 to 12.5%, and all the other nutrient contents also enhanced. Biscuits and muffins can be fortified with addition of cauliflower stem powder is a good source of dietary fibre, calcium and phosphorus and potato peels good source of dietary fibre, vit.B_6, k and omega -3 fatty acids. Regardless of lower overall acceptability of dietary fibre rich biscuit compare to muffins.

Keywords: cauliflower stems, potato peels, substitution, antioxidant, anti-carcinogenic, muffins and biscuits

1. Introduction
American Association of Cereal Chemists (AACC) in 2000 defined dietary fibre as the edible parts of plant or analogous carbohydrates that are resistant to digestion and absorption in the human small intestine with complete or partial fermentation in the large intestine. Dietary fibre (DF) includes polysaccharides, oligosaccharides, lignin and associated plant substances. The diets rich in fibre such as cereals, nuts, fruits and vegetables have a positive effect on health since their consumption has been related to decreased incidence of several diseases (Devinder Dhingra *et al*, 2011). Dietary fibre plays an important role in human health; they act as a protective agent against cardiovascular diseases, diverticulitis, constipation, irritable colon, colon cancer and diabetes. DF content has become a key component in promoting the belief that diets based on a significant intake of fruit and vegetables has long term benefits. Fibre derived from fruits and vegetables have a considerably higher proportion of soluble dietary fibre, whereas cereal fibres contain more insoluble cellulose and hemicelluloses. (Sharoba *et al*, 2013) [17].
Dietary Fibre can be separated into two basic types based on its properties and effects on the body. These two types are insoluble and soluble fibre. Insoluble fibres, such as cellulose, hemicellulose, and lignin, do not dissolve in water. Insoluble fibres are found in foods such as wheat bran, whole grains, and vegetables. Insoluble fibres absorb water and increase the intestinal bulk, which helps the intestine function properly. Soluble fibres, such as gum and pectin, dissolve in water and are found in beans, oats, barley, some fruits and vegetables. Soluble fibre may play a role in lowering blood cholesterol and in regulating the body's use of sugar. Plant foods are the only source of dietary fibre. The best sources of fibre are whole grain breads and cereals, fruits, vegetables, dried beans and peas. (Vikas Rana *et al*, 2011) [13]. Nawal *et al*. (2008) investigate the extraction and identification of antioxidant compounds in some vegetable and fruit wastes. New by-products applications should be investigated to have a positive environmental impact or to turn them into useful products. Accordingly, the functional properties of some peel components such as, pectin, flavonoids, carotenoids, limonene and polymethoxy flavones should be considered (Li *et al*., 2007). Bakery products are widely consumed and are becoming a major component of the international food market (Kotsianis *et al*., 2002). Cake is one of the most common bakery products consumed by people in the world. Now days, cake manufacturers face a major problem of lipid oxidation which limits the shelf life of their products (Lean and Mohamed, 1999) [6]. Bakery products such as cakes particularly those with high lipid content tend to become rancid after prolonged storage owing to the oxidation of polyunsaturated fatty acids (Ray and Husain, 2002; Smith *et al*., 2004) [14]. Special attention has given to the use of natural

antioxidant because of the world wide trend to avoid or minimize synthetic food additives (Kingsand Berger, 2001) [4]. In the recent years, an upward trend in bakery products with increased nutritional value, such as fibre-enriched suggests that products, has been observed. In order to increase the fibre content in cakes and muffins, several raw materials such as bran and outer layers of cereals (Polizzoto *et al*.,1983; Hudson *et al*., 1992) [11], legume outer layer (Kaack and Pedersen, 2005) [2], and processing by-products of apple (Sudha *et al*., 2007; Rupa singhe *et al*., 2008) [20, 16] have been used. The quality of cake depends on the quantity and quality of ingredient especially the flour used in preparation. It was found that mixing two or more of different materials will help to solve the deficiency problem of cereal as low nutritional value (Patel and Rao, 1995) [10].

Cauliflower (*Brassica oleracea var. botrytis)* is a vegetable of family Brassicaceae. Dietary fibre content of cauliflower was estimated to be about 5% of the total fresh weight or about 50% of the total dry weight, consisting of about 40% no starch polysaccharides. Cauliflower has the highest waste index, i.e. ratio of non-edible to edible portion after harvesting, and thus generates a large amount of organic solid waste, which creates a foul odor on decomposition. It is considered as a rich source of dietary fibre and it possesses both antioxidant and anti-carcinogenic properties. Phenolic compounds and vitamin C are the major antioxidants of *brassica* vegetables, due to their high content and high antioxidant activity. Cauliflower leaves are a good source of minerals such as calcium, copper, iron, manganese and potassium.

Potato (*Solanum tuberosum* L) a typical potato processing plant can generate 6–10% potato peel waste (PPW) from the peeling process, and other defect removal, trimming, and cutting processes can generate an additional 15% waste. In general, potato is perceived only as a source of carbohydrates, but is also an excellent source of essential amino acids. They are also rich in vitamin c, b-complex vitamins, and beneficial levels of the minerals iron, calcium, manganese, magnesium and phosphorus. Potato peel consider as a rich source of fibres, since it contains about 9.7 to 68% from its total weight. A small but significant portion of this starch is resistant to digestion by enzymes in the stomach and small intestine, and so reaches the large intestine essentially intact. This resistant starch is considered to have similar physiological effects and health benefits as dietary fibre: it provides bulk, offers protection against colon cancer, improves glucose tolerance and insulin sensitivity, lowers plasma cholesterol and triglyceride concentrations, increases satiety, and possibly even reduces fat storage.

Wheat (*Triticumaestivum*) is the most important stable food crop for more than one third of the world population and butes more calories and proteins to the world diet than any other cereal crops. It is nutritious, easy to store and transport and can be processed into various types of food. Wheat is considered a good source of protein, minerals, B-group vitamins and dietary fibre although the environmental conditions can affect nutritional composition of wheat grains with its essential coating of bran, vitamins and minerals; it is an excellent health-building food. Wheat flour is used to prepare bread, produce biscuits, confectionary products, noodles and vital wheat gluten or seitan (P.Kumar *et al* 2011) [5].

Almond (*Prunusamygdaluvar. Dulcis*) nuts are rich in dietary fibre, vitamins, and minerals and packed with numerous health promoting phyto-chemicals; the kind of well-balanced food ensure protection against diseases and cancers.

Coconut (*cocos nucifera* L.) is a complete food rich in calories, vitamins, and minerals. It is also a very good source of B-complex vitamins such as folates, riboflavin, niacin, thiamin, and pyridoxine.

The aim of this work was carried out to evaluate some nutritional properties of fibre obtained from cauliflower stem and potato peels by products, in order to use them as a dietary fibres source in the enrichment of cake and biscuits. The obtained cakes and biscuits were evaluated sensory evaluation and analyze nutritive value

2. Materials and Methods

2.1. Materials

Raw materials: Vegetables used in this study were obtained from Lucknow city in Ashiyana local area. Waste materials used were namely cauliflower (brassicaceae) stems and potato (solanum tuberosum L) peels.

Ingredients: Sugar, unsalted butter, fresh whole egg, baking powder, milk, orange juice, vanilla essence and orange essence and whole wheat flour were purchased local market of Lucknow area.

2.2 Methods

Preparation of cauliflower stems (cs) and potato peels (pp) powder

The cauliflower stems and potato peels were separated from the washed fresh vegetables, cut into small pieces, separated in tray to rinse water, dries at sun light for 4 days, then grind in laboratory grinder to fine power.

Sample Preparation: Two samples are taken for experimental in this study, for utilization of vegetable waste, dietary fibre rich food for old age.

2.3 Dietary fibre rich Biscuit preparation

Ingredients: 200gm whole wheat flour, 25gm potato peels powder, 25gm cauliflower stem powder,125gm castor sugar, 1oogm butter,1/2th tsp baking powder, 1 egg, 1tsp vanilla essence, 1 tsp orange essence, 25gm coconut powder, 25gm, almond powder.

Process

- Combine flour, potato peel flour, cauliflower stem flour, baking powder,
- Butter, sugar, and egg and essence into mixture
- Mix flour with fingertip and add coconut and almond flour. make smooth dough.
- Roll out the dough to the thickness of 1/4 inch. Cut wid a round biscuit cutter.
- Prick wid a fork, arrange in a baking tray and bake at 180 degree c for about 12-15 minute

2.4 Dietary fibre rich muffins preparation-

Ingredients

200 gm. whole wheat flour, 25gm potato peels powder, 25gm

cauliflower stem powder,125gm castor sugar, 1oogm butter, 1/2th tsp baking powder, 1 egg, 1tsp vanilla essence, 1 tsp orange essence, 1/2 cup milk, 1/2 cup fresh orange juice,1 tea spoon grated orange peel,1/4 teaspoon baking soda,1/2 teaspoon salt.

Process

- In a large bowl beat the eggs lightly
- Add the butter and milk and beat until just combined then add the sugar and whisk until you have a smooth batter
- Sift in the flour and salt (and baking powder if using) then mix until just smooth.
- Fill muffin cases two-thirds full and baked at 200°c for18-20 minute, until risen, firm to the touch and a skewer inserted in the middle comes out clean.
- Cool it in fridge.

2.5 Nutritional characteristics

The test was determined at the RFRAC (Regional Food Research Analysis Centre) Lucknow. The energy content was determined by Kilo calories/100gram, protein, fat and dietary fibre content was determined by AOAC method. Carbohydrate content was determined by SP: 18 method.

3. Result and discussion

3.1 Nutrient content in dietary fibre rich biscuit and muffins.

Table 1

Sample	Fat	Protein	Dietary fibre
T1	32.23%	8.60%	2.02%
T2	6.82%	6.13%	12.5%

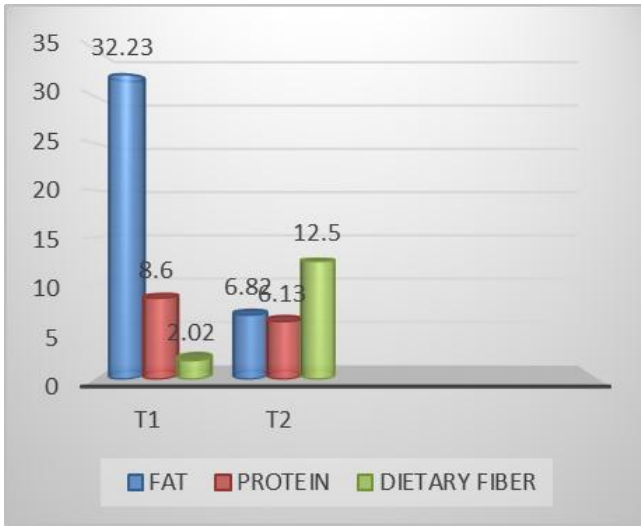

Fig 1: Graphical representation of fat protein and dietary fibre content.

- Nutrient content of prepared product increased after baking. Sample T1 fat content is 32.23% and protein content is 8.6% and dietary fibre content is 2.02%.
- Sample T2 fat content is 6.82%, protein content is 6.13% and dietary fibre is 12.5%.
- The sample T2 is highest content of dietary fibre (12.5%)

3.2 Nutrient content in dietary fibre rich biscuit and muffins.

Table 2

Samples	Energy(Kcal/ 100g)	Carbohydrates
T1	534	52.30%
T2	308	55.59%

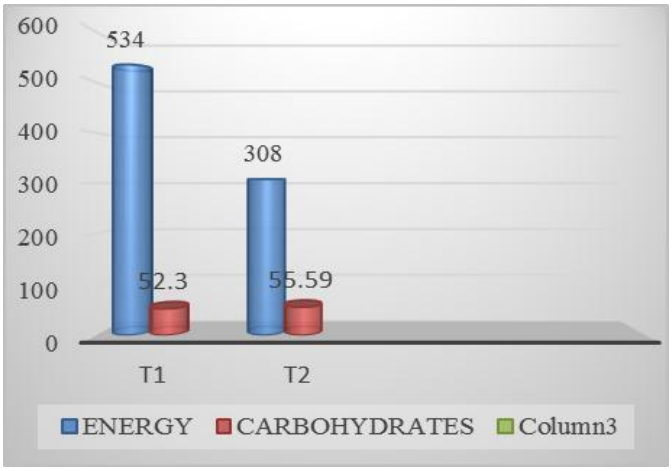

Fig 2: Graphical representation of energy and carbohydrate content

- Sample T1 Calories content is 534Kcal and carbohydrate content is 52.30%.
- Sample T2 Calories content is 308Kcal and carbohydrate content is 55.59%.
- The sample T2 is highest content of carbohydrate is 55.59%.
- The sample T1 is highest content of calories is 534 kilo calories/ 100g.

4. Conclusion

Biscuits and muffins can be fortified with addition of cauliflower stem powder and potato peels powder (CSF is a good source of dietary fibre, calcium and phosphorus) and potato peels good source of dietary fibre, vit.B_6, k and omega -3 fatty acids). Regardless of lower overall acceptability of dietary fibre rich biscuit compare to muffins.

Development and utilization of such dietary fibre rich foods will not only improve the nutritional status of the general population but also helps those suffering from degenerative diseases, constipation and colon irritation.

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