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Incorporation of manila tamarind (*Pithecellobium dulce*) pulverize as a source of antioxidant in Muffin cake

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In recent times it human health has assumed an unprecedently important status. A new diet-health paradigm is evolving which places more emphasis on the positive aspects of diet. Foods have now assumed the status of 'functional' foods, which should be capable of providing additional physiological benefit, such as preventing or delaying onset of chronic diseases, as well as meeting basic nutritional requirements in form of phytochemicals or antioxidants. Epidemiological studies have consistently shown that phytochemicals in fruits and vegetables have attracted a great deal of attention mainly concentrated on their role in preventing diseases caused as a result of oxidative stress. Keeping this view the present investigation was carried out enhance the value of muffin cake by incorporating Manila Tamarind (*Pithecellobium dulce*) as a source of antioxidants. The pulverize was incorporated in 10, 20, 30, 40 and 50 per cent and the developed muffin cake were subjected to sensory analysis and best acceptable muffin cake were nutritionally analyzed.

Key Words : Manila tamarind, Oxidative stress, Phytochemicals, Antioxidants, Phenols

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INTRODUCTION

In recent times it human health has assumed an unprecedently important status. A new diet-health paradigm is evolving which places more emphasis on the positive aspects of diet. Foods have now assumed the status of 'functional' foods, which should be capable of providing additional physiological benefit, such as preventing or delaying onset of chronic diseases, as well as meeting basic nutritional requirements in form of phytochemicals or antioxidants (Kaur *et al.,* 2001). Epidemiological studies show that many phyto-nutrients in fruits and vegetables may be beneficial in protecting the human body against damage by reactive oxygen and nitrogen species (Diplock *et al.,* 1998 and Halliwell *et al.,* 1997). Epidemiological studies have consistently shown that phytochemicals in fruits and vegetables have attracted a great deal of attention mainly concentrated on their role in preventing diseases caused as a result of oxidative stress. Oxidative stress, which releases free oxygen radicals in the body, has been implicated in a number of disorders including cardiovascular malfunction, cataracts, cancers, rheumatism and many other auto-immune diseases besides ageing (Dillard and German, 2000; Prior and Cao, 2000 and Wargovich, 2000).

It is well-known that plants produce these chemicals to protect themselves but recent research demonstrate that they can also protect humans against diseases and also play a role in preservation of foods. There are more than thousand known phytochemicals. Some of the well-known phytochemicals are phenols in fruits and vegetables, lycopene in tomatoes, isoflavones in soy and

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flavanoids in fruits (Nisha and Bhatnagar, 2014). Manila Tamarind (*Pitheceloobium dulce*) belonging to the family of Leguminosae is rich in micronutrients like; vitamin C, phenols with high antioxidant activity; which can help in reducing the risk of heart diseases and cancer. Its high fibre and low carbohydrate can also be helpful in controlling weight or obesity therefore reducing the risk of diabetes and coronary heart diseases. Ponmozhi *et al.* (2011) investigated the anthocyanin extracted from Pithecellobium dulce fruit pericarp and its evaluation for antioxidant activity. The per cent of inhibited value of *Pithecellobium dulce* fruit pericarp extracting from 40 per cent to 66 per cent in different methods of extraction. Whereas in another study Aqueous (AEPD) and hydroalcoholic (HAEPD) extracts for free radical scavenging activity by DPPH was analysed in *Pithecellobium dulce*. At the concentration of 160μg/ml the scavenging effect of AEPD and HAEPD on the DPPH radical was 41.8 per cent, 44.5 per cent, respectively, when compared to the scavenging effect of ascorbic acid at the same concentration (70.35 %) with the IC50 values of 14.89, 11.48, and 6.02 μg /ml, respectively. In the present investigation both the extracts at different doses demonstrated significant DPPH radical scavenging activity in comparison with the standard, indicating their abilities to act as radical scavengers (Megala and Geetha, 2010).

Muffin cakes are the popularly consumed bakery items in the world. Some of the reasons for such wide popularity are their ready to eat nature, affordable cost, good nutritional quality, availability in different tastes and flavours. The aim of the present work was to study the effect of Manila Tamarind Pulverize (MTP) at different replacing levels (10, 20, 30, 40 and 50%) on sensory and antioxidant properties of biscuits were evaluated.

METHODOLOGY

The Manila Tamarind fruits were purchased from the local market of Udaipur. Fruits peeled off, pulp and seeds were separated. The pulp or edible portion was then subjected to sun drying. The dried pulp was then grounded and sieved through a sieved through 30 mesh size to obtain pulverize.

Preparation of muffin cake:

Muffin cakes were prepared by replacing refined wheat flour through incorporation of Manila Tamarind Pulverize in 10, 20, 30, 40 and 50 per cent according to the method given in Fig. A. After baking, muffin cakes were left to cool at room temperature and demoulded and packed in airtight containers for further analysis.

Sensory analysis :

The prepared recipes would be evaluated for their organoleptic characteristics, appearance, colour, flavour, texture, taste and overall acceptability by a panel of ten judges on nine point hedonic rating scale.

Nutrient analysis :

Prepared muffin cakes were analysed for proximate composition (moisture, protein, fat, fibre and ash) using standardized techniques (NIN, 2003). The carbohydrate content of sample will be calculated by difference method. Energy content of the sample will be determined by using fuel value of protein, fat and carbohydrate.

Bioactive compound determination :

Manila Tamarind pulverize was analysed for antioxidant activity via vitamin C was determined by the satandardized procedure given by Jain and Mogra (2006). Total phenol which was determined according to Folin-Ciocalteu's reagent method (Mc Donald *et al*., 2001). And the free radical scavenging activity will be measured by using 2, 2- diphenyl-1-picryl-hydrazyl (DPPH) by the method described by Tadhani *et al.* (2007).

Statistical analysis:

All data were expressed as mean values ± SD. Statistical analysis was performed using one way analysis of variance (ANOVA) with $p < 0.05$ being considered statistically significant. All the analysis was carried out in triplicate.

OBSERVATIONS AND ASSESSMENT

According to Karva and Bharti (2008) sensory attributes are the major criteria after cooking for the acceptability of the products. However nutritious a product is, unless accepted it does not serve the purpose. Quality is the main criterion on which the acceptability of any product depends (Anonymous, 1995). Quality is the degree of excellence and is a composite character determining the acceptability of a product (Srilakshmi, 2007). Food quality detectable by our senses can be broken down into the main categories *viz.*, appearance, colour, flavour, texture and taste. Hence, the developed products were evaluated by a panel of ten judges on nine point hedonic rating scale. Among the five treatments and the control proposed, for each of the six ready to eat food products, the most acceptable two treatments (including control) with maximum organoleptic qualities were selected.

Sensory evaluation:

The colour of the Muffin Cake prepared by incorporating manila Tamarind pulverize in different ratios scored a maximum of 8.12 for control, and a maximum of 7.96 for muffin cake with R_1 treatment or 40% incorporation of Manila tamarind pulverize (Table 1). The score obtained for texture ranged from 8.05 to 7.40.

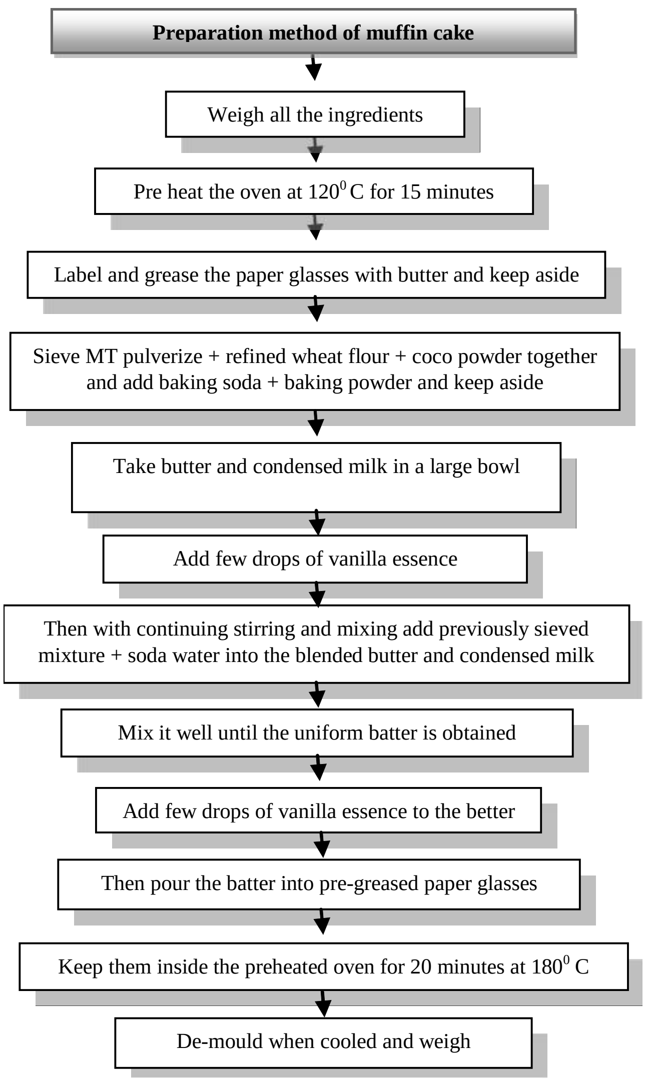

Fig. A : Preparation of muffin cake

Appearance obtained a high score of 8.29 to 7.70. Maximum score of flavour and taste was obtained by control followed by R_1 (40%) **i.e.** 8.29 and 8.16, 8.22 and 8.20, respectively. The scores for over all acceptability of Manila Tamarind incorporated muffin cake ranged between 7.80 and 8.27. On the basis of statistical analysis significant difference was observed in all the organoleptic characteristics at 5% level of significance and the muffin cake with R_1 treatment or 40% incorporation were highly acceptable after control. Nisha and Bhatnagar (2014) reported 20% acceptability of biscuits developed by incorporation of mango peel powder. Ferreira *et al.* (2013) also incorporated flour prepared from residue of fruits and vegetables in preparations of biscuits at 20% replacement of wheat flour. Zaker *et al.* (2012) developed cookies by incorporation of orange peel powder at 5, 10, 15 and 20%. They reported that the cookies with 10% incorporation of orange peel powder were highly acceptable among all. Papaya, guava and pear powder were utilized in baked products at 5, 10 and 15%. The mean scores for overall acceptability of products showed that fruit powders upto 10% can be used for making bread and cake (Negi, 2003). Baked products were developed by incorporating bael powder at 10% and 20% levels. Furthermore Johari and Kawatra (2016) also reported incorporation of fruit powders (apple, pear and plum) as fat-replacers in baked goods namely cookies, brownies and muffins.

Nutrient analysis:

The moisture content of muffin cake was found to be higher in control than R_1 *i.e.* 10.24 and 9.40 per cent respectively. The protein content was also found to be higher in Control than in R_1 *i.e.* 17.82 and 15.30 respectively; whereas the fat content was found to be similar in both control and R_1. It is because Manila Tamarind fruit contains negligible amounts of fat. The content of ash was recorded higher in R_1 than control *i.e.* 1.42 and 0.59, respectively. The crude fibre content was higher in R_1 in comparison to control (Table 2). The carbohydrate and energy content was found to be higher in control than R_1. The reason being higher protein content of control muffin cake. The findings of bioactive components revealed that there was no vitamin C, Phenol and antioxidant activity was found in muffin cake prepared without any incorporation of Manila Tamarind pulverize.

Even though there was some decrease in protein

Table 1: Mean acceptability scores of muffin cake prepared from Manila Tamarind pulverize

% replacement	Colour	Texture	Appearance	Flavour	Taste	Overall acceptability
	Mean±SD	Mean±SD	Mean±SD	Mean±SD	Mean±SD	Mean±SD
Control	8.12±0.72	8.05±0.18	8.29±0.68	8.29±0.31	8.22±0.01	8.27±0.71
R_1 (10%)	7.30±0.46	8.10±0.54	8.00±0.52	8.06±0.52	7.93±0.44	7.80±0.40
R_2 (20%)	7.53±0.50	7.43±0.56	7.76±0.43	7.86±0.43	7.60±0.49	7.86±0.68
R_1 (30%)	7.40±0.77	7.63±0.55	8.10±0.48	7.80±0.55	7.63±0.49	7.90±0.66
R_1 (40%)	7.96±0.41	8.00±0.64	8.23±0.67	8.16±0.53	8.20±0.66	8.10±0.54
R_1 (50%)	7.06±0.44	7.40±0.77	7.70±0.46	6.76±0.50	6.60±0.56	6.93±0.69

All the Values in the columns were differ significantly at 5% level of significance

Table 2 : Nutrient and bioactive constituents of muffin cake prepared from Manila Tamarind pulverize

Nutrients (g/100g)	Control	R_1 (40% incorporation)
	Mean±SD	Mean±SD
Moisture	9.40±0.23	10.24±0.12
Protein	17.82±0.19	15.30±0.37
Fat	25.52±0.58	25.52±0.58
Ash	0.59±0.91	1.42±0.14
Crude fibre	0.30±0.17	1.82±0.11
Carbohydrate	46.37±0.82	45.68±0.60
Energy (kcal)	486.48±1.40	471.17±1.52
Vitamin C	ND	15.73+0.71
Total polyphenol (mgGAE/100)	ND	190.12+1.48
Total antioxidant (mgTE/100)	ND	57.47+0.50

ND= Not detected

content but there was presence of vitamin C, phenols and antioxidant were found in muffin cake prepared with 40% incorporation of Manila Tamarind pulverize.

Conclusion :

Based on the above results, it could be concluded that Manila Tamarind Pulverize could be used as a potential source of phytochemicals in ready to eat products, baby, weaning foods etc. In addition, it could be further processed into therapeutic functional food products also.

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