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Development of Low calorie cupcakes using Coconut Milk

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Abstract
The present study focussed on reduction of calories by incorporation of Coconut milk as varying ingredient replacing butter in cupcake to enhance the nutritive value and evaluate decrease in consumption of calories and making it fibre rich by using Organic Whole wheat Flour. Coconut milk is highly nutritious rich in vitamins and minerals. Studies done on development of a cupcake using coconut milk replacing butter in proportions of 25%, 50%, 75% and 100% to lower the calories of the product. Formulation 1: Cupcakes developed using refined flour (Maida) as varying ingredient of coconut milk. Formulation 2: Cupcakes developed using Organic Whole wheat flour (Atta) and coconut milk as varying ingredient replacing butter. Sensory evaluation of the samples was carried out using 9 point Hedonic scale for various attributes namely color, texture, taste, flavor and overall acceptability.

Keywords: cupcakes, coconut milk, organic whole wheat flour, baking, low calorie

1. Introduction
Globally, over two billion children and Adults suffer from health problems related to being over-weight or Obese and an increasing percentage of people die from, these health conditions. Prevalence of diabetes in adults in India is about 69.1million in 2015. In order to overcome these health hazards consumption of low calorie foods with highly nutritive value should replace the High Calorie foods on the shelves of the Market globally. Thus present study focused on reduction of calories by incorporation of Coconut milk as varying ingredient replacing butter in cupcake to enhance the nutritive value and evaluate decrease in consumption of calories and simultaneously adding good fat and making it fibre rich by using Organic Whole wheat Flour. Cup Cake is one of baked products, which generally contains butter, sugar, wheat flour and egg. It is composed of 20-50% fat and 10-30% sugar depending on types of cakes. Physical, Textural and Sensory Characteristics of Gluten Free Muffins Prepared with Teff Flour was examined the effects of substitution of rice flour (control) with teff flour at 25%, 50%, 75% and 100% on the physical, textural, and sensory characteristics of gluten free muffins. A decrease in height of baked muffins was observed with an increase in the percentage of teff flour (Tess M *et al***.** 2015) Study of antioxidant activity and physicochemical properties of coconut milk. They studied the physicochemical properties and antioxidant activity based on TPC, FRAP, ORAC and DPPH of Malaysian coconut milk. Results of the study showed that coconut milk samples exhibited a significantly different ($P<0.05$) antioxidant activity in comparison of goat and cow's milk for all the assays except DPPH. (Saif *et al*, 2015). In this study they had replaced sucrose with sucralose in the manufacture of sponge cake and yoghurt cake. These cakes were chosen because their ingredients include little fat so they were of low calories. Such functional cakes were evaluated chemically, physically and sensorial (Hussein *et al*., 2015) [5].

Utilization of potato processing residues to produce a low caloric cupcake in present study was Targeted the functional properties of wheat flour (WF 72%) and dried potato peel varieties [Hermus (PPH) and Russet (PPR)] were carried out. Consequently, WF was partially substituted by both potato peels (PP) at 5% - 20% to prepare mixtures for cupcake making. Physico-Chemical, Organoleptical and Microbiological Characteristics of Substituted Cupcake by Potato Processing Residues by (Ibrahim *et al*, 2015) [7] The assessment of the structure components for innovative cupcake formulas integration with guava processing residues was targeted. Wheat flour was partially substituted both guava seeds and pomaces at 5-20% to prepare cupcake mixtures. The structure's ingredients were harmonically examined. Rheological parameters of among formulas were assayed using Mixolab device, Influencing of Guava Processing Residues Incorporation on Cupcake Characterization by (Khalifa *et al*, 2016) [7] Generally fat reduction is the primary target prior to the replacement of sucrose in production of low-calorie foods. The physico chemical characteristics and nutritional quality characteristics along with microbial quality, the shelf life of the superior products at ambient conditions were studied. Reduced-fat and reduced-calorie baked products offer an alternative for consumers who must restrict calorie intake.

2. Materials and Methods

2.1 Procurement of Raw Materials

Refined wheat flour (Maida), sugar, butter, egg, coconut were purchased from local market Organic whole wheat flour was procured from 24 Mantra factory outlet. Baking powder was chosen with the brand name weikfeild from supermarket factory outlet.

2.2 Steps for extraction of coconut milk

Coconut meal
↓
Addition of water

Fig 1: Steps for extraction of coconut milk

2.3 Steps involved in cupcake preparation

Weighing all ingredients
↓
Mixing (15-20 min)
↓
Filling in moulds
↓
Baking (At 180℃ for 40min)
↓
Cooling (at room temp. for 1-2 hrs)
↓
Packing (air tight polythene pouches)
↓
Storage

Fig 2: Steps involved in cupcake preparation

2.4 Formulation -1(refined wheat flour)

Control sample is made of 100%butter whereas the developed formulations were of in the combination of butter and coconut milk. In Formulation -1 the major variation is the flour, here the flour used was Maida (refined wheat flour). Samples were coded as S (control)

Butter: coconut milk -75:25 named as S1 of butter and coconut milk. In Formulation -1 the major variation is the flour, here the flour used was

a) Butter :coconut milk -75:25 named as S1
b) Butter :coconut milk - 50:50 named as S2
c) Butter :coconut milk - 25:75 named as S3
d) Butter :coconut milk - 0:100 named as S4

2.5 Formulation -2(organic whole wheat flour)

Coconut is subjected to processing to yield fresh coconut milk. It involves several steps for extraction

2.6 Basic recipe of cupcake

a) Maida (Refined wheat flour) – 100gm
b) Butter -100gm
c) Egg -100gm
d) Sugar -100gm
e) Baking powder (as raising agent)

Control sample is made of 100%butter whereas the developed formulations were of in the combination of butter and coconut milk. In Formulation -2 the major variation is the flour, here the flour used was Organic whole wheat flour. Samples were coded as O (control)

a) Butter :coconut milk -75:25 named as O1
b) Butter :coconut milk - 50:50 named as O2
c) Butter :coconut milk - 25:75 named as O3
d) Butter :coconut milk - 0:100 named as O4

3. Results and Discussion

3.1 Formulation-1: The organoleptic characteristics of the cupcakes are evaluated by the sensory evaluation. Results could be seen that all the panelists showed higher visual appearance for control sample (S) and when compared with the trial samples resulted the sample (S1) showed the note taking value.

In terms of Color, Control sample is more comparable to the sample (S1), color was varied due to the milky whiteness in the coconut milk in the order of S>S1>S2>S3>S4

Texture was highly acceptable in S(8.0) and S1(7.8)and lowest for S4(7.3)

Taste of the products was highly acceptable in control sample (s)-7.9 and S1(7.8).

Flavor is the main criteria that makes the product liked or disliked and was observed good in the trial sample as we used coconut milk it added nutty flavor of coconut.

Overall acceptability control sample (S) is more comparable to the sample (S1) among all other raw material formulations

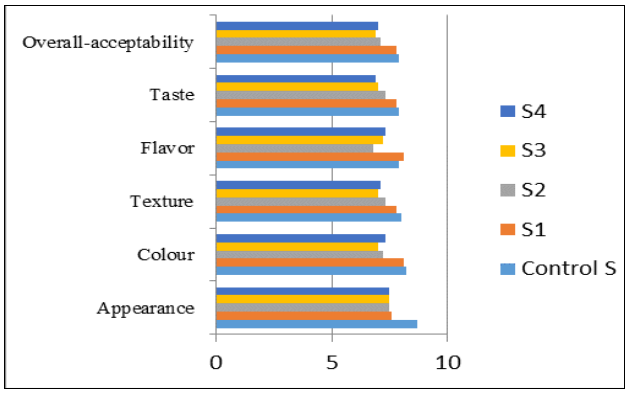

Fig 3: Mean sensory score of cupcakes (Formulation-1)

Formulation-2: From the sensory evaluation results it could be seen that all the panelists showed higher visual appearance for control sample (O) and when compared with the trial samples resulted the sample (O2) showed the note taking value. In terms of Color, Control sample is more comparable to the sample (S1), color was varied due to the milky whiteness in the coconut mlik in the order of O>O1>O2>O3>O4 Texture was highly acceptable in O(7.8) and O1(7.7)and lowest for O4(7.3) Flavor is the main criteria that makes the product liked or disliked and was observed good in the trial sample as we used coconut milk it added nutty flavor of coconut. Taste of the products was highly acceptable in control sample (s) - 7.9 and S1(7.8).

Overall acceptability control sample (O) is more comparable to the sample (O2) among all other raw material formulations.

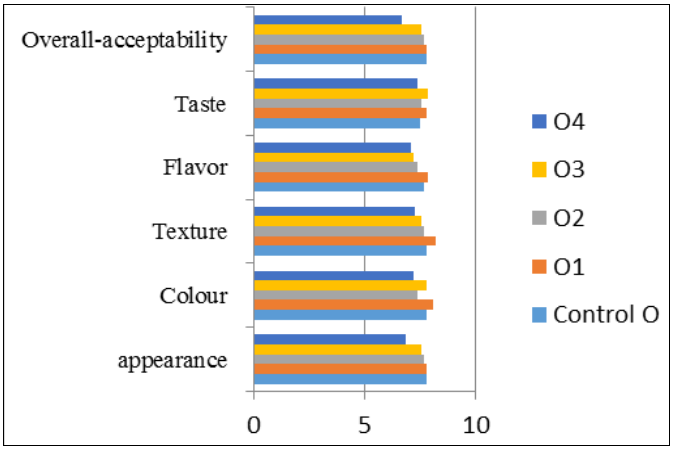

Fig 4: Mean sensory score of cupcakes (Formulation-2)

3.2 Proximate analysis of the samples

3.2.1 Moisture: Moisture Content by hot air oven method (AOAC 1990)The moisture content estimated by hot air oven method, Moisture gradually increased in variation of coconut milk samples control (S)<S1<S2<S3<S4,control(O)<O1<O2<O3<O4

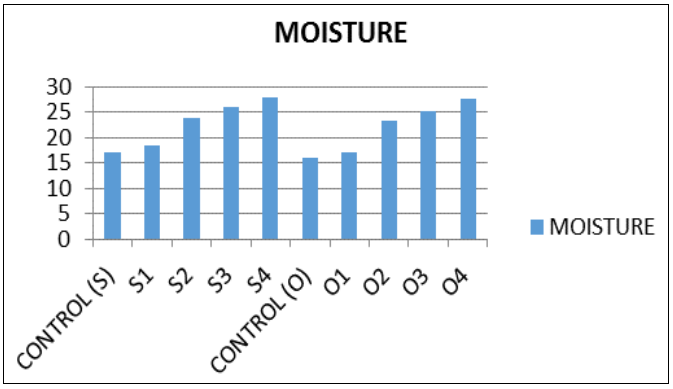

Fig 5: Estimation of Moisture

3.2.2 Protein: Protein content estimated by Kjeldhal nitrogen-N) (AOAC 1990).Highest percentage of protein was recorded in O4 sample.

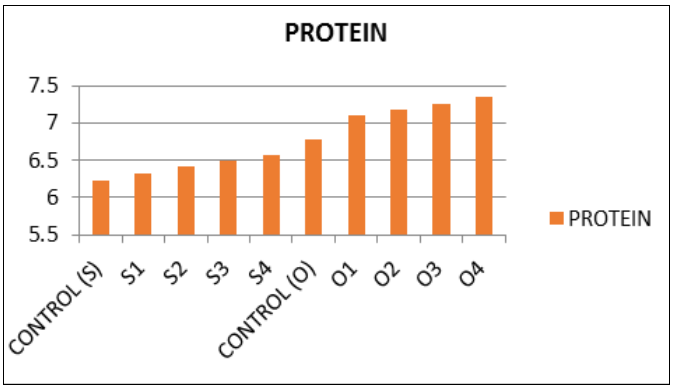

Fig 6: Estimation of Protein

3.2.3 Fat: Fat content by Soxhlet method (AOAC 1981). By use of coconut milk, there is gradual decrease in the fat content Control(S)>S1>S2>S3>S4, (O)>O1>O2>O3>O4

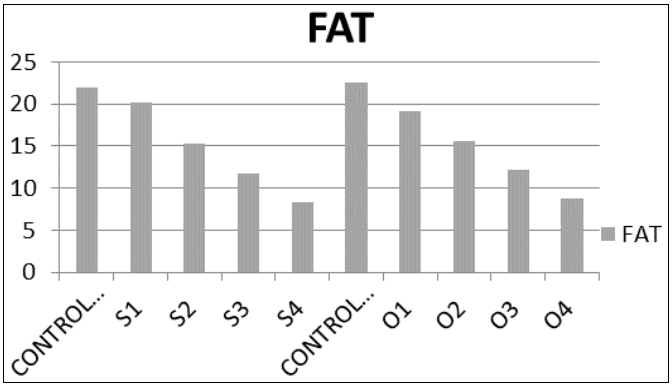

Fig 7: Estimation of Fat

3.2.4 Crude fibre: Crude fibre determined by the (AOAC 1990)Results were recorded and can observe huge variation of fibre content with the samples made with Organic whole wheat flour

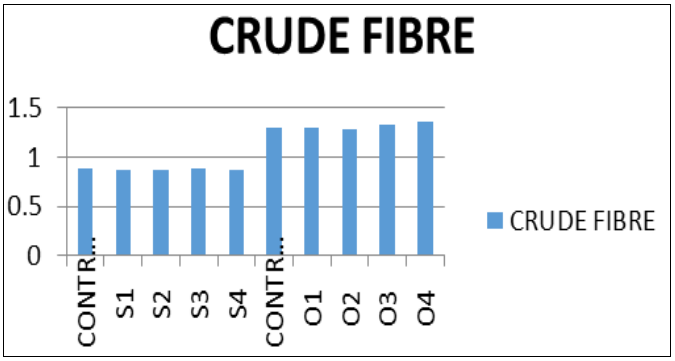

Fig 8: Estimation of Crude fibre

3.2.5 Ash: Ash content was evaluated by (AOAC, 1984).Results were varied significantly with different samples

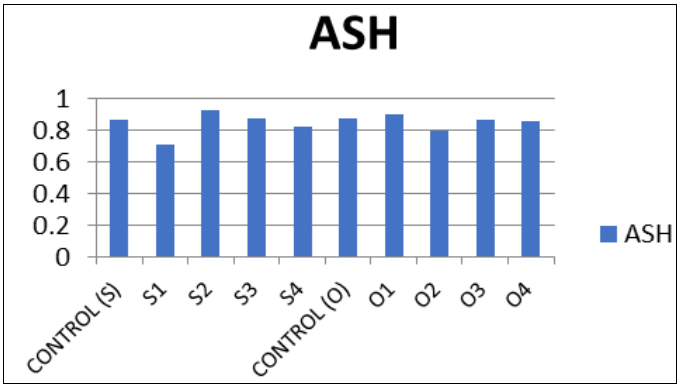

Fig 9: Estimation of Ash

3.2.6 Calculation of energy in Kilocalories: Energy was highest in sample made with butter and there was gradual decrease in the samples made with proportionately low butter which are replaced with coconut milk namely control(S)>S1>S2>S3>S4, control (O)>O1>O2>O3>O4

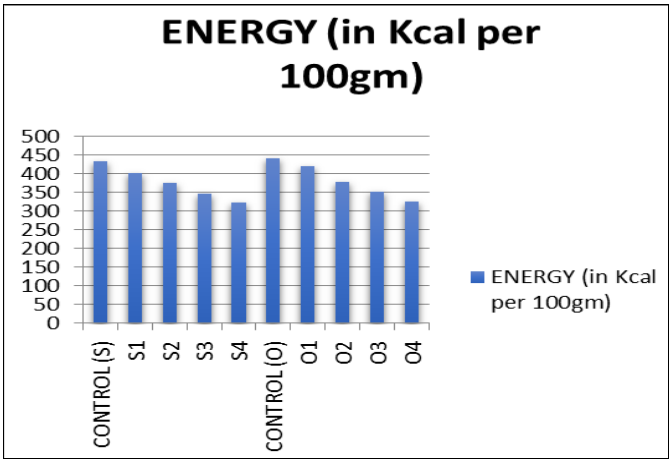

Fig 10: Estimation of Energy

Conclusion

Based on the sensory evaluation results in both formulations, 75% Butter + 25%Coconut milk- Maida sample (S1) is more comparable with 7.8 score for overall acceptability with control sample of score 7.9 50%Butter+50%Coconut milk-organic whole wheat Atta sample (O2) is more comparable with 7.7 score for overall acceptability with control sample of score 7.8 In terms of energy samples prepared has shown a variation of 100kcal per 100gm of final product in sample of refined wheat flour(S) and variation of 150kcal of energy in whole wheat flour sample.

When these developed products were compared in terms of energy with the market products shown difference of 250kcal of energy per 100gm of product. Thus in conclusion these cupcakes made from coconut milk has good taste, aroma, color and has lowered calorie intake for consumers who are bound to absorb low calorie foods

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