

Physico - Chemical and Sensory Characteristics of Carrot Pomace Powder Enriched Defatted Soyflour Fortified Biscuits

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Abstract- The present study was conducted on preparation and quality evaluation of carrot pomace powder enriched defatted soy flour fortified biscuits using different level of carrot pomace powder. The quality of biscuits was determined on the basis on physico -chemical characteristics namely: Moisture content, Ash content, Fat content, Protein content, β -carotene content, and Crude Fiber content and sensory analysis including sensory attributes namely colour, flavour, texture, taste and overall acceptability. The moisture content of biscuits was found to be increased with increase in proportion of carrot pomace powder. Estimation of crude fiber content of sample showed high improvement in nutritional value of carrot pomace powder incorporated biscuits, the highest value was observed in 10% Carrot pomace powder incorporated biscuit sample i.e 2.92%. There was linear increase in β -carotene content from 0.10 to 2.49 mg due to increase in the level of carrot pomace powder. The mean overall sensory acceptability scores of more than 8.50 for biscuit samples upto 5% carrot pomace powder indicated the commercial scope for manufacturing good quality vegetarian biscuits with carrot pomace powder and defatted soyflour, which will also be helpful in providing daily dietary requirement of β -carotene to the consumer.

Index Terms- Biscuits, Carrot pomace powder, Defatted soyflour

I. INTRODUCTION

Humans have consumed bakery products for hundreds of years. Among the different bakery products, biscuits constitute the most popular group. Biscuits are confectionery dried to very low moisture content. According to (Fayemi, 1981) biscuit is defined as a small thin crisp cake made from unleavened dough. Biscuits are an important baked product in human diet and are usually eaten with tea and are also used as weaning food for infants. The school children who are often underweight (ACC/SCN, 1987) use them as snack. The ingredients are simple; they contain soft wheat flour, shortening, sugar, fat, eggs. These ingredients are considered to be low in nutritive and biological values since soft wheat flour used for the production of biscuits is deficient in several nutrients including some vitamins, mineral elements as well as dietary fiber (Awan et al., 1991) and contains only 7 to 10% protein (Yamazaki and Greenwood, 1981). Wheat flour lacks certain essential amino acids such as lysine, tryptophan and threonine (Kent, 1975);

hence, the low nutritive value of biscuits is an issue of great concern because biscuits are the most commonly eaten snacks by school children who need more protein per unit body weight than adults.

The soybean, (*Glycine max*) a grain legume, is one of the richest and cheapest sources of plant protein that can be used to improve the diet of millions of people, especially the poor and low income earners in developing countries because it produces the greatest amount of protein used as food by man (LIU, 2000). Defatted soyflour at 2-5% improves water holding capacity and sheeting process of dough. The enhanced sheeting strength produces better layering during the fat roll in process and more tender and finished product.

Carrot is a rich source of β -carotene and contains other vitamins, like thiamine, riboflavin, vitamin B-complex and minerals (Walde et al. 1992). The carrot juice is used in fabricated baby foods, which are most popular throughout the world (Francis, 1999). Dried pomace has β carotene and ascorbic acid in the range of 9.87 to 11.57 mg and 13.53 to 22.95 mg per 100 g respectively (Upadhyay et al. 2008).

Carrot pomace is by-product of carrot juice extraction unit. Juice yield is reported to be only 60-70% and up to 80% of the carotene may be lost with the pomace.. The use of carrot pomace as a by-product utilization will decrease the environmental load. Drying or dehydration is the useful means to increase the shelf life of perishable food for further use (Roberts et al. 2008).

Carrot pomace can be stored even at room temperature for longer periods. The commercial exploitation of carrot has not been so far taken place in most of the developing countries despite having the potential for processing and value addition. So far most of the work with carrot is in juice form only. Yield and quality of carrot juice extracted by pressing is varied with the pre-treatment conditions such as pH, temperature and time (Sharma et al., 2006).

The effect of pre-treatment conditions on the physico-chemical parameters of carrot juice and the effects of different blanching solutions and blanching times (1-5 min) on the quality of carrot juice have been studied (Bin-Lim and Kyung-Jwa, 1996, Sharma et al., 2007). (Bohm et al., 1999) reported juice yield in carrots as only 60-70%, and even up to 80% of carotene may be lost with left over carrot pomace. So far the left over pomace, received after juice extraction from carrots, does not find its proper utilization.

The present study was carried out to find out the effect of addition of different proportion of carrot pomace powder and

fortified with 5% DSF on nutritional composition and sensory characteristics of beta carotene rich biscuits.

II. MATERIALS AND METHODS

Preparation of biscuits

Biscuits were prepared using creamery method for making biscuit dough. The ingredients used in biscuits were flour blends (100g), sugar (30g), shortening (20g), milk powder (2.0g), sodium chloride (1g), sodium bicarbonate (0.5g), ammonium bicarbonate (1g), vanilla essence (0.2 ml), water (20 ml) and skimmed milk powder. Five flour blends, prepared with wheat flour and defatted soy flour (DSF) were 95:5, 92.5:5, 90:5, 87.5:5, 85:5. With these flour blends, the level of carrot pomace powder (CPP) used for making biscuit samples were 0, 2.5, 5, 7.5, 10% respectively.

The dough was sheeted to a thickness of 3.5 mm with the help of an aluminium platform and frame. The sheeted dough was cut in to a square shape using a moulder. The cut dough was transferred to aluminium tray. The biscuits were baked in an electric oven maintained at 205°C for 10minutes. The baked biscuits were cooled for about 30 minutes, packed into LDPE bags for further analysis

Nutritional composition

Moisture content, Ash content, Fat content, Crude Fiber and Beta carotene in different biscuits samples were determined as per standard methods (AOAC, 2000). Total carbohydrates value was obtained by subtracting total of moisture, protein, fat, crude fiber and ash content from 100.

Sensory characteristics

Sensory attributes of biscuits samples packed in LDPE were evaluated in fresh condition. Hedonic scale rating was used for evaluation of biscuit samples. The result of sensory characteristics of biscuit samples from wheat flour, defatted soy flour, carrot pomace powder and other ingredient and packed in LDPE were evaluated in terms of different attributes namely: colour, flavour, taste, texture and overall acceptability

TABLES

TABLE 1: Details of treatment combination

TREATMENTS	WHEAT FLOUR	DEFFATED SOY FLOUR	CARROT POMACE
T ₁	100%	0%	0%
T ₂	95%	5%	0%
T ₃	92.5%	5%	2.5%
T ₄	90%	5%	5%

T ₅	87.5%	5%	7.5%
T ₆	85%	5%	10%

T₁ – The product was prepared without supplementing CP and DSF to the flour.

T₂– The product was prepared by supplementing the wheat flour with 5% DSF & 0% CP.

T₃– The product was prepared by supplementing the wheat flour with 5% DSF & 2.5% CP.

T₄– The product was prepared by supplementing the wheat flour with 5% DSF & 5% CP.

T₅- The product was prepared by supplementing the wheat flour with 5% DSF & 7.5% CP.

T₆- The product was prepared by supplementing the wheat flour with 5% DSF & 10% CP

III. RESULTS AND DISCUSSIONS

On evaluation of result it was found that there was an increase in moisture content in biscuit samples with increase in the level of carrot pomace powder from 2.5% to 10%. The increased ash content was due to high percentage of mineral content present in carrot pomace powder, therefore there was significant difference between samples. As wheat flour, defatted soy flour and carrot pomace powder were having lower fat content, therefore the total fat content of biscuits is majorily a function of externally added fat during biscuit preparation. It was found that there was linear increase in beta carotene content in the biscuit sample with increase in level of carrot pomace powder from 2.5 to 10% which was obvious. There was a decrease in protein content in the biscuit samples with increase in level of carrot pomace powder because carrot pomace powder has a lower amount of protein content compare to wheat flour. The different level of carrot pomace powder increased the total crude fiber content significantly in biscuit samples due to higher content of these nutrients in carrot pomace powder.

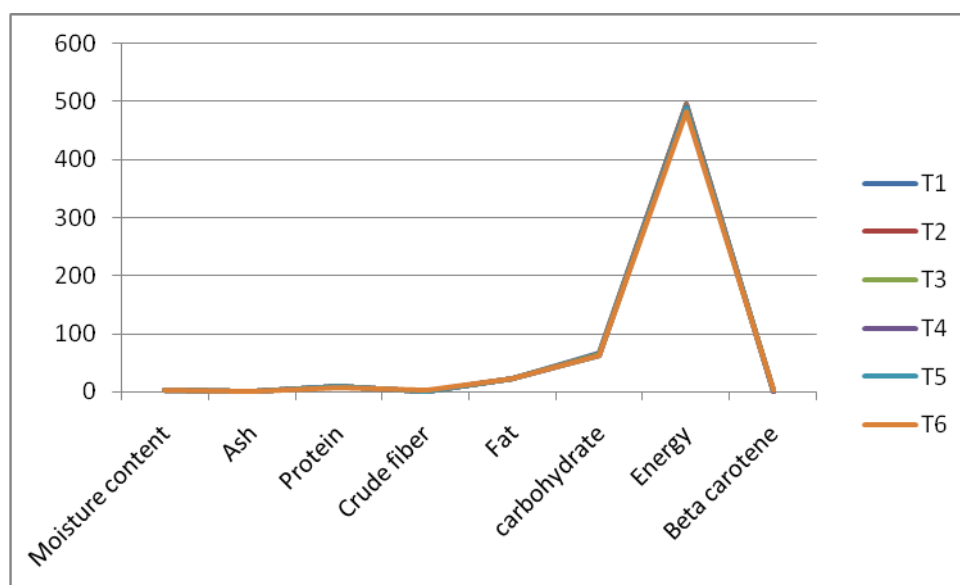
Sensory attributes of all biscuit samples packed in LDPE were evaluated in fresh condition at ambient temperature. Hedonic scale rating was used for evaluation of biscuit samples. Different attributes selected were colour, flavour, taste, texture and overall acceptability. The mean overall acceptability scores of more than 7.5 for biscuit sample upto 5% carrot pomace powder indicated the commercial scope for manufacturing good quality vegetarian biscuits with carrot powder and defatted soy flour.

Table 2: Effect of Carrot pomace powder on Physico- chemical characteristics of DSF fortified Biscuits

	Moisture content	Ash	Protein	Crude fiber	Fat	carbohydrate	Energy	Beta carotene
T1	2.96	0.50	8.51	0.10	22.13	65.8	496.41	0.390
T2	3.00	0.65	9.15	0.38	22.21	64.61	494.93	0.492
T3	3.05	0.79	9.06	0.52	22.20	64.38	493.56	1.15
T4	3.12	0.98	8.98	0.98	22.23	63.89	491.55	1.65
T5	3.18	1.09	8.84	1.09	22.21	63.59	489.61	2.388
T6	3.21	1.12	8.77	2.92	22.14	61.84	481.7	2.46

Table 3: Effect of Carrot pomace powder on Sensory characteristics of DSF fortified Biscuits

	Colour	Taste	Texture	Flavour	Overall Acceptability
T1	7.00	7.00	8.00	7.50	7.37
T2	8.00	7.50	8.50	7.50	7.87
T3	8.50	8.00	9.00	8.50	8.50
T4	9.00	8.50	8.50	9.00	8.75
T5	8.00	8.00	8.00	8.00	8.00
T6	7.50	7.50	7.50	8.00	7.62

**Figure 1: Physico- Chemical Characteristics of DSF Fortified Biscuits**

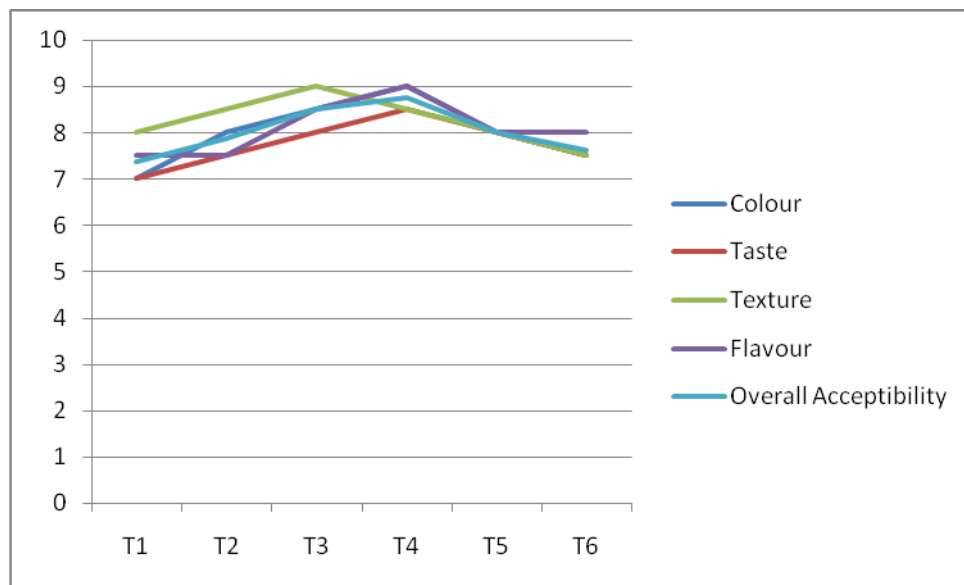


Figure 2: Sensory Characteristics of DSF Fortified Biscuits

IV. SUMMARY AND CONCLUSION

Biscuit samples of high nutrition were formulated from different combination of wheat flour, defatted soy flour and carrot pomace powder. Blend formulation showed the strongest impact on formulation. The composition and nutritive value of biscuit samples represent balanced quantity of carbohydrate, protein, fat, crude fiber and beta carotene and these samples were acceptable in sensory evaluation.

Moisture content of the experimental biscuit samples slightly increased with the level of incorporation of carrot pomace powder while Fat, Ash, Protein, Crude fiber and B-carotene content of biscuit sample decreased slightly.

The colour of the biscuits varied due to variation in level of CPP incorporation and chemical changes. The overall result reveal that the flavour of biscuits was acceptable when level of incorporation of CPP was increased up to 5%. The texture of biscuits decreased, however it depicted no prominent and undesirable change and analysis at 5% level indicated no significant difference in the texture of the treatment.

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