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Research Article

Development and Analysis of Nutrients, Antioxidants in Sweet Potato and Pumpkin Powder incorporated Value Added Products

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Abstract

In the current study Pumpkin and Sweet Potato flour were prepared by substituting refined wheat flour, Pumpkin and Sweet Potato flour in the different variations. These samples were subjected to functional properties analysis. The proximate composition of the various flour blends used for the preparation were using standard methods. Organoleptic evaluation was conducted to evaluate the sensory analysis which includes colour, flavour, texture, appearance, taste etc. The Pumpkin and Sweet Potato incorporated value added products were analyzed for energy, carbohydrate, protein, fat, moisture, starch, fibre, Vitamin A, Vitamin C, calcium, iron, phosphorus and antioxidant which are naturally present in pumpkin and sweet potato which is important for human health. On the basis of nutritional value Pumpkin and Sweet Potato cake containing 70% Pumpkin and Sweet Potato flour is acceptable than other sample, nutritional value Pumpkin and Sweet Potato cookies containing 30% Pumpkin and Sweet Potato flour is acceptable than other sample and nutritional value Pumpkin and Sweet Potato muffin containing 60% Pumpkin and Sweet Potato flour is acceptable than other sample.

Keywords: Pumpkin, Sweet Potato, muffin, antioxidant, sensory properties.

Introduction

Pumpkin (*Cucurbita moschata*) is one of the important cucurbitaceous vegetable grown all over India. Pumpkins are extensively grown in tropical and sub-tropical countries. Pumpkin is due to its dark yellow-orange colour, highly pleasing flavour and sweet taste is more likely to be used in bakery. Processed pumpkin flour can be used as natural colour additive in many food products, such as cakes, cookies, muffin, etc are very much liked by both young and old generation in rural and urban area. Pumpkins are rich in beta-carotenes, minerals, Vitamins, pectin and dietary fibre. The yellow-orange characteristic colour of pumpkin is due to the presence of carotenoids. Besides, being nutritionally rich the fruit also posses many medicinal properties. Pumpkin contains lots of antioxidant like Vitamin A and C, as well as zinc and alpha-hydroxyl acids which help to reduce the signs of aging. Pumpkin is a valuable source of functional components mainly carotenoids , lutein , zanthin, ascorbic acid, phytosterols, selenium and linoleic acid which acts as antioxidant which are reported to prevent skin diseases, eye disorders and cancer.

Sweet Potato (*Ipomoea Batatas Lam*) is the seventh most important food crop in the world. It is grown in many tropical and sub tropical regions. Sweet Potato is utilized in a lot of uses in the house hold feeding and food industries. Sweet Potatoes are good sources of Vitamin C and E as well as dietary fibre, potassium, iron and they are low in fat and cholesterol. Sweet Potatoes are high in antioxidant, which work in the body to prevent inflammatory problems like asthma, arthritis, gout. Sweet Potato flour is an excellent source of phytochemical constituents containing anthocyanin and phenolic acids and is superior to other vegetables; these biologically active compounds possess multifaceted action including antioxidant, anti bacterial, anti mutagenicity, anti-inflammation, anti-diabetes and anti- carcinogenesis.

The incorporation of pumpkin and sweet potato powder in bakery products is more beneficial to the people due its wonderful medicinal properties. Thus this study was designed to evaluate the suitability of replacement refined wheat flour in different percentage of Pumpkin and Sweet Potato (PP/SPF) mixed at equal proportion in Value added products based on bakery technology because of its taste and flavour.

Materials and Methods

Materials

Fresh pumpkin powder (*Cucurbita moschata*), Fresh sweet potato powder refined wheat flour, sugar, butter, egg, vanilla essence were obtained from the local market of Coimbatore.

Processing Methods

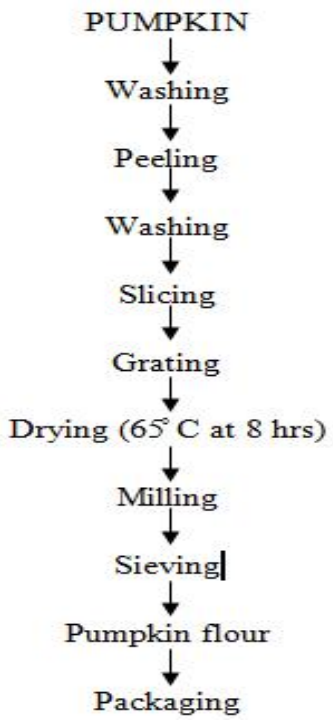
Preparation of Pumpkin Flour (PF)

The pumpkin skin were peeled off the edible portion of the pumpkin were washed in clean tap water, and sliced into pieces then it were grated .The pumpkin residue was transferred to stainless steel tray and dried in a dryer at 65℃ for 8 hours. The dried pumpkin was powdered and sifted through a siever and stored in plastic containers with lids. (Figure-I)

Preparation of Sweet Potato Flour (SPF)

The Sweet Potato skins were peeled off from the tuber, the edible portions of the sweet potatoes were washed in clean tap water, and after they were sliced into pieces then it were grated. The sweet potato residue was transferred to stainless steel tray and dried in a tray dryer at 65℃ for 6 hours. The dried sweet potato was grounded and sifted through a siever and stored in plastic containers with lids

.Figure I: Flow Chart of Pumpkin Flour Preparation



Experimental plan: (Cookies)

The experimental plan used for the present research is given in Table-I. Figure I and II shows the flow chart for preparation of Pumpkin and Sweet Potato Flour. Figure-III shows the flow chart for the preparation of cookies and Table-I shows the different combination of Pumpkin, Sweet Potato Flour, Refined wheat flour for cookies preparation.

Figure II: Flow Chart of Sweet Potato Flour Preparation

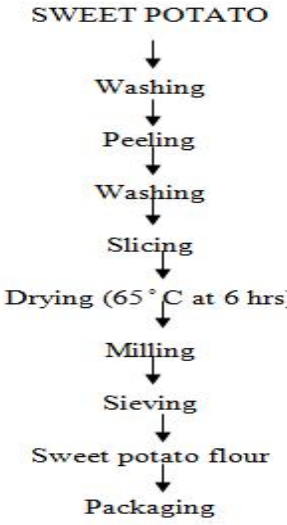


Figure-III: Flow chart for the preparation of cookies

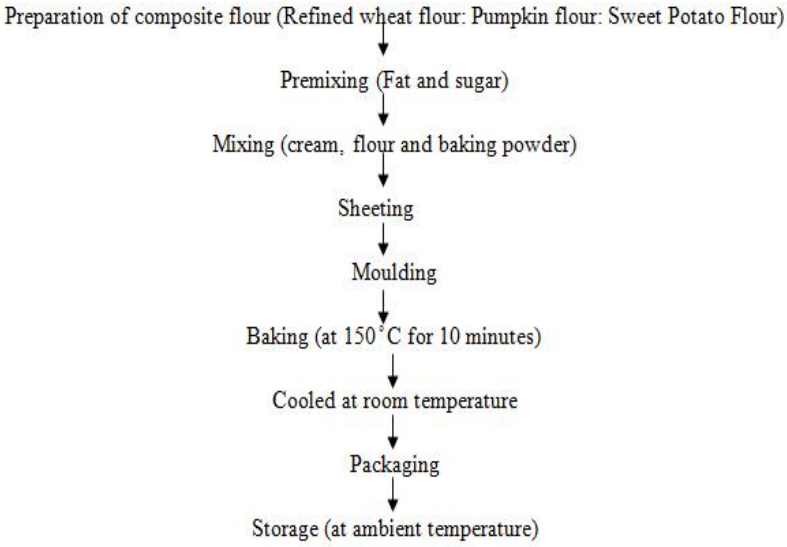


Table-I: Different combination of Pumpkin Flour, Sweet Potato Flour, and Refined wheat flour for Cookies, Cake, and Muffin

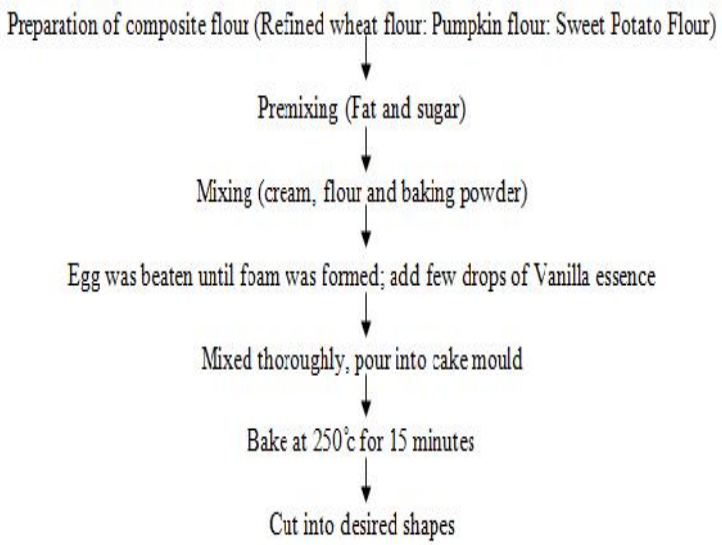
Variation	COOKIES			CAKE			MUFFIN		
	PF (%)	SPF (%)	RWF (%)	PF (%)	SPF (%)	RWF (%)	PF (%)	SPF (%)	RWF (%)
V_0	0	0	100	0	0	100	0	0	100
V_1	10	10	80	30	30	40	20	20	60
V_2	15	15	70	35	35	30	25	25	50
V_3	20	20	60	40	40	20	30	30	40

PF-Pumpkin Flour, SPF- Sweet Potato Flour, RWF-Refined Wheat Flour

Experimental plan: (Cake and Muffin)

The experimental plan used for the present research is given in Table-II. Figure I and II shows the flow chart for preparation of Pumpkin and Sweet Potato Flour in Figure-IV shows the flow chart for the preparation of cake and muffin. Table-II shows the different combination of Pumpkin, Sweet Potato Flour, and Refined wheat flour for cake and muffin preparation.

Figure-IV: Flow chart for the preparation of cakes



Results and Discussion

Sensory evaluation

Organoleptic evaluation of the incorporation of different variations of Pumpkin Flour and Sweet Potato Flour value added products were evaluated and compared with control products which prepared from 100% Refined wheat flour.

The results indicated that the per cent score of cake containing 35% Pumpkin flour and 35% Sweet Potato flour were found to be the most acceptable. At 70% level of incorporation, all the attributes scored highest level namely appearance, colour, texture, flavour, taste. The nutritional quality of the developed cake was enhanced due to the addition of Pumpkin flour and Sweet Potato flour. Furthermore the sensory evaluation Table-II depicts that highest amount of Pumpkin flour and Sweet Potato flour that can be incorporated at 30**:** 30 per cent, Variation III got high score, the best regarding all sensory attributes in muffin. 20:20 per cent Pumpkin flour and Sweet Potato flour that incorporated in variation II got high score, the best regarding all sensory attributes in cookies.

Table-II: Sensory Attributes of Value Added Products containing PF/SPF mixtures

Value Added Products	%Pumpkin Flour and Sweet Potato Flour	Sensory Attributes				
		Appearance	Colour	Texture	Flavour	Taste
Cake	(Control)	4.6± 0.48	4.72±0.53	4.56 ±0.7	4.36 ±0.8	4.28 ±0.87
	V_2 30:35:35	4.6± 0.48	4.6±0.56	4.12±0.71	4.28±0.72	4.4±0.56
Cookies	(Control)	4.48±0.57	4.36±0.63	4.28±0.72	3.08±2.09	4.6±0.56
	V_2 70:15:15	4.6± 0.48	4.6±0.56	4.12±0.71	4.28±0.72	4.4±0.56
Muffin	(Control)	3.76±0.71	4.36±0.69	3.92±0.62	4.0±0.69	4.2±0.75
	V_3 40:30:30	4.52±3.99	4.36±0.69	4.88±4.20	4.52±0.64	4.76±0.42

Note : values are mean ±S.D

Data indicated that the per cent score of muffin containing 30% Pumpkin flour and 30% Sweet Potato flour were found to be the most acceptable. The nutritional quality of the developed cake was enhanced due to the addition of Pumpkin flour and Sweet Potato flour. So Variation III was scored high than other samples.

Physico - Chemical Composition of Value Added Products Containing PF/SPF Mixtures

During the present investigation no significant different was found in the presence moisture content, was observed on increasing the incorporation of pumpkin and sweet potato flour in the variation (i.e V1, V2 and V3).whereas, there was a significant value of fibre and fat content. This was because of present study the formulation was based on different per cent of pumpkin, sweet potato flour and refined wheat flour blend. Pumpkin and sweet potato flour has a lower moisture content but high starch and fibre content. Therefore, a significant difference was observed between the cake, cookies, and muffin samples.

The energy and carbohydrate content of control and the sample cake was between the ranged of 442.50 to 463.73/100g and 45.08 to45.21/100g.The Vitamin A and Vitamin C content of control and the sample cake was between the ranged of 83.75 to 84.33/100g and 0.88 to 0.92/100g. The phosphorus and iron content of control and the sample cake was between the ranged of 146 to 158/100g and 1.90 to1.98/100g. But the starch and fibre content of control and the sample cake was between the ranged of 22.80 to 23.50/100g and2.0 to 2.20/100g.

The moisture content of control and the sample cookies was between the ranged of 2.95 to 3.52g/100g. The energy and carbohydrate content of control and the sample cookies was between the ranged of 472.10 to 475.04 Kcal/100g and 63.67 to 63.73g/100g. The Vitamin A and Vitamin C content of control and the sample cookies was between the range of 108 to110µg/100g and 2.48 to 2.66mg/100g. The phosphorus and iron content of control and the sample cookies was between the ranged of148to160mg/100g and1.48to 1.60mg/100g. But the starch and fibre content of control and the sample cookies was between the ranged of 32.50 to 35.60g/100g and 0.80 to 1.10g/100g.

The moisture content of control and the sample muffin was between the ranged of 13.24 to 17.62g/100g. The energy and carbohydrate content of control and the sample muffin was between the ranged of 442.50 to 469.77Kcal/100g and 45.08 to 45.13g/100g.The Vitamin A and Vitamin C content of control and the sample cake was between the ranged of 83.75 to 86 µg/100g and 0.88 to 1.0mg/100g.The phosphorus and iron content of control and the sample muffin was between the ranged of 146.0 to 150 mg/100g and 1.98 to 2.0mg/100g. But the starch and fibre content of control and the sample muffin was between the ranged of 22.80 to 24g/100g and 2.0 to 2.0g/100g.

The fibre and starch content of cakes, cookies, muffin increased significantly, due to higher fibre content of pumpkin and sweet potato flour. The starch content of sweet potato flour is higher. As fibre absorbed large amount of water, it gives a sensation of fullness (having high satiety value).

Table-III: Physio- Chemical Composition of value added products containing PF/SPF mixtures

S.No	PARAMETER	CAKE		COOKIES		MUFFIN	
		CONTROL	VARIATION	CONTROL	VARIATION	CONTROL	VARIATION
1	ENERGY (Kcal)	442.50	463.73	472.10	475.04	442.50	469.77
2	CARBOHYDRATE (g)	45.08	45.21	63.67	63.73	45.08	45.13
3	FAT (g)	23.68	25.20	18.34	18.50	23.68	26.64
4	MOISTURE (g)	13.24	16.41	2.95	3.52	13.24	17.62
5	FIBRE (g)	2.0	2.20	0.80	1.10	2.0	2.0
6	IRON (mg)	1.90	1.98	1.48	1.60	1.98	2.0
7	VITAMIN A (µg)	83.75	84.33	108.0	110.0	83.75	86.0
8	VITAMIN C (mg)	0.88	0.92	2.48	2.66	0.88	1.0
9	CALCIUM (mg)	166.88	170.0	216.0	220.0	166.88	168.0
10	PHOSPHORUS (mg)	146.0	158.0	148.0	160.0	146.0	150.0
11	STARCH (g)	22.80	23.50	32.50	35.60	22.80	24.0

Antioxidant activity in Pumpkin and Sweet Potato Powder

The results obtained regarding DPPH value for total antioxidants value is presented in table-IV

TABLE-IV Antioxidant activity in Pumpkin and Sweet Potato Powder

Parameters	Value
Antioxidant activity of Pumpkin and Sweet Potato Flour	98.253

Table IV shows that Pumpkin and Sweet Potato Powder contains high amount of antioxidant value like 98.253%.

Summary and Conclusion

In recent years, the Development and evaluation of functional foods to target populations has increased considerably among food scientists and technologists. The Underutilised crops which are otherwise rich source of nutrients. Pumpkin is one such vegetable which is rich in nutrients and its utilisation in India is limited to using it as a fresh vegetable. Pumpkin and Sweet Potato flour are suitable for use in value added products. The quality characteristics of Sweet Potato flour include high starch content, white colour, and crude fibre. The moisture content is important as it may lead to chemical and microbial deterioration. In this study, value added products was incorporated in Pumpkin and Sweet Potato flour at different level. The mix was studied for its development, nutritional and physical parameters. The results obtained could be very valuable in decision making for industries that want to take nutritional advantage of pumpkin and sweet potato flour as alternative or supplement to cereal flours. Pumpkin and Sweet Potato flour could be useful in the manufacture of highly nutritious cake, cookies, and muffin.

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