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Physicochemical and texture comparision data-based evaluation of fasting cookies

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Abstract
Nowadays people are health conscious, they like value added product as a part of their everyday meal or as well as the foods they eat for pleasure. The composite flour was based on fasting ingredients. In this experiment, water chestnut (50, 60 & 70), sweet potato (35, 25 & 15) and amaranth (15, 15 &15) flour in the various proportions to prepare three blended flour samples, from which fasting cookies were prepared. These samples were subjected to analysis of their functional properties. The proximate composition of the various flour blends used for the preparation of fasting cookies were determined using standard methods. The physico-chemical analysis and Texture evaluation was done to know the acceptability of fasting cookies. These were evaluated for sensory analysis that included colour, taste, flavour, texture and overall acceptability. The cookies were analyzed for analytical and chemical analysis, which includes moisture content, fat content, total ash content, protein content, minerals content and carbohydrate content. On the basis of sensory evaluation, cookies containing water chestnut, sweet potato, and amaranth flour in (70, 15&15) proportion scored high score for overall acceptability i.e. 7. From the result of proximate analysis of cookies, the fat content of Sample C is very low i.e. 24.18%, which is beneficial for health. So according to quality evaluation and sensory evaluation, preparation of cookies from water chestnut, sweet potato and amaranth flour blend in proportion of (70, 15 & 15) is recommended.

Keywords: fasting cookies, water chestnut, sweet potato and amaranth grain.

1. Introduction
The bakery industry in India is more populated is all the branches of the biggest in food industry. Bakery is a long-established activity and occupies an important place in food processing industry. Bakery products are like breads, cookies, muffin and cakes are consumed by 96% of the population in the United Kingdom (Foster *et al.,* 2006) [9]. Bakery product have become in India since the earlier times. Among the different bakery product, cookies constitute the most popular group. Cookies were first invented s a food for Nelson' Navy (1980). Cookies are chemically leavened bakery products containing high percentage of fat and sugar. India is known to be a second largest manufacturer of cookies, products the first being USA. Cookies cover 70% of the total production of bakery industry. Indian Cookies industry came into limelight and started gaining a sound status in the bakery industry in the later part of the 20th century when the urbanized society call for readymade food products at a tenable cost. Fasting is also seen as way to give the body a much needed break from the regular dietary routine. The explains the choice of food items that are light on stomach, easy to digestion but are full of nutrients. So making fasting cookies means ready to eat food without any physical work you can consume with full energy dense without any extra fat which dangerous to our body. Therefore few food items like water chestnut, sweet potato, and amaranth go into making a variety of flour, which could easily fill in the space created by the absence of refined flour or wheat flour cookies. Because of water chestnut is gluten free at the same is extremely nutritious. Water chestnut is rich in carbohydrate, fibre, vitamins and minerals. Another ingredients that attains great important Navratris amaranth and sweet potato which also full of nutritional qualities making this composite flour cookies gives best output energy to your body during Fasting days while you busy work schedule, lack of time preparing Fasting food then those days can make this type of cookies and storage for at least one month in between you can consume it regularly. During the fasting in India, people usually avoid eating cereal based food products while prefer food products prepared using selected vegetables and fruits. Being good source of starches and other nutrients and free from gluten, water chestnut flour, sweet potato, Amaranth flour may be considered for making baked product that can be utilized not only by celiac patients but also during fasting days. The fasting Cookies is prepared by Singhara, Sweet potato, and Amranth flour. Amranth flour contains less amount of protein but good source of vitamin-A, vitamin-C, and also complementing source of some other vitamins, also contain some dietary minerals including calcium, iron, zinc, copper. Shinghara is a good and inexpensive source of carbohydrates are considered as a foodstuff of high nutritional value and one of the most economical sources of energy. Sweet potatoes are an excellent source of vitamin A (in the form of beta-carotene). They are also a very good source of vitamin C, manganese, copper, pantothenic acid and vitamin B6. Additionally, they are a good source of potassium, dietary fiber, niacin, vitamin B1, vitamin B2 and phosphorus. Rajgira (Amaranth) or Ramdana, as it is popularly known in Northern India is a power house of nutrients. This grain migrated to India from America, and became an important part of our fasting ritual. Rajgira is a good source of calcium, protein and amino acids and is rich in iron, magnesium and Vitamin A, B and C too. This grain, which is only remembered during Navratri and Ganesh Chaturthi, should be included in our regular diet for the numerous benefits it offers. The presence of amino acids in Rajgira makes it the perfect fasting grain. It is easy to digest

and curtails hunger.

Water chestnut (WC) (*Trapa natans*) commonly known as 'Singhara' in India. It is an annual, floating leaved aquatic plant found in freshwater wetlands, lakes, ponds, and sluggish reaches of rivers in India (Rodrigues *et al.*, 1964)[14], particularly in Madhya Pradesh, Uttar Pradesh, Bihar and Orissa where high rainfall is conducive to successful cultivation (Little. 1979)[11].The genus Trapa being composed of about 30 species. Trapa natans var. natans, are now widely spread in Eurasia, Africa, Asia and in North Eastern United States, which bears as a four-horned fruit, the latter also known as the Jesuit nut or water caltrops (Karg *et al.*, 2006)[10], whereas Water chestnut (Trapa natans) is one of the most important minor fruit crops grown India. The kernel is delicious which contains carbohydrates, proteins and essential minerals (Singh et al., 2010). WC possess different medicinal activities such as anti-microbial (Parekh and Chanda, 2007)[12] analgesic (Agrahari *et al.*, 2010)[1] anti-inflammatory (Patel *et al.*, 2010)[13] and anti-diabetic (Das *et al.*, 2011)[6]. Chandana *et al., (*2013) reported When the fruit has been dried, it is ground to flour called "singhara ka atta" which is used in many religious rituals and can be consumed as a Phalahar diet on the Hindu fasting days, in Indian traditional festival "Navratra". Demirkesen (2010)[7] in order to utilize the nutritional health and also functional advantage of chestnut flour in gluten-free products, there is a growing trend of the use of chestnut flour. (Alfasne *et al.*, 2011)[2]studied the biochemical composition of fruit of water chestnut was studied and concluded that water chestnut could be important sources of carbohydrate, protein, minerals, which is suitable for incorporation in human diet.

Amaranth species grown in the Czech Republic (Amaranth's cruentus, A. hypochondriacus and A. caudatus) are used for human nutrition in the form of whole-meal amaranth flour, crackers, pasta without eggs, brown bread without gluten, cookies, cookies, etc. Grain amaranth has several attractive features like gluten-free ingredient, high-quality protein, and the presence of abundant quantities of fiber and minerals such as calcium and iron (Ballabio *et al.*, 2011; Moreno, Comino, & Sousa, 2014)[5]. These grains are also a source of many bioactive compounds with health-promoting effects such as phytosterols, polyphenols, saponins, and squalene (Alvarez-Jubete, Arendt, & Gallagher, 2010)[3]. Amaranth grains are rich in lysine and tryptophan To increase its nutritive value, cookies are prepared with fortified or composite flour.

Sweet potato (Ipomoea batatas L. Lam.), more commonly known as kumara, has been cultivated for domestic consumption in many countries throughout the Asia Pacific regions and beyond (Anon, 2000)[4]. Ferris *et al.*, (2001)[8] suggested that however currently dried chips and flour made from sweet potato are limited in use for household consumption and for sale by small business on local markets in Uganda and other sub-Saharan African countries. No industrial scale production of sweet potato flour or starch has been reported in Africa, where as this does occur for other starch staple crops, such as cassava.

Materials and Methods

Procurement of row materials

All most care should be taken in choosing the raw materials for the preparation of the Cookies quality was the major factor in choosing raw material purchased from the local market in Prayagraj.

Preparation of Cookies: Cookies were prepared by the standard method for the preparation of. Water chestnut flour, Amaranth flour and Sweet potato flour percentages were 50, 60, and 70% as given Table 1

S. No	Water chestnut flour	Sweet potato flour	Amaranth flour
T_0	100	00	00
T_1	50	35	15
T_2	60	25	15
T_3	70	15	15

1. Chemical Analysis

Carbohydrate – This was estimated by {100-moisture +ash+ fat+ protein) %}

Protein – This was estimated by kjeldhal apparatus by AOAC 1999 method

Fat- This was estimated by soxhlet apparatus by AOAC 1999 method.

Ash – This was estimated by muffle furnace as per the procedure given Ranganna 2007.

TS – This was estimated by {Carbohydrate +ash+ fat+ protein) %}

Moisture – this was estimated as per the procedure given AOAC,1999 methood.

2. Minerals analysis

Iron (mg) Iron content in the Fasting Cookies was determined by AAS (Atomic Absorption Spectrophotometer).

Calcium (mg) Calcium in the Fasting Cookies was assessed using standardized procedure of AOAC (2005)

3. Texture Profile Analysis (TPA): Determination of texture profile analysis as per the procedure IS: 1479, part-2 (1961)

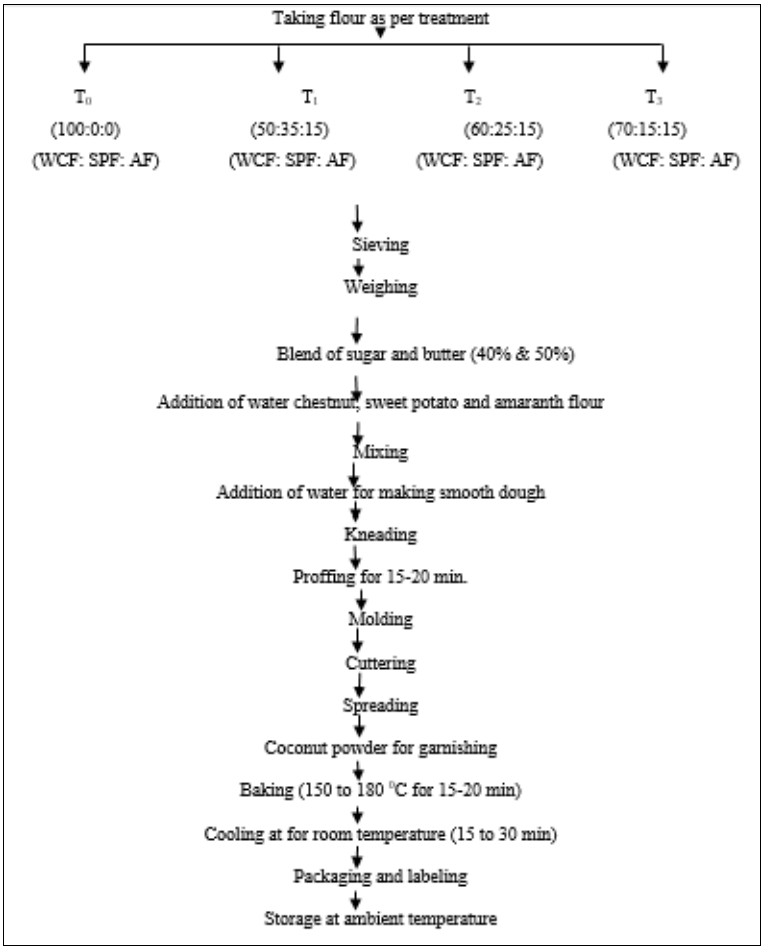

Fig 1: Flow Diagram for Prepration of Cookies

The data was analyzed using analysis of variance at 5% level of significance and Critical Difference in excel software.

Results and discussion

Results given in table 1 revealed that Protein per cent significantly increases from (12.72-14.61), fat content was found to be (24.18-28.62), Carbohydrates (53.76-57.37) ,Ash (2.38-4.22), moisture (2.52-3.43) Total solid (96.58-97.48) Iron (3.01-4.52) and Calcium (54.69-90) in Fasting cookies formulation.

Table 1: Nutritional composition of Fasting Cookies (Mean)

Parameter	T0	T1	T2	T3
Carbohydrates%	53.76	57.33	56.46	53.84
Protein%	12.72	11.58	12.07	14.61
Fat%	28.62	25.14	24.67	24.18
Ash%	2.38	2.42	3.38	4.22
TS%	97.48	96.59	96.58	96.85
Moisture%	2.52	3.43	3.32	3.12

*Average of five trials

Table 2: Minerals composition of Fasting cookies

Parameters	T0	T1	T2	T3
Iron (mg)	3.01	4.52	4.17	3.36
Calcium (mg)	54.69	85.27	87.95	90.66

Table 3: Texture profile analysis of fasting cookies

Treatments	T0	T1	T2	T3
Hardness(g)	8657.82	20817.76	9993.16	6865.94

The Significant difference thus obtained was further analyzed statistically to find out the C.D. between and within the different treatment combination, Result of C.D. are presented in table 1-8.

Table 4.1: Comparison of average carbohydrates of fasting cookies

Treatments		T0	T1	T2	T3
		53.76	57.33	56.46	53.84
T0	53.76	0.00	3.57	2.7	0.08
T1	57.33		0.00	0.87	3.69
T2	56.46			0	2.62
T3	53.84				0

C.D. at 0.5%: 0.597

The difference between the mean values of T0-T1 (3.57), T0-T2 (2.70), T0-T3 (0.08), T1-T2 (0.87), T1-T3 (3.69) and T2-T3 (2.62) was greater than the C.D value (0.597). Therefore, the difference was significant.

Table 4.2: Comparison of average protein content of fasting cookies

Treatments		T0	T1	T2	T3
		12.72	11.58	12.07	14.62
T0	12.72	0.00	1.14	0.65	1.89
T1	11.58		0.00	0.49	3.03
T2	12.07			0	2.54
T3	14.61				0

C.D. at 0.5%: 1.46

The difference between the mean values of T0-T1 (1.14), T0-T2 (0.65) and T1-T2 (0.49) was less than the C.D value (1.46). Therefore, the difference was non-significant. The difference between the mean values of T1-T3 (3.03) and T2-T3 (2.54) was greater than the C.D value (1.46). Therefore, the difference was significant.

Table 4.3: Comparison of average Fat content of fasting cookies

Treatments		T0	T1	T2	T3
		28.62	25.14	24.67	24.18
T0	28.62	0.00	3.48	3.95	4.44
T1	25.14		0.00	0.47	0.96
T2	24.67			0	0.49
T3	24.18				0

C.D. at 0.5%: 0.10

The difference between the mean value of T0-T1 (3.48), T0-T2 (3.95), T0-T3 (4.44), T1-T2 (0.47), T1-T3 (0.96) and T2-T3 (0.49) was greater than the C.D value (0.10). Therefore, the difference was significant.

Table 4.4: Comparison of average ash content of fasting cookies

Treatments		T0	T1	T2	T3
		2.38	2.42	3.38	4.22
T0	2.38	0.00	0.04	1.00	1.84
T1	2.42		0.00	0.96	1.80
T2	3.38			0	0.84
T3	4.22				0

C.D. at 0.5%: 0.20

The difference between the mean values of T0-T1 (0.04) was less than the C.D value (0.20). Therefore, the difference was non-significant. The difference between the mean values of T0-T2 (1.00), T0-T3 (1.84), T1-T2 (0.96), T1-T3 (1.80) and T2-T3 (0.84) was greater than the C.D value (0.20). Therefore, the difference was significant.

Table 4.5: Comparison of average total solid of fasting cookies

Treatments		T0	T1	T2	T3
		97.48	96.59	96.58	96.85
T0	97.48	0.00	0.89	0.90	0.63
T1	96.59		0.00	0.01	0.26
T2	96.58			0	0.27
T3	96.85				0

C.D. at 0.5%: 0.178

The difference between the mean values of T0-T1 (0.89), T0-T2 (0.90), T0-T3 (0.63), T1-T3 (0.26) and T2-T3 (0.27) was greater than the C.D value (0.178). Therefore, the difference was significant. The difference between the mean values of T1-T2 (0.01) was less than the C.D value (0.178). Therefore, the difference was non-significant.

Table 4.6: Comparison of average moisture content of fasting cookies

Treatments		T0	T1	T2	T3
		2.52	3.43	3.32	3.12
T0	2.52	0.00	0.91	0.80	0.60
T1	3.43		0.00	0.11	0.31
T2	3.32			0	0.20
T3	3.12				0

C.D. at 0.5%: 0.17

The difference between the mean values of T0-T1 (0.91), T0-T2 (0.80) , T0-T3 (0.60), T1-T3 (0.31) and T2-T3 (0.20) was greater than the C.D value (0.17). Therefore, the difference was significant. The difference between the mean values of T1-T2 (0.11) was less than the C.D value(0.17). Therefore, the difference was non-significant.

Table 4.7: Comparison of average on Iron (mg) of fasting cookies

Treatments		T0	T1	T2	T3
		3.01	4.52	4.17	3.36
T0	3.01	0.00	1.51	1.16	0.35
T1	4.52		0.00	0.36	1.16
T2	4.17			0	0.81
T3	3.36				0

C.D. at 0.5%: 0.06

The difference between the mean values of T0-T1 (1.51), T0-T2 (1.16) , T0-T3 (0.35) , T1-T2 (0.36), T1-T3 (1.16) and T2-T3 (0.81) was greater than the C.D value (0.06). Therefore, the difference was significant.

Table 4.8: Comparison of average calcium (mg) of fasting cookies

Treatments		T0	T1	T2	T3
		54.69	85.27	87.95	90.66
T0	54.69	0.00	30.58	33.26	35.96
T1	85.27		0.00	2.68	5.38
T2	87.95			0	2.70
T3	90.66				0

C.D. at 0.5%: 0.017

The difference between the mean value of T0-T1 (30.58), T0-T2 (33.26) , T0-T3 (35.96), T1-T2 (2.68), T1-T3 (5.38)and T2-T3 (2.70) was greater than the C.D value (0.017). Therefore, the difference was significant.

4.5 Texture analysis of fasting cookies

Table 4.9: Comparison of average hardness (g) of fasting cookies

Treatments		T0	T1	T2	T3
		8657.82	20817.76	9993.16	6865.94
T0	8657.82	0.00	12159.94	1335.34	1791.88
T1	20817.76		0.00	10824.60	13951.82
T2	9993.16			0	3127.22
T3	6865.94				0

C.D. at 0.5%: 2449.073

The difference between the mean values of T0-T1 (12159.94), T0-T2 (1335.34), T0-T3 (1791.88), T1-T2 (10824.60), T1-T3 (13951.82) and T2-T3 (3127.22) was greater than the C.D value (2449.073). Therefore, the difference was significant.

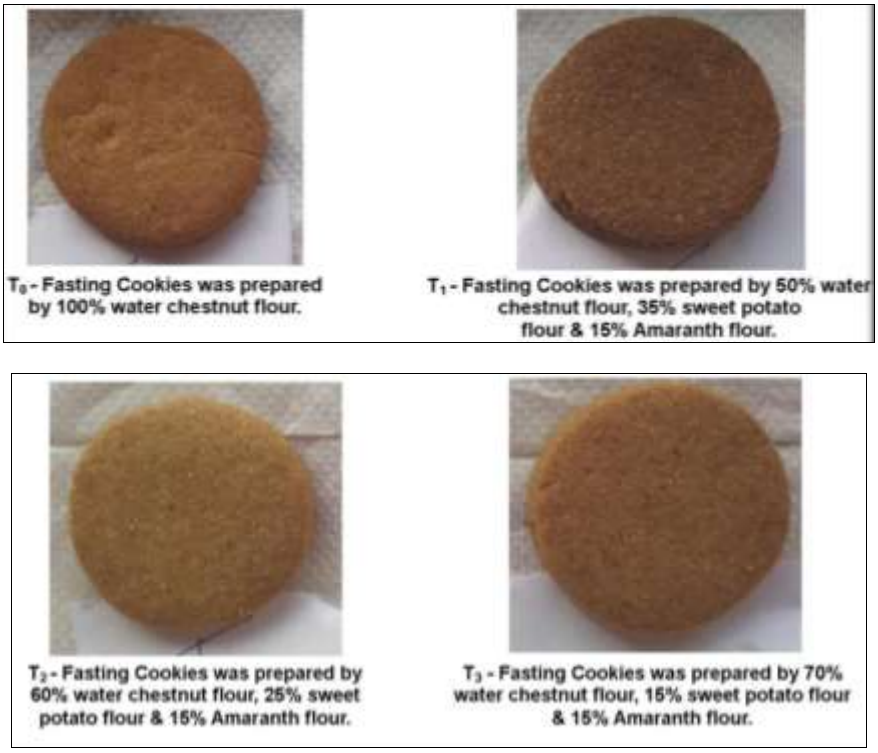

Fig 1: Developed of Fasting Cookies

Summary

Fasting Cookies was prepared to asses nutritional quality associated with different ingredients using is at fasting days to give health benefits and dense energy to the body.

Study was conducted on different sample based on different proportion of water chestnut, sweet potato, and amaranth flour (70%15%15%) that was determined the most acceptable and the best sample selected during sensory evolution.

The change were observed after baking in regards of its appearance, color, surface roughness or smoothness etc. the quality was judged by sensory evolution carried out by a panel of 5 judges (the academic staff of Warner college of dairy technology) using 9 point hedonic scale.

Incorporating unsalted butter in liquid from the Cookies were formed and were baked in baking oven at 150^0 to 180^0C for 15 to 20 minutes. After cooling, were packed in LDPE bags.

Conclusions

The cookies prepared out of 70 g water chestnut 15 g sweet potato, and 15 g amaranth flour (T3) attains good sensory and textural properties with maximum acceptance during sensory analysis. Fasting cookies was prepared to asses nutritional quality associated with different ingredients, which can be used during fasting days to give health benefits and dense energy to the body. Study was conducted on different samples based on different samples based on different proportion of water chestnut flour, sweet potato flour amaranth flour. Sample T3 (70%15%15%) was the most acceptable and the best sample selected during sensory evalution on the basis of above results revealed in the presented study it might be conclude that this formulation of fasting cookies was possible to satisfy consumer taste and preferences and will be accepted in the market as fasting purpose.

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