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Nutritive value and Organoleptic evaluation of Cookies prepared from Ragi flour, Dates and Amla powder to promote Superfoods

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Abstract
The present study was carried out in the Department of Food Science and Nutrition, Chandra Shekhar Azad University of Agriculture and Technology, Kanpur, Uttar Pradesh with the objective of "Nutritive value and organoleptic evaluation of Cookies prepared from Ragi flour, Dates and Amla powder to promote Superfoods." Superfood is a relatively recent way of referring to foods that provide the most nutritious value for the fewest calories. They include a wealth of antioxidants, vitamins and minerals. Three superfoods, *viz.* Ragi flour, Dates and Amla powder, were used for making an incorporated product, i.e., Cookies, in three treatments (T1, T2, T3), and the same control product T0 (non-incorporated) was also prepared. Incorporated Cookies and Control Cookies were analysed for their sensory characteristics. This revealed that all incorporated products had better quality in terms of colour, taste, texture, flavour and overall acceptability than control products (non-incorporated). It can be interpreted from the current study that incorporation of Ragi flour, Dates and Amla powder in the food product (Cookies) increased their nutritional value. Ragi flour, Dates and Amla powder enhance the protein, calcium, vitamin C and iron content in the incorporated food product (Cookies). Food products (Cookies) incorporated with Ragi flour, Dates and Amla powder are more nutritious than control (non-incorporated) food samples prepared from 100 percent peanuts, almond and jaggery.

Keywords: Cookies, Superfoods, Dates, Ragi flour, Amla powder, Nutritive-Organoleptic

Introduction

Super foods are incredibly rich in micronutrients, including antioxidants, enzymes, healthy fats, vitamins, and minerals. The body needs each of these nutrients to function properly. Three superfoods were taken for making value-added products, namely Ragi, Dates and Amla powder. Ragi is one of the most significant millets that may be used on a regular basis. It is more advantageous and less expensive than other millets, and is among the cheapest and simplest superfoods on the market. Calcium (Ca) and phosphorous (P), two significant minerals, are present in ragi grains; compared to other millet species, the grains have the highest concentration of calcium. Nutritional value of ragi (per 100 g): Protein 7.7 g, Carbohydrate 72.6 g, Fat 1.5 g, Calcium 344 mg, Phosphorous 250 mg, Manganese 3.5 mg, Iron 6.3 mg, Magnesium 130 mg, Crude fat 3.6 g, Ash 2.7 g.

Dates are rich in antioxidants and fibre. Their nutritional advantages may promote brain function and shield against illness, and their fibre content may also help with blood sugar regulation. Dates provide the following nutrients (per serving): Calories 277 kcal, Carbs 75 g, Fibre 7 g, Protein 2 g, Potassium 15% DV, Magnesium 13% DV, Copper 40% DV, Manganese 13% DV, Iron 5% DV, Vitamin B6 15% DV.

Amla, commonly referred to as Indian gooseberry, contains soluble fibre that dissolves quickly in the body, which helps to slow down how quickly sugar is absorbed, thereby lessening blood sugar surges. Considering that developing value-added products can make best use of Ragi flour, Dates and Amla powder for introducing these medicinal properties, the nutritional value of Amla (per serving) is: Calories 66, Protein 1 g, Fat <1 g, Carbs 15 g, Fibre 7 g, Vitamin C 46%, Vitamin B5 9%, Vitamin B6 7%, Copper 12%, Manganese 9%, Potassium 6%.

Benefits of value-added products: People these days give serious thought to how their diet can affect their health and want to eat foods that can help them live healthier lives. This has aided the growth of significant food consumption trends, including a rise in consumer interest in foods with natural and healthful features. Foods enhanced with bioactive substances like phenolic and mineral compounds, vitamins, and natural colorants fall under the category of foods with health benefits, whereas foods without artificial additions and human intervention are deemed healthier by consumers.

Methodology

Period of the study

June 2022 to June 2023.

Procurement of raw material

All the raw materials were purchased from the local market of Kanpur city.

Nutritional analysis of prepared sample through AOAC

Proximate constituents, *viz.*, crude fiber and ash contents in the sample, were determined by the standard method of AOAC (2010). Protein was determined by the Kjeldahl method.

Determination of Carbohydrate

The total CHO content in value-added products was calculated by the difference method:

$$\text{Total CHO (\%)} = 100 - (\text{Moisture} + \text{Crude protein} + \text{Total ash} + \text{Fat} + \text{Crude fiber})$$

Estimation of minerals

Minerals, *viz.*, calcium and iron, in the value-added product samples were estimated in triplicate. Calcium content was estimated by the titrimetric method of AOAC (1995). Iron was estimated colorimetrically by Wong's method as given by Ranganna (1986), using the principle that the ferric ion gives a blood-red colour with potassium thiocyanate. Vitamin C (ascorbic acid) was determined by titration, in the absence of interfering substances that may reduce the dye or oxidize ascorbic acid during sample preparation; the capacity of a sample to reduce a standard dye solution, as determined by redox titration, is directly proportional to the ascorbic acid content.

Cookies prepared from ragi flour, dates and amla powder

Incorporated Cookies were prepared in which ragi flour, dates and amla powder were used in the ratios of 30:12:8, 34:10:6 and 38:8:4.

Table 1. Recipe for Cookies prepared from ragi flour, dates, amla powder

Ingredient	T0	T1	T2	T3
Ragi flour	–	30	34	38
Dates	–	12	10	8
Amla powder	–	8	6	4
Maida	100	50	50	50
Jaggery	40	40	40	40
Butter	40	40	40	40
Baking powder	0.5	0.5	0.5	0.5
Vanilla essence	0.2	0.2	0.2	0.2

Method

- Ingredients were weighed accurately.

- Butter, jaggery powder and grinded dates were mixed well.
- Baking powder, amla powder and vanilla essence were added to the composite flour (ragi flour and wheat flour).
- The butter–jaggery–dates mixture was beaten and added to the flour.
- The batter was rolled out.
- Cookies were cut out with a cookie cutter.
- Baking was done at 180°C for 25 minutes; the cookies were then allowed to cool at room temperature.

Figure 1. Control and value added Cookies

Sensory evaluation of developed products

The acceptability of Incorporated Cookies was evaluated by a panel of 10 judges using a 9-point hedonic scale (Ranganna, 1986) to test the liking or disliking of the products.

Statistical analysis

The experiments were carried out in triplicate, and the data so obtained were subjected to analysis of mean ± SD. The obtained data were interpreted at the 5% level of significance ($P < 0.05$).

Results and Discussion

The results obtained from the present investigation, along with relevant discussion, are summarized under the following heads. The data of mean scores were tabulated and analyzed statistically; the results are presented in Table 2.

Organoleptic acceptability revealed that 38:8:4 (T3) Ragi flour: Dates: Amla powder incorporated Cookies was liked extremely, while 30:12:8 (T1) and 34:10:6 (T2) incorporated Cookies were liked very much, and the Control product (T0) was liked moderately.

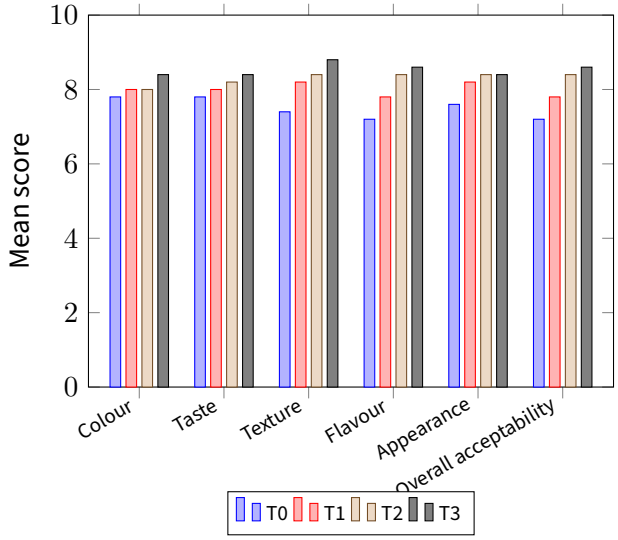

Figure 2. Mean score of Organoleptic evaluation of control and Incorporated Cookies

Nutritional Analytical procedure for Cookies

- Ash content of (T1) 30:12:8 ragi, dates and amla powder incorporated products was 2.95%, (T2) 34:10:6 was 3.42%, and (T3) 38:8:4 was 3.61%, respectively. The ash content of Control product (T0) was 1.58%. The ash content of the incorporated product (T3) was higher than the Control product (T0) and other incorporated products (T1, T2). This indicates that T3 Incorporated Cookies were found highly significant at the 5% level of critical difference with respect to ash content compared to control and other incorporated Cookies.
- Fiber content of (T1) 30:12:8 ragi, dates and amla powder incorporated products was 8.8%, (T2) 34:10:6 was 8.05%, and (T3) 38:8:4 was 7.74%, respectively. The fiber content of Control product (T0) was 1.96%. The fiber content of the incorporated product (T1) was higher than the Control product (T0) and other incorporated products (T2, T3). This indicates that T1 Incorporated Cookies were found highly significant at the 5% level of critical difference with respect to fiber content compared to control and other incorporated Cookies.
- Protein content of (T1) 30:12:8 ragi, dates and amla powder incorporated products was 9.24%, (T2) 34:10:6 was 10.02%, and (T3) 38:8:4 was 10.36%, respectively. The protein content of Control product (T0) was 7.78%. The protein content of the incorporated product (T3) was higher than the Control product (T0) and other incorporated products (T1, T2). This indicates that T3 Incorporated Cookies were found highly significant at the 5% level of critical difference with respect to protein

Table 2. Organoleptic evaluation of control and Incorporated Cookies

Parameter	T0 control	T1 (30:12:8)	T2 (34:10:6)	T3 (38:8:4)	C.D. (5%)	S.Em.
Colour	7.8	8	8	8.4	0.95	0.32
Taste	7.8	8	8.2	8.4	0.99	0.34
Texture	7.4	8.2	8.4	8.8	0.82	0.27
Flavour	7.2	7.8	8.4	8.6	0.82	0.27
Appearance	7.6	8.2	8.4	8.4	0.97	0.32
Overall acceptability	7.2	7.8	8.4	8.6	0.82	0.27

Table 3. Nutritional composition of control and Incorporated Cookies

Nutrients	Control	T1 (30:12:8)	T2 (34:10:6)	T3 (38:8:4)	CD (5%)	S.Em.
Ash	1.58	2.95	3.42	3.61	0.67	0.17
Fiber	1.96	8.8	8.05	7.74	0.29	0.07
Protein	7.78	9.24	10.02	10.36	0.33	0.08
Carbohydrates	58.47	64.33	65.8	66.69	0.46	0.12
Calcium	15.65	159.4	160.7	164.5	0.40	0.10
Iron	0.04	4.92	4.28	3.65	0.18	0.05
Vitamin C	0	46.33	43.44	40.56	0.16	0.04

content compared to control and other incorporated Cookies.

- Carbohydrate content of (T1) 30:12:8 ragi, dates and amla powder incorporated products was 64.33%, (T2) 34:10:6 was 65.8%, and (T3) 38:8:4 was 66.69%, respectively. The carbohydrate content of Control product (T0) was 58.47%. The carbohydrate content of the incorporated product (T3) was higher than the other incorporated products (T1, T2). This indicates that T3 Incorporated Cookies were found highly significant at the 5% level of critical difference with respect to carbohydrate content compared to control and other incorporated Cookies.
- Calcium content of (T1) 30:12:8 ragi, dates and amla powder incorporated products was 159.4 mg, (T2) 34:10:6 was 160.7 mg, and (T3) 38:8:4 was 164.5 mg, respectively. The calcium content of Control product (T0) was 15.65 mg. The calcium content of the incorporated product (T3) was higher than the Control product (T0) and other incorporated products (T1, T2). This indicates that T3 Incorporated Cookies were found highly significant at the 5% level of critical difference with respect to calcium content compared to control and other incorporated Cookies.
- Iron content of (T1) 30:12:8 ragi, dates and amla powder incorporated products was 4.92 mg, (T2) 34:10:6 was 4.28 mg, and (T3) 38:8:4 was 3.69 mg, respectively. The iron content of Control product (T0) was 0.04 mg. The iron content of the incorporated product (T1) was higher than the Control product (T0) and other incorporated products (T2, T3). This indicates that T1 Incorporated Cookies were found highly significant at the 5% level of critical difference with respect to iron content compared to control and other incorporated Cookies.
- Vitamin C content of (T1) 30:12:8 ragi, dates and amla powder incorporated products was 46.33 mg, (T2) 34:10:6 was 43.44 mg, and (T3) 38:8:4 was 40.56 mg, respectively. The vitamin C content of Control product (T0) was 0.0 mg. The vitamin C content of the incorporated product (T1) was higher than the Control product (T0) and other incorporated products (T2, T3). This indicates that T1 Incorporated Cookies were found highly significant at the 5% level of critical difference with respect to vitamin C content compared to control and other incorporated Cookies.

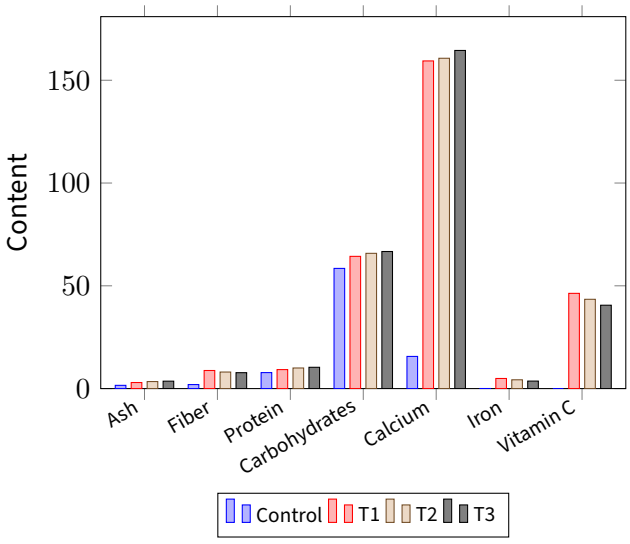

Figure 3. Nutritional composition of control and Incorporated Cookies

Conclusion

The various parameters such as ash, crude protein, carbohydrate, crude fiber, calcium, iron and vitamin C

were analyzed. Organoleptic acceptability of Incorporated Cookies prepared from Ragi flour, Dates and Amla powder (Superfoods) was analyzed by panel members. T3 (38:8:4) incorporated Cookies had better sensory characteristics than control (T0) and other incorporated Cookies (T1 and T2). All incorporated products (Cookies) had better nutritional quality than control Cookies. The ash and fiber content in incorporated Cookies increased with increased ragi flour and dates content in the product. Protein content increased with increased ragi flour and dates in Incorporated Cookies. Calcium and iron content in Incorporated Cookies was much higher than in control.

The new nutritious, natural and healthy processed foods are in great demand. There is immense potential to develop varied value-added products of Ragi flour, Dates and Amla powder (Superfoods) without much loss of their medicinal properties.

It can be predicted that the value-added products prepared from Ragi flour, Dates and Amla powder (Superfoods) will be accepted by people for taking advantage of their medicinal properties for good health.

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