

To assess the nutritional value of wheat and pearl millet-based products value added with cluster fig and beetroot

Abstract

Cluster Fig which is known as goolar in hindi is a medicinal fruit which is widely found in India. It is a rich source of most important nutrients of the diet which are iron and other micronutrients. Wheat is a staple food of Indian diet which is an energy dense food. It is a good source of carbohydrate & protein. Pearl Millet is most widely grown type of millet. It is known for its calorie value; vitamins & minerals present in it. Mung bean which belongs to the family of legumes has high calorie in it & is also a very good source of protein & poly-unsaturated fatty acid. For this study cluster fig powder, germinated wheat flour, germinated mung bean flour, germinated pearl millet, carrot powder & beetroot powder have been used. Products prepared were biscuit and kachari Each product has three treatments for sensory evaluation and nutritional assessment with three different replications. The prepared products were evaluated with sensory evaluation and analysed for chemical composition.

According to sensory evaluation T_1 was best in the biscuit & T_2 was best in kachari. On the basis of proximate chemical analysis, it has been found that in every product and with each treatment the values of moisture, iron, protein varies. The treatment with highest value of iron and protein biscuit, kachari is T_3 . This study shed light on evaluation of organoleptic acceptability and nutritive & medicinal properties of cluster fig. It also provides idea on how much quantity of cluster fig powder & other ingredients should be used in various processed convenience healthy food. The research aims at highlighting the use of cluster fig which is widely available in India but has never been used to make convenience food and in this way its important medicinal properties are unable to reach to people especially women's who are suffering allot from health issues in daily life.

Keywords: Goolar, Cluster fig, Iron, Organoleptic properties and Mung Beans.

Introduction

Food is the basic and common need of everyone. Between the extremes of optimal health and death from starvation or malnutrition, there is an array of diseases states that can be caused or alleviated by changes in diet. Deficiencies, excesses, and imbalance in diet can produce negative impacts on health, which may lead to various health problems such as scurvy,

obesity or osteoporosis, diabetes, cardiovascular diseases as well as psychological and behavioral problems. The science of nutrition attempts to understand how and why specific dietary aspects influence health. *Ficus racemosa* (Linn) is a moderate size avenue plant, belongs to family- Moraceae (Earlier this plant was placed in family Urticaceae but according to the modern views it should be placed in a separate family Moraceae which is separated from family Urticaceae) which is usually known as Cluster Fig Tree, Indian Fig Tree or Gular. It is an evergreen, moderate to large sized spreading, lactiferous, deciduous tree, without much prominent aerial roots. Fig fruit is low in calories. 100 g fresh fruits carry only 74 calories. However, they contain health benefiting soluble dietary fiber, minerals, vitamins, and pigments antioxidants that contribute immensely towards optimum health and wellness. Additionally, fresh figs contain adequate levels of some of the anti-oxidant vitamins such as vitamin-A, E, and K. Altogether these phytochemical compounds in fig fruit help scavenge harmful oxygen-derived free radicals from the human body and thereby protect us from cancers, diabetes, degenerative diseases, and infections. Furthermore, research studies suggest that chlorogenic acid in the figs help lower blood sugar levels and control blood glucose levels in type-II diabetes mellitus (adult-onset) condition. Cluster fig is a power house of health benefits and is known for its medicinal properties. The phytochemicals present in the plant constitutes as the bioactive substance that is the catalyst in prevention of diseases and also aids in curing them. Because of these reasons it has been used as a part of the study to explore the nutritional value of this plant in combating various nutritional problems.

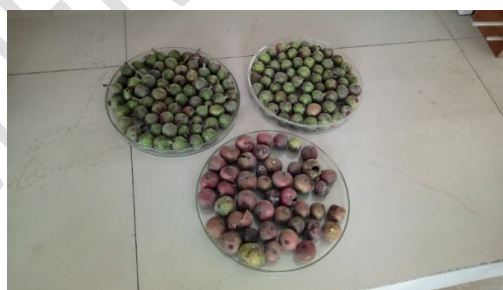


Fig. 1: Cluster fig fruit

Methodology:

The raw materials were procured from the local market. Standardisation of the product was done. The college laboratory was used to conduct all the experiments. Three products along

with a control product was made during the period of study and was evaluated for nutritional content.

Preparation of Germinated wheat flour/Germinated Pearl Millet flour/ Germinated Mung bean flour

Table No. 1: Preparation of Sample of Biscuit

Ingredients	T₁	T₂	T₃	Number of Replication
Germinated wheat Flour	70 g	60 g	50 g	<i>3 replications were made for each treatment</i>
Germinated Pearl Millet Flour	15 g	20 g	25 g	
Germinated Mung Beans Flour	10 g	10 g	10 g	
Corn Starch Flour	3 g	5 g	7 g	
Gular powder	3 g	5 g	7 g	

Method of Preparation of Biscuits:

- Beating freeze fat and sugar together till it become foam.
- Add all the flours in it slowly while mixing simultaneously.
- Add baking soda and make the dough.
- Cut into different pieces and give the shape as required.
- Bake the biscuits at 130°C for 10-15 mins in a preheated oven (220°C for 15 mins).

Table No. 2: Preparation of Sample of Extruded Product Kachari

Ingredients	T₁	T₂	T₃	Number of Replications
Germinated wheat Flour	15 g	15 g	15 g	<i>3 replications were made for each treatment</i>
Germinated Pearl Millet Flour	20 g	20 g	20 g	
Germinated Mung Beans Flour	25 g	20 g	15 g	
Rice Flour	25 g	25g	25 g	
Corn Starch Flour	10 g	10 g	10 g	
Gular powder	5 g	10 g	15 g	

Method of Preparation of Kachari :

- Mix all the flours together.
- Add salt and cumin powder.
- Add hot water to make batter.
- Extrude the product under the sun.
- Deep fry and serve hot by sprinkling salt.

Pictures of Proximate Analysis



Fig.2 Weighted Samples to be kept in oven for Moisture Estimation



Fig.3 Samples kept in dishes

Sensory Evaluation of the products

Hedonic scale 9.0 was used to assess the liking and disliking regarding the prepared products along with the control sample. A panel of 5 members have evaluated all the prepared products and give their ratings accordingly.

Nutritional Evaluation of Products:

The Moisture content, protein and iron content were calculated using standard procedure of AOAC (2005). The protein was calculated using kjeldal method, and iron was calculated using AAS. ANOVA test was used to statically establish the results obtained during the study period.

Results and Discussion

Organoleptic evaluation

A variety of products including biscuit and kachari were developed from cluster fig powder, germinated wheat flour, germinated pearl millet flour and germinated mung flour with different ratios of Cluster fig, germinated wheat flour, germinated pearl millet flour and germinated mung beans.

Organoleptic evaluation of all the developed products was done in terms of all sensory characteristics like color, appearance, flavor, texture, taste and overall acceptability on a 9-point hedonic scale.

Table No 3: Mean Score of all characteristics of sensory evaluation of products

	<i>Overall acceptability of Biscuits</i>	<i>Overall acceptability of Kachari</i>
S.E.(d)	0.35	0.529
C.D.at 5%	0.74	1.103

On the basis of overall acceptability, the score revealed that T2 is rated as “like very much” In comparison with the control products T2 got comparatively high scores than the control products. So it has been shown that T2 is best according to all the characteristics of sensory evaluation than other three treatments. It has been observed a moderate ratio of cluster fig is responsible for imparting good taste and flavor to the biscuit because if the quantity of cluster fig powder increases the taste becomes bitter and if the quantity decreases the flavor also decreases.

In comparison with the control products T1 got comparatively high scores than the control products. So it has been shown that T1 is best according to all the characteristics of sensory evaluation than other three treatments. It has been observed a moderate ratio of cluster fig is responsible for imparting good taste and flavor to the kachari because if the quantity of cluster fig powder increases the taste becomes bitter.

Proximate Analysis

Moisture content of the Products

Table no 4: Moisture Content of Biscuits

Treatment	R₁	R₂	R₃	R₄	Mean
Control	24.60	20.70	19.80	12.70	19.45
T ₁	19.78	21.98	22.17	24.60	22.13
T ₂	13.70	25.80	29.60	21.76	22.71
T ₃	31.20	29.60	21.76	25.80	30.07

SE(d)	3.27
CD	7.12

In mean result the control product contain less amount of moisture i.e. 19.45%. The different level of moisture content in each replication obtained is due to experimental error. This error arises due to some atmospheric measurement like atmospheric temperature, pressure & relative humidity. The comparable results of biscuits has shown that in the table 4, the moisture of control sample was found to be lower than other treatments i.e. 19.45%, whereas different treatment of T₁, T₂ & T₃ revealed moisture 22.13%, 22.71% & 30.07% mean value respectively. It can be said that increase in the quantity of cluster fig powder and decrease in the quantity of germinated wheat flour increases the moisture content in the product

Table No. 5: Moisture content in Extruded product Kachari

Treatment	R₁	R₂	R₃	R₄	Mean
Control	13.70	11.80	19.20	22.80	16.80
T ₁	17.80	21.80	19.00	22.90	20.37
T ₂	31.70	23.90	27.40	29.10	28.02
T ₃	24.80	32.60	27.90	29.10	28.60

SE(d)	2.31
CD	5.05

Table no 5 has shown that all three replications have different level of moisture content. In mean result the control product contain less amount of moisture i.e. 16.80%. The different level of moisture content in each replication obtained is due to experimental error.

This error arises due to some atmospheric measurement like atmospheric temperature, pressure & relative humidity.

The comparable results of kachari has shown that in the table 5, the moisture of control sample was found to be lower than other treatments i.e. 16.80%, whereas different treatment of T₁, T₂ & T₃ revealed moisture 20.37%, 28.02% & 28.60% mean value respectively. It can be said that increase in the quantity of cluster fig powder and decrease in the quantity of germinated wheat flour increases the moisture content in the product.

IRON

The evaluation of iron content was done with the help of AAS. While evaluating the iron content of three different products 4 replications were taken for each control and treatments.

Table No. 6: Iron Content in Biscuit

Treatment	R₁	R₂	R₃	R₄	Mean
Control	315.00	316.60	314.90	317.80	316.07
T ₁	329.60	327.90	328.00	330.20	328.92
T ₂	344.40	348.40	339.80	340.70	343.32
T ₃	461.60	460.90	462.70	459.80	461.25

SE(d)	1.58
CD	3.44

Table 6 has shown that all three replications have different level of iron content. In mean result the control product has amount of iron i.e., 316.07% compared to other treatment. The different level of iron content in each replication obtained is due to experimental error. This error arises due to some atmospheric measurement like atmospheric temperature, pressure, relative humidity.

The comparable results of biscuit has shown that in the table 6, the iron content of control sample was found to be 316.07%, whereas different treatment of T₁, T₂ & T₃ revealed iron content of 328.92%, 343.32% & 461.25% mean value respectively. It can be said that increase in the quantity of cluster fig powder increases the iron content in the product.

Table No. 7: Iron Content in Kachari

Treatment	R₁	R₂	R₃	R₄	Mean
Control	197.60	200.60	198.40	199.60	199.05
T ₁	227.20	229.80	226.40	225.80	227.30
T ₂	241.80	242.70	240.30	243.80	242.15
T ₃	300.40	304.20	301.90	303.80	302.57

SE(d)	1.13
CD	2.46

Table 7 has shown that all three replications have different level of iron content. In mean result the control product has amount of iron i.e., 199.05% compared to other treatment. The different level of iron content in each replication obtained is due to experimental error. This error arises due to some atmospheric measurement like atmospheric temperature, pressure, relative humidity.

The comparable results of kachari has shown that in the table 7, the iron content of control sample was found to be 199.05%, whereas different treatment of T₁, T₂ & T₃ revealed iron content of 227.30, 242.15% & 302.57% mean value respectively. It can be said that increase in the quantity of cluster fig powder increases the iron content in the product.

PROTEIN

The evaluation of protein content was done with the help of kel plus. While evaluating the protein content of three different products 4 replications were taken for each control and treatments.

Table No. 8: Protein Content in Biscuit

Treatment	R₁	R₂	R₃	R₄	Mean
Control	3.46	3.31	3.77	3.64	3.54
T ₁	3.92	3.89	3.97	3.96	3.93
T ₂	4.21	4.14	4.19	4.11	4.16
T ₃	5.72	5.70	5.69	5.67	5.69

SE(d)	0.05
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CD	0.108
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Table 8 has shown that all three replications have different level of protein content. In mean result the control product has amount of protein i.e., 3.54 compared to other treatment. The different level of protein content in each replication obtained is due to experimental error. This error arises due to some atmospheric measurement like atmospheric temperature, pressure, relative humidity.

The comparable results of biscuit has shown that in the table 9, the protein content of control sample was found to be 3.54, whereas different treatment of T₁, T₂ & T₃ revealed protein content of mean value 3.93, 4.16 & 5.69 respectively. It can be said that increase in the quantity of cluster fig powder increases the protein content in the product.

Table No. 9: Protein Content in Kachari

Treatment	R₁	R₂	R₃	R₄	Mean
Control	2.98	2.93	2.89	2.97	2.94
T ₁	4.82	4.79	4.88	4.80	4.82
T ₂	5.03	5.09	5.14	5.19	5.11
T ₃	5.98	5.96	6.03	6.07	6.01

SE(d)	0.223
CD	0.48

Table 9 has shown that all three replications have different level of protein content. In mean result the control product has amount of protein i.e., 2.94 compared to other treatment. The different level of protein content in each replication obtained is due to experimental error. This error arises due to some atmospheric measurement like atmospheric temperature, pressure, relative humidity.

The comparable results of kachari has shown that in the table 9, the protein content of control sample was found to be 2.94 whereas different treatment of T₁, T₂ & T₃ revealed protein content of 4.82, 5.11 & 6.01 mean value respectively. It can be said that increase in the quantity of cluster fig powder increases the protein content in the product.

Conclusion

In both the product there is varied difference of moisture in the product. The difference may be due to the atmospheric pressure or any other external factor or it may be due to the difference in method of preparation of the product. One other factor that also contributes to the difference in the moisture content is the change in the ratio of ingredients among each treatment.

Iron content in biscuit control sample, T1, T2 and T3 were found to be 316.07 ppm, 328.92 ppm, 343.32 ppm and 461.25 ppm respectively. In the product kachari, the control product got 199.05 ppm iron content and the treatments have iron content of T1 has 227.30 ppm, T2 has 242.15 ppm & T3 has 302.57 ppm. One other factor that also contributes to the difference in the content is the change in the ratio of ingredients among each treatment. It has been found that iron content increases with increase in the quantity of cluster fig powder because cluster fig has fairly good iron content in it.

Protein content in biscuit control sample, T1, T2 and T3 were found to be 3.54, 3.93, 4.16 & 5.69. In the product kachari, the control product got 2.94 protein content and the treatments have protein content of T1 has 4.82, 5.11 & 6.01. It has been found that protein content increases with increase in the quantity of cluster fig powder & mung bean because both have fairly good protein content in it.

From the above research it has been found that cluster fig which is not yet incorporated in the diet has very good nutritional value. It has therapeutic as well as medicinal properties in it. When we try to incorporate this valuable ingredient in diet, we have found that it increases its medicinal properties and the taste of the product. It is also good in both ways sweet and salty. The nutritional parameter on which the product has been tested is moisture, iron and protein. The product has good iron & protein content in it. We have confined our research work with women mainly because of the high value of iron and protein content found in the cluster fig powder which has been used as a value-added product in the research work. It has been found to be good for ladies in the age group of 18 to 40 years because in this age women mostly give birth to young ones and also major menstrual problems occur in this age. It has been found that the normal iron requirement of women in this age according to RDA is 18mg, protein requirement is 55g/day. Through the products made during the research with the incorporation of cluster fig powder, pearl millet and mung bean powder it has been found that we are able to provide of good iron and protein content through biscuits and kachari.

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