

Studies on Utilization of Ragi for Preparation of Malted Ragi Cookies

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Abstract: Cookies are one of the most popular bakery products. It is a rich source of protein, fat and carbohydrates but limiting in minerals and dietary fibers. A malted ragi flour cookie is rich in iodine, minerals like iron, calcium, phosphorus, fiber and vitamin contents. It was prepared with per 100gm of malted ragi flour and other minor ingredients added based on sensory trials like Vanaspati oil(50gm), Butter (10gm), Sugar(25gm), cumin(4gm), salt(2gm) etc. we take three trials like T₁, T₂ and T₃ for preparation of malted ragi cookies by using different proportion of flour. From above three trials T₃ was selected according to ten panelist members by using five point hedonic scale. Then we start storage study up to 60 days after interval of 10 days. The values of nutrients were increase significantly while the values of protein content, fat content and sensory score decreases significantly during 60 days of storage at ambient temperature. From above storage study we observe shelf life of malted ragi cookies are 60 days. After storage study the Physicochemical, Microbial and Sensory quality attributes of the product were evaluated. Malted ragi cookies contain Energy (357.00 kcal), Carbohydrate (74.09 gm), Protein(10.40gm), Fat(3.04 gm), Crude fiber(3.05gm). Those cookies beneficial for growing children decrease malnutrition problem, teenagers, pregnant and lactating women due to its high nutritive value.

Keywords: Cookies, Malt Ragi Flour, Soaking Germination, Malnutrition etc

1. Introduction

Finger millet (*Eleusine coracana*) also known as *ragi* is mainly used in India and Africa. *Ragi* is important millet crop in dry hill area of India. It is rich in protein, calcium, phosphorus, iron, fiber and vitamin content. The calcium content is higher than all cereals and iodine content is considered to be highest among all the food grains. Ragi has best quality protein along with the presence of essential amino acids, vitamin A, vitamin B and phosphorus (Gopalan et al.2004).Finger millet contains higher proportion of carbohydrate which is the form of non starchy polysaccharide and dietary fiber, which provides several nutritional and physiological benefits (Rai, 2000). Ragi contains Moisture (13.10gm), Protein (7.30gm), Carbohydrate (7.00gm), Fat (1.30gm), and Energy (328.00Kcal) (Gopalan et. al. 2004)

Now a Days human being suffer from many health problem because of lower nutritive food that is malnutrition ,anemia etc.Each person needs best nutritive food to avoid health nutritional value as compared to other food grains.

As we have seen Ragi is rich in calcium and iron other than all food grains. Iodine content is said to be highest among all the food grains. It is also rich in protein, phosphorous, fibre and vitamins content. Ragi has best quality protein along with the presence of essential amino acids, vit.A, .B and phosphorous. (Gopalan et. al. 2004).

One of the main deficiencies in malnutrition is due to the calcium and Iron, Over 69.5 per cent children in the age group 6 to 59 months in suffer from anemia, of which 63 per cent are in the urban areas and 71.5 per cent in the rural areas. (03/06/2008, NFHS); so by giving Ragi as a supplementary source we can combat the deficiency of Calcium and Iron among school children.

Ragi provides highest level of calcium, antioxidants properties, phytochemicals, which makes it easily and slowly digestible. Hence it helps to control blood glucose levels in diabetic patients very efficiently. The bulkiness of the fibers and the slower digestion rate makes us feel fuller on, fewer calories and therefore may help to prevent us from eating excess calories. Therefore, ragi is considered to be ideal food for diabetic individuals due to its low sugar content and slow release of glucose/sugar in the body (Kang et al., 2008 and Lakshmi and Sumathi, 2002).

In germination process both starch and protein are partially degraded, importance of better digestibility and some of the flatus factors are also degraded. There is also overall improvement in the flavour profile. (Nirmala et.al., 2000, Ram et.al., 1979, Rao and Belavady, 1978).

Malting improves physical and chemical composition; it improves nutritive value of the products. It improves the soluble proteins, free amino acids and reducing sugar and digestibility of protein and starch and therefore improves overall nutritive value. (Naikare et.al, 2003).Germination and malting decreases antinutritional factors such as phytate oxalate tannins, trypsin inhibitor and at the same time increases various minerals and vitamins such as B₁,B₂,B₆,niacin folic acid,tryptophan,biotin,vitamin C(Dennis Edward Briggs,1998).

2. Material and Methods

The malting of ragi was carried out with slight modification in the procedure suggested by Nirmala and Muralikrishna, 2002. In brief the ragi seeds were washed with water for 5 times and soaked in water for 5 hr. Excess water was drained, seeds were tied in a muslin cloth and specific weight kept on it. These seeds were germinated at 27± 3°C for 24hr and dried in shade for 2 days. The malted ragi seeds were grounded into flour by using the electric grinder. The

detailed flow chart for the preparation of malted ragi flour is given in Fig. 1.

The formulations of cookies prepared from different proportions of unmalted ragi flour, jowar flour and then only malted ragi flour are given in Table 1 .and finally we selected only malted ragi flour. Other ingredients like vanspati oil, butter, cumin, sugar, baking soda, baking powder were added to each of these formulations of cookies preparation.

The cookies were prepared by standard method. The basic preparation of cookies includes dough preparation. For dough preparation raw ingredients (ragi was malted and used) was first soaked for overnight (24hrs) and then dried in the cabinet drier for 8hrs at 55°C and roasted till brown colour develop and ground into fine flour. By adding melted vanaspati oil and butter dough was kneaded with the hand. Dough kept for few minutes to improve its texture of final product. Dough was rolled into thickness of 2-3mm in round shape and. Flow chart of cookies making is given in Fig. 2 .Prepared product was stored in different packaging materials (LDPE and PP bags) and stored at room temperature (25°C+/-2).

The specific proportion of unmalted ragi flour and jowar flour cookies and then only malted ragi flour cookies supplemented cookies were subjected to proximate analysis such as moisture, Ash content, calcium, iron, protein, fat and crude fiber. Also specific proportion of unmlated ragi flour ,jowar flour cookies and then only malted ragi flour cookies supplemented cookies were subjected to estimation of calcium, iron, phosphorous and vitamin C content. According to final result of proximate analysis we selected only malted ragi flour cookies. The sensory evaluation of malted ragi cookies samples were carried out by a panel of 10 semi-trained judges for different sensory attributes. 5 point hedonic scale was used for this evaluation. The analytical data obtained for malted ragi supplemented cookies were subjected to analysis of variance using complete randomized design according to Panse and Sukhatmay, 1989.

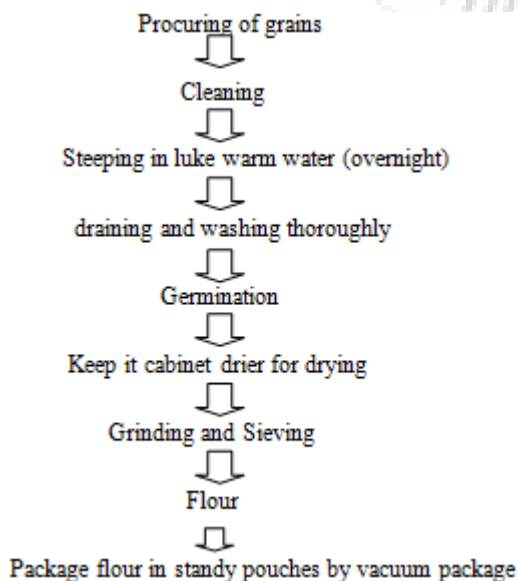


Figure 1: Flow chart of malting process

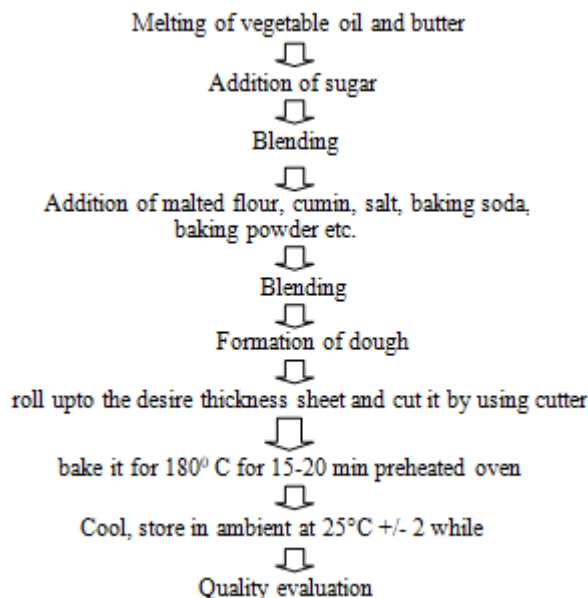


Figure 2: Flow chart of Malted ragi cookies

Table 1: Formulation of flour supplemented cookies

Sample	Unmalted ragi flour	Jowar flour	Malted ragi flour
T ₁	70gm	30gm	-
T ₂	60gm	40gm	-
T ₃	-	-	100gm

3. Result Discussion

The proximate composition of unmalted ragi flour is Moisture(13.10gm), Protein(8.20gm), Carbohydrate (75.10gm), Fat(1.30gm), Ash(2.70gm), Crude fiber (3.60gm), Energy(344.70 Kcal). The data shown that malted ragi flour is a good source of calcium and iron. Malted ragi is the best option for preparation of cookies. It helps in malnutrition problem as well as we can compact the deficiency of calcium and iron among school children.

The chemical composition of malted ragi flour is Moisture(12.67gm), Protein(10.30gm), Carbohydrate (74.10gm), Fat (1.14gm), Ash(2.10gm), Crude fiber (3.18gm), Energy(347.86 Kcal). It was noticed from the data that the malting process was useful to increase the calcium, phosphorus and vitamin C content of ragi flour. The protein and fat contents were unaffected by malting. Malting of finger millet improves digestibility and bioavailability of nutrients, improves sensory and nutritional quality (Malleshi and Desikachar, 1986). The significant increase in vitamin C content after malting is attributed to the enzymatic hydrolysis of starch by amylases and diastases, which degrade starch and produce glucose. This increased amount of glucose becomes the precursor of vitamin C (Taur *et al.*, 1984). It is reported that during malting process calcium and phosphorus content increases whereas iron content decreases (Sangita and Sarita, 2000).

Chemical compositions of cookies prepared from supplemented ragi flour were determined and obtained results are Energy (357.60Kcal), Carbohydrate(74.09gm), Protein(10.40gm), Fat(3.04gm), Crude fiber(3.05gm). The data showed that there were no significant differences in fat content. The crude fibre and mineral contents viz. calcium, iron and phosphorus of supplemented malted ragi cookies

were higher than the control cookies sample. Analysis of cookie was done on the basis of proximate analysis, microbial analysis and sensory quality analysis. 20 panel

members has selected for the sensory analysis of the product stored for 60 days.

Changes in proximate composition of cookies stored at ambient condition*(25°C +/- 2)

Parameters	Day	0 th day	10 th day	20 th day	30 th day	40 th day	50 th day	60 th day
Moisture (gm)		8.17	8.14	8.9	7.99	7.91	7.85	7.69
Protein (gm)		10.40	10.42	10.43	10.47	10.51	10.57	10.63
Carbohydrate (gm)		74.09	74.12	74.13	74.18	74.20	74.22	74.22
Fat (gm)		3.04	3.04	3	2.94	2.90	2.90	2.86
Ash (gm)		3.40	3.40	3.37	3.34	3.30	3.27	3.25
Crude fibre(gm)		3.05	3	3.55	3.45	3.35	3.05	3.35
Energy (Kcal)		357.60	304.10	304.26	357.82	358.88	358.88	359.00

The data on changes in proximate composition of cookies stored at ambient condition is presented in Table 1. From the data it was revealed that proximate constituent like moisture was found to be 8.17 % on 0th day and that of on 60th day 7.69%. In case of protein the values on 0th day was 10.40% and that of on 60th day 10.63%. Fat percent on 0th day was 3.04 % and on 60th day 2.86 %. Carbohydrates on 0th day 74.09 % while on 60th day it was 74.28%. Crude fibre on 0th day was 3.05% and on 60th day 3.35 %. While energy on 0th

day was found to be 357.60 Kcal while on 60th day it was found to be 359.00 Kcal.

Sensory analysis of the *cookies* was done by using 5 point hedonic scale. 10 panel members were employed for this sensory evaluation. The product is evaluated on the basis of its parameters as colour, texture, flavour, appearance and overall acceptability

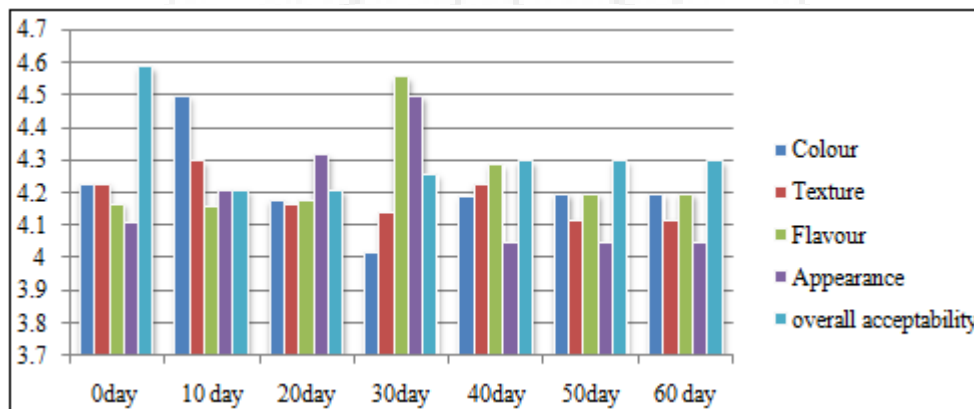


Fig. shows graphical representation of the results obtained by sensory evaluation of *cookies* stored at ambient condition for 60 days

The data on sensory quality attribute of *cookies* sample stored at ambient temperature is presented in table and graphically represented in fig from the data (means of means) It is observed that colour character score mean 4.23 on 0th day and 4.20 on 60th day. Texture character got score 4.23 on 0th day and 4.17 on 60th day. Flavour attribute gained score 4.17 on 0th day and that is of on 4.20 on 60th day. the appearance character score mean score of 4.11 on 0th day while on 60th day it has decrease to 4.05. The overall acceptability character of *cookies* scored mean 4.59 on 0th day and that is of 4.30 on 60th day. As per the rank position of the all quality attributes (color, flavour, texture, appearance, overall acceptability) had secured rank 1st indicating that product was in good condition even upto 60 day of storage score sheet evaluation test. So from sensory point of view the product remain in good condition till the study period is over.

From means of mean it may concluded that there are no significant difference in quality attribute (sensory

parameter) of *cookies* stored at ambient condition on 0th day to 60th day indicating that *cookies* remained in good condition

Sangita and Sarita, 2000 has reported that supplementation of malted ragi flour increases mineral contents i.e. calcium, iron and phosphorus of burfi. The crude fiber content of cookies samples was increased as the proportion of malted pearl millets flour was increased (Singh *et al.*, 2006). All the cookies samples prepared with different combinations of malted ragi flour were organoleptically acceptable to the panelists. The data showed that the sensory scores of supplemented cookies samples (T1, T2 and T3) for all the sensory attributes were same as the control sample.

4. Conclusion

The cookies samples prepared with combinations of malted ragi flour were rich in calcium, iron, phosphorus, and crude fiber. The cookies sample prepared combination of unmalted ragi flour and jowar flour are not best quality cookies sample as well as it has not best nutritional value as compared to malted ragi flour cookies. Hence the cookies sample prepared by supplementation with malted ragi flour will be

beneficial to growing children teenagers, pregnant and lactating women and anaemic patients.

The formulation and standardization of recipe for Malted Ragi Cookies was carried out successfully. The health benefits of Ragi Rinds are well known so the product is having some enrichments than the other marketed products. The economic feasibility can be found Rs.28/100gm ml that is more chipper than marketed Cookies (Refined Wheat Flour), so the product can be satisfy the consumer in aspects of quality, cost, health.

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