



Studies on preparation of cookies incorporated with moringa leaves powder

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Abstract

The aim is to prepare utilized moringa leaves powder for preparation of cookies as a nutritional point of view and to provide convenience to the consumer. Present investigation was undertaken to explore possibility of including moringa leaves powder in cookies. Optimum level of moringa leaves powder in the cookies was initially worked out. The moisture content in moringa leaves powder was 4.5 %, carbohydrates, 38-60.65 %, protein, 31.34 % fat, 6.95 %, crude fiber, 11.37%, calcium, 27.00 mg/100 g iron and 16775.00 g/100g β -carotene. Moringa leaf powder had deep green colour having 662kg/m³ bulk density. The health benefits of moringa powder, it is rich in antioxidants and other nutrients which are commonly missing in the diets of people living in undeveloped countries. In addition to calcium, iron and potassium, moringa leaves contain several important vitamins. Like vitamin A, vitamin C, vitamin E which act as antioxidant. The cookies were subsequently prepared with 7 % moringa leaves powder and 20% Refined wheat flour, 20% Ragi flour, Cocoa Powder 5%, Baking powder 1%, Powdered Sugar 23% and Butter 20%. For preparation all the ready ingredients mixed together and making dough than moulding through moulder and baking the cookies. The fresh cookies had 10.28 % moisture, 7.50 % protein, 25.92 % fat, 2.24% crude fibre, 58.20 % carbohydrates, 1.18% calcium. Sensory evaluation of cookies revealed that mean score for colour and appearance was 8, while for texture, flavour, taste and overall acceptability it was 8.3, 8.4, 8.2, and 8.1 respectively, on 9 point hedonic scale. The cookies packed in polypropylene (PP), low density polyethylene HDPE) and aluminium foil for storage study. It can be stored up to 21 days in good condition with minimum losses in sensory, nutritional and textural characteristics.

Keywords: Moringa leaves powder, cookies, chemical properties, sensory evaluation, health benefits etc

Introduction

M. Oleifera is commonly referred to as either Horse Radish tree (referring to the taste of its roots) or Drumstick tree (describing the shape of its pods) (Shih *et al.*, 2011) while less frequently referred to as 'The Tree of Life' or 'Miracle Tree' due to its economical importance and versatility (Abe and Ohtani 2013; Bakre *et al.*, 2013). A single genus with 14 known species, *M. oleifera* is the most widely known and utilized of these (Morton, 1991). *Moringa oleifera* is referred to as "Moringa", it is considered one of the world's most useful trees. Almost every part of moringa tree can be used for food or other beneficial applications (Quattrocchi and Umberto, 2000). It is native in Asia Minor, Africa, the Indian subcontinent (Bangladesh, India & Pakistan) (Somali *et al.*, 1984), and is also distributed in the Philippines, Cambodia, Central America, North and South America, and the Caribbean Islands (Morton, 1991). The tree ranges in height from 5 to 12 m and the fruits (pods) are around 50 cm long. When mature, the fruit of *M. oleifera* becomes brown and has 10–50 seeds inside. Fully mature dry seeds are round or triangular in shape and the kernel is surrounded by a light woody shell with three papery wings (Abdulkarim *et al.*, 2005; Vlahov *et al.*, 2002). All parts of the Moringa tree—leaves, flowers, fruits, and roots are edible and have long been consumed as vegetables (Anwar and Bhanger, 2003; Siddhuraju and Becker, 2003). *Moringa oleifera* is esteemed as a versatile plant due to its multiple uses. The leaves, fruits, flowers and immature pods of this tree are edible and they form a part of traditional diets in many countries of the tropics and sub-tropics (Siddhuraju and Becker, 2003; Anhwange *et al.*, 2004). Moringa is rich in

nutrition owing to the presence of a variety of essential phytochemicals present in its leaves, pods and seeds. In fact, moringa is said to Asian J. Med. Biol. Res. 2017, 3 (1) 21 provide 7 times more vitamin C than oranges, 10 times more vitamin A than carrots, 17 times more calcium than milk, 9 times more protein than yoghurt, 15 times more potassium than bananas and 25 times more iron than spinach (Rockwood *et al.*, 2013). Various parts of the plants such as leaves, roots, seeds, barks, fruits, flowers and immature pods act as cardiac and circulatory stimulants, possess antipyretic, antiepileptic, anti-inflammatory and antiulcer (Pal *et al.*, 1995).

The leaves of *M. oleifera* are a good source of protein, vitamin A, B and C and minerals such as calcium and iron (Dahot, 1988). The leaves are outstanding as a source of vitamins A when raw as a source of vitamin C. They are also good sources of vitamin B and are among the best plant sources of minerals (Talhaiani and Kar, 2000). Moringa leaves have been consumed by Asian people for millennia as a healthy food product. Studies from other countries indicate that the leaves have immense nutritional value such as phytochemicals, vitamins, minerals, and amino acids (Anwar *et al.*, 2007; Busani *et al.*, 2011). Moringa leaves are known to have a high content of essential amino acids, proteins, minerals and vitamins, hence an ideal nutritional supplement (Fletcher, 1998). Many evidences exposed in which *M. oleifera* experienced several drug actions including antibacterial (Dayrit *et al.*, 1990), Moringa seeds have long been used by the public as a tasty vegetable and water purifier because of its coagulant properties (Ayotunde *et al.*, 2011). Other moringa plant parts like flowers, roots,

and bark also have good nutritional and therapeutic value (Olushola, 2006).

Moringa oleifera is one of the lesser known vegetables found in Nigerian ecosystem with highly nutritious leaves, significant source of β -carotene, vitamin C, iron, potassium and protein. Its protein quality compares very well with that of milk and egg (Gardener and Ellen, 2002; Emelike *et al.*, 2015) [13, 8, 9]. To alleviate the problems of malnutrition as a result of inadequate diet in developing countries, there is need for a cheap and available source of protein like *Moringa* leaves as food enricher since animal protein is very expensive and beyond the reach of the common man. Suchada *et al.*, (2010) [38] carried out a research on eleven different samples of *Moringa oleifera*.

Wheat is the main cereal crop in India. The total area under the crop is about 29.8 million hectares in the country. The production of wheat in the country has increased significantly from 75.81 million MT in 2006-07 to an all-time record high of 94.88 million MT in 2011-12. The productivity of wheat which was 2602 kg/hectare in 2004-05 has increased to 3140 kg/hectare in 2011-12. The major increase in the productivity of wheat has been observed in the states of Haryana, Punjab and Uttar Pradesh. Higher area coverage is reported from MP in recent years. Indian wheat is largely a soft/medium hard, medium protein, white bread wheat, somewhat similar to U.S. hard white wheat. Wheat grown in central and western India is typically hard, with high protein and high gluten content. India also produces around 1.0-1.2 million tons of durum wheat, mostly in the state of Madhya Pradesh. Most Indian durum is not marketed separately due to segregation problems in the market yards. However, some quantities are purchased by the private trade at a price premium, mainly for processing of higher value/branded products. The production and productivity of Wheat crop were quite low, when India became independent in 1947. The production of Wheat was only 6.46 million tonnes and productivity was merely 663 kg per hectare during 1950-51, which was not sufficient to feed the Indian population. The Country used to import Wheat in large quantities for fulfilling the needs of our people from many countries like USA under PL-480. The reasons of low production and productivity of Wheat at that time was (a) the tall growing plant habit resulting in lodging, when grown under fertile soils, (b) the poor tillering and low sink capacity of the varieties used, (c) higher susceptibility to diseases, (d) the higher sensitivity to thermo & photo variations, etc., resulting in poor adaptability, and (e) longer crop duration resulting in a long exposure of plants to the climatic variations and insect pest / disease attacks.

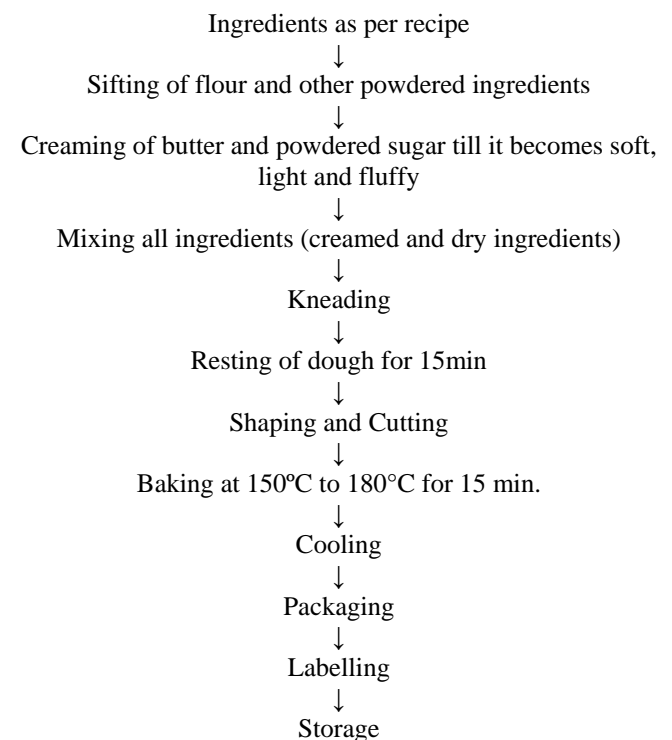
Finger millet (Ragi, *Eleusine Coracana*) is an important staple food in the eastern and central Africa as well as some parts of India (Majumder *et al.*, 2006). It is rich in protein, iron, calcium, phosphorus, fibre and vitamin content. The calcium content is higher than all cereals and iodine content is said 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). Thus ragi is a good source of diet for growing children, expecting women's, old age people and patients.

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 fibres 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 the germination process, both starch and protein are partially degraded, important for 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.).

Finger millet is usually used for preparation of flour, pudding, porridge and roti (Chaturvedi and Srivastava, 2008). With the changes in scenario of utilization of processed products and awareness of the consumers about the health benefits, finger millet has gained importance because of its functional components, such as slowly digestible starch and resistant starch (Wadikar *et al.*, 2007). Traditionally ragi is processed either by malting or fermentation (Rao and Muralikrishna, 2001). Malting of finger millet improves its digestibility, sensory and nutritional quality as well as pronounced effect in the lowering the antinutrients. Malting characteristics of finger millet are superior to other millets and ranks next to barley malt (Malleshi and Desikachar, 1986 and Pawar and Dhanvijay, 2007). There are various benefits of malting such as vitamin-C is elaborated, phosphorus availability is increased and lysine and tryptophan are synthesized (Dulby and Tsai, 1976). The malted and fermented ragi flour are extensively used in preparation of weaning food, instant mixes, beverages and pharmaceutical products (Rao and Muralikrishna, 2001).

Flowsheet for preparation of cookies incorporated with moringa leaves powder



Material and Methods

Procurement of materials for moringa cookies

Raw materials required during present investigation were procured from local market of Saralgaon such as wheat flour, Ragi flour, Moringa powder, Baking powder, Sugar, Butter, Chocolate powder, Water etc. The raw material were cleaned and made free foreign matters.

Physical Properties of cookies Incorporated with moringa powder

The colour of ingredients and product was determined by visual observations which was dark brown. The shape of the product was determined by visual observation which was round and diameter observed by vernier calliper.

Chemical Properties of cookies Incorporated with Moringa leaves powder

Different chemical properties of samples were analysed for moisture content, ash, fat, protein and total carbohydrate. All the determinations were done in triplicate and the results were expressed as the average value. For moisture determination samples were dried in oven at 130°C for 60 minutes. For ash determination samples were placed in muffled furnace at 550°C to burn out all carbon compounds leaving in organic part (ash). Fat was determined by fat extraction unit by using n. Hexane.

Sensory Evaluation cookies Incorporated with Moringa leaves powder

Prepared product was evaluated for sensory characteristics in terms of appearance, color, flavour, aftertaste, texture and overall acceptability by 10 semi-trained panel members comprised of academic staff members using 9- point Hedonic scale. Judgments were made through rating the product on a 9 point Hedonic scale with corresponding descriptive terms ranging from 9 ‘like extremely’ to 1 ‘dislike extremely’. The obtained results were recorded in sensory score card.

Storage Study of cookies Incorporated with Moringa leaves powder

Storage effect on product was good on up to 21 days at ambient temperature was carried out & score recorded was T2 sample. The significant changes were noticed in colour, consistency, appearance and taste during 21 days of storage.

Statistical analysis cookies Incorporated with Moringa leaves powder

The analysis of variance of the data obtained was done by using Completely Randomized Design (CRD) for different treatments as per the method given by Panse and Sukhatme (1967). The analysis of variance revealed at significance of P<0.05 level S.E. and C.D. at 5per cent level is mentioned wherever required.

Result

Physical and Chemical Properties of Raw Materials

Table 1: Physical and chemical Properties of Ragi flour

| Parameter | Units | Parameter | Units |
|--------------|------------------------|------------------|--------|
| Porosity | 28.25% | Ash | 3.20% |
| Bulk Density | 1158Kg/m ³ | Moisture Content | 7.69% |
| True Density | 1643 Kg/m ³ | Fat | 2.86% |
| Sperisity | 92.43% | Protein | 10.63% |

The physical parameters of dates were found to be Bulk Density (1158 Kg/m³), sperisity (92.43%), True Density (1643 Kg/m³) and porosity (28.25%) and The chemical parameters of ragi flour was found to be moisture content (7.69 %), fat (2.89 %), protein (10.63 %) and ash (3.20%) were more or less similar accordingly were more or less similar accordingly Ranjeet Chunilal Kokani¹, Hule Pournima Bharat², Kelgane Swati Sakharam³ (2015) respectively.

Table 2: Physical and chemical Properties of wheat flour

| Parameter | Units | Parameter | Units |
|------------------|------------------------|--------------|--------|
| Bulk Density | 497.5Kg/m ³ | Protein | 14.75% |
| Partical size | 154µm | Carbohydrate | 71.55% |
| viscosity | 430BU | Crude fiber | 3.46% |
| Water absorption | 31.9g/g | Fat | 2.24% |

The physical parameters of wheat flour was found that the bulk density (497.5 Kg/m³) and partical size (154µm),viscosity(430BU),water absorption(31.9g/g) were more or less similar accordingly were more or less similar according(BU=Brabender unit) were more or less similar o.o.oladumoye *et al.*, (2010) accordingly respectively.The chemical properties of wheat flour found to be fat (2.24 %), protein (14.75%), Crude fibre (3.46%) and carbohydrates (71.55%), protein(14.75%)The chemical parameters of wheat flour %) were more or less similer accordingly Fauzan Azima, Novelina, Risma Srikandi Pane (2013).

Table 3: Physical and chemical Properties of moringa leaves powder

| Parameter | Units | Parameter | Units |
|--------------|------------------------|------------------|--------|
| Bulk Density | 662kg/m ³ . | Moisture Content | 4.5% |
| True density | 971kg/m ³ . | Ash | 9.29% |
| porosity | 68.18% | Protein | 31.34% |
| sphericity | 0.889% | Fat | 6.95% |

The physical parameters of moringa powder was found to be bulk density (662 kg/m³), True density (971 kg/m³), sperisity (0.889%) and porosity (68.18%) were more or less similer accordingly Ajav, E.A and Fakayode, O.A (2013). The chemical parameters of moringa powder was found to be fat (6.95 %), protein (31.34%), Crude fibre (11.37%) and carbohydrates (38-60.5%), moisture (4.5%), gluten (50.09%) were more or less similer accordingly Ranjeet chunilal kokani, pranit sharad mokashi, yogesh pandurang shelar, (2019).

Table 4: Physical Properties of moringa leaves cookies

| Physical Properties | Cookies |
|---------------------|-------------|
| Colour | Dark brown. |
| Shape | Round |
| Diameter | 2cm |
| Thickness | 0.8cm |

Physical properties of moringa cookies ware colour of moringa cookies was found out to be Dark brown by visual Appearance. The shape is round examined by visual appearance and the diameter of the moringa cookies was 2cm measured by digital vernier calliper.

Table 5: Chemical Properties of Moringa cookies

| Chemical Parameter | Selected sample |
|--------------------|-----------------|
| Ash | 3.84% |
| Moisture | 10.28% |
| Crude fiber | 2.24% |
| Protein | 7.50% |
| Carbohydrate | 58.20% |
| Energy | 248.99kcal |

It was evident from above tabulated that the chemical properties of moringa cookies were Ash content was found out to be 7.3.84%, the protein content is 7.50 %, the total carbohydrates are 58.20 %, The energy in moringa cookies was 248.99kcal and The crude fiber content is about 2.24% respectively.

Table 6: Organoleptic Evaluation of moringa cookies Incorporated with moringa leaves powder

| Parameter | T1 | T2 | T3 |
|--------------------|-----|-----|-----|
| Colour | 8.2 | 8.2 | 8 |
| Flavour | 8.2 | 8.4 | 8 |
| Taste | 7 | 8.2 | 7.4 |
| Texture | 7.5 | 8.3 | 7.6 |
| Appearance | 7.2 | 8 | 7.2 |
| Overall Acceptance | 7.4 | 8.1 | 7.8 |

The sample T2 has highest score as compare to the other samples. The colour of T2 sample as per graph is 8.2 point while samples T1 (8.2), T3 (8). The flavour of sample T2 was acceptable with 8.4 while samples T1 (8.2), T3(8). The texture of sample T2was selected by 8.2 points while other samples points are T1 (7.5), T3 (7.6). The appearance of sample T2 was selected by 8 while other samples points are T1 (7.2), T3 (7.2). The overall acceptance of sample T2 was selected by 7.4 points while other sample are T1 (7.4), T3 (7.8). The taste of sample T2 was selected by 8.2 points while other samples points are T1 (7), T3 (7.4).

Conclusion

The formulation and standardization of recipe for selected flour in the preparation of cookies incorporated with moringa powder was carried out successfully with sensory evaluation. The uses selected ingredients in the preparation of cookies incorporated with moringa powder are well known so the product is having some nutritional values. This type of value addition by way of nutrient enrichment does certainly help to provide good source of energy. After consuming the product it can satisfy the nutritional needs of the consumer. The economic feasibility can be found Rs 296./kg that is more flexible than marketed, so the product can be satisfy the consumer in aspects of quality, cost and as breakfast item with tea, coffee etc.

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