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Development and Standardisation of Gluten Free Matthies with different Ratio of Xanthan Gum

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ABSTRACT

Gluten, an essential structure-binding protein is responsible for matthies quality. Although important, gluten causes health problems to celiac disease sufferers. Thus, the aim of this study was to develop matthies using a gluten-free composite flour, and xanthan gum and. The study was conducted in phase: xanthan gum at levels 1-3 % was incorporated into the gluten-free flour composite. Dough was made and sheeted before being evaluated by physical methods compared to wheat dough. Then an optimum xanthan gum concentration was selected. Dough was made and sheeted then evaluated for physical properties. It was observed that xanthan gum successfully replaced gluten with 2% xanthan gum giving sheetable matthies with optimum strength and extension. Together with 2% xanthan gum, incorporation softened and increased the extension length of the matthies dough. A combination of 2% xanthan gum with gave optimum dough performance in handling and processing.

Keywords :- Gluten, Oats, Gluten free, Mathari, Oats, Buckwheat, Almonds, Xanthan Gum

I. INTRODUCTION

Celiac Disease is an immune-mediated enteropathy triggered by the ingestion of gluten and related proteins in genetically susceptible individuals which was considered a rare disorder, mostly found in individuals of European origin (Catassi & Fasano, 2008). However, recent epidemiological studies have shown that CD is one of the most common lifelong disorders, affecting about 1% of the world population (Catassi & Yachha, 2009). The intake of wheat and related cereals results in an immunological response, localized in the small intestine which destroys mature absorptive epithelial cells on the surface of the small intestine (Catassi & Fasano, 2008). Yet, the clinical manifestation of CD varies greatly, depending on the patient's age, duration and extent of the disease (Chand & Mihas, 2006). Since CD is often atypical or silent, many cases remain undiagnosed, leading to the risk of long-term complications, such as osteoporosis

or cancer (Fassano & Catassi, 2001). Consequently, an increased awareness of physicians for CD and effective diagnostic methods are needed. The cornerstone of CD diagnosis is the small intestinal biopsy, although serological tests are also frequently used (Catassi & Fasano, 2008). Novel therapies under investigation for the treatment of CD are (i) supplying of propyl-endopeptidase which complements gastrointestinal proteolytic processes; (ii) supplying tissue transglutaminase inhibitors (e.g. cystamine) to block the proliferative capacity of gluten-responsive T-cells; (iii) blocking the binding sites of HLA-DQ2 to prevent the presentation of disease inducing gluten peptides; and (iv) supplying of therapeutic agents used for other chronic inflammatory diseases such as cytokine therapy and selective adhesion molecule inhibition (Sollid & Khosla, 2005). In addition, plant breeding programs are investigating the replacement of particular peptides in gluten by other amino acid sequences which are not toxic for CD patients but do not alter chemical and physical properties of gluten (Van den Broeck et al., 2009). However, despite the advances made in understanding CD pathogenesis, in diagnosis and in potential developments of novel therapies, at present the only safe and effective treatment for CD is lifelong adherence to a GF diet (Niewinski, 2008).

Adherence to the GF diet which does not contain wheat, kamut, spelt, rye and barley leads to recovery from the disease and improvement of the intestinal mucosa with recuperation of its absorptive functions (Catassi & Fasano, 2008). However, the total withdrawal of gluten is extremely difficult due to the ubiquitous occurrence of gluten-containing foods, such as bread, pastry, pizza or pasta. In addition, numerous foods contain hidden sources of gluten such as thickened sauces, soups, puddings or sausages. Moreover, the prices of GF foods are often considerably higher than those of conventional products (Arendt, Morrissey, Moore, & Dal Bello, 2008). Commercial GF breads are mainly starch-based and therefore lack fibre, vitamins and nutrients, which results in a worsening effect on the already nutritionally unbalanced diet of CD sufferers who strictly adhere to a GF diet (Mariani et al., 1998). In addition, these breads are characterised by low quality, presenting poor crumb and crust characteristics, rapid staling, as well as poor mouth feel and flavour (Gallagher, Gormley, & Arendt, 2004). Thus, the need for high-quality GF foods is becoming economically more and more important (Berghofer & Scho¨nlechner, 2009). Moreover, inadequate labelling complicates the choice of products suitable for people suffering from CD (Deutsch, Poms, Heeres, & van der Kamp, 2008). Hence, a worldwide Codex Standard on Food Labelling has recently been established which resolved the health hazard posed by unknown gluten intake due to insufficient declaration of gluten-containing ingredients and food additives (Codex Alimentarius Commission, 2008) and a threshold for the gluten level in GF products of 20 mg/kg was defined (Deutsch et al., 2008).

Persons with celiac disease have sensitivity to certain sequences of amino acids found in the prolamin fraction of wheat (gliadin), rye (secalin), and barley (hordein). When consumed, these amino acid sequences trigger histologic changes to the small intestinal mucosa that can lead to the malabsorption of nutrients. Consequently, persons with celiac disease are advised to follow a gluten-free diet strictly avoiding the prolamins of wheat, rye, and barley. Whether the oat prolamin avenin also should be excluded from a gluten-free diet has been debated since the early 1950s, when oats were first reported to be harmful. In 1995, the largest and most scientifically rigorous study on the safety of oats was published by Janatuinen and colleagues. Study investigators concluded that the consumption of oats had no adverse effect on adults with celiac disease. Despite these findings, many authorities on celiac disease were reticent to change their recommendations on oats before additional evidence in support of their safety was available. Since 1995, results of several additional investigations have been published,

including those of the first study to evaluate the safety of long-term consumption of oats. The present article examines the continuing controversy over the use of oats as well as the mounting evidence suggesting that oats are safe to include in a gluten-free diet.

Flour is used in many foods, from breads and pastas to cookies and snacks. Flour made from wheat is the most common type, but for people who can't eat wheat because of allergies or dietary choices, almond flour is a popular and healthy alternative. Because almond flour is gluten-free, it is also a helpful option for people with celiac disease. Almond flour is made from ground almonds and can replace wheat flour in just about any recipe. It's easy to make at home, or you can buy it in supermarkets and health food stores. The vitamins, minerals, and antioxidants in almond flour can provide important health benefits. For example, manganese helps the body properly clot blood, allowing it to heal after injuries. Manganese also helps the body break down carbohydrates and cholesterol. Almond flour is also rich in magnesium, which can help you better control your blood sugar levels. Almond flour is rich in monounsaturated fat, which can help keep cholesterol under control. Reducing cholesterol significantly lowers the risk of heart disease. One study showed that women who consume 50 grams of almonds daily have lower cholesterol than women who do not. Almond flour is a low glycemic index food. Compared to wheat flour, almond flour has fewer sugars and carbohydrates. Switching to almond flour can help people with diabetes manage their blood sugar levels more effectively. Almond flour contains a lot of prebiotic dietary fiber. This type of fiber is digested by bacteria in your small intestine. Getting enough prebiotic dietary fiber leads to a healthier, more efficient digestive system.

Buckwheat (Fagopyrum esculentum Moench) is highly nutritious pseudocereal known as a dietary source of protein with favorable amino acid composition and vitamins (Bonafaccia, Marocchini, & Kreft, 2003), starch and dietary fiber (Skrabanja et al., 2004), essential minerals (Steadman, Burgoon, Lewis, Edwardson, & Obendorf, 2001) and trace elements (Bonafaccia, Gambelli, Fabjan, & Kreft, 2003). Phenolic compounds are also found in abundance in buckwheat, including rutin, orientin, vitexin, quercetin, isovitexin, kaempferol-3-rutinoside, isoorientin, and catechins (DietrychSzostak & Oleszek, 1999). In comparison to most frequently used cereals, buckwheat has been reported to posses higher antioxidant activity, mainly due to high rutin content (Kreft, Fabjan, & Yasumoto, 2006). In literature, it has been reported that wheat based products have been enriched by buckwheat flour in order to achieve better functionality of final product (Chillo, Laverse, Falcone, Protopapa, & Del Nobile, 2008; Fessas et al., 2008; Lin, Liu, Yu, Lin, & Mau, 2009). One of the possible ways to promote the use of buckwheat could be its utilization in formulations for mass consumer goods, such as snack products. Crackers are popular snack products in the diet and belong to a group of bakery products which contain fat in considerable amount, up to 30% (w/w). Since natural antioxidants present in buckwheat may inhibit lipid peroxidation it can be assumed that crackers made from buckwheat flour can provide beneficial health effects and prevent their oxidation during processing and storage. Another functionality of buckwheat stems from its gluten-free characteristics making buckwheat suitable for the diet for celiac disease patients (Fessas et al., 2008). The absence of structureforming gluten proteins results in poor resistance of buckwheat dough (Pruska-Kedzior et al., 2008) and therefore production of high-quality gluten-free products represents a significant technological challenge (Gallagher, Gormley, & Arendt, 2004). Several studies have been carried out to investigate incorporation of buckwheat flour in flour mixtures for gluten-free bread production (Alvarez-Jubete, Arendt, & Gallagher, 2010; Pruska-Kedzior et al., 2008The most widely grown buckwheat species include common buckwheat (Fagopyrum esculentum) and tartary buckwheat (F. tataricum). Recently, buckwheat has received increasing attention as a potential functional

food (Zhang et al., 2012). Buckwheat is a rich source of starch and contains many valuable compounds, such as proteins, antioxidant substances, trace elements and dietary fibre . Due to its excellent nutritional value, buckwheat can be included in the gluten-free diet for patients with gluten intolerance (Saturni et al., 2010). However, gluten removal results in major problems for bakers, and currently, many gluten-free products available on the market are of low quality, exhibiting poor mouthfeel and flavour (Arendt et al., 2002). This study reviews the current knowledge regarding the development of functional BGFPs such as gluten-free bread, cookies, pasta, noodles.

Mathri is a Rajasthani snack. It is a kind of flaky biscuit from north-west region of India. Once a local delicacy, mathi or mathri as it's often called, is now available in almost all sweet shops in India. Similar to Namak para, it is made from flour, water, and, optionally, carom seeds. Mathri is a popular deep fat fried Indian snack traditionally prepared from refined wheat flour (maida) containing gluten protein. It has various side effects and disadvantages and also known as slow poison. It spikes sugar levels because it has very high glycaemic index. Maida also leads to peptic ulcer and gall bladder disease. In recent years, the impressive rise of Celiac Disease incidence, dramatically prompted changes in the dietary habit of an increasingly large population, with a rise in demand of low gluten product. Almond, buckwhear and oats protein provides all the nine essential amino acids in the amounts needed for human health. Keeping in view, the present investigation was undertaken to develop gluten free mathri mix by replacing maida almond, buckwheat and oats flour, and analysing its various quality parameters.

Objectives

The objectives of the study were to: Determine the effect of Xanthan Gum addition (1, 2, and 3 % weight of total ingredients excluding water) on the textural characteristics of gluten-free mathri dough made from almond, buckwheat and oats, (ABO) flour blends.

Importance of developing gluten free mathries

So far, the only way to treat people with celiac disease is through a gluten-free diet [6]. Complete elimination of gluten allows for healing of the gut and resolution of nutritional deficiencies and other symptoms [12]. Strict adherence to a gluten-free diet also reduces the risk of developing many of the serious long-term complications associated with untreated celiac disease [10]. Adhering to a gluten-free diet may seem easy, but it is by no means as it not only entails abstaining from gluten-containing grains and all gluten-containing products, which requires constant vigilance, but also leads to a sense of social isolation and the pressure that accompanies the process [13]. Since most breads, cookies, pasta, cakes, pastries, cereal, bagels, and soups are made from wheat, avoiding them requires a complete lifestyle change that may not be possible for everyone.For all these reasons, the demand for gluten-free products is currently growing.

Special consideration in the development of gluten free matthies

The production of gluten-free products poses a major challenge for manufacturers and the main challenge is to find alternatives suitable for gluten [14]. The main protein fractions of gluten; Gluten and gliadin play a key role in the qualitative properties of breadmaking as they are responsible for the water absorption, cohesion, viscosity and elasticity of the dough [15]. Therefore, avoiding gluten poses major quality problems, especially for bakers [14]. Other challenges for developers include product safety, acceptability and convenience, and compliance with Food and Drug Administration (FDA) approved guidelines.

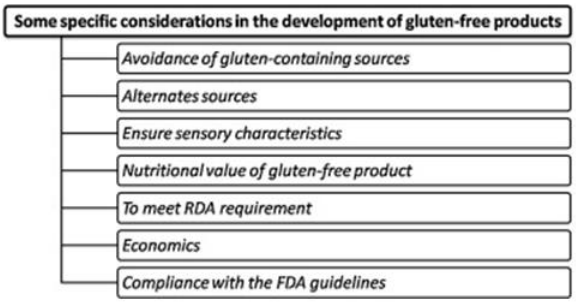

Figure 1

II. METHODS AND MATERIAL

The present study was carried to develop gluten free mathri by using almond, oats and buckwheat flour. The materials and methods used for the study have been discussed under the following headings:-

1. Technical program of work

The project will be carried out in the Department of Nutrition and Health, GD Goenka University, Gurugram , Haryana.

2. Procurement of raw materials

Almond flour, oat flour, buckwheat flour, dry fenugreek leaves, carom seeds, olive oil, salt, red chilli powder, Garam masala, xanthan gum.

3. Development of gluten free mathri

Step 1:- roast oats and almond till it's become little brown

Step 2:- glinding of both the ingredients into flour

Step 3:- take a bowl and add almond, oats, buckwheat flour, carom seeds, dry fenugreek seeds, salt, red chilli powder and olive oil into it.

Step 4:- divide the mixture into 3 bowls at same quantity and add 1, 2 and 3% of xanthan gum in 3 different bowl.

Step 5:- mix it well and make dough for mattries

Step 6:- shape them properly

Step 7:- baked it at 167* for 20 minutes

Step 8:- leave it for 10 to 15 minutes and then taste it

4. Organoleptic evaluation

The entire developed matthries product will be organoleptically evaluated for color, texture, taste and overall acceptability by using 9-point hedonic scale. On the basis of organoleptic acceptability the most acceptable value added deep fringe product will be evaluated for nutritional composition.

III. NUTRIENTS ANALYSIS

s.no	Ingredients	Amount (gm)	Protein (gm)	Fat (gm)	Carbs (gm)	Energy (kcal)
1.	Almond	150 gm	31.2	88.35	15.75	982.5
2.	oats	75 gm	9.90	4.90	50.75	284.25
3.	Buckwheat	75 gm	9.975	2.55	53.625	257.25
4.	Olive oil	10 gm	0	10	0	88
5.	Dry fenugreek leaves	15 gm	0.6	0.15	0.9	28.45
		Total	**51.675**	**105.95**	**121.025**	**1640.45**

Total amount of ingedients after mixing 318 gm
Total amount of ingredients after dividing it into 3 containers= 106 gm
Nutritive value per container (sample 1, 2 and 3)

Protein	17.225
Fat	35.31
Carbs	40.34
Energy	546.8

Cost analysis

s.no	ingredients	Amount	Cost per 500 gm	Cost of amount used
1.	Almond	150 gm	432	129
2.	Oats	75 gm	103	15.45
3.	Buckwheat	75 gm	209	31.35
4.	Olive oil	10 gm	446	8.92
5.	Carom seed	5 gm	169	4.46
6.	Dry fenugreek leave	15 gm	475	14.25
		Total	1834 rs	203. 24

IV. RESULTS AND DISCUSSION

For total matthies cost= 203.24 rupees
Total rupee of ingredients after dividing it into 3 containers= 67.74 rupees
In one portion there are 10 to 15 mathhies= 4.516 rupees for 1 matthi

V. CONCLUSION

Celiac disease affects approximately 1% of the world's population and is increasing dramatically due to underestimation as the disease often goes undiagnosed. The only treatment for people with celiac disease is a lifelong gluten-free diet. However, following a lifelong gluten-free diet can lead to nutritional imbalances in patients. In fact, avoiding gluten-containing foods from the diet means eliminating key protein sources from the diet and sticking to a carbohydrate-rich diet. There is therefore a strong need to develop gluten-free products that are both highly nutritious and inexpensive.However, there are a few things to consider and consider before developing products for celiacs. Some of the considerations include excluding all possible gluten-containing raw materials, selecting an alternative flour source, having an acceptable product texture and color, improving the product's nutritional quality, product safety, and labeling. These considerations will aid in the development of a complete, safe, and nutritionally healthy gluten-free food for people with celiac disease.

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