Mansoura University

Faculty of agriculture

Food Industries Department

Production of some fortified baked products to feed celiac and diabetes patients.

Graduation project submitted by

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INTRODUCTION

1. INTRODUCTION

This study is conducted for the purpose of producing baked goods with high nutritional value and low in calories and selected some components with high nutritional value so that diabetics, celiac patients and many diseases could benefit from them, namely Oats, beetroot, Flaxseeds, chia seeds, sesame seeds, lentils and rice flour. Each ingredient will be explained separately in this project in terms of nutritional value and health benefit from it.

Diabetes Available data from many countries of the Eastern Mediterranean Region (EMR) indicate that diabetes mellitus has become a problem of great magnitude and a majorpublic health concern. Studies have demonstrated that, in some countries, diabetes affects up to 10% of the population aged 20 years and older. This rate may be doubled if those with impaired glucose tolerance (IGT) are also included. The manifestations of diabetes cause considerable human suffering and enormous economic costs. Both acute and late diabetic complications are commonly encountered. Long-term complications represented by cardiovascular diseases, cerebro vasculaaccidents, end-stage renal disease, retinopathy and neuropathies are already major causes of morbidity, disability and premature death in countries of this Region. the development of long-term complications is influenced by hyper glycaernia. Poor control of diabetes accelerates their progression. Thus, to prevent complications, good control of diabetes is essential, and the management of diabetes should therefore aim to improve glycemic control beyond that required to control its symptoms. Intensified therapy

and maintaining near-normal blood glucose levels can result in considerable reduction in the risk of development of retinopathy, nephropathy and neuropathy. However, despite the high prevalence of diabetes and its complications and the availability of successful prevention strategies, essential health care requirements and facilities for self-care are often inadequate in this Region. Action is needed at all levels of health care and in the various aspects of diabetes care to bridge this gap and to improve health care delivery to people with diabetes. Education of the health care team on the management of diabetes and on how to educate people with diabetes is one major aspect that requires strengthening. Even though resources vary widely within the Region, the primary resource in diabetes care is now recognized to be the people with diabetes themselves, supported by well trained and enthusiastic health care professionals. This resource can be strengthened nearly everywhere by education

Dr A.A.S. Alwan
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Types of diabetes:

- **Type 1 diabetes:**

Data on global trends in T1DM prevalence and incidence are not available, but data from many high-income countries indicate an annual increase of between 3% and 4% in the incidence of T1DM in Childhood **(Patterson, C. C. et al., (2014).** Males and females are equally affected **(Maahs DM, et al.).** Despite T1DM occurring frequently in childhood, onset canoccur in adults and 84% of people living with T1DM are adults **(Centers for Disease Control and Prevention).** T1DM decreases life expectancy by around 13 years in high-income countries **(Livingstone**

SJ, et al). The prognosis is far worse in countries with limited access to insulin. Distinguishing T1DM and T2DM in adults can be challenging, and misclassifyingT1DM as T2DM and vice versa may impact estimates of prevalence and incidence **(Atkinson MA, et al.).** A recent study applied a T1DM genetic risk score to individuals of European descent taking part in the UK's Biobank research project and concluded that 42% of T1DM occurred after the age of 30 years, and accounted for 4%of all cases of diabetes diagnosed between the ages of 31 and 60 years. The clinical characteristics Of these individuals included a lower body mass index, use of insulin within 12 months of diagnosis, and increased risk of diabetic ketoacidosis. The rate of β-cell destruction is rapid in some individuals and slow in others **(Hagopian WA, et al).**

- **Type 2 diabetes:**

T2DM accounts for between 90% and 95% of diabetes, with highest proportions in low- and middle-Income countries. It is a common and serious global health problem that has evolved in association with rapid cultural, economic and social changes, ageing populations, increasing and unplanned urbanization, dietary changes such as increased consumption of highly processed foods and sugar sweetened beverages, obesity, reduced physical activity, unhealthy lifestyle and behavioral patterns, fetal malnutrition, and increasing fetal exposure to hyperglycemia during pregnancy. T2DM is most common in adults, but an increasing number of children and adolescents are also affected **(Global report on diabetes. Geneva, 2016).**

B-cell dysfunction is required to develop T2DM. Many with T2DM have relative insulin deficiency and early in the disease absolute insulin levels increase with resistance to the action of insulin **(Kahn SE, et al.).**

Most people with T2DM are overweight or obese, which either causes or aggravates insulin resistance

(**Stumvoll M, et al, 2005: 365/ Bogardus C, et al, 1985, 248**) Many of those who are not obese by BMI criteria have a higher proportion of body fat distributed predominantly in the abdominal region, indicating visceral adiposity compared to people without diabetes **(Mooy JM, et al 1995: 18).** However, in some populations, such as Asians, β-cell dysfunction appears to be a more notable prominent than in populations of European descent **(Ma RCW, Chan JCN , 2013, 64-91).** This is also observed in thinner people from low- and middle-income countries such as India **(Narayan KM, 2015**), and among people of Indian descent living in high-income countries (**Kanaya AM, et al, 2016: 39**).

- **Symptoms**
  - Urinate (pee) a lot, often at night
  - Are very thirsty
  - Lose weight without trying
  - Are very hungry
  - Have blurry vision
  - Have numb or tingling hands or feet
  - Feel very tired
  - Have very dry skin
  - Have sores that heal slowly
  - Have more infections than usual

    (https://www.cdc.gov/diabetes/basics/symptoms.html.)

- **Treatment of diabetics:**
  - Glycemic control
  - Life style (diet + physical exercise)

- Insulin
- Oral antidiabetic drugs & non-insulin
- Injectibles.

(Nóra Hosszúfalusi , 03.04.2017.)

Products intended for diabetics

- **Examples of healthy food choices:**
  - Non-starchy vegetables such as chilies, nopales, jalapeños, carrots, Cabbage, eggplant, cauliflower, broccoli, spinach, jicama, kale, lettuce, Tomatoes, and peppers
  - Starchy vegetables such as potatoes, green peas, corn, acorn squash, Butternut squash, pumpkin, plantains, yams, yuca, ñame, yautía, (malanga, camote, and batata); eat less of these foods because they Have more carbs that will raise your blood sugar.
  - Dried beans, dried peas, and lentils such as black and pinto beans, Black-eyed and split peas.
  - Whole grains such as whole wheat bread, oatmeal, brown rice, quinoa, Whole wheat pasta, whole grain corn, cornmeal, and popcorn.
  - Fruits, especially whole fruits. Fresh or frozen fruits are also good Choices, but avoid fruit that is dried or canned or fruit juices because Of the high sugar content. If you eat canned fruit, choose those Packed in their own juice rather than syrup.
  - Fat-free or low-fat dairy, including milk, yogurt, cheese, soft margarine With zero trans fats, and fortified soy beverages.
  - A variety of protein, including lean meats, poultry/chicken, turkey, fish, Seafood, eggs, nuts, seeds, and soy products. Trim fat from meats and remove the skin from poultry.

- Oils, such as olive, canola, and safflower. Avoid lard and shortening.
- Drinks with no added sugars, such as water, unsweetened tea, And coffee

(https://www.researchgate.net/publication/7690463_Glycaemic_responses_of_oat_bran_products_in_type_2_diabetes.)

Celiac disease (CD) is an autoimmune condition characterized by a specific serological and histological profile triggered by gluten ingestion in genetically predisposed individuals. Gluten is the general term for alcohol soluble proteins present in various cereals, including wheat, rye, barley, spelt and kamut. In recent years, there have been significant in the diagnosis, pathogenesis and natural history of this condition with CD undergoing a true "metamorphosis" due to the steady increase in the number of diagnosis identified, even in geratric patients. This has been mainly attributed to the greater availability of sensitive and specific screening tests which allow identification of the risk group for CD and led to a significant raise in diagnoses worldwide.

Several theories have suggested that the globalization and ubiquitous spread of false or extreme versions of the Mediterranean diet including the consumption of very high quantities of gluten (up to 20g/day) has led to an increased prevalence and incidence of CD. In addition, the quality of gluten itself might also play a contributory role. Indeed, the production of new grain variants due to technological rather than nutritional reasons may have influenced the observed increase in the number of CD diagnoses in recent years.

However, these hypotheses have not been confirmed and the real cause of the risk in CD diagnoses remains unknown. Furthermore, the epidemics are reported for other autoimmune diseases in the western

hemisphere. Suggest that environmental factors other than gluten can be at play.

(https://www.researchgate.net/publication/334634699_Celiac_disease_A_comprehensive_current_review)

Types of celiac disease

1. Symptom free celiac
2. Symptomatic celiac
3. Potentially celiac
4. Latent celiac
5. Stubborn celiac

https://lakalafya.com

Celiac disease causes

It tends to run in families and might be linked to certain genes. Stressful medical events such as aviral infections or surgery can trigger it. So can emotional trauma or pregnancy. The disease is most common among Caucasians and people who have other diseases, including:-

1- Type 1 diabetes
2- Hashimoto's thyroiditis
3- Addison's disease
4- Down syndrome
5- Rheumatoid arthritis
6- Turner syndrome
7- Lupus
8- Intestinal cancer
9- Lactose intolerance

https://www.webmd.com/digestive-disorders/celiac-disease/celiac-disease

The problem that face celiac patients:

When people with celiac disease eat gluten, their body mounts an immune response that attacks the small intestine these attacks led to damage on the villi, small fingerlike projections that line. The small intestine, that promote nutrient absorption. When the villi get damaged, nutrients cannot be absorbed properly into the body.

https://celiac.org/about-celiac-disease/what-is-celiac-disease/

Symptoms of celiac disease:

Celiac disease affects people differently. There are more than 200 signs and symptoms of celiac disease, yet a significant percentage of people with celiac disease have no symptoms at all. The undamaged part of their small intestine is able to absorb enough nutrients to prevent symptoms. However, people without symptoms are still at risk for some of complications of celiac disease.

Note: -

Symptoms may or may not occur in the digestive system. For example, one person might have diarrhea and abdominal pain, while another person has infertility or anemia. Some people develop celiac disease as children, others as adults

Symptoms of celiac disease may include one or more of the following

1) Recurring abdominal bloating and pain
2) Chronic diarrhea
3) Vomiting
4) Liver and biliary tract disorders
5) Weight loss
6) Pale, foul_ smelling stool
7) Iron _ deficiency anemia that does not respond to iron therapy

8) Fatigue
9) Failure to thrive or short stature
10) Pain in the joints
11) A skin rash called dermatitis herpetiformis (DH)
12) Tooth discoloration or loss of enamel
13) Psychiatric disorders such as anxiety, depression

https:www.cureceliacdisease.org

Symptoms of celiac disease _university of Chicago

Celiac disease symptoms in children:

1- Bloating or belly swelling
2- Constipation
3- Diarrhea
4- Pale, foul- smelling poop
5- Upset stomachor vomiting
6- Weight loss

If celiac disease keeps a child's body from absorbing the nutrients they need, they can have problems including:-

1- Anemia
2- Damaged tooth enamel
3- Delayed puberty
4- Slow growth and short height.

Note:-

Not everyone with celiac disease will have these symptoms. Some people don't notice any problems, which can make diagnosis difficult.

https://www.webmd.com/digestive-disorders/celiac-disease/celiac-disease

Treatment:

Currently, the only treatment for celiac disease is to follow a gluten free diet that is, to avoid all foods that contain gluten. For most people, following this diet will stop symptoms, heal existing intestinal damage, and prevent future damage. Improvement begin within weeks of starting the diet. Although most children undergo full healing may remain incomplete in May adults, even though symptoms may regress.
The gluten-free diet is a lifetime requirement. Eating any gluten, no matter how small an amount, can damage the small intestine. This is true for anyone with the disease, including people who don't have noticeable symptoms.

A gluten free diet means avoiding all foods that contain wheat (including spelt, triticale and kamut) rye and barley. Despite these restrictions, people with celiac disease can eat a well – balanced diet with a variety of foods, including gluten free bread and pasta. For example, instead of wheat flour, people can use potato, rice, fruits and vegetables do not contain gluten, so people with celiac disease can eat much of these foods as they like. The gluten free diet requires a completely new approach to eating that affects a person's entire life. People with celiac disease must be extremely careful about what they buy or eat.

https://www.cureceliacdisease.org/treatment/Biesiekierski

Products intended for celiac patients:

These foods are always gluten _free such as corn, millet, sorghum, teff, rice, fruits, vegetables, meat, poultry, fish, beans, nuts, nut flours, soy, sunflower seeds, flax, starch (made from safe grains) and chia are safe

for people with celiac to consume, as well as noncereal such as amaranth, quinoa and black wheat.

Noncereal carbohydrate rich food such as potatoes and bananas do not contain gluten and don't Tigger symptoms.

Callagher, Eimear (2009). Gluten _free food science and technology.

Kupper C (2005)"Dietaryguidelines and implementation for celiac disease"

https://celiac.org/gluten-free-living/gluten-free-foods/

Gluten – free additives :-

1. Acetic acid
2. Adipic acid
3. Algin
4. Annatto
5. Baking yeast
6. Benzoic acid
7. Beta carotene
8. BHA
9. BHT
10. Brown sugar
11. Ethylmatol
12. Fructose
13. Malic acid
14. Psyllium
15. Sodium benzoate
16. Sorbit

https://www.cureceliacdisease.org/treatment/

THE AIM OF PROJECT

The aim of this project is to produce products with high nutritional value and low calories.

Firstly، oat sticks are produced for diabetics. Where to add oatmeal to your diet to help manage diabetes has pros and cons. The pros of adding oatmeal to your diabetes eating plan include:

Secondly, the second aim of this project is to produce a product of high nutritional value, low in calories and useful for celiac patients and doesn't contain gluten, but it contains useful grains namely crackers and lentil bread.

Review of Literature

1. Review of literature

2.1. Oats:

Oats are gluten-free whole grains and are a good source of vitamins, minerals, fibers and antioxidants that are important for the body. They also provide many health benefits. They help to lose weight, reduce levels Blood sugar, and the risk of heart disease. Many oat products, such as oatmeal, cabbage oats or hard oats, are prepared and cooked in water or milk. Nuts. People who are allergic to wheat and who follow a diet should be advised to be free of gluten because some oatmeal products may be mixed with other grains such as wheat during harvesting or processing **(Hrefna Palsdottir, 2016).**

2.1.1. Nutritional value and benefits of Oats:

Smaller amounts of calcium, potassium, vitamin B6 (pyridoxine) and vitamin B3 (niacin) This is coming with 51 grams of carbs, 13 grams of protein, 5 grams of fat and 8 grams of fiber, but only 303 calories. This means that oats are among the most nutrient-dense foods you can eat.

1) Whole Oats Are Rich in Antioxidants, Including Avenanthramides:

Whole oats are high in antioxidants and beneficial plant compounds called polyphenols. Most notable is a unique group of antioxidants called avenanthramides, which are almost solely found in oats

Avenanthramides may help lower blood pressure levels by increasing the production of nitric oxide. This gas molecule helps dilate blood vessels and leads to better blood flow

In addition, avenanthramides have anti-inflammatory and anti-itching effects . Ferulic acid is also found in large amounts in oats. This is another antioxidant (**Rachel Hitayezu**).

2) **Oats Contain a Powerful Soluble Fiber Called Beta-Glucan**

Oats contain large amounts of beta-glucan, a type of soluble fiber:

Beta-glucan partially dissolves in water and forms a thick, gel-like solution in the gut. The health benefits of beta-glucan fiber include:

- ✓ Reduced LDL and total cholesterol levels.
- ✓ Reduced blood sugar and insulin response.
- ✓ Increased feeling of fullness.
- ✓ Increased growth of good bacteria in the digestive tract.

https://www.healthline.com/nutrition/9-benefits-oats-oatSourc

Hrefna, palst. (2016) illustrated that the Benefits of oatmeal for diabetics Oatmeal is a natural food for people with diabetes, thanks to its natural ability to adjust and lower blood sugar, because it contains a very moderate percentage of sugars, as well as being low in calories. It also contains a high percentage of dietary fiber helps to improve the health of diabetes, and to control the rate of harmful cholesterol, which exacerbates the problem of diabetes, and recommended the use of beta-glucan oats for this purpose.

Helps patients lose their excess weight faster than others, especially if they are introduced to the main meals daily. Giving them high energy, and the ability to exercise daily activities effectively, and less impact of the symptoms of diabetes. Contains a combination of basic minerals for the health of these patients in particular, which are represented in both calcium, zinc, magnesium, and ferment, as well as potassium. Helps heal wounds, treat skin problems, and heal many diseases, making it good for diabetic patients with diabetes foot problem. **(Also , Hrefna, palst. 2016)**

2.2Honey:

Honey is an organic natural substance that is produced from the nectar of flowers by Apis mellifera and is a sweet, flavorful liquid. It contains sugars, small quantities of proteins, enzymes, amino acids, minerals, trace elements, vitamins, aroma compounds, and polyphones. It is widely accepted as food and medicine by all generations, traditions and civilizations, both ancient and modern. Honey is heavily used by Asian countries such as Sri Lanka, India, Nepal, and Pakistan in their traditional medicinal systems.

It is used as a remedy for burns, cataracts, ulcers, diabetes, wound healing, etc. Many researchers have scientifically validated most of the traditional claims (e.g., usage for diabetes, diarrhea, inflammation, gastrointestinal, and cardiovascular diseases) for honey using scientifically controlled experiments. We conclude this review by exposing the benefits and traditional usage of the honey, especially in Ayurveda medicinal system.

https://www.researchgate.net/publication/313785968_Health_Benefits_and_Traditional_Uses_of_Honey_A_Review

2.2.1 Nutritional value and benefits of Honey

- The nutritional composition of honey:

Season, environmental conditions, processing techniques and varieties of flower nectar can all influence the composition of honey but, essentially, the main nutritional constituents are carbohydrates (simple sugars: fructose and glucose – find more information in our 'Carbohydrates and its functions' article). In addition to water, honey contains very small amounts of protein, vitamins, minerals, trace elements, enzymes and polyphenols, including flavonoids from pollen, which can help identify the honey origin. 6 The compositional criteria for honey are regulated by the

	Per 100 g	Per 20 g serving
Energy	288 kcal/1229 kJ	58 kcal/246 kJ
Fat (g)	0	0
Carbohydrate (g)	76.4	15.3
- fructose (g)	41.8	8.4
- glucose (g)	34.6	6.9
Protein (g)	0.4	0.08
Other constituents		
Water (g)	17.5	3.5

European Council Directive 2001/110/EC of 20th December 2001 and specifies that the maximum water content of honey must be 20% for it to be an authentic food product.

Honey benefits for diabetes

Even though honey may increase insulin levels and help people with diabetes control their blood sugar, there doesn't appear to be any conclusive research supporting honey as a preventive factor for diabetes. This might be plausible, however.

Researchers have found a possible connection between honey and a lower glycemic index. In a study of 50 people with type 1 diabetes and 30 people without type 1 diabetes, researchers found that, compared to sugar, honey had a lower glycemic effect on all participants.

It also raised their levels of C-peptide, a substance released into the bloodstream when the body produces insulin.

A normal level of C-peptide means the body is making enough insulin. More studies are needed to determine whether honey can be used for the prevention and treatment of diabetes.

https://www.healthline.com/health/diabetes/honey-and-diabetes.

2.3 Beetroot:

Beetroot (Beta vulgaris) is a root vegetable also known as red beet, table beet, garden beet, or just beet. Packed with essential nutrients, beetroots are a great source of fiber, folate (vitamin B9), manganese, potassium, iron, and vitamin C.

Beetroots and beetroot juice have been associated with numerous health benefits, including improved blood flow, lower blood pressure, and increased exercise performance. Many of these benefits are due to their high content of inorganic nitrates.

2.3.1 Nutritional value and benefits of Beetroots.

Nutrition Facts: Beets mainly consist of water (87%), carbs (8%), and fiber (2–3%).

One cup (136 grams) of boiled beetroot contains fewer than 60 calories, while ¾ cup (100 grams) of raw beets boasts the following nutrients :

- Calories: 43
- Water: 88%
- Protein: 1.6 grams
- Carbs: 9.6 grams
- Sugar: 6.8 grams
- Fiber: 2.8 grams
- Fat: 0.2 grams
- Carbs

Raw or cooked beetroot offers about 8–10% carbs.

Simple sugars — such as glucose and fructose — make up 70% and 80% of the carbs in raw and cooked beetroots, respectively.

Beetroots are also a source of fructans — short-chain carbs classified as FODMAPs. Some people cannot digest FODMAPs, causing unpleasant digestive symptoms.

Beetroots have a glycemic index (GI) score of 61, which is considered medium. The GI is a measure of how fast blood sugar levels rise after a meal (2).

On the other hand, the glycemic load of beetroots is only 5, which is very low.

This means that beetroots should not have a major effect on blood sugar levels because the total carb amount in each serving is low.

Fiber:

Beetroots are high in fiber, providing about 2–3 grams in each ¾-cup (100-gram) raw serving.

Dietary fiber is important as part of a healthy diet and linked to a reduced risk of various diseases.

Beetroots and beetroot juice have many health benefits, especially for heart health and exercise performance. Beetroots can lower blood pressure, which may lead to reduced risk of heart disease and other ailments. This root veggie can also improve oxygen use, stamina, and exercise performance.

https://www.healthline.com/nutrition/foods/beetroot.

2.4 Peanuts

Surprisingly, peanuts are not actually in the nut family. They are classified as legumes along with foods like green peas, soybeans, and lentils. The peanut plant likely originated in South America in Brazil or Peru. Scientists have found 3,500-year-old pottery in the shape of peanuts, as well as decorated with peanuts, in South America.

Peanuts grow below ground as the fruit of the peanut plant. In the early 1800s, Americans started growing peanuts as a commercial crop. On average, Americans eat more than 6 pounds of peanuts per year. Today, 50% of the peanuts eaten in the United States are consumed in the form of peanut butter.

2.4.1 Nutritional value and benefits of Peanuts

- Nutrients per Serving
- A ¼ cup serving of raw peanuts contains:
- Calories: 207
- Protein: 9 grams
- Fat: 18 grams
- Carbohydrates: 6 grams
- Protein: 9 grams
- Fiber: 3 grams
- Sugar: 1 gram

Many people believe the peanut is not as nutritionally valuable as true nuts like almonds, walnuts, or cashews. But actually, peanuts have many of the same health benefits as the more expensive nuts and should not be overlooked as a nutritious food. Peanuts are an excellent source of many vitamins and minerals. These include biotin, copper, niacin, folate, manganese, vitamin E, thiamine, phosphorus, and magnesium.

•Peanuts benefits for diabetes•

Peanuts may lower the overall risk for diabetes.

Eating peanuts or peanut butter may lower the risk of developing type 2 diabetes, according to a study from the Journal

of the American Medical Association. Peanuts are high in unsaturated fat and other nutrients that help your body's ability to regulate insulin.

Peanuts are not only valuable for their nutritional content. They also have a low impact on blood glucose levels. The glycemic index (GI) rates foods based on how quickly they cause an increase in blood sugar.

Foods with a low GI score tend to convert to sugar slowly and steadily. High-GI foods release glucose quickly into the bloodstream.

A person with diabetes will need to consider these numbers when deciding how much insulin they need, and what and when they can eat.

The GI scale goes from 0–100. An item with a score of would not affect blood sugar, such as water. A score of 100 is pure glucose.

Another common measurement is the glycemic load (GL). This considers the GI score of a food and the serving of carbohydrate in a portion. It better evaluates the impact the food will have on blood sugar levels. Foods with a GL of 10 or less are considered low-impact foods. Peanuts have a GI score of just 14 and a GL of 1, making them one of the lowest-scoring GI foods. This low impact on blood sugar levels is one reason why peanuts can be a good snack for people with

2.5 Butter

Butter is principally composed of milk fat, moisture, salt and curd. It also contains small amount of fat, lactose, acids,

phospholipids, air, microcontroller by the method of manufacture and this is turn is chiefly regulated to conform to the standards of butter prescribed by regulatory authorities such as codex and FSSAI.

2.5.1 Nutritional value and benefits of Butter

Constitutent	Per 100g
Energy (Kcal)	744
Fat (g)	82
Saturates	52.1
Monounsaturates	20.9
Polyunsaturates	2.8
Trans fatty acids	2.9
Protein (g)	0.6
Carbohydrate (g)	0.6
Thaimin (mg)	Trace
Riboflavin (mg)	0.07
Niacin (mg)	Trace
Vitamin B6 (mg)	Trace
Vitamin B12 (µg)	0.3
Folate (µg)	Trace
Pantothenate(mg)	0.05
Biotin (µg)	0.2
Vitamin C (mg)	Trace
Retinol (µg)	958
Carotene (µg)	608
Vitamin D (µg)	0.9
Vitamin E (mg)	1.85
Sodium (mg)	606*
Potassium (mg)	27
Calcium (mg)	18
Magnesium (mg)	2.0
Phosphorus (mg)	23
Iron (mg)	Trace
Copper (mg)	0.01
Zinc (mg)	0.1
Chloride (mg)	994
Selenium (Ig)	Trace
Manganese (mg)	Trace

Good source of conjugated linoleic acid. Butter is an excellent source of conjugated linoleic acid (CLA) — a type of fat found in meat and dairy products. CLA has been linked to impressive health benefits.

Test-tube studies show that CLA may have anticancer properties and could help reduce the growth of breast, colon, colorectal, stomach, prostate, and liver cancer. Butter contains CLA, a type of fat that may have cancer-fighting properties, help reduce body fat, and improve immune function. Butter does not need to be completely avoided, but it is also not a free-for-all. Amounts should be limited yet enjoyed. This advice holds true for all individuals, not only those with diabetes.

2.6. Flaxseed:

Flaxseed has nutritional and functional properties. In fact, the content of the compound such as. Fatty acids, lignans and dietary fiber. Flaxseeds contains a good amount of (ALA), Omega 3,fatty acids, protein, fiber

2.6.1. Nutritional value and benefits of Flaxseed:

Flaxseeds are loaded with nutrients one tablespoon of ground Flaxseeds contains the following.

- Calories :- 37
- Protein :- 1.3 grams
- Carbs :- 2 grams
- Total fat :- 3 grams
- Vitamin B1:- 8% of the RDL

•Vitamin B6:-2% of the RDL

Flaxseeds are good sources of many nutrients. Their health benefits are mainly due to their content of Omega 3 fats, lignans and fiber.

Flaxseeds are high in Omega 3 fats if you are a vegetarian or don't eat fish, Flaxseeds can be your best source of Omega 3 fats. They are rich source of alpha Linolenic acid (ALA) .

ALA is one of the two essential fatty acids that you have to obtain from the food you eat, as your body does not produce them Animal studies have shown that the ALA in Flaxseeds prevented cholesterol from being deposited in the blood vessels of the heart, reduce in Flammarion in the arteries and reduce tumor growth Flaxseeds may lower blood sugar due to their in soluble fiber content.

They can be a beneficial addition to the diet of people with diabetes Flaxseed have been proven to lower blood pressure and are especially helpful for those with high blood pressure Flaxseeds keep hunger at Bay, which may aid weight control. If you have The tendency to snack between meals, you might want to consider adding flaxseeds to your beverage to stave off hunger pangs.

Ona study found that adding 2.5 grams of ground flax fiber extract to a beverage reduced feelings of hunger and overall appetite.

Flaxseeds may improve cholesterol another health benefit of Flaxseeds is their ability to lower cholesterol levels.

In one study in people with high cholesterol, consuming 3 tablespoon (10 grams) of Flaxseeds powder daily for one month resulted in a 12% increase in good HDL cholesterol.

With so much fiber packed in each tiny seed, adding Flaxseeds to your diet promotes regular bowl movements and can improve your digestive health.

https://www.healthline.com/nutrition/benefits-of-flaxseeds

2.7 Sesame seeds:

Sesame seeds

Sesame seeds are rich in protein, vitamins, minerals and antioxidants. They are commonly added to certain foods to provide a nutty flavor and crunchy texture. Sesame seeds are also gluten free.

2.7.1 Nutrional value and health benefits of sesame seeds:

Sesame seeds contain a wide nutrient profile. One ounce (28 grams) of sesame seeds contains

- Calories :- 160
- Fiber :- 3.3 grams
- Monounsaturated fat :- 5.3 grams
- Omega 6 fats :- 6 grams
- Copper :- 57%of the RDL
- Manganese:- 34% of the RDL
- Magnesium :- 25% of the RDL

Like Flaxseeds, sesame seeds contain a lot of lignans, sesame seeds are the best known dietary source of lignans. Enterolactone can act like the sex hormones estrogen, and lower than normal levels of this lignan in the body have been associated with heart

disease and breast cancer. Another study found that postmenopausal women who ate 50 grams of sesame seed powder daily for five weeks had significantly lower blood cholesterol and improved sex hormones status. Sesame seeds may also help reduce inflammation and oxidative stress, which can worsen symptoms of many disorders, including arthritis.

https://www.healthline.com/nutrition/6 healthiestseeds#TOC_TITLE_HDR_5

2.8. Sunflower seeds:

Sunflower seeds are especially high in vitamin E and selenium. They are rich in healthy fats, beneficial plant compounds and several vitamins and minerals.

2.8.1. Nutrional value and health benefits of sunflower seeds:

Sunflower seeds contain a good amount of protein, monounsaturated fats, vitamin E, Omega 6 fats and many reduce inflammation and cholesterol levels. One ounce (28 grams) of sunflower seeds contains.

- Calories :- 164
- Fiber :- 2.4 grams
- Protein :- 5.8 grams
- Monounsaturated fat :- 5.2 grams
- Omega 6 fats :- 6.4 grams
- Vitamin E:- 47% of the RDL
- Magnesium :- 23% of the RDL.

Benefits of sunflower seeds :-

1- Reduces cholesterol :

The fiber content of sunflower seeds decreases levels of LDL cholesterol in the blood.

2- Reduces risk of cancer

3- Management of diabetes

Sunflower seeds are useful in reducing blood sugar levels in patients with type 2 diabetes mellitus.

4- Helps in weight loss

5- A power house of energy

6- Helps in treatment of anemia

7- Helps to detox our skin.

https://www.healthline.com/nutrition/6-healthiest-seeds#TOC_TITLE_HDR_5

2.9Nutrional value and health benefits of black sesame :-

- Black sesame seeds are rich in a number of nutrients. Just 2 tablespoon (14 grams) of black sesame seeds contain
- Calories : 100
- Protein : 3 grams
- Carbs : 4 grams
- Fiber : 2 grams
- Saturated fat : 19 grams
- Monounsaturated fat : 3 grams
- Polyunsaturated fat : 4 grams .

Health benefits of black sesame

1- Rich in antioxidants

2- May improve blood pressure

3- Have anticancer properties

4- Promote healthy skin and hair

5- Black sesame seeds are rich in iron, zinc, fatty acids and antioxidants.

Regularly eating black sesame seeds could reduce oxidation in the body, improve blood pressure and provide antioxidants and other plant chemicals that help fight cancer.

https://www.healthline.com/nutrition/black-sesame-seeds-benefits

2.10. Health benefits of psyllium husks:

1- It can lower cholesterol levels

2- It seems to be good for the heart

3- It may help treat diarrhea

4- It boosts satiety and aid weight loss

5- Most people are able to tolerate psyllium well.

https://www.medicalnewstoday.com/articles/318707

2.11. Chia seeds:

Chia seeds contain large amounts of fiber and Omega 3 fatty acids, plenty of high-quality protein, and several essential minerals and antioxidants. These seeds are highly versatile. They can be soaked and added to porridge, made into pudding, used in baked goods. Notably, chia seeds are also free of gluten.

2.11.1Nutritional value of chia seeds-:

The nutrients in (100) of chia seeds are.

- Calories : 486
- Water : 6%
- Protein : 16.5 grams
- Carbs : 42.1 grams
- Suger : 0 grams
- Fiber : 34.4 grams
- Fat : 30.7 grams

- Omega 3 : 17.83 grams
- Omega 6 : 5.84 grams

https://www.healthline.com/nutrition/foods/chia-seeds#downsides

2.12 Health benefits of dried thyme :-

1- Respiratory health – cough suppressant

Patients who were given extracts of dry thyme and evening primrose found that they had significantly better healing times than those given the placebo.

2- Antibacterial /sore throat remedy

Another traditional use of this herb that has gained traction in the scientific world is its use an effective remedy for sore throat's .

3- Wound healing :-

The antiseptic compounds. Caryophyller, camphene and thymol found in thyme will guard wounds against infections and speed up healing .

4- Heart health :-

The antispasmodic qualities of thyme help to relax veins and arteries, which in turn lower blood pressure and eases stress on the heart .

5:- **Digestive Health :-**

Thyme benefits the digestive system by promoting the overall well-being of the digestive track.

6: Mood Boosting :

Among the powerful compounds in thymey, carvacrol has been found to exert a positive effect on mood.

https://www.indigo-herbs.co.uk/natural-health-guide/benefits/thyme

2.13. Nutritional value and benefits of salt :-

Salt contains iodine, which is another essential nutrient. People with iodine deficiency can develop goiter and a range of other symptoms.

Keeps the body hydrated :-

Salt also promotes healthy hydration levels and electrolyte balance,which is necessary for organs to function properly. Your cells, muscles and tissues need wate, and salt helps these parts of your body maintain the right amount of fluid.

Prevents low blood pressure :-

An inadequate amount of sodium in your diet can also lead to low blood pressure.

https://www.medicalnewstoday.com/articles/326519#intakerecommendations

2.14. Rice flour:

Rice flour is a suitable in baking and other sweet products ,since it has no gluten ,a necessary ingredient for firm wheat bread

2.14.1-nutritional value and benefits of Rice flour:

Rice flour can provide you with a good amount of fiber, which is essential for all types of diets. Thanks to its high fiber content, it can lower cholesterol, improve blood sugar levels, and help with digestion and rich of protein. Replacing wheat flour with rice flour can also help weight loss. It can also prevent diseases such as diabetes (type-2), hypertension, and colon diseases.

Known to be rich in vitamins and protein, rice flour is widely available for low prices. It's a common substitute for wheat flour because the nutrients in both variants are very similar.

ice flour is known to have different health benefits thanks to its nutrient contents.100 gr:-

- 366 calories
- 1.4g total fat
- 0mg cholesterol
- 0mg sodium
- 76mg potassium
- 80g total carbohydrates
- 6g protein
- 1% calcium
- 2% iron
- 8% magnesium
- 20% Vitamin B-6.12.

2.15.Lentils:

Lentils are one of the world's oldest health foods. Growers first raised these beans in the Middle East in 8,000 B.C, and they've worked their way west since then. Along the way, Greeks considered the bean a poor man's food while Egyptians often regarded it as royal fare.

The lentil came to the Americas in the early 16th century. During World War II, people began to see it as a low-cost, high-protein meat substitute.

The lens-shaped bean comes in several varieties. The most common types are brown, green, and red. Dietitians like the gluten-free food because it's got lots of nutrition. Cooks like how its subtle flavor makes it the perfect canvas for other ingredients and seasonings.

2.15.1 Nutritional value and benefits of Lentils:

Lentils or Lens culinary, are legumes- plants that contain edible seeds that are surrounded by protective outer skin. They sell at the market with and without the seed coating, as well as whole or split, which impacts texture and cook time. Lentils are an excellent source of protein with the potential to reduce the risk of heart disease.

Now as a staple in many cultures, similar to the benefits of quinoa, lentils are a wonderful nutrient-dense food to add to your diet. Dried lentils are composed of about 8% water, 26% protein, 63% total carbohydrates and 42 to 47% starch. They are loaded with minerals and are an especially good source of magnesium, calcium, potassium, zinc, and phosphorus.

Their hallmark is that they are high in the essential amino acid called lysine, which other grains are low in content. However they lack another essential amino acid tryptophan, so make sure you obtain sources from meat or other cereal grains.

One serving of lentils, about 1/4 cup dried contains approximately 180 calories, 11 grams of protein, less than 1 gram of fat, 32 grams total carbohydrate, 1 gram of sugar and 19 grams of fiber. For micronutrients; 40 mg calcium, 2.5mg iron, 42 mg

magnesium, 105 mg phosphorus, 480 mg potassium and 1.5 mg zinc.

Nutrition:

Lentils are a highly nutritious food. They are rich in minerals, protein, and fiber.

100 grams (g) of cooked lentils contains:

- 116 calories (kcal)
- 9.02 g of protein
- 0.38 g of fat

20.13 g of carbohydrates, including 7.9 g of fiber and 1.8 g of sugar

Lentils also provide the following essential nutrients:

For something that is naturally gluten free such as lentils, the risk of contamination would be much lower than a processed product like bread. However, if you're still concerned, then avoid the product and choose tinned lentils that are again naturally gluten free and do not have a may contain statement. Lentil bread is high in dietary fiber and oligosaccharides, which helps to promote the growth of healthy gut bacteria in the large intestine.

2.16-Benefits of spices:

Although spices and herbs have been used since ancient times, they are playing a new and important role in modern food preparation. They not only add unique flavors to our food but contribute color and variety as well. Certain spices and herbs used alone, or in blends

Materials & Methods

3. MATERIALS AND METHODS

3.1- Materials:

Oats - Beetroot - Honey - Butter - peanuts - Flaxseed - chia seeds - Sesame seeds - Sunflower seeds - salt - Dried Thyme - black sesame seeds- Psyllium husk - Lentils- Rice flour – spices.

3.2- methods of:

- **sample (1)**

The oat sticks product is baked with beetroot by mixing:

- 2 cups oats,
- 1/3 cup butter,
- ¼ cup honey,
- 1 cup peanuts,
- beetroot,
- 2 tablespoons of oat bran.

- **sample (2)**

The materials of our product "crackers" are :-

- Flaxseed 1/3 cup
- Sunflower seeds 1.5 cups
- Sesame seeds 1 cup
- Black sesame seeds 1/3 cup
- Chia seeds 1/3 cup
- Psyllium husk 2 Tbsp
- Salt ½ Tbsp
- Dired thyme 1 Tbsp
- Boiling water 2,1/2 cup

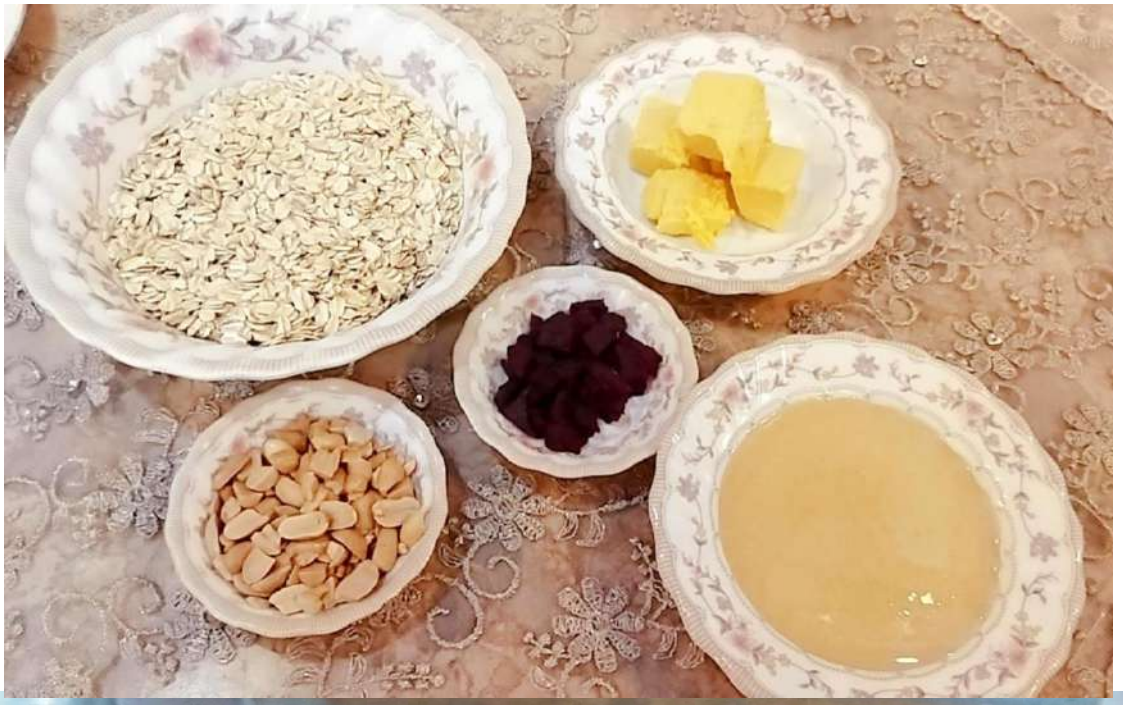
- **sample (3)**

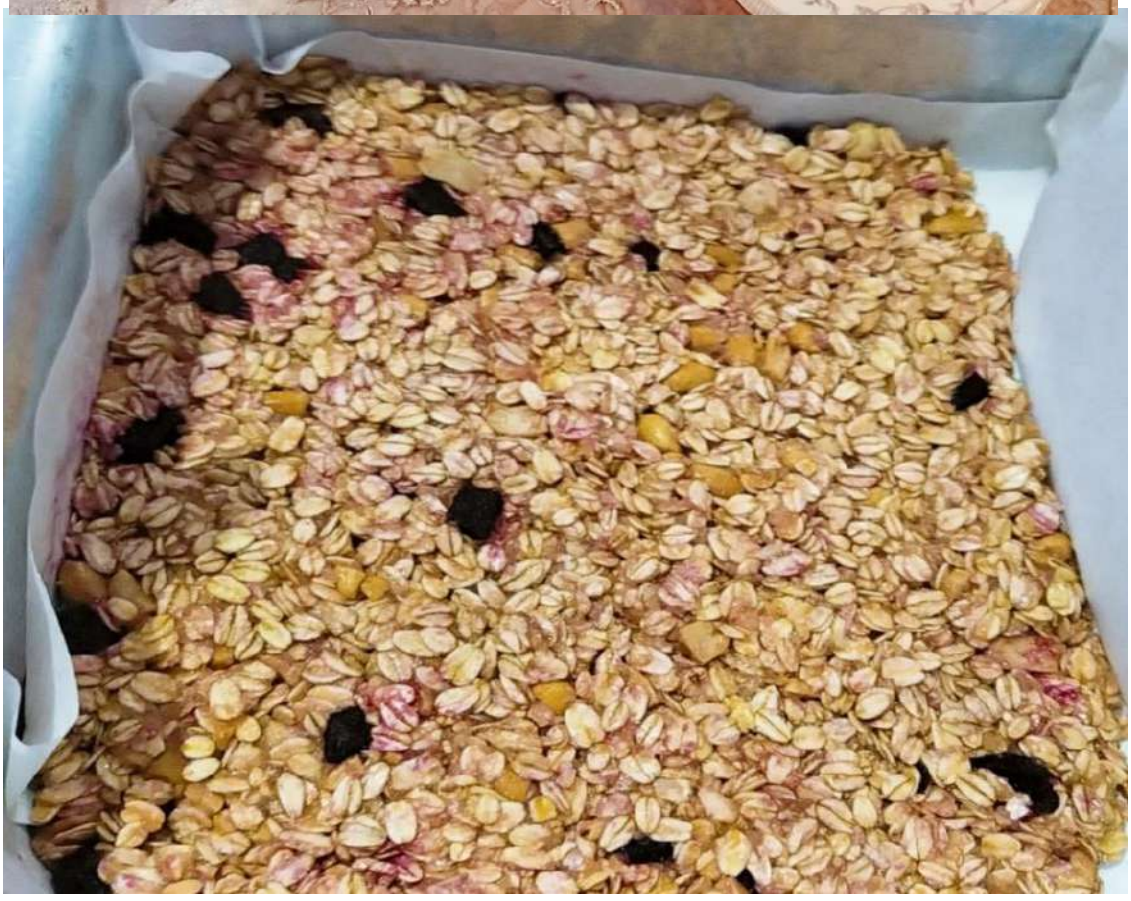
Lentils bread

- 1/2 cups (300g) lentils (brown, green or split red are all fine)
- 1/2 cup + 2 tbsps water
- 1 tbsp olive oil
- 1 tsp kosher salt
- 1/4 cup rice flour

Sample (1)

Materials before processing



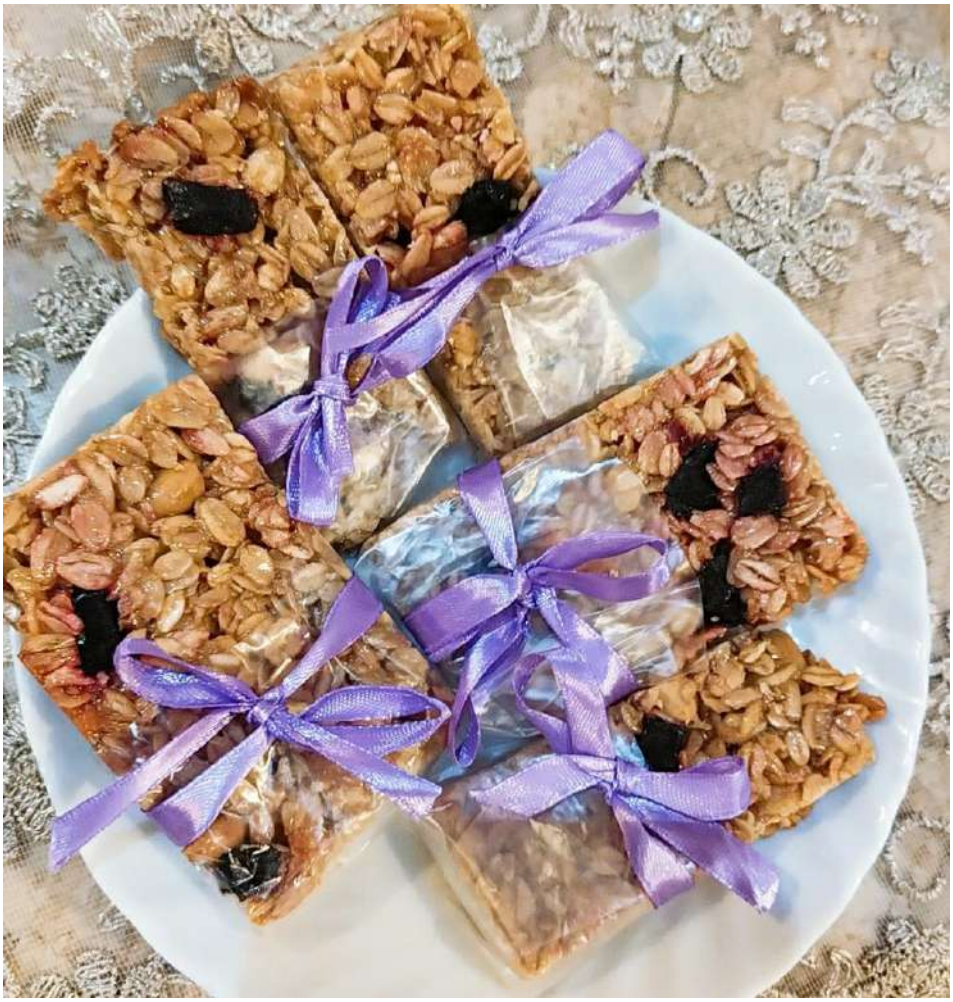


Mix the butter and honey well, add the oats, oat bran, peanuts and boiled beetroot, cut small pieces in advance and mix well.

Add them in a rectangular bowl, distribute them together and press well until they blend. Bake in an oven at 180 degrees. The golden color may take from 20:30 minutes.

Leave it until completely cool, then cut into rectangles

Materials After processing



https://www.sneakyveg.com/beetroot-and-poppy-seed-oaty-bars/

With changing some ingredients so that the prescription is suitable for diabetics and consumer category.

Sample (2)

materials before processing

Instruction:

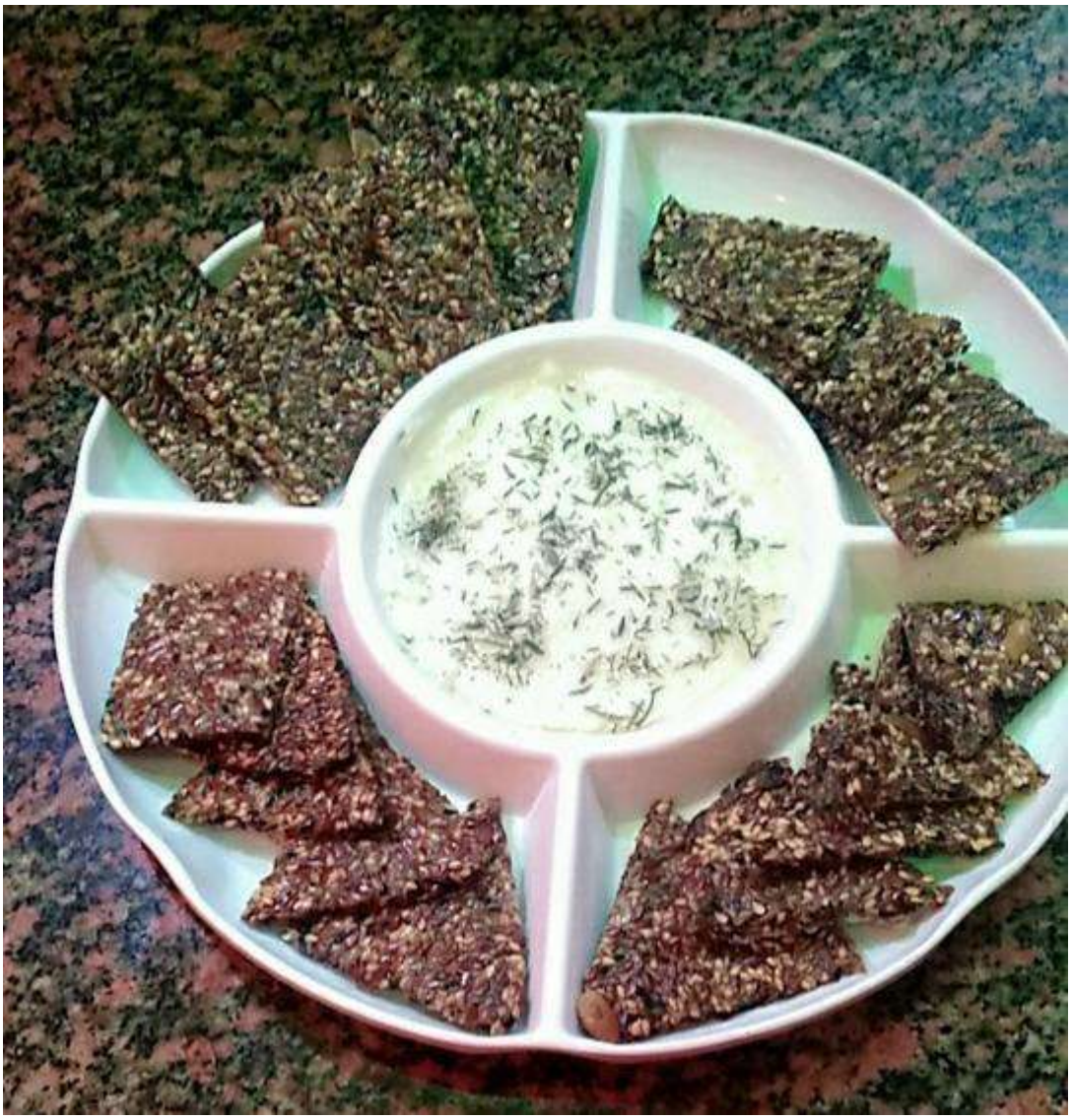
1. Mix all the ingredients in a large mixing bowl. Then add boiling water and stir well.
2. Set aside and allow to thicken for about 20 minutes. The mixture will thicken and become gel.
3. Transfer the mixture over to a baking sheet covered with parchment paper. Spread, into a thin layer.

4. Bake in a oven for 1 hour at 150 c /300 F. To get evenly cut flaxseed crackers we can use a pizza cutter or knife to cut

them.

5. Remove the keto crackers from the oven and leave to 6. cool completely before transferring to a container or eating.

Materials After processing



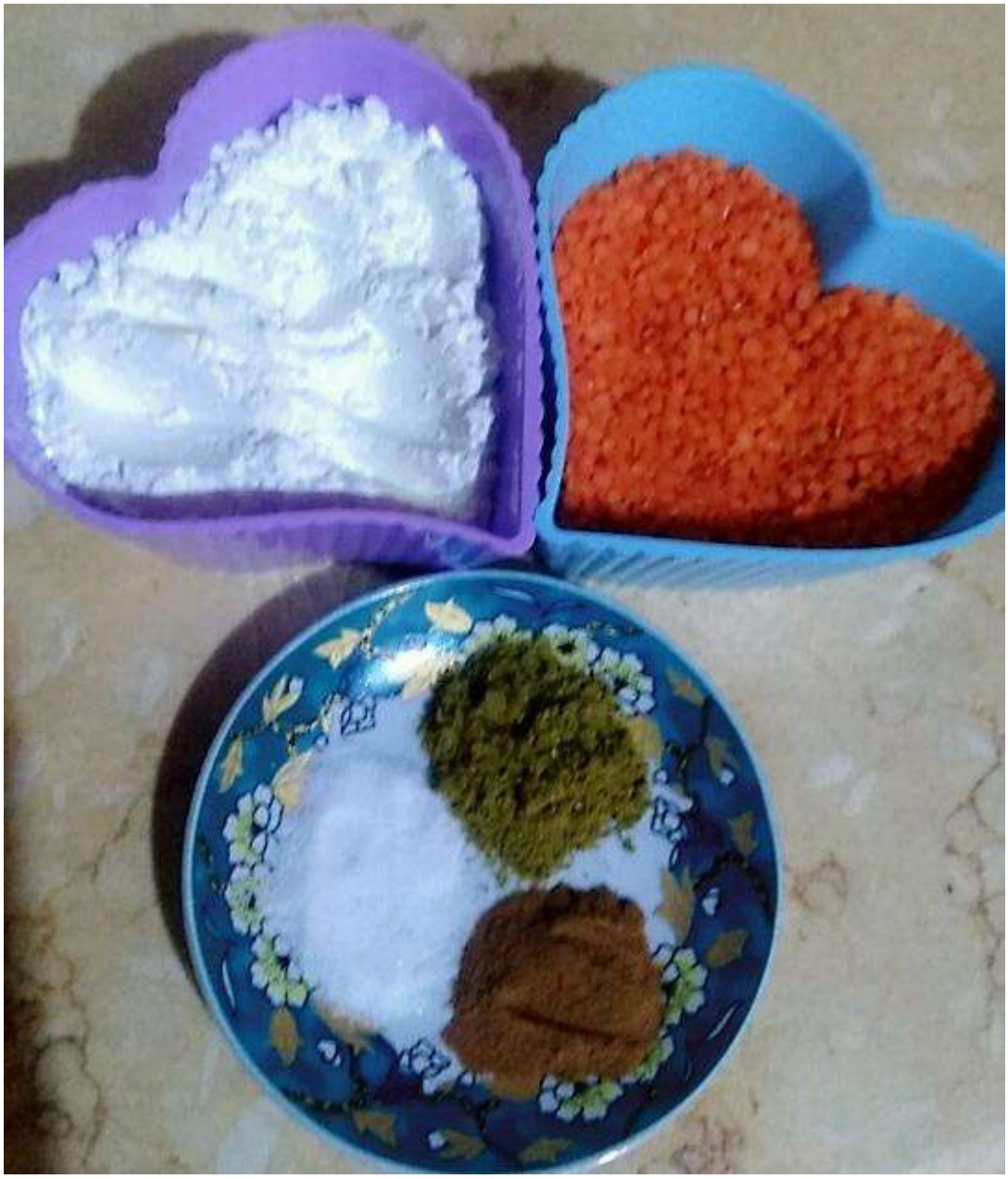
Note: -

These crackers will store in an airtight container for up to three weeks at room temperature.

https://www.alphafoodie.com/the-best-seed-cracker-recipe/

Sample (3)

Materials before processing



Instructions

Begin by rinsing the lentils then placing them in a large bowl. Fill the bowl with enough water (room temp is fine) to cover the lentils by a couple inches. Soak the lentils for at least 6 and up to 24 hours.

When you're ready to make the bread, preheat the oven to 200C/ 400F. Grease a 9×5" loaf pan and line it with parchment if

desired for easier removal.

When the lentils are done soaking, drain them and put them into a high-powered blender. Then add the water (1/2 c + 2 tbsps,) oil and salt. And process until the mixture is smooth. You will have to stop it every so often to scrape down the sides and make sure it's all getting blended.

Then dump the lentil mixture into a large and add rice flour and spices until completely blended then scrape the mixture into the prepped loaf pan. Bang the pan on the counter a few times to release any air bubbles and smooth over the top.

Bake in the preheated oven for about 45 minutes until it starts to get a little golden brown on top. Start checking it at 40 minutes as oven temperatures vary. (As Camilla says, the bread will "sound hollow when it's tapped.")

Remove the bread from the oven, immediately remove it from the pan and let it cool completely on a wire rack. Slice and enjoy.

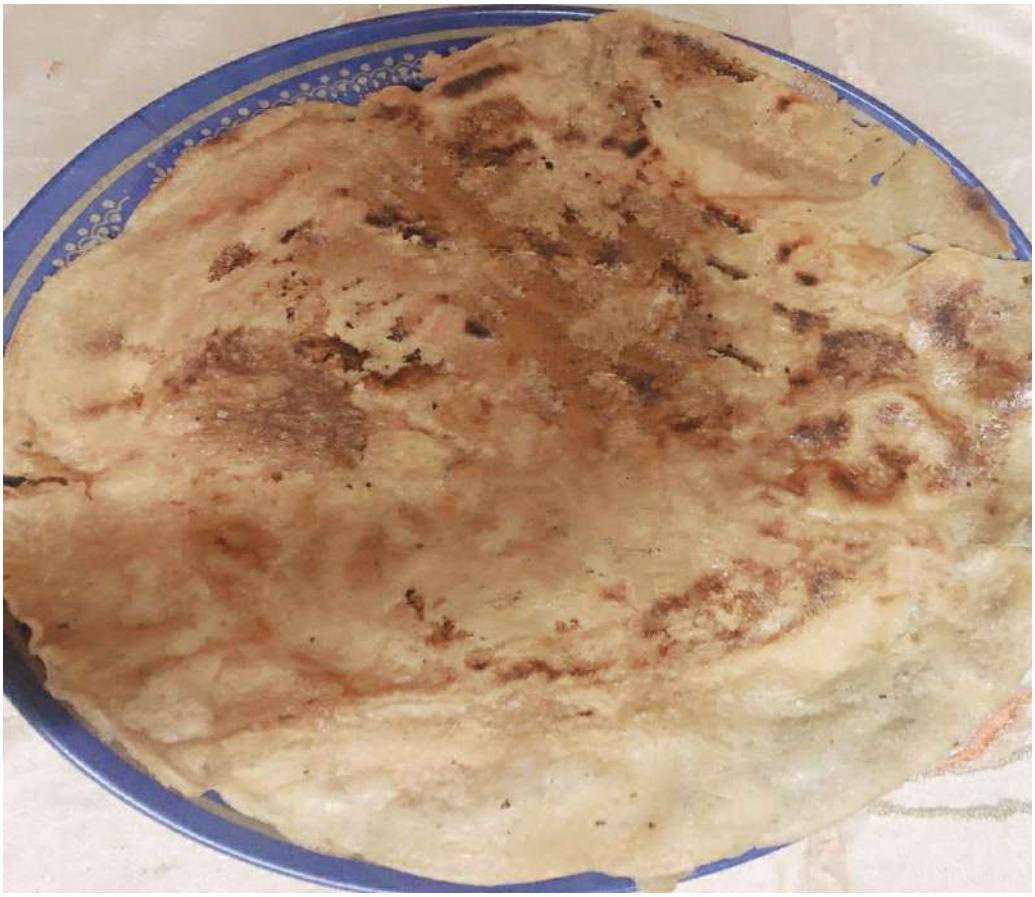
The bread can be kept tightly wrapped at room temp for 2 days or in the refrigerator for about 10 days. Or it can be frozen for several months.

Lentils are relatively quick and easy to prepare, and their low cost makes them an accessible form of high quality protein for many people around the world.

In this article, we look at how lentils can boost health, investigate their nutritional content, and look at ways to incorporate them into a balanced diet.

Rice flour is entirely gluten-free. Therefore, it’s an excellent

Materials After processing



option for those who are gluten-intolerant or for those who suffer from Celiac disease. Celiac disease is a digestive problem that affects the immune system once contacted with gluten.

Lentils are allowed by law to contain a certain percentage of foreign grain, including wheat, barley, and/or rye. That said if lentils are labeled gluten-free they should contain less than 20 ppm of gluten. Lentils are mini-sized legumes that pack a mighty dose of nutrition! Each serving contains protein, fiber, and minerals. Here's a guide to the different types of lentils and how they vary in taste, texture, and uses.

Organoleptic evaluation of Crackers sample:

Sensory evaluation of the crackers sample: -

The sample of crackers was evaluated by panels pf 20 highly experienced experts, and the evaluation was done based on taste, odor, color of crust, color of crumb and overall acceptability according to the methods prepared by them.

Results & Discussion

4. RESULT AND DISCUSSIONS

It is expected that the control sample is the highest in the total and the best in the qualities followed by other samples.

Also, it is expected that the results indicated that the sample prepared from Crackers are the best of components are the best samples after the control sample which have high nutritional value and good properties.

Simple	Color	odor	taste	crumb	crust	appearance	Overall
1	9.4	9.2	8.5	9	9	9.05	8.09
2	9.85	9.85	9.7	9.6	9.4	9.6	9.6
3	9	9.4	9.5	9.25	8.8	8.96	8.7

We recommend patients, especially diabetics, celiac, obesity and heart patients to share these products (oat fingers with beetroot, multi – seed crackers and lentil bread) in their diet because of their great health benefits as these products help in nutritional treatment and speed up recovery because they are distinguished the high nutritional value beside the unique flavor ingredients used in these products.

Summary & Conclusion

5. SUMMARY

This study was conducted to produce bakery products that benefit diabetics and celiac patients, as these products greatly aid in the recovery of patients, as well as reduce the symptoms and risks of disease among patients, as three types of baked products were used in this project, which are oats sticks with beetroot, crackers from many seeds and lentil bread. To produce oat sticks, oat, beets, butter and honey were added, and to produce crackers, flaxseed, chia seeds, sesame seeds, psyllium husk and thyme were used, as was the production of lentil bread, rice flour and lentil. All products have been carefully selected components to suit patients. The sensory evaluation of the products was carried out by experts, and the crackers were selected as the best sample in terms of nutritional value, beside their flavor, distinctive smell, and attractive shape, then the rest of the samples followed, which are oats with beets and lentil bread, so we recommend patients to use these products in their diet for what they it has great health benefits.

In conclusion, in this project, three types of high-value, low-calorie bakery were produced that help diabetics, celiac and many diseases, as well as prevent them from falling into the risks of disease, in addition to the fact that the three products are distinguished by good taste, smell and high nutritional value, which makes them distinguishes.

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الملخص العربي

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أجريت هذه الدراسة لإنتاج منتجات المخابز التي تفيد مرضى السكري ومرضى السيلياك، حيث تساعد هذه المنتجات بشكل كبير في شفاء المرضى، وكذلك تقليل أعراض ومخاطر المرض بين المرضى ، حيث تم استخدام ثلاثة أنواع من المنتجات المخبوزة في هذا المشروع. ، وهي عبارة عن أصابع الشوفان بالشمندر ، ومقرمشات من العديد من البذور وخبز العدس. ولإنتاج أصابع الشوفان تم إضافة الشوفان والبنجر والزبدة والعسل، ولإنتاج المقرمشات تم استخدام بذور الكتان وبذور الشيا وبذور السمسم وقشر السيليوم والزعتر كما تم استخدام خبز العدس من دقيق الأرز والعدس. وقد تم اختيار مكونات جميع المنتجات بعناية لتناسب المرضى. تم التقييم الحسي للمنتجات من قبل خبراء ، وتم اختيار المقرمشات كأفضل عينة من حيث القيمة الغذائية ، بجانب نكهتها ورائحتها المميزة وشكلها الجذاب ، ثم تبع ذلك باقي العينات وهي أصابع الشوفان بالشمندر وخبز العدس ، لذلك ننصح المرضى باستخدام هذه المنتجات في نظامهم الغذائي لما لها من فوائد صحية كبيرة.

وفي الختام تم في هذا المشروع إنتاج ثلاثة أنواع من المخبوزات عالية القيمة ومنخفضة السعرات الحرارية التي تساعد مرضى السكر والسيلياك والعديد من الأمراض ، وكذلك تمنعهم من الوقوع في مخاطر الإصابة بالأمراض ، بالإضافة إلى حقيقة أن الثلاثة تتميز المنتجات بالذوق والرائحة والقيمة الغذائية العالية مما يجعلها مميزة.

جامعة المنصورة
كلية الزراعة
قسم الصناعات الغذائية

انتاج بعض المخبوزات المدعمة لتغذية مرضي السيلياك والسكري

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2021

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