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# PHYTOCHEMICAL ANALYSIS AND FORMULATION DEVELOPMENT OF MULTIGRAIN KHAKHRA CONTAINING ASHWAGANDHA FOR REDUCING STRESS AND ITS DISORDERS

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***Abstract:*** Stress is a physical, mental, or emotional factor that causes bodily or mental tension. Stresses can be external from the environment, psychological, or social situations or internal illness, or from a medical procedure. Stress can lead to changes in the serum level of many hormones including cortisol, glucocorticoids, catecholamines, growth hormone and prolactin. cortisol causes an increase in your heart rate and blood pressure. Recent reports show strikingly high prevalence of stress depression among urban Indians and its disorders diabetes, CVDs, blood pressure, sexual problems etc. The dietary intake of adaptogen ashwagandha root powder high in polyphenols flavonoids was associated with stress and its disorders to preventing and multi grain is a low-fat, high-fibre diet promoted weight loss in patients with type 2 diabetes without causing unfavourable alterations in plasma lipids or glycaemic control. A High fiber and low-fat diet were found to improve the metabolic control in Type II diabetes and increase HDL and decrease LDL. so, it promotes heart health. Thus, polyphenols, Dietary fat and fibre intake are significant of sustained stress, diabetes, cardiovascular diseases risk reduction. The objective was to modify a product i.e., traditional khakhra which was high in fats and low in fibers & zero in polyphenols into the modified product i.e., Ashwagandha Multigrain Healthier khakhra. in order to improve its fat and fiber content & added ashwagandha as a value-added plant root. The modified product contains multigrain flours, ashwagandha root powder and functional foods like black pepper. On comparison it was found that ashwagandha multigrain healthier khakhra were full with polyphenols, low in fats and high in fibers as compared to the traditional khakhra which were zero in polyphenols, high in fats and low in fibers and thus can be beneficial in stress & its disorders (diabetes, blood pressure, heart diseases) subjects for better health management in today runway life. Aim- Utilization of Ashwagandha as good health promoter for making multi grain nutritious modified Khakhra.

***IndexTerms*** - Stress, Polyphenols, Dietary fibre, Low fat food.

## I. INTRODUCTION

Stress is a normal biological reaction to a potentially dangerous situation. When you encounter sudden stress, your brain floods your body with chemicals and hormones such as adrenaline and cortisol. Although adrenaline is important, it isn't the primary stress hormone[1]. That's cortisol. That gets your heart beating faster and sends blood to muscles and important organs. You feel energized and have heightened awareness so you can focus on your immediate needs. These are the different stages of stress. Too much constant stress can have negative effects on your long-term health. The severe, frequent, or prolonged stress can be mentally and physically harmful. cortisol plays an essential role in stressful situations[2]. Among its functions are raising the amount of glucose in your bloodstream, helping the brain use glucose more effectively, raising the accessibility of substances that help with tissue repair, restraining functions that are nonessential in a life-threatening situation, altering immune system response, dampening the reproductive system and growth process, affecting parts of the brain that control fear, motivation, and mood, All this helps you deal more effectively with a high-stress situation[3]. It's a normal process and crucial to human survival. But if your cortisol levels stay high for too long, it has a negative impact on your health. It can contribute to weight gain, high blood pressure, sleep problems, lack of energy, type 2 diabetes, osteoporosis, mental cloudiness and memory problems, weakened immune system, leaving you more vulnerable to infections It can also have a negative impact on your mood[4]. can lower your cortisol levels & its disorder's naturally with the help of our modified ashwagandha multigrain healthier khakhra. According to the Cigna 360 Well-Being Survey 2019

Stress levels in India remain very high compared to other developed and emerging countries such as the USA, UK, Germany, France and Australia. Those in the age-group of 35-49 years – termed the sandwich generation – are the most stressed of the lot, followed by millennials[5]. Around 89% of the 'sandwiched' respondents said they were affected by some level of stress compared to 87% of millennials and 64% of those over 50 years of age. "Less than half think they are doing well financially. They question their financial ability to meet their parents' medical needs[6]. Only 51% feel confident about their ability compared to 58% of millennials and 62% of those over 50," the study stated ®0. Increasing stress and its disorders is also due to modern life style and changed diets with balance titled towards refined foods especially sugar and fat[7]. In people with environmental factors such as excessive intake of food especially sugar, obesity and lack of exercise & outdoor activities act as precipitating agents. The marked increase in the prevalence of bad health, overweight and obesity was responsible for the recent increase in the prevalence of hormonal disbalance, diabetes, heart diseases[8].

We have made multi grain khakhra with ashwagandha and functional foods. These multigrain khakhra have been using Ashwagandha as a health promoter to reduce stress in today's runaway life. khakhra is a snack item. It originally contains refined flour & oil[9]. As health is a major concern, in our day-to-day life, nutritious and health beneficial products are on high demand. Keeping this in mind, a new innovative idea of making a Ashwagandha Multigrain Healthier khakhra was introduced. Multigrain flours, ashwagandha root powder and functional foods are the main ingredients of the recipe[10]. The multigrain flour includes flours of whole wheat, jowar, pearl millet, maize, amaranth, barley, water caltrop, bajra, soya, besan (chana dal flour) and ashwagandha root powder was used to increase nutritive value of the khakhra and help in decrease stress and its effects. Functional foods like black pepper, some spices & black salts were used which are beneficial for health[11]. The traditional khakhra was modified to have a low fat, high polyphenols - flavonoids (antioxidants) and improved fibre content multigrain khakhra was thus a healthier snack option than the traditional khakhra[12].

## II. Material and Methods

### Selection of Grains

The best quality wheat, gram, barley, amaranth, Water caltrop, Sorghum, Soyabean, Maize, Pearl Millet, Ashwagandha roots, were procured from the local market. The unwanted material was sorted from the grains using manual screening method. The sun drying of seed were performed for 2 hours prior to grinding[13].

### Grinding to flour size particles

Portable flour mill was use for grinding having the weight of 26 kgs (Approx.) with a temperature range of 55-to-60-degree Celsius after 30 mins, 1 horse power motor with 960 rpm, 230 V A.C., 50Hz Single Phase. All the grinded flour of grains is passed throw the sieve of size of 212 µm or sieve of no.70[14].

### Preparation of Dough

Procedure Oil, water or milk are added and kneaded to make a soft dough. This dough is then rolled into small balls and flattened. These are then roasted over slow heat and pressed via wooden press, until crisp and light brown in color[15].

### Preparation and drying of Khakra

In a bowl mix the dry ingredients: wheat Whole wheat flour, Gram, Barley, Amaranth, Water caltrop, Sorghum, Soyabean, Maize, Pearl millet, Ashwagandha root powder, Black salt, Black pepper, Soyabean oil, Fennel, Cumin, Carom, Red pepper, Salt, Oil[16]

↓

Add water in mixture and mix thoroughly to combine and knead it like a dough

↓

Now leave this dough for 15 minutes

↓

Now make an equal number of balls of this dough

↓

Now make chapatti from this dough or line the direct dough in the chapati maker.
(Use a cylindrical wooden cooking instrument used to flatten and shape dough)

↓

Turn on the chapati maker, after it is heated keep the chapatti in it and cook till it becomes crispy

↓

So, take this our healthy tasty Khakhra is ready

**Methods for quantitative estimation of Nutritional Values and other parameters**

**Moisture content**

For determination of moisture content, the sample is subjected to sundry then shed dry and finally placed in try dryer. In each case the pre and post weight of sample was taken and moisture content was calculated in percentage[13].

**Ash values**

For determination of Ash values the powdered sample is treated under Muffle furnace at $400^0$C to become ash in a crucible. The sample is weighed before and after the treatment and the quantity of Ash was determined[12].

**Protein determination**

Protein was quantitatively determined using the UV spectrophotometric method. After adjusting the wavelength to 280nm the calibration was performed with buffer solution. For the measurement of absorbance of Protein sample the wavelength was adjusted to 260 nm[14].

**Fat determination**

The sample was subjected to solvent extraction process. The solvent was recovered and the fat obtained was weighed and placed in desiccator, the sample was finally weighed and the percentage of fat was determined quantitatively[15].

**Crude Fibre determination**

The defatted sample is treated with concentrate sulphuric acid and water. This mixture was subjected to distillation for 30 minutes and the resultant was filtered. The residue was further treated with NaOH for 30 minutes similarly to acid treatment. The sample was analyzed for protein content and saponification was also performed. The remaining residue was transferred in Crucible and place in Hot air oven at $105^0$C for 12 hours. Finally, the Crucible was weighed and the percentage of Crude fibre was calculated[16].

**Energy determination**

A heavy steel container known as 'Bomb' is used for the sample intake. It is ignited by charging with oxygen and the dissipated heat is transferred into the water which is present around the bomb. The energy value of food is calculated by measuring the change in the temperature of the water[17].

**Carbohydrate determination**

In this Colorimetric method the sample is mixed with sulfuric acid and anthrone reagent. The mixture was boiled until the reaction was completed. The solution was cooled and absorbance was measured at 620 nm[18].

**Determination of Iron Content**

The 2-5 gm sample of was weighed into a crucible. The Crucible was heated over a Bunsen burner until the sample is reduced completely to ash. After cooling the 10 ml of hydrochloric acid was added and stirred for 5 minutes. Further, 5 ml of distilled water was added and the solution was filtered. The filtered solution will be used for colorimetric analysis and the absorbance was observed a 490 nm[16].

**Determination of Calcium Content**

The 5-15 gm of the sample was dried in an hot air oven at $105^0$C for 3 hours. The dried sample was charred in a muffle furnace at $550^0$C. The ash was treated with hydrochloric acid and transferred to a volumetric flask and made up to 50 ml. The absorbance was observed at 422 nm[17].

**Determination of Carotene**

The sample (1gm) was accurately weighed in a glass test tube. 5 ml of chilled acetone was added and vortexed at high speed for 10 min. Supernatant was collected into a separate test tube. The sample was filtered using Whatman filter paper No. 42. The absorbance of the extract was determined at 449 nm using UV-Vis spectrophotometer[9].

**Determination of Vitamin C**

The 10 gm sample was blended and 50 ml of metaphosphoric acid acetic acid solution and transferred to 250 ml conical flask. Remaining amount of 50 ml was added and the solution was filtered using whatman filter paper. To the filterate few drops of bromine solution was added and thiourea also added to remove excess bromine. 1ml of 2,4-dinitrophenylhydrazine solution was added and kept for 3 hours at $37^0$C to complete the coupling reaction[10]. After 3 hours 1 ml of sulfuric acid was added and the absorbance of the solution was observed at specific wavelength.

**Determination of Polyphenols**

For the determination of Polyphenols 1gm sample was extracted with 80 ml of 30% methanol at $70^0$C for 15 minutes on a water bath. To this solution 8 ml of water and 10 ml of acetate buffer was added. Further, 50 mg of Casein was added and mixture is shaken for 45 min to adsorb the tannins. The solution was filtered and 10 ml of sodium carbonate solution was added and absorbance was calculated at 720 nm[9].

**Free radical scavenging activity**

For the determination this activity a solution of 0.1mM DPPH in methanol was prepared and 2.4 ml of this solutions was mixed with 1.6 ml of extract in methanol at different concentration. The mixtures were vortexed thoroughly and left in the dark at Room temperature for 30 minutes. The absorbance of the mixture was measured at 517 nm[9].

## III. Results and Discussions

**Evaluation of Nutritional Value and other parameters**

Ashwagandha is well known for its various medicinal properties. In present work the nutritional properties were investigated and found that it contains the highest amount of carbohydrates (49.1). The Crude fibre content of Ashwagandha is also significant (32.9). It provides about 255 kcal of energy and besides these it is a very good source of Iron, Calcium, Carotene, Vitamin C and other nutrients. Every Nutritional product requires the antioxidant activity and it was found that it contains 65.86% in DPPH assay as per

table no.1. All such information proves that Ashwagandha is nutritionally rich source of nutrients along with the medicinal properties.

| S.No. | Nutritional Values | Ashwagandha root powder |
|---|---|---|
| 1. | Moisture (%) | 7.21 |
| 2. | Ash(g) | 4.8 |
| 3. | Protein(g) | 3.1 |
| 4. | Fat(g) | 0.6 |
| 5. | Crude Fibre(g) | 32.9 |
| 6. | Energy(kcal) | 255 |
| 7. | Carbohydrate(g) | 49.1 |
| 8. | Iron(mg) | 3.8 |
| 9. | Calcium(mg) | 28 |
| 10. | Total Carotene (µg) | 75.2 |
| 11. | Vitamin C(mg) | 3.1 |
| 12. | Polyphenols(mg) | 18.8 |
| 13. | Free radical scavenging activity (DPPH)% | 65.86 |

**Table 1. Nutritional parameters of Ashwagandha**

**Ingredients of Traditional Khakhra**

Khakhra is a very old and famous traditional formulation of Gujarat. It comprises of 80 % of Whole wheat flour 13.77 % of edible oil and 6.23 % of Mix spices and Iodized salt in q.s. amount according to taste as per table no.2. This simple formulation provides an instant source of energy and act as snacks.

| S.No. | Ingredients | Amount [gm] |
|---|---|---|
| 1. | Whole wheat flour | 80 |
| 2. | Iodized salt | To taste |
| 3. | Edible oil | 13.77 |
| 4. | Mix spices | 6.23 |

Table no. 2 **Ingredients of Traditional Khakhra**

**Ingredients of Multigrain Healthy Khakhra**

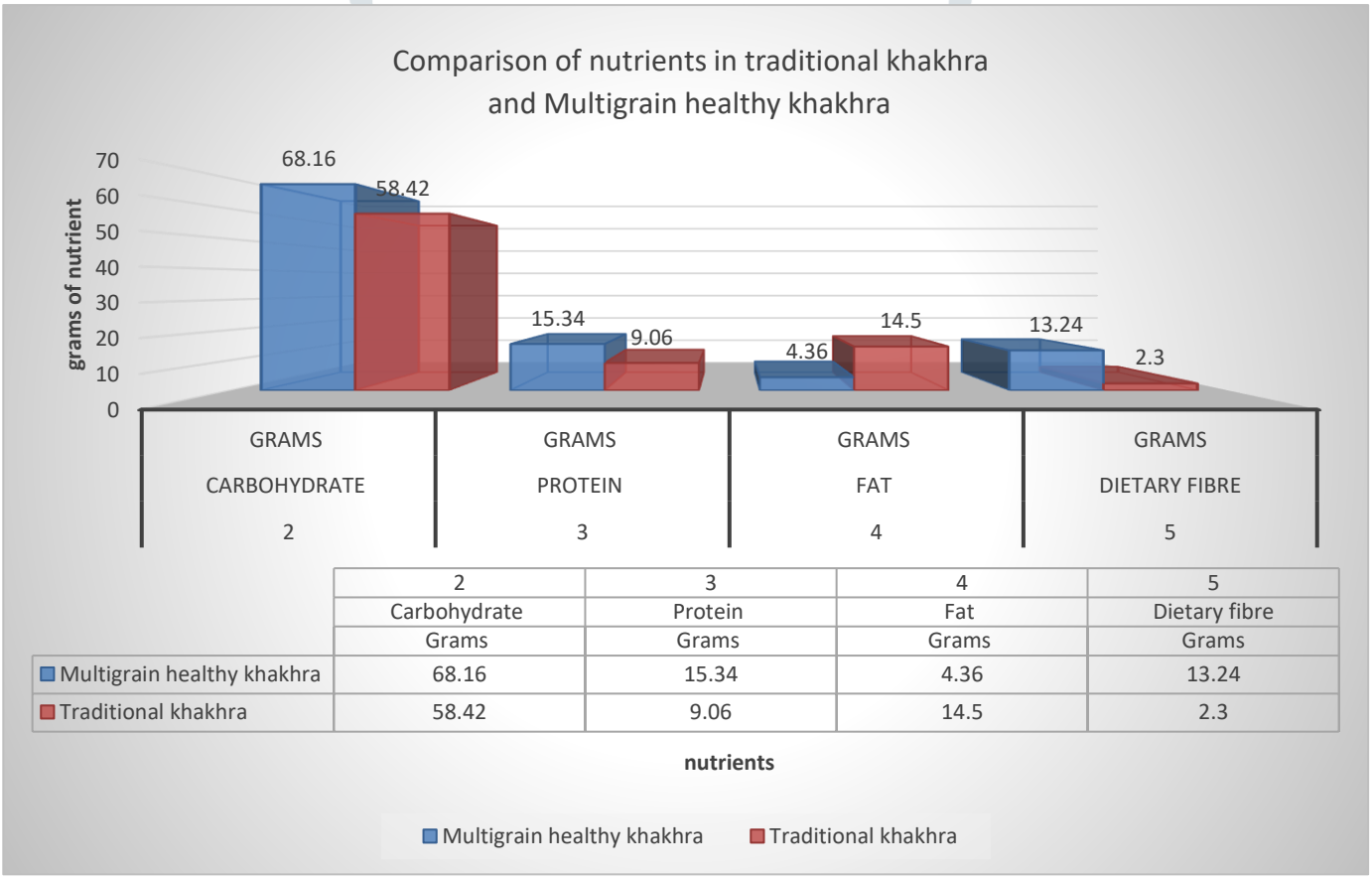
| S.No. | Ingredients | Amount [gm] |
|---|---|---|
| 1. | Whole wheat flour | 50.40 |
| 2. | Gram | 29.76 |
| 3. | Barley | 9.52 |
| 4. | Amaranth | 9.52 |
| 5. | Water caltrop | 9.52 |
| 6. | Sorghum | 4.76 |
| 7. | Soyabean | 4.76 |
| 8. | Maize | 4.76 |
| 9. | Pearl millet | 2.0 |
| 10. | Ashwagandha root powder | 5 |
| 11. | Black salt | 1.5 |

| | | |
|---|---|---|
| 12. | Black pepper | 1 |
| 13. | Soyabean oil | 2 |
| 14. | Fennel | 1 |
| 15. | Cumin | 1 |
| 16. | Carom | 1 |
| 17. | Turmeric | 0.5 |
| 18. | Red pepper | 0.5 |
| 19. | Salt | To taste |
| 20. | Oil | 2 |

**Comparison between Traditional khakhra and Multigrain healthy khakhra**

| S. No. | Nutrients | Unit | Multigrain healthy khakhra | Traditional khakhra |
|---|---|---|---|---|
| 1. | Energy | Kcal | 376.82 | 392 |
| 2. | Carbohydrate | Grams | 68.16 | 58.42 |
| 3. | Protein | Grams | 15.34 | 9.06 |
| 4. | Fat | Grams | 4.36 | 14.50 |
| 5. | Dietary fibre | Grams | 13.24 | 2.30 |

**Comparison of nutrients in traditional khakhra and Multigrain healthy khakhra**




## IV. CONCLUSIONS

Stress, non-communicable diseases being an alarming condition in India needs a healthy and nutritious diet. Keeping the status in mind, Modified khakhra was made from multigrain flour, ashwagandha and functional foods. Lifestyle changes, healthy body weight, moderate physical activity, a balanced and nutritious diet can help prevent the development of diseases. The Multigrain healthy khakhra were found to be polyphenols, higher in fiber and protein and lower in fats as compared to the traditional khakhra. The modified product also contains good amount of protein, calcium, fiber making it beneficial for patients & individuals. Thus, the product which is the amalgamation of all these ingredients can be widely suitable for people who are suffering from lifestyle disease.

## V. ACKNOWLEDGMENT

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## VI. CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

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