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PREPARATION AND ANALYSIS OF VALUE ADDED HEALTH MIX USING GERMINATED MILLETS FLOUR AND CORN SILK (FUNCTIONAL FOOD) FOR DIABETIC PATIENTS

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ABSTRACT: Diabetes is a metabolic disorder that is characterized by high blood glucose and either insufficient or ineffective insulin. Insulin is a hormone secreted by specialized cells in the pancreas in response to (among other things), increased blood glucose concentration. The primary role of insulin is to control the transport of glucose from the bloodstream into the cells.

After consuming a meal, insulin enhances the uptake of the energy nutrients (amino acids, glucose, and fatty acids). Without insulin, or when insulin is ineffective, glucose regulation falters and the metabolism of energy-yielding nutrients changes. In diabetes, there is too much glucose in the blood[1].

Diabetes mellitus (DM) is a metabolic disorder resulting from a defect in insulin secretion, insulin action, or both. Insulin deficiency in turn leads to chronic hyperglycemia with disturbances of carbohydrate, fat and protein metabolism. A diabetes analysis and survey camp was conducted in Virudhunagar District at various places and for different work groups. It is found that from the total people found to be affected by diabetes, about 60% are those in a profession which requires less physical work, 30 % because of their food habits and 10% are affected because of their heredity[2].

A High fiber and low fat diet was found to improve the metabolic control in Type II diabetes. Thus Dietary fat and fibre intake are significant predictors of sustained weight reduction and progression to Type II diabetes. Appropriate nutrition practice plays a vital role in determining optimal health of diabetes. The main aim of the study was to develop value added health mix using germinated multigrain flour and corn silk flour and to assess its organoleptic quality as well as nutritional composition of prepared product. The raw materials were procured from the local market. The flour (Bajra, Ragi and corn silk flour) were mixed in different proportion to prepared health mix and named as S1, S2 and S3. Organoleptic analysis was done to assess the sensory attributes by using nine point hedonic scales. The prepared product were analysed for its nutritional composition by using the standard procedure as described by AOAC. The result shows that S2 scored best in over all acceptability among all the samples.

The nutritional composition of product indicates that carbohydrate, energy and protein were increased with germination. Hence, it was concluded that germinated grain flour and functional food can be suitably incorporated in the HEALTH MIX product in order to effectively control diabetes.

KEY WORD: Diabetes, Health Mix, Functional food

INTRODUCTION

Diabetes mellitus describes a metabolic disorder characterized by chronic hyperglycemia with disturbances of carbohydrate, fat and protein metabolism resulting from defects in insulin secretion, insulin action, or both. The characteristic symptoms seen are polyuria, polydipsia, polyphagia, blurring, Weight loss, fatigue, tingling sensation or numbness in the hands or feet, blurred vision, frequent infections, slow-healing of wounds..

The marked increase in the prevalence of overweight and obesity was responsible for the recent increase in the prevalence of Non-insulin dependent diabetes mellitus. Inactivity and alcohol consumption are other dominant risk factors for development of type 2 diabetes. (2)

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 Value added Multigrain Health Mix was introduced. Germinated grain flours and functional food are the main ingredients of the recipe. The Germinated grain flours include Bajra and ragi. Functional food like corn silk was used which are beneficial for diabetes. The basic purpose to introducing this VALUE ADDED (CORN SILK) GERMINATED GRAINS HEALTHY MIX food is a) to provide the taste and variety to their diet, b) to provide the "missing" nutrients.

The major cereals and millets consumed in India are rice, wheat, jowar, bajra and ragi. These grains are the main source of energy in Indian diets contributing as they do 70-80% of daily intake of majority of Indians. Since cereals/millets are the cheapest, widely available source of energy, their contribution to energy intake is the highest among the poor income families and it decreases with increasing income. Millets have immense health benefits as they are rich in phytochemicals and nutrients, particularly beneficial to overcome the current life style diseases. Millet based products is economically viable and also it highlights the excellent medicinal and nutritional qualities. Cereals/millets are also source of some nutrients like calcium and iron. One of the most significant reasons for this study was to develop low cost, vale added malt foods which are easy to prepare.

Corn silk is well known and frequently used in traditional Chinese herbal medicines. Corn silk has been used as an oral antidiabetic agent in China for decades.Corn silk pertains to the thin, threadlike material found at the end of a corn husk. It ranges in color from light yellow to brown, and can reach more than a foot in length in some species of corn. As part of the corn plant, its main function is to catch pollen. Corn silk is anti-inflammatory and protects and soothes the urinary tract and kidneys.

Corn silk contains proteins, vitamins, and carbohydrates and it is reported to be an excellent source of many bioactive compounds such as fixed and volatile oils, steroids such as sitosterol and stigmasterol, alkaloids, saponins, tannins and natural antioxidants such as flavanoids and other phenolic compounds with beneficial effects on human health. Based on folk remedies, corn silk has been used as an oral antidiabetic agent in China for decades. Health benefits of corn silk have been reported in many investigations. Utilization of corn silk for commercial production of functional food is worth exploring to convert waste agricultural products into value-added products.

Finger millet (Eleusine coracana), also known as ragi is a good source of carbohydrate, protein, dietary fibre and minerals, and an important staple food for people under low socio-economic group (Sripriya, et al., 1997) and those suffering from metabolic disorders like diabetes and obesity (Mathanghi & Sudha 2012). It is important because of its excellent storage properties and nutritive value (Shashi et al., 2007). It's dietary fibre and mineral content is markedly higher than wheat, rice, and fairly well balanced protein (Ravindran, 1991)

Pearl millet is one of the four most important cereals (rice, maize, sorghum and millets) grown in the tropics (Figure 3) and is rich in iron and zinc, contains high amount of antioxidants and these nutrients along with the antioxidants may be beneficial for the overall health and wellbeing. Pearl millet is a rich source of energy (361 Kcal/100g) which is comparable with commonly consumed cereals such as wheat (346 Kcal/100g),rice (345Kcal/100g) maize (125 Kcal/100g) and sorghum (349Kcal/100g) as per the Nutritive value of Indian foods (NIN, 2003).

Hence, the present study was undertaken with the following objectives of developing a new innovative value added millet based food product for regular consumption by applying new technologies, biochemical analysis of newly developed product and assessment of its acceptability through sensory evaluation.

OBJECTIVES

1. To prepare value added health mix food product using flours of germinated grains and functional food (Corn silk).
2. To find out the acceptance of prepared value added (corn silk) germinated grains health mix.
3. To calculate the nutritive value of the prepared product.
4. To analyse the microbial count of the prepared product.

MATERIALS AND METHODS:

Source of raw materials and reagents used:

Pearl millet, ragi, roasted bengal gram and fenugreek were purchased from local market. All the chemicals and reagents used were of analytical grade.

Sprouting of cereals:

Cereals or legumes

⇩

Sorting and washing

⇩

Soaking in water for over night

⇩

Trying in a muslin cloth for sprouting

⇩

Appearance of sprouts

⇩

Germination

Dehydration of sprouts:

Taking germinated cereals and pulse

⇩

Spreading them in trays

⇩

Drying in oven at 180C for a hour

⇩

Repeating the process till moisture disappear

⇩

Dehydration

Preparation of flours:

Taking dehydrated cereals and pulses

⇩

Grinding to a fine powder

⇩

Flours

Source: http://www.nutritionflash.com

Preparation of corn silk powder:

Collection of corn silk

⇩

Washing corn silk

⇩

Cutting it into an appropriate size

⇩

Drying the corn silk at 20-40°C for 1 hour

⇩

Grinding to a fine powder

Preparation of health drink:

Health mix of 20 g was added to 200 ml of boiled milk or water and mixed well to get malt.

Standardization of millet health food mix:

Health mix was standardized using millets and corn silk in different proportions. The detail of standardization of mix was given **(Table 1).**

Table 1: Standardization of millet health food mix

PRODUCT PROPERTIES

Ingredients (gm)	S1	S2	S3	S4
Sprouted Bajra	19	19	14	14
Sprouted Ragi	25	20	20	15
Corn silk	5	10	15	20
Fenugreek	1	1	1	1
	50	50	50	50

Bulk density:

This was determined by the method of Narayana Rao (1984). A graduated cylinder tubes were weighed and flour sample filled to 5 ml by constant tapping until there was no further change in volume. The contents were weighed and the difference in weight determined. The bulk density was computed as grams per ml of the sample.

$$\text{Bulk density} = \frac{\text{Weight of the sample taken}}{\text{Volume occupied by the sample}} \times 10^3$$

Water solubility index:

WSI was determined in triplicate following the method described by Carine *et al.* (2010). Each sample (1 g) would suspend in 20 mL of distilled water in a tared 45 mL centrifuge tube and be stirred with glass rod then put in water bath for 30 min at 30ºC temperature then centrifuge at 3000 r min-1 for 15 min. The supernatants would pour into dry evaporator dishes of known weight and stored overnight at 120ºC for the process of evaporation.

$$\text{WSI} = \frac{\text{Weight of solids in supernatant}}{\text{Weight of dry samples in the original sample}} \times 100$$

Swelling index:

The method of Abbey and Ibeh (1998) was employed. One gram of the flour samples were weighed into 10 ml graduation measuring cylinder. Five millilitres of distilled water was carefully added and the volume occupied by the sample was recorded. The sample was allowed to stand undisturbed in water for 1 h and the volume occupied after swelling.

$$\text{Swelling index} = \frac{\text{Volume occupied by sample after swelling}}{\text{Volume occupied by the sample before swelling}}$$

Proximate composition analysis of health mix:

The nutrient content of the health mix was analysed according to the AOAC (1980) method.

Sensory evaluation of health drink:

Sensory evaluation provides an index of overall acceptability of foodstuffs, which depends on its appearance, flavour, taste, texture, colour and overall acceptability. To ensure the acceptability of the modified recipes, they were subjected to evaluation by composite scoring for their sensory qualities. The health drink was prepared and presented to a panel of 15 judges. Specific sensory characteristics of each recipe (appearance, colour, flavour, taste, texture and overall acceptability) were rated separately using hedonic scale on a scale of 1 to 9. Scores were defined as follows: 1 - dislike extremely, bad; 9 – like extremely, excellent.

Analyse the Microbial count of the selected Health Mix Sample:

In the present study, Total Plate Count was used. It is the most widely used method to know the Microbiological quality of the food sample.

Results and Discussion:

The results obtained from the present investigation are summarized below.

PHYSICAL PROPERTIES

Bulk density is depended upon the particle size of the samples. The value of millet based health mix obtained from the study was 0.91 g/cm3. Water solubility index measures the rate and extent to which the component of powder material or particles dissolves in water. The water solubility index of the

health mix was found to be 9 per cent. Swelling index of the mix was calculated as 1 per cent which indicates there is no swelling power in the health mix **(Table 2).**

Table 2: Physical Properties of Health Mix

Physical properties of HEALTH MIX	
Physical Properties	**Millet based health mix**
Bulk density	0.91 g/cm3
Water solubility index	9 %
Swelling index	1%

Sensory Evaluation:

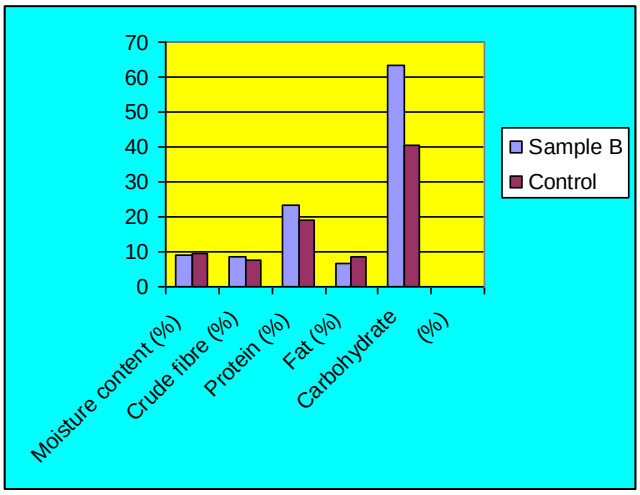
From this analysis, we can conclude that the sample B got more score than sample A, sample C and control regarding colour, flavour, taste, texture and overall acceptability.

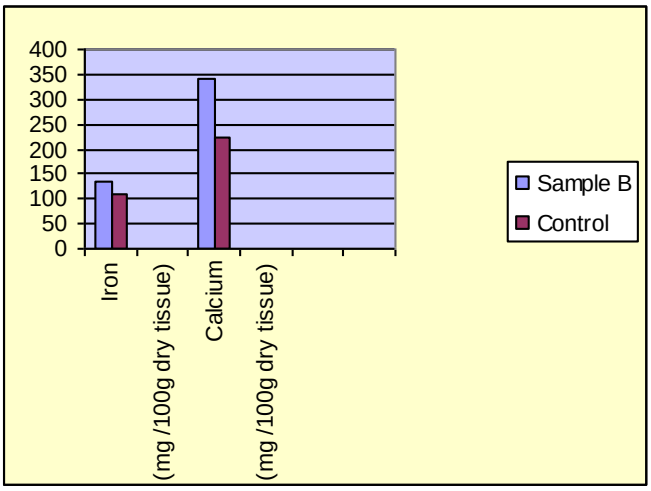
Proximate composition:

The nutritive value of the millet based health mix was calculated. It had moisture content of 8.9 per cent, carbohydrate content 63.32 percent, protein content of 23.18 per cent, and fibre content of 8.50g. The mineral content of the health mix was found to be calcium339.64mg, iron 136.36 mg. The nutrient contents of the health mix are given below **(Table 3).**

Table 3: Nutrition Composition of Health Mix

Parameters	Results of Sample	Results of Control
Moisture content (%)	8.9	9.5
Crude fibre (%)	8.50	7.50
Protein (%)	23.18	19.15
Fat (%)	6.80	8.5
Carbohydrate (%)	63.32	40.25
Iron (mg /100g dry tissue)	136.36	110.05
Calcium (mg /100g dry tissue)	339.64	223.72





Nutrition Composition of Health Mix

Table 4 : Phytochemical screening of *Sample and Control*

S.No	Phytochemical analysis	Sample	control
1	Tannin	+	+
2	Phlobatannins	-	-
3	Saponin	+	+
4	Flavonoids	+	++
5	Steroids	+	+
6	Terepenoids	+	-
7	Triterpenoids	+	-
8	Alkaloids	+	-
9	Carbohydrate	+	+
10	Protein	+	+
11	Anthroquinone	+	-
12	Polyphenol	++	-
13	Glycoside	+	-

(+) Presence (-) Absence (++) Moderately present

Microbial Analysis:

Microbial analysis was carried out in the 1st Day and the 15th Day for identifying the bacterial colony. From this analysis, it was found out that it is safe to consume up to 15 days storage period.

SUMMARY AND CONCLUSION

The life style of the people in metro cities and urban areas changed a lot where they find less time to do exercises and stay fit. Hence to keep them healthy, their food habits need to be changed. This value added health mix using germinated flours of millets and functional food (Corn silk) will be gift for them to control Diabetes.

The study carried out with the diabetic patient to determine the sensory evaluation of the prepared products and nutrient analysis of the developed product proved that this product to be nutritionally superior. Millet based products are economically viable and also it highlights the excellent medicinal and nutritional qualities. The nutritional value of millet health mix with functional food contains high carbohydrates, protein, fat, crude fibre and calcium. The nutrient rich health drink is suitable for diabetic patient.

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