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Efficacy and development of premix for genome related metabolic diseases

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Abstract
The objective of present investigation was "Efficacy and development of Premix as a Nutrigenomics Health food for genome related Metabolic Disease" refer to Nutrigenomics health food in simple words. Metabolic diseases mainly caused by the genes. For those who suffer from genome related metabolic diseases or disorders, one of the treatment genome related metabolic diseases Nutrigenomics Health food. In view of the facts regarding nutritional quality of Tulsi, Ginger, Carrot, and soyabean (ICMR 2010) were made to develop premix for genome related metabolic disorders. Premix is prepared in different combinations using Tulsi, Ginger, Carrot and Soyabean. Developed premix contains Tulsi (45%), Ginger (10%), Carrot (25%), soyabean (20%). Organoleptic evaluation of developed premix was done by panel of 10 judges using 9-point hedonic scale. The result of Nutrigenomics premix (T4) was best in case of all sensory attributes. The highest average score for overall acceptability was found in experimental premix were mostly accepted by panel member.

Keywords: Premix, metabolic diseases, Nutrigenomics health food

1. Introduction

"The new science of Nutrigenomics teaches us what specific foods tell your genes. What you eat directly determines the genetic messages your body receives. These messages, in turn, control all the molecules that constitute your metabolism: the molecules that tell your body to burn calories or store them. If you can learn the language of your genes and control the messages and instructions they give your body and your metabolism, you can radically alter how food interacts with your body, lose weight, and optimize your health."

Origin of Nutrigenomics

The concept that diet influences health is an ancient one. Nutrigenomics includes known interactions between food and inherited genes, called 'in- born errors of metabolism,' that have long been treated by manipulating the diet. One such example is Phenylketonuria (PKU); it is caused by a change (mutation) in a single gene. Affected individuals must avoid food containing the amino acid phenylalanine. Another example is lactose intolerance, majority of adults in the world are lactose intolerant, meaning that they cannot digest milk products, because the gene encoding lactase, the enzyme that breaks down lactose, is normally 'turned off after weaning. However some 10,000–12,000 years ago a polymorphism in a single DNA nucleotide appeared among northern Europeans. This single nucleotide polymorphism—a SNP—resulted in the continued expression of the lactase gene into adulthood. This was advantageous because people with this SNP could utilize nutritionally rich dairy products in regions with short growing seasons and with the revolution in molecular genetics in the late twentieth century, scientists set out to identify other genes that interact with dietary components. By the 1980s companies were commercializing Nutrigenomics. The Human Genome Project of the 1990s, which sequenced the entire DNA in the human genome, jump-started the science of Nutrigenomics. By 2007 scientists were discovering numerous interrelationships between genes, nutrition, and disease.

Nutrigenomics brings along new terminology, novel experimental techniques and a fundamentally new approach to nutrition research, such as high-throughput technologies that enables the global study of gene expression in a cell or organism.

Nutrigenomics would require a collaborative effort from people in genetics and the industries of public health, food science and culinary. It's very easy to make good-tasting food.

Put some lard or butter in it, and it's going to taste good. The challenge is how to take the fat out and create healthful but also good-tasting food." Therefore a shift in public health is greatly needed, and with an increasing incidence of obesity and chronic diseases such as type-2 diabetes, Nutrigenomics might prove to be the panacea in the future.

2. Increasing rates of chronic diseases

2.1 World health scenario

Despite the worldwide increasing rates, chronic diseases remain surprisingly neglected in the global health agenda. Because of changes in dietary and lifestyle habits—a phenomenon that can be linked to the whole globalization process—developing countries now face a fast "epidemiological accumulation" of non-communicable and infectious diseases and must cope with urgent and competing health priorities. Non-communicable diseases (NCDs)—especially cardiovascular diseases, cancers, chronic respiratory diseases and diabetes—caused 60% deaths glob- ally in 2005 (approximately 35 million deaths). Total deaths from NCDs are projected to increase by a further 17% over the next 10 years. By 2020, it is predicted that NCDs will account for 80% of the global burden of disease, causing seven out of every 10 deaths in developing countries. This places a considerable (double) burden on limited health budgets, particularly in emerging economies. Thus the promises of nutrigenomics must be addressed with respect to this current growing epidemic, both in developed and developing countries.

2.2 India's health scenario

In India, the rates of fatal diseases are lower than those seen in Western countries. However, this rate is rising with increasing migration of rural population to cities and changes in lifestyles. In recent decades, consumption of food grains also has shifted from coarse grains to refined rice and wheat.

India has some of the highest Coronary Heart Disease (CHD) rates in the world, with urban rates being three times higher than rural rates. In addition, rates for obesity (Fig. 3a and b) and diabetes are increasing dramatically in urban areas and in high-income rural residences. Obesity is related to several chronic diseases, including type-2 diabetes, hypertension, cardiovascular diseases, various types of cancers and psychosocial problems. The major reasons for its development are changing life-styles and food habits. Diet appears to be related to the high rates of CHD, obesity, and diabetes although a genetic component may exist in some cases. Therefore, a general awareness of diet and diet related problems leading to gene alteration has to be known and for this nutrigenomics should be studied extensively.

Global status of Nutrigenomics research (as per Scopus database)

Country-wise and subject-wise analysis to unravel the mystery of these chronic diseases, nutrigenomics work is booming in many parts of the world. According to Scopus database, UK and US have the highest contribution; while India is in 16th position, suggesting that nutrigenomics research in India is still in the infancy. This data was obtained by giving the following search terms: "Nutrigenomics", "Nutrigenetics", and "Diet-gene interaction" in Scopus data- base. A total of 1072 records were obtained which were refined on the basis of document type. The 769 records obtained after refining was then analyzed. The contribution of top 20 countries shows that India has only 14 papers while US and UK has 210 and 97 papers respectively as per the Scopus results. Subject-wise analysis shows that nutrigenomics work is mainly done in the fields of Medicine; Biochemistry, Genetics and Molecular Biology; Agricultural and Biological Sciences and Nursing.

Plants are the important sources of medicine & a large numbers of drugs in use are derived from plants. The therapeutic uses of plant are safe, economical & effective as their ease of availability1. Among the plants known for medicinal value, the plants of genus Ocimum belonging to family Lamiaceae are very important for their therapeutic potentials. *Ocimum sanctum* has two varieties i.e. black (Krishna *Tulsi)* and green (Rama *Tulsi),* their chemical constituents are similar. *Ocimum sanctum* is widely distributed covering the entire Indian sub-continent, ascending up to 1800 m in the Himalayas and as far as the Andaman and Nicobar Island. Tulsi is a Sanskrit word, which means "the incomparable one" and has a very special place in the Hindu culture. Several medicinal properties have been attributed to the Tulsi plant not only in Ayurveda and Siddha but also in Greek, Roman and Unani systems of medicine.

Various synonyms used in India and all over the world for *Ocimum sanctum* have also been enumerated in this review article. The phytoconstituents isolated from various parts of the plant include eugenol, cardinene, cubenol, borneol, linoleic acid, linolenic acid, oleic acid, palmitic acid, steric acid, Vallinin, Vicenin, Vitexin, Vllinin acid, Orientin, Circineol, Gallic Acid, vitamin A, vitamin C, phosphorus and iron (refer table III). *Ocimum sanctum* is one such plant showing multifarious medicinal properties viz. analgesic activity, anti-ulcer activity, anti-arthritic activity, immunomodulatory activity, anti-asthmatic activity, antifertility activity, anticancer activity, anticonvulsant activity, anti-diabetic activity, anti-hyperlipidemic activity, anti-inflammatory activity, antioxidant activity, anti-stress activity in addition to possessing useful memory enhancer and neuroprotective activity.

The carrot (*Daucus carota* subsp. *sativus*) is a root vegetable, usually orange in colour, though purple, red, white, and yellow varieties exist. It has a crisp texture when fresh. The most commonly eaten part of a carrot is a taproot, although the greens are sometimes eaten as well. It is a domesticated form of the wild carrot *Daucus carota*, native to Europe and southwestern Asia. The domestic carrot has been selectively breed for its greatly enlarged and more palatable, less woody-textured edible taproot. The Food and Agriculture Organization of the United Nations (FAO) reports that world production of carrots and turnips (these plants are combined by the FAO for reporting purposes) for calendar year 2011 was almost 35.658 million tonnes. Almost half were grown in China. Carrots are widely used in many cuisines, especially in the preparation of salads, and carrot salads are a tradition in many regional cuisines. Carrot is one of the important root vegetables rich in bioactive compounds like carotenoids and dietary fibers with appreciable levels of several other functional components having significant health-promoting properties. The consumption of carrot and its products is increasing steadily due to its recognition as an important source of natural antioxidants having anticancer activity. Apart from carrot roots being traditionally used in salad and preparation of curries in India, these could commercially be converted into nutritionally rich processed products like juice, concentrate, dried powder, canned, preserve, candy, pickle, and g*azrailla*. Carrot pomace containing about 50% of β-carotene could profitably be utilized for the supplementation of products like cake, bread, biscuits and preparation of several types of functional products. The present review highlights the nutritional composition, health promoting phytonutrients, functional properties, products development and by-products utilization of carrot and carrot pomace along with their potential application.

Ginger is the underground rhizome of *Zingiber officinale* Rosc. perennial plant and is one of the world's most popular medicinal spices. Ginger is truly a world domestic remedy. Asian cultures have used it for centuries. Ginger also claims for use as an anti-vomiting or anti-motion sickness agent. Ginger extracts have been extensively studied for a broad range of biological activities including antibacterial, anticonvulsant, analgesic, antiulcer, gastric anti-secretory, antitumor, antifungal, antispasmodic, antiallergenic, anti-inflammatory and other activities.

Soybean is in use for more than 5000 years in China and South East Asia as food. The plant is classed as an oilseed rather than a pulse. Soy contains significant amount of all essential amino acids for humans. Soybeans contains no starch, they are good source of protein for diabetics. Epidemiological studies show its importance in prevention of several diseases. Recently, an upsurge of consumer interest in the health benefits of soybean and soy products is not only due to its high protein (38%) and high oil (18%) content, but also due to the presence of physiologically beneficial phytochemicals. Past several years of clinical and scientific evidences have revealed the medicinal benefits of the soy components against metabolic disorders (cardio-vascular diseases, diabetes and obesity *etc.)* as well as other chronic diseases (cancer, osteoporosis, menopausal syndrome and anemia etc.). Many of the health benefits of soy are derived from its secondary metabolites, such as, isoflavones, phyto-sterols, lecithins, saponins etc. In this review we discuss the bioactive components of soybean and their role in prevention, maintenance, and/or curing of diseases.

2.3 Objective
To standardize and develop premix.

3. Method and material
The present study entitled "Efficacy and Development of Premix for Genome Related Metabolic Diseases" was carried out to standardize premix and its products. The study was conducted in the Department of Food and Nutrition, faculty of Home Science, Kamala Nehru Institute of Physical and Social Sciences, Sultanpur.

Justified, judicious and scientific methodological considerations are indispensable for any investigation to deduce meaningful interferences concerning the objectives of the study. The study design to reflect to the logical manner in which units of the study are assessed and analyzed for the purpose of drawing generalizations. Thus, with the view of the available resources, the best procedure for taking correct observation should be first stored out in a logical manner so that unbiased interference can be drawn. This chapter delineates information pertaining to the research design and methodological steps used for the investigation. The research procedure has been described as under in the following heads-

3.1 Procurement of material
3.2 Processing of raw material
3.3 Development of premix
3.4 Sensory evaluation
3.5 calculation of nutritive value
3.6 Statistical analysis

3.1 Procurement of material
For the present investigation materials i.e. Tulsi, carrot, Ginger, Soyabean were procured from the local market of the Sultanpur city. The procuring was done in single a lot to avoid variation and compositional differences so that quality differences could rule out.

3.2 Processing of raw material

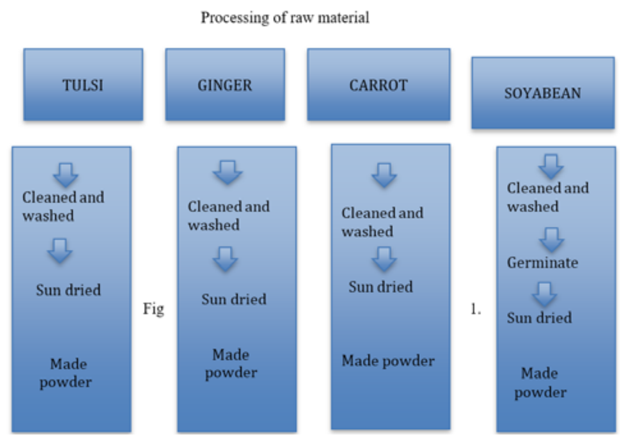

Fig 1: Flow chart of processing of raw material

3.2.1 Processing of Tulsi, Ginger, Carrot, Soyabean
These materials were subjected to cleaning, washing and drying in the following manner.

3.2.2 Cleaning and washing
Tulsi, Ginger, Carrot, Soyabean washed 5-7 times with tap water then rinsed with water to remove dust dirt and other adhering impurities.

3.2.3 Germinating
Soyabean was germinated for 2-3 days.

3.2.4 Drying
Tulsi, ginger, carrot, soyabean were spread on polythene sheet in shade and covered by from muslin cloth to protect from foreign particles at room temperature.

3.2.5 Premix making
All above dried components were converted into flour separately through grinder and strained to get uniform powder.

3.4 Development and Standardization of premix
In the view of the facts regarding nutritional quality of tulsi, ginger, carrot, soyabean of different ratio of various ingredients (ICMR 2010) were made to develop acceptable Nutrigenomics health food for different metabolic diseases. Premix was prepared in different combinations using tulsi, ginger, carrot and soyabean and best Nutrigenomics health food combination was selected by panel members.

Table 3.3.1 Different premix combinations

	Tulsi (g)	Ginger (g)	Carrot (g)	Soyabean (g)
Experimental (T1)	15	5	35	45
Experimental (T2)	15	5	45	35
Experimental (T3)	25	25	25	25
Experimental(T4)	45	15	25	15

4. Method

- Ground the all components tulsi, ginger, carrot, soyabean separately after processing and sieved to get uniform texture.
- Mixed the entire component together and packed in an airtight plastic container.

Grinding

↓

Sieving

(To get uniform texture)

↓

Mixing

↓

Packing

(In airtight container)

Fig 2: Flow diagram of preparation of premix

4.1 Organoleptic evaluation of developed premix

The developed premix was evaluated for sensory characteristics by a panel of semi-trained judges using 9-point hedonic scale (appendix- A) for flavor and taste, body and texture, color and appearance, and overall acceptability to select the best premix combination. Every combinations of premix were evaluated in the form of Nutri Powder.

NUTRI POWDER- Nutri powder is nutrient rich powder in which large quantity of nutritious component are present. It is very beneficial for the health and prevents the many of the genome related metabolic diseases.

Ingredients	Amount			
	T1	T2	T3	T4
Tulsi powder (g)	15	15	35	45
Ginger powder (g)	5	5	25	15
Carrot powder (g)	35	45	25	25
Soyabean powder (g)	45	35	25	15
Dry mango powder(g)	10	10	10	10
Black salt (g)	2	2	2	2
Salt (g)	2	2	2	2
Black peeper (g)	50	50	50	50
Sugar (g)	5	5	5	5
Fenugreek (g)	50	50	50	50
Ajvaain (g)	5	5	5	5

5. Method

- ❖ Took the tulsi, ginger, carrot, and soyabean powder.
- ❖ Mixed all above the ingredients in the powder.
- ❖ Mixed it very well.

5.1 Organoleptic evaluation of the developed products

Organoleptic evaluation is a combination of different senses of perception which come into play for choosing and eating a food or it can be defined as a scientific discipline used to evoke, measure, analyze and interpret results of those characteristics of food as they are perceived by the senses of sight, smell, taste, and touch. Therefore, the panel of judges selected for ensuring acceptability of products evaluated the organoleptic qualities.

5.2 Preparation of score card

For assessing the palatability and acceptability of food items, a scorecard was developed on the basis of certain pertinent qualities (Appendix A). Quality attributes considered were flavor and taste, color and texture, body and texture, overall acceptability. According to Yeh et. Al, (1998) 9-point hedonic rating scale was used for rating of the sensory attributes for each of the premix based recipe. The subject's task was to assign the score that the best represented their attitude about the product. The score were numerical values for ranging from "like extremely (9) to dislike extremely (1)". The hedonic test scale had an equal number of positive and negative categories with intervals of equal size and with a centered neutral category.

5.3 Selection of panel members

Threshold test was used for selection of panel members. Convenience, experience, knowledge, willingness, interest and sincerity on the part of panel members were also considered. Thus, ten members were enlisted in the panel comprised of staff members of the college of Home Science, K.N.I.P.S.S.

5.4 Method of evaluation

The processed samples were served to the panelist separately in similar containers with different codes for sensory evaluation. Care was taken to conduct the evaluation in an undisturbed environment as the environment may distract or influence the evaluation of judges.

5.5 Calculation of nutritive value of developed premix

The nutritive value of the most acceptable premix was calculated by using food composition table given by ICMR (2010).

5.6 Statistical analyses

Observations collected on the various aspects of the study have been analyzed (appendix).

5.7 Formula

Average= n/N x 100

Where,

n=total number of observations,

N= sum of observations

6. Results and Discussion
The data were collected on different aspects per plan were tabulated and analyzed statistically. The result from the analysis is presented and discussed chapter in the following sequence.

6.1 Organoleptic evaluation of developed premix
6.2 Calculation of nutritive value of developed premix
6.3 Organoleptic evaluation of developed premix
- Flavor and taste
- Body and texture
- Color and appearance
- Overall acceptability

Table 4.1: organoleptic evaluation of developed premix

Product	Flavor and taste	Body and texture	Color and appearance	Overall acceptability
Experimental (T1)	6.9	7.2	7.1	7.04
Experimental (T2)	6.9	7.1	6.9	6.95
Experimental (T3)	7.2	7.8	7.7	8.1
Experimental (T4)	8.5	8.4	8.7	8.52

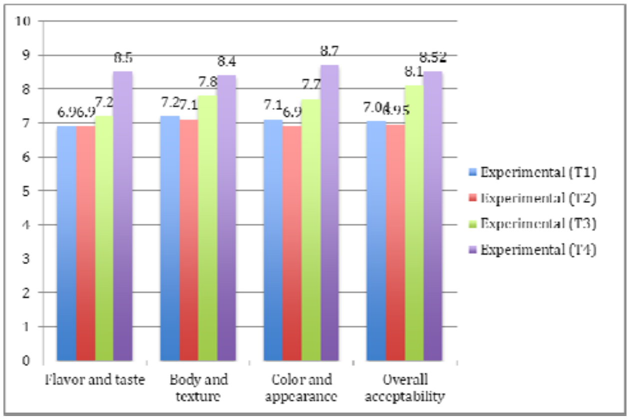

Fig 9: Overall acceptability of developed premix based on Nutri powder

Table 4.1 shows that T4 obtained maximum 8.5, 8.4, 8.7, 8.52 for flavor and taste, body and texture, color and appearance, and overall acceptability respectively; T3 obtained 7.2, 7.8, 7.7, 8.1 for flavor and taste, body and texture, color and appearance, and overall acceptability respectively; T2 obtained minimum 6.9, 7.1, 6.9, 6.95 for flavor and taste, body and texture, color and appearance, and overall acceptability respectively; T1 obtained 6.9, 7.2, 7.1, 7.04 for flavor and taste, body and texture, color and appearance, and overall acceptability respectively. This indicated that developed premix experimental (T4) was found to be fallen under the category of "Like very much to Like Extremely".
T4 was mostly accepted by panel member.

6.2 calculation of nutritive value of developed premix

Nutrient	Tulsi flour	Ginger flour	Carrot flour	Soyabean flour	Total
Energy (Kcal)	33	335	41	298	707
Protein (g)	2.5	4	0.9	36.5	43.9
Fat (g)	1.8	0.01	0.01	19.9	21.72
CHO (g)	15	60.8	18	30.2	124

The nutritive value of most acceptable premix (T4) was calculated with the help of "Food Composition Table" given by ICMR (2010). Table 4.2 shows that the total energy, protein, fat, and carbohydrate (CHO). Value of most acceptable developed premix was T4.

7. Conclusion
The developed premix were given to the panel of 10 judges, products were tested for flavor and taste, body and texture, color and appearance, overall acceptability. The organoleptic evaluation of premix was done by using scorecard method (9-point hedonic scale). The result of premixs T4 best in all of treatments in case of all sensory attributes.

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