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RESEARCH ARTICLE

DEVELOPMENT OF PREMIX AND PRODUCTS AS A NUTRIGENOMICS HEALTH FOOD FOR GENOME RELATED METABOLIC DISEASES.

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Abstract

The new science of Nutrigenomics teaches us what specific foods tell your genes. What you eat directly determines the genetic messages your body receives. 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. Tulsi, ginger, carrot and soyabean having the properties that prevents the gene related metabolic diseases. Tulsi is rich in antioxidant, anti diabetic; maintain good cholesterol, Tulsi extract was found highly effective as hepatoprotective. Similarly ginger and soyabean having biological activities antibacterial, anticonvulsant, analgesic, antiulcer, gastric antisecretory, antitumor, antifungal, antispasmodic, antiallergenic, anti-inflammatory and other activities. Soybeans contains no starch, they are good source of protein for diabetics.

Tulsi, Ginger, Carrot, and soyabean were made to develop premix for genome related metabolic disorders. Premix is prepared using Tulsi, Ginger, Carrot and Soyabean. Developed premix contains Tulsi (45%), Ginger (10%), Carrot (25%), soyabean (20%). Developed premix was used for development of standardized products i.e. Chapatti, Namkeen Sev and Pakodi. Organoleptic evaluation of developed products was done by panel of 10 judges using 9-point hedonic scale. The products were marked as; T0 for (control) contains 100% flour and T1 (experimental) contain 5% premix and T2 (experimental) contain 10% premix.

The result of Nutrigenomics health food for Chapatti, Namkeen Sev and Pakodi, (T2) was best in case of all sensory attributes. The highest average score for overall acceptability was found in experimental products made by premix were mostly accepted by panel member.

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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

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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.

Increasing rates of chronic diseases 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 globally 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.

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 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 re- search 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, palmitric acid, steric acid, Vallinin, Vicenin, Vitexin, Vllinin acid, Orientin, Circineol, Gallic Acid, vitamin A, vitamin C, phosphorous and iron (refer table III). *Ocimum sanctum* is one such plant showing multifarious medicinal properties viz. analgesic activity, anti-ulcer activity, antiarthritic activity, immunomodulatory activity, antiasthmatic activity, antifertility activity, anticancer activity, anticonvulsant activity, antidiabetic activity, antihyperlipidemic activity, anti-inflammatory activity, antioxidant activity, antistress activity in addition to possessing useful memory enhancer and neuroprotective activity.

The **carrot** (*Daucuscarota* subsp. *sativus*) is a root vegetable, usually orange in color, 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 *Daucuscarota*, 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 tones. 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 *gazrailla*. 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 *Zingiberofficinale* 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 ant 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 anaemia *etc.*). Many of the health benefits of soy are derived from its secondary metabolites, such as, isoflavones, phytosterols, lecithins, saponins *etc.* In this review we discuss the bioactive components of soybean and their role in prevention, maintenance, and/or curing of diseases.

Objective:-

1. To standardize and develop premix.
2. To develop products using standardized premix
3. Organoleptic evaluation of developed products.

Review of Literature:-

Nutrigenomics is the study of molecular relationships between nutritional stimuli and the response of the genes. It helps to understand how nutrition influences metabolic pathways and homeostatic control and how this regulation is disturbed in the early phase of a diet-related disease, and to what extent individual sensitizing genotypes contribute to such disease. It serves as a new tool for nutritional research and helps in mitigating the health related problems of humans. Individuals differ from each other in gene sequence due to which individuals respond differently to environmental factors. Literature reviewed on Efficacy and development of Premix as a Nutrigenomics Health food for different genome related metabolic diseases is present under: -

Nutrigenomics

Premix and Products

Health Benefits of Tulsi

Health Benefits of Ginger

Health Benefits of Carrot

Health Benefits of Soyabean

Nutrigenomics:-

Gomase et al. (2009) explained genomics and its new aspects in cancer research. This study gave a broader idea of its history, strategies, technology, applications and current research. SNP array has significant impact on the genetic analysis of human disorders. It can be used to measure both DNA polymorphism and dosage recommendations. SNP arrays are an ideal platform for identifying both somatic and germ line genetic variant Slavica Tudzarovaa and Mahasin A. Osmanb (2014) carried out The recent recognition of the clinical association between type 2 diabetes (T2D) and several types of human cancer has been further highlighted by reports of antidiabetic drugs treating or promoting cancer. At the cellular level, a plethora of molecules operating within distinct signaling pathways suggests cross talk between the multiple pathways at the interface of the diabetes–cancer link. Additionally, a growing body of emerging evidence implicates homeostatic pathways that may become imbalanced during the pathogenesis of T2D or cancer or that become chronically deregulated by prolonged drug administration, leading to the development of cancer in diabetes and vice versa. This notion underscores the importance of combining clinical and basic mechanistic studies not only to unravel mechanisms of disease development but also to understand mechanisms of drug action. In turn, this may help the development of personalized strategies in which drug doses and administration durations are tailored to individual cases at different stages of the disease progression to achieve more efficacious treatments that undermine the diabetes–cancer associations that lead to cancer.

Steven H Zeisel (2007) suggested that Science is beginning to understand how genetic variation and epigenetic events alter requirements for, and responses to, nutrients (nutrigenomics). At the same time, methods for profiling almost all of the products of metabolism in a single sample of blood or urine are being developed (metabolomics). Relations between diet and nutrigenomics and metabolomics profiles and between those profiles and health have become important components of research that could change clinical practice in nutrition. Most nutrition studies

assume that all persons have average dietary requirements, and the studies often do not plan for a large subset of subjects who differ in requirements for a nutrient. Large variances in responses that occur when such a population exists can result in statistical analyses that argue for a null effect. If nutrition studies could better identify responders and differentiate them from nonresponses on the basis of nutrigenomics or metabolomics profiles, the sensitivity to detect differences between groups could be greatly increased, and the resulting dietary recommendations could be appropriately targeted. It is not certain that nutrition will be the clinical specialty primarily responsible for nutrigenomics or metabolomics, because other disciplines currently dominate the development of portions of these fields. However, nutrition scientists' depth of understanding of human metabolism can be used to establish a role in the research and clinical programs that will arise from nutrigenomics and metabolomics profiling. Investments made today in training programs and in research methods could ensure a new foundation for clinical nutrition in the future.

Mutch DM and Wahkiw (2005) found that nutrients have the ability to interact and modulate molecular mechanisms underlying an organism's physiological functions has prompted a revolution in the field of nutrition. Performing population-scaled epidemiological studies in the absence of genetic knowledge may result in erroneous scientific conclusions and misinformed nutritional recommendations. To circumvent such issues and more comprehensively probe the relationship between genes and diet, the field of nutrition has begun to capitalize on both the technologies and supporting analytical software brought forth in the post-genomic era. The creation of nutrigenomics and nutrigenetics, two fields with distinct approaches to elucidate the interaction between diet and genes but with a common ultimate goal to optimize health through the personalization of diet, provide powerful approaches to unravel the complex relationship between nutritional molecules, genetic polymorphisms, and the biological system as a whole. Reluctance to embrace these new fields exists primarily due to the fear that producing overwhelming quantities of biological data within the confines of a single study will submerge the original query; however, the current review aims to position nutrigenomics and nutrigenetics as the emerging faces of nutrition that, when considered with more classical approaches, will provide the necessary stepping stones to achieve the ambitious goal of optimizing an individual's health via nutritional intervention.

Nair and Pillai's (2005) reviewed article on Human papillomavirus (HPV) and disease mechanisms provided a number of critical observations associated with the role of HPV in cervical and oral cancer. Diet-gene interactions are also likely to contribute considerably to the observed inter-individual variations in cancer risk. This is in response to exposures to the nutritional factors that have the potential to promote or protect against cancer. Similarly Sinha et al (2003) suggested that Diet is an important factor in cancer etiology and prevention. Ayurveda medicine prescribes many plant-based medicines for the treatment of cancer.

A Chávez and M Muñoz de Chávez (2000) studied that Knowledge of the human genome is helping us better understand nutrition. The nutrition health relationship depends on the adaptive capacity of genes and their functioning with the diet consumed. The greater the efficiency of the system, the lower the metabolic wear suffered. Several epidemiological studies have reported that early-life metabolic imprinting occurs in Man. Both in the uterus and during the first years of life, under and overfed mother-child units imprint gene changes that lead to chronic metabolic problems in later life. Many other mechanisms can modify gene performance, such as gene silencing, gene compensation by a vitamin or a bioactive phytochemical, or simply DNA multiplication during cell reproduction and polyploidisation. The new area of science related to the lateral transfer of recombinant genes are opening new horizons to the nutritional sciences changing the nutritional value or the organoleptic characteristics of food, or even changing genes in persons at risk of chronic disease. Many recent studies provide details about the kinds of diet, nutrients and other compounds that are the best for Man; biotechnology is becoming an instrument enabling food to be offered in the best of conditions.

Premix and products:-

Ashraf Y et al. (2014) carried out the study on sea bream (*Sparus aurata*) with initial fish weight of 1.9 ± 0.1 g to evaluate the effect of addition of basil (*Ocimum basilicum*), in different forms on; growth performance, feed utilization, body composition, biometric indices and some serum constituents. Four experimental diets were formulated; Diet 1: control diet (without basil, CTR); Diet 2: 2% dried basil leaves, (BL), Diet 3: 2% dried basil seeds, (BS) and Diet 4: 2% soaked and dried basil seeds, (BSS). Fish were fed experimental diets twice a day until visual apparent satiation, 7 days a week for 84 days. The results showed an improvement in fish growth and feed utilization indices when fed diets were supplemented either with BS or BSS respectively. Feeding of either BL or BS resulted in an enhancement in protein retention coinciding with depression in lipid content. Digestive enzyme (amylase and lipase) activities and serum total protein were elevated by the administration of basil in all forms to sea

bream diet as compared to the control.

Bunde et.al (2010) found that the result of the biscuit produce from wheat soybean and bran flour blend were used for the formulation of biscuit in these ratios;(100% wheat flour) , 29% soybean ,10% rice bran flour) . Width, thickness , spread ratio sensory attributes (color , texture , taste, odor and general acceptance). And proximate composition (protein, fiber content,fat, ash and moisture content) of the formulation was analyzed using AOAC standard method. Width of the biscuit sample ranged between 36.75-43.3 mm. it is possible to produce biscuit from composite of wheat full fat soybean and stabilized rice bran from parboiled rice flour. Adoption this technology of biscuit manufacture will result in production of better protein and fiber enriched biscuit.

Gahlwat and seghal (2000) studied that technique for development of potato flour, which standardized. Five products viz. cake, biscuit, weaning food ,panjiri and ladoo were prepared incorporating potato flour, defatted soy flour and corn flour. Baking and roasting were the major processing techniques employed for the development of these products. Protein, ash and fat contents of potato flour were almost similar to those of raw potatoes. Significant differences in protein, ash and fat contents of all the products were observed. Protein and starch digestibility of potato flour was significantly higher than of raw potatoes. Protein digestibility increased by 12 to 17 percent on baking or roasting of products. Processed products had significantly higher starch digestibility and mineral availability compared to raw products. Thus, it can be concluded that roasting and baking are effective means of improving starch and protein digestibility and mineral availability of products.

Edema et.al (2005) carried out the that examination of the functional properties of three different flour/meal and two blends of maize meal and soybean –flour (ratio 9:1 and 8:2, maize: soybean). Properties examined include amylose content, bulk density and dispensability, swelling power, water absorption capacity and viscoelastic properties. The effect of the different flours/meals using mixed starter culture of lactobacillus plant arum and saccharomyces cerevisiae. All flour/meal samples differed, sometime significantly ($p>0.05$) in their functional properties. Significant positive correlations existed among the functional properties of the flours at the 1% level (2-tailed). The maize meal/soy flour blends MSA (maize meal and soybean flour mixed-in ratio 9:1) and MSB (maize meal and soybean flour mixed in ratio 8:2) did not differ significantly from each other in functional properties except for amylose content. MSA was adjudged the best flour blend for sour maize bread production as its bread had the highest score for overall.

Lee et al. (2000) reported an important link between soy consumption and a reduce risk of certain types of cancer. Asian women who typically eat a soy-based diet have a much lower incidence of breast cancer than western women. The two primaries is flavones found in soybean are aredaidzein and Einstein which may reduce the risk of a number of cancer, Einstein which may reduce the risk of a number of cancer, including those of the breast, lung, colon, reduce, stomach , and prostate. The soy is flavones intake may reduce the frequency and intensity of hot flashes in menopausal women.

Health benefits of tulsi: -

P. Sharma et. al. (2014) concluded that *O. sanctum* can delay as well as arrest the progress of cataractogenesis. The effect is more with higher doses. They also concluded that that daily consumption of *O. sanctum* may delay emergence of lenticular opacity. It has got promising prophylactic role and is clearer in galactosaemic cataract, which is more close to diabetic cataract. Prevention of cataract may be through a mechanism involving free radical scavenging and preventing lipid peroxidation. *O. Sanctum* is also reported to have hypoglycemic activity. This may help in arresting diabetic cataract processed mice.

Kuamri S and Kumara P (2014) studied that Tulsi is very useful herb because of the wide range of properties it possesses. In addition to being considered as a holy plant, it is used for its medicinal values for thousands of years by the people all over the globe. The traditional healers use the plant for various ailments. In Ayurveda, tulsi is considered to pacify *kapha-vata* and vitiate *pitta*, and is used in the treatment of various disorders viz. respiratory tract diseases, fevers, eye diseases and depression. Recent research authenticates the claims of Ayurveda regarding pharmacological properties of the plant. Various studies conducted to study and establish the pharmacological properties of tulsi show that it has numerous pharmacological properties, many of which, like radioprotection and anticancer, can prove to be very important for the human race in this age of industrialization.

Mahesh Subramanian et al. (2012) reported a new polysaccharide (OSP) from *O. sanctum* as an efficient water soluble antioxidants that can prevent oxidative damages to lipids, DNA and splenocytes caused by various oxidation inducers. The activity was specific for OSP and could be attributed to its ability to scavenge various reactive oxygen species. They also noted that addition of OSP in increasing concentrations to the DNA, prior to irradiation, progressively reduced the intensity damage to DNA. It was also observed that addition of OSP prior to irradiation could provide good protection to the mouse cells against γ -radiation induced lethality. Orientin and vicerin, two water-soluble flavonoids isolated from the leaves of *O. sanctum*, have shown significant protection against radiation-induced lethality and chromosomal aberrations in vivo.

Dokania et al. (2011) revealed that there was enhancement of memory in mice when intraperitoneal injection of *O. sanctum* water extract was given and they proposed that this effect might be due to its antioxidant activity. Hydroalcoholic extract of *O. sanctum* has also been reported to enhance memory in restraint stress induced memory impaired.

M. Raghavendra et al.(2000) noted beneficial effects of the standardized extract of *O. sanctum* in isotonic acid and colchicine induced Alzheimer's Disease in rats. Cognitive deficit induced by these neurotoxins was significantly reduced by *O. sanctum* in rats. Rats pre-treated with *O. sanctum* extract showed improved spatial memory performance and also better consolidation of memory. It was also noted that in addition to improving the cognition, *O. sanctum* also facilitated acquisition of new information. *O. Sanctum* treatment significantly attenuated the effects of isotonic acid and colchicine on lipid peroxidation. *O. Sanctum* pre treatment from day 7 to day 28 significantly protected neurotoxin-induced oxidative stress which plays a key role in AD-associated cell death.

Benefits of ginger:-

Breyer E (2005) studied that Mild-to-moderate nausea and vomiting of pregnancy affects up to 80% of all pregnancies. Concern about antiemetic use and the time-limited nature of symptoms has restrained the development of effective treatment approaches, yet supportive, dietary, and lifestyle changes may be ineffective. This article reviews 4 recent well-controlled, double blind, randomized clinical studies that provide convincing evidence for the effectiveness of ginger in treating nausea and vomiting of pregnancy. It also provides a dosage update for the various forms of ginger.

Afzal et al. (2001) conducted that ginger contains a number of coactive constituents, which per se (or after structural modification) might be potentially useful in the treatment of various diseases including hypercholesterolemia, gastric ulcer, irritable bowel syndrome, pain, cancer, microbial infections or cardiovascular diseases.

Health benefits of carrot:-

Da silvadias (2014) found that Carrot is a root vegetable with carotenoids, flavonoids, polyacetylenes, vitamins, and minerals, all of which possess numerous nutritional and health benefits. Besides lending truth to the old adage that carrots are good for eyes, carotenoids, polyphenols and vitamins present in carrot act as antioxidants, anti carcinogens, and immune enhancers. Anti-diabetic, cholesterol and cardiovascular disease lowering, anti-hypertensive, hepatoprotective, Reno protective, and wound healing benefits of carrot have also been reported. The cardio and hepatoprotective, antibacterial, antifungal, anti-inflammatory, and analgesic effects of carrot seed extracts are also noteworthy.

Datt et al (2011) found that 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 *gazrailla*. 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.

Pisani et al (2005) studied that A total of 417 lung cancer cases and 849 controls were interviewed on their life-long tobacco usage and their current intake of four food items rich in retinol or carotene. The study was a hospital-based

case control where 'cases' were lung cancer patients diagnosed during the period 1979/80 at seven hospitals in the Lombardy region (90% pathologically confirmed) and controls were patients admitted to the same hospitals for causes unrelated to tobacco smoking (epithelial cancers being excluded from present analysis). Odds ratios (OR) have been computed for increasing frequencies of consumption of liver, cheese, carrots and leafy green vegetables, having controlled for the confounding effects of tobacco usage, residence and birthplace. Current smokers who did not consume carrots showed a three-fold risk of developing lung cancer compared with those who ate them more than once a week (OR = 2.9 less than p less than 0.01); the ORs for consumers in the categories of 1-2 and 3-4 times per month were 1.8 and 2.0 respectively, with a significant test for linear trend (p less than 0.01). Among ex-smokers or non-smokers, no decrease of lung cancer risk is evident associated with carrot consumption. An excess risk was also associated with low intake of green vegetables although it was not significant, while no excess risk was evident for non-consumers of liver and cheese. The effect of carrots is independent of histological type of lung cancer while the effect of green vegetables was confined to epidermoid carcinomas: low versus high intake group OR = 1.3.

Andrew et al (2001) suggested that Drinking carrot juice did not affect ($P > 0.1$) the plasma cholesterol, triglycerides, Apo A, Apo B, LDL, HDL, body fat percentage, insulin, leptin, interleukin-1 α , or C-reactive protein. Drinking carrot juice decreased ($P = 0.06$) systolic pressure, but did not influence diastolic pressure. Drinking carrot juice significantly ($P < 0.05$) increased the plasma total antioxidant capacity and decreased ($P < 0.05$) the plasma malondialdehyde production. Drinking carrot juice may protect the cardiovascular system by increasing total antioxidant status and by decreasing lipid peroxidation independent of any of the cardiovascular risk markers measured in the study.

Health benefits of soybean:-

Sacks (2006) found that soy consumption has been promoted by natural food companies and the soy industry's aggressive marketing campaign in various magazines, television ads and in health food markets. Research has been conducted examining the validity of the beneficial health claims with regard to the increase in consumption of soybeans which mimic hormonal activity. A practice guideline published in the journal *Circulation* questions the efficacy and safety of soy isoflavones for preventing or treating cancer of the breast, endometrium, and prostate (although the same study also concludes that soy in some foods should be beneficial to cardiovascular and overall health) and does not recommend usage of isoflavone supplements in food or pills.

Smith et al. (2005) studied that Dry beans and soybeans are nutrient-dense, fiber-rich, and are high-quality sources of protein. Protective and therapeutic effects of both dry bean and soybean intake have been documented. Dry bean intake has the potential to decrease serum cholesterol concentrations, improve many aspects of the diabetic state, and provide metabolic benefits that aid in weight control. Soybeans are a unique source of the isoflavones genistein and daidzein, which have numerous biological functions. Soybeans and soy foods potentially have multifaceted health-promoting effects, including cholesterol reduction, improved vascular health, preserved bone mineral density, and reduction of menopausal symptoms. Soy appears to have salutary effects on renal function, although these effects are not well understood. Whereas populations consuming high intakes of soy have lower prevalence of certain cancers, definitive experimental data are insufficient to clarify a protective role of soy. The availability of legume products and resources is increasing, incorporating dry beans and soy foods into the diet can be practical and enjoyable. With the shift toward a more plant-based diet, dry beans and soy will be potent tools in the treatment and prevention of chronic disease.

Gottstein et al. (2003) studied that Soybeans contain the isoflavones genistein and daidzein, types of phytoestrogen, that are considered by some nutritionists and physicians to be useful in the prevention of cancer and by others to be carcinogenic and endocrine disruptive. Soy's content of isoflavones are as much as 3mg/g dry weight. Isoflavones are polyphenol compounds, produced primarily by beans and other legumes, including peanuts and chickpeas. Isoflavones are closely related to the antioxidant flavonoids found in other plants, vegetables and flowers. Isoflavones such as genistein and daidzein are found in only some plant families, because most plants do not have an enzyme, chalcone isomerase which converts a flavone precursor into an isoflavone. In contradiction to well known benefits of isoflavones, Genistein acts as an oxidant (stimulating nitrate synthesis).

Materials and Methods:-

The present study entitled “Efficacy and Development of Premix as Nutrigenomics Health Food 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-

- Procurement of material:-**
- Processing of raw material:-**
- Development of premix:-**
- Development of premix based products:-**
- Sensory evaluation:-**
- Calculation of nutritive value:-**
- Statistical analysis:-**
- 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.

Processing of raw material:-

Processing of raw material



Fig 1:- Flow chart of processing of raw material

Processing of Tulsi, Ginger, Carrot, Soyabean:-

These materials were subjected to cleaning, washing and drying in the following manner.

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.

Germinating:-

Soyabean was germinated for 2-3 days.

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.

Premix making:-

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

Development and Standardization of premix:-

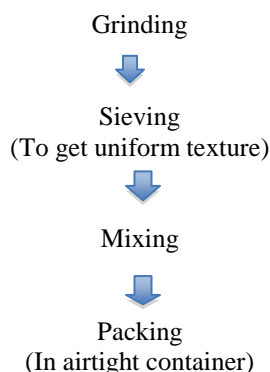
In the view of the facts regarding nutritional quality of tulsi, ginger, carrot, soyabean of different ratio of various ingredients (ICMR 2010) were made to develop acceptable Nutrigenomics health food for different metabolic diseases. Premix was prepared

Table 6.6.1:- premix combinations

	Tulsi (g)	Ginger (g)	Carrot (g)	Soyabean (g)
Experimental premix	45	15	25	15

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.

**Fig.2:-**Flow diagram of preparation of premix**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
Tulsi powder (g)	45
Ginger powder (g)	15
Carrot powder (g)	25
Soyabean powder (g)	15
Dry mango powder(g)	10
Black salt (g)	2
Salt (g)	2
Black peeper (g)	50
Sugar (g)	5
Fenugreek (g)	50
Ajvaain (g)	5

Method:-

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

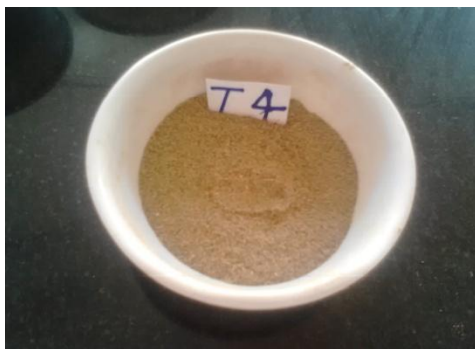


Fig. 3: - Nutri Powder

Development of premix based products: -**Chapatti**

Chapatti is an unleavened flatbread (also known as *roti*) from Bangladesh, India, Nepal, Pakistan, and Sri Lanka. It is a common staple in South Asia as well as amongst South Asian expatriates throughout the world. Versions of the dish are also found in Central Asia and the Horn of Africa, with the loafing flatbread serving as a local variation in China.

Ingredients	Amount		
	Control	Experimental	
		T1	T2
Wheat flour (g)	100	100	100
Premix (g)	-	5	10
Water	Acco to need	Acco to need	Acco to need

Method:-

- ❖ Added premix in wheat flour.
- ❖ Mixed well and added water to make dough.
- ❖ Prepared the chapatti.



CONTROL (T 0)



EXPERIMENTAL T1(5%)



EXPERIMENTAL T2(10%)

Fig 4:-Chapatti

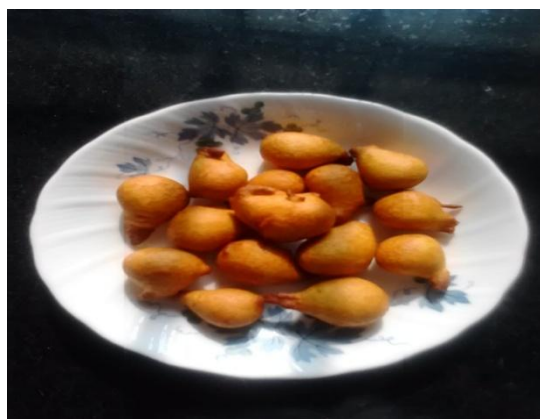
Pakodi:-

Pakodi are popular across India, Pakistan, and Great Britain—particularly in Scotland. They are sometimes served in a yogurt-based curry (*salan*), as a main dish, *pakora curry*, rather than as a separate snack

Ingredients	Amount		
	Control	Experimental	
		T1	T2
Besan (g)	100	100	100
Salt	Acco to taste	Acco to taste	Acco to taste
Premix (g)	-	5	10
Water	Acco to need	Acco to need	Acco to need
Oil	Acco to need	Acco to need	Acco to need

Methods:-

- Added premix in the flour
- Mixed salt properly.
- Prepared the paste with adding water.
- Deep fried in the oil.

**CONTROL T0****EXPERIMENTAL T1 (5%)****EXPERIMENTAL T2 (10%)****Fig. 5:-Pakodi**

Namkeen Sev:-

Namkeen Sev is a popular Indian snack food consisting of small pieces of crunchy noodles made from chickpea flour paste, which is seasoned with turmeric, cayenne, and ajwain before being deep-fried in oil

Ingredients	Amount		
	Control	Experimental	
		T1	T2
Besan (g)	100	100	100
Salt	Acco to taste	Acco to taste	Acco to taste
Premix (g)	-	5	10
Water	Acco to need	Acco to need	Acco to need
Oil	Acco to need	Acco to need	Acco to need

Method:-

- ❖ Added premix in the flour.
- ❖ Mixed salt and added water to make dough.
- ❖ Grated with the grater in the oil.
- ❖ Deep fried till become dark brown.

**CONTROL T0****EXPERIMENTAL T1 (5%)**



EXPERIMENTAL T2 (10%)

Fig 6:- Namkeen Sev

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.

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 Yehet. 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.

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.

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.

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).

Statistical analyses:-

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

Formula:-

$$\text{Average} = \frac{n}{N} \times 100$$

Where,

n=total number of observations,

N= sum of observations

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.

Organoleptic evaluation of developed premix:-

Calculation of nutritive value of developed premix:-

Organoleptic evaluation of developed products:-

- 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 (T4)	8.5	8.4	8.7	8.52

Premix was mostly accepted by panel member, so premix was selected for the product development.

Calculation of nutritive value of developed premix:-

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

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 T2.

Organoleptic evaluation of developed products:-

Table 4.3.1:- organoleptic evaluation of chapatti

Product	Flavor and taste	Body and texture	Color and appearance	Overall acceptability
Control (T0)	8.2	7.9	7.7	8.5
Experimental (T1)	9.0	8.8	8.8	9.0
Experimental (T2)	9.1	8.9	8.8	9.3

Table 4.3.1 shows that the experimental (T2) obtained maximum 9.1, 8.9, 8.8, and 9.3 for flavor and taste, body and texture, color and appearance and overall acceptability respectively; similarly experimental (T1) obtained 9.0, 8.8, 8.8, and 9.0 for flavor and taste, body and texture, color and appearance and overall acceptability respectively; while control (T0) obtained 8.2, 7.9, 7.7, 8.5 for flavor and taste, body and texture, color and appearance and overall acceptability respectively. This indicated that the developed premix based experimental (T2) chapatti was found to be fallen under the category of “Like very much to Like extremely”.

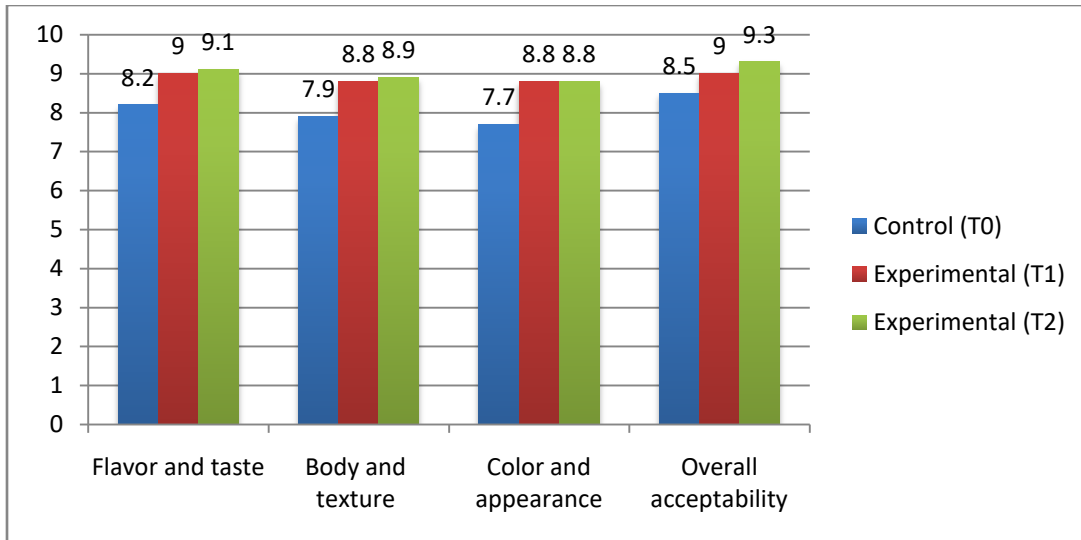


Fig.10:-Overall acceptability of developed chapatti

Table 4.3.2:- organoleptic evaluation of Pakodi.

Product	Flavor and taste	Body and texture	Color and appearance	Overall acceptability
Control (T0)	7.1	7.5	7.8	7.2
Experimental (T1)	7.4	7.5	8.2	7.6
Experimental (T2)	8.5	8.6	8.9	8.8

Table 4.3.2 shows that the experimental (T2) obtained maximum 8.5, 8.6, 8.9, and 8.8 for flavor and taste, body and texture, color and appearance and overall acceptability respectively; similarly experimental (T1) obtained 7.4, 7.5, 8.2 and 7.6 for flavor and taste, body and texture, color and appearance and overall acceptability respectively; while control (T0) obtained 7.1, 7.5, 7.8 and 7.2 for flavor and taste, body and texture, color and appearance and overall acceptability respectively. This indicated that the developed premix based experimental (T2) chapatti was found to be fallen under the category of “Like very much to Like extremely”.

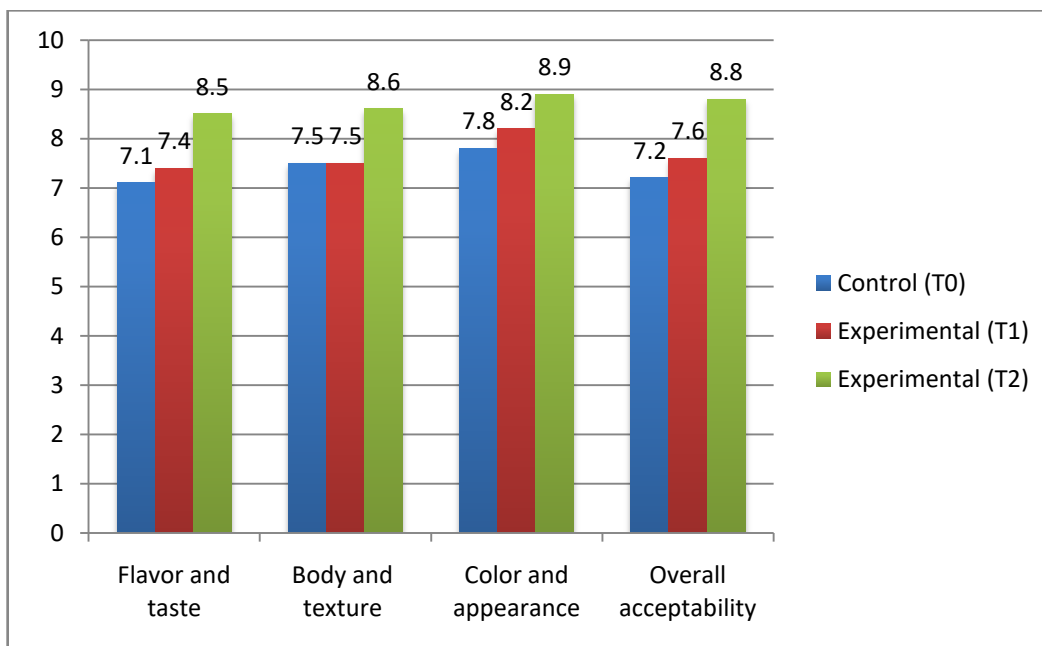
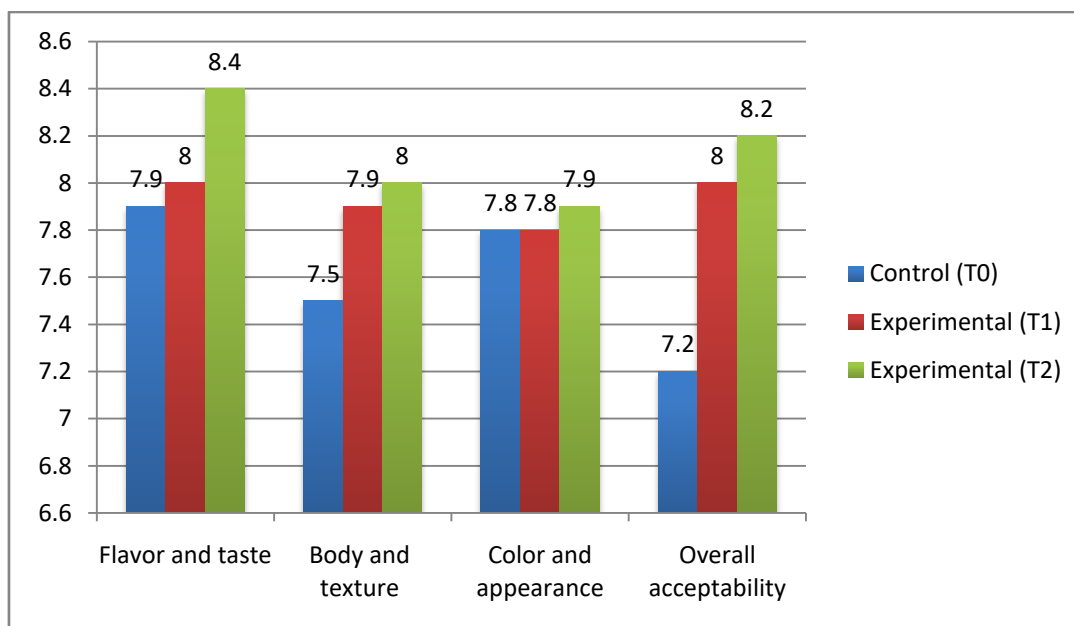


Fig. 11:- Overall acceptability of developed Pakodi.

Table 4.3.3:-Organoleptic evaluation of Namkeen Sev

Product	Flavor and taste	Body and texture	Color and appearance	Overall acceptability
Control (T0)	7.9	7.5	7.8	7.2
Experimental (T1)	8.0	7.9	7.8	8.0
Experimental (T2)	8.4	8.0	7.9	8.2

Table 4.3.3 shows that the experimental (T2) obtained maximum 8.4, 8.0, 7.9, and 8.2 for flavor and taste, body and texture, color and appearance and overall acceptability respectively; similarly experimental (T1) obtained 8.0, 7.9, 7.8, and 8.0 for flavor and taste, body and texture, color and appearance and overall acceptability respectively; while control (T0) obtained 7.9, 7.5, 7.8, and 7.2 for flavor and taste, body and texture, color and appearance and overall acceptability respectively. This indicated that the developed premix based experimental (T2) chapatti was found to be fallen under the category of “Like very much to Like extremely”.

**Fig. 12:-** Overall acceptability of developed Namkeen Sev

Summary and Conclusion:-

Nutrigenomics combines the study of nutrition and genetics to discover the different ways people respond to food based on their genetic make up. Tulsi, ginger, carrot and soyabean having the properties that prevents the gene related metabolic diseases. Tulsi is rich in antioxidant, anti diabetic; maintain good cholesterol, Tulsi extract was found highly effective as hepatoprotective. Similarly ginger and soyabean having biological activities antibacterial, anticonvulsant, analgesic, antiulcer, gastric antisecretory, antitumor, antifungal, antispasmodic, anti-allergenic, anti-inflammatory and other activities. Soybeans contains no starch, they are good source of protein for diabetics.

The present investigation entitled “Efficacy and Development of Premix as a Nutrigenomics Health Food for Genome Related Metabolic Diseases” was carried out to standardize premix and its products with three objectives: -

- To standardize and develop premix.
- To develop products using standardized premix
- Organoleptic evaluation of developed products.

The experimental work was carried out in the department of Food and Nutrition, faculty of Home Science, K.N.I.P.S.S. Sultanpur. To standardize and develop the premix and its products required different materials like tulsi, ginger, carrot and soyabean were used in the experiment would be purchased from the local market of Sultanpur. The products were developed by using premix.

In view of the facts regarding nutritional quality of tulsi, ginger, carrot, soyabean combination of different ratio of various ingredients (ICMR 2010) were made to develop acceptable premix for Nutrigenomics health food. Premix was prepared in different combinations using tulsi, carrot, ginger, soyabean and best premix combination was selected by panel members. Developed premix contains tulsi (45%), carrot (25%), ginger (15%), soyabean (15%). 3 products (Chapatti, Namkeen, Pakodi,) were developed from the acceptable premix for genome related metabolic disease in this study. The products were marked as; T0 for (control) contains 100% flour and T1 (experimental) contain 5% premix and T2 (experimental) contain 10% premix.

The experimental (T2) Chapatti obtained maximum 9.1, 8.9, 8.8, and 9.3 for flavor and taste, body and texture, color and appearance and overall acceptability respectively; similarly experimental (T1) obtained 9.0, 8.8, 8.8, and 9.0 for flavor and taste, body and texture, color and appearance and overall acceptability respectively; while control (T0) obtained 8.2, 7.9, 7.7, 8.5 for flavor and taste, body and texture, color and appearance and overall acceptability respectively. This indicated that the developed premix based experimental (T2) chapatti was found to be fallen under the category of "Like very much to Like extremely".

The experimental (T2) Pakodi obtained maximum 8.5, 8.6, 8.9, and 8.8 for flavor and taste, body and texture, color and appearance and overall acceptability respectively; similarly experimental (T1) obtained 7.4, 7.5, 8.2 and 7.6 for flavor and taste, body and texture, color and appearance and overall acceptability respectively; while control (T0) obtained 7.1, 7.5, 7.8 and 7.2 for flavor and taste, body and texture, color and appearance and overall acceptability respectively. This indicated that the developed premix based experimental (T2) chapatti was found to be fallen under the category of "Like very much to Like extremely".

The experimental (T2) Namkeen obtained maximum 8.4, 8.0, 7.9, and 8.2 for flavor and taste, body and texture, color and appearance and overall acceptability respectively; similarly experimental (T1) obtained 8.0, 7.9, 7.8, and 8.0 for flavor and taste, body and texture, color and appearance and overall acceptability respectively; while control (T0) obtained 7.9, 7.5, 7.8, and 7.2 for flavor and taste, body and texture, color and appearance and overall acceptability respectively. This indicated that the developed premix based experimental (T2) chapatti was found to be fallen under the category of "Like very much to Like extremely".

Conclusion:-

The developed products 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 products was done by using scorecard method (9- point hedonic scale). The result of premix based products for Chapatti, Namkeen and Pakodi T2 best in all of treatments in case of all sensory attributes.

The highest average score for overall acceptability was found in experimental products made by developed premix were mostly accepted by panel member.

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