

Sensory evaluation of value added products using nutrimix beneficial for diabetes

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In the present study a nutrimix was developed which is beneficial for diabetic patients. This nutrimix has anti hyperglycemic as well as anti hyperlipidemic properties. The nutrimix includes easily available indigenous food items which are packed with phytonutrients and fibre having antidiabetic properties. As diabetes has become a major health problem, now it is a necessary to tackle it multidimensionally. Apart from regular exercise, diet and medicines when this nutrimix was introduced as a part of regular diet it helped in reducing sugar and lipid levels in diabetic patients. The nutrimix is a combination of cereals, condiments and novel items. To prepare the nutrimix each ingredient was processed accordingly then mixed together in various proportions to find out the best and most acceptable formulation. To make the consumption of nutrimix easy and regular it was incorporated in various daily consumed recipes and subjected to sensory evaluation on a 5 point hedonic scale. Nutrimix was incorporated in items like *Idly*, *Dosa*, *Chapatti*, soup, curry (as thickening agent). Nutritive value of the recipes was also calculated. All the items enriched with nutrimix were well received by the panel on the various sensory parameters.

Key Words : Sensory evaluation, Nutrimix, Diabetes

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INTRODUCTION

Diabetes is a disease of modern life, the busy, stressful and short of time lifestyle is proving it true. In spite of the best of efforts from the world of medicine this disease is still baffling the physicians (Kansal Kamal, 2004).

In 2010 it was estimated that about 285 million adults aged between 20-79 years are diabetic given a prevalence of 6.6 per cent of global population. Asia is epicenter of diabetes with China and India leading in

diabetic population. In India currently 61.3 million people are diabetic which will hit 101.2 million mark by 2030, both urban and rural population are affected. Diabetes as 'disease does not interfere' with persons daily activity when the sugar levels are under control but if not taken care it may lead to severe complications affecting major body parts (Sridhar, 2007). Complications like cardiopathy, retinopathy, neuropathy, nephropathy and sometimes limb amputations. In this study emphasis is given on raised triglyceride in diabetic condition and measures to control it.

Triglycerides are major form of lipids found in food and our body. It is composed of 3 fatty acids bonded to a glycerol molecule. Triglycerides are stored in body as concentrated form of energy. When consumption of fat laden food increases and physical activity decreases these accumulate in adipose tissue leading to obesity. In a normal

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person raised triglyceride levels may rise due to refined carbohydrate and fat laden food, smoking, alcohol, genetics, physical inactivity and in some cases deficiency of lipoprotein lipase or apolipoprotein C II. Thach Nguyen and Colleagues (2008) .

In diabetic people triglycerides may elevate due to hormonal and metabolic disturbances. The metabolic pathways for utilization of fat and carbohydrate are deeply and intricately related. Abnormal lipid and sugar levels may be due to abnormal metabolism but they can be handled and put under control by dietary and lifestyle changes. Traditionally Indian diets have always been one of the healthiest and most balanced one as it is rich in vitamin, minerals and fibre etc. consumption of more ready to eat and refined foods have pushed the population towards various disorders.

The nutriment formulated, is rich in fibre and phytochemicals. Fibre is nothing but food derived from plant cells which is resistant to hydrolysis or digestion by humans. It is a type of carbohydrate which helps detoxifying the body. High fibre diet is highly recommended for diabetes as it gives feeling of satiety even when low amount of food is consumed. This is due to decreased gastric emptying and there is a decrease in glucose absorption and the level of blood sugar does not increase rapidly. Fibre is equally effective in controlling lipid levels when it combines with cholesterol and prevents it from being absorbed. Fibre binds to bile acid and cholesterol and help in lowering fat levels (Patricia Trueman, 2007).

Phytochemicals as the name suggests are chemicals derived from plants. These chemicals are biologically active but non-nutritive. Our body undergoes a lot of chemical and metabolic reactions throughout the day. During these processes by products are released called free radical which are oxygen containing molecules that has one or more unpaired electrons making it highly reactive with other molecule. When there is an imbalance between the production of free radicals and ability of the body to detoxify the harmful effects is called oxidative stress. These phytochemicals have the potential to clear free radicals from the body eventually reduce the oxidative stress (Srinivasan, 2005).

Keeping in view the alarmingly rising sugar and lipid levels in the population and beneficial effects of indigenous food products on the same, in the present study the developed nutriment is subjected to sensory evaluation

where the quality of food product is assessed by means of human sensory organs, the evaluation is said to be sensory or subjective or organoleptic (Srilakshmi, 2003). Similar investigation are reported by Taylor *et al.* (2015). The following objectives were framed for this study:

- To develop a functional food (nutriment)
- Develop value added recipes by incorporating the nutriment
- Sensory evaluation of recipes.

METHODOLOGY

In view of the fact that diets with high fibre and high polyphenol content are good for sugar patients, the current study was undertaken to develop a nutriment cereals, condiments etc. for use as supplement for diabetic patients.

Ingredients of nutriment are as follows and presented in Table A.

Ragi- for its high fibre and pigment content and easy acceptability (Chandrasekara and Fereidoon, 2010).

Oats- for its high fibre content, β -glucan approved blood glucose controller (Braaten *et al.*, 1994)

Tender mango leaves- rich in bioactive components like tannins, gallic acid, saponins, anthocyanins etc. it also gives distinct flavour to the product (Sarmah *et al.*, 2012).

Apple peel- it is rich in bioactive components like procyanidin, which prevents infection which is very common in diabetic patients (Tsao *et al.*, 2005).

Cumin- cumin aldehyde present in cumin seeds works against aldose reductase and α -glucosidase (Srinivasan, 2005).

The above processing methods were done to eliminate anti nutritional factors and also ease of digestibility.

Table A : Processing of raw materials

Ingredients	Processing
Ragi	Soaking, germinating, drying and grinding.
Oats	Grinding into fine powder
Apple peel	Shade drying then grinding into fine powder
Mango leaves	Shade drying and then grinding into fine powder
Cumin	Dry roasting the seeds to bring out the flavour and ease of grinding.

The processed raw materials were mixed in 5 different blends, where the proportion of major components that is *Ragi* and oats were changed but all

Ingredients	Nutrimix I	Nutrimix II	Nutrimix III	Nutrimix IV	Nutrimix V
Ragi	25	25	15	30	40
Oats	30	25	40	25	15
Apple peel	15	15	15	15	15
Cumin	10	10	10	10	10
Mango L.	20	20	20	20	20

other ingredients remained constant (Table B).

Using the above blends *Chapatis* were prepared and were subjected to sensory evaluation. A panel of 5 judges evaluated the chapatis on the basis of taste, colour, flavour, texture on a 5 point Hedonic scale, hedonic rating relates to pleasurable and unpleasurable experiences and it is used to measure consumer acceptability of food products (Srilakshmi, 2003). The nutrimix which was having the best score was selected for further experimentation.

Commonly consumed indianrecepies were prepared by incorporating the nutrimix, the following products were developed :

Idly (70:30) :

Normal *Idly* batter was prepared using rice and black gram dal. 70 g of *Idly* batter was taken and 30 g of nutrimix was mixed in it. Small quantity of water was added to loosen the batter. Batter was portioned into *Idly* plates and steamed as usual. It yielded 3 *Idlies*.

Dosa (70:30) :

Normal *Dosa* batter was prepared using rice and black gram dal. 70 g of *Dosa* batter was taken and 30 g of nutrimix was mixed in it. Small quantity of water was added to loosen the batter. On a hot tawa *Dosas* were made as usual. It yielded 3 *Dosas*.

Soup (90:10) :

Mixed vegetable soup was prepared and nutrimix was added to it, due to presence of *Ragi* and oats it also acted as thickening agents. Vegetables like tomato, cauliflower, French beans, carrots were taken, all collectively weighed 100 g. Vegetables were boiled mashed, ground and sieved to a smooth thick liquid then boiled with some spices and seasonings then nutrimix was added. 1 bowl of soup was yielded.

Curry (95:5) :

Ridge gourd was taken 95 g and usual curry was

prepared using some onions, tomato and spices, to it 5 g of nutrimix powder was added. A small bowl of curry was yielded.

Chutney (90:10) :

A *Chutney* was prepared using tomato, onion, green chilli, spices etc. tomato, onion, green chilli collectively weighed 90 g to it 10 g of nutrimix was added. By using some oil all the ingredients were fried, till tomatoes and onions softened, then cooled and ground into small paste.

OBSERVATIONS AND ASSESSMENT

The four nutri mix that were incorporated in *Chapatti*, were subjected to sensory evaluation, in order to select one nutri mix for further experimentation. The mean score value of fivenutri mix for attributes like taste, texture, flavour, colour and overall acceptability is presented below. The sensory score of five nutrimixes were subjected to ANOVA for each sensory attribute and presented in Table 1 and 2.

The sensory evaluation of freshly prepared recipes namely *Idly*, *Dosa*, soup, curry, *Chutney* was carried out by a panel of 5 judges:

Dosa :

There was not much difference in texture and taste of both control and experimental *Dosa*. But due to addition of nutrimix modified *Dosa* gave a dull colour and a different flavour. Both the dosa's were well accepted (Fig. 1).

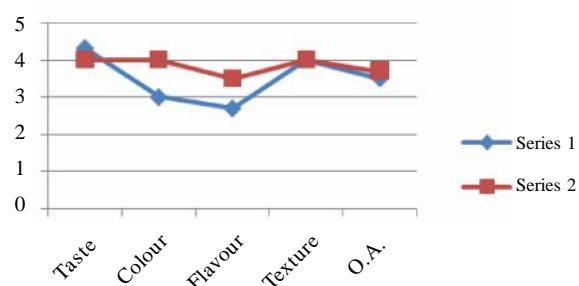


Fig. 1 : Sensory evaluation of fresh prepared recipe of Dosa

Idly :

Both control and experimental idlies were close on the score card. Experimental dosa was also well accepted as control one, only colour was a bit dull compared to control *Idli* (Fig. 2).

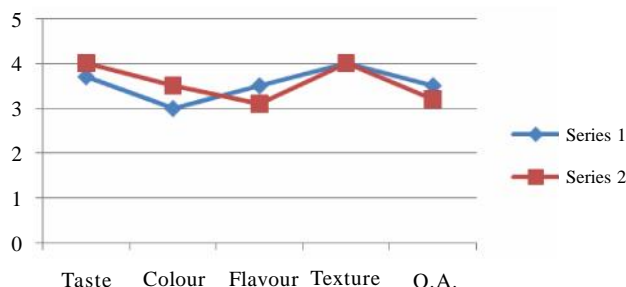


Fig. 2 : Sensory evaluation of fresh prepared recipe of *Idly*.

Soup :

Nutrimix incorporated soup tasted equally good compared to control soup. Nutrimix was used in place of

corn flour and it gave same thick consistency. Presence of cumin and mango leaves gave extra flavour to the soup compared to control recipe (Fig. 3).

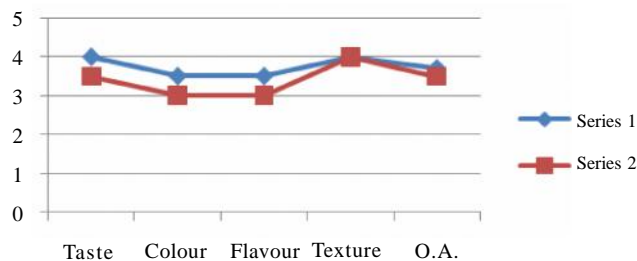


Fig. 3 : Sensory evaluation of fresh prepared recipe of soup

Curry :

A basic ridge gourd curry was modified by adding nutrimix. Control recipe was very bland but experimental recipe gave a good flavour and taste. Experimental curry was darker in colour but gave a thick consistency (Fig. 4).

Table 1 : Mean score value of five nutrimix

Sensory attributes	Food mixture	Mean score	f -value	p-value	Remarks
Taste	NM I	3.9	18.4	0.0001	Significant
	NM II	3.7			
	NM III	2.5			
	NM IV	3.5			
	NM V	2.7			
Colour	NM I	3.5	2.4	0.0842	Not significant
	NM II	3.1			
	NM III	2.3			
	NM IV	3			
	NM V	2			
Flavour	NM I	3.8	7.7	0.0004	Significant
	NM II	4.1			
	NM III	3.2			
	NM IV	3.9			
	NM V	3.3			
Texture	NM I	4.2	17.5	0.0001	Significant
	NM II	3.9			
	NM III	3.0			
	NM IV	3.6			
	NM V	3.1			
Overall acceptability	NM I	4.1	17.6	0.0001	Significant
	NM II	3.8			
	NM III	3.3			
	NM IV	3.5			
	NM V	3.5			

Table 2 : Sensory evaluation of basic recepies along with prepared by incorporating the best nutrimix

Recipe	Taste	Colour	Flavour	Texture	Overall acceptance
Dosa					
Control	4.3	4	3.5	4	3.7
Exptl.	4.3	3	2.7	4	3.3
t- test	4.74	-9.13	-11.3	NS	-6.32
Idly					
Control	4	3.7	3.5	4	3.2
Exptl.	3.7	3	4	4	3.5
t- test	-2.37	-7.8	5.0	NS	3.59
Soup					
Control	3.5	3	3.	4	3.5
Exptl.	4	3.4	3.5	4	3.7
t- test	5.9	6.0	7.07	NS	2.58
Curry					
Control	3.5	4.2	3.5	3.7	3.7
Exptl.	4	3.5	4	3	3.5
t- test	5.9	-11.1	8.2	7.0	-2.8
Chutney					
Control	3.5	4	3.7	3.5	3.3
Exptl.	4	3.2	3.7	3	3.5
t- test	7.9	-9.5	NS	-5.9	2.7

NS=Non-significant

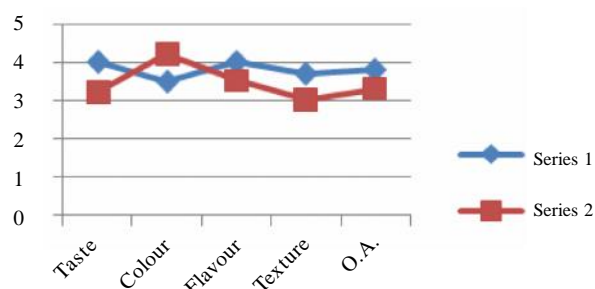


Fig. 4 : Sensory evaluation of fresh prepared recipe of curry

Chutney :

Nutrimix incorporated tomato *Chutney* varied sharply from basic tomato *Chutney*. Colour of control recipe was bright red and it tasted more sour and spicy. Experimental recipe was brownish in colour and texture was more thick and coarser, it tasted lot more milder (Fig. 5).

Conclusion:

From the above study it can be concluded that nutrimix is highly versatile, which can be incorporated in many recipes. Adding of this mix makes the product rich in fibre and phytonutrients, which is very good for

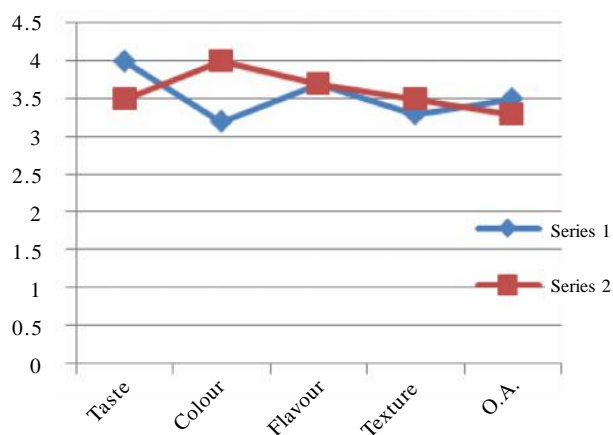


Fig. 5 : Sensory evaluation of fresh prepared recipe of Chutney

diabetics patients.

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