Research Paper

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Development of Low Glycemic Foods with The use of Pearl Millet and Finger Millet

Home Science

KEYWORDS : Glycemic index, glycemic load,Uthapum and Cheela.

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ABSTRACT

The glycemic index (GI) is a numeric system of measuring how much of a rise in circulating blood sugar a carbohydrate triggers- the higher the number, the greater the blood sugar response. So a low GI food will cause a small rise, while a high GI food will trigger a dramatic spike. A GI of 70 or more is high, a GI of 56 to 69 inclusive is medium, and a GI of 55 or less is low .Consumption of foods with a high glycemic index (GI) or glycemic load (GL) is hypothesized to contribute to insulin resistance, which is associated with increased risk of diabetes mellitus, obesity, cardiovascular disease, and some cancers. Twenty normal subjects aged between 20 to 25 yrs (female) students of SHIATS were selected. They were clinically normal and non diabetic. They were divided into two groups. One group was given Cheela as control food 50g and test food 50g and the other group was given Uthapam 50g as control food and test 50g. All subjects for investigation fasted overnight (10-12) hr. The determination of blood sugar was taken at intervals i.e. 0 fasting, 15mins, 45mins, 60mins, 90mins, and 120mins after feeding the experimental diets. The glycemic index of finger millet and pearl millet flours based cheela (36.83±1.23) and uthapam (38.72±1.879) was found to be lower than control cheela (44.07±1.67) and uthapam (39.9±1.14). The glycemic load of finger millet and pearl millet flours based cheela (12.5±0.525) and finger millet and pearl millet flours based uthapam (11.36±0.533) were found to be lower than control cheela (13.37±0.794) and control uthapam (14.72±0.418) respectively. The present study indicates that foods made from finger millet and pearl millet are low glycemic index.

INTRODUCTION

Glycemic index (GI) describes the blood glucose response after consumption of a carbohydrate containing test food relative to a carbohydrate containing reference food, typically glucose or white bread. GI was originally designed for people with diabetes as a guide to food selection, advice being given to select foods with a low GI. The amount of food consumed is a major determinant of postprandial hyperglycemia, and the concept of glycemic load (GL) takes account of the GI of a food and the amount eaten. Glycemic index measures how fast a given food raises your blood sugar level .

Finger millet (Eleusinecoracana L.) also known as Ragi.Finger millet contains important amino acids viz., isoleucine, leucine, methionine and phenyl alanine which are not present in other starchy meals. It has the highest amount of calcium (344 mg %) and potassium (408 mg %) . Ragi is a great source of iron making it beneficial for individuals with low hemoglobin levels.

Pearl millet (Pennisetumglaucum) also known as Bajra. Pearl millet contains important amino acids viz. Methionine and leucine. It has the highest amount of phosphorus (296mg %) ,energy (361kcal) and protein (11.6gm)

The objectives of this study were 1). To develope products by incorporation of finger millet and pearl millet flours . 2)To determine the glycemic index of the developed products.

MATERIALS AND METHODS

The present work of dissertation entitled "Development of low glycemic index foods with the use of Pearl millet and Finger millet flours" was conducted in the Nutrition Research Laboratory of Department of Foods and Nutrition, Ethelind School of Home Science, Sam Higginbottom Institute of Agriculture, Technology and Sciences, Allahabad.

Procurement of ingredients: Procurement of raw materials: Pearl millet and Finger millet flours were purchased from the local market of Allahabad. Semolina, Besan flour, refined oil, curd, curry leaves, mustard seeds, onion, tomato, chilli, ginger, garlic used for the product development were obtained from the local market of Allahabad.

Formulation of food products:The proportions of the ingredients used are mentioned in the Table 1.

Product development from finger millet and pearl millet flours :Two products namely Uthapamand Cheelawere developed by incorporating Finger millet and Pearl millet flours at three different levels of incorporation. The Finger millet flours and pearl millet flours was prepared in the Nutrition Research Laboratory of Department of Foods and Nutrition. First the finger millet and pearl millet were washed with water and then dried in sunlight. Then it was grinded into fine flours which were used for the entire experiment.

Table 1.Formulation for Uthapam

Products Treatment	Products and incorporation level of finger millet and pearl millet flours by substituting main ingredient.				
	Uthapam				
	Semolina	Pearl millet Flours	Finger millet flours	Tomato	Onion
T_0(control)	100%	-	-	-	-
T_1	40%	20%	20%	10%	10%
T_2	30%	25%	25%	10%	10%
T_3	20%	30%	30%	10%	10%

Pick, wash and soak the semolina for 1 hour

↓

Add water to make thick batter

↓

Mix onion, tomato and green chilli pieces also

↓

Heat non-stick pan & spread a little oil on it

↓

Then spread the batter properly

↓

Pour few drops of oil again on the side of the set batter

↓

Spread curry leaves and fry mustard seeds over the uthapam.

↓

Fry both the sides till crispy and golden

Table 2. Formulation for Cheela

Products Treatment	Products and incorporation level of finger millet and pearl millet flours by substituting main ingredient.				
	Cheela				
	Besan	Pearl millet Flours	Finger millet flours	Tomato	Onion
T_0(control)	100%	-			
T_1	40%	20%	20%	10%	10%
T_2	30%	25%	25%	10%	10%
T_3	20%	30%	30%	10%	10%

Take Bengal gram flours in a bowl

↓

Add water to make thick batter

↓

Mix onion and tomato pieces also

↓

Heat non-stick pan & spread a little oil on it

↓

Then spread the batter properly

↓

Pour few drops of oil again on the side of the set batter

↓

Fry both the sides till crispy and golden.

2. Subjects

Twenty normal subjects aged between 20 to 25 yrs (female) students of SHIATS were selected. They were clinically normal and non diabetic. They were divided into two groups. One group was given Uthapam as Test food and control food and the other group was given Cheela as Test food and control food .The subjects was appraised about the experiment and their consent was taken.

Ethical Approval

The protocol was approved by Institutional Ethical Committee for Biomedical Research on Human Participants, Faculty of Health Science, SHIATS.

Analysis of blood glucose in the subjects

All subjects for investigation fasted overnight (10-12) hr. Their blood sample was collected through finger prick using a hypodermic needle. Each blood sample was inserted into a calibrated glucometer (Accu-check/ one touch) which (principle in Appendix F) gave direct reading after 45 seconds based on glucose oxidase assay method. The determination of blood sugar will be taken at intervals i.e. 0 fasting, 15mins, 45mins, 60mins, 90mins, and 120mins after feeding the experimental diets.

Experimental diets

(i)Reference foods :

After fasting for 10-12 hours, subjects were required to arrive at the laboratory at 8 O' clock in the morning and a blood sample was obtained. Fasting blood sugar was estimated and postprandial blood sugar was taken at 15, 30, 45, 60, 90 and 120 minutes after consumption of 50g glucose dissolved in 200 ml drinking water.

(ii) Control food :

Uthapam and Cheela (control food containing 50g carbohydrate) standardized in the Nutrition lab was used as control food. Fasting blood glucose of the subjects after 10-12 hours overnight fasting was obtained and postprandial blood sugar (PPBS) was taken at 15, 30, 45, 60, 90, 120 minutes interval after consumption of test food. One group was given Uthapam as control food and the other group was given Cheela was control food.

(iii) Test food (Finger millet and Pearl millet flours based Uthapam and Cheela):

Uthapam and Cheela developed by incorporating Finger millet at 20% and Pearl millet at 25 % percent level was taken as a test food as it scored best in terms of organoleptic characteristics.

RESULT AND DISCUSSIONS

Fig4.(a) Postprandial blood sugar (PPBS) values were highest for reference food at 45 minutes followed by control uthapum and least values were reported for pearl millet and finger millet flours based uthapum (ranging between 71.1-90.8 mg/dl)

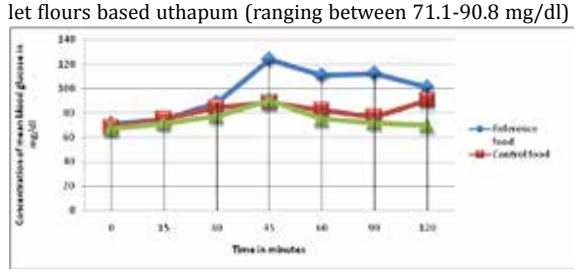

Fig4. (a) Graphical presentation showing the glucose response area of reference food (glucose), Control food (uthapum) and test food (Pearl millet and Finger millet flours uthapum)

Fig 4.(b). Results shows that PPBS values of reference food ranged between 80 to 125.1 mg/dl with the peak value at 60 minutes. Peak values for reference food, control food and test food were highest at 60 minutes .The peak for test food (90.9) was lowest in comparison to control food (92.4) PPBS was highest for reference foods followed by control cheela and finger millet and pearl millet flours based cheela respectively.

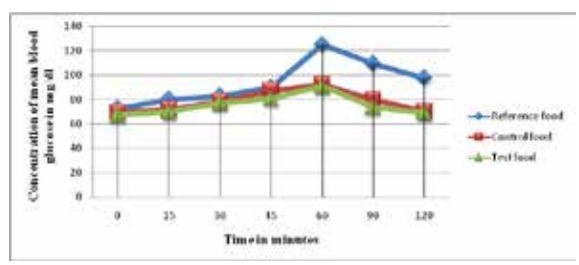

Fig4.4. (b). Graphical presentation showing the glucose response area of reference food (glucose), control food (cheela) and test food (finger millet and pearl millet flours cheela

Table 4.(c). Mean glycemic index of control and developed products prepared finger millet and pearl millet flours.

S.No	Name of the products	Control products	FingerMillet and PearlMillet flours based products	Cal. Value of t	Table value at (5%)
1	Uthapum	39.91±1.14	38.725±1.879	0.47	2.101
2	Cheela	44.07±1.67	36.83±1.23	3.7	2.101

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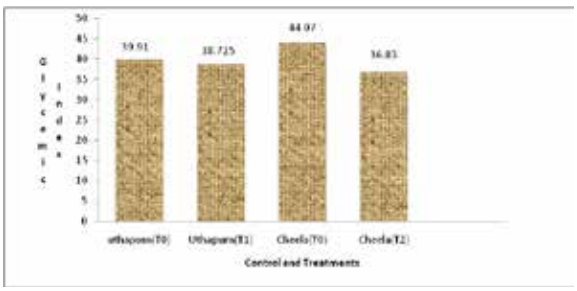

Fig4. (c). Mean glycemic index of control and developed products prepared by finger millet and pearl millet flours

CONCLUSION

In this study mean IAUC of finger millet and pearl millet flours based Cheela and Uthapam were significantly reduced in comparison to their control product. Finger millet and pearl millet flour based (20% and 25%) Uthapam and Cheela had lower GI i.e. 38.72 and 36.83 respectively in comparison to control Uthapam and Cheela 39.91 and 44.07 respectively. The difference in the glycemic index of finger millet and pearl millet flours based product and control were found highlysignificant($p \leq .05$).

RECOMMENDATIONS

Low glycemic index food is benefical for diabetitic patient, obeses and in helpful in several diseases.

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