INTERNATIONAL JOURNAL OF APPLIED BIOLOGY AND PHARMACEUTICAL TECHNOLOGY

www.ijabpt.com Volume-4, Issue-3, July-Sept-2013 Coden : IJABPT Copyrights@2013

ISSN : 0976-4550

Received: 24th June-2013 *Revised: 28th June-2013* *Accepted: 01st July-2013*

Research article

SENSORY ATTRIBUTES OF INDIAN FRIED FOODS INCORPORATED WITH DIFFERENT LEVELS OF FRUCTOOLIGOSACCHARIDES

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ABSTRACT: Prebiotics are the non-digestible fibers which have the potential to exert a positive effect on human health. They serve as a substrate for microflora in the large intestine and are known to improve overall gut health. Fried foods contribute greatly to the snack foods industries and are specially liked for their crispy texture and unique flavor. Addition of fructooligosaccharides in fried food products has a potential to be developed into a therapeutic food. Hence, the effect of incorporating fructooligosaccharide on sensory qualities of fried products namely *vegetable paratha* (Shallow fried) and *lilva kachori* (Deep fried) was investigated. Fructooligosaccharides was added to the one serving of vegetable paratha and lilva kachori's stuffing at 10 g, 15 g and 5 g, 10 g, and 15 g respectively and were compared with the standard recipes. Three successive trials were conducted for screening the panelist through threshold test. Sensory evaluation was carried out at nine point hedonic scale test for the two products in triplicates. An internal panel of 25 semi trained members evaluated the products for color and appearance, mouthfeel, texture, taste, after taste, and overall acceptability. The results revealed a non-significant reduction in most of the sensory attributes for vegetable paratha, whereas, a significant reduction was observed in texture scores ($p<.05$). A significant reduction ($p<.001$) was found in all sensory attribute scores of lilva kachori. Addition upto 5 g fructooligosaccharide did not altered sensory qualities of lilva kachori. The most affected attribute for vegetable parantha was texture (8.6 percent reduction) and for lilva kachori it was color and appearance. Thus it can be concluded that fructooligosaccharides can be incorporated in vegetable paratha upto 15 g and upto 5 g in lilva kachori. An addition of fructooligosaccharide in stuffed fried snacks may serve to fulfill consumer demand for health foods.

Key words: Organoleptic evaluation, Fructooligosaccharide (FOS), Sensory attributes, Fried food products, Indian recipes.

Abbreviations: FOS - Fructooligosaccharide

INTRODUCTION

Prebiotics and probiotics are gaining popularity as functional foods as they have the ability to improve the human health by improving the colonization of beneficial gut microbiota (Roberfroid, 2000). They are markedly interesting agents in the field of preventive nutrition, therefore, have an important development. For more than a decade, there has been a rapid increase in the use of probiotics and prebiotics (Marteau and Ruault, 2002). Among these, oligosaccharides are attracting increasing interest as prebiotic functional food ingredients (Rastall, 2009). Prebiotics are non-digestible food ingredients that stimulate the growth and/or activity of bacteria in the digestive system (Gibson and Roberfroid, 1995). "Prebiotic are selectively fermented ingredients that allow specific changes, both in the composition and/or activity in the gastrointestinal microflora that confers benefits upon host well-being and health" (Roberfroid, 2007). Inulin and fructoligosaccharides (FOS) are linear polymers consisting of fructose monomers linked to each other by -(2, 2, 1) bonds, these bonds are resistant to mammalian digestive enzymes and extremes of pH found in the human gastrointestinal tract.

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Therefore, Inulin and oligofructose escape hydrolysis in the upper intestine and reach the colon intact, where they are selectively fermented by indigenous bacteria (Gibson and Delzenne, 2008) and result in production of metabolites that have beneficial health effects. Preparation and sale of FOS based spreads, chocolates, beverage concentrate and honey like product has been successful and are easily available in the market (Ramesh et al., 2004). FOS is one of the functional food ingredient which is not yet well exploited and consumed by Indian population, therefore, FOS added recipes need to be developed and studied for the feasibility of its addition and their acceptability so as to broaden the data base of FOS added Indian recipes. The consumer of today is health conscious and demands foods which is both tasty and having additional health benefits. Inulin and oligofructose are widely used in functional foods throughout the world for their health promoting properties. Use of garlic, ginger and onion in traditional Indian foods is well known. FOS meets all the requirement of consumer as well as food industries (N Kaur and Gupta, 2002). Fried food has an excellent sensory appeal in Indian context. *Puri, paratha, kachori, and samosa's* are some of very popular fried food which is consumed by Indians very frequently. Addition of FOS in these recipes will make them healthier and will give more healthy choices, especially to those who are afraid to having fried foods. The study explores the possibility of utilizing prebiotic food ingredient FOS in stuffed fried food snacks with the purpose of providing health benefits and improving sensory qualities. Therefore, the present study draws an attention to acceptability trial of FOS addition in the filling material of the popular Indian foods namely; *vegetable paratha* and *lilva kachori* on their sensory attributes.

MATERIALS AND METHODS

Food grade fructooligosaccharide (Make: Meiji Japan; 20 kg bag; Lot no.MMS 182-270) was procured (Powder form) from Mitushi Pharma, Ahmedabad. Other ingredients required for developing FOS incorporated recipes included spices, oil, vegetables; flour, etc. were purchased from local market of Vadodara city in cleaned and packaged form. Two food products namely vegetable paratha and lilva kachori were developed using standard recipes (Pasricha and Rebello, 1998) with a little modifications. These products were selected on the basis of their cooking method namely shallow frying and deep frying.

Standardization and addition of FOS in the stuffed fried products:

Dough for vegetable paratha : For preparing standard vegetable paratha dough 120 g wheat flour, 6 g salt, 15 ml oil, and 75 ml water were kneaded together to make the dough. Further, it was divided into three equal parts for making balls which were rolled.

Preparation of stuffing of vegetable paratha: Potatoes, french beans, carrots, spring onions, and green chillies were washed properly and chopped in small pieces. 15 ml oil was taken in a pan and all vegetables were cooked for 15 min. 5 g corn flour powder, salt and spices were added to the vegetables. 30 g stuffing was filled in one paratha and rolled again.

Frying of paratha: Paratha's were shallow fried on medium flame for 3 min. each side with ½ tsp. of oil. FOS was added at 2 levels, i.e. 10 g and 15 g in the stuffing.

Dough for lilva kachori: Standard kachori dough was prepared using 80 g maida, 20 g whole wheat flour, 20 ml oil, ¼ tsp. salt and 60 ml water. All the ingredients were kneaded well to make the dough. Further, it was divided into ten equal parts for making balls. Balls were rolled and put into the mold.

Preparation of stuffing of lilva kachori: Fresh green peas (without shell) were taken and crushed once. Til seeds, green chilles, garam masala, 5 g sugar and salt were added and sauté for 2 min. 10 g stuffing was filled in the flattened dough kept in the mold with cover. The mold was closed to give the desirable shape.

Frying of lilva kachori: The stuffed kachori's were deep fried in fresh hot oil (160^0-170^0 C) for one minute. Addition of FOS to the stuffing was at three levels, i.e. 5 g, 10 g, 15 g.

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Organoleptic evaluation

Three successive trials were conducted for screening the panelist through threshold test (Rangana, 1986). Sensory evaluation was carried out by nine point hedonic scale test for the two products in triplicates. An internal panel of 25 semi trained members evaluated the products for color and appearance, mouthfeel, texture, taste, after taste, and overall acceptability.

Statistical analysis

The mean and standard deviation of the sensory scores were computed and the data were analyzed statistically. To determine the significant difference between different levels of FOS addition for various sensory attributes, ANOVA – one way variance was used. To compare the means of two groups of FOS substitution "t" test was applied.

RESULTS AND DISCUSSION

The results presented are an average of triplicate analysis of all samples for their sensory attributes.

Sensory qualities of vegetable paratha: As seen in Table I, except for texture, there was a slight reduction in most of the sensory attributes of *vegetable paratha* studied, up to 15 g addition of FOS. However, this was not found to be statistically significant. The *color and appearance* scores were reduced by 5.5 percent as the level of addition increased. This might be due to non-enzymatic maillard reaction, which was indicated by increased burn spots on the surface of paratha. Similar results were found in a study wherein, burn spots on the surface of chapatti increased significantly as the level of FOS addition increased (Mahendra and Sheth, 2013). Reduction in *mouthfeel* scores was observed as the levels of FOS incorporation increased. This may be attributed to increased stickiness of the paratha. A significant reduction (7.4 to 8.6 percent) in the *texture* scores was observed as the level of FOS addition increased ($p<.05$) upto 10 g. The resultant paratha felt sticky and were difficult to break. Similar results were obtained from a study where an increase in crumb hardness of bread was observed when inulin was added at 3 percent to 5 percent levels (O'Brien, et. al., 2003). *Taste* scores reduced with increased level of FOS addition, this could be because of increased sweetness of paratha. Physico-chemical characteristics of oligofructose showed it has moderately sweet in taste and has a sweetness of about 35% in comparison with sucrose (A Frank, 2002). At 10g addition, *aftertaste* scores remained same as standard. However, *Overall* scores remained similar to standard at 15g addition of FOS.

Sensory qualities of lilva kachori*:* As can be observed in Table II, all the sensory attributes altered significantly ($p<.001$). FOS could be added successfully upto 5 g without affecting most of the sensory attributes such as mouthfeel, texture, taste, aftertaste and overall acceptability. However, upon addition of 5g FOS to the filling material, the burn spots on the surface of kachori increased after frying. All the sensory attributes reduced significantly upon addition of 10 g and 15 g of FOS to the stuffing of the kachori. The most affected attribute was *color and appearance* with 18.7 percent reduction in the scores. An enhancement of bread crust coloration was also reported for breads prepared with as little as 3 percent and up to 10 percent inulin addition, the crust became darker as the level of addition increased (Hager, et. al., 2011). Taste and aftertaste of kachori showed reduction with the increased level of FOS addition. Instead of spicy taste of kachori there was an increase in sweetness, which is not preferred normally. A similar result was observed in a study, wherein, a significant decrease in the scores of aftertaste was perceived for bread with 22 percent level of inulin substitution (Parnami and Sheth, 2010). The texture of the kachori became soft and soggy giving undesirable mouthfeel with increased fluidity of the stuffing of kachori. FOS increases retention of moisture. Similar observations have been found in a study where the investigators have reported that oligofructose contributes humectancy to soft baked goods (N Kaur and Gupta, 2002). Overall acceptability scores of lilva kachori were greatly reduced because of reduced sensory scores of the various sensory attributes. At 5g addition level, overall scores reduced by 5.4 percent, while at 15g addition level, the scores reduced by 17 percent. The overall reduction in most of the sensory attributes of lilva kachori ranged from 14 percent to 18 percent.

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Table 1: Effect on sensory attributes of *vegetable parantha* incorporated with different levels of FOS addition

Sensory Attributes							
Levels of FOS addition		Color & Appearance	Mouth feel	Texture	Taste	After Taste	Overall Acceptability
Std.	Mean SD	7.45 ±0.94	7.04 ±0.90	7.40^{a} ±0.96	7.09 ±1.07	6.90 ±1.14	7.14 ±1.00
10g	Mean SD	7.21 ±1.11	6.95 ±1.08	6.85^{b} ±1.33	7.07 ±1.15	6.90 ±1.00	6.97 ±1.13
15g	Mean SD	7.04 ±1.32	6.92 ±1.29	6.76^{ab} ±1.39	7.04 ±1.24	6.97 ±1.19	7.14 ±1.24
	% decrease	$5.5^{\#}$	$1.7^{\#}$	$8.6^{\#}$	$.78^{\#}$	$1.0^{\#}$	No change$^{\#}$
F- Value		1.34^{NS}	0.13^{NS}	3.25*	0.01^{NS}	0.05^{NS}	0.30^{NS}

Note: Level of significance:* p- value <0.05; NS = Not Significant;
abc: the non identical letters in any two rows within the column denotes a significant difference at minimum 5% level;
#: Percent decrease in standard and 15 g of FOS addition.

Table 2: Effect on sensory attributes of *lilva kachori* incorporated with different levels of FOS addition

Sensory Attributes							
Levels of FOS addition		Color & Appearance	Mouth feel	Texture	Taste	After Taste	Overall Acceptability
Std.	Mean SD	7.52^{a} ±1.13	7.09^{a} ±1.14	7.23^{a} ±0.95	7.14^{a} ±1.11	7.11^{a} ±1.17	7.40^{a} ±1.03
5g	Mean SD	7.16^{b} ±1.14	7.11^{a} ±1.10	6.95^{a} ±1.12	7.09^{a} ±1.03	7^{a} ±1.10	7^{a} ±1.24
10g	Mean SD	6.76^{c} ±1.18	6.59^{b} ±1.17	6.23^{bd} ±1.12	6.54^{b} ±1.13	6.28^{b} ±1.21	6.33^{bd} ±1.05
15g	Mean SD	6.11^{d} ±1.13	6.09^{c} ±1.031	5.97^{cd} ±1.37	5.95^{c} ±1.14	5.85^{c} ±1.11	6.14^{cd} ±1.22
	% decrease	$18.7^{\#}$	$14.1^{\#}$	$17.4^{\#}$	$16.6^{\#}$	$17.7^{\#}$	$17.0^{\#}$
F-Value		11.55^{***}	7.95^{***}	11.06^{***}	10.65^{***}	11.31^{***}	11.01^{***}

Note: Level of significance: * * *p < 0.001; #: Percent decrease in standard and 15 g of FOS addition

abc: the non identical letters in any two rows within the column denotes a significant difference at minimum 5% level

CONCLUSION

FOS can be incorporated to *vegetable paratha* upto 15g level without affecting sensory attributes. In *lilva kachori* it can be added upto 5g without affecting sensory attributes significantly. At higher levels of FOS incorporation, a significant gradual decrease in all the sensory attributes was exhibited, where color and appearance and texture were greatly affected. Hence, it can be concluded that FOS can be incorporated to stuffed fried products but more innovation is needed for improving sensory attributes. Addition of FOS in stuffed fried snacks may serve to fulfill consumer demand for health foods.

ACKNOWLEDGMENT

We acknowledge the financial support extended by the Department of Biotechnology (DBT), Ministry of Science and Technology, New Delhi.

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REFERENCES

A. Frank (2002), “Technological functionality of inulin and oligofructose”, British Journal of Nutrition, 87, Suppl. 2, S287–S291.

Aakansha Mahendra and M. Sheth (2013), “Feasibility and acceptability of fructooligosaccharide substituted popular Indian foods”, Nutrition & Food Science, Vol. 43 No. 3, 2013, pp. 204-212.

Gibson G.R. and Delzenne N, (2008), “Inulin and oligofructose: new scientific developments”, Nutrition Today, Vol. 43 No. 2, pp. 54-59.

Gibson GR, Roberfroid MB (1995), "Dietary modulation of the human colonic microbiota: introducing the concept of prebiotics". *J Nutr.* **125** (6): 1401–1412.

Hager, A., Ryan, L. A. M., Schwab, C., Gaenzle, M. G., O'Doherty, J. V., & Arendt, E. K., “Influence of the soluble fibres inulin and oat beta-glucan on quality of dough and bread”, European Food Research and Technology (2011), 232(3), 405-413.

Narinder kaur and Anil K gupta, Applications of inulin and oligofructose in health and nutrition”, J. Biosci. (2002), Vol. 27, No. 7, 703–714.

Morris, Cecile and Morris, Gordon, “The effect of inulin and fructooligosaccharide supplementation on the textural, rheological and sensory properties of bread and their role in weight management: A review”, Food Chemistry (2012), 133 (2), 237-248.

O'Brien, C. M., Mueller, A., Scannell, A. G. M., & Arendt, E. K., “Evaluation of the effects of fat replacers on the quality of wheat bread”, Journal of Food Engineering (2003), 56(2-3), 265-267.

P. Marteau and M. C. B. Ruault (2002), “Nutritional advantages of probiotics and prebiotics”, British Journal of Nutrition, 87, Suppl. 2, S153–S157.

Pasricha S. and Rebello L.M. (1998), Some Common Indian Recipes and Their Nutritive Value, ICMR Offset Press, New Delhi (Edited by National Institute of Nutrition, Hyderabad).

Ramesh, M.N., Ramalakshmi, K., Sangeetha, P.T. and Prapulla, S.G. (2004), “Beverage concentrate based on fructoligosaccharides”, Indian Patent Office, Govt. of India. 457/DEL, Preparation of Neutraceutical Beverage Concentrate Based on FOS: The Novelty Process is the Preparation of Neutraceutical Beverage Concentrate Based on FOS is prepared by Fermentation.

Rastall, R.A. (2009), “Functional oligosaccharides: application and manufacture”, Annual Review of Food Science & Technology, Vol. 1, pp. 305-339.

Roberfroid MB (2000), “Prebiotics and probiotics: are they functional foods?”, *Am J Clin Nutr*; 71(suppl):1682S–7S.

Roberfroid MB (2007), "Prebiotics: The Concept Revisited". J Nutr. **137** (3 Suppl 2): 830S–7S.

Surekha S. Puyed, Khyrunnisa Begum, G. Saraswathi And Jamuna Prakash (2010), “Shelf Stability And Sensory Attributes of A Deep-Fried Product Incorporated With Pre-Treated Soy Flour”, Journal Of Food Processing And Preservation 34, 439–459.

Swati Parnami and Mini Sheth (2010), “inulin as prebiotics in bread and cookies- A feasibility study”, Inventi Rapid: Nutraceuticals, Vol. 1, issue 3.