International Journal of Scientific Engineering and Technology (ISSN : 2277-1581)
Volume No.3 Issue No.5, pp : 686-688 1 May 2014

Effect of Hydrocolloids on the Oil Uptake of Kachori

P. A. Pawar, Rashmeetsingh Monga & Aachal Purwar
Department of Chemical Technology, Sant Gadge Baba Amravati University, Amravati-444602, Maharashtra, India
Email id: papawar40@rediffmail.com

Abstract:- Awareness of adverse effects of excessive dietary fat intake is virtually universal. Consequently, health conscious individuals are modifying their dietary habits and eating less fat (Miller and Groziak, 1996). Consumer acceptance of any food product depends upon taste which is the most important sensory attribute. Although consumers want food with minimum to no fat or calories, they also want the food to taste good. Because several food items formulated with fat replacers do not compare favorably with the flavor of full-fat counterparts, it is difficult for some people to maintain a reduced fat dietary regime. Food manufacturers continue to search for the elusive "ideal fat replacer" that tastes and functions like conventional fat without the potential adverse health impact.

Keywords : Control, Consumer, sensory, calories

Introduction:

Rationale for Fat Replacers

As a food component, fat contributes key sensory and physiological benefits. Fat contributes to flavor, or the combined perception of mouth feel, taste, and aroma/odor (Ney, 1988). Fat also contributes to creaminess, appearance, palatability, texture, and lubricity of foods and increases the feeling of satiety during meals. Fat can also carry lipophilic flavor compounds, act as a precursor for flavor development (e.g., by lipolysis or frying), and stabilize flavor (Leland, 1997). From a physiological standpoint, fat is a source of fat-soluble vitamins, essential fatty acids, precursors for prostaglandins, and is a carrier for lipophilic drugs. Fat is the most concentrated source of energy in the diet, providing 9 kcal/g compared to 4 kcal/g for proteins and carbohydrates. High fat intake is associated with increased risk for obesity and some types of cancer, and saturated fat intake is associated with high blood cholesterol and coronary heart disease (AHA, 1996; USDHHS, 1988). The 1995 Dietary Guidelines (USDA ,USDHHS, 1995) recommend limiting total fat intake to no more than 30% of daily energy intake, with saturated fats no more than 10% and mono unsaturated and poly unsaturated fats accounting for at least two-thirds of daily energy intake. Consumer surveys indicate that 56% of adult Americans try to reduce fat intake and many show interest in trying foods containing fat replacers (Bruhn et al., 1992). A survey conducted by the Calorie Control Council (CCC, Atlanta, Ga.) found that 88% of adults reported consuming low-fat, reduced-fat or fat-free foods and beverages (CCC, 1996). Although fat intake is declining, probably due to the increased availability of low and reduced-fat products and lean meats, fat consumption is greater than the recommended levels, and the prevalence of the population classified as overweight is increasing (Frazao, 1996). Foods formulated with fat replacers are enjoyable alternative to familiar high-fat foods. By choosing these alternative foods, health conscious consumers are able to maintain basic food selection patterns and more easily adhere to a low-fat diet (CCC, 1996). Fat may be replaced in food products by traditional techniques such as substituting water or air for fat, using lean meats in frozen entrees, skim milk instead of whole milk in frozen desserts, and baking instead of frying for manufacturing or preparing snack foods (CCC, 1992). Fat may also be replaced in foods by reformulating the foods with lipid, protein, or carbohydrate-based ingredients, individually or in combination. Fat replacers represent a variety of chemical types with diverse functional and sensory properties and physiological effects.

Kachori is a traditional snack product and it was originated in India. Kachori is a spicy snack popular in various parts of India. This snack is highly consumed in Vidharbha region of Maharashtra state (India).

Materials and Method:-

Materials:

Besan, green chilies and curry leaves, salt, turmeric powder, spice mix and raw mango powder, maida and vegetable oil were purchased from local Amravati market. The hydrocolloids such as Hydroxypropylmethylcellulose (HPMC), Carboxylmethylcellulose (CMC) and xanthan gum were gifted from Connell Bros. incorporated in wheat flour on dry basis.

Method for preparation of kachori: - First the paste of green chilies and garlic was prepared in mixer. This paste was then added to oil in the vessel. Once the garlic become brown in color then salt, turmeric powder, spice mix, sugar and raw mango powder were cooked and mixed well. The refined wheat flour, water and vegetable oil in the ratio of 10:4:1 were mixed thoroughly and dough for the casing of kachori was prepared. The hydrocolloids such as HPMC, CMC, and xanthan gum were all incorporated in wheat flour on dry basis each at 0.5, 1.0 and 1.5% level. Other ingredients were kept constant in all the preparations. The dough of 20 g was pressed and a known quantity of filling material was filled inside and the ends were sealed manually and once again pressed to give the circular shape. The kachori was fried in fresh refined vegetable oil at 150°C±5°C for 8 min, allowed to cool and used for analysis of oil uptake and sensory quality. The frying of kachori was carried out in the fresh refined oil at every time.

Physico-chemical and sensorial analysis of Kachori:-Oil uptake was determined by using Soxhlet apparatus (AOAC 2002). The Kachori's were evaluated for sensory quality attributes like color, aroma, taste, mouth feel and overall acceptability by a trained panel of 7 judges on 9 point Hedonic scale (1- extremely dislike, 9- extremely like) suggested by Amerine et al. (1965).

Result And Discussion:-

Oil uptake: -

1) Effect of HPMC on Oil uptake: The concentration of HPMC level was varied from 0.5, 1.0 & 1.5%. The reduction in oil uptake was reduced from 17.23 for control to 10.21% as the concentration of HPMC increased as shown in Table No. 1.

Table No.1: Effect of levels on HPMC on oil uptake of kachori.

Hydrocolloids	Levels of Addition (%)	Oil Content (%)
Control		17.23
HPMC	0.5	15.5
HPMC	1.0	11.5
HPMC	1.5	10.21

2) Effect of CMC on Oil uptake: The concentration of CMC level was varied from 0.5, 1.0 & 1.5%. The reduction in oil uptake was reduced from 17.23 for control to 7.5% as the concentration of HPMC increased as shown in Table No. 2.

Table No. 2: Effect of levels on CMC on oil uptake of kachori.

Hydrocolloids	Levels of Addition (%)	Oil Content (%)
Control		17.23
CMC	0.5	14
CMC	1.0	11.5
CMC	1.5	7.5

3) Effect of Xanthum Gum on Oil uptake: The concentration of Xanthan Gum level was varied from 0.5, 1.0 & 1.5%. The reduction in oil uptake was reduced from 17.23 for control to 8.85% as the concentration of Xanthan Gum increased as shown in Table No. 3.

Table No. 3: Effect of levels on Xanthan Gum on oil uptake of kachori.

Hydrocolloids	Levels of Addition (%)	Oil Content (%)
Control		17.23
Xanthan gum	0.5	13.56
Xanthan gum	1.0	10.33
Xanthan gum	1.5	8.85

The results of deep-fat frying of kachori showed moisture loss and oil uptake by the casing only. The hydrocolloids were found statistically significant for reduction of oil uptake at 1% level and above. The oil content of kachori significantly decreased with increase in the level of hydrocolloids, irrespective of the type of hydrocolloids. On addition of hydrocolloids, the oil content of kachori decreases significantly, being least (7.5) with CMC at 1.5% level, followed by xanthan gum (8.85%), and HPMC (10.21%) in that order. Among of the hydrocolloids studied, CMC with 1.5% concentration level was found statistically effective in reducing oil content in kachori as compared to other hydrocolloids and their levels. The reduction in oil uptake was maximum with CMC followed by xanthan gum and HPMC at 1.5% level of each hydrocolloid over the control. This could have been due to formation of film of hydrocolloids on the product which might have decreased the tendency of the product to absorb the oil and lose moisture (Annapure et al. 1999). Khalil (1999) also reported 40% reduction in oil uptake in French fries with 5% pectin. The film forming characteristics of these hydrocolloids might have prevented the absorption of oil and at the same time helped to retain the natural moisture of foods. This trend was also observed in samosa, banana chips, poori provided the reason for using these hydrocolloids in deep frying of fried products. (Williams and Mittal 1999; Mallikarjunan et al. 1997; Ang 1993; Koelsch and Labuza 1992).

Sensory quality of Kachori: - The sensory quality is an important aspect in considering the overall acceptability of food product. Deep fat frying is widely used in industrial preparation of foods, because consumers prefer the taste, appearance and texture of fried food products (Saguy and Pinthus 1994). The kachori prepared by addition of various hydrocolloids in varied levels were subjected to sensory evaluation for various quality parameters like color, aroma, taste, mouth feel and overall acceptability by semi trained panel of seven judges using nine point hedonic scales. The sensory scores obtained with respect to various quality attributes were statistically analyzed and presented in Table 4. The results on sensory quality of kachori with different hydrocolloids showed that coating with CMC at1.5% level was found superior in quality with respect to overall acceptability as compared to all other hydrocolloids. This treatment was followed by xanthan gum at the same level. The kachori with HPMC scored poorly with respect to sensory quality. Xanthan gum at 1.5% level resulted better in sensory quality. Both xanthan gum and CMC show equal sensory quality, in fact CMC has scored higher except for some difference in oil absorption. It is reported that hydrocolloids are used to improve the texture and moisture retention in cake batters and dough, to increase the volume and shelf life of cereal foods by limiting starch retro gradation, improve their eating quality and appearance (Kotoki and Deka 2010; Kohajdova and Karovicova 2009).

Table No.4: Effect of levels of hydrocolloids on sensory quality of kachori.

Hydro-colloids	**Levels of Addition (%)**	**Color**	**Aroma**	**Taste**	**Mouth feel**	**Overall-accept-ability**
Control		9	9	8	8	8.5
HPMC	0.5	7	6	6	6	6
HPMC	1.0	7	7	6	7	7
HPMC	1.5	7	6	6	7	6.5
CMC	0.5	8.5	7.5	8	8	8
CMC	1.0	8	8	8	8	8
CMC	1.5	9	9	9	9	9
Xanthan gum	0.5	8	8	8	8	8
Xanthan gum	1.0	7	8	8	8	8
Xanthan gum	1.5	8	9	9	8	8.5

Conclusion

Among all the hydrocolloids studied at different levels for preparation of kachori, it can be concluded that kachori prepared with addition of CMC at 1.5% was statistically significant over all other hydrocolloids in oil uptake with optimum sensory quality characteristics. Thus, kachori with low fat and low calorie content with better acceptance can be prepared in order to meet the demand of low fatty foods of health cautious consumers.

References:-

i. *AHA. 1996. Dietary guidelines for healthy Americans. Circulation94: 1795-1800.*

ii. *Amerine MS, Pangborn RM, Roessler EA (1965) Principles of sensory evaluation of foods. Academic, New York*

iii. *Annapure US, Singhal RS, Kulkarni PR (1998) Studies on deep-fat fried snacks from some cereals and legumes. J Sci Food Agric76:377–382*

iv. *Annapure US, Singhal RS, Kulkarni PR (1999) Screening of hydrocolloids for reduction in oil uptake of a model deep-fat fried product.Fett - Lipid 101:217–221*

v. *AOAC (2002) Official methods of analysis, 16th edn. Association of Official Analytical Chemists, Washington DC*

vi. *Bruhn, C.M., Cotter, A., Diaz-Knauf, K., Sutherlin, J., West,E., Wightman, N., Williamson, E. and Yaffee, M. 1992.Consumer attitudes and market potential for foods using fat substitutes. Food Technol. 46(4): 81-86.*

vii. *CCC. 1992. "Fat Replacers: Food Ingredients for Healthy Eating," 12 pp., Calorie Control Council, Atlanta, Ga.*

viii. *CCC. 1996. "Fat Reduction in Foods," 111 pp., Calorie Control Council, Atlanta, Ga.*

ix. *Frazao, E. 1996. The American diet: A costly health problem. Food Review, Jan.-Apr. pp. 1-6.*

x. *Khalil AH (1999) Quality of French fried potatoes as influenced by coating with hydrocolloids. Food Chem 66:201–208*

xi. *Koelsch C, Labuza TP (1992) Edible water vapor barriers: properties and promise. Trends Food SciTechnol 5:76–81*

xii. *Kohajdova Z, Karovicova J (2009) Application of hydrocolloid as baking improvers. Chem Pap 63:26–38*

xiii. *Kotoki D, Deka SC (2010) Baking loss of bread with special emphasis on increasing water holding capacity. J Food SciTechnol 47:128–131*

xiv. *Leland, J.V. 1997. Flavor interactions: The greater whole. Food Technol. 51(1): 75-80*

xv. *Mallikarjunan P, Chinnan MS, Balsubramanium VM (1997) Edible coatings for deep fat frying of starchy products. J Food SciTechnol 30:709–714*

xvi. *Miller, G.D. and Groziak, S.M. 1996. Impact of fat substitutes on fat intake. Lipids 31(S): 293-296*

xvii. *Ney, K.H. 1988. Sensogamme, einemethodischeErweiterung der Aromagramme. Gordian 88(1): 19.*

xviii. *Saguy IS, Pinthus EJ (1994) Oil uptake during deep fat frying: factors and mechanisms. Food Technol 49:142–145, 152*

xix. *USDA and USDHHS. 1995. Nutrition and your health: Dietary guidelines for Americans. 4th ed., Home and Garden Bulletin, No. 232., U.S. Dept. Agriculture and U.S. Dept. Health and Human Services, Washington, D.C.*

xx. *Williams R, Mittal GS (1999) Low fat fried foods with edible coatings: modeling and simulation. J Food Sci 64:317–322*

xxi. *USDHHS. 1988. "The Surgeon General's Report on Nutrition and Health. Publ. No. 88-50210. U.S. Govt.Print.Office, Washington, D.*