USE OF HYDROCOLLOIDS AS EDIBLE COVERS TO PRODUCE LOW FAT FRENCH FRIES

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Abstract—The effect of different hydrocolloids as barrier agents on reduction of oil absorption in French fries during deep fat frying, investigated. Among different gums that used in this study, mixture of pectin and CMC 1% and xanthan gum 1.5% led to highest decrease in fat content and lowest decrease in amount of fat content observed in pectin 0.5% and guar gum 0.5% respectively. Strips that coated with xanthan gum, pectin and mixture of pectin and CMC had the highest amount of moisture content while the lowest moisture content were related to blank samples and strips that coated with guar gum and CMC. All coated strips in comparison with blank sample had lower amount of fat content significantly. Samples were coated with mixture of pectin and CMC 1% and blank sample need to maximum shearing force for cutting and coated samples with xanthan, guar and CMC gums need the lowest shearing force respectively.

Keywords—French fries, oil absorption, coating, Hydrocolloids.

I. INTRODUCTION

The potato is the world’s root and tuber crop grown in the greatest quantities (FAO, 1999). Frying is one of the oldest cooking methods widely used to prepare tasty and crispy foods; which fried potato products being one of its largest applications. Deep-fat frying can be defined as the process of drying and cooking through contact with hot oil (Sahin et al., 1999; Lesinska and Leszczynski; 1989). In deep-fat fried products, both health and sensory aspects should be addressed to meet consumer demand. High heat transfer rates are largely responsible for the development of the desired sensorial properties in fried products (Hubbard and Farkas, 1999). Dehydration in hot oil at temperatures between 160 and 180°C is characterized by very high drying rate that is critical for ensuring favorable structural and textural properties of the final product (Baumann and Escher, 1995).

In recent years, consumer’s preference for low fat and fat-free products has been the driving force of this food industry to produce lower oil content fried potatoes that still retain the desirable texture and flavor. Pinthus et al. (1993) introduced the criterion UR, which expresses the ratio between the amount of oil uptake and water removed. Different means to reduce oil uptake in fried potatoes have been reported. For instance, vacuum frying may be an option for fried potatoes with low oil content and desired texture and flavor characteristics (Garayo and Moreira, 2002). Soaking of potato strips in NaCl solutions reduced oil uptake in French fries after frying (Bunger et al., 2003). Pre-drying of potatoes is as well a common way to reduce fat uptake in fried potatoes (Krokida et al., 2001; Moyano et al., 2002). Rubnov and Saguy (1997) added fructose to a restructured potato product that resulted in a change of the surface properties, with a reduction of absorbed oil after frying. The blanching step previous to frying in potato chip processing improves the color and texture, and could reduce in some cases the oil uptake by gelatinization of the surface starch (Califano and Calvelo, 1987).

Since most of the fat is taken up after removal of fried potatoes from the fat, the conditions in which the potato pieces are removed from the fryer are important for fat uptake (Aguilera and Hernández, 2000; Bouchon et al., 2003; Ufheil and Escher, 1996). Besides, properties of the surface of the potatoes are highly relevant for fat uptake, so the application of a coating is a promising route to reduce oil content (Mellema, 2003).

There are many options available to reduce fat uptake by application of coatings such as gellan gum, corn zein, cellulose derivatives (e.g. methylcellulose and hydroxyl propyl methyl cellulose), pectin, sodium alginate, etc. (García et al., 2002; Khalil, 1999; Rimac-Brnacic et al., 2004; Williams and Mittal, 1999a; Altanakar, 2003). The aim of this study was to investigate the effect of coating with different hydrocolloids on oil uptake and quality attributes of potato French fries.

II. MATERIALS AND METHODS.

A. Preparation of Gums Suspensions

Carboxy methyl cellulose (CMC), pectin, guar and xanthan gums provided from Provisco Company of Iran. Aqueous suspensions of 0.5, 1% CMC, 0.5%, 1% pectin, 0.3, 0.5% and 1% guar gum and 0.5, 1 and 1.5% xanthan gum (w/v) provided and used for coating formulations.

Pectin was selected due to its ability to react with calcium content of potato tissue and formation of hard and dense structure that can decrease oil absorption. CMC was selected due to its gel formation ability in higher temperature that can form a thin film on the potato stripes during frying and so this film act as a barrier agent against oil absorption. By respect to the profitable properties of pectin and CMC gums and in order to study of the effect of the interaction between pectin and CMC gums on fat reduction of final potato stripes the mixture of these gums (at 0.5 and 1% concentration)