Aloe Vera Coating improves sensory attributes for potato fries

Potato Chips / French potato fries as Influenced by Aloe Vera Coating

The application of edible coatings prior to frying has been shown to be an effective strategy for reducing oil uptake in foods. Edible coatings are commonly made with food-grade polysaccharide-based hydrocolloids such as *Aloe Vera*. These hydrocolloids form a thin layer on the food surface and are regarded as an effective oil reduction method due to their action as a barrier against lipid absorption by the food.

Currently, researchers are more interested in developing plant-based coating formulations for consumer safety. A variety of plants and plant-based materials are being investigated for their usefulness. *Aloe vera (AV)* is reported to carry specific barrier properties and is thus used as postharvest edible coating to increase the shelf life of cherries and table grapes and many fruits and vegetables are benefited from this coating. It is reported Aloe vera as a coating carries specific barrier properties and is used as a post-harvest edible coating to increase the shelf life of Cherries and table grapes.

Consumer demand for healthier snacks has stimulated scientific work on the issues of fat uptake on fried products. Most of the oil absorption is surface-controlled, evaluating different pre-treatments (soaking, dehydration, enzyme activation, sonication) associated with the calcium ion impregnation in potato tissue to enhance cellular-structure integrity during frying and its effects on oil absorption. Many factors have been reported to affect the oil content of French fries and crisps including oil quality, frying temperature and duration, slice thickness, product shape and composition (moisture content, solids, fat, gel strength), pre-frying techniques (blanching, drying, and frying) and any added coating such as methylcellulose or colloids, the loss of moisture and the oil uptake in French fries during frying to be interrelated; a reduction of the initial moisture

content by drying was recommended to reduce the oil uptake into potatoes. Deep-fat frying of potato slices for crisp production involves an initial, very short period of heating at high moisture level resulting in the gelatinization of starch followed by a rapid dehydration period to a final moisture content of about 2%. There exists an intimate contact between the frying oil and the surface of the potato slices that ensures high heat and mass transfer rates. In addition, the frying oil is taken up by the potato slices to a final oil content of approximately 35% for most industrial-manufactured crisps. It has been noted that the residence time of frying determines the amount of oil absorbed by the potato slices; the longer the time, the greater the amount of oil absorbed. Deep-fat frying produces food products with very process-specific attributes, the main ones being texture, flavor, and color imparted by several chemical reactions. The coating with Aloe Vera derivatives causes the formation of a protective layer on the surface and eventually decreases the oil uptake in the fried products. In addition, pre-processing coating on potato products is reported to mitigate likely *acrylamide* formation in the processed products. One of the typical methods for reducing oil uptake in food commodities is using coating before the frying process. Edible coatings are known as thin layer of edible polymers which is placed on the surface of the food. The application of edible coating decreases some destructive factors like the presence of various gases such as oxygen and carbon dioxide and humidity. Biopolymers plan-based are referred to a group of polysaccharides and proteins that create many features such as consistency in aqueous solutions, foams stability, emulsions, improve the sense of mouth and create a similar state of fatty and oily mode for products with lower content. In fact, hydrocolloid coatings can reduce the excessive oil uptake due to their interesting thermo-gelling properties and at the same time, they are invisible and have no negative influence on the sensory attributes of fried foodstuff. Even more, fried products have low-fat content with improved nutritional values, higher crispiness, and better palatability. This product absorbed high oil content during the frying process.

Crude potatoe coating process

Aloe vera Coating (Pre-Treatment)

Once cut potatoes, require pre-treatment of the raw product prior to frying to achieve specific desirable product quality attributes. Among them, the most used are coating, blanching, pre-drying, and osmotic dehydration. Some post-treatments are more focused on oil uptake since it takes place mostly after the frying stage, at the cooling stage. Centrifugation, steam blast, hot air blast, and vertical placement of chips to allow for the dripping of surface oil are among the most physical processes used to hinder oil uptake during the cooling stage. The use of pre-treatments such as blanching, drying, freezing, osmotic dehydration, and coating are among the most employed pre-treatments in frying operations that have been used to preserve color, improve texture, and reduce oil absorption. Potato chips are the oil-rich (35-40%) products and are considered as preferred snack foods the world over due to their palatable taste and ease of preparation. High oil contents however of grave concern for people suffering from chronic heart diseases and obesity. Different techniques like modification in size and thickness, pre-drying, modification in frying techniques, frying medium, frying temperature, and potato chip coatings have been employed to minimize oil contents in thermally processed products.

Oil uptake in the fried products is determined by two mechanisms i.e., condensation effect and capillary effect, which are altered by the application of different coating materials. Since the oil uptake by potato chips during frying is largely the function of their surface properties. Therefore, *Aloe Vera coating is considered a promising route* for its mitigation in the finished processed product, the coating with cellular derivatives cause the formation of a protective layer on the surface, which eventually decreases the oil uptake in the fried products, *the surface application of Aloe Vera concentrates in different formulations for the reduced oil uptake in fried products coated*, the coating reduces the oil uptake by 35-40% with appreciable retention of different sensory attributes.

The selection of Aloe Vera gel for chips coating, as a novel technique in the potato processing industry, is a based coating material to get reduced fat uptake in potato chips along with appreciable retention of sensorial attributes. The such high-quality processed product would equally be appreciated by the processor and consumer due to added economic and health benefits. In addition, a prolonged storage study would also be helpful to identify storage-related changes in the quality attributes of potato chips during processing. Preprocessing potato chip coating was carried out in different concentrations of Aloe Vera gel followed by subsequent frying. Aloe Vera gel was prepared in three different formulations each with 1% sorbitol (Sigma-Aldrich, USA) added as a plasticizer along with distilled water as under Peeled tubers were sliced (1.2-1.5 mm thick) and blanched in 1.5% NaCl2 solution at 85°C for two minutes. The potato chips were dipped in prepared gel formulations for five minutes, allowed to drip off, and dried before frying. After pre-drying, the chips were fried in an electric fryer at 180-185°C for three minutes using palm oil.

Potato chips process

Chip Moisture Contents

In general preprocessing application of *different concentrations of Aloe Vera as a coating on the potato chip showed an increase in chip moisture contents (CMC).* The effect of treatments, storage intervals, and their interaction was found significant for the chip moisture contents (α-0.05). The increase in Chip Moisture Contents in Aloe Vera 10%, 20%, and 30% remained around 8.1-folds, 9-folds, and 11.1-folds after storage for 180 days. In contrast, the increase in control remained less than 2-fold during the same storage period. The surface properties of frying raw material are very important to establish the eventual fat content absorbed during processing. Modification in the surface coatings may be carried out by the application of different edible coatings which can be transparent or thick like batter. In doing so, uniform coating configuration on the surface is imperative to bound mass transfer during processing, Quality attributes of potato chips in response to different biopolymers applications. Different coating materials i.e., carboxymethyl cellulose, xanthan gum, and guar were applied in selected concentrations before processing, all the coating materials retained comparatively high moisture contents and reduced fat absorption as compared to control, Aloe Vera Extract concentrations resulted in a substantial increase in Chip Moisture Contents after processing and a steady increase was observed along the extended storage intervals. The possible reason might be due to the barrier properties offered by the coating concentrations to mass transfer during processing. A steady increase in chip moisture contents along the storage intervals in all treatments might be due to the

conversion of starch into soluble sugars under prolonged storage. *The appropriate concentration of coating material however must be established to prevent sogginess and reduced sensorial scores as happened in 30% Aloe Vera concentrations during most of the storage period.* The applied concentration of Aloe Vera presented moderate chip moisture contents along with a considerable decline in their oil absorption during most of the storage period, regarding increased moisture contents in French fries in response to increased coating concentrations.

French potatoe fries

Chip Oil Uptake

Chip oil uptake (COU) decreased in response to all coating applications during storage except in control. The effect of treatments, storage intervals, and their interaction was found significant (α-0.05) for the chip oil uptake. In general, *different concentrations of Aloe Vera showed significant reduction in Chip oil uptake* along the storage period. Chip oil uptake increased among all the treatments with the lowest Chip oil uptake observed in 30% Aloe Vera (27.53%) followed by 20% Aloe Vera (27.98%) and maximum Chip oil uptake was estimated in the control (37.00%) on 180th-day storage. The efficiency of these coating materials however depends on their barrier properties, applied concentration, and ability to produce quality finished products. In general, Chip oil uptake is thought to be associated with moisture loss during frying and defines the volume of oil pockets in the finished product.

Aloe Vera coating improves Chip Crispiness

Chip Color

Chip color (CCL) estimated as an approximate L-value generally decreased with the increase in storage duration. The effect of treatments, storage intervals, and their interaction was found significant (α-0.05) for the chip color. L-value decreased in all treatments with the increase in storage period with statistically similar values recorded during most of the storage period. , the percent decrease in L-value remained higher in aloe vera coated chips with the utmost decline observed in 30% concentration (10.7%) during the same storage time. In terms of L-value, 10 and 20% Aloe Vera remained statistically the same with an overall 8.7% decline in each treatment at the end of storage period. This aloe coating process currently complies with a *healthy halal product* with a greater consumer acceptance level. The coated chips were found high in moisture content with lower fat absorption and appreciable sensorial scores. While comparing the different concentrations of aloe vera, it revealed that 10 and 20% gel produced potato chips with acceptable color which can also be associated with low perceived acrylamide formation. The application of different coating materials helps to reduce oil uptake and improve consumer preference for fried products. Aloe vera coating for french fries is thin and invisible or thick like batter, Aloe Vera is a proper coating material with a desirable barrier and mechanical properties are essential for premium quality products. Moreover, the application of coating material is also associated with increased moisture contents and decreased color scores in the processed product which should be kept in insight for consumer acceptance.

Chip Crispiness

Chip Crispiness

Appreciable Chip crispiness scores were recorded in low and moderate Aloe Vera coatings during the storage period. 20% Aloe Vera concentration presented the best Chip crispiness scores throughout the storage periodChip crispiness scores were recorded in low and moderate Aloe Vera coatings during the storage period. 20% Aloe Vera concentration presented the best Chip crispiness scores throughout the storage period. Frying is a rather complex process of heat and mass exchange that induces chemical and physical transformations in the food that results in its unique structure. Moisture leaving the food makes cells shrink at first, then will expand, and escape the food product through the surface.

Avoid sogginess in your potato chips line

Potato chip texture is often described as crispiness which is an important sensorial attribute for consumer appreciation. Eminent crispy structure develops in potato chips due to the hardening of chip crust during frying at elevated temperatures. Starch and proto-pectin are the most imperative chemical components contributing to quality chip texture during processing. The textural attributes of chips are reported to be affected by the application of different coatings due to modification of surface properties. The formation of a uniform coating on the chip surface is essential to impart even textural attributes. Application of Aloe Vera 20% presented remarkable chip texture during frying which might be due to the gelatinization of surface starch while inferior Chip crispiness scores were quantified in Aloe Vera 30% which might be due to their excessive moisture retention, which subsequently caused sogginess during processing.

Flavor retention in potato chips

Chip Flavor

Chip flavor scores, in general, illustrated a gradual initial increase followed by a decline at the end of the storage period. The flavor is the sensory impression of food detected by the blend of taste and smell senses. It is the overall resultant impression derived by the taste buds in the mouth and aroma detected by olfactory epithelium in the nose. Flavor evolution in potato chips is primarily attributed to the oil uptake and corresponding volatile formations during thermal processing. In general hydrocolloid coatings presented lower Chip flavor scores as compared to control due to reduced oil uptake. Maximum Chip flavor scores were estimated in control during most of the storage period which might be attributed to their high-fat absorption during processing. The efficiency of different cellulose-based edible coatings in reduced oil absorption during processing concluded that the combination of *1% methylcellulose and 0.5% sorbitol proved to be the most efficient coating for fat reduction and flavor retention in potato chips*. Aloe Vera coatings maintained appreciable Chip flavor scores of the processed chips. Chip flavor scores of the processed chips in 20% application which is also of great significance because of no coating-based bitter flavor. Plant-based edible coating for the preparation of low-caloric processed products is required to address health, economic and ethical issues. Therefore*, the current investigation revealed 20% Aloe Vera gel concentration as the best choice to produce low-caloric HALAL (permissible food in Islamic jurisprudence) processed products.* The outcomes of the present research might be utilized by small as well as large-scale processors to produce potato chips of low caloric value with higher sensory quality.

The application of edible coating decreases some destructive factors like the presence of various gases such as oxygen and carbon dioxide and humidity. Hydrocolloids are referred to a group of polysaccharides and proteins that create many features such as consistency in aqueous solutions, foams stability, emulsions, improve the sense of mouth and create a similar state of fatty and oily mode for products with lower content. In fact, hydrocolloid coatings can reduce the excessive oil uptake due to their interesting thermo-gelling properties and at the same time, they are invisible and have no negative influence on the sensory attributes of fried foodstuff. Even more, fried products have low-fat content with improved nutritional values, higher crispiness, and better palatability.

Coating process pre-treatment

The plant cell wall is a highly organized composite that may contain many different polysaccharides, proteins, and aromatic substances. These complex matrices define the features of individual cells within the plant body. Pectin is a major component of the primary cell walls of all land plants and encompasses a range of galacturonic acid-rich polysaccharides. Three major pectic polysaccharides (homogalacturonan, rhamnogalacturonan-I, and rhamnogalacturonan-II) are thought to occur in all primary cell walls. These three polysaccharide domains can be covalently linked to form a pectic network throughout the primary cell wall matrix and middle lamellae. This network has considerable potential for modulation of its structure by the action of cell wall-based enzymes. The pectic network influences the pH and ionic status of the matrix and, through its capacity to form gels, is also intimately involved in the generation of mechanical and porosity properties of cell walls, *Aloe Vera mucilaginous gel, and calcium chloride (0.2% W/V), and pectin (0.5% W/V) was used in the formulation of the edible biodegradable coating*, microbial growth could be suppressed by single and double-layered aloe-pectin coatings.

To ask for samples, and technical information on Innovaloe aloe concentrates and powders 200X, contact our global sales manager oscar@amb-wellness.com o WhatsApp at +52 871 315 4092.

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