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Influence of Agitation Speed and Water Temperature on Dried Squash (*Cucurbita pepo*) Properties during its Rehydration Process

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ABSTRACT

Throughout the present research, squash (*Cucurbita pepo*) slices (0.4 cm thickness and 4 cm diameter) were blanched in a steam chamber for 4 min. Following cooling to room temperature, the squash slices were dehydrated by use of a hot air dryer, under air temperature of 60°C up to moisture content of 0.1065 kg H₂O per kg d.m. Squash slices of specified weights were rehydrated by immersion in distilled water at different temperatures (25, 50, and 75°C). They were agitated at different speeds (0, 100, and 200 rpm). For any of the experiments, the dry matter to water ratio was kept at 1:25. The squash samples were removed from water at specified time intervals of up to 300 min. Then their weight, dry matter content and water absorption content (in percent) were determined. The squash slice color was examined over a 180 min period. The results showed that rehydration time, water temperature and agitation speed had significant effects ($p < 0.01$) on dry matter content, water absorption (percent) and color indices (L^* , a^* , b^* , and ΔE) in the dried squash slices. Water absorption percent and total color difference (ΔE) of squash slices increased, whereas dry matter content and color indices (a^* , b^* , and L^*) decreased with rehydration time. Maximum water absorption and ΔE , minimum dry matter content as well as color indices (a^* , b^* , and L^*), were observed in squash slices rehydrated into 75°C water and agitated at 200 rpm.

Keywords: Agitation, Rehydration, Squash, Water absorption percent, Color indices

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Measurement of Date Fruit Moisture Content by Use of a Nondestructive Dielectric Method

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ABSTRACT

Developing a rapid, nondestructive and reliable method to measure moisture content of date fruit is of interest in pre- and post-harvest processes of this valuable product. Throughout this research, by putting date palm fruits (cv. Mazafati) in a parallel plate capacitor, the sinusoidal alternative voltage in the frequency range of 1 to 100 MHz was exerted to the dates and the response of the circuit recorded while using a spectrum analyzer. Then, the relation between the power consumption of the system at different frequencies and the moisture content of the samples was studied and modeled using Multiple Linear Regression (MLR) analysis. The results indicated that by using the entire frequencies within the range of 1-100 MHz, the moisture content of date palm fruits could be predicted by a coefficient of determination (R_p^2) of 0.956, a Root Mean Squares Error of Prediction (RMSEP) of 5.28% and a Standard Deviation Ratio (SDR) of 2.97. By analysis of regression coefficients, some six effective frequencies in moisture content estimation were selected and used for building up the simpler models. The same similar results were obtained when compared with modeling by the entire range of frequencies.

Keywords: Capacitor, Function generator, Spectrum analyzer, Modeling, Standard deviation ratio.

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Optimization of Land Leveling Operations through Least Square Method and Its Comparison with the Genetic Algorithm and Particle Swarm Optimization Algorithm

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ABSTRACT

For a uniform distribution of water, decrease in water waste and decrease in erosion of soil, it is important that a land be prepared with proper slopes along its length as well as width. The aim of leveling is to create appropriate slopes for irrigation and drainage on the lands that were not already properly levelled and of the same time creating the level surface with a minimum transport of soil. Throughout the present study, characteristics of a level plane of an agricultural land are modeled by programming algorithm with the results being compared with Minimum Least Square method. Statistical and descriptive results show that Genetic Algorithm and Particle Swarm Optimization algorithm benefit from more accuracies than Minimum Least Square. Also, practice of such restrictions as maximum depth of excavation is easy to be applied in this method. In addition, using Genetic Algorithm method decreased the volume of excavation by 20% and 17.5%. Another method, called Particle Swarm Optimization, was also applied with the results indicating that the volume of the soil cut and fill for Particle Swarm Optimization method was recorded as less than that in Genetic Algorithm method.

Keywords: Algorithm, Leveling, Minimum Least Square, Particle Swarm Optimization, Genetic

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The Effect of Chitosan-Based Nano-Emulsion Coating on Extending the Shelf Life of Apple var. Golab Kohanz

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ABSTRACT

The effects of a nano-emulsion chitosan-based coating on enhancing the shelf-life and quality of Golab Kohanz apples were studied. The nano-emulsion coating containing Chitosan with a concentration of 2000 ppm was applied for coating of Golab Kohanz apples. Coated and uncoated apples were packed in normal packaging cardboards and kept at 2 ± 1 °C with a relative humidity within 80-85%. Flesh firmness, the activity of polyphenol oxidase, flesh and skin colors, the rate of respiration based on the level of CO₂ produced and the sensory characteristics of the coated vs. uncoated apples were recorded during a ten week of storage period at some specified intervals of one week. The results indicated that the coatings had no significant effect on flesh firmness and sensory characteristics of the apples, while the respiration rate of the coated apples decreased up to 50% with the coating lowering the respiration peak significantly. The polyphenol oxidase activity and the browning of the flesh increased significantly in uncoated apples following the respiration peak. Overall, results showed that the nano-emulsion chitosan-based coating can help increase the storage life of the apple.

Keywords: Nano-emulsion Chitosan-based coating, Flesh firmness, Golab Kohanz apple, respiration rate, polyphenol oxidase

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Effect of Pomegranate Peel Extract on the Antibacterial and Mechanical Properties of Sodium Caseinate Film

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ABSTRACT

Throughout the present, Caseinate based edible films containing extracts of pomegranate peel were prepared in 3 levels of $\times 1$, $\times 1.5$ and $\times 2$ (MIC) and the physicochemical, thermal, antimicrobial, and barrier properties of the films studied. To assess the microstructure changes resulting from the addition of the antimicrobial extracts, SEM images were prepared from the surface and cross-section of the films. Addition of the extract at concentrations up to $\times 2$ MIC increased the values for thickness and solubility from 0.054mm and 92.18% to 0.061mm and 95.37% respectively, and caused the films to become opaque. Also, addition of pomegranate peel extract significantly increased the WVP (up to 3.90×10^{-9} g/s.m.pa) of the prepared films, but lowered the mechanical properties. To evaluate the antimicrobial property of the prepared films' disc diffusion method was applied and the diameter of the formed halo measured. Antimicrobial properties of edible films were tested against two strains of Gram-positive and Gram-negative bacteria. Films were more responsive against Gram-positive bacteria than against Gram-negative ones.

Keywords: Edible film, Casinat sodium, Extract of pomegranate peel, Physicochemical properties.

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Evaluation of Antioxidant Properties of Essential Oil of Fennel (*Foeniculum vulgare*) and Its Effect on the Oxidative Stability of Soybean Oil

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ABSTRACT

In recent years the use of toxic and carcinogenic synthetic antioxidants are recommended to get limited. Therefore, the use of natural resource materials as an alternative substitution for synthetic compounds is indispensable. Throughout the present study, antioxidation properties of fennel essential oil, at different concentrations containing 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7 and 0.8 mg/ml in refined soybean oil, at 90°C for a duration of 4 weeks, and in constant seven day intervals were evaluated by recording the anisidine value, peroxide value as well as totox value. Also the resistance time against oxidation of samples was measured through Rancimat apparatus. Then the results of the two tests, incubation (oven test) and rancimat, were compared with control and synthetic antioxidants of Butylated Hydroxy Anisole (BHA) and Butylated Hydroxy Toluene (BHT) in their allowable consuming concentrations. Based upon the results of the study it became evident that the antioxidant effects will be increasing by increase in the concentration of the essential oil. But in the investigated concentration range, no direct linear relationship was observed between treatments' concentrations and their antioxidative activities in soybean oil. Concentrations of 0.5 and 0.6 mg/ml of fennel essential oil show a higher antioxidant activity than any of the synthetic antioxidants BHA and BHT as regards soybean oil.

Key words: Fennel, Essence, Soybean oil, Antioxidant

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Modeling and Optimization of the Effect of Osmo-Ultrasonic Pretreatment Followed by Hot Air Drying of Black Cherry Fruit

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ABSTRACT

Response Surface Methodology (RSM) was employed to determine the optimum processing conditions leading to maximum anthocyanin, phenolic compound and antioxidant activity during osmo-ultrasonic pretreatment followed by hot air drying of black cherry fruit. Temperature (40, 50 and 60°C), sucrose content (40, 50 and 60% w/v) and ultrasound frequency (0, 65 and 130 kHz) were the factors investigated with respect to anthocyanin, phenolic compound and %Ec50 during osmo-ultrasonic pretreatment followed by hot air drying of fruit. Experiments were designed according to Central Composite Design with the three factors each at three different levels. The experiments were conducted with solution to sample ratio of 10/1 (V/W). With respect to the dependent variables, both linear and quadratic effects of all the three independent variables on anthocyanin, phenolic compound and %EC50 were found to be significant ($P < 0.05$). For each response, second order polynomial models were developed using multiple linear regression analysis. Analysis of Variance (ANOVA) was performed to check the adequacy and accuracy of the fitted models. Optimization procedure was done using RSM to maximize polyphenol and anthocyanin content and as well to minimize Ec_{50} . Optimum conditions for the process were obtained as: 40°C for temperature, 40% for sucrose concentration and 1.31 kHz for frequency. Predicted values for phenolic compounds, total anthocyanins and Ec_{50} were recorded as 1.189 mg eq. galic acid/100g dry matter, 2837.82 $\mu\text{g}/100\text{g}$ dry matter and 0.0245/mg of dry matter, respectively. The proposed model for the prediction of dependent variables was in very closed match with the experimental results.

Keyword: Black cherry, Antioxidant activity, Modeling, Response Surface Methodology, Osmo-ultrasonic pretreatment

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Effect of Kefiran and Xanthan on Properties of Dough and Quality of French Bread

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ABSTRACT

Kefiran, extracted from kefir grains, is a water-soluble, glucogalactan containing almost equal amounts of D-glucose and D-galactose residues. Throughout this research, Kefiran and Xanthan were added at concentrations of 3% (w/w flour basis) to two wheat dough samples to investigate the effects on the rheological and physical properties of French bread. Physicochemical properties of wheat and its flour were analyzed through Inframatic, the rheological of wheat dough by Farinograph, the staling of bread by Instron texture analyzer apparatus. Results of Farinograph evaluation of the dough showed, adding of 3% level Kefiran and Xanthan led to a significant increase ($p < 0.05$) in the water absorption capacity, dough development time, dough stability in comparison with control, although the dough degree of softening after 10 and 20 minutes and Mixing tolerance index got decreased significantly ($p < 0.05$). Based on the results of staling tests done within the three times of: 24, 48 and 72 hours, it was characterized that an addition of levels of Kefiran 3% and Xanthan 3% to wheat dough, the rate of bread's crumb staling decreased significantly ($p < 0.05$), whereas the 3% xanthan sample had a lower rate of staling as well as higher hardness than the control samples. As a result, although Xanthan (like Kefiran) exerted a positive effect on the rheological properties of dough, but the hardness of breads in comparison with control and with samples containing Kefiran got increased.

Keywords: Kefir grains, Kefiran and xanthan, Wheat, Dough rheological, Bulky bread

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Three-dimensional modeling and simulation of Ohmic Heating of processing in a two-phase food system

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ABSTRACT

The basis of the Ohmic Heating process is the transmission of alternating electric current through multi-phase solutions that is followed by heat generation due to particle resistance to the transmitted electric current. Throughout the present study, simultaneous transfer of heat and electricity was modeled in a two-phase system of solid-liquid food to investigate the critical factors affecting the process. A three-dimensional simulation was employed in the modeling to investigate the effect of particle distribution, salt diffusion as well as electrical conductivity. The results revealed that there existed a good agreement between the results of the modeling with the experimental results. It was also revealed that with increase in the concentration of salts and electrical conductivity, heating rate increased. In total, it can be concluded that heat and electricity diffusion throughout the product is faster than that in conventional heating methods and proceed similarly and almost with equal speed in both liquid and solid phases.

Keywords: Ohmic Heating, Modeling, Solid-liquid phase

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Assessment of the Rheological Properties of Dough and Shelf Life of Barbary Bread Containing Sodium Alginate Hydrocolloid

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ABSTRACT

In the baking industry, use of hydrocolloid technology to improve the operation and to increase the tolerance to paste fermentation conditions, improve quality and increase the shelf life of fresh as well as stored bread, is of large applications. This research was carried out to evaluate the effects of gel of sodium alginate on rheological properties of dough and quality (volume, specific volume, cooking loss and water activity), sensory properties and staling of Babary bread. Hydrocolloids of sodium alginate were added at 0.5%, 1%, 1.5% w/w levels (flour basis) to wheat flour. The rheological properties measurement of the dough and of staling of breads were investigated using Farinograph and Instron instruments, respectively. Results of rheological evaluation of dough showed that addition of gel, leads to increase in the water absorption capacity, dough arrival time in line of 500 BU, dough development time, dough stability, dough departure time of line of 500 BU and time to breakdown, while the dough degree of softening after 10 and 20 minutes past and mixing tolerance index got decreased in comparison with control. Results in an evaluation of bread water activity showed that addition of hydrocolloid decreased bread water activity. Results related to an evaluation of the properties of technology of bread showed that an addition of gel at a level of 1.5 percent increased volume as well as specific volume of the bread. The results of staling tests done within the three times of 24, 48 and 72 hours showed that addition of sodium alginate (0.5, 1, and 1.5%) on dough, the rate of bread's crumb staling decrease significantly ($p < 0.05$). Also, breads containing sodium alginate benefitted from a lower rate of staling than the control samples. In other words, bread samples containing 1.5% sodium alginate and control samples were of the least and the most staling rates. In relation to sensory evaluation of bread samples, it was revealed that the addition of hydrocolloid of levels of 1.5 percent exerted the strongest positive effects on some sensory properties of the bread.

Keywords: Sodium alginate gel, Dough rheology, Improving quality, Barbari bread, Staling

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