An Evaluation of Energy Efficiency of Broiler Production Farms Using Data Envelopment Analysis Technique, Case Study: Isfahan Province

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ABSTRACT

Energy consumption pattern, efficiency and the percentage of saved energy vs. inputs in poultry production farms in Isfahan, Nain and Najafabad townships (of different capacities) were evaluated. The average net energy gains per 1000 bird for capacities less than 10, 10-30 more than 30 thousand pieces were calculated as -143.66, -129.58 and -94.99 GJ/1000 birds, respectively. Technical efficiencies for different capacity groups amounted to 88, 92 and 96 %, respectively, while pure technical efficiencies were recorded as 97, 98 and 99%, respectively. The optimized input energy by the returns to variable scale models and for capacities less than 10, 10-30 vs. that of more than 30 thousand pieces were reported as 146.90, 136.80 and 117.77 GJ/1000 birds, respectively.

Keywords: Poultry, Capacity, Energy management, Technical efficiency, pure technical efficiency.

A Study of Drying Kinetics of Button Mushroom Pretreated through Osmotic Dehydration

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ABSTRACT

Dehydration is one of the most common preservation methods for button mushroom. Dried mushroom slice and powder are used in formulation of soups and sauces. Throughout the present study, the effect of osmotic pretreatment on drying kinetics of button mushrooms was studied. Thin slices of mushroom were immersed in an osmotic solution, containing 5% sodium chloride and 0.5% calcium chloride at a temperature of 40 °C for 120 min. Pretreated samples were then hot air dried (with air speed of 1.8 m/s) at a temperature of 50 vs 60 °C to a final desired moisture content. Effective moisture diffusion coefficient, activation energy, shrinkage, rehydration ratio and colorimetric parameters were evaluated following dying. Osmotic dehydration significantly ($p<0.05$) decreased drying time and increased drying rate. The effective moisture diffusion coefficient in osmotic pretreated samples was higher than that of control. Osmotic pretreatment prior to hot air drying led to a significant ($p<0.05$) decrease in activation energy. Osmotic pretreatment decreased shrinkage, rehydration ratio and color L value. However, overall color and "a" and "b" values were not significantly ($p<0.05$) influenced by osmotic dehydration.

Keyword: Drying kinetic; osmotic dehydration; hot air drying; button mushroom

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Effect of Paddy Discoloration on Apparent Quality, Milling Properties and Grain Bending Strength

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ABSTRACT

Grain discoloration (caused by fungal agents) is a complex disease and in the crop seasons when mature grain stage coincides with successive rain falls, it spreads and causes many damages. In this research the effects of paddy discoloration in three varieties (*Hashemi*, *Gohar* and *Khazar*) as well as disease index (high vs. low disease index levels) on grain apparent quality, milling properties and grain bending strength were investigated. The experiment was conducted in a factorial layout based on a randomized complete design of three replications. The milling recovery, degree of whitening, bending strength, length and thickness of the grains (brown rice) in the case of high disease index were lower than those in low disease index. Also it was shown that the broken grains in the three varieties of *Hashemi*, *Gohar* and *Khazar* (in high disease index) increased by 5.33, 1.53 and 2.52% as compared with those of low disease index. Therefore it becomes evident that grain discoloration reduces the bending strength and grain size resulting in lower milling recovery, head rice yield degree of whitening of rice.

Keywords: Paddy discoloration, grain dimensions, bending strength, milling recovery.

Effect of Extruder Parameters on Some Mechanical Properties of Compost Pellets

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ABSTRACT

Conversion of the organic wastes and losses into compost is an appropriate technique to stabilize organic materials. One of the limitative factors in transportation and storing of composts is their low specific mass which usually leads to increased costs in their handling and processing. To overcome this, several such methods as pelleting have been proposed especially for the efficient handling of voluminous materials. Throughout the present study, the effects of pellet particle size (two levels: 1 and 2 mm), pellet's moisture content (at three levels: 25, 35, and 45%, wet basis), and kneading length (three levels: 1, 2, and 3 m) have been investigated on some mechanical properties of obtained pellets namely fracture energy, fracture force, as well as toughness. Obtained pellets were produced using a kneading extruder apparatus. Experimental results showed that the effect of length of kneading on all studied mechanical properties was significant ($p<0.01$). Maximum values were recorded for 3 m kneading lengths. The highest fracture force (556.32N) was determined for pellets with 35% moisture content and 3 m kneading length. Furthermore, a maximum level of toughness (1.03 $MJ.m^3$) was recorded for compost pellets with 1 mm particle size and 3 m kneading length.

Keywords: kneader extruder, length of kneading, densification, pellet, compost

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Energy Modeling of Plum Production in Golestan Province

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ABSTRACT

The aims followed in this study were to investigate the energy flow and its modeling for Shablon cultivar of plum production in Golestan Province, Iran. Data were collected through questionnaires as well as interviews with producers. Cobb-Douglass model and sensitivity analysis were used to determine the effects of energy inputs on plum yield. The results revealed that the total energy inputs and energy use efficiency of plum production in the region were 25870.33 MJha-1 and 1.04, respectively. Diesel fuel and chemical fertilizer, the highest energy inputs, carried shares of 33 and 30 percent, respectively. The shares of renewable energy and non-renewable energy of production were recorded as 88 and 12 percent, respectively. The Cobb-Douglas model results revealed that the effects of human labor, agricultural machinery, diesel fuel, biocide and farmyard manure were positive on the yield, in contrast, the effect of chemical fertilizer use on plum yield was negative. The results concerning the sensitivity analysis showed that increasing one unit of MJ in input energies of human labor, machinery, diesel fuel, biocide and farmyard manure led to an additional increase in yield recorded as 0.34, 0.46, 0.12, 0.26 and 0.21 kg, respectively. An increase of one unit of MJ inputin the form of energy of chemical fertilizers led to a decrease in yield of 0.87 kg.

Keywords: Energy inputs, Cobb-Douglas, Energy efficiency, Sensitivity analysis

Experimental Study of Thermal Behavior for a Non-evacuated CPC Collector with Heat Transfer Oil

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ABSTRACT

Sustainable development would be a key solution for climate change and renewable energy plays an important role in this policy. Recently, according to increase of CO2 emission and other relevant impacts, solar energy has been gaining more attentions from policy makers. Thus, compound parabolic concentrators collectors are considered as one of the promising applications from solar thermal advantages. Therefore in this study a non-evacuated CPC collector with 2.5 of concentrating ratio and heat transfer oil as the fluid has been provided and tested under different mass flow rates (3 levels). Experimental results indicate that, outlet temperature is within 80-100^{o}C for all conditions. Moreover, it was concluded that heat losses decrease, when oil mass flow rate descends, presumably wind cooling effects is a dominant factor during test periods. Additionally, extracted differential temperature of oil in the collector was correlated with solar radiation and results proved system compatibility with industrial heat demands.

Keyword: Non evacuated, Heat loss, Heat transfer oil, Thermal efficiency

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The Influence of Enzymatic Treatment Time of Microbial Transglutaminase on the Properties of Edible Film Based on Whey Protein Isolate

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ABSTRACT

The effect of enzymatic treatment time of microbial transglutaminase (MTGase) on the characteristics of whey protein isolate (WPI) films was investigated. Results shown that the properties of MTGase-treated films were affected by increasing the enzymatic treatment time. Enzymatic treatment at lower incubation time, i.e. for 1 h, significantly resulted in higher values of tensile strength (TS) and lower values of elongation at break (EB) as compared to control film. In the MTGase-treated films, the TS values decreased gradually and EB values increased progressively with increasing incubation time from 1 to 3 h. Water vapor permeability (WVP) and total soluble matter (TSM) of control film in comparison with MTGase-treated films decreased from3.6 $\times 10^{10}$ to 2.31 $\times 10^{10}$ g m^{-1} s^{-1} pa^{-1} and from 37.07 to 19.97 percent, respectively. However, as the time of enzymatic treatment was increased the TSM and WVP were gradually increased.

Keywords: Edible film, Mechanical properties, Microbial transglutaminase, Whey protein isolate

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Applying the Decision Support Software for Evaluation of Tractor-Plow System Matching and Effect on Energy Consumption in Plowing Operation

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ABSTRACT

This study aimed to determine the accuracy of tractor-moldboard plow system for tillage operation in paddies and also survey on efficacy of decision support software application on energy consumption as a case study in Sari. Hence, a decision support software was used to selected proper tractors-moldboard plow systems for each case study fields as for effective parameters and calculates the amount of energy use in case study operation. For survey in amount of efficacy of applying the decision support system in paddies tillage operation, amount of energy used in those paddies compared with other paddies. Results showed that 21.38% of energy use in tillage operation was slaking by using of decision support system for selection of tractor-moldboard plow systems. In other section of study, developed decision support system was applied for determining of amount of accuracy in tractor-moldboard plow system for tillage operation on paddies. For this purpose, properties of used tractor-moldboard systems on paddies collected from 40 samples. Decision support system showed that 65% of total samples had inappropriate tractor-moldboard plow systems. Also, 100% of them were inappropriate for paddies less than 3 hectares. In other hand, owning of tractor and moldboard plow was important and effective in appropriate matching of them. Generally, this study showed that selection and matching of used tractor-moldboard plow systems on paddies were inappropriate and illogical; subsequently causes to increase the energy use, decrease the economic benefit and operation efficiency. Developed decision support system is usable for aims of researching, learning and managing about agricultural machineries and attainment to mechanization purposes.

Keywords: Energy, Decision support system, Paddy, Tractor-moldboard plow system, Mechanization

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An Investigation of the Physicochemical, Textural and Sensorial Properties of Functional Dairy Dessert Prepared from Hull-less Barley Malt

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ABSTRACT

Milk-based dairy desserts play on important role in human diet because of their nutricious nature. This study aims at finding out of effect of adding hull-less barley malt flour and gelatin to dairy dessert. Formulations were prepared varying in gelatin concentration (0, 0.5, 1.0, 1.5 and 2%) and as well malt to starch ratio (0, 25, 50, 75 and 100%). Dessert samples were analyzed for their physicochemical properties as well as sensory attributes. Results revealed that desserts with higher levels of malt contained higher protein, ash and fat and also desserts containing gelatin had high protein, ash and dry matter. In all the samples during their storage for duration of 3 weeks, pH got increased. Texture analysis showed that increasing levels of gelatin increased texture factors of hardness, thickness and cohesion. Desserts containing the highest malt and gelatin won the most acceptability.

Keywords: Hull-less barley, Malt, Gelatin, Dairy dessert.

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A Study of Fixed Bed Pyrolysis Process on Urban Pruned Woods of Trees in An Oxidative Atmosphere

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ABSTRACT

The purpose followed in this article is to study the effects of the presence of oxygen on the waste wood pyrolysis process to produce bio-char towards this end cubic samples of 2.5 cm dimension were pyrolized at 300 and 400 °C. The surface and in center temperatures of samples were recorded and their mass losses calculated from the ratio of pyrolized mass to initial mass of the sample. Increase in temperature caused increase in the rate of pyrolysis and temperature changes, but decreased the final efficiency of biochar. Moreover, the surface temperature of samples in oxidative pyrolysis, as compared with the pyrolysis in an inert gas containing environment, is more for about 100 °C, i.e. reduction in time spent, and consequently in energy use during the oxidative pyrolysis process .According to the non-linear nature of waste wood pyrolysis process, Artificial Neural Network (ANN) was employed to model the temperature distribution and the mass loss of samples. The results obtained from ANN analysis were in good agreement with the experimental findings and resulted in the correlation coefficients of 0.9998 and 0.9991 in modeling of temperature distribution and mass loss of samples, respectively.

Keywords: waste wood, Oxidative pyrolysis, Temperature changes, Mass loss fraction, ANN

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Effects of Moisture Content, Loading Rate and Grain Size on Some Mechanical Properties of Barley Seed

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ABSTRAT

This study was carried out to determine some mechanical properties of barley seed including Deformation, Rapture Force, Rapture Energy and toughness as a function of moisture content (10.5%, 12.5%, 14.5% , 16.5%, db), loading rate (5, 15, 25, 35 $mm.min^{-1}$) and grain size (small, medium, large). Tests were performed in 7 replications by means of a factorial base plot experiment. The results reflected a significant effect of moisture content on all the studied properties ($p>0.01$).Also there were significant effects of grain size observed on rapture force, rapture energy and deformation as well as significant effect of loading rate observed on deformation at 1% level of probability. The interaction effect of moisture content- loading rate was significant on deformation and toughness ($p>0.01$) and as well on rapture force and rapture energy ($p>0.05$). The more the percentage of moisture content, the more the mean level of all the measured properties of barley seed. The mean levels of rapture force and deformation increased linearly with increase in the moisture content.

Keywords: Barley seed, Toughness, Mechanical properties, Rapture force.

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Evaluating the Potential of Wind Energy Generation through Statistical Analysis of Wind Characteristics – Case Study: Eqlid County of Fars Province

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ABSTRACT

Wind speed is one of the most important determinants related to wind energy; Data obtained in different areas with the potential for wind energy is comes from meteorological stations The potential for wind energy can be assessed through statistical probability distributions of its data. Throughout the present study, the data obtained from the weather station in the city of Eqlid during a ten-year period has been used. Weibull distribution was chosen as the most suitable distribution function using curve fitting method as well as some statistical parameters. The results indicated that the average wind speed was about 2.96 meters per second. Average rating for extracting the maximum wind speed (V_{emp}) at the studied station was about 7.81 meters per second. The total power density and wind energy were 79 Watts per square meter and 657.6723 KiloWatt hours per square meter during the ten-year period, respectively. The dominant wind direction with the highest contribution in the region belonged either to the east or west.

Keywords: Eqlid County, Wind energy, Renewable energy, Rayleigh distribution, Weibull distribution

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Assessment of Structural Problems of Vegetable Greenhouses in Khuzestan Province

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ABSTRACT

Greenhouse structure plays an important role in success and productivity of greenhouse production. This research work was conducted to study problems related to vegetable greenhouse structure in Khuzestan province for duration of one year (2011-2012). Twenty one greenhouses were selected through simple randomized sampling while Questionnaires were being filled up. The results revealed that the major problems in greenhouse vegetable production are: low height of the roof and gutters, low ratio of height to width, insufficient ratio of ventilated area to floor area, inefficiency of cooling and heating systems along with poor ventilation. Finally, it can be concluded that, the studied greenhouses are grouped in low class technology greenhouses.

Keywords: Greenhouse, Khuzestan, Structure, Vegetable, Problems

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Design, Development and Evaluation of a Differential Lock Control System for Mf-399 Tractor

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ABSTRACT

A differential lock control system was designed and developed for activating the differential lock mechanism automatically and without the driver's interference at various working conditions as well as providing safety. The system is comprised of the main control board equipped with monitor and keyboard which receives input data from the sensors mounted on the wheels and steering rod, processes the data, and controls the hydraulic actuator as according to the predetermined conditions. The system was tested and evaluated after fabrication and its accuracy determined. A field experiment with three replications was conducted to investigate the effect of gear ratio (high and low), the method of tractor movement during plowing (over the preceding furrow and on the unplowed land), and differential position (conventional and under the developed control system) on drive wheel slippage and fuel consumption of *MF399* tractor with mounted three-bottom moldboard plow. For data analysis, a 2×2×2 factorial experiment was applied with a randomized complete block design. The results of analysis of variance of test data showed the highly significant effects of plowing method, differential position, and their interaction and also the significant effect of gear ratio on drive wheel slippage. Moreover, differential position showed the highly significant effect on fuel consumption, so that with differential lock engagement under system control, the fuel consumption was reduced from 25 to 40 percent on the average. The overall results indicate that the continuous employment of this type of differential lock control system is needed for reduction of energy consumption and increasing of the tractor efficiency and field capacity.

Keywords: Tractor, Wheel slip, Differential lock, Tractive efficiency, Differential lock control system.

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Effect of Clay Nanoparticles on Structural and Thermal Properties of Nano-biopolymer Films Based on Kefiran

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ABSTRACT

Kefiran is an exopolysaccharide produced by microorganisms present in the kefir grains that are of several health promoting properties. In this research, physico-mechanical and thermal characteristics of nanocomposite film composed of kefiran-montmorillonite (MMT; 1, 3 and 5% w/w) were studied. Results revealed that the thickness and the tensile strength of the films increased by increasing the nanoclay content, but the effect on the elongation at break, glass transition temperature and melting temperature in various concentrations was different. These factors increased until concentrations of up to 3% of the nanoclay and decreased in higher concentrations (5%). X-ray diffraction analysis exhibited the formation of an exfoliated structure with the addition of small amounts of MMT to the kefiran matrix. Scanning electron microscopy and the surface topography results showed ideal dispersion for MMT nanoparticles into the structure of the bio-nanocomposite films and a considerable increase in roughness parameters (by incorporating the nanoparticles in kefiran matrix) respectively.

Keywords: Nanocomposite Film, Kefiran, X-ray diffraction, Surface topography

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An Investigation of Mechanical and Physical Properties of Soy Protein Isolate - Tragacanth-Nanocellulose based Nanocomposite Film

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ABSTRACT

In the past decades, environmental pollution caused by plastic packing materials, limitation of petroleum resources along with their high prices attracted many researchers to produce biodegradable packaging materials. Poor mechanic properties and high water vapor permeability are two main shortcomings of biodegradable polymers. Nanotechnology seems to be of the capacity to provide the answer in this case. Throughout the current study, the effects of NanoCellulose (NC) as nano filler on the functional properties (i.e. Solubility in Water (SW), Moisture Content (MC), Water Vapor Permeability (WVP), Tensile Strength (TS), Elongation up to Break point (EB), color and structural properties) of Soy Protein Isolate-Tragacanth Gum (SPI-TG) were investigated. The results indicated that the functional properties of SPI-TG-NC were promoted. The highest yellowness index and total color difference were observed in SPI: TG (4.7:0.3), The lowest yellowness index and total color difference were observed in SPI-TG-NC (3%). The microstructure of film specimens was investigated using scanning electron microscope.

Keywords: Soy protein isolate, Tragacanth Gum, Nanocellulose, Mechanical and physical properties, Nanocomposite.

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Flow Rate Determination of Granular Material by Use of Sound and Multivariate Data Analysis

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ABSTRACT

Throughout the present study, making use of sound created by wheat grain passing through a pipe, wheat flow rate was measured. The developed device consists of a hopper, metering device, sound sensor, delivery tube, DC motor as well as power supply. Several wheat mass flow rates were tested and the sound signals created through the passage of the grain through the discharge tube was measured and transferred to a computer using Data Acquisition Card (DAC). Utilizing MATLAB signal processing toolbox and wavelet transfer functions, it was possible to extract frequency characteristics of the sound signals used as the distinguishing features of the different flow rates. Artificial Neural Networks-Multilayer Perceptron (ANN-MLP) and Discriminate Analysis (DA) were applied to classify different wheat flow rates. Results indicated that through an application of DA vs ANN-MLP it was possible to determine different wheat flow rates with respective accuracies of 97% and 89%.

Keywords: Flow rate, Wheat grain, Sound processing, Wavelet transform, Precision farming.

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Classification of Different Floral Origins of Honey Samples Using a Machine Olfaction System

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ABSTRACT

Honey is a delicious sweet viscous fluid, produced by bees through sucking of the nectar of flowers. Honey is in total a highly concentrated water-soluble compound of sugars which due to its containing of fermenting material, is helpful in food exchanges, and as an aid to digestion. It is also of a high order of standing among the foods. Flavor is one of the determinant parameters in honey for quality distinction and classification. Gases that are involved in honey smell are resulted from flower's pollen scents collected by bees. It is also dependent upon the processes in the bee's body to convert pollen to honey. So the emitted smell by the honey depends on flowers varieties and can naturally be different. These factors led the authors to design an apparatus of olfactory system based on Metal Oxide Sensors (MOS) to distinct and classify different floral origins of honeys. Ten samples from each of the seven different floral origins of honey comprising a total of 70 samples (at the rate of 5 g in each sample) were placed in sterile petri dishes and then tested. Experiments were conducted in three stages: baseline correction, injection of sample gas odor and cleansing of the sensor. The fractional data preprocessing procedure was employed for normalization and to prevent over fitting, as well as reducing the input data. Principal Component Analyze (PCA), Linear Discriminant Analyze (LDA) and Artificial Neural Network (ANN) were methods to classify and analyze the extracted features obtained from the signals of the olfactory system apparatus. To classify the floral origin of the honey using the olfaction apparatus, the results indicated 97% of variance by PCA, as well as 87.3% and 88.5% accuracy classification by LDA and ANN, respectively. As a conclusion, it was found that the apparatus, namely the electronic nose could provide the proper information for the classification of different floral origin honeys.

Keywords: Principal Component Analysis, Linear Discriminant Analysis, Artificial Neural Network, Gas Sensors, Quality

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Improvement of Physicochemical, Textural and Sensory Properties of Layer Cake as Affected by Replacement of Egg Yolk with Commercial Gel Emulsifiers

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ABSTRACT

Egg constitutes one of the essential ingredients in cake formulation. Numerous such concerns as egg contamination, yolk after-taste, fat acidity and high levels of cholesterol exist in utilization of egg in cake industry. Nevertheless, complete removal of egg in cake formula is not possible due to the importance of functional properties of egg white as moistening, aeration and structural impact, freshness, non-enzymatic browning reactions and hence crust color, as well as aroma and flavor development. Thus, the objective of this study was to replace egg yolk with different industrial gel emulsifiers "emulgels", on the one hand to improve different quality parameters of the layer cake, and on the other to control cake fat acidity. Other treatments used were egg yolk and egg white as well as whole egg (control). Batter density and consistency, cake volume, height and symmetry, moisture, fat acidity and peroxide value, cake instrumental and sensory firmness, staling and organoleptic properties were scrutinized for a duration of two months of storage. Results indicated that batter physical properties, cake shape characteristics (volume, height and symmetry), textural and sensory properties of cakes with gel emulsifiers specially "emulgel Jilk" were significantly improved as compared with those of other treatments. Moreover, formulations with emulgels and egg white had significantly lower fat acidity and peroxide value as compared with those with egg yolk in their formulation.

Keywords: Layer cake, Gel emulsifier, Physicochemical, Organoleptic properties

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Quality, Sensory and Microbial Characteristics of Fresh Orange Juice Packed in LDPE Nano Composite Films Incorporated with Organoclay, Modified Nanoclays and Ag, Cu and ZnO Nanoparticles

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ABSTRACT

The aim followed in this research was to investigate the efficiency of LDPE films incorporated with different Nano fillers in extending shelf life of orange juice. Fresh orange juice packed in different films was assessed for microbial stability, ascorbic acid content, pH, color parameters and sensory quality following 1, 7, 28 and 58 days of storage. Mold and yeast, acidophil and aerobic mesophyll bacteria populations in orange juice packed in Nano composite films containing metallic nanoparticles were significantly ($p<0.05$) lower than those packed in LDPE films containing Nano clay as well as those packed in pure LDPE films. LDPE with metallic nanoparticles exhibited the strongest antimicrobial effect after 28 days pas compared with the other films. The least ascorbic acid loss was seen in LDPE-modified organoclay films as compared with other Nano composite films; pH increased upon storage, the lowest being recorded in LDPE-metallic nanoparticles as compared with other treatments during different periods of storage. The overall color change (ΔE) and browning index (BI) of orange juice packed in LDPE-metallic nanoparticle films were significantly ($p<0.05$) higher than those packed in LDPE-modified organoclay and then control films (pure LDPE). The highest and lowest overall sensory scores were obtained for orange juice packed in LDPE-metallic nanoparticles and control films, respectively. According to the related standards, the migration of silver, copper and zinc ions from films coated with metallic nanoparticles were counted as lower than in their toxic limits.

Keywords: Orange juice; Nano composite film; Shelf life; Quality; Microbial; Organoleptic

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