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Extraction and Identification of Phytoestrogen Compounds, Ellagic and Syringic Acids from Pomegranate Peel : Rahmatollah Zараezadeh Mehrizi, Zahra Emam-Djomeh, Keramatollah Rezaei, Mohammad Shahedi Bagh Khandan, Javad Keramat, Elaheh Loni	1
Optimization of Passive Tractor Cabin Suspension Parameters Using Particle Swarm Optimization Algorithm: Saman Abdanan Mehdizadeh	2
Design Portable Pneumatic Branch Shaker with Programmable Logic Controller: Ali Rezaei, Mohammed Loghavi, Saadat Kamgar, Dariush Rezaei	3
Influence of Air Flow Recirculation on Energy Consumption and Efficiency in a Solar Dryer: Omidreza Roustapour, Ahmad Afsari, Yaser Jahangir	4
Energy and Exergy Analyses of Thin Layer Drying of Tomato in a Forced Solar Dryer: Hadi Bagheri, Akbar Arabhoseini, Mohammad Hosein Kianmehr	5
Prediction of Internal Bruising in Cantaloupe by Nonlinear FEM Model Using ABAQUS Software: Esmail Seyedabadi, Mahdi Khojastehpour, Hasan Sadrnia	6
Effect of Guar and Carboxymethyl Cellulose Thickening Agents on the Physical and Rheological Properties of Set Fruit Yogurt: Akbar Zamani, Hadi Almasi, Babak Ghanbarzadeh	7
Identification of Apple Leaf Varieties Using Image Processing and Adaptive Neuro-Fuzzy Inference System: Elham Omrani, Seyed Saeid Mohtasebi, Shahin Rafiee, Soleiman Hosseinpour	8
Investigating Different Properties of Anti-microbial Nanocomposite Packaging Films Containing Organically Modified Nanoclays: Seyede Homa Fasihnia, Seyed Hadi Peighambardoust, Seyed Jamaledin Peighambardoust	9
Design and Evaluation of a Path Detection Algorithm in Road Images Using Hough Transform: Saeid Minaei, Alireza Mahdavian, Ahmad Banakar	10

Extraction and Identification of Phytoestrogen Compounds, Ellagic and Syringic Acids from Pomegranate Peel

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ABSTRACT

Fresh peels of three dominant Iranian pomegranate cultivars were taken to be extracted through soxhlet extraction method via four different solvents. The extracts were analyzed by use of High Performance Liquid Chromatography (HPLC), using ultraviolet-visible spectrometric detection. The extraction yields and presence of seven phytoestrogenic compounds, two tannic acids along with their quantities in the extracts were determined. The compounds were identified and quantified according to their retention times in comparison with those in standard samples. A comparison of fresh pomegranate peel of some three cultivars indicated that the yield of extraction from Poost Goliye Malase Saveh variety was more than the yields of the other two cultivars and the yield of extraction of extracts obtained through a mix of the solvents was more than that through any single solvent ($p \leq 0.05$). HPLC analysis indicated besides ellagic and syringic acids, some of such phytoestrogens as Esteriol (up to 7.45 mg/100 g fresh peel), Testosterone and α -Estradiol (up to 8.43 mg/100 g fresh peel) were also found in the extracts of the pomegranate peels. The results show that, of the two tannic acids, a high value of ellagic acid (up to 103.0 mg/100g fresh peel of Poost Siyahe-Ardestan) was detected in any of the extracts.

Keywords: HPLC; Soxhlet; Esteriol; Ellagitannin; Acetone.

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Optimization of Passive Tractor Cabin Suspension Parameters Using Particle Swarm Optimization Algorithm

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ABSTRACT

A survey intended to determine the spring and damper settings of ITM285 tractor's cabin that ensured the optimal ride comfort of the tractor operator was conducted. Analysis was done in terms of Root Mean Square Acceleration Response (RMSAR) within one-third-octave band and International Standard Organization (ISO). Optimization was performed using Particle Swarm Optimization (PSO) method on a 2 DOF modeled in MatLab software for frequencies ranging from 1 to 10 Hz. The obtained figures for C_1 , C_2 , K_1 and K_2 were 943 (Ns/m), 850 (Ns/m), 3927 (N/m) and 26199 (N/m), respectively. Modeling tractor cabin, applying optimized parameters according to ISO 2631-1985, showed 16.7, 10.1, 11.5 and 12.2 % reduction in rise time, peak time, settling time and max. overshoot of the tractor cabin displacement. Therefore, the transmitted vibration was diminished, and and improvement in the ride comfort of the tractor operator achieved.

Keywords: Tractor cabin, Transmitted vibration, Particle Swarm Optimization (PSO)

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Design Portable Pneumatic Branch Shaker with Programmable Logic Controller

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ABSTRACT

A portable light pneumatic branch shaking system was designed and the device manufactured for harvesting such fruits that could be harvested through shaking of the tree branch. The required electric current and airflow, for operating the system, are provided from a system containing an electrical generator and an air compressor on wheelbarrows and portable chassis. The vibration system is equipped with Programmable Logic Controller (PLC) for controlling the frequency and it is also equipped with a pantograph arrangement to provide change in the amplitude. The first farm test was done on an olive tree with three levels of frequency (8, 12 and 16 Hertz) and three times of shaking (5, 10 and 15 seconds) within a constant amplitude of oscillation of 5 cm in a completely randomized design of four reduplications. The second test was performed on olive with three levels of frequency (8, 12 and 16 Hertz) and three amplitudes of oscillation (50, 80 and 100 mm) for a fixed period of 5 s in a completely randomized design of four reduplications. Some needed experiments were performed for determining the static force needed for separating the fruit from the intended branch and for comparing it with the dynamic force initiated produced through vibration. The results showed that oscillatory frequency and duration of shaking out have meaningful effects (one percent level of probability) on the efficiency of the shaking system. The interaction was not of any meaningful effect. A comparison of means indicated that an increase of the time of vibration didn't meaningfully affect the level percent of harvested olive in constant oscillation, but increase in oscillation within constant time of vibration exerted a meaningful effect on percent of harvested fruit. Also, the results indicated a meaningful effect of amplitude of oscillation on the falling olive. Through a comparison of means, it was evidenced that falling olive is increased with increasing frequency within constant amplitudes of oscillation. There were no meaningful differences observed between percent of olive falling and increase in amplitude of oscillation from 50 to 80 mm within constant frequencies. But when amplitude of oscillation was increased from 80 to 100 mm, the percent of falling olive increased meaningfully. Finally, by performing 16 Hz frequency and 100 mm amplitude of oscillation for a duration of 5 s, 90 percent of the fruit olive got detached from the branches, and therefore they were selected as the most desirable rates of amplitude, frequency and time of vibration.

Keywords: Olive, Vibration, Frequency, Amplitude, PLC

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Influence of Air Flow Recirculation on Energy Consumption and Efficiency in a Solar Dryer

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ABSTRACT

A combined solar dryer of a specific mechanism to be adjusted for the tilted angle of the collector was utilized to get the following needed information. The efficiency of the dryers is low because of such various reasons as heat loss of air occurred in an open flow circuit. Getting air back toward the air inlet of a dryer can increase the efficiency of the dryer while decreasing the drying process period. A new mechanism was considered for a dryer in which, the percentage of air recirculation is controlled. It contains two dampers embedded in return air channel of the dryer. In order to investigate the effect of air recirculation on energy consumption of drying and dryer efficiency, thin layers of tomato slices are dried at three levels of air flow rate (0.018, 0.036 and 0.054 m³/s) and at four levels of air recirculation percentage (0, 50, 75 and 87.5%). The experiments were carried out, starting with the beginning of the autumn when the moisture content of the samples reaches 12% (w.b.). The results indicated that a minimum of energy consumption and a maximum of efficiency were achieved when 75% of air flow was forced back to the inlet of the dryer.

Keywords: Solar dryer, Air flow recirculation, Energy consumption, Efficiency

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Energy and Exergy Analyses of Thin Layer Drying of Tomato in a Forced Solar Dryer

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ABSTRACT

The energy and exergy analyses in the process of chamber drying of thin layers drying of tomato in a forced solar drying was investigated. The experiments were carried out with two thicknesses of 5 and 7 mm and two airflows of 0.5 m.s⁻¹ and 1 m.s⁻¹. During the experimental process, ambient temperature was adjusted between 22 and 36 °C, air relative humidity between 14 and 50%, and while solar radiation ranging from 150 to 850 W.m⁻². The effects of drying variables on energy utilization, energy utilization ratio, exergy loss and exergy efficiency were studied by applying the first law of thermodynamics. In chamber drying at an airflow of 1 m.s⁻¹ and thickness of 5mm, the values of energy utilization, energy utilization ratio, exergy loss and exergy efficiency varied from 6.62 to 152.72W, 0.02 to 0.45, 2.42 to 32W and 32 to 80, respectively. In addition, the results indicated that both energy utilization rate and exergy loss efficiency of the drying chamber decreased with increase in the mass dried, flow rate and drying thickness while the exergetic efficiency and energy utilization of the drying chamber getting increased.

Keywords: Energy, Exergy, Thin layer tomato, Solar dryer.

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Prediction of Internal Bruising in Cantaloupe by Nonlinear FEM Model Using ABAQUS Software

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ABSTRACT

Mechanical damages in the processes of harvest and post-harvest form the most important causes of loss in Cucurbits. They cause tissue destruction and consequent fruit's decay. Because of the difference between the mechanical strength of cantaloupe flesh vs. that of the skin of cantaloupe, internal bruising's constitute the more usual damages with no visibility. This type of injury is hard to predict through analytical methods. Throughout the present study, the mechanical properties of skin vs. flesh were determined through individual experiments and then Finite Element Model (FEM) was developed through ABAQUS software. The applied displacements on the model were equal to 5.5, 11 and 16.5 mm or 10, 20 and 30% of the final deformation, respectively. The analytical results showed that the internal tissue of fruit reached the yield point at 20% of whole displacement or in 90N force, with the internal failure occurring as not visible on the surface of the fruit. The model was verified by a comparison of force-displacement graph from the experimental data and FEM results. A high correlation ($R^2=0.983$) between the predicted vs. the actual force indicated the validity in use of FEM model.

Keywords: Mechanical damage, Finite Element Method, Nonlinear Modeling, ABAQUS Software, Cantaloupe.

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Effect of Guar and Carboxymethyl Cellulose Thickening Agents on the Physical and Rheological Properties of Set Fruit Yogurt

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ABSTRACT

The effect of two thickening agents, namely Carboxy Methyl Cellulose (CMC) and Guar, on the rheological properties of set fruit yogurt was investigated. Viscoelasticity moduli (G' , G''), apparent and complex viscosities increased while loss factor getting decreased by increase in Carboxy Methyl Cellulose and Guar contents up to 0.2% and 0.06% respectively. However, in concentrations exceeding these, some contradictory results were observed. Also it was observed that, by adding CMC and Guar to fruit yogurt, syneresis and water holding capacity decreased and increased respectively. In spite of positive effect of the two thickening agents on the rheological properties, addition of a mixture of the two exerted negative effects on the properties. By increase in different proportions of CMC in constant concentrations of Guar (0.02% and 0.04%) no improving synergistic effect on the three-dimensional yogurt structure was observed, the rheological properties and water holding capacity being weakened, while the syneresis getting increased.

Keywords: Set fruit yogurt, Hydrocolloids, Viscoelastic modulus, Complex viscosity, Syneresis.

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Identification of Apple Leaf Varieties Using Image Processing and Adaptive Neuro-Fuzzy Inference System

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ABSTRACT

In modern agriculture, image processing technique is employed in mechanization and in its related intelligent machines to replace humans. One application of the technique is an identification of varieties of plants and fruits. Identifying plant varieties is essential in plant eugenic programs. Visual examination of plant leaves and fruit is the common procedur towards the aim. Identification and classification of plants while using machine vision techniques can be more quickly and accurately performed. Throughout the present study, four varieties of apple namely Granny Smith, Golab Kohans, Gala, and Delbar-astyval were studied. Following a collection of leaf samples, the images of leaves were captured and subsequently color, texture, as well as morphological properties from each image were extracted. Adaptive Neuro - Fuzzy Inference System (ANFIS) was made use of for classification. The results indicated that it was possible through ANFIS to successfully classify leaves with respective linear and triangular input and output membership functions, along with hybrid learning method, in grid partitioning FIS mood. An accuracy of 95-83% was finally estimated for the method.

Keywords: Detection of apple varieties, Machine vision, Texture analysis of image, Grid partition.

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Investigating Different Properties of Anti-microbial Nanocomposite Packaging Films Containing Organically Modified Nanoclays

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ABSTRACT

Low density polyethylene films incorporating different types of organically modified nanoclays were prepared. Physical, surface morphology and mechanical properties of the films were analyzed through x-ray diffraction pattern, scanning electron microscopy, Tensile Strength (TS), and length increase until fracture point (E) parameters, respectively. Colony counting method was applied to investigate anti-microbial activity of the resulting films. X-ray diffraction pattern showed layered structures for most of the produced films. It was found that Cloisite 20A nanoclay produce a smooth and uniform surface in films, due to a proper compatibility with low density poly ethylene matrix. Mechanical properties of the films were not significantly influenced by the addition of nanoclays into the polymeric matrix, although there was a little improvement observed. Microbial results revealed that Cloisite 15A and 20A films at their concentrations of 6% exhibited a good anti-microbial activity. All the nanoclays at any concentration tested throughout the study showed anti-microbial activity against *E. coli*.

Keywords: Active packaging, LDPE, Clay, Antimicrobial properties

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Design and Evaluation of a Path Detection Algorithm in Road Images Using Hough Transform

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ABSTRACT

One of the most practical applications of automated navigation systems is the use in automatic steering systems in agricultural vehicles. Throughout the present research, a machine vision algorithm was designed as based on image acquisition from a camera mounted on the front of a combine harvester cab for detection of its forward path. Following filtration and optimization of the image, Hough Transform was utilized for extracting the path as a line. Then the lateral and angular deviations from the path were obtained as the main inputs for the automatic guidance system of the combine harvester. The algorithm was tested in 7 lateral and 7 angular deviation treatments of three replications. The tests were carried out under different conditions of daylight. A Comparison of the values of angles and deviations extracted from the image processing algorithm with those manually obtained indicates that it is possible to detect the path of the combine, through the algorithm, with an accuracy of 98%.

Keywords: Automatic guidance, Combine harvester, Machine vision, Line detection, Hough Transform.

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