

Validating Wismer-Luth Model in Relation to Wheel Rolling Resistance Prediction Considering Forward Velocity as well as Wheel Pass Number Parameters

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ABSTRACT

Wismer-luth model function was employed to estimate the rolling resistance of a wheel considering forward velocity and wheel number of passes parameters. Experimental tests were performed using a single wheel tester in controlled environment, soil bin. Forward velocity and weight were considered at three levels and with wheel pass repeated in each path, applied. Results suggest that Wismer model presented a proper accuracy at prognosticating rolling resistance at all levels of weight and forward velocity, but with pass numbers up to 5, traffic parameter presented a more predicting accuracy of compared with the higher ones. A regression model was applied as based upon experimental data to predict the wheels' rolling resistance, considering the effect of forward velocity as well as traffic. As a result it was found that Wismer model possessed a strong capacity of predicting the wheel rolling resistance while it did not encompass either forward velocity of the number of passes.

Keywords: Wismer-Luth model, tire, Rolling resistance, pass, soil bin

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Optimization of Dextran Production through *Leuconostoc mesenteroides* and the Synergistic Effect of *Lactococcus Lactis* on Dextran Production in Dairy Fermented Beverage

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ABSTRACT

Some lactic acid bacteria are of the capacity to produce extracellular polysaccharide through fermentation process. In the food industry sector, these polysaccharides are frequently used in beverages due to their water binding capacity as well as increasing viscosity. In addition to technological benefits, certain exopolysaccharides (EPS) bring upon such health effects on human, as lowering of cholesterol, immune-stimulatory effect as well as prebiotic activity. In this study, EPS (Dextran) production in dairy fermented beverage by *Leuconostoc mesenteroides* and Synergistic efficacy of *Lactococcus lactis* on dextran production have been investigated. Production of dextran in milk was optimized using response surface methodology with four independent factors, including: fermentation temperature (20-40 °C), fermentation time (15-35 hours), *L.mesenteroides-L.lactis* inoculation ratio (10:90 - 90:10) and percent of sucrose (0-6%). According to the findings 20 °C, 20 hours, 4.5% sucrose and inoculation ratio of *L.mesenteroides-L.lactis* 50:50 constituted optimum conditions for dextran production, and as well the experimental results confirming the predicted amount of dextran production in its optimum conditions.

Keywords: Exopolysaccharide, Dextran, *Leuconostoc mesenteroides*

Intelligent Determination of the Most Suitable Color Space for Water Stress Discrimination for Plants inside the Greenhouse (Case Study: Coleus)

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ABSTRACT

A precise estimation of required water for plant depends on many factors, among which the percentage of ground cover is a key parameter. Digital image processing and machine vision can be widely used to obtain this parameter in irrigation management applications. The aim of this study was to recognize the required water for plants based on color parameters of plants' ground cover; therefore, different color spaces (RGB, rgb, XYZ, HSV, HLS, L*a*b, L*u*v*, YCbCr, YUV, TSL and I1I2I3) were applied on a set of the ornamental shrub with the scientific name of *Plectranthus scutellarioides* in two states of water content (fresh and at wilt). Each color space were employed demonstrated different probability distribution of a given color class corresponded to two plant conditions (fresh and wilting). Thus, after examining the color spaces, both statistically and visually, the suitable color spaces were selected. Finally, histograms of suitable color spaces have been used to train the Bayesian Classifier. The Bayesian classifier detected two conditions of plant (fresh and wilting) with a precision of 83.11%. In general, on the basis of information obtained from image histograms, (frequency of pixels' intensity) plants' water status for irrigation scheduling was recognizable.

Keywords: Color Spaces, Digital images processing, Irrigation, Wilting, Bayesian classifier

Sensitivity Analysis of Membership Functions for Fuzzy Sorting of Tomato as Affected by Storage Temperature and Duration

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ABSTRACT

In the present study, classification of tomatoes through fuzzy logic and change in classification due to storage conditions were studied. To conduct the study, such qualitative properties as color, size and hardness of tomatoes were assessed. Tomato samples were sorted through a designed fuzzy logic system based on fuzzy rules, and compared with the experts' knowledge and views sensitivity analysis of outputs of membership functions were tested through chi-square statistics. In cool room storage, sensitivity of membership functions started a from six-day period, following storage with change from grade 1 to 2. As for samples kept at ambient temperature, sensitivity started on the third day following storage with the same change in sorted groups as those in the previous tests. The results revealed that any processing operation or marketing following initial sorting of tomatoes should occupy time in a way that does not change the results related to the initial classification.

Keywords: Fuzzy logic, Image processing, Sensitivity analysis, Sorting, Tomatoes

The Effect of Kefiran as a Fat Replacer on Physicochemical Properties, Sensory and Microbial Stirred Fruit Yoghurt

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ABSTRACT

The use of fat replacers in foods plays an important role in human health, especially cardiovascular disorders. In this study, three levels of Kefiran (0.2, 0.5, 0.8%) were employed in fruit yogurt as fat replacer. Their physicochemical (pH, syneresis, rheological), microbial (number of lactic acid bacteria, molds and yeasts) as well as sensory properties were compared with those containing three of fruit yogurt (non-fat, low-fat (fat 1.5%) and fat (fat 3%). Samples were prepared in similar conditions. The results revealed that concentrations of Kefiran had no effect on the acidity of yogurt. The lowest level of syneresis was obtained in the presence of 0.5% of Kefiran. This sample also received the highest score of sensory evaluation. With increase in kefiran concentration, consistency index increased while the growth of mold and yeast decreased, which no effect on the number of lactic acid bacteria observed.

Keywords: Stirred fruit yogurt , fat substitutes , Kefiran , texture , syneresis

Analysis of Energy Flows of Grape Production in North Khorasan Province through Artificial Neural Networks

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ABSTRACT

The aim followed in this study was to model the energy flow of grape production in North Khorasan Province of Iran. Data were collected through questionnaires and interviews with producers. The results revealed that the total energy input, output and, energy use efficiency of grape production in North Khorasan amounted to 52553.61 MJha⁻¹, 283513.17 MJha⁻¹ and 5.39, respectively. Chemical fertilizers with 35094.98Mjha⁻¹ was attributed the highest share of energy consumption to itself. The shares of renewable and non-renewable energies of production were 15 and 85%, respectively. The results of neural networks indicated that the most appropriate structure for modeling the energy consumption for grapes production was estimated at 6-10-1. The coefficient determination of the best topology was 0.98 for the grape production. This model was finally selected as the most conclusive method for estimating the output energy on the basis of input energies in the studied region.

Keywords: Renewable energy, Energy output prediction, Energy efficiency, Energy modeling

Mechanical Behavior of Tomatoes in the Process of Road Transport

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ABSTRACT

Damage inflicted during transportation upon transported fruits, is one of the main reasons for their injuries this can happen in one of the forms of impact, exertion of tangential force or weight (dead load). Vibrations set upon the fruit in transit, can be one of the serious damages brought upon the fruit. Modulus of elasticity and firmness of the fruit comprise some of the other important mechanical properties changes that can be decided upon to determine the extent of damage. Throughout the present study, two kinds of asphalt roads (highways vs. subsidiary), two vehicle types with differing suspension systems (air equipped vs. and spring suspension), three levels of box height arrangement in the vehicle (low: H_1 , middle H_2 vs High H_3), two locations of the box on the vehicle (front: S_1 and rear: S_2 positions) as well as two sets of settings of fruit in a box (bottom row of boxes: Loc_1 and the top rows of boxes Loc_2) on changes in modulus of elasticity and on fruit stiffness were evaluated. The moduli of elasticity and firmness of control fruits (non-transported) were initially assessed, then the transported fruits were the ones tested. The injury was considered as based on the percentage difference among the injuries. According to the results obtained from the analysis of the main parameters and interaction factors, fruits that had been transported via air suspended vehicles had a lower reduction rate of modulus of elasticity, less than that of fruits that had been transported with spring suspended vehicles. The level of paved roads and highways with the spring air suspension of respectively 34/44 and 41/66, asphalt road lying second at the levels of respectively 48 and 57/577 percent (as compared with control). By increasing the height of boxes of flooring within both suspensions' moduli of elasticities decreased in fruits that had been placed in the rear position (S_2) each comprised of two vehicles on the highway of asphalt road were faced with a modulus of elasticity reduction of 12.27. This is the second asphalt road with a greater reduction equivalent rate of 13/62 percent. Fruits that had been placed at the bottom row (Loc_1) of boxes (on the secondary paved road) had a moduli of elasticities higher than those of the top row of fruit boxes (Loc_2), (equivalent to 14/43). The results indicated that fruits set at the first height (H_1) and second (H_2) air suspension (T_1) had sustained a greater part of their stiffness. Fruits placed at the bottom row of boxes (Loc_1) and the front part (S_1) air suspension (T_1) were within each height level (H_1 , H_2 and H_3) were found as stiffer than those in the rear position (S_2).

Keywords: Asphalted highway, Vehicle suspension, Stiffness, Modulus of elasticity.

A Study on the Relationship between Microstructure and Technological Properties of Yoghurt Produced from Bovine vs. Buffalo Milks as during Storage

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ABSTRACT

Using two different type of different characteristics resulted in change in characteristics of the final dairy product. . In this study, yogurt samples were produced from cow vs. buffalo milk, and their characteristics including chemical properties, syneresis, texture, rheological behavior as well as photography of atomic force microscope at 1, 15 and 30 days following storage determined. The microscopic images obtained from surfaces of three types of yogurt following fifteen days of storage showed that the number as well as the height of peaks in bovine yoghurt surface was higher than those in buffalo yoghurt. The results also showed that the technological properties, percentage of syneresis and texture of the product were affected by its microstructure.

Keywords: yogurt, buffalo, syneresis, texture, microstructure

A Comparison of the Efficiency of Epi-Fluorescence Light Microscopy in Investigating the Activity of Bakery Yeast (*Saccharomyces cerevisiae*) through Conventional Methods

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ABSTRACT

EpiFluorescence Light Microscopy (EFLM) was employed to investigate the survival and activity of bakery yeast. Fermentative activity of three types of commercial bakery yeasts encoded as A to C was investigated through EFLM technique and compared with such conventional methods as Gasograph, microbial incubation and breadmaking. Double staining of yeast suspensions with FDA and Evance Blue in EFLM revealed green and red colors for live and dead yeast cells, respectively. Yeast A with the highest number of green (alive) cells (178 counted cells per microscopic image) and yeast B with the lowest number of surviving cells (102 counted cells) achieved the most and the least survival ranks, respectively. The most vs. least Colony Forming Units (CFU) were obtained for yeast A (15×10^{10} cfu/mg) and C (12×10^{10} cfu/mg), respectively in microbial tests. Within Gasography method, yeasts A and C produced the highest (163 mL CO₂/3h) vs. the lowest (140 mL CO₂/3h) gas volumes, respectively. Similarly, in breadmaking tests the highest (132 cm³) and lowest (108 cm³) loaf volumes corresponded to yeasts A and C, respectively. Results indicated that there is a positive correlation between green yeast cells in EFLM, live yeasts in microbial test and the level of gas produced in gasography analysis, and subsequently in the loaf volume.

Keywords: Yeast; survival; Gassing power; Epifluorescence Light Microscopy (EFLM)

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Effect of Processing Temperature on Membrane Ultrafiltration of Lignite coals-derived Humic Alkaline Extracts, Membrane Performance and Humic Acid Purity

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ABSTRACT

Separation of inorganic materials and fulvate compounds from alkaline humate solutions is seriously needed to obtain a higher quality and more purified humic acid. For this reason, in this research a membrane separation system was employed to separate fulvate compounds from humate solutions obtained from alkaline extraction of lignite coals (low rank coal). A hydrophilic ultrafilter membrane of polysulfone material with a pore size of 5 kDa was employed using a plate and frame module. The effect of temperature (35, 45 and 55°C) on such membrane performance as permeate flux of fulvates, fouling percentage, total membrane resistance and membrane resistance (R_T and R_f), as well as morphology of membrane layers were investigated. Also, the influence of temperature on the humic acid purity obtained as retentate was determined using gravimetric analysis. The results revealed that by increasing the temperature from 35 to 55 °C, the value of permeate flux of fulvates increased by 38%. Multiple behaviors were observed in the membrane fouling and resistances by increasing the temperature. The cake layer formation mechanism was obtained as dominant of fouling in 35°C temperature according to Hermia's theoretical model results but by increase in temperature to 45 and then to 55°C, the intermediate blocking mechanism occurred in the process. Blocking index (i) results showed that, the standard and complete pore blocking occurred earlier within higher temperatures. Analysis of fouling in microstructures of membrane through SEM, showed that by increase in temperature from 35 to 55°C, the value of cake formed on the surface of membrane decreased by about 61% with, the membrane pores blocked. Also, the results of gravimetric analysis showed that the highest purity of humic acid (92.26%) obtained from retentates of humates at 35°C temperature and by increase in the processing temperature, a significant effect on humic acid purity was not observed.

Keywords: Membrane Separation, Fulvate Compounds, Temperature, Purity, Humic Acid, Lignite coals.

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Estimation of Chicken Meat Freshness Using Image Processing and Artificial Intelligent Techniques

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ABSTRACT

Throughout the current study, such new methods as image processing and artificial intelligence have been applied for fast, easy and non-destructive evaluation of meat freshness, including chicken meat. Following image acquisitions of the meat and pre-processing operations, the images were transferred to different color spaces where the statistical texture features of the images were obtained. The feature selection operation was performed by combining Particle Swarm Optimization (PSO) and Artificial Neural Networks (ANNs) classifier to lower the volume of calculations and improve the classification indicators. According to the number of selected features, the number of existing neurons in input layer were obtained 22 while the number of existing neurons within output layer determined as 5, according to classification of the images as 5 classes. Finally, 22-8-5 structures obtained as the optimal structure of the intended classifier. For the purpose of the classifier assessment operations to estimate the freshness of the chicken meat, such statistical indicators as precision, accuracy, sensitivity, specificity as well as area under the curve were assessed the values of which for classification as based on the selected features were recorded 92, 80.02, 80.68, 94.89 and 87.83 percent, respectively. The obtained results of the study finally indicates that the suggested system is well of the capacity to diagnose the freshness of the meat with acceptable accuracy.

Keywords: Chicken meat, Freshness diagnosis, Image processing, Artificial neural networks (ANNs), Particle swarm optimization (PSO).

Applying Interpretive Structural Modeling Approach to Obtain a Suitable Distribution Chain Agility Model for Combine Owners' Cooperative, Fars Province

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ABSTRACT

Agility is known as the ability of quick response to the changes and also the main means of success and survival factor in the domain of manufacturing and service companies. Nowadays the companies are all aware of the fact that agility is essential for their competitiveness and even survival. In this study, following an identification of the parameters of agility, using structural modeling interpretative model was drawn and the parameters determined through MIC MAC analysis. Flexibility, integration processes and tasks, the development of staff skills, use of IT and appropriate planning are among the important agility factors in the distribution chain of combine owners' cooperative of Fars Province. Cost reduction, customer satisfaction, new product introduction, speed and quality of service are of high dependence which shows their further dependence on other variables. The results of this study showed that the integration of processes and tasks is the base of agility distribution chain, meaning that factor is the start of application of an agility system. So that a higher level of agility would be provided and will continue to insure customer satisfaction.

Key words: Agility, Interpretive Structural Modeling, MIC MAC analysis.

Determining the Environmental Impacts of Canola Production as through Life Cycle Assessment, (Case Study: Ardabil Province)

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ABSTRACT

One of the limitations regarding input in agriculture is the various emissions that negatively affect natural environment. In the present research, environmental impacts of canola production as well as its transportation to oil extracting factories gate in Ardabil Providence were studied as based on life cycle assessment considering four scenarios including central; north regions; Moghan Agro-Industrial & Livestock Co. with the application of surface, and sprinkler irrigation methods. The required information in the study was gathered using questionnaires as well as interviews with farmers and staff of the related organizations in Ardabil Province. The results of life cycle assessment showed that nitrogen fertilizer, fuel and electricity inputs constituted the highest share of environmental indicators. Also, indicator normalization showed that free water Eco toxicity, eutrophication, acidification and global warming had more serious and adverse impacts on the environment than any of the other indicators.

Keywords: Canola, Emissions, Environment, Life cycle assessment, Ardabil.

Assessment of the Energy, Economic and Environmental Indices of Rainfed vs Irrigated Wheat Production (Case Study: Lorestan Province)

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ABSTRACT

Agricultural sector stands among the important sectors highly affecting the environment. Assessment and management of environmental impacts through Life Cycle Assessment (LCA) can be considered as one of the prominent factors to leading attain sustainable production of agricultural crops. The aim followed in this study is the life cycle assessment of wheat production from the view point of energy, economic and environmental perspectives. The study was conducted in Lorestan Province within 2014-2015 cropping year. The production of wheat in the framework of Life Cycle Assessment of raw material extraction stage to delivery to the silo has been detailed. The results indicated that nitrogen applied via chemical fertilizers had the highest contribution (12.64 GJ ha⁻¹) in total energy consumption with the portion of non-renewable energy being significantly higher than the renewable share contributed. Energy and economic indices were calculated. Economic net return and benefit to cost ratio were estimated as 59/16 million Rial/ha and 2.58 annually indicating economically appropriate conditions of wheat production in the study area. Evaluation of environmental effects revealed that the consumption of fertilizers, particularly nitrogen and phosphate, manure and electricity imposed the greatest loads upon the environment, respectively. The rainfed fields are of a lower level in energy consumption but the results indicate that they produce greater environmental effects per ton of production in which the production and consumption of fertilizers form the major contributions.

Keywords: Life Cycle Assessment (LCA), Energy and economic indices, Economic net return, Environmental effects.

Feasibility of Implementing Conservation Agriculture through TOPSIS Multi-criteria Technique in GIS (Case Study: Maroon Basin of Khuzestan Province)

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ABSTRACT

A GIS-based plan with TOPSIS multi-criteria technique was used to assess the feasibility of implementing conservation agriculture in the Maroon Basin of Khuzestan Province. For this purpose, a total of 17 information layers mechanization-farming including machinery (level of mechanization, operation factor, number of conservation tillage and drill), climatic (temperature and precipitation), topographic (slope and elevation), soil properties (texture, pH, salinity, phosphorus and organic carbon) as well as water resources (potential and salinity) were considered, to determine the areas most suitable for a crop rotation of canola, chickpea and wheat. Thematic layers for the above parameters were prepared in a GIS environment, classified into 5 categories according to FAO guidelines as: highly suitable, suitable, moderately suitable, marginally suitable and not suitable and weighted through AHP method. Then, prepared layers are ranked with TOPSIS techniques and overlapped in GIS. The results showed that 1.6% (5030 ha) and 14.5% (44595 ha) of the studied area is either highly suitable or suitable for implementing conservation agriculture, respectively.

Keywords: Analytical Hierarchy Process, GIS; Mechanization; Rotation; TOPSIS

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