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Life Cycle Assessment of Cotton Production in Golestan Province As Based on the Production of Biomass, Energy as well as Net Income

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ABSTRACT

The main objective followed in the present study was to investigate the environmental impacts of cotton production in Golestan Province, Iran applying life cycle assessment methodology. The data made use of in the study were obtained from cotton farmers through the method of face-to-face questionnaire, during 2011-2012. The questionnaires included the total inputs as regards cotton production in the region vs yield. The environmental impacts as based upon three functional units (FU) namely: the production of one ton of biomass, generation of 1000 MJ of energy, and 10000 Toman of net income were put into investigation. The environmental impacts were evaluated in the framework of seven impact categories of: global warming, acidification, terrestrial eutrophication, land use, depletion of water resources, fossil resources depletion, and as well the depletion of phosphate and potash resources. Results revealed that the terrestrial eutrophication along with the depletion of fossil resources as based upon the environmental index (EcoX) and Resource Depletion Index (RDI) introduce the highest potential environmental impacts. EcoX for one ton production of cotton, generation of 1000 MJ energy and gain of 10000 Toman net income were calculated as 0.832, 0.048 and 0.036, respectively. RDI figures for these three functional units were respectively estimated as: 6.825, 0.396 and 0.296.

Keywords: Environment, Global warming, Net income, Pollution, Resource depletion

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A Study on the Feasibility of Functional Synbiotic Yoghurt Produced from Camel Milk and Oat β-glucan

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ABSTRACT

With regard to the unique desirable properties of camel milk, it can be promising to be used as a nutraceutical product. The effect of different variables on the quality characteristics of symbiotic yoghurt made of camel milk was studied. Independent variables (all at three levels) were: β-glucan (prebiotic agent) 0 - 1 - 2%, fat content 0 - 2.5 - 5%, the level of probiotic bacteria at 0.5 - 1 – 1.5% plus storage time of 0 - 7 -14 days. The least syneresis (0%) was observed when the highest levels of β-glucan (3%) and fat content (5%) were used. Least pH (pH=4.06) was observed in non-fat yoghurt (0% fat) when it was inoculated with an increased amount of probiotic bacteria (1.5%), β-glucan (2%) and time duration (fourteen days). The optimum viability of probiotic bacteria in yoghurt (10^7 cfu/mL) was obtained by increasing β-glucan and reducing fat contents at the early days of storage. The highest viscosity was obtained at the 7th day of storage when the highest contents of β-glucan (3%) and fat (2.5%) were involved. According to the test panel analyses the producl's overall acceptance and taste became more desirable when the concentration of β-glucan as well as storage time got increased.

Keywords: Syneresis, Acidity, Prebiotic, Viability of probiotic

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Design, Construction and Evaluation of an Automatic Position Control System for a Tillage Tool

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ABSTRACT

The new device made according to the findings in this study could determine the point with the hydraulic operating system setting it at its optimum position. The optimum position of the tool is assessed through depth control software developed for the device, its input data being the right depth for proper root development. The performance of the device was tested for a subsoiler and as regards precision tillage operation. The accuracy of applying the desired depth was studied in both laboratory and on agricultural land. Factors considered in the laboratory consisted of: type of depth change (whether increasing or decreasing) and seven steps of depth change within the range of 0 to 350 mm and at 50 mm intervals. In the field test, in addition to the above mentioned factors, gear change was also considered (gears 1, 2, 3 of a Massey Ferguson Tractor). Precision error for the laboratory test was 3.3 percent for increase vs 3.83 percent for the case of decrease in depth. The precision error (deficiency) for the agricultural land was 4.19 percent for gear one, 5.19 for gear two and 5.78 percent for gear three. Eventually, this record (for decreasing depth) was 6.84 percent for gear one, 4.67 percent for gear two and 6.14 percent for gear three.

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Analysis of Energy Consumption in Greenhouse Cucumber Production (a Case Study, Tehran Province)

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ABSTRACT

With the increasing world population and limitations on the arable land, increasing the yield per unit land is considered as one of the alternatives for further human food supply. Greenhouse cultivation as one of the ways to improve the performance can help to get closer to the purpose. But energy limit is another of the human challenges, so that promotion in the supply of further food without considering the extra energy demand appears to be close to impossible. Due to the high energy demand in the greenhouse productions, in this study, the energy demand and its energy indices within the greenhouse style of cucumber productions (in Tehran Province) were assessed. Also, the energy efficiency of the production units was examined employing the method of Data Envelopment Analysis (DEA). The data for the study was gathered through interviews with 160 greenhouse cucumber producers of Tehran in 2013. The results of the study revealed that energy efficiency, energy productivity, net and specific energies were equal to 0.52, 0.65 kg/ MJ,-73180 MJ/ ha and 1/52 MJ /Kg, respectively. The shares of direct, indirect, renewable and nonrenewable energies from the total energy consumed were recorded 0.86, 0.14, 0.04 and 0.96, respectively. Also the results indicated that the greenhouses are not efficient, that, in these production units, increase in inputs exceeds the production output, the issue reducing the energy efficiency of the units.

Keywords: Energy Productivity, Net Energy Gain, Specific Energy, Renewable Energy, Nonrenewable Energy.

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Evaluation of Mathematical Models to Describe the Effect of Temperature on Oil Uptake During the Frying Process

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ABSTRACT

The rate of oil uptake during the process of frying of a product is one of the moin aspects of the final quality of the fried product. The purpose followed in the present study was to investigate the effect of frying temperature on oil content of the final product and its perception as through empirical models. Potato stripes in specified sizes, following their blanching were fried using a fryer equipped with thermos controller at 145, 160 and 175 °C for durations of 60, 120, 180 and 240 seconds. For separation of various stages of the process, surface as well as core temperatures of the product were recorded using thermocouples and data logger. Oil contents of the samples were extracted through Soxhlet method and the variations fitted using kinetic models (Model 1 and Model 2) in MATLAB. Models were compared through R^2, RMSE and also Arrhenius equation. The results revealed that the equilibrium oil content (O_{eq}) obtained from fitting of models is in inverse relation with temperature that confirms a reduction in oil uptake with increase in frying temperature. Statistical analysis of the experimental data indicated that critical temperature for reducing the oil uptake was 160 °C. The time limit before an end to surface boiling was estimated as about 160-180 seconds.

Keywords: Oil uptake, Frying, Temperature, Model, MATLAB.

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Effect of Isomalt and Maltitol on Quality and Sensory Properties of Sponge Cakes

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ABSTRACT

The use of isomalt and maltitol as replacements for sucrose in foodstuff plays an important role in human health as controller of blood glucose levels and control of obesity. Throughout the present study, isomalt and maltitol (in place of sucrose) were used at three concentration levels of 75, 85, and 100%. Effects of the polyols were investigated on physicochemical properties (size of bubbles in cake batter, moisture content, water activity, crust and crumb color, firmness, volume and porosity) and as well the sensory traits of sponge cakes. Results indicated that a complete replacement of sucrose by isomalt and maltitol increases the size of air bubbles in the batter (p<0/05). The largest bubbles were observed in the batter containing 100 % isomalt. The highest moisture content and firmness were observed in samples containing 100% maltitol (p<0/05). Brightness of cake crust increased with an addition of polyols in cakes, while volume and porosity of cakes decreased with an increase in the amount of polyols. In sensory evaluation, the highest overall acceptance score was given to cakes containing 75% maltitol.

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Extraction of the Most Effective Wavelengths of Egg Spectra using Genetic Algorithm and Their Classification Using Regression Equations

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ABSTRACT

The potential of Vis-IR (400–1100 nm) transmittance method was investigated to assess the internal quality (freshness) of intact chicken egg during storage at temperatures of $30 \pm 7\ ^{o}C$ and 25% ± 4 relative humidity. One hundred egg samples were used for assessing the freshness and spectral recordings during egg storage period (up to 30 days). Two correlation models were developed between either of Haugh Unit (HU) and Yolk Coefficient (YC) versus storage time with the respective correlation coefficients of 0.86, and 0.96. The equations revealed that (in those aforementioned conditions) the egg quality decreased dramatically. Furthermore, a method was developed to acquire the wavelength features based on Ggenetic Algorithm (GA). Which could solve the problem of the effective information extraction from the high-dimensional data matrix? Regression equations were developed through raw data and according to the wavelength features acquired, being respectively based upon different preprocessing (SNV, MSC, FFT, as well as 1st and 2nd derivations). The results finally indicated that regression equations based on GA and preprocessing SNV as well as MSC could classify the eggs' spectra in three groups while by 1st derivation preprocessing, each daily spectrum could allocate each in a separate group.

Keywords: Egg quality, Regression equation, Genetic algorithm

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Effect of Variety, Time of Harvest, and Fruit Size on the Mechanical Properties of Pomegranate

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ABSTRACT

The effect of variety, harvesting time and fruit size were investigated on the mechanical properties of pomegranate skin, density and mechanical strength. The results revealed that pomegranate cultivars (Ardestani, Shisheh-Cap and Malas) were of different skin thicknesses, resulting in difference in forces required for penetration into the fruit (10%). Shisheh-Cap variety was of a skin thicker than those of the others. Mechanical strength of Shisheh-Cap and Ardestani varieties were found of 453 and 428 N respectively. Malas variety exhibited the least strength against compression forces with the strength getting decreased by 15% with delay in harvesting of the fruit. It was shown that by increase in fruit size, the density was reduced by 39% and while the mechanical strength being increased by 25%.

Key words: Pomegranate, Mechanical strength, Density, Variety

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A Comparison of the Effects of Vacuum Oven, Freeze vs Oven Drying on the Rheological and Textural Atributes of Wild Sage (*Salvia macrosiphon*) Sedd Gum

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ABSTRACT

To improve food texture, hydrocolloids are widely used as gelling material in food processing systems. Wild sage seed carries a remarkable amount of gum (mucilage) of desirable functional properties. The mucilage also improves the rheological, textural, and as well functional properties of foods. Throughout the present study the effects of different drying methods of : hot air drying (40, 50, 60, 70 and 80°C), freeze drying vs vacuum oven drying on rheological and textural properties of wild sage seed gum were investigated. The apparent viscosity of dried gum solutions at shear rate of 60 s^{-1} varied from 0.162 to 0.344 Pa.s. With increase in oven temperature from 40 to 80°C, the apparent viscosity of gums decreased from 0.271 to 0.162 (shear rate 60 s^{-1}). Heschel-Bulkley's model was found as the most suitable one to describe the flow behavior of wild sage seed gum over the experiment entire processes of ation. Drying method of the mucilage significantly affects the change of textural characteristics of the prepared gel from the dried gum. The highest values of hardness, stickiness, consistency and adhesiveness of gum texture were recorded for freeze-dried gum, respectively amounting to: 78.2 g, 17.0 g; 794.8 g.s, and 159.2 g.s.

Keywords: Drying, Hot air, Rheology, Vacuum, Wild sage seed gum.

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Rheological Properties, Texture and Color of Balangu (*Lallemantia royleana*) Seed Gum Affected by Different Temperatures

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ABSTRACT

Hydrocolloids (gums) are used in food science to control and improve texture, taste and also to increase stability. Most food processings cause changes in rheological and textural properties of the food. In this study, the effects of thermal treatments on color changes, rheological and textural (firmness, adhesiveness and consistency) properties of Balangu seed gum were investigated. Balangu seed gum was extracted and to evaluate the rheological properties and color, solutions with concentrations of 0.2 %(w.w) and to evaluate the textural properties, gum solutions (concentrations of 3 and 4% (w.w)) were prepared and treated under different Temperatures of 25, 50, 75, 100, 121°C, for 20 min. Viscosities of gum solutions were assessed at 25°C through Brookfield rotational viscometer and fitted by the power law, Casson and Bingham models. Fitted results indicate that Balangu seed gum possesses pseudoplastic behavior and Power law model is appropriate to evaluate it (R2=0.99). Balangu seed gum did not tolerate the high temperature of (121°C), but the texture of the prepared gels show adequate resistance against heat treatments. Hardness and consistency of Balangu seed gel (3%) following heat treatment of 121°C were recorded as 10.6gr and 32.48gr.s, respectively. In addition, with increase in temperature, the color of samples became darker (decrease in L).

Keywords: Hydrocolloid, Gel, Penetration test ,Viscosity.

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The Effect of Subsoiling within Different Distances from Open Drain on Irrigated Wheat Yield

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ABSTRACT

A split-plot experiment of three replications was employed to study the effect of subsoiling within different distances from the drain axis on soil salinity, and on wheat yield. The measurements included soil cone index, soil bulk density, infiltration rate and electrical conductivity of the saturated extract. Each treatment was composed of two factors. The main factor consisted of 3 different distances from the drain axis comprise of 50, 100 and 150 meters from the drain, and while the subfactor being consisted of 3 cultivation methods namely: conventional plowing; subsoiling at a soil depth of 40-45cm; and subsoiling at the soil depth of 40-45 cm + plowing. The results indicated that subsoiling decreased the value of soil cone index by about 25%, soil bulk density (about 4%), EC- saturated extract (about 25%), and white increasing the other parameters of infiltration rate and wheat yield by 133 and 18%, respectively.

Keywords: Subsoiler, Open drain, Distance from drain, Wheat

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Estimation of the Fuel Consumption Rate of as Tractor vs Different Aspect Ratios of a Chisel Plow Blade

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ABSTRACT

The purpose followed in the present research was to study and predict fuel consumption rate of tractor due to different aspect ratios for a chisel plow blade and to determine a general relationship between aspect ratio ($\frac{D}{W}$) and fuel consumption rate. An ITM-399 (81 kW) tractor and a mounted-type chisel plow of 9 shanks were employed. Two 5 and 10 cm width chisel blades were tested. The experiments were conducted in a clay-loam soil when at 9% of d.b moisture content, three levels of tillage depths (10, 15, and 20 cm), and three levels of travel speed (3, 4, and 5 $km.h^{-1}$) in three replications. Results from F-test at 95% showed that three was no significant difference between the measured vs predicted values as compared with 1:1 line plot. Normalized Root Mean Square Error (NRMSE) and Mean Bias Error (MBE) indices were made use of to verify the accuracy of the equation. The results validated the precision of the attained equation.

Keywords: Tillage, Chisel plow, Fuel consumption, Aspect ratio

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