Effect of Aluminum Foil and Greaseproof Paper Packages on Physico-chemical, Textural, Microbiological and Sensory Features of Dry Ice Cream

NEGAR RAVASH[1], JAVAD HESARI[2]*, SODEYF AZADMARD-DAMIRCHI[3] AND S. ABBAS RAFAT[4]

1. M.Sc., Dept. of Food Science and Technology, Faculty of Agriculture, Tabriz University
2. Professor., Dept. of Food Science and Technology, Faculty of Agriculture, Tabriz University
3. Associate Professor, Dept. of Food Science and Technology, Faculty of Agriculture, Tabriz University
4. Associate Professor, Dept. of Animal Science, Faculty of Agriculture, Tabriz University

ABSTRACT

Dry ice cream is a traditional product of Iran similar to such products as khoa, danedar khoa, barfi, pedha, lal peda, brown peda and dulce de leche in the other countries. The aim followed in the current study was to evaluate the effect of different types of packaging on the qualitative features of the dry ice cream. Dry ice cream was prepared by a mixture of milk, sugar, glucose syrup and shortening, then packed in three types of materials namely aluminum foil/cardboard, greaseproof paper/cardboard and cardboard (control) and kept in three temperatures of: -18, +8 and +28°C for 60 days. In all of the samples, by passage of time and increase in storage temperature, moisture content, pH and scores of sensory features decreased, while acidity, free fatty acid content, peroxide value, firmness, total count of microorganisms, and mold, as well as yeast count increased. Within all the temperature changes, dry ice cream that was packed in the aluminum foil/cardboard carried more moisture content, pH, total count of microorganisms, mold and yeast count and scores of sensory features along with less acidity, free fatty acid content, peroxide value, and firmness than those in the other samples. At -18 and +28 °C temperatures, there respectively occurred minimum vs. maximum changes in all the features of dry ice cream. The results finally indicated that dry ice creams that were packed in the aluminum foil/cardboard and kept at temperature of -18°C carried the most acceptable qualitative features as well as the highest shelf life.

Keywords: Dry ice cream, Traditional product, Packaging, Qualitative features, Shelf life

* Correspondent author's E- mail: jhesari@tabrizu.ac.ir

Evaluation and Comparison of Energy Indices within Wheat Farms in Townships of Alborz Province

MUHAMMAD MANAFI DASTJERDI[1*], AMIR LARI[2]

1. Graduate student, Mechanization, Faculty of Agriculture and Natural Resources, Science and Research Branch, Tehran, Islamic Azad University
2. PhD Graduate Mechanization, Faculty of Agriculture and Natural Resources, Science and Research Branch, Tehran, Islamic Azad University

ABSTRACT

The present research was undertaken to evaluate and compare energy flows within wheat farms in townships of Alborz Province, Iran. The indices of energy ratio, Net Energy Gain (NEG), specific energy, Energy Productivity (EP), energy intensity, and total input vs. output energies were assessed. The statistical population included all the farmers engaged in wheat farming in townships of Alborz Province, Iran, during 2012/13 crop year. Based upon the size of population and Morgan Table, the studied sample such selected as to include 273 farmers working in the agricultural sector of Alborz Province, Iran. A researcher-developed questionnaire (with a reliability coefficient of 0.91) along with a set of data from Agricultural Jihad Organization constituted the base for data collection. The results indicated that, among the input energy sources for wheat cultivation in the four townships studied, chemical fertilizers (28,176 MJ/ha) and fuel (22,154 MJ/ha) were associated with the highest energy consuming factors, while human force (85 MJ/ha) took the lowest level of energy. Throughout the research, energy ratio was obtained at farms within Nazarabad (2.74), Karaj (2.57), Eshtehard (2.23), and Savojbolagh (2.5). The highest and lowest EPs were found to be those of Nazarabad and Eshtehrad Townships (0.086 kg/MJ and 0.070 kg/MJ, respectively). Among the four townships studied, Nazarabad benefitted from better conditions, in terms of NEG (90,802.42 MJ/ha), energy intensity (5.21 MJ/m2), and specific energy (11.57 MJ/kg), as compared with the other three townships. In total, results of the research indicated that the farms at Nazarabad exhibit more efficient energy consumption, indicating them as being more properly managed .

∗ Correspondent author's E- mail: M.manafi207@yahoo.com

Fabrication and Development of a Machine Olfaction System Combined with Pattern Recognition Techniques for Detecting Formalin Adulteration in Raw Milk

TOHIDI MOJTABA[1], GHASEMI-VARNAMKHASTI MAHDI[2][*], GHAFARINIA VAHID[3], MOHTASEBISEYED SAEID[4], BONYADIAN MOJTABA[5]

1. Ph.D. Graduate, Faculty of Agriculture, Shahrekord University
2. Assistant Professor, Faculty of Agriculture, Shahrekord University
3. Assistant Professor, Isfahan University of Technology
4. Professor, Faculty of Agricultural Engineering and Technology, University of Tehran
5. Associate Professor, Faculty of Veterinary Scuebces, Shahrekord University

ABSTRACT

Adulteration in milk and other dairy products is not only a serious threat to human health but it also leads to economic losses in the dairy industry. Utilization of materials that reduce microbial load is a common adulteration. In this study, a machine olfaction (electronic nose) based on 8 Metal Oxide Semiconductor (MOS) sensors were fabricated, developed, and its capability of formalin detection in raw milk investigated. Feature vector was then extracted from the sensors' response and used as the inputs to lay the pattern of recognition models. Based on the obtained results, Principal Component Analysis (PCA) with two first PCs (PC1 and PC2) could describe 93 % of variance within the data. In the sensor array, MQ4, FIS, TGS822, and TGS2620 sensors presented the highest loading coefficient values whilst TGS2602 devoted the lowest loading one. Linear Discriminant Analysis (LDA) revealed the classification accuracy as 80.1 %. Support Vector Machine (SVM) with three order multinomial kernel function showing the training and validation accuracy values as 100% and 90.91%, respectively. Also, the full success rate was obtained for the overall classification, using Artificial Neural Network.

Keywords: Electronic nose, Semiconductor gas sensors, Formalin, Principal Component Analysis, Artificial Neural Network

* Correspondent author's E- mail: ghasemymahdi@gmail.com

Analysis of Factors Affecting Rice Breakage Losses in Guilan Province

MOJTABA GOURABJIRI[1], SAEED FIROUZI[2]*, HASHEM AMINPANAH[2]

1. Department of Agricultural Management, Rasht Branch, Islamic Azad University, Rasht, Iran
2. Department of Agronomy, Rasht Branch, Islamic Azad University, Rasht, Iran

ABSTRACT

Reduction of rice kernel losses is one of the most prominent concerns in rice growing areas, including Guilan province, Iran. In order to identify factors affecting milled rice breakage losses as in Guilan province, a research was conducted based on a descriptive survey with participation of 75 rice mill owners from Guilan province. A semi-structured interview with 5 experienced mill owners and 3 rice milling experts was initially used to design the preliminary questionnaire. The final questionnaire was designed as based upon the results of interviews and related researches. The considered factors were classified as "Agronomical", "Technical", "Knowledge-Skills", "Economical", and "Policy" ones. Statistical analysis of the results related to secondary questionnaires indicated "rice harvest time", "threshing the paddy applying either inappropriate paddy threshers or paddy combine harvesters", "the low skill level of paddy dryer operator", "shortage of financial sources to renew and update the rice mills", and "an enhancement of the level of knowledge of rice mill owners comprised the most important agronomical, technical, knowledge-skill, economical, and policy making factors, respectively. In this regard, financial and educational support of the government for farming activities of paddy farmers, enhancing the level of knowledge of paddy thresher operators, as well as combine harvester operators, promoting the skill level of rice mill operators and owners, and supportive policies for renewing and updating of the rice mills are among the factors effective in reducing the rice breakage losses in Guilan province. A final comparison of the studied categories showed that the category of economic factors exerted the most impacts among all the factors studied. Therefore, in order to reduce rice breakage losses (as Guilan province), promotion of the economical basis of paddy farmers and that of rice mill owners were emphasized through codification, and execution of the supportive policies, throughout the Province.

Keywords: Rice breakage, paddy, losses, rice mills.

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* Correspondent author's E- mail: firoozi@iaurasht.ac.ir

Application of Green Walnut Shell as a Novel Pigment in DSSC Based on TiO$_2$ Nanoparticles.

KAMBIZ HOSSEIN PANAHI[1], MOHAMMAD HOSSEIN ABBASPOUR-FARD[2][*], JAVAD FEIZY[3], MAHMOOD REZA GOLZARIAN[4]

1. Former Graduate student, Faculty of Agriculture, Ferdowsi University of Mashhad, Mashhad
2. Former Graduate student, Faculty of Agriculture, Ferdowsi University of Mashhad, Mashhad
3. Assistant Professor, Research Institute of Food Science and Technology (RIFST), Mashhad.
4. Assistant Professor, Faculty of Agriculture, Ferdowsi University of Mashhad, Mashhad

ABSTRACT

Natural dye extract of walnut shell, has been extracted using an ultrasonic processor, purified through Hot saponification method, and studied as a novel sensitizing dye to fabricate TiO2 nanoparticles as based on Dye Sensitized Solar Cells (DSSC). The extract was characterized applying UV−Vis absorption spectroscopy and Fourier Transform Infra-Red (FTIR), employed to *identify the anchoring groups* in the walnut shell pigment. The typical current-voltage and the Incident Photon to Current Efficiency (IPCE) curves were also prepared, and analysed for studying the photovoltaic properties. The walnut shell extract exhibited a short circuit current density (Jsc) of 0.939 mA/cm2, open-circuit voltage (Voc) of 0.792 V, Fill Factor (FF) of 0.71 and conversion efficiency of 0.528% under standard test conditions. These are fairly acceptable in comparison with the other similar cells. The improvement in efficiency is mainly due to the correct and proper extraction and purification methods and also due to the structure of walnut shell pigments that enhanced the charge transfer between the dye extract, and the TiO$_2$ photo anode surface. However, such efficiency is still in need of a lot to be improved to compete with the existing cells. This shows the need for further extensive studies in this area of research.

* Correspondent author's E- mail: m.abbaspourfard@gmail.com

Simulation of Tire-Soil Interaction Applying Nonlinear Finite Element Method

SAADAT KAMGAR[1], ALI REZAEI[2]*, MOHAMMAD MERAJI[3]
1. Assistant Professor, Department of Biosystems Mechanical Engineering of Shiraz University
2. Graduate Student, Department of Biosystems Mechanical Engineering of Shiraz University
3. Graduate Student, Department of Biosystems Mechanical Engineering of Shiraz University

ABSTRACT

Throughout the present study, a simulation of tire–soil interaction model was considered with special view at the two-Dimensional (2-D) Finite Element Method (FEM) model of carcass. In contrast with the existing 2-D tire models, in the new model it was not tried to find a mathematical description for the global reaction of tires, but was based on a mechanical structure of the basic components of a tire. Here, the reproduction of the carcass as the most challenging part for a 2-D model was described in details. Also, the reproductions of tire wall model as a hyperelastic material and soil model as an elastopelastic one were investigated. Coefficients of mechanical behavior of silty-loam soil were accurately assessed to obtain an effective simulation. The results of simulation implemented in MATLAB7 Software, showed that the radial-ply tire benefitted from a greater tractive efficiency than the bias one within the same conditions on silty-loam soil. Bias-ply tires suffered from a greater motion reduction (slip) and while their gross traction was slightly greater than that of radial-ply tire. The net traction force was estimated as the same for both tires. Also, the results of simulation and tests revealed that the radial-ply tire bore lower rolling resistance than bias-ply tire on silty-loam soil in similar conditions. Based upon the simulation results, the effects of slip, inflation pressure and mechanical stiffness of soil on tractive efficiency were satisfactorily predicted.

Keywords: Tire-Soil Interaction, Finite element method, Elastopelastic, Hyperelastic, MATLAB.

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* Correspondent author's E- mail: alirezaei59@yahoo.com

Accumulation of Beta-Carotene in Pure Microalgae, *Dunaliella Salina* vs. in the Mixed Cultures of Caspian Sea under Nitrogen Starvation

AZITA GHORBANI[1], MARYAM HOSSEINI[2], SIROUS EBRAHIMI[3][*]

1. Senior Expert, Department of Chemical Engineering, Biotechnology Research Center, Sahand University
2. Assistant Professor, Department of Engineering, Chemical Engineering Group, Shahid Madani University of Azarbaijan
3. Associate Professor, Department of Chemical Engineering, Biotechnology Research Center, Sahand University

ABSTRACT

Beta-carotene being a carotenoid is known as the most famous natural pigment. Microalgae are considered as the most important sources of beta-carotene synthesis. Due to the high sterilization cost of a pure culture, in this study, and for the first time, growth, levels of beta-carotene and chlorophyll in Caspian Sea microalgae (under nutrient deficiencies' stress) have been assessed, and compared with the pure microalgae of Dunaliella *Salina.*The initial vs final concentrations of beta-carotene under nitrogen starvation (after 188 hours) amounted 7.5, 14.8 vs 7.0, 3.5 mol Beta-Carotene/g Protein for pure vs mixed cultures, respectively. Under nitrogen starvation the final protein concentration of microalgae *Dunaliella Salina* increased from 341.8 to 950.1 mg/L. However, for Caspian Sea mixed microalgae the concentration was raised from 357.1 to 1010.0 mg/L. The operating conditions were the same for both samples as follows: pH=7.5, temperature 24-26 ° C and stirring at 160 rpm. This study demonstrates that the accumulated Beta-carotene in Caspian Sea microalgae was comparable to the obtained one from pure microalgae of *Dunaliella Salina*. Therefore, mixed microalgae culture can be used for Beta-carotene production which is preferable and more economical than sterile system needing processes. Consequently, the possibility of process industrialization would also be enhanced.

* Correspondent author's E- mail: sirous.ebrahimi@epfl.ch

Analysis and Modeling of Energy Use vs. Production of Dryland Chickpea in the Surroundings of the City of Bukan, Iran

OMID GHADERPOUR[1], SHAHIN RAFIEE[2][*]

1. Graduate Student, Agricultural Mechanization Engineering, Tehran University
2. Professor, Department of Agricultural Machinery Engineering, Tehran University

ABSTRACT

The present study is to analyze and model the energy need vs. the energy performance of dry land chickpea using   adaptive neuro-fuzzy inference system (ANFIS).The experiments were carried out cropping season of during the chickpea in the surroundings of Bukan Township. Data were collected from 70 producers of chickpea, using face to face interview with farmers, and filling up of specialized questionnaires. The areas of production units were chosen between 2 and 10 hectares. Inputs include labor, machinery, seed, diesel fuel and pesticides while the output was comprised of the chickpea seed and its straw. There was no kind of fertilizer applied in the research regions. The results indicated that the total energy consumption in the process of production and total energy gained (grain + straw) were 7760.441 Mj/kg vs 15305.976 Mj/kg respectively. Energy efficiency and energy productivity for the production of chickpea amounted to 1.229 and 0.0836 Mj/kg respectively, while for chickpea+straw respectively 1.972 and 0.1946 Mj/kg. The most prominent input was found to be diesel fuel with a share of 73.49% of the total energy used up. Adaptive Neuro-Fuzzy Inference System that combines fuzzy systems and artificial neural networks, is one of the ways of artificial intelligence that benefits from many such advantages as the ability of removal of uncertainties in the data. Values of correlation coefficient (R), Root Mean Error (RME) and Root Mean Square Error (RMSE) for the most appropriate ANFIS model as for chickpea energy uptake were 0.94, 0.027 and 369.08 respectively while for chickpea yield were respectively 0.95, 0.025 and 21.58.

Keywords: Energy analysis, Modeling of energy and performance, Anfis, Dry land chickpea, Energy Ratio.

* Correspondent author's E- mail: shahinrafiee@ut.ac.ir

Optimization of Energy Consumption and Mitigation of Greenhouses Gasses, Emissions as Regards Irrigated Lentil Production Using Data Envelopment Analysis

BEHZAD ELHAMI[1], ASADOLLAH AKRAM[2], MAJID KHANALI[3][*]

1.Graduate Student, of Agricultural Mechanization, Department of Agricultural Machinery Engineering, Faculty of Agricultural Engineering and Technology, University of Tehran, Karaj

2. Associate Prof., Department of Agricultural Machinery Engineering, Faculty of Agricultural Engineering and Technology, University of Tehran, Karaj

3. Assistant Prof., Department of Agricultural Machinery Engineering, Faculty of Agricultural Engineering and Technology, University of Tehran, Karaj

*Address and e-mail of corresponding author: khanali@ac.ir

ABSTRACT

The increasing trend in use of agricultural inputs in recent years has resulted in the increase in energy consumption and consequently increases in Green House Gas (GHG) emissions. Throughout the present study, the optimization of energy use and thereby the reduction of greenhouse gas emissions in irrigated lentil production (in Esfahan Province) were investigated, using Data Envelopment Analysis (DEA) method. The data were, made use of, and randomly collected from 140 lentil producers using face to face questionnaire method in the cropping season of 2014-2015. Based upon two DEA models of Constant Returns to Scale (CRS) and Variable Returns to Scale (VRS), the average values of technical efficiency, pure technical efficiency and scale efficiency were obtained as 0.960, 0.991 and 0.961, respectively. Through a consumption of optimum levels of inputs, the total energy saving was estimated 1031 MJ/ha, i.e., 3.12% of the total energy consumption, in which, irrigation water and nitrogen fertilizers contributed most to on the total energy saving with the respective shares of 28% and 20%, total GHG emissions in actual reality vs optimum conditions were assessed as 930.45 and 882.17 $kgCO_2$eq. per ha, respectively (5.18% reduction in total GHG emissions). Electricity and diesel fuel respectively contributed by 37% and 32% of total reduction to GHG emissions.

Keywords: Greenhouses gas emissions, Energy, Optimization, Data envelopment analysis, Lentil

* Correspondent author's E- mail: khanali@ut.ac.ir

Creation of Two-Dimensional Greenhouse Environment Map Using Stereo Vision

AMIN NASIRI[1], HOSSEIN MOBLI[2][*], SOLEIMAN HOSSEINPOUR[3], SHAHIN RAFIEE[4]

1. Ph. D. Candidate, Faculty of Agricultural Engineering and Technology, University of Tehran
2. Professors, Faculty of Agricultural Engineering and Technology, University of Tehran
3. Assistant Professor, Faculty of Agricultural Engineering and Technology, University of Tehran
4. Professors, Faculty of Agricultural Engineering and Technology, University of Tehran

ABSTRACT

It is possible to prepare a two-dimensional map of a greenhouse for automatic control to perform such operations as spraying and watering through locating the cultivation platforms and pots. Through getting disparity image from rectified stereo images and transferring the data to 3D-space, point cloud model of the environment was constructed. Then by projecting points to XZ plane and putting local maps together, based upon visual odometry, two-dimensional greenhouse environment map of the greenhouse was constructed. In order to detect and separate the cultivation platforms and pots and as well to localize the corner of platforms and position of the pots in the framework of two-dimensional point, three-dimensional coordinates of environment components were employed. Results obtained indicated that the proposed algorithm can detect 100.26 m or 94.05% of total length of the platform. Also, through the algorithm it was possible to detect 83.33% of the corners of the cultivation platforms with an average error of 0.09 meter and mean squared error of 0.009 meter. From the two-dimensional map of the greenhouse, became evident that the proposed algorithm benefits from the detection and localization capability of 92.10% of the pots with an average error of 0.07 meter and mean squared error of 0.006 meter.

Keywords: Cultivation platform, Pot, Three-dimensional coordinates Visual odometry.

* Correspondent author's E- mail: hmobli@ut.ac.ir

Life Cycle Assessment of Paste Production (Case Study: Alborz Province)

SEYYED HASSAN PISHGAR-KOMLEH[1][*], ASSADOLAH AKRAM[2], ALIREZA KEYHANI[3], MARK A.J. HUIJBREGT[4]

1. Ph.D. Candidate, Department of Agricultural Machinery Engineering, Faculty of Agricultural Engineering and Technology, University of Tehran, Karaj, Iran. Email address: hpishgar@ut.ac.ir
2. Associate Professor, Department of Agricultural Machinery Engineering, Faculty of Agricultural Engineering and Technology, University of Tehran, Karaj, Iran. Email address: aakram@ut.ac.ir
3. Professor, Department of Agricultural Machinery Engineering, Faculty of Agricultural Engineering and Technology, University of Tehran, Karaj, Iran. Email address: akeyhani@ut.ac.ir
2, Professor, Radboud University, Netherland

ABSTRACT

Agriculture, food industry and environment are among the concepts that because of their interaction nature cannot be surveyed. The present research aimed at studying tomato paste production through an application of Life Cycle Assessment (LCA). A number of three tomato production stages, namely: post-harvest transportation and tomato paste production were assessed. System boundary included all production, transportation and application operations of inputs at different tomato paste production stages (cradle to tomato paste gate). Data were collected from one paste factory in Alborz Province and open-field tomato farms in the Alborz and East Azerbaijan provinces. In order to evaluate the greenhouse gas effect, Carbon Footprint (CF) index was employed. Two functional units of kg CO_{2-eq}/ kg tomato and kg CO_{2-eq} / kg paste were taken into account. The average CF of the paste production was 3.02 kg CO_{2-eq}/kg paste in which tomato production bore the highest share (28%) in the total emissions. CF related to of tomato production was 0.22 kg CO_{2-eq}/ kg tomato. Electricity (irrigation) and chemical fertilizers had the highest emission share within the tomato production stage. A comparison of CFs between Alborz and East Azerbaijan provinces and between conventional and modern irrigation systems indicated that CFs in modern irrigation system in Alborz province is less pronounced than that in the other one. Irrigation and chemical fertilizers were found as hotspots in CF. Overall recommendations to decrease CF are farm integration and application of modern irrigation systems throughout the tomato production processes.

Keywords: Carbon footprint, Life cycle assessment, Tomato paste, Alborz, East Azerbaijan

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* Correspondent author's E- mail: hpishgar@ut.ac.ir

Active Packaging of Lighvan Cheese with Nanocomposite Films Based on LDPE-Metallic Nanoparticles and Modeling of the Migration of Nano silver

PARISA ABDOLSATTARI[1], SEYED HADI PEIGHAMBARDOUST[2]*, AYNAZ MOLAYI[3], SEYED JAMALEDDIN PEIGHAMBARDOUST[4], MIR YUSEF HASHEMI[5]

1. Former Graduated Student, Food Science and technology, Faculty of agriculture, Universityof Tabriz
2. Professor, Department of Food Science, College of Agriculture, University of Tabriz
3. Assistant Professor, Food Science and technology, Faculty of agriculture
4. Assistant Professor, Department of Chemical Engineering & Petroleum
5. Assistant Professor, Department of Mechanical Engineering, Faculty of Engineering, University of Shahid Madani, Azarbaijan

ABSTRACT

Lighvan made cheese is one of the most popular grades of Iranian cheeses that always face microbial problems due to the traditional ways of its production. Throughout the present study, the effect of two types of low density polyethylene-nanocomposite films containing Ag, CuO and ZnO nanoparticles of   different percentages on increasing the shelf-life of the product stored at $4°C$, was investigated. Microbial tests of the packed cheese were started to be carried out immediately after being packaged (at day 0) and after 7, 14, 21, 28 and 60 days of storage. After 60 days past of storage, the growth rate of coliforms and *Staphylococcus aureus* significantly decreased ($p<0.05$) as a result of application of nanocomposite package containing equal percentages of nanometals (sample 1) but it did not affect lactic acid bacteria's growth. The results of migration tests of nano metal particels from packaging material in to simulant food showed that nano composite that contains metal nanoparticles is safe as according to limitations set by FDA and EFSA. Migration modeling for nano silver within 12 months tine lapse was also carried out.

Keywords: Active packaging, Lighvan cheese, Nanocomposite, Nanometal particles migration, Modeling

Life Cycle Assessment of Potato Production through Semi-mechanized Methods in Iran: Case Study: Markazi Province

ALIREZA SHAHMOHAMMADI[1][*], HADI VEISI[2], KOUROS KHOSHBAKHT[3], ABDOLMAJID MAHDAVI DAMGHANI[4], ELIAS SOLTANI[5]

1-Graduate student, Agroecology, Institute of Environmental Sciences, University of Shahid Beheshti, Tehran
2. Associate Professor, Agroecology, Institute of Environmental Sciences, University of Shahid Beheshti, Tehran
3. Associate Professor, Agroecology, Institute of Environmental Sciences, University of Shahid Beheshti, Tehran
4. Associate Professor, Agroecology, Institute of Environmental Sciences, University of Shahid Beheshti, Tehran
5. Assistant Professor, Department of Agronomy and Plant Breeding, Aboureihan University College of Tehran University

ABSTRACT

In recent years, the debate over the environmental sustainability as regards agricultural production is widely increased. In this context, environmental impacts of potato production, Through semi-mechanized methods were studied in Markazi province, Iran. To follow the purpose, life cycle assessment approach was employed to identify and reduce the environmental undesirable impacts. The environmental impacts of potato production in Markazi Province within the categories of the effect on the abiotic depletion, global warming, acidity, eutrophication, and ozone layer depletion were investigated. The results revealed that direct emissions from farms, use of chemical fertilizers and electricity exerted the highest shares of environmental degradation. In this regard, the indexes for category effects of abiotic depletion, global warming, acidity, eutrophication and ozone layer depletion were obtained as: 1.11, 152.89, 1.90, 0.87 and 0.00005 respectively. Based upon the obtained results, the use of organic inputs, precision farming, optimal application of chemical fertilizers and pesticides, the use of more efficient methods of irrigation as well as technologies in potato production were proposed.

Keywords: Life cycle, Potato, Abiotic depletion, Global warming, Acidity

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* Correspondent author's E- mail: ashahmohammadi@ut.ac.ir

Optimization of Chisel Tine Operation when Used in Combination with a Tillage Machine

MAJID DEHGHANI[1], SEYED HOSSEIN KARPARVARFARD[2]*

1. Former Graduate Student, Mechanics of Agricultural Machinery, Biosystems Engineering Department, Shiraz University
2. Associate Professor, Mechanics of Agricultural Machinery, Biosystems Engineering Department, Shiraz University

ABSTRACT

Performance optimization of a chisel tine was investigated by use of a chisel plow equipped with a rake adjustable in its rake angle. The affecting parameters consisted of soil moistures, namely: 0.5, 0.7 and 0.9 of plastic limit (PL), three rake angles of 30, 40 and 50 degrees and speeds of: 3, 5 and 7 km h^{-1}. The assessed parameters included draft, soil disturbance area, soil upheaving area, clod Mean Weight Diameter (MWD), specific draft and soil Cone Index (CI). The statistical design applied was a factorial split block one. To optimize the chisel plow in terms of six evaluated factors, three regression equations based on multiple regression for three factors of: soil moisture, tine rake angle and travel speed were obtained the for six measured traits. Regression analysis showed that the most appropriate moisture for tillage is 0.71 (PL), the most acceptable rake angle is 34 degrees and the most convenient speed 5.5 km h^{-1}.

Keywords: Tillage tool, Rake angle, Soil moisture content, Draft, Specific draft.

* Correspondent author's E- mail: karparvr@shirazu.ac.ir

An Evaluation of the Effect of Antifermentation Activity of *Lactobacillus. brevis and Enterococcus* Faecium Isolated from "Chal (Camel's Fermentative Milk) against Destructive Fermentation agents Present" in Iranian Yoghurt Drink (Doogh)

MORTEZA KHOMEIRI[1], SAMIRA ESAZADEH RAZLIQ[2]*, AHMAD NASRALLAHZADEH[3]

1.Academic Member, Faculty of Food Science and Technology, Gorgan University of Agricultural Sciences and Natural Resources

2.Graduate Student,   Faculty of Food Science and Technology, Gorgan University of Agricultural Sciences and Natural Resources

3. Graduate Student,   Faculty of Food Science and Technology, Gorgan University of Agricultural Sciences and Natural Resources

ABSTRACT

Anti-microbial effects of the lactic acid bacteria have been studied and verified in various investigations. Through this investigation it was aimed to study the anti-yeast effect of two isolated lactic acid bacteria species from "chal" (a product from yogurt) as biological preservatives in doogh. To do so, anti-yeast activity of L. brevis and E. faecium against Saccharomyces cerevisiae, Kluyveromyces. marxianus and Rhodotorula glutinis was evaluated making use of the overlay method. Besides, anti-yeast activity of the bacteria was assessed in yogurt samples containing the yeast. According to the obtained results, L. brevis and E. faecium exhibited strong prohibiting trend against R. glutinis ; however, they rendered no anti-yeast effect against S. cerevisiae and K. marxianus. Statistical analysis revealed that, in contrast to the other two studied yeasts, content of the yeast R. glutinis decreased over 15 days of a logarithm cycle as compared with the control. Therefore, based on the attained results, lactic acid bacteria could be recommended as biological preservative along with the common chemical preservatives.

Keywords: Antiyeast effect, overlay method, Spoilage yeasts*, L. brevis, E. faecium*

*Correspondent author's E- mail: 1368samira@gmail.com

An Investigation of the Effect of Active Edible Coating and Vacuum Packaging on Chemical, Microbial and Sensorial Properties of Ready to Eat Pomegranate Arils

MINA RABBANI[1], MIRKHALIL PIROUZIFARD[2]*, HADI ALMASI[3]

1. Graduate Student, Food Science and Technology, Faculty of Agriculture, Urmia University, Urmia, Iran
2. Associate Professor, Food Science and Technology, Faculty of Agriculture, Urmia University, Urmia, Iran
* k.pirouzifard@yahoo.com
3. Assistant Professor, Food Science and Technology, Faculty of Agriculture, Urmia University, Urmia, Iran

ABSTRACT

The aim Followed in the present research, was to investigate the effect of active edible coating based on Carbocy Methyl Cellulose (CMC) containing pomegranate peel extract (PPE) (at two concentrations of 2.5% and 5% w/w of CMC) as well as rose Essential Oil (REO) (at two concentration levels of 0.125% and 0.25% w/w of CMC) along with Vacuum Packaging (VP), and also their combined effect on chemical properties, microbial quality and sensorial attributes of packaged pomegranate arils for a duration of 15 days of storage at 5 °C. The results show that the weight loss increase by increase in storage time. All the other treatments were also capable of diminishing the weight loss. The coated samples treated with PPE and REO in combination with VP presented the lowest weight loss at day 15. Total soluble solids increased by use of active coatings and VP. Acidity was not affected by active coatings and VP but it slightly increased especially when active coatings applied. Aerobic mesophilic bacteria were not capable of growth in pomegranate arils but yeast as well as mold counts increased with the passage of time. VP was more effective than active coating on total yeast and mold counts. Total acceptability of arils increased by use of active coating along with VP. But the effect of edible coating on sensorial properties was more than that of VP. In total, CMC coated sample containing 0.25% REO in combination with vacuum packaging showed the most acceptable chemical, microbial and sensorial characteristics, during storage.

Keywords: Pomegranate arils, Vacuum packaging, Rose essential oil, Pomegranate peel extract, Microbial count

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*Correspondent author's E- mail: k.pirouzifard@yahoo.com

Evaluation of a Chisel Plow Draft Force and Power Estimation as Based on the Required Mechanical Laws

IMAN AHMADI[1]*

1. Assistant professor, Isfahan (Khorasgan) Branch, Islamic Azad University

ABSTRACT

Chisel plow is one of the tillage implements utilized to carry out conservation tillage practices; therefore, paying more attention to the force required for its. Operation is of much concern. To achieve this, a theoretical model was developed to estimate draft, specific draft, and drawbar power as required by a chisel plow. The results obtained from the developed model were compared with the reports of other studies and with the results of field experiments to validate the operation of the developed model. According to the results, the required draft force of a twelve-shank chisel plow, working at 30 cm depth in sandy, loamy, and clay soils were 27, 43 and 55 kN respectively and the required specific draft of this implement were 3.3, 5.1 and 6.5 N/cm^2 respectively. The results were in agreement with the results attained from other studies, well with the results of ASABE standard (2011), therefore; it was concluded that the developed model is of the capability to estimate draft force of a chisel plow to an acceptable degree.

Keywords: Mechanical laws, Soil cutting, Specific draft force, Theoretical models

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* Correspondent author's E- mail:i_ahmadi_m@yahoo.com

Weight Estimation System of Individual Broiler Chickens Using Digital Image Processing and Multi-Regression Analysis

SOMAYYE AMRAEI[1], SAMAN ABDANAN MEHDIZADEH[2][*], SOMAYYEH SALARY[3]

1. Graduate Student, Mechanics of Biosystems Engineering Department, Faculty of Agricultural Engineering and Rural Development, Ramin University of Agriculture and Natural Resources of Khuzestan.
2. Assistant professor of Biosystems Engineering Department, Faculty of Agricultural Engineering and Rural Development, Ramin University of Agriculture and Natural Resources of Khuzestan.
3. Assistant Professor, Department of Animal Science, Faculty of Animal Science and Food Technology Ramin University of Agriculture and Natural Resources of Khuzestan

ABSTRACT

The purpose followed in the present study was to identify the daily changes in body weight of broiler chicks employing image processing and multi-regression analysis. A number of, thirty 1-day-old broiler chicks were reared under standard rearing conditions and following the acquiring of their images, they were individually weighted. Out of 2490 digital images, six features (perimeter, area convex, major axis, minor axis, eccentricity) were picked up. Linear equations between body weight and the features indicated that R^2 values for these features (except for eccentricity) for the individual birds exceeded 0.9. Furthermore, stepwise selection process was utilized to develop multi-regression model and to remove non-significant factors from the regression equation. According to the developed equation, area, perimeter, area convex, major axis, minor axis, interaction between area and major axis, as well as convex area, perimeter, major and minor axis were capable of predicting weight with $R^2 = 0.945$ within the confidence level of %5. This shows that the digital image processing and multi-regression analysis could promisingly predict the weight of live chickens..

Keyword: Weight prediction, Digital image analysis, Multi-regression analysis, Broiler chicken

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* Correspondent author's E- mail: saman.abdanan@gmail.com; s.abdanan@ramin.ac.ir

Non-destructive Prediction of Quality Parameters of Sweet Lemon (*Citrus limetta*) through Vis/SWNIR Spectroscopy

SHAHRAM MOOMKESH[1], SEYED AHMAD MIREEI[2*], MORTEZA SADEGHI[3], MAJID NAZERI[4]

1. Graduate Student Department of Biosystems Engineering, College of Agriculture, Technical University of Isfahan
2. Assistant Professor, Department of Biosystems Engineering, College of Agriculture, Technical University of Isfahan
3. Associate Professor, Department of Biosystems Engineering, College of Agriculture, Technical University of Isfahan
4. Assistant Professor, University of Technology, Department of Photonics, Faculty of Physics, University of Kashan

ABSTRACT

Among different attributes for the distinction of maturity and quality evaluation of sweet lemon, Soluble Solids Content (SSC), Titratable Acidity (TA), and Moisture Content (MC) are considered as the most important ones. Throughout the present study, the potential of Visible and Short Wavelength Near-Infra Red (Vis/SWNIR) spectroscopy for nondestructive predicting of SSC, MC, and TA of sweet lemon was investigated. The spectra of 120 sweet lemon samples were acquired in the interactance and transmission modes and within the wavelength region of 400 to 1100 nm. Different preprocessing methods, including Savitzky-Golay (SG) algorithm, Multiplicative Scatter Correction (MSC), Baseline Correction (BC), Standard Normal Variate (SNV), 1st derivative, and a combination of these methods were applied to the raw spectra. The most appropriate preprocessing methods were then selected for building the predictive models using partial least squares (PLS) method. The results showed that the most appropriate SSC and MC predictive models were achieved in the interactance mode while the most desirable TA predictive model was obtained in the transmission mode. Among three quality parameters, the most suitable models resulted in the prediction of SSC, MC, and TA, respectively. The SSC with a correlation coefficient (r_p) of 0.87 and a Root Mean Squares Error of Prediction (RMSEP) of 0.5 °Brix, MC with an r_p of 0.88 and an RMSEP of 0.57%, as well as TA with a r_p of 0.74 and an RMSEP of 0.0076% could be predicted.

Keywords: Correlation coefficient, interactance, Partial Least Squares, Preprocessing, Root Mean Square Error, Transmission.

*Correspondent author's E-mail: samireei@cc.iut.ac.ir

Diagnosis of Avian Newcastle, Bronchitis and Influenza Diseases Employing Heart Sound Signal and Artificial Intelligence Methods

MOHAMMAD SADEGHI[1], AHMAD BANAKAR[2]*, ABDOLHAMID SHOOSHTARY[3]

1. Graduate Student, Faculty of Agriculture, Tarbiat Modarres University
2. Assistant Professor, Faculty of Agriculture, Tarbiat Modarres University
3. Assistant Professor, Razi Vaccine and Serum Research Institute

ABSTRACT

The present study presents an intelligent procedure for simultaneous diagnosis Avian Newcastle Disease Virus, Infection Bronchitis Virus as well as Influenza through heart sound signals. To follow the aim, the sample chickens were divided into four groups. The first group was taken as the control. The second, third and fourth groups were respectively infected with Newcastle Disease Virus, Infection Bronchitis as well as Avian Influenza. The time domain signals were transferred to the frequency and time-frequency domain using Fast Fourier and Discrete Wavelet Transforms. In data mining stage, 25 statistical features were extracted from three domains and the most appropriate features selected, using Improved Distance Evaluation (IDE) method. The heart sound signals were classified using multiclass support vector machine and Dempster-Shafer Evidence Theory. Total accuracy, Specificity, and Sensitivity of classifiers, fusion in diagnosis of avian diseases were obtained as 81.93, 93.29 and 82.28 percent respectively.

Keywords: Support Vector Machine (SVM), Discrete Wavelet Transform (DWT), Avian Disease, Dempster-Shafer Evidence Theory.