

Estimating Solar Radiation through Ordinary Meteorological Data, Mashhad

HANIFREZA MOTAMED SHARIATI¹, HOSEIN MOBLI^{2*}, MOHAMMAD SHARIFI³, HOJJAT AHMADI⁴

1. PhD Candidate, Agricultural mechanization department, University of Tehran

2. Professor, Agricultural Mechanization Department University of Tehran, Karaj

3. Professor, Agricultural Mechanization Department University of Tehran, Karaj

4. Professor, Agricultural Mechanization Department University of Tehran, Karaj

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ABSTRACT

Considering the increase in the world population, human needs for food and energy have been on the increase too. One of the main tasks of the heads in governments is to provide the needed energy for the people in their countries. As the fossil sources are towards their ends and they also are the source of greenhouse gas emissions causing environmental pollution, shifting to renewable sources of energy is an indispensable alternative for most countries. The sun is undoubtedly the most important source of renewable energy. To assess the accessible solar radiation in Mashhad Province from the ordinary meteorological data via Artificial Neural Network (ANN), a survey was conducted. Results indicated that ANN with six variable inputs of : daily mean temperature, daily relative humidity, daily sunshine duration, daily extraterrestrial radiation, number of days of the year and daily dry temperature, with two hidden layers including 37 and 18 neurons respectively, presented a good estimation of a high accuracy for solar radiation. The measured R, MAE, MSE and RMSE were recorded 0.9533, 1.4391, 4.1790, and 2.0443, respectively. Therefore, as for Mashhad, and the regions of similar climate to that of Mashhad, where there is no easy access to solar radiation data, one can use ordinary meteorological data, as above, to estimate the solar radiation with a high degree of acceptable accuracy.

Keywords: Renewable energy, Estimating, Solar radiation, Ordinary meteorological data, Artificial neural network.

Prediction of Tehran Solid Waste Production by Use of Neural Network vs. Adaptive Neuro-fuzzy Inference System

SAJJAD NASROLLAHI SARVGHAJI¹, REZA ALIMARDANI^{2*}, MOHAMMAD SHARIFT³, MOHAMMAD REZA TAGHIZADEH YAZDI⁴

1. MSc. Student, Faculty of Agricultural Engineering and Technology, University of Tehran

2. Professor, Faculty of Agricultural Engineering and Technology, University of Tehran

3. Assistant Professor, Faculty of Agricultural Engineering and Technology, University of Tehran

4. Assistant Professor, Faculty of Management, University of Tehran

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ABSTRACT

Two intelligent systems, based upon Adaptive Neuro-fuzzy Inference System (ANFIS) and artificial neural networks (ANNs) of forecasting Municipal Solid Wastes (MSWs) generation were proposed. ANFIS and ANNs as intelligent tools were compared one with another to monthly predict MSWs generated in Tehran, Iran. Monthly solid wastes (SWs), total monthly precipitation, monthly mean temperature, and average humidity as well as the rank of months per year within the experimental period of 2009-2014 were used as input data for model learning. The most suitable ANN model had a 5-14-1 structure. It consisted of an input layer of five input variables, one hidden layer of 14 neurons as well as the MSW production as the output. The most appropriate ANFIS model was one designed using one ANFIS architecture along with some six-time run outs developed at three stages. Correlation coefficient (R^2), Root Mean Square Error (RMSE) and Mean Absolute Percentage Error (MAPE) for the fittest ANN model were found out as 0.825, 0.132 and 1.19, respectively. The corresponding R^2 , RMSE and MAPE values for the most suitable ANFIS topology amounted to 0.963, 0.096 and 1.05 respectively. The results finally indicated that, multi-layer ANFIS model due to its employing of fuzzy rules, ended up with a better performance than the ANN model.

Keywords: Waste, municipal solid wastes, intelligent systems, ANFIS, ANN

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

Analysis of Greenhouse Gas Emissions in the Process of Pasta Production

MOHAMMAD DAVOOD HEIDARI¹, HOSEIN MOBILI^{2*}, MAHMOOD OMI³, SHAHIN RAFIET⁴, VAHID JALAMI MARBINI⁵

1. Ph. D. Student, Faculty of Agricultural Engineering and Technology, University of Tehran

2. Professor, Faculty of Agricultural Engineering and Technology, University of Tehran

3. Professor, Faculty of Agricultural Engineering and Technology, University of Tehran

4. Professor, Faculty of Agricultural Engineering and Technology, University of Tehran

5. Instructor, Zar Industrial Research group, Zarmakaron Co.

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ABSTRACT

The goal followed in the present study was to analyze the GreenHouse Gas (GHG) emissions in pasta production. Data for the study was collected from durum wheat production farms from three provinces, Iran. Data of soil properties, transportation as well as and pasta factory production stages were collected and analyzed, using SimaPro Software, Ecoinvent data base and Global Warming Potential (GWP) for 100 year method. EPIC model was used to calculate GHG emissions of land use change. Results indicated the average greenhouse gas emission related to one kg of pasta production was 2.64 kg CO₂-eq. Among the different sources of emissions, land use change and fuel consumption for agricultural operations constituted the main contributors to total GWP of pasta production.

Keywords: Carbon dioxide, Durum wheat, Global warming potential, Land use change, Life cycle assessment.

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

Effect of Different Drying Methods on Viscosity and Gelation of *Lipidium perfoliatum* Seed Gum**LEILA MOMENI¹, ARASH KOOCHEKI², BEHZAD ALAEDINI^{3*}**

1. M.Sc. Student, Department of Food Science and Technology, Islamic Azad University Noor Branch

2. Associate Professor, Department of Food Science and Technology, Ferdowsi University of Mashhad

3. Instructors, Department of Food Science and Technology, Islamic Azad University Noor Branch

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ABSTRACT

The main purpose followed in the present study is to investigate the effect of different drying methods on apparent viscosity and Gelation of *Lipidium perfoliatum* seed gum. Three drying methods, namely: air, freeze, and vacuum drying, were tested. Results indicated that the viscosity values of samples varied from 0.31 to 1.26 pas at shear rate of 12.23 s⁻¹ and while control sample exhibiting the highest viscosity. Apparent viscosity decreased through all the drying methods but vacuum drying exerted the most negative effect on viscosity. The differences between hot air and freeze dried gum treatments were not significant. Drying methods extend significant effects on hardness and adhesiveness changes of gels made of dried gums. The numerical values of hardness and adhesiveness were respectively, in the ranges of 0.142 to 0.264 (N) and 0.192 to 0.309 (Ns) for the gels prepared from dried gum in various conditions. It was shown that each of the functional properties of final gum can be affected by a different drying method. So these results can be effective in selection of proper drying method of *Lipidium perfoliatum* seed gum as thickening and gelling agent

Keywords: *Lipidium perfoliatum* seed, Gum, Drying, Apparent Viscosity, Gelation

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

Investigating Possibility of Using Low Pressure Rotary Fog System to Control the Temperature of Poultry Houses

MEHDI BAGHER¹, RAMIN JAFARI^{2*}

1. Graduate Student, Department of mechanics of agricultural machinery, Shiraz University

2. Ph.D., Department of mechanics of agricultural machinery, Shiraz University

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ABSTRACT

Distribution of water vapor within the atmosphere of the poultry houses is as a whole an effective and an economical solution to reduce heat stress upon the chickens. Experimental studies were conducted in a small saloon located in the farm machinery department of Shiraz University. A rotary cup fog making system consisting of a cup, driven by a DC electric motor, was set up. The rotational speed of the cup led to the distribution of water droplets into the air in small particles. The effects of rotary speed of the cup (at three levels), cup material, and the quality of the cup inner surface were investigated. Results revealed that increasing the rotary speed of the cup causes an increase in the relative humidity of the room causing a decrease in room temperature. Increase in the cup rotary speed caused an increase in the fraction of water vaporized into the air. The cup material significantly affected the in/out temperature ratio. The, in question ratio, was lower for Teflon cup than that for aluminum one.

Keywords: Water vaporising cooler, Heat stress, Poultry house, Humidity control

Environmental Impacts Estimation of Watermelon Production in Guilan Province through Life Cycle Assessment

ALLAHYAR MOHAMMADI-BARSARI¹, SAEED FIROUZI^{2*}, HASHEM AMINPANAH³

1. MSc. Student, College of Agriculture, Rasht Branch, Islamic Azad University

2. Associate Professor, College of Agriculture, Rasht Branch, Islamic Azad University

3. Associate Professor, College of Agriculture, Rasht Branch, Islamic Azad University

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ABSTRACT

Iran is considered as among the greatest emitters of greenhouse gasses in the world. Agricultural sector plays a remarkable role in non-renewable energy consumption, and thus, the environmental impacts are great within the whole country. Within this context, the environmental impacts of watermelon production (as the most important melons produced in Guilan Province, Iran) were investigated as through the Life Cycle Assessment (LCA) approach. The primary data were gathered using the questionnaires and face to face interviews with 58 watermelon producers in Kiashahr region of Guilan Province in 2014. The environmental impacts were classified into six categories including global warming, acidification, terrestrial eutrophication, depletion of fossil resources, and depletion of phosphate and potash resources. Results revealed that the terrestrial eutrophication (0.185) followed by depletion of phosphate resources (0.116) exerted the highest negative impacts on the environment. Therefore, efficient use of chemical fertilizers, specially nitrogen fertilizers and instead replacing them with a variety of organic fertilizers accompanied by use of bio-fertilizers can reduce the negative environmental impacts of watermelon production in terms of terrestrial eutrophication and phosphorus fertilizer groups in Guilan Province, Iran.

Keywords: Terrestrial eutrophication, Pollutant, Resource depletion, Global warming, Environmental impacts.

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

Effects of Ultrasound Pretreatment of Soaking on Physico-Chemical Properties of Two Iranian Rice Varieties

HAKIMEH GHANOON NEIRIZI¹, MOHAMMAD ABOONAJMI^{2*}, SARA MOVAHED³

1, MSc. Student, Islamic Azad University, Varamin- Pishva Branch

2. Associate Professor, University College of Abureyhan, University of Tehran

3. Associate Professor, Islamic Azad University, Varamin- Pishva Branch

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ABSTRACT

The effect of power ultrasound (20 kHz, 800, and 1000W) for duration of 20, 40, and 60 minutes on physico-chemical properties of two rice varieties of: Tarom and Neda were investigated and then with the conventional soaking method (controlled temperature of 47°C) compared. Results indicated the maximum level of water sorption of rice, was observed at 60 minutes past of ultrasound treatment (1000W) and whilst the lowest observed in the treatment of 20 minutes past of rice being soaked. The highest rates of TDS and EC were observed for Tarom variety, i.e., observed for 60 minutes of sonication (800 W) while the lowest occurring 20 minutes after soaking treatment. The highest rice length obtained was observed for Neda variety following 20 minutes of ultrasound treatment (1000 watts). Results finally indicated that the pretreatment of rice using ultrasound, as compared with the conventional method is positively effective in the process of rice being soaked.

Keywords: Power ultrasound, rice, water absorption, TDS, EC

Kinetics of Generation and Extraction of Reducing Sugars and Color Changes during Blanching of Potato Strips in Hot Water

HAMED BEYKI^{1*}, NASSER HAMDAMI²

1. Graduate Student, Isfahan University of Technology
 2. Assistant Professor, Isfahan University of Technology
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ABSTRACT

To investigate the effect of temperature and time of blanching process on the generation and extraction of reducing sugars and as well on the kinetics of color changes during blanching, potato strips either packaged in the polyethylene (HDPE of 10 micron thickness) films or with no polyethylene coverings, were immersed in distilled water at temperature rates of 50, 60, 70, 80 and 90 °C for 120 minutes. The results indicated that an increase in the temperature of blanching accelerated the diffusion of reducing sugars, but the generation of the sugars decreased with increase in temperature, getting terminated at 80 and 90 °C. Increases in temperature and the time of blanching also reduced the colorimetric parameters significantly ($P < 0.01$). Kinetic modeling results showed that the first order kinetic with production rate limiting effect stood at the most conformity with experimental data of reducing sugars generation and redness-greenness parameter changes while the extraction of reducing sugars and darkness-lightness as well as yellowishness-bluishness parameter changes followed a first order kinetics.

Keywords: Reducing sugars, Blanching, Colorimetric parameters, Kinetic modeling

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

Design, Installation and Evaluation of an Automatic Controlled Atmospheric Cold Store

MOHAMMAH HOSSEIN SAEIDIRAD^{1*}, SOODABEH EYNAFCHAR², SAEED ZARIFNESHAT³, SAMAD NAZARZADEH⁴

1. Research associate professor, Khorasan Agricultural and Natural Resources Research Center

2. Research assistant professor, Khorasan Agricultural and Natural Resources Research Center.

3. Research assistant professor, Khorasan Agricultural and Natural Resources Research Center.

4. Academic Staff, Khorasan Agricultural and Natural Resources Research Center.

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ABSTRACT

One of the ways to increase the shelf life of agricultural products is the use of atmospherically controlled cold stores. To obtain the needed controlled gas components, an equipped with cooling system cold store and an atmospheric controller system were designed and constructed. The volumes of CO₂, O₂ and N₂ were assessed and automatically controlled, then directed into the store, pre-adjusted through Programmable Logic Control (PLC). The store consisted of a laboratory refrigerator of 780 liter capacity. Three 10 kg capacity capsules were used to feed the gases of CO₂, O₂ and N₂ into the cold store. Three sensors, sensing the concentrations of CO₂, and O₂ as well as air pressure with the help of three electrical values controlled the injection of CO₂, O₂ and N₂ into the system. Finally, the gas injection control system was evaluated as with the three components of CO₂, O₂ and N₂. The results finally revealed that the gas injection control system performed with some 17.55 average error percentages. The average error of the cooling system as related to the adjusted temperature was 19.87%.

Keywords: Increasing shelf life, Agricultural product, Co₂ Injection, PLC.

Investigating the Effects of Using Biodiesel Fuel Extracted from Persian lilac Seeds on the Performance of a Diesel Engine

HOSSEIN JAM¹, AHMAD GHAZANFARI^{2*}, MOHSEN SHAMSI³

1. Graduate Student, Department of Mechanics of Agricultural Machinery Shahid Bahonar University of Kerman

2. Professor, Institute of Horticulture, Shahid Bahonar University of Kerman

3. Associate Professor, Shahid Bahonar University, Kerman

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ABSTRACT

The gradual depletion of fossil fuels and the resulting increase in the production costs have made the researchers look for renewable sources of energy. Biodiesel fuel has attracted the attention of many researchers due to its low environmental pollution and its being a renewable fuel. In this research work, bio diesel was prepared by trans esterification of Persian lilac seed oil. The prepared fuel was mixed with the common petro diesel in 0, 10, 20, 30 and 100% proportions (biodiesel/diesel). The moisture was tested using a diesel engine operating at 1300 to 1800 rpm with a variable load of 200, 250 and 300 Nm. The results indicated that, with increase in proportion of biodiesel/diesel fuel the break specific fuel consumption (bsfc) increased and while the break mean effective pressure (bmep) decreased. When pure biodiesel was used as fuel, in comparison with pure diesel fuel, bsfc increased up to 68.9% while bmep decreasing to 13.4%. The most appropriate performance for the blended fuel was achieved when either B10 or B20 used. With these blends, the increase in bsfc was 4.9 and 6.8%, respectively and the decrease in bmep 3.6 and 4.3%, respectively.

Keywords: Break specific fuel consumption, Biodiesel, Engine, break mean effective pressure

* Correspondent author's E-mail: aghazanfari@uk.ac.ir

Effect of Microwave Heating Treatment on Mortality of Date Red Palm Weevil (*Rhynchophorus ferrugineus*) vs. Chemical Combat

SAEED MOLLAZEHI^{1*}, HASAN SADRNI²

1. PhD candidate, Ferdowsi university of Mashhad

2. Assistant Professor, Ferdowsi university of Mashhad

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ABSTRACT

Rhynchophorus ferrugineus which is considered as the most important blight of the date palm causes the extermination of many palm trees every year. For a determination of the appropriate age for fighting blights and a study of the effect of trunk's thickness on blight's damage, two series of experiments were carried out. The first series contained two independent variables vs. a dependent one. The independent variables consisted of the blight's age at four levels (1,2,3 and 4) vs. thermal care period of four levels(10,15,20 and 30 seconds) while the dependent variable being blight's death rate. The second series of experiments contained two independent variables against one dependent too. The two independent variables were comprised of the thermal care period at three levels (30, 60 and 100 seconds) plus the wood's thickness of three sizes (5, 10, 12 cm) while the dependent variable being blight's death rate. The results show that the most fatalities occur at age 3 with 100 percent death within the times of 15, 20, 30 seconds and the least fatalities at the ages of 1, and 4 of 10 seconds. In the study of the effect of a trunk's thickness on blight's death, the age 3 by considering its damages exposed indirectly by microwave in trunk's cubic pieces, the results show that in 60 and 100 seconds and in thicknesses of 5 centimeter the death rate is in the sequence range of 100 percent and while in 10 centimeter thickness is 13.33 (73.33 percent), and in 12 centimeter it is 6.66 (30 percent).

Keywords: Fatalities, Direct exothermic, Indirect exothermic

A Study of the Factors Affecting the Development of Mechanization of Rice Cultivation in Guilan Province through Delphi Technique

SAEED YOUSEFZADEH¹, AND SAEED FIROUZI^{2*}

1. MSc Student, College of Agriculture, Rasht Branch, Islamic Azad University
 2. Associate Professor, College of Agriculture, Rasht Branch, Islamic Azad University
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ABSTRACT

Increased cost of rice production is of a major concern in Iran, so that a development of mechanization to reduce its production costs is inevitably indispensable. Within this context a Delphi study was conducted within three phases to identify the driving vs inhibiting forces concerning the development of mechanized cultivation of rice in Guilan Province. Following consultation with some of the academic staff of the Guilan University involved in rice production and the staff of the Department of Technical and Engineering section of Rice Research Institute of Iran, a number of 30 experts from the Jihad-e agriculture organization of Guilan province and its subsidiary offices (offices of Roudsar, Langaroud, Amlash, Lahijan, Siahkal, Astaneh Ashrafieh, Rasht, Anzali, Some-Sara, Fouman, Shaft, Masal, Talesh, and Astara) as well as research faculty members of the Department of Technical and Engineering section of Rice Research Institute of Iran were called upon for cooperation in the study. Results revealed that “The development of such infrastructures as increase in the number of “transplanting banks” with the acquisition of 97.5% of the votes of the mechanization experts “Improvement of the machineries’ after-sales services, especially for imported machines and equipments with 95.8% of experts’ agreement were the most driving forces for the development of paddy fields’ mechanization in Guilan. The Delphi study as related to inhibiting factors indicated that “the small and scattered paddy fields” with acquisition of some 97.5% of the experts’ agreement as well as “low prices of milled rice” with 92.5% of experts’ agreement constituted the top inhibiting factors of the development of rice mechanized cultivation in Guilan province. Therefore, according to infrastructures required for paddy field mechanization, building of enough trust to provide all the after-sales services, effort to consolidate the small paddy fields, and provision of the appropriate governmental policies to ensure purchase of produced rice (in line with inflation) are the most important steps needed to be taken by the custodians of the Iran’s Ministry of Agriculture.

Keywords: Agricultural mechanization, Paddy fields, Driving factors, Inhibiting forces

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

Modeling of Different Subsoiler Tines Performance Using Discrete Element Method

GHOLAMHOSSEIN SHAHGHOLOI^{1*}, SIRVAN HAJIMAMANDI²

1. Assistant Professor, Faculty of Agricultural Technology and Natural Resources, Mohaghegh Ardebili University

2. Senior Expert, Faculty of Agricultural Technology and Natural Resources, Mohaghegh Ardebili University

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ABSTRACT

For the design of tillage implements it is indispensable to estimate the soil forces exerted upon the implements. Many researches have shown that the numerical method of Discrete Element Method (DEM) is the cheapest as well as the fastest technique for modeling such granular material as soil, and especially the sandy ones. In this study, Para plow and bentleg tines' performances were compared with those in the conventional tine, using experimental, as well as numerical methods. The Experiments were conducted in a soil bin at the Agricultural Machinery Department of Urmia University as based upon a factorial experimental design of three replications. Three types of tines, at 5 levels of travel speeds of 1, 1.5, 2, 2.5, and 3 km/h at constant depths of 35 cm were examined. Before modeling to calibrate DEM parameters, soil parameters were calibrated through shear test simulation. Later tine and soil bin of certain dimensions were modeled through PFC_{3D} software. Results of analysis of variance and mean comparison showed that tine type and travel speed had significantly affected the draft force. A maximum draft requirement of 1541 N at forward velocity of 3 km/h and minimum value of 294.8 N were related to the conventional and bentleg tines, respectively. With increase in tool velocity connective energy between particles, frictional work between tine and soil particles and kinetic energy of soil particles increased, the increment contributing to draft increment. Bentleg tine had the lowest draft in comparison with the other tines, while the conventional tine the highest. A high correlation between test vs. modeling results ($R^2=0.9935$) showed that discrete element method can lead to the simulation of the effect of the tine type, and travel velocity on draft force. An average relative error of 6.871% was found between the test and modeling results.

Keywords: Subsoiler, Bentleg tine, Paraplow, Draft

Evaluation of Sound as a Deterrent for Reducing Bird Damage Incurred Upon Grain Fields

EASA ZARE GHALAE ABDE SHAHI¹, REZA YEGANEH^{2*}

1. Master of Science, Faculty of Agriculture, Ilam University

2. Assistant Professor, Faculty of Agriculture, Ilam University

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ABSTRACT

Birds, sometimes numbering in millions, can cause serious damage to grain fields. In order to find a method in line with the environmental issues, and as well effective in controlling birds, the deterrence effect of sound was studied in the present research to keep birds away. The broadcast unit was developed with the following design criteria: 1) Three sound levels of hawk, gas gun and sparrow distress, with frequencies of 1, 5 and 10 kHz 2) A combination of the sounds of cannon gas and sparrow distress with a frequency of 5 kHz in the morning, and 3) the same in the evening. The results indicated the percent flight of birds as by a mixture of the sounds by 92.46, gas gun 82.90, sparrow distress by 74.58, and hawk 48.22%. There was no significant difference observed between numbers of birds' flight, following sound produced in different frequencies. Also, it was recognized that percent flight of birds in the morning was 8.06 times that in the afternoon.

Keywords: Agricultural products, Birds damage, Birds away, Sound.

* Correspondent author's E-mail: r.yeganeh@ilam.ac.ir

Effect of Moisture Content and Frequency in Dielectric Properties of Two Paddy Varieties

MOHAMMAD TAHMASEBI^{1*}, REZA TABATABAEI KOLOR², AND JAFAR HASHEMI³

1. PhD Candidate, Faculty of Agricultural Technology and Natural Resources, University of Mohagheh Ardabili

2. Associate Professor, Faculty of Crop Engineering, Sari University of Agricultural Sciences and Natural Resources

3. Assistant Professor, Faculty of Crop Engineering, Sari University of Agricultural Sciences and Natural Resources

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ABSTRACT

Dielectric properties of agricultural products are among some of their most important physical characteristics, extensively used in developing new technologies in agriculture and in the related industries. Throughout the present study, the changes in the dielectric properties of Pazhoohesh and Gha-em paddy varieties (dielectric materials) in four moisture contents of: 13, 16, 19 and 22% (dry basis) and four frequency levels of : 100, 300, 500, and 700 KHz were investigated within the factorial framework of a completely randomized design. Results indicated no significant differences involved between the investigated varieties in terms of dielectric properties. Moisture content, on the other hand, significantly and on an increasing trend affected the dielectric properties of the paddies. Increase in the frequency of the input voltage, led to the increased conductivity, but it reversely affected the relative dielectric constant as well as loss factor. From among the interaction effects, the interaction between moisture and frequency significantly influenced the relative dielectric constant as well as loss factor. MLR models could predict the relationship between the moisture and dielectric constant within all the frequency levels, and moisture content with dielectric loss factor and electrical conductivity at frequencies of 100 and 700 KHz with reasonable accuracy.

Keywords: Dielectric properties, frequency, paddy, moisture content, variety.

Evaluating Functional Factors of Electrostatic Spraying for the Upper and Rear Surfaces of the Leaves Using Image Processing

HOSSEIN HAJI AGHA ALIZADE^{1*}, HASSAN POURVOUSOOGHI GARGARI², AMIR ABBAS BAKHTIARI³

1. Assistant Professor, Bu-Ali Sina University of Hamedan

2. Senior Expert, Tabriz Agricultural Research Center

3. Ph. D. Student, Bu-Ali Sina University of Hamedan

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ABSTRACT

The necessity to use pesticides in agriculture is inevitably accompanied by environmental pollution, and a significant part of the agro economy research is being allocated to this sector. Therefore, it is of important issues to use pesticides with the highest degree of efficiency, and minimal loss. Throughout the present study, electrostatic spraying along with its functional factors was evaluated. The applied experimental design was a completely randomized factorial one of three replications. The investigated factors included the electrostatic head with respect to the target (three levels), the engine rotational speed of the sprayer (at three levels) and the discharge of solute from the nozzle outlet (at three levels). In addition to a determination of the degree of drift for charged toxin particles, other experimental factors comprised of: electric charging factor (two levels), the wind speed (two levels), and the head (at three stages) were recorded. Assessment of pesticides' particle images' effects on water sensitive paper was carried out, using image processing toolbox of MATLAB and coding an image processing algorithm. The results, in some of the studied cases showed that the degree of significance of the examined factors was different depending on the upper and lower surfaces of the leaves. Also within the context of surface coverage, the degree of electric charging of particles was statistically significant with a probability of 99%.

Keywords: Surface coverage percent, Volume median diameter, Ratio of deposition uniformity, Drift

* Correspondent author's E-mail: h-alizade@basu.ac.ir

Evaluation of the Physical Stability of Garlic Powder Dried through Freeze vs. through Cabinet Drying

FARIBA BAYAT^{1*}, FOJAN BADI², ZAHRA RAFIEE DARSANGI³

1. Member of the Scientific Board, Agriculture and Natural Resources Research Centre of Hamedan

2. Member of the Scientific Board, Agricultural Engineering Research Institute of Karaj

3. Expert, Agricultural Engineering Research Institute of Karaj

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ABSTRACT

Sorption isotherm and thermal properties of powders were employed for determining stability during storage. Garlic slices of 2 mm thickness were dried, using two methods of freeze vs. cabinet drying. The results indicated that, the density, loss of pyruvate, as well as color changes of the freeze dried powder were less pronounced than those in the cabinet dried powder. Sorption isotherm curves of both garlic powders changed slightly up to 0.40 water activity while being increased drastically at higher water activity values. The glass transition temperature of the freeze dried powder of 50.36 °C (at 6.98% moisture content) was more than that of the cabinet dried powder of 44.5 °C (at 7.68 % moisture content). The glass transition temperatures of the powders decreased with increase in their moisture contents. The critical condition for the storage of garlic powder was the water activity of higher than 0.55 and the temperatures above 35 °C that increased the risk of moisture absorption accompanied by agglomeration of the garlic powder.

Keywords: Drying, Glass transition temperature, Specific heat capacity, Isotherm curves

Manufacturing and Testing of Wireless Sensor to Detect Bee Colony Activity inside the Hive Using Machine Vision

SAMAN ABDANAN MEHDIZADEH^{1*}, MARYAM SOLTANI KAZEMI²

1. Assistant professor , Faculty of Agricultural Engineering and Rural Development, Ramin University of Agriculture and Natural Resources of Khuzestan
2. MSc Student, Faculty of Agricultural Engineering and Rural Development, Ramin University of Agriculture and Natural Resources of Khuzestan

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ABSTRACT

The aim followed in this research was to construct and equip a hive with the acquisition, communication and analysis systems to send images on-line, wirelessly. This system could be used to evaluate behavior of bee colonies and also work as bait box to eliminate bee pests, when necessary. Throughout the study, two methods, optical flow vs. neighborhood gray-tone difference matrix, were employed to determine hive conditions as well as bee activities. According to the results obtained through optical flow analysis, means and variances could effectively be used to detect the bulk of existing bees inside the hive. Textual analysis is also a useful method to determine the level of uniformity, which, according to this analysis, the parameters of busyness and complexity bear a strong relationship with the bees' density inside the hive. Moreover, to determine the activity of bees among both analysis methods and extracted parameters, the mean parameter of optical flow analysis was more responsive than any other parameter.

Keyword: Honey bees, Sensor, Machine Vision, optical flow, Neighborhood Gray-Tone Matrix (NGTDM)

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

Effect of Production Conditions on Efficiency and Properties of Niosomes Incorporating Natural Canthaxanthin

MARYAM RAVAGHI¹, SEYED HADI RAZAVI^{2*}, SEYED MOHAMMAD MOUSAVI³

1. Ph.D. Candidate, Department of Food Science and Technology, College of Agriculture, Tehran University

2. Professor, Department of Food Science and Technology, College of Agriculture, Tehran University

3. Professor, Department of Food Science and Technology, College of Agriculture, Tehran University

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ABSTRACT

Canthaxanthin was produced through *Dietzia natronolimnaea* HS1 and used for incorporation in niosomes after extraction. Effect of rotational speed of rotary vacuum evaporator flask (100 and 150 rpm), anthaxanthin concentration (0, 1 and 2 microgram/ milliliter), concentration of poly ethylene glycol 400 (0, 0.1 and 0.2 %), surfactant type (Tween 60 and 80, Span 60 and 80) and surfactant to cholesterol micromolar ratio (100:100, 120:80, 140:60) on efficiency and niosome properties were evaluated. The results showed that rotational speed of 150 rpm, canthaxanthin concentration of 2 µg/ml, polyethylene glycol 400 in concentration of 0.2% and surfactant to cholesterol ratio of 100:100 produced niosomes with higher efficiency as well as smaller size. Utilization of span 60 with similar efficiency to span 80, smaller and more uniform vesicle size while using ethanol as solvent was preferred.

Keywords: Canthaxanthin, *Dietzia natronolimnaea* HS1, Niosome, Surfactant.

Effect of Basil Seed Mucilage on Physical, Sensory and Staling Properties of Sponge Cake

PEIGHAMBARDOUST SEYED HADI¹, HOMAYOUNI RAD AZIZ², BEIKZADEH SAMIRA^{3*}, ASGHARI JAFAR AABADI MOHAMMAD⁴, BEIKZADEH MEHDI⁵

1. Professor, College of Agriculture, University of Tabriz

2. Associate Professor, Faculty of Nutrition, Tabriz University of Medical Sciences

3. Graduate Student, Faculty of Nutrition, Tabriz University of Medical Sciences

4. Associate Professor, Road Traffic Injury Research Center, Faculty of Hygiene, Tabriz University of Medical Sciences

5. Graduate Student, Faculty of Nutrition, Tabriz University of Medical Sciences

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ABSTRACT

Retard of the staling rate of baked food is one of the main issues of nutritional, as well as economical importance. Application of native plant and seed hydrocolloids and mucilages of medicinal as well as nutritional value seems to be an appropriate solution in postponing the staling phenomenon. Throughout the present study the effect of different concentrations of basil seed mucilage (0, 0.25, 0.5, 0.75 and 1% w/w) on cake batter specific gravity and as well the physical properties of the cake (volume, apparent density, symmetry, and moisture), firmness, staling and sensory attributes were investigated. The highest specific gravity was observed in the sample containing 1% mucilage. The samples containing 0.25% and 0.5% basil seed mucilage did not significantly ($p>0.05$) differ as compared with control as for volume, apparent density and symmetry. However, the samples containing 0.25% and 0.5% basil seed mucilage contained the highest moisture content following 1, 7 and 14 days past of baking. The lowest firmness was observed in sample containing 0.25% gum (1, 7 and 14 days following baking). Also the results indicated that the addition of basil seed mucilage up to 0.5% significantly ($p<0.05$) increased the overall acceptability of sponge cakes in comparison with the control samples.

Keywords: Basil seed mucilage; Sponge cake; Physical; Sensory properties; Staling