CONTENTE

Determination of saome physical properties of strawberry fruit *(selva cultivar)*

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(Received: Aug. 6, 2012- Accepted: March. 21, 2013)

ABSTRACT

In the present research, the physical, nutritional and chromatic properties of strawberry (Fragaria x ananassa), Selva Cultivar were studied. The values for mass, diameter, length, geometric mean diameter and sphericity of strawberry fruit at 91.07% moisture content (d.b.) were 11.885 g, 28.260 mm 29.697 mm, 28.585 mm and 0.971 respectively. At the same moisture content, volume, true density, bulk density, porosity and hardness were 12.325 cm^3, 1068.880 (kg/m^3), 474.330 (kg/m^3), 51.11%, 8.606 cm^2 and 3.632 N respectively. Static coefficient of friction on the steel, galvanized iron, plywood and rubber surface measured as 0.415, 0.439, 0.473 and 0.575 respectively. Analysis of variance showed that there was a significant difference between the surfaces of various materials and only galvanized steel and iron surfaces were not significantly different. The color parameters L*, a*, b* and color intensity were 29.6, 29.7, 28.2 and 40.95, respectively. The values for pH, TSS, total acidity, vitamin C, dry matter and ash were 3.6, 7%, 3.8%, 64.13 (mg/100g), 8.90 (mg/100g)and 0.787(mg/100g), respectively.

Key words

Acidity, Hardness, color intensity, Static coefficient of friction

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Design, construction and evaluation of a non-contact tool for estimating crop density by laser beam

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(Received: Apr. 17, 2012- Accepted: May. 21, 2013)

ABSTRACT

Crop density measurement is one of the most important factors in precision farming and effect on the performance of harvesting machines such as combine and mower. So, the purposes of this study are to design, build and calibrate of an inexpensive and non-contact instrument that can estimate crop density for crops such as wheat, barley and alfalfa stems. The sensing unit is consisted of laser transmitters, LDR receivers and AVR microcontroller used as register and data processing unit. Experiments were done on Polystyrene plates for alfalfa and barley stems. The LDR receivers receive the reminder of the laser light which passes through the crop stems and with using analog to digital converter in the microcontroller data was stored on internal memory of micro and displayed on the display. Total LDRs voltage was used as an indicator of density estimating. This voltage is proportional to the density of the crop stems and the results of the voltage measurements show a correlation of 0.93 to 0.98 percent between the voltage and the value of alfalfa density and $R^2 = 0.9$ for barley. Ambient light was a factor that affecting the amount of voltage and to eliminate this effect, receivers were placed in a protective aluminum box. This method has the potential of estimating on the go measurement of various crop densities.

Keywords

harvesting machines, microcontroller, non-destructive method, precision farming.

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Design, development and test of apparatus to measurement of electrical resistance and impedance of fruit

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(Received: July. 20, 2011- Accepted: Dec. 25, 2012)

ABSTRACT

Electrical properties of fruits are accepted indicators for detecting fruit quality. Electrical resistance one reluctance can detect quality factors and are sensitive to variations in the concentration and state of water. Therefore, these properties can be associated with maturity, damage, overripe condition, decay or other quality factors. In most of previous research on electrical resistance and impedance of fruits, sensors pushed into the fruit to measure electrical resistance of the sample between two electrodes. Needle type electrodes usually are used which results in damages to the fruit. Thus in every tests, samples should change. In this experiment, especial electrodes for measuring electrical resistance were developed and used which did not damage the fruit. Electrical sensors for electrical resistance measurement consisted of two copper plates. Fruit sets between two plate electrodes where constant force was applied on it. The overall construction of the apparatus was made up of the following main components: LCR Meter, Load cell, Indicator, Base, Frame, and Probes. Red apples were used in this experiment. Electrical resistance measurements were performed at two frequencies; 120 Hz and 1 kHz. Water loss of the whole fruit also contributed in decreasing the mobilization of ions, thus, increasing of electrical resistance of the ripen fruit. The results indicated that the relationship between the electrical resistance and the weight loss, during the storage period, was also investigated. The results indicated that, the electrical resistance decreases by third degree equation and the weight of apple decreases linearly with increase in storage period.

Keyword

damage of fruits, electrical impedance of fruits, electrical resistance of fruits, plate electrode, storage of apple.

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Effect of simulated transport vibration on the egg hatchability percentage

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(Received: Feb. 7, 2012 - Accepted: Dec. 25, 2012)

ABSTRACT

Improper transportation of agricultural materials causes mechanical damage to them. The damage is depended to the physical and mechanical properties of the product and properties of the applied force. Vibration generated by vehicles during road transportation causes shake the product, contact it with carrier bin and other components, tissues deformation and damage to product. This research was conducted to evaluate the effects of vibration frequency and position in bin, on the eggs damage during transportation. At first a laboratory vibrator, which simulates the road transportation under laboratory conditions, was designed and used to obtain some factors influencing the damage during eggs transportation. The damage was described as a difference of eggs hatchability percentage between vibrated and control samples after the tests. Four vibration frequencies of 5, 7.5, 10 and 12.5 Hz and three positions in bin of bottom (40 cm), middle (80 cm) and top (120 cm) at constant acceleration of 0.5 g and vibration duration of 10 mines were used. The results showed that, vibration frequency and position in bin significantly influenced the percentage reduce in eggs hatchability at the 1% probability level. Eggs hatchability was reduced as vibration frequency increased. Vibration with frequencies higher than 5 Hz caused higher damage levels. Eggs located at top position in bin significantly had higher damage than middle and bottom positions.

Keywords

egg, hatchability, simulation, transportation, vibration.

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Kinetic model simulation of thin-layer drying of peppermint (*Mentha piperita L.*) using adaptive neuro-fuzzy inference system (*ANFIS*)

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(Received: Dec. 25, 2011- Accepted: Dec. 25, 2012)

ABSTRACT

Rating medicinal plants based on the total number of drug shows that the mint plant species, with general name mentha, among the most consumption herbs that are used in various industries such as pharmaceutical, food, cosmetics and health. Drying process, in order to maintain the quality and quantity of essential oil extraction have a great role in the processing medicinal plants. Important aspects of drying technology with the aim of selecting the most appropriate drying method, is modeling of the drying process. Therefore in this study, thin layer drying behavior of Peppermint (*Mentha piperita* L.) was experimentally investigated in a convective type dryer by using adaptive neuro-fuzzy inference system (ANFIS). Drying experiments were conducted at inlet drying air temperatures of the 40, 50 and 60°C, at three drying air velocity of 1, 1.5 and 2 m/s. For kinetic model simulation of thin-layer drying of peppermint, four anfis models was used and for generate the fuzzy inference system model, the two partitioning techniques, grid partitioning and subtractive clustering, was used. Results indicated that, anfis model could satisfactorily describe the drying curve of peppermint, also comparison of two partitioning techniques results showed that subtractive clustering technique was found to be the most suitable for fuzzy inference system generation for predicting moisture ratio of the thin layer drying of peppermint.

Keywords

anfis, drying, grid partitioning, peppermint, subtractive clustering.

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Optimization the specific energy consumption in compost manure extrusion process using response surface methodology

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(Received: Oct. 8, 2012- Accepted: May. 21, 2013)

ABSTRACT

Densification of biomass material that usually has a low density is proper way to increasing density, reduce transportation cost and simplify storage and distribution of these materials. Pellet production using extrusion process is a common method for densification. The goal of this research is optimization of specific energy consumption for extrusion process considering its effect on pellet density. Compost was extruded into cylindrical pellets utilizing open-end dies under axial stress from a vertical piston applied by a hydraulic press. The effects of independent variables, including the raw material moisture content (35, 40 and 45% (w.b.)), particles size (0.3, 0.9 and 1.5 mm), speed of piston (2, 6 and10 mm/s), and die length (8, 10 and 12 mm) on specific energy consumption and pellet density, were determined. The experiments were designed using response surface methodology based on Box Behnken design (BBD) in order to optimize. The results revealed that all independent variables have significant effects on studied responses in this research at $P<0.01$. The optimum values of the factors for high density and low specific energy consumption were: moisture content between 40-45%, speed of 2 mm/s, particle size from 0.8 to 1 mm and die lengths of 10 to 12 mm.

Key words

optimization, pellet, extrusion, response surface methodology, specific energy consumption.

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Assessing of energy indices and environmental impacts of potato production (Case study: Fereydoonshahr region, Isfahan province)

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(Received:June. 30, 2012- Accepted: Feb. 5, 2013)

Abstract

By increasing crops yield due to intensive use of agricultural machinery and energy inputs, utilized energy in agriculture has been increasing rapidly which negative environmental impacts on water, air and soil are its consequences. In this paper, potato production in Isfahan province was studied using life cycle assessment approach from the standpoint of energy consumption and environmental impacts. Functional unit and system boundary were determined to be one hectare and the farm gate, respectively. Moreover, the environmental impacts of inputs application rate were interpreted in three impact categories: global warming potential, human toxicity and eutrophication. Results revealed that the highest proportion of energy consumption belonged to electricity. In addition, chemical fertilizers and diesel fuel showed the greatest impact on global warming potential and eutrophication. However, Pesticides had insignificant contribution to the total energy input; they had the greatest effect on human toxicity with a share of 70%. Among the emissions of chemical fertilizers, N_2O had the highest impact with a share of 97% on global warming potential. Phosphate and Diazinon played an important role with 68% (each one) in the impact categories of eutrophication and human toxicity respectively.

Key words

energy consumption, eutrophication, global warming, human toxicity, life cycle.

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Investigation of chemical pretreatment of rice straw with ammonia, urea and sodium hydroxide

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(Received: May. 24, 2011- Accepted: May. 21, 2013)

ABSTRACT

Agricultural residues have high potential to produce biogas, but they contain lignocellulosic materials which are not easily degradable, so the pretreatment is required. Chemical pretreatment increases the rate of degradation and efficiency of biogas production. This study has been investigated the effect of 4% -urea, 5%-ammonia and 8%-sodium hydroxide on degradation of rice straw and production of biogas combined with sheep manure with three Carbon to Nitrogen ratios (15, 20 and 29) in anaerobic digester at temperature of 40±2 ℃. The process was performed in a factorial design with two factors in three replications. Results showed that the cumulative production of biogas and the maximum percent of Methane are 594 (ml/VS_{add}) (that is 133.33% more than the control) and 71% that they achieved by 8%-NaOH-pretreated straw combined with manure in Carbon to Nitrogen ratio of 29. The results show the positive effect of chemical pretreatment of rice straw on efficiency of biogas production combined with sheep manure.

Keywords

agricultural residue, biodegradability, biogas, carbon to nitrogen ratio, pretreatment, sheep manure.

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Application of dispersive liquid-liquid microextraction in determination of menthol absorption from yogurt drink into polyethylene terephthalate bottles

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(Received: May. 29, 2012- Accepted: May. 21, 2013)

ABSTRACT

Absorption of flavor compounds from food into the package is one of the interactions which occur between food and packaging material. This phenomenon is of high importance, because absorption of flavors into the packaging material could diminish the flavor intensity of the product as well as loss of mechanical/border properties of the packaging material, so the final loss of quality in the food product will be appear. Absorption of menthol (mint flavor agent) from yogurt drink into the PET was studied at three storage temperature (4, 25 and 45°C). Solvent extraction method used for extraction of menthol from PET bottle and dispersive liquid-liquid mixroextraction used for pre-concentration of extracted solution before instrumental analysis by GC. Quantification of menthol performed using gas chromatograph coupled with FID detector. The results showed that the absorption of menthol into the packaging material is a time and temperature dependent phenomenon so that the content of menthol absorbed into bottle increases with elevation in time and temperatures. The mathematical model represented fickian diffusion in the absorption of menthol into polyethylene terephthalate bottles.

Keywords

absorption, dispersive liquid-liquid microextraction, menthol, polyethylene terephthalate, yogurt drink.

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Comparing the microstructure, topography and surface hydrophilicity of starch polyvinyl alcohol based films containing nanoclay and cellulose nanocrystal

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(Received: Jan. 2, 2012-Accepted: Feb. 5, 2013)

ABSTRACT

The main objectives of this research were the study and comparing the microstructure of PVA-ST-NCC and PVA-ST-MMT by X ray diffraction and atomic force microscopy (AFM) and as well as, comparing the effects of two nanoparticle on surface hydrophilicity and moisture absorption. X diffraction patterns showed that microstructure of the PVA-ST-MMT films was exfoliated and PVA-ST-NCC was closer to intercalated structure. The AFM phase images showed good dispersion of nanoparticle in matrix and there wasn't observed any agglomeration in the phase images of the both films. Comparing the three dimensional topographic images, height distribution point's curves and roughness parameters showed that MMT produce rougher film in comparison with NCC. Adding MMT and NCC increased the contact angle of film and there isn't significant difference between MMT and NCC on increasing the contact angle. The water absorption of the films decreased with adding MMT and NCC however, MMT caused higher decrease in comparison to NCC. Comparing the color parameters showed that adding two nano reinforcements didn't affect the transparency of starch-PVA bionanocomposites however, increased the yellow color of the films.

Keywords

cellulose nanocrystal, nanoclay, starch.

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