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PT J
AU Ou, YG
Wegener, M
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Liu, QT
Zheng, DK
Wang, MM
Liu, HC
AF Ou Yinggang
Wegener, Malcolm
Yang Dantong
Liu Qingting
Zheng Dingke
Wang Meimei
Liu Haochun
TI Mechanization technology: The key to sugarcane production in China
SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING
LA English
DT Review
DE mechanization technology; sugarcane production; sugarcane harvester; sugarcane machinery; development pattern
AB Sugarcane is an important cash crop in southern China now planted on about 1.5 million ha in the main production areas in Guangxi, Zhuang Autonomous Region and Yunnan, Guangdong, and Hainan Provinces. Since the cost of labor in China is increasing rapidly and the price of local sugar is uncompetitive with the product from mechanized international producers, China needs to change its sugarcane production methods from manual work to mechanization in order to catch up with international trends in this global industry. Although a lot of effort in China have gone into sugarcane mechanization since the 1960s, the overall level of mechanization in sugarcane production is still only approximately 30%, which is about 20% lower than that achieved in the other main field crops. Almost all of the sugarcane grown in China is still harvested by hand. In order to summarize past experience and promote the mechanization of sugarcane production in China, this paper reviews the whole process of developing mechanization since 1960s and describes the current state of sugarcane mechanization in China. The research currently being undertaken and the main obstacles to be overcome in developing a mechanized sugarcane production system, are described. The design and testing of sugarcane harvesting machinery and its key components has been a significant research area by some Chinese universities, research institutes, and manufacturing companies in these past decades. This paper reviews that research and outlines the main achievements which have been made in this area. Mechanized harvesting systems for sugarcane, and the appropriate harvesting patterns suitable for different growing conditions applying in China, have also been studied. The paper concludes with some comments on the future directions for progress in China's mechanization of sugarcane production and some policy suggestions to facilitate the industry's transition.
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FU Ministry of Science and Technology Project on International Cooperation; development of key technology and equipment for full sugarcane mechanization [2011DFB70350]; National Technology System for Sugarcane Industry: Annual research fund; [201003009]; [2011BAD20B05-3]
FX This research was financially supported by the following projects: The project on special scientific research fund of agricultural public welfare profession: Production technology and equipment development for full sugarcane mechanization (Grant No. 201003009); The National Five-Year Plan for 2011 to 2015 project on rural areas science and technology plans: The research and integrated demonstration of self-propelled sugarcane combine harvesting equipment (Grant No. 2011BAD20B05-3); the Ministry of Science and Technology Project on International Cooperation; the development of key technology and equipment for full sugarcane mechanization (Grant No. 2011DFB70350); and the National Technology System for Sugarcane Industry: Annual research fund. The authors would like to acknowledge the assistance of all the people who have contributed to this review paper.
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PT J
AU Chen, P
Li, YB
Cui, TH
Ruan, R
AF Chen, Paul
Li, Yanbin
Cui, Tianhong
Ruan, Roger
TI Nanoparticles based sensors for rapid detection of foodborne pathogens
SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING
LA English
DT Review
DE nano-sensor; magnetic nano-particle; food pathogens; nuclear magnetic resonance
ID MAGNETIC NANOPARTICLES; MOLECULAR-INTERACTIONS; BACTERIAL DETECTION; PROTEIN SEPARATION; DRUG-DELIVERY; RELAXATION; DNA; RESONANCE; CELLS; PARTICLES
AB Rapid detection of foodborne pathogens is a key step in the control of food related diseases. Conventional methods for the detection of food pathogens, although typically sensitive, often require multiple time-consuming steps such as extraction, isolation, enrichment, counting, etc., prior to measurement, resulting in testing times which can be days. There is a need to develop rapid and sensitive detection methods. This review is intended to provide food scientists and engineers an overview of current rapid detection methods, a close look at the nanoparticles especially magnetic nanoparticle-antibody conjugates based methods, and identification of knowledge gaps and future research needs.
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PT J
AU Huaitalla, RM
Gallmann, E
Liu, XJ
Hartung, E
AF Huaitalla, Roxana Mendoza
Gallmann, Eva
Liu Xuejun
Hartung, Eberhard
TI Aerial pollutants on a pig farm in pen-urban Beijing, China
SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING
LA English
DT Article
DE pig farm; aerial pollutant; barn; China; gases; dust
ID CARBON-DIOXIDE; GAS EMISSIONS; AMMONIA; BUILDINGS; EXPOSURE; METHANE; BARNS; DUST
AB The study was carried out to evaluate the airborne gases and suspended particulate matter concentrations in the pig barns of a commercial pig farm situated in the pen-urban area of Beijing, China. The measurements followed the natural pig life-stages namely: gestation, farrowing, weaning, and fattening. In order to accomplish these objectives, three different measurement devices were employed: (i) color diffusion tubes, (ii) a portable gas measuring device, and (iii) a dust measuring instrument. Due to the rotation of the devices in the different sampling places, the measurements were performed at different time periods during the months of the summer and winter season in Beijing. The pig farm had a capacity of 15 000 pigs per year and the manurial system was identified as "gan cling fen" or dry cleaning of the manure. The main by-products generated by the farm were irrigation water and small-scale biogas production. High dust concentrations were identified in the pig barns, especially during the feeding and manure cleaning events inside the farrowing and weaning barns with slatted floors. Inhalable dust ranged from 0 mg/m(3) to 12.45 mg/m(3), while the allowable dust ranged from 0 mg/m(3) to 9.62 mg/m(3). Ammonia concentration ranged from 0 ppm to 20 ppm (1 ppm = 1 cm(3)/m(3)), and the carbon dioxide concentration ranged from 300 ppm to 8 000 ppm. The highest ammonia concentration was recorded in the fattening barn during the summer season, while the highest carbon dioxide concentration was reported in the weaning barn during the summer season. The results of this study were similar to the results of studies performed on pig farms under natural and mechanical ventilation systems. On the other hand, the problems encountered during the gas measurements on the pig farm were directly related to the inadequate housing layout due to the obstruction of windows, fans and air channels for indoor ventilation, and thus the measurement devices faced harsh working conditions. Therefore, it is recommended that the housing system should be improved with repaired windows and curtains especially for the winter season; similarly, the repair of the fans should be attempted in order to improve the ventilation, especially in the gestation barns.
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FU International Research Training Group of the University of Hohenheim; China Agricultural University; German Research Foundation [GRK 1070]; Ministry of Education (MOE) of the People's Republic of China; BMBF [FKZ 0330847A-H]
FX The authors would like to thank the International Research Training Group of the University of Hohenheim and the China Agricultural University for their supports. This study is part of the Sub Project 1.4 "Evaluation of nutrient and pollutant cycles of livestock production systems and manure management systems in the North China Plain". The project is funded by the German Research Foundation (GRK 1070) and the Ministry of Education (MOE) of the People's Republic of China. The authors also thank the fruitful cooperation with the Sino German Project: "Recycling of Organic Residues from Agricultural and Municipal Origin in China", Sub Project 1: "Farm gate balance for animal production," granted by the BMBF (FKZ 0330847A-H).
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PT J
AU Lan, YB
Zhang, HH
Hoffmann, WC
Lopez, JJD
AF Lan, Yubin
Zhang, Huihui
Hoffmann, W. C.
Lopez, Jr Juan D.
TI Spectral response of spider mite infested cotton: Mite density and miticide rate study
SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING
LA English
DT Article
DE spectral reflectance; infested cotton plants; crop protection; Normalized Difference Vegetative Index (NDVI); Temprano rate treatments
ID TETRANYCHIDAE; ACARI; CORN
AB Two-spotted spider mites are important pests in many agricultural systems. Spider mites (Acari: Tetranychidae) have been found to cause economic damage in corn, cotton, and sorghum. Adult glass vial bioassays indicate that Temprano (TM) (abamectin) is the most toxic technical miticide for adult two-spotted spider mite. From an aerial application standpoint, additional research is needed to identify aerial application parameters for this miticide. The objective of this study was to investigate spectral response of spider mite-infested cotton plants with different density levels of mites and treated with different rates of miticide. Results showed significantly different spectral signatures of cotton plants infested with different density levels of mites. By treating mite-infested cotton plants with five different Temprano rate treatments (control, one-eighth, one-fourth, one-half, and full rates), spectral reflectance curves were found to be significantly different. Four wavelengths of 550 nm, 560 nm, 680 nm and 740 nm were important for detecting the spectral differences among mite infested cotton plants treated with various rate of Temprano. Normalized Difference Vegetative Index imagery was able to detect different levels of cotton plant damage. Half-rate application of Temprano controlled mite-infested plants as effectively as the full-rate application. These findings may lead to reduced cost and quantity of miticides used to maintain effective crop production and protection.
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PT J
AU Zhou, R
Lei, HW
Julson, JL
AF Zhou, Rui
Lei, Hanwu
Julson, James L.
TI Effects of reaction temperature, time and particle size on switchgrass microwave pyrolysis and reaction kinetics
SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING
LA English
DT Article
DE switchgrass; microwave pyrolysis; kinetics; bio-oil; syngas; bio-char
ID EUCALYPTUS; BIOENERGY
AB This study investigated microwave pyrolysis of switchgrass with particle sizes from 0.5 mm to 4 mm and determined the effects of reaction temperature and time on the yields of bio-oil, syngas, and bio-char. A prediction model was satisfactorily developed to describe the bio-oil conversion yield as a function of reaction temperature and time. Second-order reaction kinetics was also developed to model the switchgrass pyrolysis. Switchgrass with different particle sizes was found to be similarly pyrolyzed by microwave heating. The research results indicated that thermochemical conversion reactions can take place rapidly in large-sized switchgrass by using microwave pyrolysis. GC-MS analysis indicates that the bio-oil contained a series of important and useful chemical compounds: phenols, aliphatic hydrocarbons, aromatic hydrocarbons, and furan derivatives. These chemical compounds evolved were related to the pyrolysis conditions.
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WC Agricultural Engineering
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PT J
AU Long, CC
Gibbons, WR
AF Long, Craig C.
Gibbons, William R.
TI Conversion of soy molasses, soy solubles, and dried soybean carbohydrates into ethanol
SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING
LA English

DT Article

DE ethanol production; soy molasses; soy solubles; oligosaccharides

ID IMMOBILIZED SACCHAROMYCES-CEREVISIAE; CONTINUOUS FERMENTATION; PROTEIN PRODUCTS; WHEY; INVERTASE; SUBSTRATE; STRAINS

AB Soy molasses and soy solubles are byproducts of the conventional soy protein concentrate and soy protein isolate manufacturing processes, respectively. Conversion of the carbohydrates in these byproducts into ethanol was examined. Standardized amounts of commercial cellulase enzymes (Novozyme cellulase, beta-glucosidase, and pectinase) were added to soy molasses and soy solubles solutions prepared at various solid loading rates (33%, 50%, 60%, 75%, and 80%) to hydrolyze oligosaccharides, followed by fermentation for 96 h using Saccharomyces cerevisiae NRRL Y-2034 and Scheffersomyces stipitis NRRL Y-7124. Ethanol-extracted soybean meal (SBM) carbohydrates were also fermented for 96 h without enzymes. S. cerevisiae and S. stipitis produced about 12.5-45.0 g/L and 6.0-28.0 g/L ethanol, respectively, on molasses and solubles across these solid loading rates. The S. stipitis produced about 6.5-17 g/L ethanol and S. cerevisiae produced about 6.5-22 g/L ethanol on ethanol-extracted carbohydrates.

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PT J

AU Naegele, HJ
Lindner, J
Merkle, W
Lemmer, A
Jungbluth, T
Bogenrieder, C

AF Naegele, Hans-Joachim
Lindner, Jonas
Merkle, Wolfgang
Lemmer, Andreas
Jungbluth, Thomas
Bogenrieder, Claus

TI Effects of temperature, pH and O-2 on the removal of hydrogen sulfide from biogas by external biological desulfurization in a full scale fixed-bed trickling bioreactor (FBTB)

SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING

LA English

DT Article

DE external biological desulfurization; fixed-bed trickling bioreactor (FBTB); H2S removal efficiency (RE); hydrogen sulfide; biogas; full scale biogas research plant

ID SULFUR; BIOFILTRATION

AB Hydrogen sulfide (H2S) is a critical component of biogas formed under anaerobic conditions by sulfur and sulfate redicing bacteria from animal manure and renewable energy crops. H2S causes high corrosion in equipment, has a negative environmental impact, inhibits the biogas formation process and is furthermore odorous and toxic. Although several methods for internal and external desulfurization found their way into practice and had been explored at laboratory scale, no data were available on the performance of such methods in full scale practice, especially for an external fixed-bed trickling bioreactor (FBTB). The effects of temperature, pH and air ratio on H2S removal efficiency (RE) were studied. The study was conducted at a research biogas plant with a given output of 96 m(3) biogas per hour, and an H2S concentration ranging between 500 ppm and 600 ppm (1 ppm=1 cm(3)/m(3)) on average. The FBTB column has been designed to hold a packing volume of 2.21 m(3) at a gas retention time of 84 seconds being loaded at an average of 32.88 g H2S/(m(3).h). The highest H2S RE of 98% was found at temperatures between 30 degrees C and 40 degrees C. A major decline in RE to 21%-45% was observed at temperatures from 5 degrees C to 25 degrees C. The results clearly showed a temperature optimum range for sulfate reducing bacteria. The results reveal that RE is little affected by different pH values and air ratios. During the experimental period, the practical suitability of the FBTB system could be proved while avoiding the disadvantages of internal biological desulfurization methods.

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FU Zublin Umwelttechnik GmbH

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WC Agricultural Engineering

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PT J

AU Jegede, AO

AF Jegede, Abiodun O.

TI Pre-treatment of mscanthus sinensis with Bacta-sile to aid anaerobic digestion

SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING

LA English

DT Article

DE anaerobic digestion; methane (CH4); carbon dioxide (CO2); cyanobacteria; Hydraulic Retention Time (HRT); Organic Loading Rate (ORL)

AB The investigation of the biodegradability and methane potential of bacterial pre-treated miscanthus sinensis has been carried out. One percent golution of Bacta-sile: A silage promoter was used to pre-treat miscanthus sinensis at 25 degrees C. The anaerobic digestion experiments were carried out at 25 degrees C and 35 degrees C in batch experiments. The organic loading rates (OLR) varied between 1.25 g and 7 g in different batch reactors. The results showed that the highest methane concentration was 57% from digester 1 while the lowest methane produced was 38% from digester 3. The low methane production from digester 3 was attributed to temperature changes and poor organic loading rate. Bacterial pretreatment aided biodegradation of miscanthus at 25 degrees C. Operating temperature of 25 degrees C had a great effect on digestion experiments resulting to longer required Hydraulic Retention Time (HRT).

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WC Agricultural Engineering
SC Agriculture
GA AK2RK
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PT J
AU Gursoy, S
Choudhary, R
Watson, DG
AF Gursoy, Songul
Choudhary, Ruplal
Watson, Dennis G.
TI Microwave drying kinetics and quality characteristics of corn
SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING
LA English
DT Article
DE microwave drying; corn; stress-crack; germination; bulk density; true density
ID YELLOW DENT CORN; ZEA-MAYS L.; BREAKAGE SUSCEPTIBILITY; MILLING CHARACTERISTICS; MOISTURE-CONTENT; TEMPERATURE; GRAIN; PROTEINS; INDUSTRY; HYBRIDS
AB In recent years, microwave (MW) drying has gained popularity as an alternative drying method for a wide variety of food and agricultural products because of increasing concerns over product quality and production costs. However, the determination of drying kinetics that accurately describes microwave drying characteristics is crucial for the optimization of operating parameters, performance improvement of the drying system and product quality. The objective of this study was to investigate the drying kinetics and the quality characteristics of corn kernels, especially the effects of different initial moisture contents (18.3%, 26.3%, 34.3% and 42.3% db), MW power levels (70, 175 and 245 W) and exposure time (80 s and 120 s) on the drying kinetics, drying rate and various key quality parameters. The results indicated that the increased drying rate at higher power levels (P3, 245 W) reduced the drying time considerably but increased stress crack index and reduced germination. In addition, it reduced bulk density, true density and thousand grain weight (TGW). The germination rate of corn was the highest at MW power level P1 (70 W), with the lowest drying rate and observed to decrease with increase in initial moisture content. The reduction in exposure time decreased stress crack index and increased germination rate, bulk density and true density. The correlation analysis among drying rate, germination, stress-crack index (SCI), bulk density, true density and TGW showed that increasing drying rate could lead to an increase in SCI and decrease in germination, bulk density and true density.
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FU Dicle University
FX The authors would like to thank the Dicle University for providing financial support for Songul Gursoy's visit to Southern Illinois University, Carbondale, IL, USA. Corn seeds were provided by SIU Farms, Carbondale.
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PT J
AU Prukwarun, W
Khumchoo, W
Seancotr, W
Phupaichitkun, S
AF Prukwarun, Wuttichai
Khumchoo, Wasan
Seancotr, Waraporn
Phupaichitkun, Sarawut
TI CFD simulation of fixed bed dryer by using porous media concepts: Unpeeled longan case
SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING
LA English
DT Article
DE deep-bed dryer; longan; velocity and temperature distribution; Computational Fluid Dynamic (CFD); ANSYS
ID FLUID-DYNAMICS CFD; FOOD-INDUSTRY
AB Quality of dried product depends on the temperature and velocity at each position in the dryer. Simultaneous microscopic and macroscopic simulation on Computational Fluid Dynamic (CFD) is a general problem of fixed bed dryer consisting of water transportation in porous media and dynamic flow of hot air in the dryer. Simplifying the dryer by assuming the packed bed as porous volume, viscous and inertial resistances (1/alpha and C-2) are necessary for calculating the pressure drop and velocity change in the bulk. Comparing the Delta P/L of the standard packing with experimental results, the porosity and resistance parameters can be estimated. Simulation of unmodified, adding false floor and invest mesh, and insulating the dryer wall are used for validation with previous results. Adding the round holed sieve as false floor and invert mesh can produce better profile but cannot obtain uniform distribution. Air velocity distribution shows similar but the calculating temperature is higher than that from the experiment. By analysis of thermal efficiency of dryer without insulator, the heat loss rates with flue gas and heat flux at wall are in the range 14%-17% and 5.5%-7.3%. Integrating with single fruit or thin layer drying kinetic in the future, the CFD simulation can be used for optimal design of fixed bed dryer.
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FX This work was financed by Department of Material Science and Engineering and Faculty of Engineering and Industrial Technology, Sipakorn Univesity, THAILAND. Authors would like to specially thank Prof. Joachim Mueller and Dr.agr.sc. Marcus Nagle, Institute ATS 440e, Hohenhim University, Stuttgart, Germany, for supporting and allowing us to use the experimental data of the dryer for validation.
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WC Agricultural Engineering
SC Agriculture
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PT J
AU Ozturk, T
Esen, B
AF Ozturk, Turgut
Esen, Bilge
TI Physical and mechanical properties of some hybrid corn varieties
SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING
LA English
DT Article
DE corn varieties; physical properties; angle of internal friction; coefficient of friction
ID MOISTURE-CONTENT; LENTIL SEEDS; PEA; NUT
AB The aim of this study was to determine the structural designing parameters of silo and bins used for storage of some hybrid corn varieties (Zea mays L.). In the research, three corn varieties-dentcorn (Zea mays indentata Sturt.), popcorn (Zea mays everta Sturt.), sweetcorn (Zea mays sacharata Sturt.)-widespread cultivated in Turkey were used. Physico-mechanical parameters (bulk density, true density, angle of internal friction, static coefficient of friction) were considered as the dependent variables, and moisture content (8%, 10%, 12%, and 14%) as the independent variable. The bulk density, true density and angle of internal friction varied from 608.46 to 856.46 kg/m(3), 950.88 to 1110.89 kg/m(3), and 25.2 degrees to 34.2 degrees, respectively, with the increase in moisture content from 8% to 14%. According to results of the research, the highest average value for bulk density, true density, angle of internal friction were found in popcorn variety (839.17 kg/m(3)), popcorn variety (1 074.40 kg/m(3)), sweetcorn variety (30.50 degrees), respectively. The highest average value for static coefficient of friction at concrete surface (C30) was recorded in dentcorn variety (0.662).
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FU Project Management Office of Ondokuz Mayis University [Z-479]
FX The authors would like to thank Project Management Office of Ondokuz Mayis University for financial support to this project (Z-479).
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WC Agricultural Engineering
SC Agriculture
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ER

PT J
AU Adapa, PK
Tabil, LG
Schoenau, GJ
AF Adapa, Phani K.
Tabil, Lope G.
Schoenau, Greg J.
TI Factors affecting the quality of biomass pellet for biofuel and energy analysis of pelleting process
SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING
LA English
DT Review
DE biofuel; biomass; steam explosion; pretreatment; pelleting; specific energy; barley straw; canola straw; oat straw; wheat straw
ID COMPRESSION CHARACTERISTICS; MOISTURE-CONTENT; WOOD RESIDUES; CORN STOVER; WHEAT-STRAW; GRINDS; BARLEY
AB Agricultural biomass residue such as barley, canola, oat and wheat straw has the potential to be used for sustainable production of bio-fuels and offset greenhouse gas emissions. The biomass substrate must be processed and handled in an efficient manner in order to reduce industry's operational cost as well as meet the requirement of raw material for biofuel production. Biomass has low bulk density, making it difficult and costly to store and transport in its native loose form. Therefore, in this study, an integrated approach to densification of non-treated and steam exploded barley, canola, oat and wheat straw was developed. During this process, the significance of major contributing factors (independent variables such as biomass type, treatment, pressure and grind size) on pellet density, durability and specific energy were determined. It has been found that applied pressure (60.4%) was the most significant factor affecting pellet density followed by the application of steam explosion pre-treatment (39.4%) for lab-scale single pelleting experiments. Similarly, the type of biomass (47.1%) is the most significant factor affecting durability followed by the application of pre-treatment (38.2%) and grind size (14.6%) for pellets manufactured using the pilot-scale pellet mill. Also, applied pressure (58.3%) was the most significant factor affecting specific energy required to manufacture pellets followed by the biomass (15.3%), pre-treatment (13.3%) and grind size (13.2%), which had lower but similar effect on specific energy for lab-scale single pelleting experiments. Overall energy analysis of post-harvest processing and densification of agricultural straw was performed, which showed that a significant portion of original agricultural biomass energy (89%-94%) is available for the production of biofuels. Almost, similar amount of specific energy is required to produce pellets from barley, canola, oat and wheat straw grinds. Customized pellets having steam exploded straw required more energy to manufacture resulting in availability of only 89% of total energy for biofuel production.
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FU Agricultural and Bioproducts Innovation Program (ABIP) of Agriculture and Agri-Food Canada; ABIP through the Cellulosic Biofuel Network; ABIP through Agricultural Biorefinery Innovation Network for Green Energy, Fuels Chemicals
FX The authors would like to express their gratitude towards the financial support received from the Agricultural and Bioproducts Innovation Program (ABIP) of Agriculture and Agri-Food Canada to successfully undertake the current project. In particular, the authors acknowledge the ABIP funding received through the Cellulosic Biofuel Network and Agricultural Biorefinery Innovation Network for Green Energy, Fuels & Chemicals. And the authors would also like to acknowledge the technical assistance of FP Innovations personnel during the steam explosion of agricultural straw. In addition, special thanks to Ms. Dallas Nelson and Mr. Bill Crerar for their technical support during the experiments.
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TC 0
Z9 0
PU CHINESE ACAD AGRICULTURAL ENGINEERING
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PT J
AU Zhang, DH
Wang, JW
Zong, XJ
Wei, HR
Zhu, DZ
Liu, QZ
AF Zhang Daohui
Wang Jiawei
Zong Xiaojuan
Wei Hairong
Zhu Dongzi
Liu Qingzhong
TI Telemetering system and its application for fruit cultivation in greenhouses
SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING
LA English
DT Article
DE sweet cherry; temperature wire telemetering; universal instrument; temperature measurement and control system
AB Circuit of the temperature measurement equipment was improved in order to develop temperature telemetering system for cultivating fruit facilities. The traditional temperature measuring equipments used in monitoring temperature changes in greenhouse include mercury column, merbromine column, kerosene column glass rod thermometer and mechanical inductive thermometer. Compared with the traditional method of temperature measurement the new system reduces the labor requirement and promotes precision monitoring and control of the temperature. In addition, the temperature in the greenhouse was very accurate especially at night or in rainy and snowy weather. This new temperature telemetering system will promote the development of the fruit protection cultivation.
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FU International S&T Cooperation Project of China [2012DFR30700]; Special Fund for Agro-scientific Research in the Public Interest of China [200903019]; Ministry of Agriculture 948 Project of China [2011-Z40]; Shandong agricultural improved variety project [(2010)6]; Taian scientific and technological development planning item [20075014]
FX This work was supported by Grants from the International S&T Cooperation Project of China (Project No. 2012DFR30700), Special Fund for Agro-scientific Research in the Public Interest of China (Project No. 200903019), The Ministry of Agriculture 948 Project of China (Project No. 2011-Z40), Shandong agricultural improved variety project [No. (2010)6] and Taian scientific and technological development planning item (20075014).
NR 15
TC 0
Z9 0
PU CHINESE ACAD AGRICULTURAL ENGINEERING
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PT J
AU Han, WT
Ju, YT
Wu, PT
Dang, GR
Nie, JF
Ooi, SK
AF Han Wenting
Ju Yutu
Wu Pute
Dang Gerong
Nie Junfeng
Ooi, Su Ki
TI Dynamic remote monitoring system for plant root growth and water consumption
SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING
LA English
DT Article
DE root system monitoring; soil column; real time weighing system; root system growth
ID WEIGHING LYSIMETER; DESIGN
AB In order to improve the level of multi-functional and automatic observation of crop root system growth, a soil column monitoring system was designed to facilitate in situ dynamic monitoring of root growth and water consumption. The system consists of 20 plastic tubular backfill soil columns, each with an inner diameter of 32 cm and height of 300 cm. The crops were planted at the top of the soil column with the surrounding leveled with the ground surface and the site is in a greenhouse. The underground portion of the soil column contains small round windows on the tube through which root growth can be monitored, roots can be pruned and soil samples can be obtained. A multiport serial weighing system was designed and placed at the base of the soil column. Twenty electronic balances were connected to the personal computer through three CP-168U multiport serial cards and RS-232 serial cables. The host software was developed on the browser/server (Browser/Server), and data collection and remote data transmission and data sharing were implemented using the Java programming language and applying Internet data transmission technology and Web application technology. System tests showed a relatively good stability and real-time capability, and with accuracy up to 50 g and the evapotranspiration of each soil column was 0.25-0.65 kg per day. The root-system observation system developed in this study surpassed the traditional method of root-digging sampling and thus provided an alternative that could be used to automatically monitor the root system growth status.
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FU National Science & Technology Supporting Plan [2011BAD29B08, 2012BAH29B04-02]; "111" Project [B12007]
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WC Agricultural Engineering
SC Agriculture
GA AK2RL
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ER

PT J
AU Sobowale, A
Oyedepo, JA
AF Sobowale, A.
Oyedepo, J. A.
TI Status of flood vulnerability area in an ungauged basin, southwest Nigeria
SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING
LA English
DT Article
DE flood; modeling; vulnerability; management; basin; Nigeria
ID SCS-CN; MODEL
AB Many rivers in Nigeria had been ungauged in the last three decades; this worrisome scenario has impacted negatively on the livelihood of people who live in flood plains. The general lack of up to date streamflow data has made river basin management problematic especially in the area of flood risk management and the development of a real time flood warning system. Flood studies were carried out in the Ogun River Basin in the southwest Nigeria using synthetic data generated by Rainfall-Runoff Modeling using a combination of the Natural Resources Conservation Service (NRCS) curve number model and digital terrain modeling using ArcGIS (R) 9.3 software to identify vulnerable areas in relation to synthesized flood waves generated from the basin, extent of inundation and ranking of the flash points that was equally done using proximity to hazard source as a criteria. The total area in the basin covered by fresh water swamps, salt marsh, and tidal flats at the lower course of Ogun river is 49 km(2), while the spatial extent of the entire wetland is 556 Km(2) accordingly. When a peak flood volume of 4 270 million m(3) generated in September is routed into the fresh water swamp, about 33.4 m of flood depth was left unaccommodated, which will cause inundation of the entire flood plain and severe damage on its path. Over 1.4 million inhabitants were identified to be at risk in the area. When the entire wetland was considered, the flood wave was reduced to an average depth of 8.5 m which is still capable of causing grave damages in the remaining parts of the flood plain. The flood wave was found to have a residence time of about 45 days. Appropriate recommendations were given for practical adaptations.
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NR 14
TC 0
Z9 0
PU CHINESE ACAD AGRICULTURAL ENGINEERING
PI BEIJING
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WC Agricultural Engineering
SC Agriculture
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ER

PT J
AU Huang, YB
Sui, RX
Thomson, SJ
Fisher, DK
AF Huang, Yanbo
Sui, Ruixiu
Thomson, Steven J.
Fisher, Daniel K.
TI Estimation of cotton yield with varied irrigation and nitrogen treatments using aerial multispectral imagery
SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING
LA English
DT Article
DE remote sensing; multispectral imagery; cotton; yield; nitrogen; irrigation; soil properties
ID QUICKBIRD SATELLITE IMAGERY; GRAIN-SORGHUM YIELD; INDEXES; STRESS
AB Cotton yield varies spatially within a field. The variability can be caused by various production inputs such as soil properties, water management, and fertilizer application. Airborne multispectral imaging is capable of providing data and information to study effects of the inputs on yield qualitatively and quantitatively in a timely and cost-effective fashion. A 10-ha cotton field with irrigation and non-irrigation 2x2 blocks was used in this study. Six nitrogen application treatments were randomized with two replications within each block. As plant canopy was closed, airborne multispectral images of the field were acquired using a 3-CCD MS4100 camera. The images were processed to generate various vegetation indices. The vegetation indices were evaluated for the best performance to characterize yield. The effect of irrigation on vegetation indices was significant. Models for yield estimation were developed and verified by comparing the estimated and actual yields. Results indicated that ratio of vegetation index (RVI) had a close relationship with yield (R-2=0.47). Better yield estimation could be obtained using a model with RVI and soil electrical conductivity (EC) measurements of the field as explanatory variables (R-2=0.53). This research demonstrates the capability of aerial multispectral remote sensing in estimating cotton yield variation and considering soil properties and nitrogen.
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TC 0
Z9 0
PU CHINESE ACAD AGRICULTURAL ENGINEERING
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WC Agricultural Engineering
SC Agriculture
GA AK2RL
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PT J
AU Wu, WH
AF Wu, Weihua
TI Fuel ethanol production using novel carbon sources and fermentation medium optimization with response surface methodology

SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING
LA English
DT Article
DE gluconate salts; ethanol; response surface methodology; medium optimization; biofuel
ID ESCHERICHIA-COLI KO11; CELLULOSIC BIOMASS; HYDROLYSATE; GLUCONATE
AB In this study, ethanol production abilities of the novel carbon sources: sodium and calcium gluconate in different minimal and rich media were compared with glucose using Escherichia coli KO11. The strain produced higher ethanol yield in the rich medium Luria-Bertani (LB) than the other two minimal media: corn steep liquor (CSL) and M9 for two substrates (sodium and calcium gluconate). Additionally, higher ethanol yields were achieved when the strain was grown in LB and M9 medium with calcium gluconate than sodium gluconate, while the ethanol yields were similar when both sodium and calcium gluconate were added into CSL medium respectively. Response surface methodology was used to optimize the fermentation medium components for enhancing ethanol production using strain E. coli KO11 in CSL medium with calcium gluconate as the substrate in batch culture. The concentration of the potassium phosphate buffer is the only significant factor among five factors considered. A quadratic model was developed to describe the relationship between ethanol production and the factors. The optimal conditions predicted for five factors were 14.38 g/L CSL, 0.0398 g/L FeCl3 center dot 6H(2)O, 1.12 g/L MgSO4 center dot 6H(2)O(5), 15.41 g/L (NH4)(2)SO4, and 1.58/1.26 g/L KH2PO4/K2HPO4 (2:1 molar ratio). The highest ethanol concentration under optimal conditions was 31.5 g/L, which was 5.6 g/L higher than that from the same fermentation concentration of calcium gluconate in LB media. The high correlation between the predicted and experimental values confirmed the validity of the model.
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FX The work was supported by California Energy Commission grant (55779A/08-03). Special thanks to Dr. Chaowei Yu and Dr. Yi Zheng, who gave valuable suggestions and helps with experimental data analysis and draft editing.
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WC Agricultural Engineering
SC Agriculture
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PT J
AU Degenstein, J
Kamireddy, SR
Tucker, MP
Ji, Y
AF Degenstein, John
Kamireddy, Srinivas Reddy
Tucker, Melvin P.
Ji, Yun
TI Oligomer saccharide reduction during dilute acid pretreatment co-catalyzed with Lewis acids on corn stover biomass
SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING
LA English
DT Article

DE pretreatment; corn stover; biomass; biofuel; enzymatic saccharification; Lewis acid; transition metal

ID LIGNOCELLULOSIC BIOMASS; METAL CHLORIDES; HYDROLYSIS; CELLULOSE; INHIBITORS; CONVERSION; FEATURES; SALTS; WATER

AB The dilute sulfuric acid pretreatment of lignocellulosic biomass is a well understood process that significantly enhances the yield of glucose after enzymatic saccharification. The goal of this research was to perform a systematic study to evaluate the yield of fermentable sugars during dilute sulfuric acid pretreatment that is co-catalyzed with the transition metal Lewis acid salts: AlCl3, FeCl2, FeCl3, and La(OTf)(3). All Lewis acids apart from FeCl2 reduced the presence of xylo-oligomers by a large margin when compared to the non-co-catalyzed control sample pretreatments. The presence of these xylo-oligomers acts as inhibitors during enzymatic saccaharification step. The Lewis acids AlCl3, FeCl3, and La(OTf)(3) were also able to marginally increase the overall enzymatic digestibility specifically for corn stover pretreated at 160 degrees C with 10 mM of Lewis acids. The hard Lewis acid such as AlCl3 increased the formation inhibitory products such as furfural and 5-hydroxymethylfurfural (HMF). There was good correlation between reduction of xylo-oligomers and increased concentration furfural with increase in Lewis acid hardness.

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FU National Renewable Energy Laboratory [AEV-0-40634-01]; North Dakota Experimental Program to Stimulate Competitive Research (EPSCoR)

FX This study was financially supported by National Renewable Energy Laboratory Subcontract No. AEV-0-40634-01 and North Dakota Experimental Program to Stimulate Competitive Research (EPSCoR).

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ER

PT J

AU Stockl, A
Loffler, D
Oechsner, H
Jungbluth, T
Fischer, K
Kranert, M

AF Stockl, Andrea
Loeffler, Daniel
Oechsner, Hans
Jungbluth, Thomas
Fischer, Klaus
Kranert, Martin

TI Near-infrared-reflection spectroscopy as measuring method to determine the state of the process for automatic control of anaerobic digestion

SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING

LA English

DT Article

DE near-infrared-reflection spectroscopy (NIRS); state of the process; automatic process control; anaerobic digestion; biogas

AB A recently developed control strategy for the anaerobic digestion process requires secure knowledge about the state of the process. The near infrared reflection spectroscopy (NIRS), provides the possibility to determine process parameters of the anaerobic digestion process online and directly at the digester. To investigate if the NIRS measurements can successfully be used for the characterization of the state of the process within the control strategy the control was operated on two experimental digesters. The NIR spectra were recorded during the experiments. The values of the process parameters (mainly concentrations of organic acids) obtained by NIRS differ from the values of the chemical analyses during the experiment. Nevertheless the state of the process is categorized equally on the basis of both measurement methods. consequently be stated that NIRS is expected to meet the requirements of the control strategy.

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WC Agricultural Engineering

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ER

PT J

AU Mosqueda, MRP
Tabil, LG
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AF Mosqueda, Maria Rosario P.
Tabil, Lope G.
Muthukumarappan, Kasiviswanathan

TI Effects of condensed distillers solubles and drying temperature on the physico-chemical characteristics of laboratory-prepared wheat distillers grain with solubles

SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING

LA English

DT Article

DE condensed distillers solubles (CDS); chemical composition; distillers dried grain with solubles (DDGS); physical properties; wheat distillers grain

ID THIN STILLAGE; ETHANOL-PRODUCTION; FLOW PROPERTIES; BY-PRODUCTS; DDGS; QUALITY; DIGESTIBILITY; FLOWABILITY; CATTLE; GRIND

AB Samples of wheat distillers grain with solubles were prepared at 15%, 30%, and 45% condensed distillers solubles (CDS) and dried under 40 degrees C, 80 degrees C, and 120 degrees C to examine the effects of CDS level and drying temperature on their chemical, physical, flow, compression, thermal, and frictional properties. As CDS level increased, protein and ash contents increased while fat and fiber contents decreased. Fat and acid detergent fiber contents were also markedly affected by drying temperature. While CDS level, drying temperature, and their interaction significantly affected a number

of the physical properties, results suggest that CDS level had a stronger influence. Samples with high CDS level, for example, were significantly finer, denser, less flowable, and less dispersible than those with lower CDS. These samples also had significantly higher thermal diffusivity and coefficient of internal friction and produced pellets with higher failure stresses than those with lower CDS. Their pellet density increased with CDS level and was also significantly affected by drying temperature. Further, the samples were classified as fairly flowable and floodable and their compression characteristics were adequately described by the Kawakita-Ludde model.

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ER

PT J

AU Yan, RJ
Zhi, H
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Zhu, HK
Bo, L
Wang, SJ

AF Yan Rongjun
Zhi, Huang
Rui, Li
Zhu Hankun
Bo, Ling
Wang, Shaojin

TI Temperature measurement and analysis of postharvest agricultural products associated with thermal disinfestations

SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING

LA English

DT Article

DE hot air; hot water; fruit; postharvest treatment; heating rates; temperature measurement; thermal disinfestation

ID POMONELLA L. LEPIDOPTERA; HOT-WATER TREATMENT; HEAT-TREATMENTS; INSECT CONTROL; FRUIT; TORTRICIDAE; CHERRIES; MODEL; LIFE

AB Hot air and hot water treatments are practical, environmentally-friendly and non-chemical heating methods, which are widely used for postharvest insect control and quality preservation in agricultural products. Taking apple and pear as representative fruits, this study mainly analyzed influences of their thermal properties, diameter, and medium speed on the heating rates of fruits through their real-time measured temperatures at surface and center. Based on the reported thermal death kinetic models of the target codling moth, the minimum heating time was estimated to achieve 100% insect mortality. The results showed that the heating rates in fruits decreased gradually with the increasing depth from the surface to the center. With increasing heating time, the heating rate became small. The apple was heated faster than the pear. Hot water was more effective than hot air in treating fruits. Increasing hot air speed increased the heating rate but increasing water circulating speed had no clear effects on the heating rate. Based on the measured temperature-time history of the fruit center, the minimum heating time could be effectively determined for codling moth control through the estimated total equivalent thermal lethal time. The results could provide reliable validation data for the computer simulation and a scientific basis to improve the hot air and hot water treatments.

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ER

PT J

AU Yu, HN
Guo, BH

AF Yu Huaning
Guo Benheng

TI Storage stability of freeze-dried colostral whey powders with different additives

SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING

LA English

DT Article

DE colostral Whey (CW) powders; storage stability; freeze drying; sucrose; maltodextrin

ID MILK IMMUNOGLOBULIN-G; THERMAL PROTECTANTS; BOVINE COLOSTRUM; YOGURT POWDER; ANTIBODY; SORPTION; MALTODEXTRINS; PROTEINS; KINETICS; SYSTEMS

AB Effects of different additives (sucrose and maltodextrin) on storage stability of colostral whey (CW) powders packaged in aluminium-laminated polyethylene pouches were investigated under different storage conditions (4 degrees C and 40%-70% relative humidity (RH), 25 degrees C and 50% RH, and 50 degrees C and 20%-60% RH). All the samples stored under 50 degrees C and 20%-60% RH showed the highest levels, of lipid oxidation, Maillard reaction, proteolysis, and color difference, and the lowest immunoglobulin G (IgG) retention. Moisture contents showed an increase trend with increasing RH. Addition of sucrose into CW powders increased water adsorption capacity and Maillard reaction, whereas addition of maltodextrin showed the opposite effects. Maltodextrin as drying aids was suitable for keeping quality during storage. Sucrose did not clearly play any roles in

protecting denaturation of IgG during 90-day storage. The low storage temperature and RH were helpful for keeping storage stability of CW powders with different additives.

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PT J

AU Miazek, K
Ledakowicz, S

AF Miazek, Krystian
Ledakowicz, Stanislaw

TI Chlorophyll extraction from leaves, needles and microalgae: A kinetic approach

SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING

LA English

DT Article

DE chlorophyll; extraction; leaves; needles; microalgae; kinetic approach

ID PIGMENTS; CAROTENOIDS

AB Currently, there is a strong focus on industrial production of chlorophyll as a natural pigment. Two factors are required in the economically feasible process to make chlorophyll production: material with high pigment content and efficient extraction mechanism. In this work, extraction of chlorophyll from harvested black locust (Robinia pseudoacacia) leaves, Scots pine (Pinus sylvestris) needles, field sow thistle (Sonchus arvensis) leaves, and green microalga (Chlorella sp.) was discussed. The highest pigment content was detected in Chlorella cells (4.46%) followed by black locust leaves (1.63%), sow thistle leaves (1.48%) and pine needles (0.38%). The chlorophyll extraction rate was the highest for black locust leaves (k = 3.59 h(-1)), sow thistle leaves (k = 2.90 h(-1)) and Chlorella cells (k = 2.80 h(-1)) with the use of methanol as a solvent. hi investigated materials, needles showed higher resistance for chlorophyll extraction (k = 0.93 h(-1)) when compared to leaves and microalgae. Values of extraction kinetic constant were much lower for all materials (0.22 - 1.12 h(-1)) in the case of using ethanol as a solvent. Black locust leaves and Chlorella cells were proved to be the most attractive materials for chlorophyll production.

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PT J
AU Xu, YT
Zhang, LF
Zhong, JJ
Shu, J
Ye, XQ
Liu, DH
AF Xu Yuting
Zhang Lifen
Zhong Jianjun
Shu Jie
Ye Xingqian
Liu Donghong
TI Power ultrasound for the preservation of postharvest fruits and vegetables
SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING
LA English
DT Article
DE power ultrasound; postharvest; fruits and vegetables; decontamination; quality
ID MODIFIED ATMOSPHERES; BIOLOGICAL-CONTROL; CHLORINE DIOXIDE; SALICYLIC-ACID; DECONTAMINATION; TECHNOLOGY; DISEASES; LETTUCE; QUALITY; EFFICACY
AB Increasing public demands for improved safety and quality of fruits and vegetables in the fresh market, awaken a growing interest for novel technologies for the preservation of postharvest fruits and vegetables before storage. Ultrasound technology provides one of the methods that with better treating time, enhanced products quality, reduced chemical hazards, low consumption of energy, and is environmentally friendly. This review provides an up-to-date summary of published findings on the application of ultrasound in the preservation of fresh fruits and vegetables. The ultrasound devices commonly utilized, effects of power ultrasound treatment. as a factor that affects decay incidence, safety and quality of fresh fruits and vegetables are included. Application challenges and research trends in the future are also analyzed. It is concluded that much progress has been achieved in this field during recent years. These achievements paved the way for the industrial-scale application of ultrasound in the preservation of postharvest fruits and vegetables.
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FX This work was financially supported by National Natural Science Foundation of China (31171784). The authors are grateful to Zeng Chufeng and Xu Juandi, Department of Food Nutrition, Zhejiang University, China, for their kind suggestions to the manuscript.
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PT J
AU Huang, YB
Thomson, SJ
Hoffmann, WC
Lan, YB
Fritz, BK
AF Huang, Yanbo
Thomson, Steven J.
Hoffmann, W. Clint
Lan, Yubin
Fritz, Bradley K.
TI Development and prospect of unmanned aerial vehicle technologies for agricultural production management
SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING
LA English
DT Review
DE unmanned aerial vehicle; aircraft; aerial application technology; sensor; remote sensing; precision agriculture; agricultural aviation
ID CROP; HELICOPTER; IMAGERY; SYSTEM
AB Unmanned aerial vehicles have been developed and applied to support agricultural production management. Compared with piloted aircraft, an Unmanned Aerial Vehicle (UAV) can focus on small crop fields at lower flight altitudes than regular aircraft to perform site-specific farm management with higher precision. They can also "fill in the gap" in locations where fixed winged or rotary winged aircraft are not readily available. In agriculture, UAVs have primarily been developed and used for remote sensing and application of crop production and protection materials. Application of fertilizers and chemicals is frequently needed at specific times and locations for site-specific management. Routine monitoring of crop plant health is often required at very high resolution for accurate site-specific management as well. This paper presents an overview of research involving the development of UAV technology for agricultural production management. Technologies, systems and methods are examined and studied. The limitations of current UAVs for agricultural production management are discussed, as well as future needs and suggestions for development and application of the UAV technologies in agricultural production management.
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PT J
AU Du, RC
Gong, BC
Liu, NN
Wang, CC
Yang, ZD
Ma, MJ
AF Du Ruicheng
Gong Bingcai
Liu Ningning
Wang Chenchen
Yang Zidong
Ma Mingjian
TI A Design and experiment on intelligent fuzzy monitoring system for corn planters
SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING
LA English
DT Article
DE corn planters; stepless adjustment; plant spacing; fuzzy control; monitoring system; fault alarm
AB When sowing summer corn without tillage, it is necessary to ensure that the furrow opener is free from straw congestion and that the spacing of the sowing can be adjusted according to the breeds of corn and the preset seeding rate per acre. On the basis of the structural features of newly developed no-tillage corn fertilizers, an intelligent fuzzy monitoring system for corn planters was developed in this study. The system facilitates automatic control of the spacing adjustment and the status monitor for the fertilizer tank, seed tank, and seeding orifice. According to the preset number of rows, line spacing, number of plants per acre, and seed germination rate, the control rate can be calculated through designing in surveillance software. The control rate is output to the fuzzy controller through the digital output module of the CAN bus. Fuzzy control is applied to the DC motor for stepless adjustment of the spacing. A system for video surveillance of the working status of a planter is developed for displaying a real-time video image of the planter operation and achieving an anti-congestion status monitoring of a no-tillage planting operation in a dusty environment. Through field trials, the detection accuracy was 91.4%. The seed-clogging fault-alarm accuracy was 96.0%. The entire system remained stable and reliable.
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PT J
AU Thiyagarajan, R
Jayashree, GC
Mohankumar, AP
Vijayakumary, P
AF Thiyagarajan, R.
Jayashree, G. C.
Mohankumar, A. P.
Vijayakumary, P.
TI Performance evaluation of cone penetrometer device for measuring the subsoil compaction in mulched plots
SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING
LA English
DT Article
DE soil strength; raw coir pith; composted coir pith; cone penetrometer; cone index; subsoil compaction
ID DEEP TILLAGE; ROOT-GROWTH; YIELD; RESISTANCE; SOILS
AB Soil exhibits layers of extreme compaction from both natural causes and wheel traffic. These compaction layers impede root growth, thereby reducing the plants capacity to obtain water during drought. Subsoil tillage is a remedy for adverse soil compaction that results in improved conditions for crop growth. Mechanical disturbance of subsoil increases water holding capacity and reduces impedance to root penetration. Vertical mulching is a technique that can be used to partially alleviate soil compaction within the critical root zones of deep rooted crops. A study was conducted by placing raw and composted coir pith using a two row subsoil coir pith mulching machine in three different soil depths (250, 350, and 450 mm) at the three application rates of 15 t/ha, 20 t/ha, and 25 t/ha and the effect of soil strength was investigated. The experiment was conducted for a minted cotton crop. The soil strength profile was recorded in all the treatments. The cone penetrometer resistance was measured for each increment of 10 mm and recorded manually from a digital force indicator during maturity stages of crop in all the treatment plots. The cone penetrometer resistance was measured directly on the row and the cone index was computed. Deep placement of mulch reduced the soil strength as compared to shallow placement. The lower soil strength (0.5 kPa to 0.8 kPa) in the loosened and mulched zone provided an impedance free zone for the root to proliferate. The rapid increase in cone index values at depths immediately below the respective depth of placement (250, 350 and 450 mm) of raw and composted coir pith mulch indicated that the existence of undisturbed soil profile below the mulched zone which could be potential limiting factor for root development.
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ER

PT J
AU Rahman, A
Latifunnahar, M
Alam, MM
AF Rahman, Anisur
Latifunnahar, Most.
Alam, Md Monjurul
TI Financial management for custom hire service of tractor in Bangladesh
SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING
LA English
DT Article
DE tractor operating cost; economic parameter; effective scheduling; tractor entrepreneur; Bangladesh
AB The main purpose of the study was to determine the economic parameters and effective schedules for tractor operation. Secondary data from various sources were used in this research. Some essential data were collected from primary sources through survey. Operating costs were calculated and project financial profitability was determined by four major factors on farm financial measurement techniques, namely, benefit-cost ratio (BCR), net present value (NPV), internal rate of return (IRR), and payback period. Considering the economic use, land topography and cropping pattern was developed to effective scheduling for tractor operation. The operating cost of tractor with implement was found to be US$ 9.25 per hectare. For replacement of the existing tractor on expiry of economic life, the entrepreneur has to save an amount of US$ 219 per year in a bank account. Based on the operating cost, annual savings for replacement and a profit margin for the entrepreneur, the rent-out charge of the tractor is estimated at US$ 11.58 per hectare. Considering 10% interest rate, the NPV of the tractor at existing condition is US$ 18 757. The NPV of tractor indicates that tractor entrepreneurship is considered financially sound and the project is financially viable, with an average IRR of 36.96%. This is because IRR of the tractor was higher than the bank interest rate and it is highly profitable from the viewpoint of individual investors. The Payback period of tractor with implement was determined as 2.03 yrs. The minimum tenure for an economic use of a common tractor used in agriculture is about 6 310 hrs. Above this critical use, the utilization of a tractor is economical for a tractor entrepreneur. Depending on the cropping pattern two major and one minor turn-around periods are available in between cropping seasons for tilling operation. The time available for tilling of land is estimated about 140 days at 12 hours a day in a year. To strengthen the existing capacity of the tractor customer hire service entrepreneurs and develop new entrepreneur, appropriate adoption and dissemination programs must be launched in all over Bangladesh.
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WC Agricultural Engineering
SC Agriculture
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ER

PT J
AU Kumar, R
Singh, PK
Langoo, BA
AF Kumar, R.
Singh, P. K.
Langoo, B. A.
TI Poverty alleviation and resource conservation through development of cost effective technology at foot hill of Shivalik - A case study
SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING
LA English
DT Article
DE Integrated watershed management; mechanical measures; D-50; vegetative measures
ID SOIL-EROSION; MODEL
AB The study revealed the development of cost effective technology utilized as a practical tool for treatment of seasonal torrent and addressing erosion problems and land use planning. Technology was implemented in a small agricultural watershed located in foot hill of Shivalik, India, to assess its prediction capacity of runoff, peak runoff flow and sediment yield. Cost effective technology was evaluated at the event scale by using a database of hydrological, geomorphologic and land use data collected during a two-year period. In the catchment, the gullies which are small to medium in size were treated with gully plugging by erecting loose boulder check dams and erected with different species of plants. Different types of spur were constructed with vegetative reinforcement for channelization of stream flow. The sediments deposited in the first year at downstream was recorded 0.09-81.0 tons, while in the second year it was reduced up to 0.07-16.7 tons. Similarly, up stream sediment deposition was recorded 1.0-72.0 tons and 0.37-13.1 tons in two consecutive years. The D-50 analysis of sediment deposited was carried in three different places of torrent and it was found that deposited particle size material decreased after treatment undertaken in the torrent bed. Therefore, the mechanical as well as vegetative measures helped in the channelization of water course towards the central line with the tune of 10-100 m, stabilization of torrent bed and reclamation of degraded land.
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FU National Agricultural Technology Project (NATP) in village Johranpur-Kulahriwala, Govt. of India
FX The project was funded by National Agricultural Technology Project (NATP) in village Johranpur-Kulahriwala during 2001-2005, Govt. of India. Authors are highly thankful to Dr. V N Sharda and Dr. A K Tiwari and Dr. I P Sharma for their inspiration, encouragement and guidance.
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TC 0
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PU CHINESE ACAD AGRICULTURAL ENGINEERING
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WC Agricultural Engineering
SC Agriculture
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ER

PT J
AU Niphadkar, NP
Burks, TF
Qin, JW
Ritenour, MA
AF Niphadkar, Nikhil P.
Burks, Thomas F.
Qin, Jianwei
Ritenour, Mark A.
TI Estimation of citrus canker lesion size using hyperspectral reflectance imaging
SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING
LA English
DT Article
DE citrus canker; lesion size; disease detection; hyperspectral reflectance imaging; image classification; multispectral algorithm; size detection limit
ID FLORIDA; VISION
AB The Citrus industry has need for effective approaches to remove fruit with canker before they are shipped to selective international market such as the European Union. This research aims to determine the detectable size limit for cankerous lesions using hyperspectral imaging approaches. Previously developed multispectral algorithms using visible to near-infrared wavelengths, were used to segregate cankerous citrus fruits from other peel conditions (normal, greasy spot, insect damage, melanose, scab and wind scar). However, this previous work did not consider lesion size. A two-band ratio method with a simple threshold based classifier (ratio of reflectance at wavelengths 834 nm and 729 nm), which gave maximum overall classification accuracy of 95.7%, was selected for lesion size estimation in this study. The smallest size of cankerous lesion detected in terms of equivalent diameter was 1.66 mm. The effect of variation of threshold values and number of erosion cycles (applying morphological erosion multiple times to the image) on estimation of smallest detectable lesion was observed. It was found that small threshold values gave better canker classification accuracies, while exhibiting a lower overall classification accuracy. Meanwhile, higher threshold values portrayed the opposite tendency. The threshold value of 1.275 gave the optimum tradeoff between canker classification accuracy, overall classification accuracy and minimal lesion size detection. Increasing the number of erosion cycles reduced detection rates of smaller canker lesions, leading to the conclusion that a single erosion cycle gave the best size estimation results. The erosion kernel of the size 3 mm X 3 mm was used during the exploration.
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FU Florida Fresh Packer Association; USDA Technical Assistance for Specialty Crops
FX The authors gratefully acknowledge the financial support of Florida Fresh Packer Association and USDA Technical Assistance for Specialty Crops. The authors would also like to thank Dr. Moon Kim and Dr. Kuanglin Chao from USDA-ARS Environmental Microbial and Food Safety Laboratory, and Mr. Mike Zingaro and Mr. Greg Pugh from University of Florida, for their help in building the hyperspectral imaging system.
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WC Agricultural Engineering
SC Agriculture

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ER

PT J
AU Qing, Y
Dong, L
Zhang, DY
Xu, W
AF Qing, Yan
Dong, Liang
Zhang Dongyan
Xu, Wang
TI Recognition algorithm for plant leaves based on adaptive supervised locally linear embedding
SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING
LA English
DT Article
DE supervised locally linear embedding; manifold learning; Fisher projection; adaptive neighbors; leaf recognition; Precision Agriculture
ID SPECIES IDENTIFICATION
AB Locally linear embedding (LLE) algorithm has a distinct deficiency in practical application. It requires users to select the neighborhood parameter, k, which denotes the number of nearest neighbors. A new adaptive method is presented based on supervised LLE in this article. A similarity measure is formed by utilizing the Fisher projection distance, and then it is used as a threshold to select k. Different samples will produce different k adaptively according to the density of the data distribution. The method is applied to classify plant leaves. The experimental results show that the average classification rate of this new method is up to 92.4%, which is much better than the results from the traditional LLE and supervised LLE.
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FU National Natural Science Foundation of China [61172127]; Research Fund for the Doctoral Program of Higher Education [KJQN1114]; Anhui Provincial Natural Science Foundation [1308085QC58]; 211 Project Youth Scientific Research Fund of Anhui University; Provincial Natural Science Foundation of Anhui Universities [KJ2013A026]
FX This study was financially supported by the National Natural Science Foundation of China (61172127), the Research Fund for the Doctoral Program of Higher Education(KJQN1114), Anhui Provincial Natural Science Foundation (1308085QC58), the 211 Project Youth Scientific Research Fund of Anhui University, and Provincial Natural Science Foundation of Anhui Universities (KJ2013A026)
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SC Agriculture
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PT J

AU Pekke, MA
Pan, ZL
Atungulu, GG
Smith, G
Thompson, JF

AF Pekke, Milly A.
Pan, Zhongli
Atungulu, Griffiths G.
Smith, Gary
Thompson, James F.

TI Drying characteristics and quality of bananas under infrared radiation heating

SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING

LA English

DT Article

DE drying; banana; infrared radiation; hot air drying; enzyme inactivation

ID DESORPTION ISOTHERMS; POLYPHENOL OXIDASE; KINETIC-PARAMETERS; PRODUCTS; SLICES; DEHYDRATION; MODELS

AB Hot air (HA) drying of banana has low drying efficiency and results in undesirable product quality. The objectives of this research were to investigate the feasibility of infrared (IR) heating to improve banana drying rate, evaluate quality of the dried product, and establish models for predicting drying characteristics. Banana slices of 5 mm and 8 mm thickness were dried with IR and HA at product temperatures of 60 degrees C, 70 degrees C and 80 degrees C. Banana drying characteristics and changes in residual polyphenol oxidase (PPO), Hydroxymethylfurfural (HMF), color, moisture content (MC) and water activity during the treatments were investigated. Results showed that significant moisture reduction and higher drying rates were achieved with IR drying compared to HA drying in the early stage. The drying data could be fitted to the Page model for accurate prediction of MC change for IR and HA drying with mean R-2 of 0.983. It was noted that enzyme inactivation occurred more quickly with IR than with HA drying. A unique response of PPO under IR and HA drying was revealed. IR heating of banana inactivated PPO within the first 20 min of drying at 60 degrees C, 70 degrees C and 80 degrees C, while PPO was first activated before inactivation at 60 degrees C and 70 degrees C drying with HA. The highest HMF content occurred in banana slices with 5 mm thickness dried with IR at a product temperature of 80 degrees C. It is therefore recommendable to dry banana with IR at product temperature of 70 degrees C or below to preserve the product quality. These findings are new and provide more insight in the application of IR. heating for drying banana for improved drying rate and product quality.

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WC Agricultural Engineering

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ER

PT J

AU Sorrentino, E
Tipaldi, L
Pannella, G
La Fianza, G
Succi, M
Tremonte, P

AF Sorrentino, E.
Tipaldi, L.
Pannella, G.
La Fianza, G.
Succi, M.
Tremonte, P.

TI Influence of ripening conditions on Scamorza cheese quality

SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING

LA English

DT Article

DE pasta filata cheese; ripening; drying; cheese quality; Lactic acid bacteria; air flow; ripening room

ID PARMIGIANO REGGIANO CHEESE; LACTIC-ACID BACTERIA; WATER

AB Scamorza is a pasta filata cheese produced in Southern Italy and eaten after a short ripening. The ripening phase is critical in defining the main qualitative features of the Scamorza cheese. The success of this operation is conditioned not only by the process parameters, but also by the characteristics of the ripening room in which different microclimates originate. This work intended to evaluate the influence of the different positions of cheeses within the ripening room on the evolution of their qualitative characteristics during the process of drying/ripening. For this purpose, samples of Scamorza cheese, produced in the Molise Region (Italy), were divided into two batches (C and L) and subjected to ripening for seven days in a thermo thermo-regulated room. The two batches were placed in different points of the room: the batch C in the central area and the batch L in the lateral area. During the ripening, temperature, humidity and air flow were monitored and the Scamorza cheeses were analysed to assess some qualitative characteristics. In a ripening room, the created microclimates are able to influence the quality of the product, as demonstrated by data related to temperature, humidity and air flow. In fact, from the results obtained, some appreciable differences among products from batches C and L were observed for the weight loss, the water activity and the calorimetric indexes. Differences in the behaviour of mesophilic lactic acid bacteria, pH and acidity were also found. The more rapid loss of water, characterizing the batch C, resulted in an evolution of physicochemical, physical and microbiological features, which resulted different from those observed in the samples from the batch L. Therefore, the results obtained in this study point out that, within the ripening room, the formation of different micro-environments is able to strongly influence the definition of the qualitative characteristics of the products placed in it.

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FU PSR Molise [Misura 124]

FX Authors wish to thank Caseificio Molisano L. Barone s.n.c. for the production of cheeses. The study was performed within the project "Trasferimento di innovazione nella filiera lattiero-casearia per la valorizzazione del caciocavallo molisano e il recupero di sottoprodotti di trasformazione", financially supported by PSR Molise 2007-2013 - Misura 124.

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PT J
AU Mu, YQ
Zhao, XH
Liu, BX
Liu, CH
Zheng, XZ
AF Mu Yanqiu
Zhao Xinhuai
Liu Bingxin
Liu Chenghai
Zheng Xianzhe
TI Influences of microwave vacuum puffing conditions on anthocyanin content of raspberry snack
SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING
LA English
DT Article
DE raspberry snack; microwave vacuum puffing; processing condition; anthocyanin content; absorbance
ID DRYING CONDITIONS; SLICES; CARROT; AIR
AB Microwave technology is fit for the processing of berry products, but it may affect nutrition components of berry fruit. To improve the nutritional value of the berry products, the influences of microwave vacuum puffing conditions on the anthocyanin content of raspberry snack were investigated using central composite experiments. Results indicated that vacuum pressure had the most significant effect on the anthocyanins of berry snack, followed by the puffing time, microwave power, and initial moisture content. The interaction between microwave power and puffing time on the anthocyanins was extremely significant. Under microwave power of 2.68 kW and the puffing time of 81.00 s, the anthocyanin content of raspberry snack was retained at high level. The results can provide some technological basis for the berry fruit products processed with high quality.
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FU National Natural Science Foundation of China [31071579, 31271911]; Natural Science Foundation of Heilongjiang Province of China [ZD201013]; Education Department of Heilongjiang Province of China [12521z003]
FX The authors thank the financial support by the National Natural Science Foundation of China (No. 31071579 & 31271911), the Key Program of the Natural Science Foundation of Heilongjiang Province of China (No. ZD201013) and Key Project of Education Department of Heilongjiang Province of China (No. 12521z003) for this research project.
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JI Int. J. Agric. Biol. Eng.
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WC Agricultural Engineering
SC Agriculture
GA AK2RM
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ER

PT J

AU Nahal, AM
Arabhosseini, A
Kianmehr, MH

AF Nahal, A. Mokhtari
Arabhosseini, A.
Kianmehr, M. H.

TI Separation of shelled walnut particles using pneumatic method

SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING

LA English

DT Article

DE Pneumatic; separation of kernel and shell; terminal velocity; walnut; postharvest; shelled walnut; Persian walnut

ID RADIO-FREQUENCY TREATMENTS; PHYSICAL-PROPERTIES; AERODYNAMIC PROPERTIES; KERNEL; L.; ATTRIBUTES; SEEDS; NUT

AB Separation of shelled walnut particles was studied on two varieties of Persian walnut, Poost-Kaghazi and Poost-Sangi using pneumatic method. The moisture contents of the samples were determined. The particles were considered in three categories of shell, kernel and shell-kernel together. Each category was manually classified based on their size, in three portions of 1/8, 1/4, and 1/2, as well as the whole kernel and whole walnut. The terminal velocity of each group was determined. The shelled walnuts were sieved and classified in three groups of small, medium and large. The effects of separation time (5, 10 and 15 seconds), feeding value (50 to 80 gr) and air velocity on separation of the kernels and shells were studied for both varieties. The interaction effects were also studied for three walnut sizes (small, medium and large). The terminal velocity was the highest for the whole walnut and the whole kernel while it was lowest for 1/4 and 1/8 of the shell. The best separation was performed at air velocities of 9.20, 10.04 and 10.94 m/s with 98.2%, 98.9% and 98.2%, respectively.

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Z9 0

PU CHINESE ACAD AGRICULTURAL ENGINEERING

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WC Agricultural Engineering

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ER

PT J

AU Bai, YL
Yu, M
Du, B
Chen, QF
Yang, GM

AF Bai Yongliang
Yu Ming
Du Bing
Chen Qingfa
Yang Gongming

TI Modulation of fasting blood glucose by raw banana powder in alloxan-induced diabetic rats

SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING

LA English

DT Article

DE raw banana powder; dietary fiber; resistant starch; fasting blood glucose; diabetic rats

ID CHAIN FATTY-ACIDS; HIGH-AMYLOSE CORNSTARCH; WHOLE-GRAIN INTAKE; RESISTANT STARCH; DIETARY FIBER; SERUM-CHOLESTEROL; CARDIOVASCULAR-DISEASE; INSULIN-RESISTANCE; SMALL-INTESTINE; GLYCEMIC INDEX

AB This study aimed to observe the influence of raw banana powder (RBP) on fasting blood glucose (FBG), blood lipid and other biochemical indicators in type-2 diabetic rats and therefore to provide experimental evidences for developing suitable food from banana powder for diabetic patients. Eight Sprague-Dawley rats were selected randomly as the normal control group (NCG) before the experiment. After establishing type-2 diabetic rat models (11.1-16.7 mmoL/L) by alloxan, 32 rats were divided into four groups: the diabetic control group (DCG, n=8), low-dose group (LDG, n=8), middle-dose group (MDG, n=8) and high-dose group (HDG, n=8). The LDG, MDG and HDG rats received gastric perfusion of RBP at the doses of 2 g/kg, 4 g/kg and 6 g/kg per day, respectively. After four weeks, oral glucose tolerance test was carried out in each group, and then the FBG level, blood lipid, insulin, short chain fatty acids content, pH value of colon content and other biochemical indicators of rats in each group were determined and compared among the groups. Results showed that the levels of FBG significantly decreased in the LDG (11.97 +/- 0.83), MDG (8.95 +/- 0.45) and HDG (9.28 +/- 1.45), compared with their initial values (13.00 +/- 1.25, 13.68 +/- 0.75 and 13.91 +/- 0.80, respectively). The FBG levels in these three groups were obviously lower than that in the DCG. However, there were no dramatic FBG changes in the NCG and DCG (5.77 +/- 0.59, 14.14 +/- 0.72) compared with the initial stage (5.55 +/- 0.23, 13.93 +/- 0.47). The RBP intervention increased insulin-sensitivity index and regulated postprandial blood glucose. Besides, RBP showed the positive effects on symptoms of type 2 diabetic rats, such as the reduction of weight gain and total cholesterol.

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NR 50

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ER

PT J

AU Wei, D
Huang, YB
Zhao, CJ
Xiu, W
Liu, JL

AF Wei, Deng
Huang, Yanbo
Zhao Chunjiang
Xiu, Wang
Liu Jinlong

TI Spatial distribution visualization of PWAT continuous variable-rate spray

SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING

LA English

DT Article

DE spray distribution; pulse width modulation (PWM); variable-rate spray; distribution visualization

AB Pesticide application is a dynamic spatial distribution process, in which spray liquid should be able to cover the targets with desired thickness and uniformity. Therefore, it is important to study the 2-D and 3-D (dimensional) spray distribution to evaluate spraying quality. The curve-surface generation methods in Excel were used to establish 1-D, 2-D, and 3-D graphics of variable-rate spray distribution in order to characterize the space distribution of the variable-rate spray. The 1-D, 2-D, and 3-D distribution graphs of Pulse-Width Modulation (PWM)-based continuous variable-rate spray were developed to provide a tool to analyze the distribution characteristics of the spray. The 1-D graph showed that the spray distribution concentrated toward the center of the spray field with the decreased flow-rate. The 2-D graph showed that the spray distribution always spread as the shape of Normal Probability Distribution with the change of the flow-rate. The 3-D graph showed that the spray distribution tended to be uniform when the sprayer travelled forward at the appropriate speed. This study indicated that the visualization method could be directly used for analysis and comparison of different variable-rate spray distributions from different experimental conditions and measuring methods.

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FU National High Technology Research and Development Program of China (863 Program) [2012AA101904]; National Sci-tech Support Plan Projects of China for the 12th Five-year Plan [2011BAD20B07]

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AU Liu, HJ
Li, Y
Zhang, RH
Huang, GH

AF Liu Haijun
Li Yan
Zhang Ruihao
Huang Guanhua

TI Evaluation and modification of potential evapotranspiration methods in Beijing, China

SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING

LA English

DT Article

DE potential evapotranspiration; Penman-Monteith method; determination coefficient; coefficient of efficiency; Beijing

ID REFERENCE CROP EVAPOTRANSPIRATION; PENMAN-MONTEITH EQUATION; BLANEY-CRIDDLE EQUATION; CALCULATING MONTHLY ETO; WINTER-WHEAT; ARID REGION; COEFFICIENTS; WATER; CALIBRATION; CLIMATE

AB In this study, seven widely used potential evapotranspiration (ETo) methods were evaluated by comparing with the FAO-56 Penman-Monteith method (PM method) to provide useful information for selecting appropriate ETo equations under data-limited condition in Beijing, China Statistical methods and parameters, namely linear regression, root mean squared error (RMSE) and mean bias error (MBE), were used to evaluate the seven ETo methods. Results showed that ETo estimated using Kimberly Penman method have fairly close agreement with the PM method (referring to standard ETo), considering the coefficient of determination (R-2) of 0.96, RMSE of 0.42 mm/day, and a coefficient of efficiency (E) of 0.96. Locally calibrated Penman and Doorenbos-Pruitt methods also have better agreement with the PM method, correspondingly with R-2 of 0.99 and 0.95, RMSEs of 0.24 mm/day and 0.21 mm/day, and coefficients of efficiency of 1.02 and 0.99, respectively. The ETo is the most sensitive to vapor pressure deficit (VPD) and net radiation in the Beijing area. Hence, the VPD-based and VPD-radiation combined ETo methods were developed and calibrated. Results showed that the two developed methods performed well in ETo estimation. By fully considering the data-limit situation, the calibrated Turc method, VPD-based method and VPD-radiation-combined method may be attractive alternatives to the more complex Penman-Monteith method in Beijing.

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FU Major Science and Technology Program for Water Pollution Control and Treatment [2009ZX07212-002-003-002]; Open Research Funds of State Key Laboratory of Simulation and Regulation of Water Cycle in River Basin [IWHR-SKL-201105]; National Natural Science Foundation of China [51179005]

FX The study is supported by the Major Science and Technology Program for Water Pollution Control and Treatment (No. 2009ZX07212-002-003-002), the Open Research Funds of State Key Laboratory of Simulation and Regulation of Water Cycle in River Basin (No.IWHR-SKL-201105), and the National Natural Science Foundation of China (No. 51179005). The authors greatly appreciate the China Meteorological Data Sharing Service System (http://cdc.cma.gov.cn/) for providing valuable meteorological data.

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WC Agricultural Engineering

SC Agriculture

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PT J

AU Kumar, R

AF Kumar, Rohitashw

TI Ecohydrologic modeling of crop evapotranspiration in wheat (Triticum-aestivum) at sub-temperate and sub-humid region of India

SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING

LA English

DT Article

DE crop coefficient; crop evapotranspiration; reference evapotranspiration; lysimeter

ID TRANSPIRATION; EQUATION

AB Efficient water management of crop requires accurate irrigation scheduling which, in turn, requires the accurate measurement of crop water requirement. Reference evapotranspiration plays an important role for the determination of water requirements for crops and irrigation scheduling. Various models/approaches varying from empirical to physically base distributed are available for the estimation of reference evapotranspiration. This study identified most suitable reference evapotranspiration model for sub-temperate, sub humid agro-climatic condition using climatic and lysimeter data. The Food and Agriculture Organization (FAO) recommended crop coefficient values are modified for the local agro-climatic conditions. The field experiment was conducted in sub-temperate and sub-humid agro-climate of Solan, Himachal Pradesh, India. Actual crop evapotranspiration for different crop growth stages of wheat (Triticum-aestivum) has been obtained from water balance studies using lysimeter set-up. Field observed and computed individual-stage wise crop evapotranspiration values are compared, to identify the most suitable reference evapotranspiration model for computing crop evapotranspiration. Penman Monteith model shows close agreement with observed value with coefficient of determination, standard error estimate and average relative discrepancy values of 0.96, 13.69 and -5.8, respectively. Further, an effort has been made to compare the accuracy of various widely used methods under different climatic conditions.

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ER

PT J

AU Hu, YG
Lu, YZ
Lu, J

AF Hu Yongguang
Lu Yongzong
Lu Jian

TI Comparative proteomics analysis of tea leaves exposed to subzero temperature: Molecular mechanism of freeze injury

SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING

LA English

DT Article

DE freeze injury; molecular mechanism; freeze protection; comparative proteomics; Camellia Sinensis; mass spectrometry

ID GEL-ELECTROPHORESIS; SPINACH; PLANTS; EXPRESSION; TOLERANCE; STRESS; TOMATO; FAMILY; HSP70

AB Tea freeze injury is one of the most severe agro-meteorological disasters, which leads to sizable losses of tea production in China. The freezing resistant ability of overwintering tea trees becomes weaker and weaker from early-spring to late-spring. If it decreases to critical temperature of -2 degrees C or lower in the stage with one or two leaves, tea trees suffer from freeze injury and the yield or quality of spring tea production could decrease greatly. Although measurements have been taken to prevent such damage, the physiological and biochemical mechanism of how tea (Camellia Sinensis) plant response to freeze injury is still to be elucidated. A comparative proteomics analysis was made on tea leaves at the two-leaf stage. The differential image analysis showed 46 spots with density changes (29 spots increased and 17 spots decreased; $p<0.01$) in the freeze injury group compared with the control group. Thirty eight differential protein spots ($p<0.01$) with good resolution and relatively high abundance in MS were subjected to further protein identification. Among them, all 17 up-regulated spots were collected whereas only six of the down-regulated spots were selected. These differentially expressed proteins including heat shock protein 70, oxygen-evolving enhancer protein, adenosine triphosphate synthase,

S-adenosylmethionine synthetase and some enzymes involved in carbohydrate metabolism, were shown responsive to freeze injury. The results would greatly increase the comprehension of the molecular mechanism for freeze injury and provide a better decision making for freeze protection and control.

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FU National High Technology Research and Development Program of China [2012AA10A508]; National Natural Science Foundation of China [31101089/BK2010326]; Jiangsu Agriculture Science and Technology Innovation Fund [CX(12)3025]; National Natural Science Foundation of Jiangsu Province [31101089/BK2010326]

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PT J

AU Ma, JQ
Zhu, HG
Fan, M

AF Ma Jieqiong
Zhu Hongguang
Fan Min

TI Distribution of heavy metals in pig farm biogas residues and the safety and feasibility assessment of biogas fertilizer

SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING

LA English

DT Article

DE fluid biogas residue; heavy metals; distribution; correlation; fertilization

ID SLURRY; SLUDGES

AB The presence of high levels of heavy metals in anaerobic fermentation residues is a major obstacle to the resource utilization and urgent research for removal of heavy metals in the biogas slurry is needed. The handling of large-scale residue slurry and safely returning to field urgently needed constructive suggestion. The contents of heavy metal elements in the residue of anaerobic digestion processes of the wastewater and waste of the piggery were mainly investigated. The contents of heavy metals in the original fluid and the centrifugal solution were determined in this study. They included elements, such as Cu, Zn, Cr, Cd, Pb, As, Ni, Mn, and Se, which were compared with the existing standard including the irrigation water quality standards (GB5084-2005), comprehensive discharge standard of sewage (GB8978-1996) and water-solubility humic acid fertilizer quality standards (NY1106-2010). The preliminary data suggested that both the heavy metals before and after centrifugation were in excess of the standards to some degree and the exceeding standard rate declined significantly after centrifugation. The absolute contents of heavy metals after centrifugation declined significantly compared with that before centrifugation. Those ratios are 91.8%, 73.2%, 47.6%, 94.5%, 93.5%, 59.4%, 95.8%, 100% for Zn, As, Cd, Cr, Cu, Ni, Mn, Pb, respectively. A descriptive statistics as well as a correlational analysis showed that there existed strong correlation among Cu, Pb, and the total suspended solids (TS). Meanwhile, significant correlation was found among TS, Cd, Zn, As, Cr, Ni, and Mn at 0.01 level. The data and

the analysis above provided the theoretical and experimental support for the removal of heavy mental mainly characterized by the removal of TS. According to the comparison between contents of heavy mental conversed from large amount nutrients and corresponding standard (NY1110-2006), only as was found beyond standard. It was feasible to apply biogas residues after centrifugation as water-solubility fertilizer due to the fact that As had low accumulation efficiency in soil and plants.

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FU Tongji Eco-park and biogas project in Chongming County, shanghai

FX This work was supported by Tongji Eco-park and biogas project in Chongming County, shanghai. Authors also would like to express gratitude to Shen Wenyan, Fan Biying, Wang Yaohua, Chen Tinghua and all the personnel working in the field for their supports and suggestions.

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ER

PT J

AU Cui, Y
Yuan, WQ
Cao, J

AF Cui, Yan
Yuan, Wenqiao
Cao, Jian

TI Effects of surface texturing on micro algal cell attachment to solid carriers

SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING

LA English

DT Article

DE algae attachment; algal biofuel; Cassie model; contact point theory; surface texture; Wenzel model

ID BIODIESEL PRODUCTION; POINT THEORY; WASTE-WATER; SETTLEMENT; ZOOSPORES; MICROTOPOGRAPHY; WETTABILITY; RECRUITMENT; ENTEROMORPHA; COATINGS

AB The objective of this study was to understand the role of surface texturing in microalgal cell attachment to solid surfaces. Two microalgal species, Scenedesmus dimorphus and Nannochloropsis oculata, were studied on solid carriers made of nylon and polycarbonate. Ridge, pillar and groove at micro-scale were engineered on the solid carriers. Cell response to the textured surfaces wars separately described by the Cassie and Wenzel models and the contact point theory. Comparison between measured and model-predicted contact angles indicated that the wetting behavior of the textured solid carriers fell into the Wenzel state, which implied that algal cells could fully penetrate into the designed textures, but the adhesion behavior would be dependent on the size and shape of the cell. Experimental results showed that the attachment was preferred when the feature size was close to the diameter of the cell attempting to settle. Larger or smaller feature dimensions had the potential to reduce cellular attachment. The observation was found to qualitatively comply with the contact point theory.

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FU U.S. National Science Foundation [CMMI-1239078]; North Carolina State University

FX We would like to thank Dr. Vikas Berry at the Chemical Engineering Department of Kansas State University for the use of the microscope, and Mr. Chuck Mooney at the Analytical Instrument Facility of North Carolina State University for AFM and SEM measurements. This research was financially supported by the U.S. National Science Foundation (Award # CMMI-1239078) and the startup fund of North Carolina State University.

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PT J

AU Khambalkar, VP
Kankal, US
Karale, DS
Gangde, CN

AF Khambalkar, V. P.
Kankal, U. S.
Karale, D. S.
Gangde, C. N.

TI Biomass energy cost and feasibility of gasifier based biomass power generation system

SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING

LA English

DT Article

DE cost of biomass energy; biomass power generation system discounted cash flow; benefit cost ratio; net present value; payback period; internal rate of return

ID TECHNOECONOMIC ASSESSMENT

AB The present research work has been carried out on biomass based on 10 kW capacity gasifier power generation system installed at College of Agricultural Engineering and Technology, Dr. Panjabrao Deshmukh Agricultural University (Dr. PDKV), Akola Maharashtra, India. The main objectives were to evaluate various costs and benefits involved in the power generation system. The costs of energy per unit were calculated for the first year of operation. The economics of gasifier based power generation system and thereby the feasibility of the system was examined by estimating per unit cost, Net Present Value (NPV), Benefit Cost Ratio (BCR), Internal Rate of Return (IRR) and payback period. The discount cash flow method was used to find out the IRR. In the present analysis, three costs viz., installed capital cost, operation and maintenance cost, and levelised replacement cost were examined for the evaluation of the power generation per unit. Discount rate on investment in case of subsidy (Case I) and in case without subsidy (Case II) for installation cost of system was considered as 12.75%. The BCR comes in Case I for operating duration of 22 h, 20 h, and 16 h are 1.24, 1.18, and 1.13, respectively. Similarly for Case II BCR comes 1.44, 1.38, and 2.39. The IRR comes in Case I for operating duration of 22 h, 20 h, and 16 h are 26%, 22%, and 19%, respectively. Similarly for Case II, IRR comes 52%, 44%, and 39% for operating duration of 22 h, 20 h, and 16 h, respectively. The payback period in the present analysis was worked out. The payback period for biomass based gasifier power generation system was observed to be for Case I from three to four years and for Case II it was one to two years.

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PT J
AU Farzaneh-Gord, M
Arabkoohsar, A
Bayaz, MDD
Khoshnevis, AB
AF Farzaneh-Gord, Mahmood
Arabkoohsar, Ahmad
Bayaz, Mandi Deymi Dashte
Khoshnevis, Abdolamir Bak
TI New method for applying solar energy in greenhouses to reduce fuel consumption
SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING
LA English
DT Article
DE solar energy; greenhouse; storage tank; stratification; NPV
ID PRESSURE-DROP STATIONS; TOMATO PRODUCTION; FEASIBILITY; SYSTEMS; INPUTS; WATER
AB Renewable energies (especially solar energy) are globally suitable alternatives for fossil fuels. On the other hand, greenhouses, as a main part of agriculture industry, use a significant amount of fossil fuels annually to provide the required heat for the under-cultivation crops in the greenhouse. Currently this heat demand is provided by a heater which burns gas oil as its main fuel. The main problem with these heaters is fuel hyper-consumption. That is why feasibility of utilizing a solar energy storage system in greenhouses is studied here. As the low temperature heat is required for preheating the air in the greenhouse, a solar collector array is proposed to be utilized in order to displace heating demand of the heater and to reduce amount of fuel consumption. To evaluate the proposed system effectiveness, an economic survey has been done on the proposed system based on Net Present Value (NPV) method. The optimum capital cost for the project is found based on economic methods. The economic analysis showed that 85 flat plate collector modules and an 8.5 cubic meters of storage tank are optimum selection of the project. The results showed that, by employing the proposed system, 7 735 USD benefit as well as 11 050 litres of fuel providence is obtainable annually. Economic evaluation based on NPV method resulted in the payback period of ten years.
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PT J
AU Li, XP
Shi, JY
Zhu, XY
Wang, JH
Yuan, ZX
Luo, J
Liu, TX
Wang, R
Rao, S
Chen, WX
AF Li Xueping
Shi Jingying
Zhu Xiaoyang
Wang Jinghua
Yuan Zhenxin
Luo Jun
Liu Tongxin
Wang Rong
Rao Shen
Chen Weixin
TI Pre-harvest and post-harvest application of benzothiadiazole for controlling anthracnose and extending shelf life of harvested banana
SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING
LA English
DT Article
DE banana fruit; shelf life; ripening; post-harvest preservation; BTH treatment; anthracnose; peel color; firmness
ID SYSTEMIC ACQUIRED-RESISTANCE; ACIBENZOLAR-S-METHYL; DISEASE RESISTANCE; BOTRYTIS-CINEREA; BTH; EXPRESSION; BACTERIAL; DEFENSE; STORAGE; TOBACCO
AB Anthracnose, caused by the fungus Colletotrichum musae, is a serious latent post-harvest disease of banana, which results in major economic losses during transportation and storage. Benzo-thiadiazole-7-carbothioic acid S-methyl ester (BTH), a functional analogue of the plant endogenous hormone-like compound salicylic acid (SA), has been known to possess resistant effects on some diseases caused by fungi. The aim of present study was to select an appropriate BTH concentration and an appropriate stage of banana ripening for its application in controlling anthracnose and extending shelf life of harvested banana fruit. Different concentrations of BTH (50, 100, 200 and 300 mu g/mL) were applied at different stages of banana fruit ripening, including one week, two weeks and one month before harvest. The results suggest that while the concentrations of BTH ranging from 50 mu g/mL to 200 mu g/mL in both pre-harvest and post-harvest application, this could control anthracnose of harvested banana fruit, the appropriate concentration of BTH in both pre-harvest and post-harvest treatment was 100 mu g/mL and the best time of BTH treatment was two weeks before harvest. Examination of quality parameters including peel color and firmness indicated that 100 mu g/mL BTH treatment delayed banana fruit ripening at room temperature.
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FU China Agriculture Research System [CARS-32-09A]; Guangdong Modem Agricultural Industry Technology System [LNSG2011-12]; Ministry of Agriculture of China [Nyhyzx3-55, 2006-G32]; National Natural Science Foundation of China [U0631004]

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PT J

AU Hu, ZQ
Jia, LL
Yue, TL

AF Hu Zhongqiu
Jia Lili
Yue Tianli

TI Microwave-low-pressure process (MWLP): An effective technology applied in extraction of total polyphenols

SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING

LA English

DT Article

DE Microwave-low-pressure process (MWLP); total polyphenols; Chaenomeles speciosa fruit; model optimization; performance evaluation

ID HIGH HYDROSTATIC-PRESSURE; ASSISTED EXTRACTION; CHLOROGENIC ACID; ANTIOXIDANT ACTIVITY; IDENTIFICATION; L.

AB The microwave-low-pressure process (MWLP) of total polyphenols from Chaenomeles speciosa fruit was studied, and the advantages of MWLP were further evaluated by comparing with ultra high pressure (UHP) and microwave-assisted extraction (MAE). The influences of liquid/solid ratio, extraction time, pressure, and ethanol concentration on the performance of MWLP were investigated. Thereafter, the interactive variables were further optimized by the stepwise multiple quadratic regression model on the basis of the previous univariate analysis. The results showed that temperature as an intermediate variable in MWLP significantly affected the yields of polyphenols and 3-o-caffeoyl-quinic acid, which was determined by pressure and ethanol concentration. The optimized parameters were proved to be valid because the results predicted by the stepwise multiple quadratic regression model equations fit well with the experimental results. Compared with UHP, the predominance of MWLP was that the extraction time was shortened and the cost of extraction equipment was lowered. MWLP is an effective technology since MWLP was superior to MAE based on extraction yield, solvent loss and reproducibility.

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FU Ministry of Science and Technology of China [2012BAD31B01, 2012BAK17B06]

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WC Agricultural Engineering
SC Agriculture
GA AK2RN
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ER

PT J
AU Kalaivani, K
Devi, VC
AF Kalaivani, K.
Devi, V. Chitra
TI Mathematical modeling on drying of Syzygium Cumini (L.)
SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING
LA English
DT Article
DE activation energy; drying; effective moisture diffusivity; mathematical model; Syzygium cumini
ID POTATO SLICES; GREEN-PEPPER; KINETICS; DRYER; PRETREATMENTS; BEHAVIORS; QUALITY; FRUITS; SUN
AB In this study, drying characteristics of Syzygium cumini was experimentally investigated under the temperatures of 50 degrees C, 60 degrees C and 70 degrees C and the mathematical models were used to fit the drying of Syzygium cumini. Moisture transfered from Syzygium cumini was described by applying the Fick's diffusion model and the effective moisture diffusivity was calculated. The temperature dependence of the effective moisture diffusivity for the drying of Syzygium cumini samples was described by an Arrhenius-type relationship with activation energy. Drying data were fitted to seven drying models, namely Lewis, Henderson and Pabis, Logarithmic, Twoterm, Page, Wang and Singh and modified Henderson and Pabis. The Logarithmic model was found as the best fitted model in describing the drying behavior of Syzygium cumini.
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NR 37
TC 0
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PU CHINESE ACAD AGRICULTURAL ENGINEERING
PI BEIJING
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PG 8
WC Agricultural Engineering
SC Agriculture
GA AK2RN
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ER

PT J
AU Shittu, SK
Isiaka, M
AF Shittu, S. K.
Isiaka, M.
TI Storage stability of dried tomato slice
SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING
LA English
DT Article
DE dried tomato; storage stability; moisture content; humidity; temperature
AB Unlike fresh farm produce, processed fruits and vegetables such as sun dried tomatoes can be categorized as ambient temperature shelf stable products. However, large quantities of these products yet easily go bad most especially when the appropriate conditions for their storage are not offered. To minimize these losses, it is important to know and exploit the optimum environmental conditions and moisture content range for the storage of the products. The present study through systematic theoretical assertions employed by other researchers on other crops seeks to establish the storage stability of dried tomato slice at three probable temperatures of 10, 30 and 45 degrees C. Results showed that in this temperature range, upper limit moisture content varied between 6%-7.5% and 6.5%-8.3% d.b. for adsorption and desorption, respectively. The corresponding lower limit moisture contents varied between 4.29%-5.52% and 5.15%-6.29% d.b. In order to minimize moisture migration into or out of dried tomato slice during storage, the study revealed that the product should be stored within 29%-62% relative humidity.
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NR 19
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PU CHINESE ACAD AGRICULTURAL ENGINEERING
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DI 10.3965/j.ijabe.20130604.012
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WC Agricultural Engineering
SC Agriculture
GA AK2RN
UT WOS:000338267300012
ER

PT J

AU Said, PP
Pradhan, RC
AF Said, Prashant Pandharinath
Pradhan, Rama Chandra
TI Moisture dependent physical properties of Lagenaria siceraria seed
SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING
LA English
DT Article
DE Lagenaria siceraria; physical properties; angle of repose; aspect ratio; gravimetric properties; sphericity
ID L. SEEDS; KERNELS; GRAINS; GRAM; NUT; PEA
AB The investigation was done to evaluate the effect of moisture content on some physical properties of Lagenaria siceraria seed. The study was conducted at five moisture levels including 8.84%, 10.10%, 11.89%, 12.60% and 15.10% (w.b.). Results showed that the mean value of principal dimensions, average diameters, surface area and 1000 seed mass increased linearly but aspect ratio decreased with increase in moisture content. The sphericity increased in the moisture range of 8.84% to 11.89% but decreased with further raise in the moisture up to 15.10%. Gravimetric properties like bulk density increased with increase in moisture content however true density and porosity decreased linearly with increase in moisture content. Angle of repose and terminal velocity increased linearly with moisture content of the seed. The coefficient of friction increased linearly with seed moisture content on five experimental surfaces (plywood, galvanized iron, glass and plastic). The information pertaining to moisture dependant physical properties of Lagenaria siceraria seeds may become an essential part in design of processing machines and its unit operations, design of dehulling, oil expression and other processing equipments.
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NR 52
TC 0
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PG 10
WC Agricultural Engineering
SC Agriculture
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ER

PT J
AU Vayupharp, B
Laksanalamai, V
AF Vayupharp, Benjaruk
Laksanalamai, Varaporn
TI Nutrients and anti-nutrients of high chlorophyll - mungbean sprouts as affected by different periods of germination and sprouting stages
SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING
LA English
DT Article
DE high chlorophyll; phytic acid; total phenolic content; radical scavenging activity; HCl extractability of minerals; mungbean sprouts
ID ANTIOXIDANT ACTIVITY; PHYTIC ACID; ANTINUTRITIONAL FACTORS; ROUGH RICE; BROWN RICE; SEEDS; L.; POLYPHENOLS; MINERALS; SOAKING

AB The variation of nutrient and anti-nutrient compounds in commercial mungbean cultivars (Chinat 72, MS-1, Chinat 80, and L3-8) during seven periods of germination and sprouting was determined. The seeds were selected randomly at 6 h of soaking (1st stage), 23 h (2nd stage), 47 h (3rd stage), 71 h (4th stage), 77 h (5th stage) of sprouting, and 12 h, and 24 h of sunshine exposing (6th and 7th stage, respectively). It was found that nutrition compositions (including protein content, crude fiber content, vitamin C content, total minerals, and HCL-extractability of minerals) of all cultivars significantly increased with germination and sprouting. At the last stage, the total phenol was the highest amount which was not significantly different from all cultivars. The total antiradical capacity (%, DPPH inhibition) increased up to the maximum value in the last two stages of sprouting. The results showed that the phytic acid, the anti-nutrient component decreased with the consequence of germination, and reached the untraceable value at the last stage. In addition, the highest amount of chlorophyll (7.15-8.99 mg/100 g) was found in Chinat 72 and MS-1 cultivars at the last stage of sprouting, comparing to Chinat 80 and L3-8 cultivars. It is therefore recommended to consume high chlorophyll mungbean sprout with the benefits of high nutrient constituents and low price purchase comparing to other green vegetables.

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FX The authors are grateful to the Chai-Nat Field Crops Research Center, Department of Agriculture Thailand for supplying the four commercial mungbean cultivars. The authors also thank Rangsit University for financial assistance.

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PT J
AU Wang, YK
AF Wang Yingkuan
TI Open Access Leads to Success
SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING
LA English
DT Editorial Material
C1 Chinese Acad Agr Engn, Beijing 100125, Peoples R China.
RP Wang, YK (reprint author), Chinese Acad Agr Engn, Beijing 100125, Peoples R China.
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PT J
AU Flores-Velazquez, J
Montero, JI
Baeza, EJ
Lopez, JC
AF Flores-Velazquez, Jorge
Montero, Juan I.
Baeza, Esteban J.
Lopez, Juan C.
TI Mechanical and natural ventilation systems in a greenhouse designed using computational fluid dynamics
SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING
LA English
DT Article
DE greenhouse cooling; fan ventilation; roof ventilators; combined ventilation
ID INSECT-PROOF SCREENS; FLOW CHARACTERISTICS; COOLING GREENHOUSES; AIR-FLOW; EFFICIENCY; MICROCLIMATE; SIMULATIONS; PERFORMANCE; CANOPY; REGIME
AB The aim of this study was to analyse air exchange and temperature distribution in a greenhouse with combined mechanical and natural ventilation and to design more efficient mechanical ventilation systems. For this purpose, a computational fluid dynamics (CFD) model of the greenhouse was used. Three configurations were considered: Configuration 1 (mechanical ventilation and closed roof ventilators), Configurations 2 and 3 (mechanical ventilation and roof ventilators open 30% and 100%, respectively). After validation, the CFD model was used to improve the design of the greenhouse mechanical ventilation system in each of the three configurations analyzed. Four greenhouse lengths, 28 m, 50 m, 75 m and 100 m, were used in the simulations. Compared to fan ventilation only, roof ventilation improved the climate of fan-ventilated greenhouses in terms of the air exchange rate (22%) and climate uniformity because the internal air was mixed better than with mechanical ventilation only. As the greenhouse length increased, more advantages were achieved with natural ventilation compared to mechanical ventilation. For most configurations, there was a strong linear correlation between temperature gradient and greenhouse length. The greenhouse whose regression line had the steepest slope was the one with closed roof ventilators. Increasing the fan capacity produced a general reduction in temperature, but the effect was less intense for the greenhouses with open roof

ventilators. Compared to box inlet ventilators, an enlarged continuous inlet in the wall opposite the fans increased overall system performance because it eliminated backflow recirculation zones, which are prone to produce high temperatures. Keywords: greenhouse cooling, fan ventilation, roof ventilators, combined ventilation

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FU EUPHOROS project, Efficient Use of inputs in Protected Horticulture; Seventh EU Framework Programme; INIA project RTA [2008-00109-C03-01]; CONACYT-Mexico

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Z9 0

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ER

PT J

AU Yi, SJ
Liu, YF
Wang, C
Tao, GX
Liu, HY
Wang, RH

AF Yi Shujuan
Liu Yongfen
Wang Chun
Tao Guixiang
Liu Haiyan
Wang Ruihan

TI Experimental study on the performance of bowl-tray rice precision seeder

SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING

LA English

DT Article

DE bowl-tray rice precision seeder; rice seed; sowing performance; seed injury; shaped hole; quadratic orthogonal rotary regression experiment; optimal design

AB In order to optimize the parameters of bowl-tray rice precision seeder and improve its performance, three major factors respectively at five levels, including shaped hole diameter, vertical displacement of rice seeds and rotating speed of cam, were tested, the quadratic orthogonal rotational

regression experiments were conducted, and the effects on seeding rate, leakage sowing rate and the injury rate were investigated. The test results show that factors affecting rice seeding rate are in the order of shaped hole diameter, rotating speed of cam and vertical displacement of rice seeds. The factors affecting rice planting leakage rate are in the order of shaped hole diameter, vertical displacement of rice seeds and rotating speed of cam, and the factors affecting rice injury rate are in the order of rotating speed of cam, vertical displacement of rice seeds and shaped hole diameter. Optimal parameters (shaped hole diameter: 10 mm, vertical displacement of rice seeds: 27 mm, rotating speed of cam: 13 r/min) and performance index (seeding rate: 95.43%, leakage sowing rate: 0.37%, injury rate: 0.58%) provided the basis for design and performance improvement of the bowl-tray rice precision seeder.

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FU Science and Technology Research Projects of Education of the Heilongjiang Province of China [12531439]; Natural Science Foundation of Heilongjiang Province of China [E201331]; Heilongjiang Province Agricultural Reclamation Administration Science and Technology Projects [HNk11A-09-11-02]

FX This work was supported by Science and Technology Research Projects of Education of the Heilongjiang Province of China (12531439), Natural Science Foundation of Heilongjiang Province of China (E201331), Heilongjiang Province Agricultural Reclamation Administration Science and Technology Projects (HNk11A-09-11-02).

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WC Agricultural Engineering

SC Agriculture

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ER

PT J

AU AI-Ghobari, HM
El Marazky, MSA

AF AI-Ghobari, Hussein Mohammed
El Marazky, Mohamed Said Abdalla

TI Effect of smart sprinkler irrigation utilization on water use efficiency for wheat crops in arid regions

SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING

LA English

DT Article

DE smart irrigation system (SIS); sprinkler irrigation scheduling; water use efficiency; arid region; evapotranspiration; grain yield

ID NORTH CHINA PLAIN; DRIP IRRIGATION; TOMATO YIELD; WINTER-WHEAT; SOIL; EVAPOTRANSPIRATION; GROWTH

AB The smart irrigation system (SIS) developed in this research is a valuable tool for scheduling irrigation and quantifying water required by plants. SIS was implemented and tested under sprinkler irrigation system to irrigate wheat crops (YecoraRojo). Results obtained from this system were compared with the control irrigation system (CIS), whose scheduling method was based on data from an automatic weather station. Results indicated significant savings in applied water using the SIS. In addition, the use of the SIS conserved 12% of irrigation water compared to CIS and obtained an economical yield. The water use efficiency (WUE) under SIS had generally higher values (1.64 kg/m(3)) compared to CIS (1.46 kg/m(3)). Hence, the application of SIS technology provides significant advantages on WUE and irrigation water use efficiency (IWUE). Relatively high WUE and IWUE were found for the irrigation treatment (80% of evapotranspiration under SIS). Results showed that the irrigation requirements of wheat increased (100% of ETc under CIS) with increasing evapotranspiration (ETc) but excessive irrigation could decrease WUE and IWUE. These results indicated that extreme irrigation

might not produce higher yield or optimal economic benefit, thus, suitable irrigation schedules by using SIS must be established and extendable to other agricultural crops.

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FU King Saud University, Deanship of Scientific Research, College of Food & Agriculture Sciences, Research Center

FX This project was supported by King Saud University, Deanship of Scientific Research, College of Food & Agriculture Sciences, Research Center.

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WC Agricultural Engineering

SC Agriculture

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ER

PT J

AU Hu, JT
Li, TC

AF Hu Jingtao
Li Taochang

TI Cascaded navigation control for agricultural vehicles tracking straight paths

SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING

LA English

DT Article

DE agricultural vehicle; navigation control; relative kinematics model; optimal PD controller; improved PD controller

ID ADAPTIVE STEERING CONTROL; FARM TRACTOR

AB In precision agriculture (PA), an agricultural vehicle navigation system is essential and the navigation control accuracy is important in this system. As straight path tracking is the major operating mode of agricultural vehicles on large fields, a cascaded navigation control method for straight path tracking is proposed in this study. Firstly, a cascaded navigation control structure for the agricultural vehicle was discussed. Based on this structure, the navigation control task was decomposed into two cascaded control tasks, namely, the path tracking control task and the steering control task. Secondly, a relative kinematics model of agricultural vehicles was deduced, and an optimal Proportional-Derivative (PD) method based on the deduced model was developed in the path tracking control task. Then, an improved PD method based on a transition process was proposed in the steering control task to enhance the performance of the steering control subsystem. Finally, the effectiveness and the superiority of the proposed method were verified by a series of experiments. Results of the experimental data analysis show that mean value of the lateral position deviation is 0.02 m and standard deviation of the lateral position deviation is 0.04 m, which proves that the proposed method has achieved satisfactory effects on the straight path tracking of agricultural vehicles.

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FU National Hi-tech Research and Development Program of China [2013AA040403]; National Science and Technology Pillar Program [2011BAD20B06]

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PT J

AU Han, WT
Yu, S
Xu, TF
Chen, XW
Ooi, SK
AF Han Wenting
Yu, Sun
Xu Tengfei
Chen Xiangwei
Ooi, Su Ki

TI Detecting maize leaf water status by using digital RGB images

SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING
LA English
DT Article
DE maize leaf; moisture content; image processing; color feature extraction; texture feature extraction
ID STRESS DETECTION; TREES; FEATURES; VISION

AB To explore the correlation between crop leaf digital RGB (Red, Green and Blue) image features and the corresponding moisture content of the leaf, a Canon digital camera was used to collect image information from detached leaves of heading-stage maize. A drying method was adopted to measure the moisture content of the leaf samples, and image processing technologies, including gray level co-occurrence matrices and grayscale histograms, was used to extract the maize leaf texture feature parameters and color feature parameters. The correlations of these feature parameters with moisture content were analyzed. It is found that the texture parameters of maize leaf RGB images, including contrast, correlation, entropy and energy, were not significantly correlated with moisture content. Thus, it was difficult to use these features to predict moisture content. Of the six groups of eigenvalues for the leaf color feature parameters, including mean, variance, energy, entropy, kurtosis and skewness, mean and kurtosis were found to be correlated with moisture content. Thus, these features could be used to predict the leaf moisture content. The correlation coefficient (R-2) of the mean-moisture content relationship model was 0.7017, and the error of the moisture content prediction was within +/- 2%. The R-2 of the kurtosis-moisture content relationship model was 0.7175, and the error of the moisture content prediction was within +/- 1.5%. The study results proved that RUB images of crop leaves could be used to measure moisture content.

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FU Science and Technology Innovation Project from Northwest A F University [Z109021202]

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ER

PT J
AU Li, B
Liu, FY
Mu, JY
Chen, J
Han, WT
AF Li Bo
Liu Fanyi
Mu Junying
Chen Jun
Han Wenting
TI Distinct element method analysis and field experiment of soil resistance applied on the subsoiler
SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING
LA English
DT Article
DE distinct element method (DEM); parallel bond; subsoiler; modeling; simulation
ID SANDY LOAM SOIL; DEM SIMULATION; BLADE; MODEL; TILLAGE
AB Since the design of the subsoiler is a complex work, the interaction between the subsoiler and soil was investigated by using Distinct Element Method (DEM) in this study. Based on the traditional discrete element theory, the 3D model of soil particles and the subsoiler were established after considering the liquid bridge force between soil particles. The operating resistance curves of the subsoiler were achieved after the DEM simulation at a speed of 1 m/s, and three depths of 180 mm, 220 mm and 260 mm, respectively. The simulation curves agreed well with the field experimental results based on relative errors of 2.96%, 14.95% and 7.15%, respectively, at three depths. All these data proved that it was feasible and favorable to analyze the performance of the subsoiler by using the DEM and it is of important significance for studying and further optimizing the structure of the subsoiler.
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FU National Science and Technology Supporting Plan [2011BAD29B08]; "111"Project [B12007]
FX This study was funded by the National Science and Technology Supporting Plan (No. 2011BAD29B08) and the "111"Project (No. B12007).
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PG 6
WC Agricultural Engineering
SC Agriculture
GA AK2RO
UT WOS:000338267400007
ER

PT J
AU Fan, M
Zhu, HG
Ma, JQ
AF Fan Min
Zhu Hongguang
Ma Jieqiong
TI Measurement and analysis of biogas fertilizer use efficiency, nutrient distribution and influencing factors of biogas residues and slurry on pig farms
SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING
LA English
DT Article
DE biogas residues and slurry; biogas fertilizer; fertilizer use efficiency; nutrients; influence factors; environmental protection; pollution control; supernatant
AB Although the effects of biogas residues and slurry returning to farmland are good, they still cannot be used widely in China. In this study, the biogas fertilizer use efficiency, nutrient distribution and influencing factors of fertilizer use efficiency of biogas residues and slurry in 20 biogas projects in Chongming County, Shanghai, China were measured and analyzed. The correlation and a linear regression fit of parts of test indicators were also analyzed. The results show that pig farm biogas residues and slurry mixture are nutrient-rich and can be used as a high-quality organic fertilizer, while its fertilizer use efficiency is unstable because of the differences among area, raw materials, fermentation technology and operation management. Nutrients are not evenly distributed in biogas residues and slurry. Higher levels of organic matters, P and trace elements were detected in biogas residues and higher levels of water-soluble N and K were detected in biogas slurry. The correlations between some test indicators of biogas residues and slurry mixture are significant, especially between total K and conductivity. Linear regression model fitting results of parts of test indicators are satisfactory. Hence, the values of the other test indicators can be estimated by one known indicator which can effectively reduce the determination workload under some limited situations.
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FU Tongji Eco-park and biogas project in Chongming County, Shanghai, China
FX This work was supported by Tongji Eco-park and biogas project in Chongming County, Shanghai, China. Authors also would like to thank Shen Wenyan, Fan Biying, Wang Yaohua, Chen Tinghua and all the personnel working in the farmland for their supports and suggestions.
NR 24
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Z9 0
PU CHINESE ACAD AGRICULTURAL ENGINEERING
PI BEIJING
PA RM 506, 41, MAIZIDIAN ST, CHAOYANG DISTRICT, BEIJING, 100125, PEOPLES R CHINA
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J9 INT J AGR BIOL ENG
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EP 69
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WC Agricultural Engineering
SC Agriculture
GA AK2RO
UT WOS:000338267400008
ER

PT J
AU Ndyabawe, K
Kisaalita, WS
AF Ndyabawe, Kenneth
Kisaalita, William S.
TI Validity of the Africa-wide Lang factor of 2.63 for estimating small biogas plant installation costs in Uganda
SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING
LA English
DT Article
DE biogas; fixed capital investment; Lang factor; Uganda; renewable energy
AB There is an increasing interest in popularizing small biogas plants to meet the bulk of domestic energy needs in Africa for cooking, lighting, and other activities such as cooling or refrigeration. As stakeholders (policy makers, donors, credit providers, sector experts, and product development professionals) contemplate programs, one of the key questions to which a reliable answer is needed is biogas plant installation cost that may vary from region to region. An Africa-wide materials' cost multiplier factor (Lang factor of 2.63) estimation approach has been proposed, based on data from only two locations. The factor's validity throughout Africa has been questioned. This study shows that the Africa-wide Lang factor of 2.63 is applicable in Uganda. However, differences in accuracy have been observed based on whether the installation is located in a rural or urban setting. Location-specific factors of 2.984 and 2.404 for rural and urban locations were established and validated, respectively, which produced more accurate estimates in comparison with a single composite non-location specific factor.
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FU World Bank through the Development Marketplace Program [DM08 5681]
FX The authors acknowledge Green Heat Uganda, Gumisiriza Robert and Kazerero Jornard for their assistance in sourcing some of the data used in this report. The supports from Mr. Davis Bariho, Dr. Dick Kamugasha, and Prof. Charles Kwesiga, all at Uganda Industrial Research Institute, are also acknowledged. This study was supported by the World Bank through the Development Marketplace Program Award, DM08 5681.
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Z9 0
PU CHINESE ACAD AGRICULTURAL ENGINEERING
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J9 INT J AGR BIOL ENG
JI Int. J. Agric. Biol. Eng.
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EP 76
DI 10.3965/j.ijabe.20140701.008
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WC Agricultural Engineering
SC Agriculture
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ER

PT J
AU Hu, YH
Wang, CC
Bing, B
Li, MT
Wang, RH
Li, YB
AF Hu Yaohua
Wang Chengcheng
Bing, Bai
Li Mintong
Wang, Ronghui
Li, Yanbin
TI Detection of Staphylococcus Aureus using quantum clots as fluorescence labels
SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING
LA English
DT Article
DE staphylococcus aureus; fluorescence measurement; biological detection; quantum dots; microbial monitoring; food safety
ID CAPTURED ESCHERICHIA-COLI; IMMUNOMAGNETIC SEPARATION; SALMONELLA-TYPHIMURIUM; RAPID DETECTION; PATHOGENIC BACTERIA; IN-VIVO; DOTS; WATER; ENUMERATION; BIOSENSOR
AB Staphylococcus aureus (S. aureus) has been identified as one of the major foodborne pathogenic bacteria. The development of rapid detection methods for S. aureus is needed for assuring food safety. In this study, quantum dots were used as fluorescent labels in an immunoassay for quantitative detection of S. aureus. Firstly, biotin-labeled anti-S. aureus antibody was conjugated with streptavidin-coated magnetic nanobeads (180 mu diameter) and used to separate S. aureus cells. Then streptavidin coated quantum dots (QDs) were conjugated with biotin-labeled anti-S. aureus antibody and used as the fluorescence labels to mix with the separated S. aureus. Finally the fluorescence intensity of the bead-cell-QD complexes was measured at a wavelength of 620 mu. A linear relationship between S. aureus cell number (X) and fluorescence intensity (Y) was found for cell numbers ranging from 10(3) to 10(6) CFU (Colony Forming Unit)/mL, and the detection limit was 10(3) CFU/mL. The regression model can be expressed as Y = 7.68X + 35.06 with R-2=0.94. The detection of S. aureus in food sample was explored initially. The fluorescence intensity of food sample was close to the background, so it was not satisfied. Further study will focus on the application of the method for detection of S. aureus in food sample.
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FU Fundamental Research Funds for the Central Universities of China [QN2011144]; Yangling Modern Agriculture International Institute [A213021005]
FX This research was financially supported by the Fundamental Research Funds for the Central Universities of China (No. QN2011144) and the Yangling Modern Agriculture International Institute (No. A213021005).
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WC Agricultural Engineering
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PT J
AU Aviara, NA
Ibrahim, EB
Onuoha, LN
AF Aviara, Ndubisi A.
Ibrahim, Elizabeth B.
Onuoha, Lovelyn N.
TI Physical properties of Brachystegia Eurycoma seeds as affected by moisture content
SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING
LA English
DT Article
DE Brachystegia eurycoma; physical properties; seed processing; frictional properties; specific heat; moisture content
ID THERMAL-PROPERTIES; MECHANICAL-PROPERTIES; SUNFLOWER SEEDS; KERNEL; GRAM; NUTS
AB Some physical, frictional and thermal properties of Brachystegia eurycoma seed were studied at different moisture contents in order to explore the possibility of mechanizing the handling and processing techniques. Results showed that the seed could be considered an oval disc in shape. In the moisture range of 2.79% to 27.13% (d.b.), the major, intermediate and minor axial dimensions increased with increase in moisture content from 2.29 mm to 2.45 mm, 1.65 mm to 1.91 mm and 0.34 mm to 0.52 mm, respectively. In the above moisture range, one thousand seed weight, particle density, porosity, roundness, sphericity, surface area and angle of repose increased linearly from 0.901 kg to 1.252 kg, 2270 kg/m(3) to 2520 kg/m(3), 11.23% to 15.46%, 35% to 47%, 67% to 82%, 7.67 cm(2) to 8.48 cm(2) and 16.8 degrees to 29.2 degrees respectively, while bulk density decreased from 745.4 kg/m(3) to 613.6 kg/m(3). Static coefficient of friction on different structural surfaces increased linearly with moisture content and had the highest values on galvanized steel sheet (0.445-0.639), and the lowest Values on fiber glass (0.287-0.404). Kinetic coefficient of friction increased linearly with moisture content on different structural surfaces except on galvanized steel sheet where it decreased linearly with increase in moisture content in the above moisture range. It had the highest values on hessian bag material (0.266-0.389), and the lowest values on plywood with wood grains perpendicular to the direction of movement (0.204-0.271). Specific heat ranged from 1474 to 5992.7 J/kgK, and increased with increase in moisture content and temperature. Regression equations were used to express the relationships existing between the seed properties and moisture content.
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DI 10.3965/j.ijabe.20140701.010
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WC Agricultural Engineering
SC Agriculture
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ER

PT J
AU Zhu, BM
Wen, XS
Wei, GD

AF Zhu Baomeng
Wen Xuesen
Wei Guodong

TI Effect of pre-treatments on drying characteristics of Chinese jujube (Zizyphus jujuba Miller)

SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING

LA English

DT Article

DE Zizyphus jujuba; Chinese jujube; pre-treatment; hot-air drying; activation energy; mathematical modelling

ID WHOLE FRUIT; MOISTURE DIFFUSIVITY; ENERGY-CONSUMPTION; LAYER; CHERRY; PLUMS

AB Chinese jujube is delicious and nourishing fruit. However, fresh Chinese jujube is liable to rot and drying is a necessary process. Traditional drying is a time-consuming task due to the thick cuticle of Chinese jujube. To improve its drying efficiency, fresh Chinese jujube was pretreated with nine different methods prior to hot-air drying.. Among these methods, dipping in 2% ethyl oleate plus 5% K2CO3 for 10 min (alkaline emulsion of ethyl oleate, AEEO) was recommended for its time-saving effect, which was found more significant at lower drying temperatures. The beneficial effect was considered based on its cuticle destruction by AEEO pre-treatment. hi the meantime, the drying process was divided into three stages; each of them obeyed the first order reaction kinetics. Activation energies for the first, second and third stages of control over jujube drying were 41.45 kJ/mol, 35.24 kJ/mol and 49.52 kJ/mol, and reduced by 20.9%, 22.1% and 29.0%, respectively, after AEEO pre-treatment, and the drying process was well predicted by Midilli et al. model. In view of browning during drying at higher temperatures, AEEO pretreated jujube was suggested to be dried at 60 degrees C. This finding was considered to be helpful to the industrial drying of Chinese jujube.

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FU National Natural Science Foundation of China [81072984]

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TC 0

Z9 0

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WC Agricultural Engineering

SC Agriculture

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ER

PT J

AU Kate, AE
Lohani, UC
Shahi, NC
Pandey, JP
Sarkar, A
Chand, K

AF Kate, A. E.
Lohani, U. C.
Shahi, N. C.
Pandey, J. P.
Sarkar, A.

Chand, Khan

TI Effects of moisture content and feed rate on milling characteristics of wild apricot pits (Prunus armeniaca L.)

SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING

LA English

DT Article

DE wild apricot pit; milling characteristics; decortication efficiency; moisture content; husk percentage; broken percentage; output capacity

ID MECHANICAL-PROPERTIES; FINGER MILLET; DECORTICATION; OPTIMIZATION; CULTIVARS; CRACKING; QUALITY

AB Milling with decortication of wild apricot pits was done in wild apricot pit decorticator working on the principle of "impact and compression". The milling characteristics includes decortication efficiency, percentage of husk, percentage of broken kernels and output capacity was evaluated at the different levels of moisture content, i.e., 8%, 10%, 12%, 14% and 16% (w.b.) and feed rates, i.e., 12 g/stroke, 14 g/stroke, 16 g/stroke, 18 g/stroke and 20 g/stroke. The moisture content as well as feed rate significantly ($P<0.05$) affected the decortication efficiency, percentage of husk as well as brokens and output capacity. Decortication efficiency was initially increased and then decreased. and opposite nature was found for the percentage of husk. Both percentage of broken kernels and output capacity decreases with the increase in moisture content, while output capacity increases with the increase in feed rate and brokens decreases with the increase in feed rate of wild apricot pits.

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NR 25

TC 0

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PU CHINESE ACAD AGRICULTURAL ENGINEERING

PI BEIJING

PA RM 506, 41, MAIZIDIAN ST, CHAOYANG DISTRICT, BEIJING, 100125, PEOPLES R CHINA

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WC Agricultural Engineering

SC Agriculture

GA AK2RO

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ER

PT J

AU Cheng, YL
Wang, YK
Chen, P
Deng, SB
Ruan, R

AF Cheng Yanling
Wang Yingkuan
Chen, Paul
Deng, Shaobo
Ruan, Roger

TI Non-thermal plasma assisted polymer surface modification and synthesis: A review

SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING

LA English

DT Review

DE plasma; modification; synthesis; NTP; polymers; functional groups

ID CONTROLLED DRUG-RELEASE; ATMOSPHERIC-PRESSURE; BIOMEDICAL APPLICATIONS; HYDROPHOBIC RECOVERY; DISCHARGE; FILMS; HELIUM; CORONA; AIR; BIOCOMPATIBILITY

AB This article reviews the applications of plasma to polymer surface modification and polymer synthesis. Plasma treatment causes changes in morphology, structure and properties of polymers. When polymers are treated using plasma, certain monomers with functional groups can be copolymerized with backbone chain or be loaded on the surface, which would help couple reaction of existing polymer chains, graft monomers onto polymers, immobilize proteins, carry antimicrobial drugs, and enhance cell attachment. Hence, non-thermal plasma process creates unique properties on polymers which allow improved and expanded applications of polymers in food packaging and biotechnology.

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FU Beijing Municipal Commission of Education Project [KZ201411417038]; High Technology Research and Development Program of China [2012AA021704, 2014AA022002]; Science and Technology Support Project of China [2014DFA61040]

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TC 0

Z9 0

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PI BEIJING

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WC Agricultural Engineering

SC Agriculture

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ER

PT J

AU Xue, Z
Qu, LQ
Yang, XS

AF Xue, Zhao
Qu, Liqin
Yang, Xiusheng

TI Potential production and spatial distribution of hybrid poplar as a biofuel crop in Connecticut, USA

SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING

LA English

DT Review

DE biofuel plants; hybrid poplar; spatial distribution; ethanol production; Connecticut; suitability model; ecological suitability

ID LAND-USE; BIOMASS; MODEL

AB The objective of this study was to assess the biomass production potential from hybrid poplars using marginal lands in the state of Connecticut, USA. A land-use suitability model was developed to identify and classify marginal lands in the state that could be used for growing hybrid poplars as a biofuel woody energy crop. The model was built on a geographic information system (GIS) platform, consisting of an exclusion area section, an ecological suitability section, and an economic/land-use suitability section. The model then was used to estimate the total biomass of the land-cover forests, annual biomass from forest and agricultural residues, and in particular the production potential of biomass from hybrid poplars over marginal lands in the state at county level. The results indicated that about 50% of the land in this state is unavailable for hybrid poplar cultivation and that less than 5% is highly suitable. The amount of usable area is highly variable on the county level. Without large-scale land use change, it appears that biofuel production in this

state can only be a supplemental resource to the current energy supply.

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NR 27

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J9 INT J AGR BIOL ENG

JI Int. J. Agric. Biol. Eng.

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IS 2

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PG 9

WC Agricultural Engineering

SC Agriculture

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ER

PT J

AU Feng, QC
Cheng, W
Zhou, JJ
Wang, X

AF Feng Qingchun
Cheng Wei
Zhou Jianjun
Wang Xiu

TI Design of structured-light vision system for tomato harvesting robot

SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING

LA English

DT Article

DE harvesting robot; tomato; linear structure-light; 3D measurement; feature extraction

AB In order to improve the operating precision of the harvesting robot, a vision system for intelligently identifying and locating the mature tomato was designed. The active detection method based on structured-light stereo vision was expected to deal with the problem of variable illumination and target occlusion in the glasshouse. The maximum between-cluster variances of hue (H) and saturation (S) value were adopted as the threshold for color segmentation, which weakened the impact on the image caused by the light intensity variation. Through the limit on the pixel size and circularity of the candidate areas, the vision system recognized the fruit area and removed the noise areas. The fruit's 3D position was computed on the basis of spatial relationship between the laser plane and the camera, when the linear laser was projected on the centre area of the mature fruit. The blue view-scanning laser stripe pixels on the mature fruit were extracted according to its Cb color characteristic. As the field test results show, the measurement error on the fruit radius is less than 5 mm, the centre distance error between the fruit and camera is less than 7 mm, and the single axis coordinate error is less than 5.6 mm. This structured-light vision system could effectively identify and locate mature fruit.

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FU National High Technology Research and Development Program of China [2013AA100307]

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DI 10.3965/j.ijabe.20140702.003
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WC Agricultural Engineering
SC Agriculture
GA AK2RP
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ER

PT J
AU Rasoulzadeh, A
Yaghoubi, A
AF Rasoulzadeh, Ali
Yaghoubi, Ali
TI Inverse modeling approach for determining soil hydraulic properties as affected by application of cattle manure
SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING
LA English
DT Article
DE soil hydraulic property; parameter estimation; inverse method; HydroGeoSphere; unsaturated flow; cattle manure
ID LONG-TERM APPLICATION; CLAY LOAM SOIL; PHYSICAL-PROPERTIES; WATER-RETENTION; ORGANIC-CARBON; FARMYARD MANURE; WHEAT SYSTEM; IRAN; FERTILIZATION; CONDUCTIVITY
AB Numerical codes are extensively used in the modeling of water and solute transport in the vadose zone. The application of these codes depends on knowledge of soil hydraulic properties such as soil water retention curve and hydraulic conductivity. Application of cattle manure to the soil can increase soil organic matter (SOM) contents. Increases in SOM associated with changes in the structure and adsorption properties of soil and, thus, their hydraulic properties. In this study the effect of cattle manure on soil hydraulic properties was investigated using inverse method. Applied inverse method was based on Levenberg-Marquart optimization algorithm to estimate hydraulic properties of soil in transient condition using C++ programming language along with forward model (HydroGeoSphere) as a numerical code. Nine iron cylinders of 57 cm in inner diameter and about 40 cm in height were filled with Sandy clay loam soil of 30 cm in height. Cattle manure applied at 0, 30, and 60 Mg/ha at three replications in a completely random design. One year after cattle manure application, saturated hydraulic conductivity, porosity, and water retention curve parameters (van Genuchten function, alpha and beta) were estimated using inverse method. Statistical analysis showed that the automatic calibration is sensitive to alpha more than the other parameters. The results showed that porosity, saturated hydraulic conductivity, residual water content, alpha and beta increased significantly ($P<0.05$) with application 30 and 60 Mg/ha cattle manure. But there was no significant difference ($P<0.05$) in beta between application of 30 and 60 Mg/ha cattle manure. The study also indicated that a was 25.0% and 50.0% higher and beta was 9.6% and 12.6% lower than control treatment in 30 and 60 Mg/ha treatments. In addition, application cattle manure showed positive effect on hydraulic parameters of soil.
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FX The authors would like to appreciate Mohaghegh Ardabili University for the financial support of the study.
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WC Agricultural Engineering
SC Agriculture
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ER

PT J
AU Samuel, MP
Mathew, AC
AF Samuel, Manoj P.
Mathew, A. C.
TI Improving water use efficiency by integrating fish culture and irrigation in coconut based farming system: A case study in Kasaragod District of Kerala (India)
SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING
LA English
DT Article
DE rainwater harvesting; water use efficiency; plastic lined tank; seepage loss; fish culture; financial viability
AB The crop production in the district of Kasaragod in Kerala State (India) is characterized by low input-low yield concept and rain-fed agriculture. A field study was conducted in Western Ghat region of the district to develop a suitable rainwater harvesting system adoptable to hilly terrains and to test its efficacy for improving the use efficiency of the harvested water by its multiple uses. The cost-benefit analysis of the water harvesting system was also carried out to find out its affordability to farmers. The water harvesting system has been developed by integrating three components: (i) improving the productivity of coconut and component crops in the cropping units (ii) developing multiple water use systems, and (iii) the conjunctive use of the harvested water along with other surface and groundwater resources. Based on the estimated annual costs and returns, the Benefit -Cost ratio was found to be 1.69 and all other financial viability criteria (IRR and NPV) were also found favourable for investment on a lined water harvesting tank integrated with a micro-irrigation system and fish farming. The study suggested that the rainwater harvesting could be implemented as a viable alternative to conventional water supply or on-farm irrigation projects considering the fact that any land anywhere can be used to harvest rainwater. Further, the water use efficiency can be improved through effective harvesting and subsequent multiple uses of stored water.
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PU CHINESE ACAD AGRICULTURAL ENGINEERING
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SC Agriculture
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ER

PT J
AU Zhao, ZP
Yan, S
Liu, F
Ji, PH
Wang, XY
Tong, YA
AF Zhao Zuoping
Yan Sha
Liu Fen
Ji Puhui
Wang Xiaoying
Tong Yan'an
TI Effects of chemical fertilizer combined with organic manure on Fuji apple quality, yield and soil fertility in apple orchard on the Loess Plateau of China
SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING
LA English
DT Article
DE organic manure; mineral fertilizer; apple yield; quality; soil fertility
ID TERM MANAGEMENT IMPACTS; PHYSICAL FERTILITY; NITROGEN UPTAKE; GRAIN YIELDS; CROP YIELDS; RED SOIL; CARBON; ENVIRONMENT; FRACTIONS; STORAGE
AB To evaluate the effects of chemical fertilizer combined with organic manure on apple yield, quality and soil fertility, an experiment was conducted in an apple orchard on the Loess Plateau of China. Six treatments, i.e., 1) no nitrogen (N) with chemical phosphorus (P) and potassium (K) (PK), 2) no P with chemical N and K (NK), 3) no K with chemical N and P (NP), 4) N, P and K chemical fertilizers only (NPK), 5) swine manure (M) only (M), and 6) half chemical fertilizers combined with half swine manure (NPKM) were included with three replications for each. The NPKM treatment achieved 36.9 t/ha average annual yield, which was 42.5% greater than the yield of PK treatment. The average annual yields followed the sequence of NPKM>NPK>M>NK>NP>PK. In NPKM treatment 71.3% of the collected apples had an apple diameter greater than 80 mm compared with 58.2%, 41.5 % and 37.2% in NK, PK and NP treatments, respectively. The sugar to acid (S:A) ratio was the greatest in NPKM treatment. The results of Vitamin C, soluble solid and firmness showed that NPKM treatment had the highest values. The concentration of soil organic carbon (SOC) in the 0 to 20 cm depth of soil was significantly affected by addition of M. Compared to the antecedent soil properties, the SOCS in the NPKM and M treatments were increased by 28.8%, 29.4%, and TN contents were 56.5, 49.8% more for soil at 0-20 cm depths, respectively. The major soil nutrients of N, P and K were also significantly increased by M and NPKM treatments in surface soil for five years. The data support the conclusion that, for a production of 35-40 t/ha in an apple orchard on the Loess Plateau of China, the 25-30 t/ha organic manure, 160-200 kg/haN, 100-150 kg/ha P2O5 and 120-160 kg/ha K2O were the most suitable fertilizer application. The finding will be helpful for harmonious development of apple production technology, economic income increase for farmers, and improvement of the apple orchard ecosystem.
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FU IPNI (International Plant Nutrition Institute)
FX This work was financially supported by IPNI (International Plant Nutrition Institute). We also thank Prof. Lars Lovdahl, Swedish University of Agricultural Sciences, for constructive comments and linguistic improvement.
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WC Agricultural Engineering
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ER

PT J
AU Priya, LS
Kumutha, K
Arthee, R
Pandiyarajan, P
AF Priya, Srimathi L.
Kumutha, K.
Arthee, R.
Pandiyarajan, P.
TI Identification of Arbuscular mycorrhizal multiplicity in the saline-sodic soils
SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING
LA English
DT Article
DE AM fungal identification; saline-sodic soil; crop rhizosphere; spore density; nested PCR technology; glomalean fungus
ID ENDOMYCORRHIZAL FUNGI; PLANT-GROWTH; COMMUNITY COMPOSITION; MOLECULAR DIVERSITY; AGRICULTURAL SOILS; ROOTS; GLOMEROMYCOTA; COLONIZATION; INFECTIVITY; EVOLUTION
AB This study focused on the Arbuscular mycorrhizal (AM) fungal diversity in the saline-sodic soils based on native spore density and most probable number (MPN) assay. Identification through spore morphology showed existence of five genera in the various crop rhizospheres. The physico-chemical analysis of the native soils revealed that they were saline-sodic with pH ranging from (8.7 +/- 0.5) to (9.5 +/- 0.6) and habituated five different genera of AM fungi including Glomus, Scutellospora, Acaulospora, Sclerocystis and Gigaspora. Each location revealed presence of varied species of AM fungus namely Acaulospora and Glomus in rhizosphere of maize; Scutellospora and Glomus in tulsi; four isolates of Glomus in onion; Glomus and Sclerocystis in guava; three isolates of Glomus in rice; Glomus in neem and Gigaspora and Glomus in bamboo. The molecular identification through nested PCR analysis showed amplification of 600 bp size in SSU rDNA gene in samples A and C (predominated by Acaulospora and Glomus mosseae respectively).
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NR 63
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PT J
AU Thomson, SJ
Huang, Y
AF Thomson, Steven J.
Huang, Yanbo
TI Portable device to assess dynamic accuracy of global positioning system (GPS) receivers used in agricultural aircraft
SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING
LA English
DT Article
DE GPS receiver accuracy; agricultural aircraft; aerial application; remote sensing; georeferencing; UAV
ID AERIAL APPLICATION SYSTEM
AB A device was designed to test the dynamic accuracy of Global Positioning System (GPS) receivers used in agricultural aircraft and other aerial vehicles. The system works by directing a sun-reflected light beam from the ground to the aircraft using mirrors. A photo detector points downward from the aircraft to detect the light beam, and photo detection circuitry triggers an event in the guidance system data file at the aircraft's location corresponding to the precisely georeferenced position on the ground. Construction details are presented on the mirror-based light reflection system and photo-electronic circuitry designed to trigger an event in the guidance system's log file. An example application evaluated the horizontal accuracy of a stand-alone GPS receiver by matching dynamic data with data from the aircraft's guidance system. Results indicated a 2.16 s lead in position registered by the stand-alone receiver over that registered by the aircraft's guidance system GPS receiver, which had been previously evaluated to be within 0.13 s of Real-Time Kinematic (RTK)-referenced time and position.
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PT J
AU Pei, W
Lan, YB
Luo, XW
Zhou, ZY
Wang, ZG

Wang, YH

AF Pei, Wang
Lan, Yubin
Luo Xiwen
Zhou Zhiyan
Wang, Zhigang
Wang, Yonghui

TI Integrated sensor system for monitoring rice growth conditions based on unmanned ground vehicle system

SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING

LA English

DT Article

DE unmanned ground vehicle system (UGVS); multi-sensors; rice growth condition; spectral vegetation indices; leaf area index (LAI)

ID SPECTRAL VEGETATION INDEXES; NITROGEN STATUS; PRECISION AGRICULTURE; CHLOROPHYLL STATUS; CROP MANAGEMENT; FIELD-LEVEL; REFLECTANCE; WHEAT; CORN

AB Ground-based platform systems provide a good tool for monitoring and managing crop conditions in precision agriculture applications and have been widely used for monitoring crop conditions. To develop an unmanned ground vehicle system (UGVS) based multi-sensors and test the feasibility of this system for monitoring rice conditions, an UGVS was developed to collect real-time rice condition information including NDVI values, reflectance measurements and crop canopy temperature in this study. Major components of the integrated system are GreenSeeker R100 system, hyper-spectroradiometer and infrared temperature sensor. The leaf area index (LAI) was measured by the CGMD302 Spectrometer. The Independent Samples T-Test method and the one way ANOVA method were used to determine the best spectral indices and analyze the relationship between the vegetation indices and rice LAI. It was found that the two best spectral indices for estimating LAI were NDVI (860 nm and 750 nm) with the correlation coefficient (R-2) at 0.745 and RVI (853 nm and 751 nm) with the R2 at 0.724. The results show the UGVS can support multi-source information acquisition and is useful for crop management and precision agriculture applications.

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ER

PT J

AU Cui, Y
Yuan, WQ
Cao, J

AF Cui, Yan
Yuan, Wenqiao

Cao, Jian

TI Effect of surface texturing on microalgal cell attachment to solid carriers

SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING

LA English

DT Article

DE algae attachment; algal biofuel; Cassie model; contact point theory; surface texture; Wenzel model

ID BIODIESEL PRODUCTION; POINT THEORY; WASTE-WATER; ALGA ULVA; SETTLEMENT; ZOOSPORES; MICROTOPOGRAPHY; WETTABILITY; RECRUITMENT; ENTEROMORPHA

AB The objective of this study was to understand the role of surface texturing in microalgal cell attachment to solid surfaces. Two microalgal species, Scenedesmus dimorphus and Nannochloropsis oculata, were studied on solid carriers made of nylon and polycarbonate. Ridge, pillar and groove at micro-scale were engineered on the solid carriers. Cell response to the textured surfaces was separately described by the Cassie and Wenzel models and the contact point theory. Comparison between measured and model-predicted contact angles indicated that the wetting behavior of the textured solid carriers fell into the Wenzel state, which implied that algal cells could fully penetrate into the designed textures, but the adhesion behavior would be dependent on the size and shape of the cell. Experimental results showed that the attachment was preferred when the feature size was close to the diameter of the cell attempting to settle. Larger or smaller feature dimensions had the potential to reduce cellular attachment. The observation was found to qualitatively comply with the contact point theory.

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FU U.S. National Science Foundation [CMMI-1239078]; startup fund of North Carolina State University

FX We thank Dr. Vikas Berry at the Chemical Engineering department of Kansas State University for the use of the microscope, and Mr. Chuck Mooney at the Analytical Instrument Facility of North Carolina State University for AFM and SEM measurements. This research was financially supported by the U.S. National Science Foundation (Award # CMMI-1239078) and the startup fund of North Carolina State University.

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WC Agricultural Engineering

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ER

PT J

AU Emami, S
Tabil, LG
Adapa, P
George, E
Tilay, A
Dalai, A
Drisdelle, M
Ketabi, L

AF Emami, Shahram
Tabil, Lope G.
Adapa, Phani
George, Elizabeth
Tilay, Ashwini
Dalai, Ajay
Drisdelle, Mark
Ketabi, Lily

TI Effect of fuel additives on agricultural straw pellet quality

SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING

LA English

DT Article

DE biomass; biofuels; slag; foul; pelleting; fuel additive

ID BIOMASS; GRINDS; SIZE

AB An investigation was conducted to determine the effect of addition of different levels of AK2, a fuel additive that reduces ash fusion for agricultural biomass, on the physico-chemical properties of biomass pellets. Three different biomass straws, barley, oat, and wheat were ground at two hammer mill screen sizes of 0.8 mm and 1 6 mm. Each ground biomass sample was mixed with three levels of AK2, 0.05%, 0.10%, and 0.15% by mass and also a blank (no AK2) was set aside for comparison. Pellets were made using single-pelleting unit at a pre-set load of 4 400 N corresponding to a pressure of 138.9 MPa. Physical quality of pellets were determined by measuring pellet density, relaxed density, durability, and the specific energy required to make a pellet. Pellets having higher durability values (74%-88%) were obtained from ground straw at hammer screen size of 0.8 mm and AK2 level of 0.15% compared to other treatments. Carbon, hydrogen, nitrogen, and sulfur content of blank pellets and those with 0.15% AK2 at hammer screen size of 0.8 mm were determined. Pellets made with 0.15% AK2 at hammer screen size of 0.8 mm, manufactured by pilot-scale pellet mill, were gasified and the tar content was determined. The tar content of pellets with 0.15% AK2 was significantly lower than blank pellets.

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FU Natural Sciences and Engineering Research Council of Canada (NSERC) through the Engage Grant Program

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ER

PT J

AU Zhang, H
Zhang, K
Zhou, XH
Hu, JJ
Jing, YY
Liu, SY

AF Zhang Huan
Zhang Kun
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Hu Jianjun
Jing Yanyan
Liu Shengyong

TI Thermal properties of biomass tar at rapid heating rates

SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING

LA English

DT Article

DE biomass tar; liquid fuel; rapid heating rate; thermal dynamics; pyrolysis; gasification; renewable energy

ID PYROLYSIS; ENERGY

AB Gasification of biomass tar by pyrolysis is a valuable source for renewable energy, providing chemicals, a precursor to carbon material and potentially a raw material for liquid fuel. hi this research, experimental studies via thermal gravimetric analysis (TGA) of biomass tar were implemented at three rapid heating rates (i.e., 10 10 K/min, 50 K/min, 100 K/min, respectively) in a nitrogen atmosphere. On the basis of analytical methods utilized in thermal dynamics and physical chemistry, the results showed that the thermogravimetric curve (TG) of the biomass moved in a high-temperature direction with an increase in the heating rate. The greater the heating rate, the steeper the curve and the lower the resolution, the lag phenomenon of the temperature being more significant. Concurrently, a differential thermal analysis (DTA) was one of the methods employed to study the relationship between the temperature difference and the temperature or time of the tested substance and a reference substance. The peak temperature and maximum reaction rate of the differential thermal analysis curve (DTA) increased as the heating rate, the volatiles and the molecular residence time of the biomass was shortened at a higher heating rate, thereby potentially inhibiting the generation of carbon and increasing the production and yield of liquid fuel.

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FU National Natural Science Foundation of China [551376056]; National High Technology Research and Development Program (863) of China [2012AA051502]

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ER

PT J

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Tan, JC
Wang, J

AF Wang Xiangyou
Tan Jincui
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TI Effect of precooling temperature on physiological quality of cold stored Agaricus bisporus

SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING

LA English

DT Article

DE precooling; Agaricus bisporus; cold storage; precooling temperature; quality

AB Effect of precooling temperatures (2 degrees C, 6 degrees C, 10 degrees C and 14 degrees C) on the physiological quality of postharvest Agaricus bisporus during cold storage was investigated. After six hours' precooling, Agaricus bisporus was stored at 3 degrees C and sampled on day 3, 6 and 9, respectively, for physiological quality analysis. Results showed that physiological quality of the Agaricus bisporus increased with the decrease of precooling temperature in the range of 2-14 degrees C. Precooling at 2 degrees C before cold storage had a positive impact on the storage quality of Agaricus bisporus. The decrease of hardness, whiteness and pH value was delayed, while the increase of cell membrane permeability and PPO and POD activities was restrained. Whiteness value of the Agaricus bisporus precooled at 2 degrees C was above 80 on day 9, which means it was still acceptable, but the Agaricus bisporus precooled at 6 degrees C and 10 degrees C lost their commercial values.

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WC Agricultural Engineering

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ER

PT J

AU Qiang, L
Cai, JR
Bin, L
Lie, D
Zhang, YJ

AF Qiang, Lu
Cai Jianrong
Bin, Liu
Lie, Deng
Zhang Yajing

TI Identification of fruit and branch in natural scenes for citrus harvesting robot using machine vision and support vector machine

SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING

LA English

DT Article

DE citrus; machine vision; citrus harvesting robot (CHR); branch; identification; multi-class support vector machine (SVM)

ID COMPUTER VISION; IMAGE SEGMENTATION; RECOGNITION

AB With the decrease of agricultural labor and the increase of production cost, the researches on citrus harvesting robot (CHR) have received more and more attention in recent years. For the success of robotic harvesting and the safety of robot, the identification of mature citrus fruit and obstacle is the priority of robotic harvesting. In this work, a machine vision system, which consisted of a color CCD camera and a computer, was developed to achieve these tasks. Images of citrus trees were captured under sunny and cloudy conditions. Due to varying degrees of lightness and position randomness of fruits and branches, red, green, and blue values of objects in these images are changed dramatically. The traditional threshold segmentation is not efficient to solve these problems. Multi-class support vector machine (SVM), which succeeds by morphological operation, was used to simultaneously segment the fruits and branches in this study. The recognition rate of citrus fruit was 92.4%, and the branch of which diameter was more than 5 pixels, could be recognized. The results showed that the algorithm could be used to detect the fruits and branches for CHR.

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FU International Science & Technology Cooperation Program of China [2013DFA11470]; National Natural Science Foundation of China [30771243]; International Science & Technology Cooperation Program of Chongqing [cstc2011gjhz80001]; Fundamental Research Funds for the Central Universities [XDJK2013C102]

FX This work has been financially supported by International Science & Technology Cooperation Program of China (2013DFA11470), the National Natural Science Foundation of China (30771243), International Science & Technology Cooperation Program of Chongqing (cstc2011gjhz80001) and Fundamental Research Funds for the Central Universities (XDJK2013C102).

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ER

PT J

AU Zhai, CY
Zhao, CJ
Wang, X
Li, W
Li, W
Zhu, RX

AF Zhai Changyuan
Zhao Chunjiang
Wang Xiu
Li Wei
Li Wei
Zhu Ruixiang

TI Nozzle test system for droplet deposition characteristics of orchard air-assisted sprayer and its application

SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING

LA English

DT Article

DE air-assisted spraying; orchard sprayer; flow distribution; droplet deposition; nozzle test system; characteristics test system

ID PESTICIDE; DRIFT; DYNAMICS; QUALITY; SIZE

AB In order to obtain nozzle droplet deposition characteristics for sprayer mechanical design and variable spraying control algorithms, a nozzle droplet deposition characteristics test system for air-assisted spraying was designed. The test system can supply a stable wind site with precisely controlled air speed whose speed control ranges from 2 m/s to 16 m/s with maximum relative error of 4.5%. It can spray out a certain amount of liquid pesticide with adjustable spraying pressure which can be controlled with high precision while the maximum relative error is only 1.33%. The distribution of droplet deposition can be collected and measured by using the acquisition device and a pesticide deposition optical measurement system. The experiment of two-dimensional nozzle flow measurement was carried out. The results show that nozzle flow distribution is uniform and symmetric with "double-hump" shape in the spray range. Multi-nozzle overlapped droplet deposition ranges from 85% to 116% relative to the average. The nozzle droplet deposition experiment was completed. The experiment results show that in air-assisted spraying, the higher the wind speed, the less droplet deposition is affected by gravity. When the wind speed is higher than 12 m/s and spraying distance is 0.80 m, droplet deposition is concentrated on the originally designated point and hardly affected by gravity. The horizontal spray width becomes smaller with higher wind speed. When the wind speed is high, it can be considered that nozzle deposition only focuses on the nozzle center, if the position requirement is not very high in orchard spraying.

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FU China National 863 Project [2012AA101904]; NSFC [31201128]; IEA [KFZN2012W13-013]; Northwest AF University [2452013QN070]

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SC Agriculture

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ER

PT J

AU Guo, ZM
Huang, WQ
Chen, LP
Peng, YK
Wang, X

AF Guo Zhiming
Huang Wenqian
Chen Liping
Peng Yankun
Wang Xiu

TI Shortwave infrared hyperspectral imaging for detection of pH value in Fuji apple

SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING

LA English

DT Article

DE shortwave infrared hyperspectral imaging; synergy interval partial least squares; pH value; apple

ID SOLUBLE SOLIDS CONTENT; PARTIAL LEAST-SQUARES; NONDESTRUCTIVE ASSESSMENT; VIS/NIR SPECTROSCOPY; QUALITY; PREDICTION; REGRESSION; VARIABLES; FIRMNESS; BRUISES

AB pH value is regarded as one of the most important attributes that affect sensory characteristics and edible quality of apple. The objective of the research was to explore the feasibility of applying shortwave infrared hyperspectral imaging system to detect the pH value of apple. A shortwave infrared hyperspectral imaging system was developed over the wavelength region of 1 000-2 500 urn and used to acquire hyperspectral images of apple samples. After reflectance calibration, mean reflectance spectral was calculated by averaging the intensity of all pixels within the roundness region of interest (ROI). Synergy interval partial least squares. (siPLS) algorithms as an effective multivariable method was conducted on the calibration of regression model to estimate the pH value in Fuji apple. The performance of the final model was back-evaluated according to root mean square error of calibration (RMSEC) and correlation coefficient (R-c) in calibration set, and tested in prediction set. The optimal prediction siPLS model was obtained with correlation coefficient (R-p) of 0.8474 and mean square error of prediction (RMSEP) of 0.0398. The results indicated that shortwave infrared hyperspectral imaging combined with siPLS chemometrics could be an accurate and fast method for nondestructive prediction of pH value in Fuji apple.

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FU Beijing Natural Science Foundation [6144024]; Science and Technology Innovation Foundation of Beijing Academy of Agriculture and Forestry Sciences [CXJJ201314]

FX This study was supported financially by the Beijing Natural Science Foundation (Project No. 6144024) and Science and Technology Innovation Foundation of Beijing Academy of Agriculture and Forestry Sciences (Project No. CXJJ201314).

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ER

PT J

AU Qian, W
Hong, S
Li, MZ
Wei, Y

AF Qian, Wu
Hong, Sun
Li Minzan

Wei, Yang

TI Development and application of crop monitoring system for detecting chlorophyll content of tomato seedlings

SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING

LA English

DT Article

DE multi-spectral image; crop growth status; image acquisition; 2-CCD sensor; precision agriculture

ID VEGETATION

AB A crop monitoring system was developed to nondestructively monitor the crop growth status in the field. With a two channel multispectral camera with one lens, controlling platform, wireless remote control module and control software, the system was able to synchronously acquire visible image (red(R), green(G), blue(B): 400-700 nm) and near-infrared (MR) image (760-1 000 nm). The tomato seedlings multi-spectral images collection experiment in the greenhouse was conducted by using the developed system from the seeding stage to fruiting stage. More than 240 couples of tomato seedlings pictures were acquired with the Soil and Plant Analyzer Development (SPAD) value measured at the same time. The obtained images were available to process, and some vegetation indexes, such as normalized difference vegetation index (NDVI), ratio vegetation index (RVI) and normalized difference green index (NDGI), were calculated. Considering the SPAD value and the correlation coefficient between SPAD and other parameters in different fertilization treatments, the multiple linear regressions (MLR) model for estimating tomato seedlings chlorophyll content was built based on the average gray value in red, green, blue and NIR., vegetable indexes, NDVI, RVI and NDGI in the 33.3% (Ni), 66.6% (N2), and 100% (N3) nutrient levels during seeding stage and blossom and fruit stage. The R-2 of the model is 0.88. The results revealed that the developed crop monitoring system provided a feasible tool to detect the growth status of tomato. More filed experiments and multi-spectral image analysis will be investigated to evaluate the crop growth status in the near future.

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FU 948 Project [2011-G32]; High Technology Research and Development Research Fund [2013AA102303]

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WC Agricultural Engineering

SC Agriculture

GA AK2RP

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ER

PT J

AU Guo, X
Zheng, LH
Li, MZ
Zhang, Y

AF Guo Xiang
Zheng Lihua
Li Minzan
Zhang Yao

TI Intelligent data acquisition and cloud services for apple orchard

SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING

LA English

DT Article

DE orchard; PDA; WSN; WebGIS; distributed storage; web service

ID SOIL

AB An intelligent data acquisition and service system for apple orchard was developed for acquiring apple tree growth information in time and managing orchard production remotely. The data of fruit tree growth environment were collected by Portable Digital Assistant (PDA) through the ZigBee Wireless Sensors Network (WSN) deployed in the apple orchard. The collected data were packaged and uploaded following the transportation protocol through the web service interface provided by the orchard server. After that the orchard data were parsed and stored using distributed mechanism. Finally, the data could be processed, analyzed and visualized by the cloud orchard server, and the orchard production decisions based on WebGIS technology could be made as well. Hence the users could access the services provided by the network platform via remote mobile or fixed terminals. The system operation test showed that the whole process was stable and reliable, during which intelligent data collection, storage, and cloud data processing and publishing services were achieved.

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FU National High Technology Research and Development Program of China (863 Program) [2012AA101901]; Chinese National Natural Science Foundation [31071330]

FX The financial support provided by the National High Technology Research and Development Program of China (863 Program, 2012AA101901) and Chinese National Natural Science Foundation (No. 31071330) are greatly appreciated.

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ER

PT J

AU Yu, JJ
Liao, YT
Cong, JL
Yang, S
Liao, QX

AF Yu Jiajia
Liao Yitao
Cong Jinling
Yang Song
Liao Qingxi

TI Simulation analysis and match experiment on negative and positive pressures of pneumatic precision metering device for rapeseed

SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING

LA English

DT Article

DE precision metering device; pneumatic device; simulation; positive and negative pressures; stepwise regression; fitting; rapeseed

ID OPERATIONAL PARAMETERS; SEED DISTRIBUTION; DESIGN; OPTIMIZATION; UNIFORMITY

AB Positive and negative pressures determine the performance of pneumatic precision metering device for rapeseed. In order to investigate the relationship between positive and negative pressures of nozzles, fluid models of chamber were developed to simulate the airflow, and the k-epsilon turbulence model was conducted to capture the pressure ad velocity of nozzles. Through these efforts linear models were achieved. Meanwhile, the three-factor factorial split-split experiment was designed with negative pressure, positive pressure and the rotating speeds varying from -1 000 to -4 500 Pa, 50 to 250 Pa and 10 to 45 r/min, respectively. The mathematical models were developed through employing the stepwise regression method. The sequence of influential factors on the quality of feed index was positive pressure, negative pressure and rotating speed. To obtain the match regulation of negative and positive pressures with "good" performance, the ratio coefficient K of negative and positive pressures was introduced to build mathematical models. Models relating ratio coefficient K with positive pressure were fitted in different rotating speeds. The results showed that the ratio coefficient was matched Gamma is an element of[f(1)(x), f(2)(x)] from the fitting equations with the rotating speed of 10 - 30 r/min; while the rotating speed has greater influence when it was 35 40 r/min and the sets Lambda is an element of [g(1)(x), g(2)(x)] were achieved, where x is an element of [100, 250]. This study could be conducted to adjust the rotating speed of the pneumatic system to optimize the ideal performance of the seeder.

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FU National Science Foundation of China [51275197]; National Rapeseed Industrial System Special Foundation [CARS-13]; National Science and Technology Support Project [013BAD08B02]; High School Science Research Foundation [2014PY033]

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WC Agricultural Engineering

SC Agriculture

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ER

PT J

AU Zhai, JB
Xia, JF
Zhou, Y
Zhang, S

AF Zhai Jianbo
Xia Junfang
Zhou Yong
Zhang Shun

TI Design and experimental study of the control system for precision seed-metering device

SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING

LA English

DT Article

DE agricultural machinery; precision seeder; seed-metering device; sensor; control system; stepper motor

ID PLANTER

AB The precision seeding technique has been developed at full speed along with the continuous development of new agricultural technologies, especially those concerning cultivated patterns. The seed-metering device is the key component of a precision seeder. A ground wheel is used to drive the seed-metering device of the conventional direct seeder. However, the wheel bears high resistance and easily slips. Moreover, the adjustment of the precision seeder's seeding rate is more difficult. In order to solve these problems, a control system which could keep the rotational speed of the seed-metering device consistent with the seeder's working speed for the precision seed-metering device was designed. The control system includes a Hall sensor, a single chip microcomputer system, a motor control module, a stepper motor and a display. The control system used a Hall sensor to measure the seeder's working speed and employed a single chip microcomputer system to predict the rotational speed of seed-metering device. It would then determine the relationship between the seeder's working speed and the rotational speed of the seed metering-device according to the seeder's working state, distance between seeds and the requirement of sowing rate. The system could effectively reduce the influence of inhomogeneous sowing caused by the ground wheel's slipping. The system was found to be reliable by the experiment. The seeding control system could also make the speed of the seed-metering device and seeder's uniform, improving the uniformity of the amount of seeding, and achieving the goal of design. This new design provides a platform to solve problems of the seed-metering device and the seeder.

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FU Special Fund for Agro-scientific Research in the Public Interest [201203059]; Natural Science Foundation of China [51275196]; Fundamental Research Funds for the Central Universities [2012ZYTS022]; National Key Technology RD Program [2011BAD20B08]

FX This work was financially supported by the Special Fund for Agro-scientific Research in the Public Interest (No. 201203059), the Natural Science Foundation of China (No. 51275196), the Fundamental Research Funds for the Central Universities (No. 2012ZYTS022), and the National Key Technology R&D Program (No. 2011BAD20B08).

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ER

PT J

AU Wang, L
Huang, NS
Kuang, YQ
Zhou, JH
Zhao, Y
Zhang, Z
Hu, YM

AF Wang Lu
Huang Ningsheng
Kuang Yaoqiu
Zhou Jinhao
Zhao Yuan
Zhang Zhen
Hu Yueming

TI Optimized selection of suitable sites for farmland consolidation projects using multi-objective genetic algorithms

SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING

LA English

DT Article

DE farmland consolidation; site selection; evaluation index system; multi-objective optimization; genetic algorithm; suitability

ID LAND CONSOLIDATION

AB In order to select suitable sites for farmland consolidation projects, correlation analysis and evolutionary algorithms were used to optimize the evaluation of ecological, social and economic factors, avoiding subjective selection and ignorance of spatial relationships among land attributes. Multi-objective Genetic Algorithms (MOGA) were applied to select the best sites from the perspective of spatial relationship and land attribute evaluation. With carefully defined restrictions and variables, multi-objective optimization is able to select several suitable sites for farmland consolidation projects. The results from a case study in Yangshan, Guangdong of China showed that the selected sites were on the central and southern Yangshan with expected flat terrain and abundant water resources. An empirical experiment also demonstrated that the proposed method is able to provide well selected sites for land consolidation projects.

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FU National Natural Science Foundation of China [41001310]; Natural Science Foundation of China-Guangdong Joint Fund [U1301253]

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WC Agricultural Engineering

SC Agriculture

GA AL0JG

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ER

PT J

AU Li, B
Wang, TL
Sun, J

AF Li Bo
Wang Tieliang
Sun Jian

TI Crop water stress index for off-season greenhouse green peppers in Liaoning, China

SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING

LA English

DT Article

DE crop water stress index; off-season green peppers in greenhouse; high yield; canopy temperature; irrigation; water deficit

AB The crop water stress index (CWSI) is a complex instrument to effectively monitor the degree of water stress of crops and provides guidance for timely irrigation. In an experiment utilizing the CWSI with off-season green peppers planted in barrels in a greenhouse in Liaoning Province, Northeast China, this study monitors the sub-indexes such as canopy temperature, environmental factors and yield-determines the changing law of each constituent,

achieves an empirical model as well as a baseline formula for the canopy temperature of the peppers with a sufficient water supply, and verifies the rationality of the formula with corresponding experimental data. The results obtained by using the CWSI show that the optimal time to determine the water deficit for off-season green peppers is at noon, by measuring the diurnal variation in the peppers with different water supplies. There is a nonlinear relationship between the yield and the average CWSI at the prime fruit-bearing period; moreover, the optimal time to supply water for off-season green peppers comes when the average water stress index ranges between 0.2 and 0.4 during the prime fruiting stage, thereby ensuring a high yield.

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FU Education Department of Liaoning Province, China [L2012239]; Ministry of Agriculture, China [201303125]

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ER

PT J

AU Yang, H
Zhang, DY
Huang, LS
Zhao, JL

AF Yang Hao
Zhang Dongyan
Huang Linsheng
Zhao Jinling

TI Wavelet-based threshold denoising for imaging hyperspectral data

SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING

LA English

DT Article

DE wavelet; denoising; spectral domain; Pushbroom Imaging Spectrometer; red edge position

ID COMBINATION; SYSTEM; IMAGES; FILTER; WHEAT

AB Imaging spectroradiometer is highly susceptible to noise. Accurately quantitative processing with higher quality is obligatory before any derivative analysis, especially for precision agricultural application. Using the self-developed Pushbroom Imaging Spectrometer (PIS), a wavelet-based threshold (WT) denoising method was proposed for the PIS imaging hyperspectral data. The WT with PIS was evaluated by comparing with other popular denoising methods in pixel scale and in regional scale. Furthermore, WT was validated by chlorophyll concentration retrieval based on red-edge position extraction. The result indicated that the determination coefficient R-2 of the chlorophyll concentration inversion model of winter wheat leaves was improved from 0.586 to 0.811. It showed that the developed denoising method allowed effective denoising while maintaining image quality, and presented significant advantages over conventional methods.

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FU Key Laboratory of Agricultural information Technology, Ministry of Agriculture [2012007]; National Natural Science Foundation of China [41301471]; Anhui Provincial Natural Science Foundation [1308085QC58]; State Key Laboratory of Remote Sensing Science [OFSLRSS201319]
FX This study was financially supported by the Agricultural Outstanding Talent Research Fund and Open Fund of Key Laboratory of Agricultural information Technology, Ministry of Agriculture (2012007), National Natural Science Foundation of China (41301471), Anhui Provincial Natural Science Foundation (1308085QC58) and Open Fund of State Key Laboratory of Remote Sensing Science (OFSLRSS201319). We are grateful to the reviewers for their helpful suggestions on the manuscript.
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PT J
AU Tan, KZ
Chai, YH
Song, WX
Cao, XD
AF Tan Kezhu
Chai Yuhua
Song Weixian
Cao Xiaoda
TI Identification of diseases for soybean seeds by computer vision applying BP neural network
SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING
LA English
DT Article
DE soybean seed; disease identification; computer vision; BP neural network; characteristic parameters; data reduction
ID SYSTEM; IMAGE
AB The use of computer vision for estimating quality in agriculture products has become wide spread in recent years and the composition, variety, or ripeness can be estimated. On the other hand, the appearance is one of the most worrying issues for producers due to its influence on quality. In this research, computer vision technology combined with BP artificial neural network (ANN) was developed to identify soybean frogeye, mildewed soybean, worm-eaten soybean and damaged soybean. Thirty-nine characteristic parameters from color, texture and shape characteristics were computed after preprocessing the acquired soybean images. The dimensionality of the characteristic parameters was reduced from 39 dimensionalities to 12 dimensionalities using the method of principal component analysis (PCA). MALAB software was used to build a prediction model according to 12 characteristic parameters. The identification accuracies of soybean frogeye, mildewed soybean, damaged soybean and worm-eaten soybean are 96%, 95%, 92%, and 92%, respectively. And the accuracy for heterogeneous soybean seeds with several diseases is 90%. The results show that the prediction model constructed by BP neural network can identify the diseases of soybean seeds. And it is useful to estimate appearance quality of soybean by computer vision applying BP neural network.

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ER

PT J

AU Mi, CQ
Liu, Z
Zhang, XD
Peng, XN
Huang, B

AF Mi Chunqiao
Liu Zhe
Zhang Xiaodong
Peng Xiaoning
Huang Bin

TI GIS-based evaluation of maize cultivar lodging resistance performance in target growing environments

SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING

LA English

DT Article

DE lodging in maize; environment lodging stress; cultivar lodging resistance; GIS; maize production; growing environment

ID ZEA-MAYS-L; MORPHOLOGICAL CHARACTERS; STRESS TOLERANCE; YIELD STABILITY; VARIETIES; TRIALS; WIND; AMMI; GGE

AB Lodging in maize is one of the major problems in maize production worldwide, which causes serious yield and economic losses annually. By evaluating cultivar lodging resistance performance in target growing environments before cultivar extension and application, the risks and losses can be significantly reduced. In this study, a GIS-based quantitative method for evaluating maize cultivar lodging resistance performance in target growing environments was established based on full cognition of environment stress, cultivar resistance, and the interaction between them. At first, comprehensive environment lodging stress is measured by three factors: 1) extreme wind event in maize vegetative stage which is the direct factor, 2) soil potassium content in target growing environment which is an indirect factor affecting corn stem sturdiness, and 3) planting density which is a human influence factor. Quantification methods of extreme probability analysis, spatial interpolation, normalization, and so on were used. Then, maize cultivar lodging resistance was determined using cumulative frequency distribution analysis of tested lodging data. At last, an evaluation matrix was established combining environment lodging stress and cultivar lodging resistance together, which was very simple and easy to understand method and the result is promising providing good direct support in practical cultivar application. The method used in this study, at county-level, cultivar-level and stress-level with GIS, can facilitate the identification of better-adapted growing environments for a specific maize cultivar, and provide direct support for maize cultivar recommendation and extension, so as to reduce the risk and loss of lodging in maize. It is more easy-operational and feasible than traditional surveying approach, especially for large-scale spatial trend analysis. So it is of both academic significance in accelerating precision

agriculture development and practical significance in improving maize cultivar application.

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FU National Natural Science Foundation of China [41301084]; Hunan Provincial Natural Science Foundation of China [13JJ6075]; Huaihua University

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ER

PT J

AU Sekiya, N
Hattori, T
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Abe, J
Morita, S

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Abe, Jun
Morita, Shigenori

TI Identifying potential field sites for production of cellulosic energy plants in Asia

SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING

LA English

DT Article

DE bioethanol; biomass; cellulosic energy plants; geographic information system; unused land

ID KHON-KAEN REGION; RICE ORYZA-SATIVA; LEGUMINOUS LEY PASTURES; NORTHEAST THAILAND; SOIL-FERTILITY; SOUTH SUMATRA; SALINE SOILS; CHEMICAL-PROPERTIES; CROPPING SYSTEMS; EASTERN INDIA

AB Cellulosic bioethanol produced from non-edible plants avoids food-fuel competition. Growing such plants on marginal non-arable lands also avoids the use of farmland. In this study, attempts were made to identify potential field sites for cellulosic bioethanol production in Asia. In this study, GIS databases containing information about requirements such as land use, landform, and climate were superimposed. Areas with terrestrial constraints were then removed from the candidate field sites using a terrain slope database. The remaining lands were evaluated using a net primary production (NPP) database. Of these areas, southern and eastern India, northeastern Thailand, and southern Sumatra (Indonesia) had high NPP. In the 2nd phase, local information regarding infrastructure, and agriculture were analyzed. Field-establishment feasibility was high for eastern India and southern Sumatra. Potential field sites were then located in satellite images of these two areas. In the 3rd phase, soils around potential sites were evaluated. Local residents

were interviewed to estimate the cost of producing plants for biomass energy. Sites selected using this simple method are suitable for biomass production.

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PT J

AU Iroba, KL
Tabil, LG
Sokhansanj, S
Meda, V

AF Iroba, Kingsley L.
Tabil, Lope G.
Sokhansanj, Shahab
Meda, Venkatesh

TI Producing durable pellets from barley straw subjected to radio frequency-alkaline and steam explosion pretreatments

SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING

LA English

DT Article

DE radio frequency; steam explosion; densification; biomass pellets; and alkaline pretreatment

ID LIGNOCELLULOSIC BIOMASS; ENZYMATIC-HYDROLYSIS; PARTICLE-SIZE; STRENGTH; REQUIREMENT; PARAMETERS; POPLAR

AB Pelletization, a form of densification, increases bulk density and improves the convenience and accessibility of biomass feedstock due to the uniform shape and size. Pretreatment of biomass enhances the breakdown and accessibility of the cross-linking lignin, which acts as a binding agent. In this study, pelletization of radio frequency-alkaline and steam explosion pretreated barley straw was performed. Three levels of temperature (70 degrees C, 80 degrees C, and 90 degrees C), five levels of the mass ratio of biomass to NaOH solution (1:4, 1:5, 1:6, 1:7, and 1:8), one hour equilibration time, biomass screen size of 1.6 mm, 1% NaOH concentration, and 20 min residence time in the radio frequency chamber were used for the radio frequency-alkaline pretreatment. Three levels of steam temperature (140 degrees C, 160 degrees C, and 180 degrees C), three levels of moisture content of 8%, 30%, and 50% (mass fraction of total mass), and 5 min and 10 min exposure to steam were tested for the steam explosion pretreatment. The effects of both pretreatment methods were evaluated by pelletizing the pretreated and non-pretreated barley straw samples in a single pelleting unit. The pellet density, tensile strength, durability, dimensional stability, and color of the pellets were determined. Radio frequency-alkaline pretreatment with the use of 1% NaOH solution and a ratio of biomass: NaOH solution of 1:8 has significant effect ($P<0.05$) on the breakdown of the lignified matrix, resulting in pellets with superior physical characteristics. The steam exploded samples pretreated at higher temperatures (180 degrees C) and retention time of 10 min resulted into pellets with good physical qualities.

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FU Natural Sciences and Engineering Research Council of Canada; Agriculture and Agri-Food Canada through the Agricultural Bioproduct Innovation Program

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ER

PT J

AU Fei, WT
Liu, RH
Zhou, WQ
Mei, YF
Yin, RZ

AF Fei Wenting
Liu Ronghou
Zhou Weiqi
Mei Yuanfei
Yin Renzhan

TI Influence of methanol additive on bio-oil stability

SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING

LA English

DT Article

DE bio-oil; pyrolysis; stability; methanol

ID FAST-PYROLYSIS; STRUCTURAL-ANALYSIS; FORESTRY RESIDUE; FUEL; QUALITY; BIOMASS; REACTOR; LIQUID; YIELDS; PINE

AB Methanol at different mass concentrations (1, 6, 11, 16, 21 wt %) was added into crude bio-oil to upgrade oil properties. Indexes including pH value, water content and viscosity were measured regularly during a storage period of 91 days. GC-MS analysis was conducted before and after storage. An addition of 21 wt % methanol was found to improve the pH value from 2.97 to 3.88, and decrease the water Content and viscosity after storage by 35.02% and 81.35%, respectively. The GC-MS analysis result convincingly showed that methanol could inhibit aging reactions such as polymerization and esterification which created new compounds in the oil. The FTIR and NMR analysis showed that methanol caused some structural changes in bio-oil.

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FU National Natural Science Foundation of China [51176121]; National Science and Technology Supporting Plan [2011BAD22B07]

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ER

PT J

AU Phoophuangpairoj, R
Srikun, N

AF Phoophuangpairoj, Rong
Srikun, Niyomsri

TI Computerized recognition of pineapple grades using physicochemical properties and flicking sounds

SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING

LA English

DT Article

DE Ananas comosus L.; total soluble solid; pH; physiochemical properties; flicking sounds; computerized pineapple grading; non-destructive grading

ID TRANSLUCENCY

AB Fruit is one of the essential sources of human nutrition. Consumers around the world need to be able to purchase fruit of reliable flavor and nutritional quality. Physical appearance and physicochemical properties play a key role in determining desirable quality and flavor. However, for some fruits such as watermelon, durian, pineapple, it is very hard to determine quality and flavor by external appearance. Therefore, a practical method to predict physical and physicochemical properties of fruit needs to be developed. In this study, a computerized technique is investigated to determine pineapple grades and their physical and physicochemical properties, including ripeness, total soluble solids, pH value and water content. The results reveal that by grading using pulp characteristics it is possible to classify pineapples into three distinct groups, which are significantly different in TSS, pH value and water content. In addition, predicting pineapple grades using flicking sounds and signal processing demonstrates that pineapples classified as grade 1 and grade 3 are significantly different in TSS, pH value and water content. This suggests that the estimation of the texture of pineapple pulp and its physicochemical properties can be performed prior to cutting. Therefore, it is feasible to develop an automated grading technique that can be used to determine pineapple quality as accurately as destructive grading to predict pineapple grades, texture and physicochemical properties.

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PT J
AU Zhang, LJ
Yang, JS
Ma, LW
Tan, HS
AF Zhang Lijuan
Yang Jinsong
Ma Liwei
Tan Haisheng
TI Optimization of fermentation process of papaya sauerkraut using response surface method
SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING
LA English
DT Article
DE papaya; sauerkraut; fermentation process; response surface method; lactic acid bacteria; central composite design
ID KIMCHI
AB Papaya, a tropical fruit was used as the raw material to produce sauerkraut in the study. Three lactic acid bacteria strains isolated from papaya were added to the sauerkraut to facilitate the fermentation of papaya sauerkraut. In the fermentation process, the dynamic changes of total acid in sauerkrauts at different levels of sugar concentration, salt concentration, inoculation and temperature were studied. The response surface method was used to study the effects of changes in multiple factors at the same time. On the basis of "one-variable-at-a-time" approach, the response surface method optimized papaya sauerkraut fermentation process. According to the change of total acid in single factor, 29 experiments were designed by 4x3 factorial central composite design. The optimum fermentation conditions were obtained as follows: sugar at 3.8%, salt at 2.8%, inoculation at 5%, and temperature at 31 degrees C.
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ER

PT J
AU Zhang, BH
Guan, SJ
Ning, XF
Gong, YJ
AF Zhang Benhua
Guan Shujie
Ning Xiaofeng
Gong Yuanjuan
TI Mechanical characteristics of Hanfu apple at low temperature
SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING
LA English
DT Article
DE Hanfu apple; low temperature storage; mechanical characteristics; weight loss rate
AB To find out a low temperature storage method for the maintenance of Hanfu apple's firmness, crispness and moisture content, three storage methods in refrigerator, large cellar, and small cellar were experimented. Tests and comparisons were conducted for parameters including maximum absolute deformation, elastic modulus, firmness in compression test, and weight loss rate using mechanical characteristics monitoring and regular weighing during and after storage. Five testing groups with different pretreatments were arranged for refrigerator tests. The results showed that lower weight loss rates were achieved in two cellars than in the refrigerator; and difference between the large and small cellars was insignificant. However, cellar storage was only feasible for a relatively short term. Refrigeration storage with humidification sealing treatment yielded the optimal result in maintaining firmness, crispness and moisture of Hanfu apples, showing advantage in long-term storage.
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PT J
AU He, J
Zhang, ZQ
Li, HW
Wang, QJ
AF He Jin
Zhang Zhiqiang
Li Hongwen
Wang Qingjie
TI Development of small/medium size no-till and minimum-till seeders in Asia: A review
SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING
LA English
DT Review
DE conservation agriculture (CA); conservation tillage; no-till; minimum-till; seeder; tractor; anti-blockage; Asia
ID LAND-USE; WHEAT; OPPORTUNITIES; PRODUCTIVITY; SYSTEMS; CHINA; SOIL
AB The benefits of conservation agriculture (CA) have been widely recognized and CA has been widely adopted in many parts of the world. However, there are some factors that limit the widespread adoption of CA in Asia. The most prominent factor appears to be the lack of suitable CA seeders for small to medium sized land-holding (SLH) farmers. This paper summarizes the small to medium no-till and minimum-till seeders currently available in Asia, and classifies these seeders into four types: manually operated units, animal traction seeders, two-wheel tractor and four-wheel tractor driven seeders. Detailed characteristics have been provided for some typical CA seeders and comparisons were made as to their suitability under particular working conditions. Typically manual and animal traction seeders are confined to small farms and hilly areas, while the larger CA seeders suited to four-wheel tractors are used on larger acreages. To ensure seeding performance on most four-wheel tractor CA seeders, two types of anti-blocking mechanisms (passive and active anti-blocking) have been fitted. Finally, the paper proposes a future direction and development of CA seeders for small/medium size farms in Asia, and also suggests changes in policy support, improvement of anti-blocking mechanisms, suitability for various crops, geographical zones and the contribution of development by public private partnerships to advance the adoption of CA seeders.
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FU Program for Changjiang Scholars and Innovative Research Team in University of China [IRT13039]
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Wang, C
Zhang, XY
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Zhang Xinyue
Li Guangyong

TI Improvement and optimization of preparation process of seedling-growing bowl tray made of paddy straw

SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING

LA English

DT Article

DE seedling-growing bowl tray; preparation process; paddy straw; rice production modified starch-based adhesive; straw powder

ID PELLET; COMPOSITES; QUALITY; FIBER

AB A new type of rice seedling carrier named seedling-growing bowl tray made of paddy straw (SGBTMPS) was developed in China. Traditional preparation process for SGBTMPS is complex and difficult to operate. Hence, a new SGBTMPS preparation method has been developed by using straw powder as the main raw material. In this method, modified starch-based adhesive was replaced by the binder of thermosetting adhesive, and preparation constraints such as forming pressure, forming temperature, and dwell time were decreased. The effects of factors such as glue (modified starch-based adhesive), forming pressure, forming temperature and dwell time on SGBTMPS preparation were evaluated by single factor experiment. Orthogonal experiment and comprehensive weight analyses were adopted to optimize the parameters for SGBTMPS preparation. The results showed that optimized parameters were 125% glue and 1.2 kg mixed materials with the forming pressure, temperature, and dwell time of 30 MPa, 140 degrees C and 330 seconds, respectively. Compared with traditional preparation process, the proportioning link, preparation link, and preparation time in the new preparation process were reduced by 66.7%, 33.3%, and 17%, respectively; the pot-hole percentage and the expansion ratio were increased by 0.09% and 0.05%, respectively. This study indicated that the new preparation process for SGBTMPS was simpler and easier to operate and would provide a useful reference for further research and industrialization on SGBTMPS.

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FU National Agricultural Science and Technology Achievement Transformation Project [2009GB2B200101]; Specialized Research Fund for the Doctoral Program of Higher Education [20112305120003, 20092305110002]; Start-up Capital of Doctoral Research of Heilongjiang Bayi Agricultural University [2011YB-08]

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NR 32

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Z9 0

PU CHINESE ACAD AGRICULTURAL ENGINEERING

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WC Agricultural Engineering

SC Agriculture

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ER

PT J

AU Xue, XY
Tu, K
Qin, WC
Lan, YB
Zhang, HH

AF Xue Xinyu
Tu Kang
Qin Weicai
Lan, Yubin
Zhang, Huihui

TI Drift and deposition of ultra-low altitude and low volume application in paddy field

SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING

LA English

DT Article

DE paddy field; ultra-low altitude; low volume; UAV; droplet drift; deposition

AB Field trials were performed to evaluate various techniques for measuring spray deposition and aerial drift during spray application to paddy field. The application of a spraying agent containing the fluorescent dye Rhodamine-B was applied by an unmanned aerial vehicle (UAV) which flew at a height of 5 m, a speed of 3 m/s, and the wind speed of 3 m/s. The results showed that because the downdraft produced by a helicopter rotor increased the penetrability of crops, there is a higher deposition on the upper layer and the under layer than the traditional spraying. The average deposition on the upper layer accounts for 28% of the total spraying, the deposition on the under layer accounts for 26% of the total spraying. The deposition on the under layer takes up 92.8% of the deposition on the upper layer. Droplets drift data showed that the drift of non-target area took up 12.9% of the total liquid spray. The 90% drifting droplets were located within a range of 8 m of the target area; the drift quantity was almost zero at a distance of 50 m away from the treated area.

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FU Special Fund for Agro-scientific Research in the Public Interest, Ministry of Agriculture, China [201203025]; National High Technology Research and Development Program of China [SS2013AA100303]

FX The authors gratefully acknowledge the financial support provided by 1) Special Fund for Agro-scientific Research in the Public Interest (201203025) by Ministry of Agriculture, China and 2) the National High Technology Research and Development Program of China (SS2013AA100303).

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WC Agricultural Engineering

SC Agriculture

GA AO7TU

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ER

PT J

AU Zhang, T
Xia, JF
Wu, G
Zhai, JB

AF Zhang Tian
Xia Junfang
Wu Gang
Zhai Jianbo

TI Automatic navigation path detection method for tillage machines working on high crop stubble fields based on machine vision

SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING

LA English

DT Article

DE high crop stubble; paddy field tilling; texture statistics; road navigation; vision navigation

ID HOUGH-TRANSFORM; VEHICLE

AB Due to the influence of complex working environment and artificial factors, it is easy to cause crop up over or less tillage problem when straw returning machine is working in paddy field. A new method for path detection suitable for rice, rape and wheat high crop stubble tilling environments was proposed. First the distribution characteristics of rice, rape and wheat high crop stubble images in paddy field based on RGB color model were analyzed, and rice, the color images of rape and wheat high crop stubble were converted into gray ones using custom factor combination R+G-2B; Then, the gray images of rice, rape and wheat high crop stubble were segmented from soil background by means of luminance mean texture descriptor; Next, the binary image through custom shear-binary-image algorithm was cut to remove big noise blobs in high crop stubble's tilled area; Finally, navigation path from navigation points by using the least square method was derived. The experimental results indicated that the navigation path detection algorithm was fast and effective to obtain navigation path in rice, rape and wheat high crop stubble tilling environments with up to 96.7% of segmentation accuracy within 0.6 s of processing time.

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FU Special Fund for Agro-scientific Research in the Public Interest [201203059]; Natural Science Foundation of China [51275196]

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WC Agricultural Engineering

SC Agriculture

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ER

PT J

AU Dwomoh, FA
Yuan, SQ
Li, H

AF Dwomoh, Frank A.
Yuan Shouqi
Li Hong

TI Sprinkler rotation and water application rate for the newly-designed complete fluidic sprinkler and impact sprinkler

SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING

LA English

DT Article

DE sprinkler rotation; variation; water application rate; complete fluidic sprinkler; impact sprinkler; rotation uniformity

ID DROPLET SIZE; PERFORMANCE; UNIFORMITY; WIND; HEAD

AB One important indicator of the good performance of rotating sprinklers is the uniformity of rotation. The objective of this experimental study was to investigate the rotation uniformity and water application rate of the newly designed complete fluidic sprinkler in comparison to the widely used impact sprinkler, with the goal to offer recommendations to improve the fluidic sprinkler's operation performance. Single-sprinkler water application experiments were conducted in accordance with the American Society of Agricultural and Biological Engineers standard. Sprinkler completion time through the four quadrants of rotation and water delivery in catch cans were measured at different operating pressures for each sprinkler-nozzle size configuration. The capabilities of Matrix Laboratory were employed to simulate the overlap of adjacent quadrants and to visualize the effect of sprinkler rotation speed variation on water application rate. Quadrant completion time variations were small for both impact and fluidic sprinklers. However, variations in completion time through the quadrants were higher for the fluidic sprinkler compared to the impact sprinkler. Relatively higher variations in water application rates were also observed for the fluidic sprinkler. The optimization of the design features of the fluidic component is necessary to improve rotation stability and to minimize variability in water application rate of the fluidic sprinkler. The study significantly highlighted some performance qualities of the complete fluidic sprinkler in comparison to that of the impact sprinkler. The findings of this research will help to improve the efficiency of the new type complete fluidic sprinkler.

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FU National Hi-tech Research and Development (863 Program) [2011AA100506, 2011GB2C100015]; National Natural Science Foundation of China [51109098]

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WC Agricultural Engineering

SC Agriculture

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ER

PT J

AU Zhong, SQ
Zhang, WH
Lv, JK
Wei, CF

AF Zhong Shouqin
Zhang Weihua
Lv Jiake
Wei Chaofu

TI Temporal variation of soil water and its influencing factors in hilly area of Chongqing, China

SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING

LA English

DT Article

DE soil water; temporal variation; influencing factors; hilly area

ID MOISTURE DYNAMICS; VARIABILITY; SCALE; PRECIPITATION; SIMULATIONS; STABILITY; STORAGE; TREND; FIELD

AB The paper studied the temporal variation of soil water content and its influencing factors in hilly area of Chongqing by the yearly data of 2006 and 2007. According to precipitation anomaly percentage, the year 2006 was a dry year and 2007 a normal year. In the dry year 2006, the variations of soil moisture in all three layers (0-10 cm, 10-20 cm, 20-40 cm) were medium (10%<CV<30%); in the normal year 2007, the variation in the layer of 0-10 cm was strong (CV>30%), and those of the two deeper layers were weak (CV<10%). Hence, the seasonal variation of soil moisture in the humid area was large in the dry year and small in the wet year. The probability distributions of soil moisture in all three layers in both dry and normal years showed single-peak shapes. However, peak locations and values varied with different layers and years. Among factors affecting the temporal variation of soil moisture in the 0-10 cm layer, during March to May, the meteorological factors including temperature, sunshine and precipitation were all inversely correlated with soil water content variation. The correlations with average temperature and accumulated temperature were both highly significant P<0.01 (P=0.00). The inverse correlations with sunshine and precipitation were significant P<0.05 (P=0.01). Among soil physical properties, except for bulk density which was inversely correlated with soil moisture, all other properties were positively correlated. Organic material was positively correlated with soil moisture, which suggested that organics had the sponge effect and contributed to soil water storage and movement. During the period of June to September, there was no significant correlation between soil water content and total storage. The meteorological factors of temperature, accumulated temperature and sunshine were all inversely and highly significantly correlated with soil water content P<0.01 (P=0.00).

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FU National Key Technology R&D Program of China [2012BAD05B06]

FX This research was supported by the National Key Technology R&D Program of China (No. 2012BAD05B06). The support is gratefully acknowledged.

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Z9 0

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EF

FN Thomson Reuters Web of Science™
VR 1.0
PT J
AU Kusnierek, K
Korsaeth, A
AF Kusnierek, Krzysztof
Korsaeth, Audun
TI Challenges in using an analog uncooled microbolometer thermal camera to measure crop temperature
SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING
LA English
DT Article
DE analog thermal camera; uncooled microbolometer; canopy temperature; cereals; UAV
ID STOMATAL CLOSURE; WATER; EMISSIVITY; VEGETATION; RESPONSES; IMAGERY; STRESS; WHEAT; FIELD
AB It has been long known that thermal imaging may be used to detect stress (e.g. water and nutrient deficiency) in growing crops. Developments in microbolometer thermal cameras, such as the introduction of imaging arrays that may operate without costly active temperature stabilization, have vitalized the interest in thermal imaging for crop measurements. This study focused on the challenges occurring when temperature stabilization was omitted, including the effects of focal-plane-array (FPA) temperature, camera settings and the environment in which the measurements were performed. Further, the models for providing thermal response from an analog LWIR video signal (typical output from low-cost microbolometer thermal cameras) were designed and tested. Finally, the challenges which typically occur under practical use of thermal imaging of crops were illustrated and discussed, by means of three cereal showcases, including proximal and remotely based (UAV) data acquisition. The results showed that changing FPA temperature greatly affected the measurements, and that wind and irradiance also appeared to affect the temperature dynamics considerably. Further, it is found that adequate settings of camera gain and offset were crucial for obtaining a reliable result. The model which was considered best in terms of transforming video signals into thermal response data included information on camera FPA temperature, and was based on a priori calibrations using a black-body radiation source under controlled conditions. Very good calibration (r(2)>0.99, RMSE=0.32 degrees C, n=96) was obtained for a target temperature range of 15-35 degrees C, covering typical daytime crop temperatures in the growing season. However, the three showcases illustrated, that under practical conditions, more factors than FPA temperature may need to be corrected for. In conclusion, this study shows that thermal data acquisition by means of an analog, uncooled thermal camera may represent a possible, cost-efficient method for the detection of crop stress, but appropriate corrections of disturbing factors are required in order to obtain sufficient accuracy.
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FU Research Council of Norway at Hanninghof, Germany
FX We thank A.O. Kristoffersen for allowing us to utilize the indoor pot experiment with phosphorus stress, and J. Jasper (Yara International ASA) for letting us perform measurements at the field experiment at Hanninghof, Germany. The project was funded by the Research Council of Norway (Program: "Bionaer"). H. Riley is gratefully acknowledged for critically reading the manuscript.
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PG 15
WC Agricultural Engineering
SC Agriculture
GA AO7TU
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ER

PT J

AU Xiao, BX
Wang, CY
Guo, XY
Wu, S

AF Xiao Boxiang
Wang Chuanyu
Guo Xinyu
Wu Sheng

TI Image acquisition system for agricultural context-aware computing

SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING

LA English

DT Article

DE image acquisition; agriculture; context-aware computing

AB Context-aware computing is a new mode originated from ubiquitous computing. Its emergence brings a substantial change to traditional computing and related service. Image is a pervasive tool for context awareness. A large number of applications are developed based on images analysis. In this paper, an image acquisition system is presented for agricultural context-aware computing. The potential use of the system includes production evaluation, precise management and assistant control. The system includes four modules: the camera system, the control system, mechanism, and communication. The system can be easily installed in target crop fields. The camera system is composed of a binocular stereo camera and a color camera. Two cubic images and a corresponding texture image are collected for each plant in the process of data acquisition. An accessorial software system is developed to control and manage the capture system. Experiments show that the presented system is effective for image acquisition of agricultural context-aware computing.

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FU National High Technology R&D Program ("863" Program) of China [2013AA102404-02]; National Natural Science Foundation of China [31171454, 61300079]; Beijing Municipal Natural Science Foundation [4132028]; Special Fund for S&T Innovation of Beijing Academy of Agriculture, and Forestry Sciences [KJCX201204007]

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PG 6

WC Agricultural Engineering

SC Agriculture

GA AO7TU

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ER

PT J

AU Jiang, LL
Yu, XJ

He, Y

AF Jiang Lulu
Yu Xinjie
He Yong

TI Identification of automobile transmission fluid using hyperspectral imaging technology

SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING

LA English

DT Article

DE transmission fluid; hyperspectral image; sparse representation; principal component analysis; identification

AB An identification method combining sparse representation with principal component analysis (PCA) was proposed for discriminating varieties of transmission fluid of automobile by using hyperspectral imaging technology. Principal component analysis was applied to obtain the characteristic information in the 874-1 733 nm spectra. For each transmission fluid variety, 80 samples were randomly selected as the training set, and 20 samples as the testing set. The eigenvectors of all training samples form the matrix were used for the sparse representation, and the problem of transmission fluid types classification was transformed into one to solve a sample expressed by the overall training sample matrix through optimization under the 11 norm. The results demonstrate that the accuracy of the algorithm that was composed of sparse representation and principal component analysis (PCA) was 93%. The accuracy is higher than those of PCA-LDA (Linear Discriminant Analysis) and PCA- LS-SVM (Least Squares Support Vector Machine). Therefore, the proposed method provides a better approach for the identification of transmission fluid types.

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FU 863 National High-Tech Research and Development Plan [2013AA102301]; National Natural Science Foundation of China [31201446]; Zhejiang Provincial Science & Technology Innovation Team Project; Ningbo Natural Science Foundation of China [201301A6101002]

FX The authors appreciate the financial support to the study by 863 National High-Tech Research and Development Plan (Project No: 2013AA102301), National Natural Science Foundation of China (Project No: 31201446), Zhejiang Provincial Science & Technology Innovation Team Project and Ningbo Natural Science Foundation of China (Project No: 201301A6101002).

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PG 5

WC Agricultural Engineering

SC Agriculture

GA AO7TU

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ER

PT J

AU Kamireddy, SR
Kozliak, EI
Tucker, M
Ji, Y

AF Kamireddy, Srinivas Reddy
Kozliak, Evguenii I.
Tucker, Melvin
Ji, Yun

TI Kinetic features of xylan de-polymerization in production of xylose monomer and furfural during acid pretreatment for kenaf, forage sorghums and sunn hemp feedstocks

SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING

LA English

DT Article

DE acid pretreatment; sunn hemp; sorghum brown-mid rib (BMR); sorghum non brown- mid rib (SNBMR); kenaf; reaction kinetics; activation energy; reaction order

ID SUGAR-CANE BAGASSE; CORN STOVER; LIGNOCELLULOSIC BIOMASS; CHEMICAL-COMPOSITION; HYDROLYSIS; HEMICELLULOSE; CELLULOSE; BIOFUELS; CRYSTALLINITY; BIOCONVERSION

AB A kinetic study of acid pretreatment was conducted for sorghum non-brown mid rib (SNBMR) (Sorghum bicolor L Moench), sorghum-brown mid rib (SBMR), sunn hemp (Crotalaria juncea L) and kenaf (Gossypiumhirsutum L), focusing on rates of xylose monomer and furfural formation. The kinetics was investigated using two independent variables, reaction temperature (150 degrees C and 160 degrees C) and acid concentration (1 and 2 wt%), with a constant dry biomass loading of 10 wt% and a treatment time up to 20 min while sampling the mixture every 2 min. The experimental data were fitted using a two-step kinetic model based on irreversible pseudo first order kinetics at each step. Varied kinetic orders on the acid concentration, ranging from 0.2 to >3, were observed for both xylose and furfural formation, the values depending on the feedstock. The crystallinity index of raw biomass was shown to be a major factor influencing the rate of both xylose and furfural formation. A positive correlation was observed between the activation energy and biomass crystallinity index for xylose formation.

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SC Agriculture

GA AO7TU

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ER

PT J

AU Parent, J
Graziano, M
Yang, XS

AF Parent, Jason
Graziano, Marcello
Yang, Xiusheng

TI Potential of using forest residue to offset coal use in co-fired coal power plants in the eastern United States

SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING

LA English

DT Article

DE forest residue; coal; biofuel; co-firing; GIS; alternative energy

ID LOGGING RESIDUE; MISSISSIPPI

AB The global transition from fossil fuel-based energy sources to renewable energy sources will be most effective, for at least the near future, by utilizing local resources and existing infrastructure. In many areas of the eastern United States, forest residue is abundant and can be used in existing facilities to supplement coal in coal-fired power plants. Thus forest residue has potential as a renewable energy source that could be effectively utilized in the near future. This study uses GIS to estimate the potential quantity of forest residue available for use in coal-fired power plants in the eastern United States. Transportation costs limit the distance over which it is feasible to transport forest residue to the power plants and these costs may fluctuate depending on economic conditions. Thus, we consider three scenarios in our analysis assuming the maximum feasible transport distances to be 60, 80, and 100 km. In the eastern U.S., the total annual forest residue available to coal plants is approximately 29.4, 40.2, and 48.2 million dry tons, respectively, for maximum transport distances of 60, 80, and 100 km. Assuming an 80 km transport distance, forest residue has the potential to reduce coal consumption by 22.3 million tons per year. Under this scenario, greenhouse gas emissions would be reduced by almost 58.1 million tons per year, and NOx and SOx emissions would be reduced by 69.3 and 122.6 thousand tons respectively. This analysis suggests that by offsetting coal use, forest residue has the potential to substantially reduce power plant emissions.

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WC Agricultural Engineering

SC Agriculture

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ER

PT J

AU Meghwal, M
Goswami, TK

AF Meghwal, Murlidhar
Goswami, T. K.

TI Effect of grinding methods and packaging materials on fenugreek and black pepper powder quality and quantity under normal storage conditions

SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING

LA English

DT Article

DE grinding method; packaging material; storage condition; quality deterioration; behavior; aroma; cryogenic; ambient

ID ANTIOXIDANT ACTIVITY; PIPER-NIGRUM; SPICES; PRINCIPLES; COLOR

AB The effects of different grinding methods and packaging materials on qualities of fenugreek and black pepper powders were evaluated. Various parameters and their evaluation methods are as follows: change in colour determined using Chroma meter calorimeter, aroma and odour measured by sensory evaluation, and change in moisture measured using oven drying method. Packaging materials such as glass jar, steel jar, plastic jar, aluminum bag and poly bags were used for keeping ambient and cryogenically ground fenugreek and black pepper powders. Packed powders were stored in dry and cool places under ambient condition. Sensory evaluation revealed quality reduction in terms of colour, odour, flavour, aroma and acceptability for fenugreek and black pepper powder stored for a long term (6 months). However, glass jar and steel jar were found to be better containers for storing powders for longer storage period than other options. For practical applications, the present investigation on the deterioration behaviour of fenugreek and black pepper powder contributes to the design of a suitable grinder out of ball, hammer, rotor, and pin mill for spice grinding. The study also helps select a suitable packaging material or container to store spice powders. A method to assess the quality of stored powder and its deterioration with the storage time is provided.

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PT J
AU Hande, AR
Swami, SB
Thakor, NJ
AF Hande, A. R.
Swami, Shrikant Baslingappa
Thakor, N. J.
TI Effect of drying methods and packaging materials on quality parameters of stored kokum rind
SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING
LA English
DT Article
DE kokum rind; storage; drying methods; packaging materials; quality evaluation
ID STORAGE; AIR
AB In this study kokum rind dried by different methods, i.e. open air sun drying, solar drying and the convective hot air drying (60 degrees C) was taken after being packaged in gunny bags, nylon bags and plastic jars for storage study upto nine months. The effect of different drying methods on quality parameters i.e. acidity, pH, TSS, reducing sugar, non-reducing sugar, colour (L, a and b) and calorific value of the stored product were evaluated. The quality parameters were tested at three-month intervals. Among three packaging materials, plastic jar was found best for kokum rind storage upto nine months as compared with nylon and gunny bags. Deterioration occurred as changes in acidity, non-reducing sugar, lightness, redness and calorific value over the storage period from the 0th to the 9th month. However, the TSS and b value increased as storage duration extended.
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PT J
AU Zhang, Q
Jia, FG
Liu, CH
Sun, JK
Zheng, XZ
AF Zhang Qiang
Jia Fuguo
Liu Chenghai
Sun Jingkun
Zheng Xianzhe
TI Rapid detection of aflatoxin B-1 in paddy rice as analytical quality assessment by near infrared spectroscopy
SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING
LA English
DT Article
DE near infrared spectroscopy; rapid detection; quality assessment; aflatoxin B-1; paddy rice; partial least square regression
ID WATER ACTIVITY; RED PAPRIKA; MYCOTOXINS; PRODUCTS; MAIZE; FOODS
AB A rapid identification method for aflatoxin B-1 in paddy rice samples was developed by using near infrared spectroscopy under a wavelength range of 1 000-2 500 nm. Eighty paddy rice samples were collected from both natural and artificial infection with aflatoxin B-1 to build the calibration models based on the partial least square regression method. The best predictive model to detect aflatoxin B-1 in paddy rice was obtained using standard normal variate detrending spectra, with a correlation of 0.850, and a standard error of prediction of 3.211%. Therefore, the result showed that near infrared spectroscopy could be a useful instrumental method for determining aflatoxin B-1 in paddy rice. The near infrared spectroscopy methodology can be applied to the monitoring of aflatoxin fungal contamination in postharvest paddy rice during storage and may become a powerful tool for the safety of grain and grain products.
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FU National 12th Five-Year Plan for Science & Technology Support Fund [2012BAK08B04-02]
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PT J
AU Yao, XM
Lu, SW
Zheng, XZ
Sun, JK
Ren, CY
Zhang, YL
Xie, XJ
Sun, XD
AF Yao Xinmiao
Lu Shuwen
Zheng Xianzhe
Sun Jingkun
Ren Chuanying
Zhang Yinglei
Xie Xuejun
Sun Xiangdong
TI Effect of cooking conditions on quality of sweetened adzuki an
SO INTERNATIONAL JOURNAL OF AGRICULTURAL AND BIOLOGICAL ENGINEERING
LA English
DT Article
DE sweetened adzuki an; quality; cooking conditions; processing; sensory evaluation
ID SPONTANEOUSLY HYPERTENSIVE-RATS; BEANS PHASEOLUS-VULGARIS; GEL-FORMING ABILITY; VIGNA-ANGULARIS; STORAGE TIME; WALLEYE POLLACK; AZUKI; SALT; PROTEIN; MEAT
AB To produce high sensory quality sweetened adzuki an, the effects of cooking conditions including cooking time, heating power, sugar soaking time and soaking liquid pH on textural properties and sensory scores were evaluated using central composite experimental method. Blanching treatment and sodium tripolyphosphate were adopted to improve the mouthfeel of the whole bean an product. Results showed that the optimal parameters were as follows: cooking time of 50 min, heating power of 1.1 kW, sugar soaking time of 2 h and soaking liquid pH of 8.0, which resulted in the highest sensory score of 89.6. In this study, the effectiveness of the method to process sweetened whole bean adzuki an was validated and a sensory evaluation method for whole grain adzuki an product was developed.
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FU National "948" project of Ministry of Agriculture, P.R. China
FX This study was financially supported in part by the National "948" project of Ministry of Agriculture, P.R. China.
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AU Wang, YK
AF Wang Yingkuan
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RP Wang, YK (reprint author), Chinese Acad Agr Engn, Chinese Soc Agr Engn, Beijing, Peoples R China.
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