

INOPTEP 2009  **PTEP 2009**

**FIRST INTERNATIONAL CONFERENCE
SUSTAINABLE POSTHARVEST AND
FOOD TECHNOLOGIES
INOPTEP 2009**

**and
XXI NATIONAL CONFERENCE
PROCESSING AND ENERGY
IN AGRICULTURE**

PTEP 2009

April 21nd – 26th, 2009, DIVČIBARE, SERBIA

BOOK OF ABSTRACTS ZBORNIK REZIMEA

**PRVA MEĐUNARODNA KONFERENCIJA
ODRŽIVE POSLEUBIRAJUĆE I
PREHRAMBENE TEHNOLOGIJE
INOPTEP 2009**

i

**XXI NACIONALNA KONFERENCIJA
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ABSTRACTS

REZIMEI

(In alphabetical order - Po abecednom redu)

ANTIOXIDANT ACTIVITY OF SOME FRUIT PEELS ANTIOKSIDATIVNA AKTIVNOST KOD NEKIH OLJUŠTENIH PLODOVA VOĆA

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SUMMARY

The objective of this study was to determine the major antioxidants of different organic solvents and antioxidant activity of some fruit peels (apple, banana and orange). Results indicated that methanol extracts of all samples were significantly higher ($P \leq 0.05$) in either extraction yield % or total polyphenols if compared with the other solvents. The extracts of sample showed that the higher source of polyphenols, flavonoids, flavonols and antioxidant measured by DPPH and ABTS⁺ scavenging radical activity. On the other hand, there positive correlation between antioxidant activity and total phenolics was observed. Apple peels had significantly higher level of antioxidants and antioxidant activity, followed by banana and orange peels. Moreover, apple peels showed similar antioxidant activity when compared with BHT; therefore it was rich source natural antioxidant and could be replacement by synthetic antioxidants.

Key word: Fruit, Peels, Antioxidants, Polyphenols, Flavonoids, DPPH, ABTS.

FOOD LOSSES FROM FIELD TO FORK: SCOPE, ENVIRON- MENTAL CONSEQUENCES AND CHALLENGES FOR THE FOOD INDUSTRY

GUBICI HRANE OD NJIVE DO VILJUŠKE: DOMETI, POSLEDICE PO OKOLINU I IZAZOVI ZA INDUSTRIJU HRANE

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SUMMARY

Losses occur at every stage of the food system, from farming, processing, retail to consumer and food service. Food losses translate into a tremendous strain on the economy and the environment. Moreover, cutting losses could add a sizeable quantity to the global food supply, thus reducing the need to intensify production in the future. Yet, surprisingly, little solid information exists on the precise amount of losses along the entire value chain for food products. This is partly due to the fact that losses vary greatly by crop, country and climatic region, and to the methodological issues pertaining to the assessment of food production and losses. This article discusses published estimates of food losses at specific stages of the value chain in developed and developing countries. Besides, it explores the monetary and environmental consequences of food losses and discusses the scope for optimization.

Key words: food waste, post harvest losses, food industry, retail, households

ESTIMATION OF AN APRICOT (*Prunus armeniaca*) HALVES SURFACE AREA

IZRAČUNAVANJE POVRŠINE POLUTKI KAJSIJE (*Prunus armeniaca*)

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SUMMARY

The surface area of any biomaterials is necessary data when heat and mass transfer are figured out. Two mathematical models for apricot halves surface area predicting are presented in the paper, based upon fruit dimensions estimation. The length, height and width of 30 apricots and stones samples have been measured. Additionally, the real surface area of 5 control fruit halves and stones were appraised too, by the help of narrow adhesive tapes. The first mathematical calculus is done according to assumption that apricot fruit shape is similar to ellipsoid. Therefore, this model has been used for counting an apricot halves surface area. The difference of surface area between predicting ellipsoid model results and real measured surface area values is 2%. When correlation matrix for apricot three dimensions applies, the confirmation of dependency between commodity heights with other two fruit dimensions is reached. That statement has been used for another mathematical model for apricot surface area creation. The advantage of second reorganized ellipsoid model is in simplicity, only one apricot dimension, height is necessary to be measured. An error which occurs when comparing second model results and measured surface area of apricot halves is 4.8%. It has been emphasized that second model is more practical useful, regardless of a larger results dispersion, therefore suitable for further usage.

Key words: surface area, apricot.

REZIME

Poznavanje površine biomaterijala je neophodno u svim slučajevima kada se analiziraju transporti toplote i materije između njih i radnog fluida. U radu su prezentovana dva matematička modela za izračunavanje površine polutki kajsije, koji su rađeni na osnovu merenja sve tri dimenzije plodova. Dužina, visina u širina celog ploda i koštice su mereni na 30 uzoraka. Pored toga, uzorak od pet celih kajsija je poslužio za merenje stvarne površine plodova metodom nalepljivanja uzanih papirnih traka. Prvi matematički model je urađen tako što se pošlo od pretpostavke da je oblik ploda kajsije ličan elipsoidu. Zbog toga je elipsoidni model prezentovan na definisanje površine polutki kajsije. Razlika u površini polutki kajsija dobijena na osnovu rezultata elipsoidnog modela i stvarno izmerene površine iznosi 2%. Primenjena koleraciona matrica za dimenzije kajsije potvrdila je da postoji zavisnost visine ploda od ostalih dveju veličina dimenzije. Ovo saznanje je iskorišćeno za kreiranje drugog matematičkog modela. Prednost drugog modela je u njegovoj jednostavnosti, samo jedna dimenzija ploda kajsije, visina je potrebna da se meri. Greška koja se javlja pri poređenju rezultata računanja drugog modela i stvarno izmerenih vrednosti površina polutki kajsija je u ovom slučaju 4.8%. Zbog toga se zaključuje da je drugi model pogodniji za praktičnu primenu, bez obzira na veće rasipanje poređenih rezultata, te je pogodniji za dalju upotrebu.

Ključne reči: površina, kajsija.

SUSTAINABLE ENERGY MODEL OF THE SUCROSE SOLUTION CONCENTRATING

ODRŽIVI ENERGETSKI MODEL UGUŠĆIVANJA RASTVORA SAHAROZE

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SUMMARY

The osmotic drying in sucrose solution contributes to the decrease of energy consumption within the total energy balance of the combined fruit and vegetable drying. The utilised solution as a by-product of the technology represents a problem. The sustainability of the fruit drying technology depends on the solution recycling efficiency. The solution can be regenerated by two major means: the thermal evaporation and mechanical filtration. Due to sensitive colloidal admixture, the temperature of the thermal treatment has to be low so as to prevent undesirable chemical reactions. Nanofiltration is an energetically favourable method but the issue of its efficiency is posed due to its high procurement and filter replacement costs. The ecological issue of the used nanofilter disposal is inevitable. My personal researches have been aimed at cheap solar energy consumption for the purpose of the heat requirements of the combined technology. The original device for the evaporation of the sucrose solution has been designed based upon the air solar heating. It is an apparatus for thermodiffusion with a large volume of filling. The heated air and solution of alternating electrical current. The tests have been conducted with two kinds of fillings. The first filling is made of stainless steel shavings and the second comprises plates. The coefficient of thermal efficiency has been established. Favourable results have been obtained with stainless steel shavings filling, which can be applied to the practical device. With plates, the concentrating is possible provided there is an interspace of 30 mm or more between the plates. However, the efficiency of the device is considerably lower in comparison with the shavings filling. The lesser spacing between the plates leads to the interruption of the air flow due to the congestion between the plates. The specific heat energy consumption is around 5000 kJ/kg of the evaporated water with the shavings filling. The utilisation of the filling made of stainless steel shavings is recommendable due to its notably lower price.

Key words: osmotic dehydration, sucrose solution, evaporating, fruit, renewable energy sources

REZIME

Osmotsko sušenje u rastvoru saharoze doprinosi smanjenju energetske potrošnje u ukupnom energetskom bilansu kombinovanog sušenja voća i povrća. Iskorišćeni rastvor kao sporedni proizvod tehnologije predstavlja problem. Održivost ove tehnologije sušenja voća zavisa je od ekonomičnosti recikliranja rastvora. Rastvor se može regenerisati na dva osnovna načina: toplotnim postupkom uparavanja i mehaničkim postupkom filtriranja. Zbog osetljivih koloidnih primesa temperatura termičkog tretmana mora biti niska, kako nebi došlo do nepoželjnih hemijskih reakcija. Nanofiltracija je energetski povoljan metod, ali postavlja se pitanje eko-

nomičnosti zbog visoke cene nabavke i zamena filtera. Neizbežan je i ekološki problem odlaganja iskorišćenih nanofiltera. Sopstvena istraživanja usmerena su ka jeftinom korišćenju solarne energije za toplotne potrebe kombinovane tehnologije. Konstruisan je originalni uređaj za ishlapljivanje rastvora saharoze baziran na solarno zagrejanom vazduhu. To je termodifuzioni aparat koji ima veliku površinu ispune. Zagrejani vazduh i rastvor struje u suprotnim smerovima. Obavljena su ispitivanja sa dve vrste ispuna. Prva ispuna je od strugotine nerđajućeg čelika, a drugu čine tanjiri. Ustanovljen je koeficijent termičke efikasnosti. U slučaju ispune sa strugotinom dobijeni su povoljni rezultati, koji se mogu primeniti na praktičnom uređaju. U slučaju tanjira moguće je ugušćivanje u slučaju tanjira međusobnog razmaka 30 mm ili više. Međutim, efikasnost uređaja je znatno manje nego u slučaju ispune sa strugotinom. U slučaju manjeg razmaka između tanjira dolazi do prekida protoka vazduha zbog zagušenja između tanjira. Specifična potrošnja toplotne energije je oko 5000 kJ/kg isparene vode u slučaju ispune sa strugotinom. Preporučuje se korišćenje ispune od strugotine od nerđajućeg čelika zbog znatno niže cene.

Ključne reči: osmotsko sušenje, rastvor saharoze, uparavanje, voće, obnovljivi izvori energije

SVEOBUHVAATNA ANALIZA GODIŠNJEG ZAGREVANJA STAKLENIKA ZA UZGOJ POVRĆA

COMPREHENSIVE ANALYSIS OF GREENHOUSE HEATING FOR ANNUAL VEGETABLE GROWING

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REZIME

Vegetacija se normalno razvija pri usklađenosti svih faktora spoljnog okruženja. Dakle, ostvarenje visokokvalitetnih proizvoda u stakleniku zavisi od optimalnog režima uzgoja, specifičnog za sve biljne vrste. Fotosinteza, tj. biljna apsorpcija sunčevih zraka sa njihovom transformacijom u kompleks organskih komponenti-ugljeni hidrati, u najvećoj meri zavisi od stepena i vremena osvetljenosti. Agrobiološkim posmatranjem ustanovljeno je da normalan razvoj većine povrtarskih biljnih vrsta (krastavac, paradaiz, itd.), zahteva ukupnu osvetljenost 8.000 do 10.000 luksa pri prosečnom periodu 10 h tokom 24 h.

Ključne reči: staklenik, zagrevanje, povrće, analiza.

SUMMARY

The vegetation normally develops when all factors of outdoors environment takes favorable effects. Therefore, achievement of the final products high quality in greenhouses depends on needed optimal growing regime specific for all plant species. Photosynthesis, i.e. plants sunrays absorption and theirs transformation into complex organic components-carbohydrates, to a grate extent depends on level and period of illumination. By agrobiologic observation it's established that for normal development of majoriti truck farming plants (cucumber, tomatoes etc.), total illumination of 8.000 to 10.000 lux with average active periods of 10 h during 24 h.

Key words: greenhouse, heating, vegetable, anlysis.

FLOW CHARACTERISTICS OF POWDERED INFANT FORMULA

KARAKTERISTIKE TEČENJA POČETNOG MLIJEKA U PRAHU ZA DOJENČAD

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SUMMARY

Infant formula is a synthetic version of mother's milk and belongs to a class of materials known as dairy substitutes. In addition to nutritional value, safety, flavour, colour and ease of use, modern consumers are now looking for extra convenience in terms of improved reconstitutive properties, dustless powders and easy dosing. To help prevent some of the main issues concerning powdered infant formula production and handling, it is very important to determine its flow characteristics. This paper presents a characterization of the flow properties of 3 different infant formula samples. Cohesion index, compaction index, powder flow speed dependency and caking properties were determined using Stable Micro Systems Powder Flow Analyzer which operates with the TA.XT Plus Texture Analyzer manufactured by Stable Micro Systems, Surrey, UK. Particle size was determined using conventional sieving analysis, while bulk density was determined in a beaker using a calliper and a laboratory scale. The relationship between particle size, bulk density and flow characteristics was identified and discussed.

Key words: infant formula, flow properties, powders.

REZIME

Početno mlijeko za dojenčad je sintetička verzija majčinog mlijeka i ubraja se u kategoriju prehrambenih proizvoda poznatih kao specijalni mliječni pripravci. Uz hranidbenu vrijednost, sigurnost, okus, boju i lakoću upotrebe, današnji potrošači imaju i dodatne zahtjeve vezane uz dobro otapanje praha, prah koji se ne praši (dustless powder) i prah koji je lako dozirati. Da bi se spriječili glavni problemi vezani uz proizvodnju praškastog početnog mlijeka za dojenčad vrlo je bitno utvrditi njegove karakteristike tečenja. U ovom radu okarakterizirana su svojstva tečenja 3 različita uzorka početnog mlijeka za dojenčad. Indeks kohezije, indeks sabijanja, ovisnost o brzini tečenja i sposobnost stvaranja bloka utvrđeni su pomoću Stable Micro Systems Powder Flow Analyzera u kombinaciji s TA.XT. Plus Texture Analyzerom, proizvođača Stable Micro Systems, Surrey, Velika Britanija. Veličina čestica utvrđivana je granulometrijskom analizom, dok je nasipna gustoća određivana usipavanjem uzorka u laboratorijsku čašu te mjerenjem visine sloja pomičnom mjerkom i mase laboratorijskom vagom. Utvrđena je povezanost veličina čestica, nasipne gustoće i karakteristika tečenja, o kojoj se u radu i raspravlja.

Ključne riječi: početno mlijeko za dojenčad, karakteristike tečenja, prahovi.

DESIGN AND CHARACTERISTICS OF A RFID -TRACER FOR MARKING CEREAL BATCHES

REŠENJE I KARAKTERISTIKE RFID TRASERA ZA OBELEŽAVANJE MASE ZRNA

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SUMMARY

The traceability of many products can be realized easily but there is needed optimisation for cereals which are usually transported as a bulk good. One possibility is given by RFID-Tracern (radio frequency identification) so-called corn dummies. These corn dummies shall remain in the cereal batches from the combine until shortly before the processing in a mill. The design and the characteristics of the corn dummy are important for a save marking of the cereal batches. The corn dummy must correspond to the cereals approximately, so that no re-mixing takes place.

The section agricultural engineering in Goettingen has developed different corn dummies to test these on its suitability to mark different batches. The main differences are the form and the density. The experiment described here investigated the characteristics of the aforementioned corn dummies in winter wheat under conveying conditions. The corn dummies were mixed with winter wheat. Each of these mixtures were transported vertically in an elevator and then horizontally in a chain trough conveyor. Finally, the mixtures were made to slip over a 45°-angled tube and fall freely over a short distance on to the floor. The three-dimensional distribution of the dummies in the grain heap was determined using a sample divisor. The result shows that the density has a greater influence of the remixing as the form. In addition, a density analogue to the density of the winter wheat is to prefer for the marking of the wheat batches.

Key words: RFID, traceability, bulk goods, tracer.

ADHESION OF BREWERY YEASTS ON CHAMOTTE CARRIERS WITH CHEMICALLY MODIFIED SURFACES

PRIJANJANJE PIVSKOG KVASCA NA ŠAMOTNE NOSAČE SA HEMIJSKI MODIFIKOVANOM POVRŠINOM

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SUMMARY

Immobilization of microorganisms on specific carriers become an important technical solution applied now days in many biotechnological processes.

The leading idea of our research was to study how the surface of ceramic carriers made from chamotte with specific siloxanes can effect immobilization of yeast cells and its physiological state.

Industrial strains of top (*Saccharomyces cerevisiae*) and bottom (*Saccharomyces pastorianus*) fermenting yeasts from NCYC Cultures (England) were used in this study with immobilization performed in three different systems: 24 hrs incubation of chamotte tablets with yeast suspension in wort broth or in Ringer solution with two following passages in fresh culture medium, or 168 hrs incubation in wort broth.

In all experiments, for the stimulation of the number of adhered cells and effectiveness of immobilization, microscopic method and methylene blue staining (score method) were applied. The immobilization efficiency for 4 from 6 applied strains was higher on modified surfaces in the case of N,N-dimethyl-N-(2-hydroxyethyl) aminopropyltrimethoxysilane. The immobilization after 168 h starvation was weak. The significant differences between type of applied yeast (top or bottom fermenting strains) and the rate of adhesion were not observed. Therefore we can conclude, that the optimal adhesion conditions should be estimated individually for each strain, solid carrier and fermentation process.

Key words: brewery yeasts, chemically modified.

MICROWAVE PRE-TREATMENT FOR ENHANCING OF BIOGAS PRODUCT AND BIODEGRADABILITY OF FOOD INDUSTRIAL SEWAGE SLUDGE

MIKROTALASI KAO PREDTRETMAN RADI POVEĆANJA PROIZ- VODNJE BIOGASA I BIORAZGRADIVOSTI OTPADNOG TALOGA IZ PREHRAMBENE INDUSTRIJE

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SUMMARY

A large scale development was experienced in the last few decades in the water management technology and hereby the cleaning efficiency could be in a large measure improved, but simultaneously the quantity and the environmental risk of emitted sewage sludge increased. Nowadays requires of biomass based energy sources have led to the utilization of organic content of sludge for biogas producing. The controlled biological degradation of organic matters is limited by toxically matter and persistent chemical from waste water treatment technology, and however many kind of organic compound is less biodegradable. One of the possibilities of enhancing biodegradability is to transform the organic compounds into more water soluble forms by different type of pre-treatments. Our work focused on the microwave pre-treatment of food industrial sewage sludge. The aerobic biodegradability, changing of ratio of soluble organic compounds and the biogas production of the microwave pre-treated municipal and food-industrial sewage sludge were examined. Our results showed that the microwave irradiation is successfully adjustable and utilizable technique in sewage sludge handling. Applying of microwave pre-treatment the solubility of organic matter content increased and therefore the aerobic biodegradability enhanced and the biogas production of sludge increased also.

Key words: sewage sludge, microwave pre-treatment, biogas, biodegradability.

TRITICUM AESTIVUM SPP. SPELTA – THE POTENTIAL FOR THE ORGANIC WHEAT PRODUCTION

TRITICUM AESTIVUM SPP. SPELTA – POTENCIJAL ZA ORGAN- SKU PROIZVODNJU PŠENICE

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SUMMARY

Spelt (*Triticum aestivum* subsp. *spelta*) is an ancient wheat that is currently grown marginally and mainly for organic foods. The grain samples were collected from Hungary, Austria and Serbia in order to establish organic field trials. The spelt flours were used to evaluate the chemical composition and the functional properties. The Hungarian spelt population, Ekö10 had the highest protein (17.5% d.b.) and the gluten content (46%), whereas the Serbian cultivar Nirvana had the highest gluten index. Parameters obtained by the Mixolab[®] dough mixer were submitted to determine the single effect of protein and starch qualities on thermomechanical properties of spelt dough.

Key words: Kernel of *Triticum aestivum* subsp. *spelta*, physical, chemical and rheological properties.

REZIME

Spelta (*Triticum aestivum* subsp. *spelta*) je stara podvrsta pšenice koja se u poslednje vreme sve češće gaji za organski seertifikovanu proizvodnju hrane. Uzorci tri sorte spelte prikupljeni su u Mađarskoj Austriji i Srbiji u cilju postavljanja mikroogleda na organski sertifikovanim površinama. Nakon mlevenja, brašno dobijeno od sva tri genotipa spelte je ispitivano na hemijski sastav i funkcionalna svojstva. Mađarska sorta spelte (Ekö 10) imala je najviši sadržaj proteina (17,5%) i glutena (46%), dok je srpska sorta Nirvana imala najveći gluten indeks. Parametri dobijeni pomoću Mixolab[®] analizatora su korišćeni za određivanje uticaja kvaliteta proteina i skroba spelte na termomehanička svojstva testa.

Ključne reči: Zrna *Triticum aestivum* subsp. *spelta*, fizička, hemijska i reološka svojstva.

THERMAL CONDUCTIVITY AND THERMAL DIFFUSIVITY VALUES OF FOODS

VREDNOSTI KOEFICIJENATA PROVOĐENJE TOPLTE I KOEFI- CIJENTA TOPLOTNE DIFUZIJE HRANE

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SUMMARY

For food industry is very important to protect high quality during processing from biological materials to final food products. Processing and manipulation with biological materials have significant influence on its physical characteristics. Physical parameters values and development of physical characteristics can determine condition of biological materials. Food industry engineers need to know mainly mechanical and thermophysical parameters because these are changed continuously during the processing and manipulation. The article deals with some thermophysical parameters of different biological materials (food raw materials and final food materials). There were measured thermal conductivity and thermal diffusivity of granular materials, selected vegetables and fruits and also liquids and suspensoid materials. This paper reports the thermal conductivity - temperature and thermal diffusivity – temperature relationship and for granular materials moisture content relations. There were measured two temperature ranges according to experimental materials. There were find two types of thermophysical characteristics progresses (linear or polynomic). It strongly depends on structure and character of measured material. All results are summarised in tables and graphs.

Key words: food, biological material, thermal conductivity, thermal diffusivity, temperature.

DECONTAMINATION OF FOOD-RELATED SURFACES BY PHOTOSENSITIZATION

DEZINFEKCIJA POVRŠINA KOJE SU U KONTAKTU SA HRANOM METODOM FOTOSENZITIVNOSTI

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SUMMARY

The use of effective decontamination technique on surface-attached microbes minimizes risks of foodborne diseases, enhances microbiological safety of product and expands its shelf-life. This study deals with the development of novel approach to decontaminate packaging from food pathogens by photosensitization.

For this purpose packaging samples with adhered pathogen were submerged Chlorophyll derivative solution (1.5×10^{-5} M) for 5 min. and afterwards illuminated with 20 mW/cm² ($\lambda=400$ nm) light for 20 min up to the total dose 24 J/cm². Gram-positive *Bacillus cereus* as well as *Listeria monocytogenes* was inactivated by 3-4 log, depending on experimental conditions. Inactivation of *Listeria* biofilms by 1.7-3.1 log indicate that this treatment has potential to combat biofilms. Moreover, obtained data indicated that the bacillus spores are susceptible to this treatment as well. The spore population on the surface of packaging material was reduced by 3.8 log after photosensitization.

In conclusion, our data support the idea, that photosensitization is effective non-thermal and not-chemical antibacterial treatment, which inactivates food pathogens *Bacillus cereus* and *Listeria monocytogenes* as well as spores and biofilms on the surface of packaging material and has potential to be useful in the development of novel food safety technologies.

Key words: decontamination of packaging, photosensitization.

REALIZATION OF INDUCTION MACHINE SPEED CONTROLLER USING DUAL MAMDANI FUZZY LOGIC CONTROLLER

REALIZACIJA INDUKCIONOG KONTROLERA BRZINE KORIŠĆENJEM DUAL MAMDANI FAZI LOGIČNOG KONTROLERA

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SUMMARY

Although PID controller is most frequently used controller in industry, fuzzy logic controllers with artificial intelligence are more and more popular nowadays, because of their design which includes human reasoning and logic in controlling algorithms. Progress of semiconductor technology gives us cheap static frequency converters which have made theory of vector control possible. Thanks to that we may use induction machines as an adjustable speed drives today. This paper deals with speed control of an induction machines using PI-like fuzzy controller. It recognizes advantages of fuzzy controller toward conventional controllers. Further, it explains design of dual fuzzy logic controller. Two Mamdani fuzzy controllers were designed in Matlab fuzzy logic interface and their outputs were lined-up in parallel. One controller reacts on large errors and controls the system in transition period, while other reacts on small error changes and controls the system in steady state. Paper presents software development environment, rule base and membership functions of fuzzy controllers and experimental test drive. First test was actually a computer simulation which has given first good results. Later, speed control of induction machine using this type of fuzzy control was experimentally tested on laboratory test drive. Results were recorded with optical encoders and presented.

Key words: speed control, induction machine, fuzzy logic, automatic control.

REZIME

Premda je PID regulator najčešće korišćen regulator u industriji, regulatori bazirani na rasplinutoj logici i veštačkoj inteligenciji postaju danas sve popularniji pošto se njihovi upravljački algoritmi baziraju na ekspertskom znanju i oponašanju ljudskog razmišljanja. Napredak poluprovodničke tehnologije obezbedio je jeftine pretvarače frekvencije koji su omogućili praktičnu realizacije teorije vektorskog upravljanja. Zahvaljujući tome danas se asinhroni motor koristi u pogonima promenljive brzine. Ovaj rad se bavi problemom regulacije brzine asinhronog motora primenom regulatora baziranog na rasplinutoj logici i PI zakonu upravljanja, tako da su u radu pokazane prednosti regulatora baziranih na rasplinutoj logici u odnosu na klasične regulatore. Dalje, u radu je objašnjen princip projektovanja dualnog regulatora baziranog na rasplinutoj logici. Projektovana su dva Mamadani regulatora koji rade u paraleli. Jedan regulator reaguje na velike vrednosti greške i upravlja sistemom u prelaznom režimu, dok drugi reaguje na male vrednosti greške i upravlja sistemom u stacionarnom stanju. U radu je prikazano razvojno softversko okruženje, baza pravila i funkcije pripadnosti projektovanih regulatora, kao i eksperimentalno postrojenje. Prvi test je izveden računarskom simulacijom, i to je dalo dobre rezultate. Kasnije su izvedeni eksperimenti na laboratorijskom test sistemu regulacije brzine asinhronog motora. Rezultati su snimljeni optičkim enkoderom i prezentovani u ovom radu.

Ključne reči: regulacija brzine, asinhrona mašina, rasplinuta logika.

**APPLICATION OF BALANCE VALVE FOR CONTINUAL
MEASURING OF SUGAR WATER SOLUTION FLOW RATE**

**PRIMENA BALANSNOG VENTILA ZA KONTINUALNO MERENJE
PROTOKA RASTVORA ŠEĆERA I VODE**

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SUMMARY

The scope of this paper is continual measurement of volumetric flow rate of sugar water solution during evaporation process. This process is nonstationary, i.e. temperature and concentration change in time. Hence, flow rate measurement is pretty difficult. The aim of this research is to examine possibility to apply angle valve for continual flow rate measurement of sugar water solution in process of solution vaporization during which temperature and concentration rise in time. It is concluded that it is possible to use angle valve for successful flow rate measurement of sugar water solution. Angle valve simplify measurement, although more improvements could be expected.

Key words: sugar water solution, flow rate measurement, angle valve, evaporation of solution.

REZIME

Predmet istraživanja je kontinualno merenje protoka rastvora šećera i vode pri procesu uparavanja. Proces uparavanja je nestacionaran, temperatura i koncentracija menjaju se u vremenu. Merenje protoka je iz tog razloga veoma komplikovano. Cilj istraživanja je primena kosog regulacionog ventila za kontinualno merenje protoka rastvora šećera i vode. Zaključeno je da kosi regulacioni ventil može uspešno da se koristi za kontinualno merenje zapreminskog protoka rastvora šećera i vode. Primena kosog regulacionog ventila doprinosi pojednostavlivanju merenja, ali postoji prostor da se postupak još više pojednostavi.

Ključne reči: rastvor šećera i vode, merenje protoka, kosi regulacioni ventil, uparavanje rastvora šećera i vode.

**EFFECT OF PULSED ELECTRIC FIELD ON PHENOLIC ACIDS
EXUDATION FROM GRAPE (*VITIS VINIFERA*) SUSPENSION
CULTURE**

**EFEKT PULSACIONOG ELEKTRIČNOG POLJA NA IZLUČIVANJE
FENOLNIH KIESLINA IZ IZDVOJENE CULTURE GROŽĐA
(*VITIS VINIFERA*)**

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SUMMARY

Cell cultures provide a large potential for the production of secondary metabolites. Application of pulsed electric field (PEF) treatment causes membrane permeabilization, allowing loss of cell content or intrusion of external media. The use of PEF with very low intensity as an external stress source induces a stress reaction of the cells with a possible stimulation of secondary metabolite production.

Phenolic acids are compounds found in plants that have powerful antioxidant properties, generally considered to have a protective effect on coronary heart disease and cancer. Grape constitutes the major source of phenolic acids among different plants.

In this study, effect of PEF on phenolic acids exudation from grape (*Vitis vinifera*) suspension culture was investigated. Grape cell cultures were treated with PEF. Phenolic acids from the growing media on the 1st, 4th, 7th, 10th, and 13th days after PEF treatment were extracted and determined in high performance liquid chromatography (HPLC). The results show that, after the treatment with PEF, the phenolic acids concentrations in grape cell culture are higher than in the control.

Key words:

**THE EFFECT OF CONTROLLED ATMOSPHERE STORAGE
CONDITIONS ON SOME PHYSICAL AND SENSORIAL
CHARACTERISTICS OF APPLES**

**UTICAJ KONTROLISANE ATMOSFERE SKLADIŠTA NA NEKE
FIZIČKE I SENZORSKE OSOBINE JABUKE**

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SUMMARY

Freshness represents one of the main characteristics of consumer choice of fruits and vegetables. The apple storage by controlled atmosphere is a technique for quality fruit preservation involving careful control of temperature, oxygen, carbon dioxide and humidity. During storage in controlled atmosphere storing rooms for a long period fruits lose their freshness and some of their characteristics depreciate. The objective evaluation of the quality of fruits is a difficult task, mainly due to the fact that every single person is not necessarily influenced by the same attributes and that the quality scale may vary strongly from one person to another. In this article we characterized four types of apples stored in refrigeration industrial conditions concerning their freshness, smell, aroma, juiciness, crispness using sensorial analysis and some physical parameters as sugar content, ph and firmness.

**THE IDENTIFICATION OF SOME HYPOGLYCEMIC PROTEIN
FRACTIONS IN CELLULAR JUICE OF *Momordica Charantia L.*
FRUITS**

**IDENTIFIKACIJA DELOVA JEDNOG HIPOGLIKEMSKOG
PROTEINA U ĆELIJSKOM SOKU VOĆA *Momordica Charantia L***

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SUMMARY

Momordica charantia L. (Cucurbitaceae) is a plant native to Asia which possesses therapeutic properties, and has been used in traditional medicine for a long time. All plant parts have been used for treating various diseases: tumors, fevers, fungal infections of the skin, hypertension. But most of all, this species represents an important vegetable source of active compounds with a proved anti-diabetic action.

Among these compounds observed in this study, the presence of some protein fractions – polypeptide-p and peptide MC6 can be noticed in fruits. Researches were carried out on cellular juice of fresh fruits. The separation of all protein fractions and identification of compounds of interest were realized by SDS-PAGE electrophoresis.

Key words: *Momordica charantia*, polypeptide-p, peptide MC6, electrophoresis, SDS-PAGE.

ONE OF THE POSSIBILITY HOW TO USE AGRICULTURAL BIO- MASS BY-PRODUCTS AS FUEL

JEDAN OD NAČINA KORIŠĆENJA NUZPROIZVODA IZ POLJOP- RIVREDNE PROIZVODNJE KAO GORIVA

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REZIME

Sadašnja potrošnja energenata u Srbiji je na nivou od 15 miliona tona ekvivalentne nafte (Mtoe), a sa druge strane procenjeno je da Srbija raspolaže sa 3,2 Mtoe u obnovljivim izvorima energije, koji se koriste u zanemarljivoj količini. Od procenjene količine biomase (koja iznosi 2,6 Mtoe) 60% se odnosi na biomasu poljoprivrednog porekla, dok se 40% odnosi na šumsku biomasu. U radu je prikazano razvijeno postrojenje za sagorevanje balirane biomase po principu sagorevanja cigarete i dogorevanja koksnog ostatka u fluidizovanom sloju sopstvenog pepela. Prvo postrojenje-kotao ovog tipa, snage 1,5 MW je izgrađeno i pušteno u rad u poljoprivrednom kombinatu PKB. Prednost ovog načina sagorevanja je minimalan utrošak električne energije za pripremu goriva, zadovoljavanje ekoloških kriterijuma sagorevanja, niski eksploatacioni i investicioni troškovi i mogućnost potpune automatizacije rada postrojenja. Ovo postrojenje je razvijeno u Institutu Vinča.

Ključne reči: Obnovljivi izvori energije, biomasa, cigaretno sagorevanje.

SUMMARY

The Republic of Serbia consumes the amount of fuels equivalent to 15 million tons of oil per year (Mtoe). At the same time, the potential of the renewable energy sources is about 3.5 Mtoe/year. The main renewable source is biomass, with its potential of about 2.6 Mtoe/year, and 60% of the biomass source is agricultural biomass. Generally, this type of biomass is collected, transported and stored in form of bales. This paper presents one of the possibilities how to use this type of biomass – without any additional preparation – as fuel in furnaces and boilers with cigar burners. Furnaces and boilers with cigar burners were developed in the Institute Vinča.

Key words: Renewable energy sources, biomass, cigarette combustion.

CASE-STUDY OF POST-HARVEST TREATMENTS WITH 1-MCP ON WHOLE AND FRESH-CUT FRUITS

POSLEUBIRAJUĆE TRETIRANJE SVEŽE UBRANOG VOĆA GASOM 1-MCP: JEDNO ISTRAŽIVANJE

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SUMMARY

The postharvest gaseous application of 1-MCP has been shown to improve many physiological characteristics of fruits, such as reduced ethylene production and respiration, enhanced fruit firmness and acidity retention. The aim of the work presented in the case-study on whole fruit was to investigate the effects of a semi-commercial postharvest treatment with 1-MCP on the quality of Pink Lady apples as functions of fruit ripening stage, 1-MCP dose and storage time. The results obtained showed an important significance from the point of view of the commercial application of 1-MCP. They show that it is possible to choose the most suitable treatment conditions in terms of fruit maturity 1-MCP dose and storage time in order to meet the market/consumer needs and then in order to put in the market excellent fruit. In the case-study on fresh-cut fruit, the effects of 1-MCP treatment of pineapples in combination with packaging were studied. The results showed that 1-MCP treatment and MAP in a N₂O enriched atmosphere had a positive effect on the inhibition of respiration and ethylene production. From a microbiological viewpoint, N₂O MAP extended the shelf-life of the products of 3–4 days by increasing the lag phase of microbial growth.

SHELF LIFE AND STORAGE OF THE STRAWBERRY VARIETIES

SKLADIŠTENJE I OČUVANJE SVEŽINE VARIJETETA JAGODE

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SUMMARY

Freshly picked strawberry fruit can be stored for as much as 14 days under optimal circumstances. This involves regulated temperature, humidity, and atmosphere. It is of primary economic importance to know, however, the length of shelf life of the fruit under normal room air temperature (22°C). Nine different strawberry varieties were stored and tested the change of fruit quality as a function of storage days after harvest, without any additional treatment. Three forms of fruit quality losses were recorded independently: fruit weight loss, disease (*Botrytis cinerea*), and decay. While decay was identified to cause the majority of the quality loss, the varieties showed considerable differences in shelf life. All varieties kept the marketable quality during 2 days, but the quality loses rapidly after the next day. The sample of Nerina had only 20% deteriorated fruit after 4 days, but Polka, Elsanta, and Alba had 100% deterioration. Mara de Bois, Cirafine, Alba, and Cijosee had 20-35% amount of disease, but this was only 10-15% of the other varieties. The positive correlation was found between the water loss and the fruit decay. It was also found that earlier ripening varieties are more sensitive to *Botrytis* than those with medium, and late varieties.

Key words: strawberry varieties, shelf life, storage, water loss, decay, *Botrytis*

COMPARISON BETWEEN SUPERHEATED STEAM AND AIR DRYING OF MUSHROOMS

POREĐENJE SUŠENJA PEČURKI PREGREJANOM PAROM I VAZDUHOM

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SUMMARY

The aim of this paper was to compare superheated steam drying, so called airless drying, with air drying of mushrooms. Samples of the variety "agarica bisporus" were dried under atmospheric pressure at several levels of temperature and velocity of the drying media. Drying kinetics and the physical behaviour of the mushrooms were studied in both drying techniques. Re-hydration and browning of mushrooms were examined, as the quality criteria, in order to find out the optimum conditions of drying in each method.

Using hot air at a temperature of 70°C, as drying media, proved to be the best condition for a quality product. The temperature of the inversion point was determined at 157.5°C for mass velocity 1043 kg per m² per hr.

Key words: superheated steam drying, air drying, mushrooms, quality criteria, inversion point.

REZIME

Cilj ovog rada bio je upoređivanje sušenja pečurki pregrejanom vodenom parom - bezvadušno sušenje, sa sušenjem vazduhom – konvektivno sušenje. Uzorci pečurki sorte "agarica bisporus" sušeni su na nekoliko različitih nivoa temperature i brzine medija za sušenje pri atmosferskim pritiskom. Kinetika sušenja i promene fizičkih osobina pečurki su istraživani pri obe primenjene tehnike sušenja. Kao kriterijum kvaliteta sušenja upotrebljeni su vreme rehidracije i promena boje u cilju pronalazjenja optimalnih faktora sušenja za obeistraživane tehnike. Sušenjem zagrejanim vazuhom na 70°C dobijen je krajnji proizvod najboljeg kvaliteta. Temperatura tačke inverzije medija za sušenje je 157.5°C za maseni protok vazduha 1043 kg/m²/h.

Ključne reči: sušenje pregrejanom parom, sušenje vazduhom, pečurke, kriterijum kvaliteta, tačka inverzije.

STUDY OF THE DRYING CONDITIONS OF REED BIOMASS

ISTRAŽIVANJE USLOVA SUŠENJA TRSKE KAO BIOMASE

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SUMMARY

The objective of this work was to determine the most appropriate drying conditions of reeds (varieties Arundo Donax L and Arundo plimos) in order to use them for biomass energy. These plants have two main advantages; after their harvest they bud again without seed and they have high calorific value, almost equal to wood. The experiments took place in a prototype hot air batch drier. Several drying parameters, such as drying temperature, air recirculation and air flow rate, were tested. Drying rate as well as energy consumption vs. drying time was estimated in the experiments. The canebrakes, used in the experiments, were taken from reeds of several cane diameter, length, age and initial moisture content. The total energy consumption of the drying process was calculated, taking into consideration the heat at the inlet and outlet of the air, the heat loss of the drier, the heat of evaporation, and the heat for the product warming. The results of drying experiments determine the most appropriate drying conditions of reed in order to use them as biomass. Considering drying time and energy consumption, low temperatures and high percentage of air recirculation seems to be the most appropriate conditions to dry the reeds.

Key words: reed, drying, biomass, kinetic of drying, drying conditions.

AN OVERVIEW OF PHENOMENA MODELLING APPROACHES IN MIXED-FLOW DRYERS

PREGLED PRISTUPA MODELOVANJU FENOMENA PRENOSA U SUŠARAMA SA KOMBINOVANIM TOKOVIMA

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REZIME

U radu je izvršena analiza različitih pristupa modelovanju kombinovanih sušara za sušenje zrnastih materijala. Date su bilansne jednačine kojima se opisuju fenomeni prenosa u modelima kojima se opisuje proces sušenja u sušarama sa kombinovanim tokovima agensa za sušenje i zrnastog materijala, kao i komentari u vezi sa primenljivošću pojedinih pretpostavki i metoda rešavanja za neke od analiziranih slučajeva.

Analiza je započeta od osnovne podele na determinističke i stohastičke modele, a zatim je uglavnom dat pregled modela pravljenih po principu idealnog mešanja i istiskivanja. Navedena su i ograničenja različitog nivoa, koja se najčešće tiču odnosa pravaca strujanja agensa sušenja i sušenog materijala, dominantne vrste fenomena prenosa u pojedinim fazama, odnosno otpora pojedinim tipovima fenomena prenosa u jednoj ili više prisutnih faza u sušenom materijalu. U radu su takođe navedene i korišćene pretpostavke i uprošćenja napravljena u cilju omogućavanja dolaska do rešenja posmatranog modela, kao i problemi vezani za određivanje pojedinih parametara koji se koriste u bilansnim jednačinama modela. Izvršen je pokušaj sistematizacije postojećih modela uz komentare autora u vezi sa postojećim primenama.

Naveden je i pregled matematičkih metoda koje je moguće koristiti za rešavanje navedenih modela, uz komentare o pogodnosti upotrebe nekih od njih.

Ključne reči: sušenje u sušarama s kombinovanim tokovima, modelovanje, prenos toplote, prenos mase

SUMMARY

An analysis of different approaches to mixed-flow grain dryers is shown in this article. The governing equations describing transport phenomena in the models of the drying process in the dryers with mixed flows of drying agents and grain material and the comments connected with the applicability of some of the assumptions and the solving methods for some of the analyzed cases are given in this paper.

The analysis is started from the basic division on deterministic and stochastic models, followed with a review of models, lumped parameter and distributed parameter models, mostly. The limits of different levels are given, concerning mostly the ways of flow of the drying agents and the dried material, dominant type of transport phenomena in some of the existing phases or resistance to some of the transport phenomena types in one or more available phases in the dried materia.

In the article is also given a review based on different assumptions and simplifications made in order to made possible solution of the reviewed model, and the problems connected to establishment of different parameters used in the governing equations. It is made a systematization of existed models together with the authors' comments on existing applications.

A review of mathematical methods available for solving reviewed models, together with the availability for use of some of them is given, too.

Key words: mixed-flow drying, modelling, heat transfer, mass transfer

ASSESSING THE OVERALL EFFICIENCY OF BIOGAS PLANTS BY MEANS OF DATA ENVELOPMENT ANALYSIS (DEA)

OCENJIVANJE UKUPNE EFIKASNOSTI BIOGAS POSTROJENJA UZ POMOĆ DATA ENVELOPMENT ANALYSIS (DEA)

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SUMMARY

Considering the large number of biogas plants in Germany, the need exists for comparing the plants and identifying those who are operating efficiently. Since the operation of a biogas plant is complex and influenced by many parameters, multi-criteria analysis should be applied. For this purpose, the method of Data Envelopment Analysis (DEA) was used. Evaluation in DEA of 10 biogas plants in Bavaria provided results which were mostly in accordance with analysts' expertise. Due to the complexity of the biogas production process, a single measure of overall efficiency can hardly be determined.

Keywords: Biogas plant; Efficiency; Data Envelopment Analysis.

REZIME

S obzirom na brojnost biogas postrojenja u Nemačkoj, postoji potreba za njihovim poređenjem i identifikovanjem onih koja rade efikasno. Pošto je rad biogas postrojenje kompleksan i zavisi od mnoštva parametara, potrebno je da se koristi višekriterijumska analiza. U tu svrhu, primenjen je metod Data Envelopment Analysis (DEA). Ocenjivanjem 10 biogas postrojenja u Bavarskoj u DEA, pokazano je da se dobijeni rezultati u većini slučajeva slažu sa ekspertizom analitičara. Zbog kompleksnosti procesa proizvodnje biogasa, teško je odrediti jedinstvenu meru ukupne efikasnosti.

Ključne reči: biogas postrojenje; efikasnost; Data Envelopment Analysis.

ANALYZE OF THE POWER CONSUMPTION DURING THE PROCESSING OF LUCERNE SEED OF THE DIFFERENT PURITY

ANALIZA UTROŠKA ELEKTRIČNE ENERGIJE PRI DORADI SEMENA LUCERKE RAZLIČITE ČISTOĆE

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SUMMARY

The emerging problem of energy deficiency and the rising prices of energents, as well as deficiency of food, stipulate that during small grained legumes processing attention should be paid on saving up the electric power.

In the processing of small grained legumes, output is in direct dependence with percent of weed species and of presence of the other particles in naturalized seed. High percent of purity of naturalized lucerne seed does not always guarantee for high processing output, even if percent of weed is small, it primary depends on species of present weed in naturalized seed. High content of weed in high purity natural lucerne seed decreases total amount of processed seed, which also makes it more difficult and more expensive.

In this study, analyze of power consumption during processing of natural lucerne seed of different purity is given. Process of cleaning was done using the same system of machines.

Keywords: power, seed processing, lucerne, machine system

REZIME

Sve aktuelniji problem nestašice i visoke cene energenata, kao i nedostatak hrane, uslovljava da se prilikom procesa dorade semena sitnozrnih leguminoza posveti maksimalna pažnja uštedi energije.

U procesu dorade semena sitnozrnih leguminoza visina randmana direktno zavisi od zastupljenosti korovskih vrsta i ostalih primesa u naturalnom semenu. Visok stepen čistoće naturalnog semena lucerke nije uvek garancija i visokog randmana dorade, čak i pri malom sadržaju korova, već on prvenstveno zavisi od vrste prisutnih korova u naturalnom semenu. Veći sadržaj štetnih korova u naturalnom semenu lucerke sa visokom čistoćom smanjuje ukupnu količinu doradenog semena, otežava i poskupljuje doradu.

U radu je data analiza utroška električne energije prilikom dorade naturalnog semena lucerke različite čistoće pri čemu se dorada obavljala na istom sistemu mašina.

Ključne reči: električna energija, dorada semena, lucerka, sistem mašina.

IMPORTANCE OF CARRIER FOR FEED PREMIXES PRODUCTION

ZNAČAJ NOSAČA U PROIZVODNJI PREMIKSA

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SUMMARY

Production of feed premixes is significant aspect of feed production. Even the premixes are designed for market or used directly for feed production, it is necessary to achieve homogeneity of all ingredients at 1:100.000 ratio. Different kind and quantities of microingredients has used depends on species and categories of animals but in whole quantity of product, carrier takes a remarkable part. According to mentioned requirements, it is necessary to assure carrier with suitable physical and chemical properties. Different kind of carriers and their combination have been examined as well as homogeneity of premixes. Results are shown through the coefficient of variation.

INFLUENCE OF STORAGE ON THE RHEOLOGICAL PROPERTIES OF NECTARINE (*Prunus persica* var. *Nucipersica l*) PUREE

UTICAJ SKLADIŠTENJA NA REOLOŠKA SVOJSTVA KAŠE NEKTARINE (*Prunus persica* var. *Nucipersica l*)

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SUMMARY

Nectarine is a subspecies of the peach which comes in summer, and is very advantageous because of high content of β -carotene. Like any other fruit it can be processed into half-product (puree, pulp), or final product (jelly, juice, marmalade). The primary objective of this research was to determine how the time of storage and storage conditions affect rheological properties of nectarine puree. Rheological properties are shown as the rheological parameters and indicate consistency and viscosity, which are essential quality parameters of food products (or half-products). The measurements were carried out by rotation Rheometer, model VT550 362-0001 HAAKE at 20°C and shear rates 0-60 s⁻¹. The samples were kept at room temperature, in the refrigerator and in the freezer, during the period of 4 months. The results are presented graphically as the dependence of shear stress upon shear rate, and as a table which contains consistency coefficient and flow behaviour index. It is shown that consistency of all samples declines during storage time. The biggest change is in the samples stored in the freezer. Shear stress also declines during the storage time, most in the samples stored in the freezer.

Key words: nectarine, fruit puree, rheology, storage.

REZIME

Nektarina je podvrsta breskve, dospevaju u leto i veoma su preporučive upravo tada zbog dobrog sadržaja beta karotena. Na tržištu se pojavljuje kao gotovi proizvod (kompot, pekmez, sokovi) ili poluproizvod (kaša, pulpa). Cilj ovoga istraživanja je utvrditi kako vreme i uveti skladištenja utiču na reološka svojstva kaše. Reološka svojstva iskazana kao reološki parametri ukazuju na konzistenciju i viskoznost, i bitni su parametri kvaliteta nekog proizvoda ili poluproizvoda. Merenje je izvršeno na 20°C pri brzinama smicanja 0-60 s⁻¹ na rotacionom reometru VT550 362-0001 HAAKE sa koncentričnim cilindrima. Merenja uzoraka koji su skladišteni na sobnoj temperaturi, u hladnjaku i zamrzivaču su provedena kroz 4 meseca. Rezultati su prikazani grafički kao ovisnost napona smicanja o brzini smicanja i tablično kao koeficijent konzistencije i indeks tečenja. Utvrđeno je da skladištenjem znatno opada konzistencija svih uzoraka, najviše u zamrzivaču, a najmanje u hladnjaku. Također je merenjem utvrđeno da napon smicanja opada tokom vremena skladištenja što je najviše vidljivo na uzorcima skladištenim u zamrzivaču.

Ključne reči: nektarina, voćna kaša, reologija, skladištenje.

NUTRITIONAL QUALITY OF DARK BREAD ON THE DOMESTIC MARKET

PREHRAMBENI KVALITET CRNOG HLEBA NA NAŠEM TRŽIŠTU

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SUMMARY

The number of strong epidemiological evidences suggest that a diet based on products made from wholegrain or less refined grains has a protective effect against diseases. The beneficial health effect is due to the presence of many biologically active compounds in the outer layer and germ fraction of the grain, such as fibres, phenolic acids, minerals, vitamins of B group, tocopherols, phytic acids, etc. Therefore, higher intake of products made from wholegrain or flour from higher extraction rates is recommended. This recommendation especially concerns bread with regards to its high consumption rate in Serbia.

The paper gives an overview of the nutritional quality of dark bread present on the Serbian market. Beside the quality parameters ordered by the current regulation and the basic chemical composition, content of dietary fibres and phytic acid were also included in the study as being important parameters to determine this product category. Data obtained were used to make a rough estimation to what extent dark bread could contribute to the intake of fibres. The obtained results were compared to the control sample of true dark bread and coloured i.e. false dark bread prepared in a laboratory bakery.

Key words: dark bread, quality, chemical composition, dietary fibres, phytic acid.

REZIME

Niz epidemioloških studija je ubedljivo pokazao da ishrana koja se bazira na proizvodima od celog zrna žita ili od tamnijih vrsta brašna ima značajnu ulogu u zaštiti od brojnih bolesti savremenog čoveka. Zaštitni efekat potiče od prisustva brojnih biološki aktivnih jedinjenja prisutnih u klici i mekinjama kao što su vlakna, folati, fenolne kiseline, mineralne materija, tokoferoli, vitamini grupe B, fitinska kiseline, itd. Iz tog razloga se preporučuje veći unos proizvoda od tamnijih i integralnih brašna. Ova preporuka se naročito odnosi na hleb, s obzirom na njegovu visoku potrošnju kod nas.

U radu je dat pregled pokazatelja prehrambenog kvaliteta crnog hleba prisutnog na domaćem tržištu. Pored pokazatelja kvaliteta propisanih važećim pravilnikom i osnovnog hemijskog sastava, određen je sadržaj prehrambenih vlakana i fitinske kiseline kao važnih parametara koji determinišu prehrambeni kvalitet ovog tipa proizvoda. Izvršena je procena u kojoj meri ova grupa proizvoda doprinosi unosu dnevno preporučene količine prehrambenih vlakana. Takođe je ukazano na pojavu da se na našem tržištu pojavljuju falsifikati crnih hlebova. Dobijeni rezultati su upoređeni sa kontrolnim uzorkom pravog crnog i "obojenog" tj. falsifikovanog crnog hleba.

Ključne reči: crni hleb, kvalitet, hemijski sastav, prehrambena vlakna, fitinska kiselina.

EFFECT OF OSMOTICALLY DEHYDRATED APPLES AND PLUMS IN SUGAR BEET MOLASSES ON DOUGH THERMO-MECHANICAL PROPERTIES AND BREAD QUALITY PARAMETERS

UTICAJ OSMOTSKI DEHIDRIRANE JABUKE I ŠLJIVE NA TERMO- MEHANIČKE OSOBINE TESTA I KVALITET HLEBA

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REZIME

Cilj rada je bio da se ispita uticaj dve doze (5 i 10%) praškastog dodatka osmotski dehidrirane jabuke i šljive na termička i mehanička svojstva testa kao i na osobine gotovog hleba. Svi dodaci su uticali mehanička svojstva testa kao i na njegovo ponašanje tokom zagrevanja. Dodaci su smanjivali apsorpciju vode, produžili razvoj testa i smanjili stabilitet. Elastičnost testa je ostala nepromenjena pri nižim dozama dodatka. Dodaci su delovali u pravcu slabljenja proteinskih veza u testu u odnosu na kontrolni. Dodaci su nisu narušavali sposobnost želatinizacije skroba u testu ali su je usporavali. Dobijeni podaci ukazuju da niže doze dodatka ne bi trebalo da utiču na pogoršanje svežine sredine hleba. Specifična zapremina hleba se značajno smanjila osim kod hleba sa dodatkom 5% dehidrirane jabuke u melasi. Po čvrstoći sredine, od kontrolnog hleba se nije razlikovao samo uzorak sa dodatkom 5% jabuke. Dodaci nisu delovali na značajno smanjenje elastičnosti sredine. Hlebovi sa dodacima su imali tamniju boju kore i sredine i izraženu aromu na karamel.

Ključne reči: hleb, Mixolab, čvrstoća, elastičnost, melasa.

SUMMARY

The objective of this paper was to investigate how the addition of powdered supplements, made from osmotically dehydrated apples and plums in sugar beet molasses, influenced the thermo-mechanical properties of dough and bread quality parameters. The supplements were tested at two doses (5 and 10%). All supplements affected the thermo-mechanical properties of the dough samples. The supplements were found to decrease the water absorption and dough stability and to increase the dough development. Lower doses of supplements did not change the dough elasticity, however they have increased the protein weakening process. Starch gelatinization was not significantly affected in the supplemented doughs, however the process was slightly impeded. The results obtained for lower doses implied that the investigated supplements did not have a tendency to negatively affect the freshness of breads. The addition of 5% of dehydrated apples did not significantly influence the specific volume and the hardness of bread. The supplements did not decrease the bread crumb elasticity. The supplemented breads had darker colour of crust and crumb and an intense aroma on caramel.

Key words: bread, mixolab, hardness, elasticity, molasses.

PROLONGATION OF OPTIMAL TECHNOLOGICAL QUALITY OF PACKAGED DRIED FRUITS

PRODUŽENJE OPTIMALNOG TEHNOLOŠKOG KVALITETA UPAKOVANOG SUŠENOG VOĆA

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SUMMARY

The world market has great interest in dried products, especially fruits, which production is widely spread in the region of Balkan. Dried fruits are very susceptible to biochemical changes during storage, due to low water content, as well as low a_w value. The "shelf life" of these products depends on a_w value.

To keep optimal technological quality of dried fruits, it has been needed to ensure optimal, exactly defined quality of packing, which can provide satisfactory quality of dried fruits, during the storage. The aim of this work was to define the quality of packaging material and conditions of packaging using vacuum and modified atmosphere, to provide the successful "shelf life" of packaged dried fruit.

Key words: Dried fruits, packaging materials, biochemical changes during storage

REZIME

Na svetskom tržištu postoji velika zainteresovanost za sušenim proizvodima naročito od voća, široko rasprostranjene sirovine u regionu Balkana. Sušeno voće, zbog niskog sadržaja vode i male a_w vrednosti, predstavlja proizvod vrlo osetljiv na biohemijske promene tokom skladištenja. Održivost ovih proizvoda zavisi od a_w vrednosti.

Da bi se zadržao optimalni tehnološki kvalitet sušenog voća, potrebno je obezbediti i optimalni, tačno definisani kvalitet ambalaže koji će omogućiti da se upakovani kvalitet sušenog proizvoda održi što je duže moguće do momenta upotrebe. Cilj ovog rada je da definiše kvalitet ambalažnih materijala i uslova pakovanja u vakuumu i modifikovanoj zaštitnoj atmosferi kako bi uspešno ispunili zahteve održivosti upakovanih sušenih proizvoda.

Ključne reči: sušeno voće, ambalažni materijali, biohemijske promene tokom skladištenja

THE MULTIPARAMETRIC FLOW CYTOMETRY AS A POWERFUL TOOL FOR ASSESSING THE MECHANISM OF ACTION OF ESSENTIAL OILS ON LAB STRAINS.

VIŠEPARAMETARSKA CITOMETRIJA PROTOKA NA LABORATORIJSKOM NIVOU KAO SNAŽNA METODA ZA PROCENU MEHANIZMA DELOVANJA ESENCIJALNIH ULJA

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SUMMARY

The growing interest in the substitution of traditional food preservatives, both antimicrobials and antioxidants, by natural ones has fostered the screening of plant materials. In this context, essential oils (EOs) and their components are known to exhibit varying degrees of antimicrobial activity namely against pathogens. Nevertheless, there is no data concerning the examination of their effects on beneficial normal microbiota or on the starter cultures largely used in many industries. This work describes, for the first time, the use of a multiparametric flow cytometry technique to assess the mode of action, at the single cell level, of *Melaleuca armillaris* and *Lavandula dentata* EOs against LAB strains. Using an automated microtiter assay (Bioscreen C), bacteriostatic or bactericidal effects were noticed depending on the studied strain and on the applied concentration of each of the EOs. The mathematical modelling of the kinetics showed that in presence of increasing concentrations of a given EO, the lag phases of growth were extended (1.55% to 94.3%) and both the growth rate and final cell density were reduced. Variations depending on the strain were noticed.

Live/dead assays of the multiparametric flow cytometry technique (combining cfda and pi fluorescent probes) were done by dual staining of each sample culture to differentiate viable, dead and stressed cells. The behaviour of each strain, in presence of increasing concentrations of the eos, was evaluated by quantifying the relative percentages of each subpopulation throughout 3 days of culture. Results displayed disparate patterns of subpopulations which reveal dynamic changes in cells behaviour. This is probably due to disparate influences of the eo components on cellular physiological properties during the incubation period. Therefore, the use of a rapid and sensitive technique such as flow cytometry is advantageous for quickly generating a large amount of data. This technique can serve as powerful tool in optimally combining different preservative factors in order to design an effective antimicrobial system for selected foods. Furthermore, such study could be useful to understand how to fully take advantage of lab as probiotics or as potential candidates to improve food hygiene and to assure food quality; namely when they are associated with natural preservatives such as eos.

DEPENDENCIES OF LIGHT BEW RHEOLOGIC PROPERTIES ON VARIOUS PARAMETERS

ZAVISNOST REOLOŠKIH OSOBINA BELOG HLEBA OD RAZLIČ- ITIH PARAMETARA

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SUMMARY

At quality valuation of food materials is important to know their physical properties particularly mechanical, rheologic, electric and thermophysical properties. Physical quantities of materials are required at automatically controlled processes at manufacturing, at handling and holding. Results from measuring of rheologic properties of light brew are shown in this paper. Measuring was performed by digital viscosimeter anton paar (dv-3p). Sample of light brew was stored in special cool box in temperature 3°C and was measured in different days. The measurements were done after the temperature stabilization from 7 °C to laboratory temperature. Dependencies of dynamic, kinematic viscosity and fluidity on temperature and on time of storing are described. Dependency of dynamic viscosity on temperature can be described by arrhenius equation. Temperature dependencies of dynamic and kinematic viscosity of light brew are decreasing exponentially and in this temperature range almost linearly for all measurements. Dynamic and kinematic viscosity of sample had increased a bit with time of storing. Temperature dependencies of light brew fluidity are increasing exponentially and in this temperature range almost linearly for all measurements. Fluidity of sample had decreased a bit with time of storing. All drawn dependencies had very high coefficients of determination.

**ELECTRICAL PROPERTIES UTILIZATION AT OTHER
CHARACTERISTICS OF LOOSE MATERIALS DETERMINATION**

**KORIŠĆENJE ELEKTRIČNIH OSOBINA MATERIJALA ZA PRO-
CENU NEKIH NJIHOVIH DRUGIH FIŽIČKIH OSOBINA**

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SUMMARY

Electrical properties of loose materials are influenced by various factors. The most important are moisture content and its distribution in materials, temperature, density, volume or bulk density. They can be used at the other characteristics of loose materials determination. The relationship between the resistivity, conductivity, impedance, capacitance, relative permittivity and various influencing factors are described

TRACEABILITY OF ELEMENTS IN THE TECHNOLOGY OF CHEESE PRODUCTION AND SKIMMING

SLEDLJIVOST ELEMENATA U TEHNOLOGIJI PROIZVODNJE SIRA I OBRANOG MLEKA

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SUMMARY

Milk and milk products are very important for humans mainly due to their mineral content. Importance of milk itself lies in its biological value that can be enhanced by different technological processes. We have found that the element content of milk products is determined by element content of raw milk first of all while different additives may also have influence on it to a small degree. So we have to make efforts to produce milk of better quality and relatively stable composition for the milk composition.

The concentration of elements during cheese production and skimming was determined by inductively coupled plasma optical emission spectrometry. In our experiment the two most favourable hungarian types of cheese (hajdú and trappista) and the whey from their production were examined. We have pointed out that micro and trace elements, except b accumulated in the cheese while macro elements, except k do so in the whey. We have found that after skimming the examined micro elements remained in the cream and the rest was in the skimmed milk. Examining distribution of macro elements a significant difference appeared to the advantage of skimmed milk: most of each macro element remained in the skimmed milk.

MAXIMUM RECOVERY OF DIFFERENT TYPES OF BERRY BYPRODUCTS

MAKSIMALNO KORIŠĆENJE RAZLIČITIH NUZ PROIZVODA IZ BOBIČASTOG VOĆA

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SUMMARY

The main element of juice technologies is squeezing. The juices are very rich in such useful components as vitamins, colorants, sugars, minerals, amino acids, etc. but the extraction from the tissues is never complete, numerous valuable components remaining in the press-cakes. Classical methods of using these components include fermentation and/or compost preparation. The aim of our work was to extract certain of the valuable components, e.g. pectin or galacturonic acid, from the press-cake of red currant (*Ribes rubrum*) and to achieve a better biodegradability of the residuum of the cake for enhancing of biogas product. In the case of examination of pectin extraction the classical hot-water process and the microwave assisted extraction at 5 -25 W/g specific microwave power level were compared. Our experiments show that, as compared to hot water extraction, microwave assisted extraction reduced the processing time from 6-8 h to 30 min, the pectin yield was higher and, the liquid phase demand could be lowered. The residual carbohydrates of the cake can be used for biogas production. The rate of conversion into biogas is much higher after MW treatment than for the untreated samples, and there is a similar tendency in the biodegradability of MW-treated samples.

Key words: berry byproducts; microwave assisted extraction, pectin, biodegradability, biogas

**STUDY REGARDING THE INFLUENCE OF ULTRASOUND AS-
SISTED EXTRACTION ON THE PEA PROTEIN STRUCTURE**

**STUDIJA UTICAJA EKSTRAKCIJE POMOĆU ULTRAZVUKA NA
PROTEINSKU STRUKTURU GRAŠKA**

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SUMMARY

Pea proteins represent a valuable source of edible proteins which are well tolerated by human body, and contain all essential amino acids. Mature pea seeds are very rich in proteins that can be extracted in order to be used to improve the nutritional value of foods. A modern extraction technology of proteins from different sources is the ultrasound assisted extraction. If it is done at the optimal parameters, the proteins structure will not be damaged. We have proved this by a comparative determination by electrophoresis of main protein fractions from protein concentrates obtained through the ultrasound assisted extraction and the conventional extraction procedure. The electrophoresis was conducted following the SDS-PAGE protocol.

Key words: ultrasound extraction, pea protein, electrophoresis, SDS-PAGE.

TURKEY HAMS: EVALUATION AND TECHNOLOGICAL RELEVANCE OF SENSORY AND OBJECTIVE DATA

ĆUREĆA ŠUNKA: OCENA TEHNOLOŠKI RELEVANTNIH SEN- ZORNIH I OBJEKTIVNIH OSOBINA

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SUMMARY

Research has been carried out on the relationship between sensory evaluation and objective measurements of turkey ham's colour and texture. Objective measurements were performed with the computer vision system (cvs). A total of 26 colour features and 40 textural features were extracted for different colour scales. Among them three best colour features namely, r, v, x (r_mean, v_mean x_mean; from rgb colour space, hsv colour space and xyz colour space, respectively) and three textural features such as b_contrast, b_energy s_contrast, that may affect significantly the classification of turkey hams were identified using mahalanobis distance analysis. Sensory evaluation was carried out at the same time with the representative images of turkey hams for five sensorial attributes namely, surface colour, colour uniformity, bitonality, visual texture, and acceptability. Finally, it was of interest to model the consumers' preferences (measured from the scores obtained by the sensory attributes) with the selected best features. A stepwise logistic regression (slr) model was used to correlate the sensorial attributes and selected features. The correlation coefficients were found in the range of 94.08% (with bitonality) to 98.97% (with surface colour).

TWO-STEP MIXING IN FEED PREMIXES PRODUCTION

DVOSTEPENO MEŠANJE U PROIZVODNJI PREMIKSA

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SUMMARY

Producing of feed premixes is very delicate, concerning use of great number of different ingredients (vitamins, minerals, enzymes, etc.). In contemporary feed premixes production, it has been used over the 20 different ingredients per charge, depends on purpose. Ingredients are very often different in their properties, so it is necessary to adjust technology to fulfill requirements for homogenous product. It is necessary to achieve coefficient of variation (CV) under the 5% at mixing ratio 1:100.000 that is very often impossible without two-step mixing. Two-step mixing means “diluting” of feed ingredients concentration, making premix with small quantity of carrier (about 3% of total amount) in small mixer, and then mixing with remained amount of carrier in bigger mixer. This paper has shown results of homogeneity of premix produced with and without two-step mixing.

Key words: premixes, feed ingredients concentration, coefficient of variation, two-step mixing

ALTERNATIVE FUEL FROM AGRICULTURE AND FARMS

ALTERNATIVNO GORIVO IZ POLJOPRIVREDE I SA FARMI

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ABSTRACT

One of the driving forces for integrating biogas production into the national energy system is the necessity of solving environmental and sanitation problem". Biogas must not only be seen as a renewable energy source, but even more as one of the promising solution to the huge environmental problem concerning waste and manure handling, water pollution, CO₂ emission etc. The establishment of all centralized and decentralized biogas plants is directly or indirectly a consequence of a strengthening of environmental policies in these countries

Key words: alternative fuels, energy, agricultural policies, digester

REDUCTION OF DEOXYNIVALENOL (DON) USING XYLANOLYTIC ENZYMES DURING ALCOHOLIC FERMENTATION OF FUSARIUM CONTAMINATED WHEAT

SMANJENJE DEOKSINIVALENOLA UPOTREBOM KSILANOLITIČKIH ENZIMA TOKOM ALKOHOLNE FERMENTACIJE PŠENICE ZARAŽENE FUZARIJUMOM

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SUMMARY

Deoxynivalenol (DON) in food and feed is considered as important safety and economic issue of growing concern. The cereal grains contaminated by Fusarium fungi may also be referred to as biological inhibitors. In recent years, the interest in biological detoxification of mycotoxins has increased due to the potential application of different strains of yeast and bacteria. This study was dedicated to evaluate the influence of new biotechnological means: xylanolytic enzymes in combination with traditional amylolytic enzymes on the efficiency of the alcoholic fermentation process and DON detoxification during fermentation of Fusarium contaminated wheat with high concentration of DON (3950 µg/kg). The results show that Fusarium contaminated wheat has a negative influence on alcoholic fermentation: the quantity of alcohol was 13.5% lower than in the case of wholesome grain fermentation and 73% of DON came into DDGS (Dried Distillers Grains with Solubles), usually used for feed. The application of a new combination of amylolytic and xylanolytic enzymes allowed to increase the concentration of alcohol in the broth by 35.3% and in the same way increased the efficiency of the fermentation process. By using this enzyme combination for cereal saccharification, the highest degree (51.5%) of partial detoxification of DON was achieved during the fermentation process. However the residual DON concentration in DDGS was still too high despite its reduction as to use it in feed. Therefore, cereal material must be properly investigated before bioethanol production to avoid that higher amounts of mycotoxins come in the DDGS and onwards in feed.

Key words: deoxynivalenol (DON), Fusarium contaminated wheat, xylanolytic enzymes, alcoholic fermentation, Dried Distillers Grains with Solubles (DDGS).

FUZZY CONTROL OF AN ELECTRO-HYDRAULIC POSITION SYSTEM

FAZI UPRAVLJANJE ELEKTROHIDRAULIČKIM POZICIONIM SISTEMOM

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SUMMARY

The paper presents a hybrid concept of a fuzzy controller for use in electro-hydraulic position control system. Hydraulic position systems are commonly used in various applications. In essence, these kinds of systems are nonlinear in nature and generally difficult to control. With changing system parameters, using of the same gains will cause overshoot or even loss of system stability. The highly non-linear behavior of these devices makes them ideal subjects for applying different types of sophisticated controllers. This article shows a performance of a hybrid controller for electro-hydraulic position control system based on two concepts of fuzzy controllers: a self-learning fuzzy logic (SLFLC) controller, which contains a learning algorithm that utilizes second order reference model and a sensitivity model related to the fuzzy controller parameters; and a position control using fuzzy gain-scheduling (FGSC). The paper also shows the design procedures for the controller and simulation results. The results suggest that using of the hybrid fuzzy controller decreases the error of position reference tracking in relation to the classical PID controller and solely SLFLC controller.

Key words: electro-hydraulic system, position control, fuzzy controller, gain scheduling, self-learning fuzzy controller.

REZIME

U radu je prikazan koncept hibridnog fazi kontrolera za primenu u pozicionim elektrohidrauličkim sistemima upravljanja. Takvi sistemi su u suštini nelinearni i generalno teški za upravljanje. Usled promene parametara sistema, korišćenje istih pojačanja izaziva preskok ili čak gubitak stabilnosti sistema. Izrazito nelinearno ponašanje ovih uređaja čini ih idealnim za primenu različitih tipova sofisticiranih kontrolera. Rad prikazuje performance hibridnog kontrolera za elektrohidraulički pozicioni sistem, zasnovanog na dva koncepta fazi kontrolera: a) samoučećem fazi kontroleru (SLFLC), koji sadrži algoritam učenja na osnovu referentnog modela i funkcija osetljivosti i b) fazi „gain scheduling“ kontroleru (FGSC). Prikazana je procedura projektovanja kontrolera i dati su rezultati simulacije, koji pokazuju da hibridni kontroler smanjuje grešku praćenja referentnog signala u odnosu na klasični PID kontroler i samo SLFLC kontroler.

Ključne reči: elektro hidraulički sistem, upravljanje položajem, fazi kontroler, gain scheduling, samo učeći fazi kontroler.

PURIFICATION OF SYNTHETIC WASTEWATERS BY NANOFILTRATION

PREČIŠĆAVANJE SINTETIČKOG OTPADA IZ VODA NANOFILTRACIJOM

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SUMMARY

A lot of industrial effluents and food wastewater streams contain detergents in concentrations of up to 1-5 g l⁻¹ which must be removed to a great extent prior to water recycling or discharge. In this study, aqueous solutions of an anionic surfactant cleaning agent were examined at different parameters. The nanofiltration of synthetic wastewaters of the anionic surfactant was examined at detergent concentrations of 0.5, 1.0 and 5.0 g l⁻¹ at 20, 30 and 40 °C and at 20, 30 and 40 bar. Statistical evaluation of the data revealed that the retention was principally affected by the temperature. The highest retention was observed at the lowest temperature. Increase of both pressure and temperature increased the flux, but the impact of pressure was higher than that of temperature. The highest flux was measured at the highest temperature. There was no appreciable difference between 30 bar and 40 bar. The fouling index, calculated by fitting a power function to the measured data, was mainly affected by the temperature. The ideal parameters were found to be 20 °C and 30 bar for the best retention and respectable flux or 30 °C and 30 bar for the minimal fouling.

Key words: statistical analysis, nanofiltration, ANOVA, detergent, anionic surfactant

FLORICULTURAL AND APPLICATION CRITERIA FOR ENERGY BIOMASS IN SLOVAKIA

BILJNA MASA I KRITERIJUMI PRIMENE ZA ENERGIJU U SLOVAČKOJ

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SUMMARY

Today in EU and Slovakia also is clear that consumption of energy and alternative securing of its sources is aside long-term condition of the sustainable development, expressed through ecology and climate changes, and other side it is a factor of living standard. From these views is important the present situation of Slovakia and its energy dependency in the context with other EU members and condition of RES exploitation also. From the RES sources in Slovakia has the biggest value the biomass. From the next development of biomass application on the production of heat and electric energy and fuels too, is necessary to define strategy and criteria its cultivation and application such that were removed limitations as are opposing relation between foods and fuels and negative energy balance of cultivation some types of biomass. As well for next applications of unconventional types of biomass (e.g. algae, manure) is necessary a development of new technologies (photo-bioreactor, liquid manure treatment, HTC, bio-butanol production) that are able to transform the chemical energy of biomass to electricity, heat and nutrients and to secure an ecological production of bio-fuels.

Key words: sustainable development, ecology, RES, biomass, energy crops, new technologies

**INFLUENCE OF NUTRIENTS PRESENT IN SUGAR BEET MOLAS-
SES AND SACCHAROSE SOLUTIONS ON QUALITY OF
OSMODEHYDRATED CARROT**

**UTUCAJ NUTRITIJENATA PRISUTNIH U RASTVORIMA MEŠASE
IZ ŠEĆERNE REPE I ŠEĆERA NA KVALITET OSMOTSKI SUŠENE
MRKVE**

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SUMMARY

Effect of useful bioactive substances (carbohydrates and mineral matters), from osmotic solutions, on quality osmodehydrated carrot was analysed. Saccharose solutions and sugar beet molasses, in different concentration, were used as osmotic mediums. Osmotic dehydration was conducted at the constant temperature of 55°C and atmospheric pressure. At first, content of analysed nutrients was investigated in fresh and then in osmodehydrated samples, after 1, 3 and 5 hours of immersion duration.

During osmotic dehydration, in samples which were treated in sugar beet molasses, content of mineral matters was increased to a great extent and carbohydrates content was also increased, but slightly. Nutritively and sensory high-quality product was made.

In carrot which was dehydrated in saccharose solutions mineral matters content was greatly decreased and, at the same time, content of analysed carbohydrates was increased.

Based on gain results, great priority of sugar beet molasses application as osmotic solution, was determined. Nutritive and sensory properties of osmodehydrated carrot was improved.

HIGH QUALITY NOODLE PRODUCTS AND THEIR TRADITIONAL AND NON-TRADITIONAL PROCESSING

VISOKOKVALITETNA TESTA I NJIHOVA TRADICIONALNA I NETRADICIONALNA PROIZVODNJA

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SUMMARY

Traditional pasta is produced only from different qualities of wheat flour (*T. durum*, *T. aestivum*) and water, but the use of leguminous flour (like yellow pea flour), pseudocereals (like amaranth) or maize starch as well etc. for producing noodle products is unconventional. There are several possibilities for improving the quality of the products: to change the technology (drying on low or high temperature) or to use additives such as emulsifiers and/or enzymes. For developing an improved pasta structure the enzyme transglutaminase can be used as well.

In the presence of emulsifier an emulsifier-carbohydrate-protein-lipid complex can be expected. The rate of the individual interactions depends on the components of the sample and on the type of applied emulsifiers. Transglutaminase enzyme, a protein-glutamine γ -glutamyl-transferase (EC.2.3.2.13), catalysis acyl-transfer reactions, and introduces covalent cross-links between proteins. The application of transglutaminase has great importance for the development of pasta products: from pseudocereals, or wheat flours (*T. durum*, *T. aestivum*). Pasta products with good quality like *T. durum*-based pastas can be produced from *T. aestivum* flour. By using transglutaminase the quality of *T. durum* flour can also be improved, so the pastas will show higher cooking quality. The enzyme insures cholesterol free products. Pasta and noodle products were produced according a modelling system. The effect of the enzyme treatment on cooking properties, sensory assessment and protein distribution was analyzed. The change of the protein structure depends on the type of systems, the amount and the type of additives.

Key words: emulsifiers, transglutaminase enzyme, pasta properties, SDS-PAGE.

TECHNICAL AND TECHNOLOGICAL, PERFORMANCE AND ENERGY REVIEW OF A POULTRY-PROCESSING FACTORY

TEHNIČKE I TEHNOLOŠKE PERFORMANSE I ANALIZA ENERGETIKE U FABRICI PRERADE ŽIVINE

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SUMMARY

Poultry is food which didn't absent on the royal tables, it is amounted by gourmets and it is a part of the world-famous kitchen. For its attributes it became the significant healthier and high quality life. The aim of this work is a technical-technological assessment of the company for the poultry processing. A assessed the efficient and energetic parameters and the analysis of the time spent on the line for poultry processing was done. This join stock company was found according to § 154 Commercial Code no. 513/1991 Enactment, September 1992. The company concerns with the processing of its own and purchased poultry and with the production and sale of utility eggs. Besides company also own the agricultural land which is used processing of the sowed grain, sunflowers and corn.

Key words: Poultry, processing poultry, quality life

**THE SELECTION OF YEAST STRAINS – NATURAL MICROFLORA
OF FRUITS AND THEIR ABILITY TO GROWTH
ON APPLE POMACES**

**SELEKCIJA PORASTA KVASCA – MIRKOFLORA VOĆA I NJI-
HOVA MOGUĆNOST RAZVIĆA NA PODLOZI OD USITNJENE
JABUKE**

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SUMMARY

Apple pomace is the by-product rich in high-value components and is highly biodegradable. Its utilization to obtain valuable yeast biomass is essential from both economical and environmental point of view. The aim of the experiments was screening of yeasts derived from natural microflora of fruits and checking for their abilities to multiply on apple pomace. In these experiments 16 different isolates belonging to *candida*, *kluveromyces*, *cryptococcus*, *rhodotorula* and *debaryomyces* genera were studied. The yeasts were cultivated on fresh apple pomace in aerobic conditions during 7 days. The amount of yeast cells after cultivation was calculated by pour plate method. The composition of fresh pomace and pomaces after cultivation was analysed by hplc. The yeasts *cryptococcus laurenti* and *rhodototula minuta* were able to multiply in the most efficient way (1×10^9 cfu/g). The number of cells of *debaryomyces hansenii* and *candida kefir* was also very high, however these strains produced high amounts of acetic acid. This fact discredits these strains as fodder yeasts for biomass production from apple residues.

IN SEARCH FOR NEW ANTI-ADHESIVE MATERIALS

U POTRAZI ZA NOVIM ANTI-ADHEZIONIM MATERIJALIMA

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SUMMARY

Bacterial adhesion is very important and in many cases undesirable phenomenon in many circumstances of every day live, since it is a determinant for the overall biofilm formation. The disadvantageous examples of biofilms can be found in microbial corrosion, hospital infections, biofouling etc.

The main idea of studies was to carry out preliminary research on prevention or reduction of bacterial adhesion via the chemical modification of the surface susceptible to biofilm formation. Therefore adherence abilities of *Aeromonas hydrophila* as model bacteria with high potential for immobilization to materials covered with selected polysiloxanes as anti-adhesive agents were tested.

Two types of modified polymers were prepared: polysiloxane A with pendant 3-chloropropyl groups and B with 3(N,N-dimethyl-N-octyl)propyl groups. The control sample was polydimethylsiloxane (PDMS) with –OH groups. The incubation of bacterial suspensions and polysiloxane carriers was conducted in 1000-times diluted buffered peptone water at 22°C during 10 days. After incubation carriers were studied by measuring ATP of adhered bacterial cells in relative light units (RLU). Additionally the microscopic studies were employed.

The A and B polymers showed strong anti-adhesive properties. The rlu level indicating adhesion of bacterial cells was 30-times lower than rlu of control sample. These results were also confirmed by microscopic observations

PHYSICO-CHEMICAL PROPERTIES OF RAPESEED AFTER DIFFERENT TREATMENTS OF DRYING TEMPERATURE AND STORAGE

FIZIKALNO-KEMIJSKA SVOJSTVA SJEMENKI ULJANE REPICE NAKON RAZLIČITIH TRETMANA TEMPERATURE SUŠENJA I SKLADIŠTENJA

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SUMMARY

This paper presents a three year research conducted on the seeds of 6 rapeseed cultivars (Alaska, Bristol, Express, Eurol, Lirajet and Silvia) from primary production to storage. After the soil taken from the district of Daruvar, was analyzed, it was submitted to the identical cropping intensity, with the goal of achieving a higher yield. The harvesting was conducted on the same day of the year for all cultivars and the basic physical and chemical properties (mass of 1000 seeds, water and oil content, and content of free fatty acids (FFA)) were determined before storing.

The drying was conducted in laboratory drier at the 1,0 m/s air velocity and three different air temperatures, namely 40, 60 and 80°C. After drying, the rapeseed seeds were stored and the influence of storage conditions on the quality of seeds in rapeseed was determined, namely on the oil and free fatty acids content, which are the two most important rapeseed quality parameters. The rapeseed seeds were stored in three conditions: in storage facility with controlled atmosphere (with temperature of 4°C and 10°C and relative air moisture about 70%) and in storage facility without atmosphere control. During a one year storing period, the samples' mass was monitored monthly while oil content, FFA content and seed moisture in cultivars were determined.

Storing in conditions without atmosphere control showed that the samples' mass varied, while the sample storing in controlled atmosphere showed variations in sample mass with minor oscillations during the whole storing period, which resulted with lower FFA content in comparison with the samples stored without atmosphere control. The oil content after storing in facility without atmosphere control decreased, while the FFA content after storing in the same conditions rose in all seeds samples. In conclusion, storing in controlled atmosphere showed better results in rapeseed quality.

Key words: cultivars, rapeseed, drying, storing

SAŽETAK

U ovom radu prikazana su trogodišnja istraživanja 6 sorata sjemenki uljane repice (Alaska, Bristol, Express, Eurol, Lirajet i Slivia) i to od primarne proizvodnje do skladištenja. Nakon provedenih kemijskih i fizikalnih analiza tla (područje Daruvara), napravljena je istovjetna agrotehnička mjera s ciljem dobivanja što većeg prinosa. Žetve su provedene istog dana unutar

godine za sve kultivare te su utvrđena osnovna fizikalno-kemijska svojstva sjemenki prije sušenja (masa 1000 sjemenki, udio vlage, ulja i slobodnih masnih kiselina).

Nakon toga, provedeno je konvekcijsko sušenje na laboratorijskoj sušari uz brzinu zraka 1,0 m/s s tri različite temperature zraka i to 40, 60 i 80°C. Nakon sušenja, sjemenke uljane repice su skladištene i praćen je utjecaj načina skladištenja na kvalitetu sjemenki uljane repice i to praćenjem promjene udjela ulja i slobodnih masnih kiselina (SMK) kao dva najvažnija parametra kvalitete sjemenki uljane repice. Sjemenke uljane repice bile su skladištene na tri načina: u skladištu s kontroliranim uvjetima vlage i temperature (pri čemu je relativna vlaga zraka bila oko 70%, a temperatura 4°C i 10°C) i u skladištu s uvjetima okoline.

Skladištenjem u uvjetima okoline utvrđeno je da je masa uzoraka općenito varirala, dok su skladištenjem u kontroliranim uvjetima zabilježene tek promjene mase s manjim oscilacijama tijekom cijelog razdoblja skladištenja, što je rezultiralo manjim porastom slobodnih masnih kiselina, u odnosu na uzorke skladištene u uvjetima okoline. Udio ulja nakon skladištenja u uvjetima okoline prosječno je pao, a udio SMK nakon skladištenja u istim uvjetima prosječno je porastao. Može se zaključiti, što se tiče kvalitete sjemenki, da je skladištenje u kontroliranim uvjetima pokazalo bolje rezultate.

Ključne riječi: kultivari, uljana repica, sušenje, skladištenje

MICROSTRUCTURAL PROPERTIES OF POTATOES

MIKROSTRUKTURNA SVOJSTVA KROMPIRA

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SUMMARY

The potato tuber tissue was studied by means of the methods of optical microscopy and image analysis. Tubers of varieties Picasso, Laura and Red Anna were tested after storage in standard and nonstandard conditions. The methods of taking of digital images of tissues are presented. The possibility of method of computer image analysis is analysed. Computer aided measurement is discussed. The geometrical properties of cell structure were evaluated. The area of cells, the perimeter of cells, the circularity and Feret's diameter were determined.

Key words: microstructure, potato tuber tissue, digital image.

DEVELOPMENT AND REALIZATION OF ENERGY MANAGEMENT SYSTEM IN PROCESS INDUSTRY

RAZVOJ I PRIMENA SISTEMA NADZORA I UPRAVLJANJA TOKOVIMA ENERGENATA U PROCESNOJ INDUSTRIJI

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SUMMARY

This paper deals with developing and realization of energy management system in process industry. Such a system should be based on standard scada system following some modifications and adding specific components. One of specific functions of such a system is load consumption forecasting. This paper shows a new original algorithm for energy consumption forecasting based on support vector machines. The developed energy management system is realized and it operates in sojaprotein ad bečej, soybean processing factory.

PACKAGE AS AN ECOLOGICAL ISSUE

AMBALAŽA KAO EKOLOŠKO PITANJE

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SUMMARY

Package is a necessary part of food products. Appropriately chosen and used, package realizes all of its functions; protective, storage-transport and informative.

Modern technology is responsible for the environmental pollution. In solid waste structure, significant place has been taken by disposed packaging materials.

After use, package is usually disposed and thus represents a significant ecological problem. As every product, package also has its own life cycle. The life cycle of packing starts with the production of packaging material and package itself, its use for packaging the product, and finally it ends with disposal to the environment. Throughout the whole life cycle, package has been affect environment.

The aim of this work was to reviewing the most frequently used packaging materials used in food packaging. The definition the term which describes the ecological status of packaging materials is be given. Also, the life cycle of packaging material has been presented, as well as the possible treatments of disposed packages.

Key words: package, packaging, food, shelf life, ecology

REZIME

Ambalaža je neizbežan pratilac prehrambenih proizvoda. Pravilno odabrana i upotrebljena, realizuje, sve svoje funkcije, od zaštitnih, skladišno-transportnih pa sve do informativnih.

Savremene tehnologije su odgovorne za narušavanje ekološke ravnoteže u prirodi, sve većim zagađenjima različitog porekla, kao što su izduvni gasovi, otpadne vode, čvrst urbani otpad. U strukturi čvrstog otpada, značajno mesto zauzima i odbačena ambalaža.

Osim pozitivnog uticaja na održivost upakovanih prehrambenih proizvoda, upotreljena i odbačena ambalaža, predstavlja značajan ekološki problem. Kao što upakovani proizvod ima svoju održivost i rok trajanja, tako i ambalaža ima svoj životni ciklus.

Životni ciklus ambalaže počinje proizvodnjom ambalažnih materijala i ambalaže, nastavlja se pakovanjem, odnosno pratilac je upakovanog proizvoda do upotrebe, a zatim nastavlja svoj životni ciklus kao odbačena ambalaža. U svim fazama svog životnog ciklusa, ambalaža ima uticaj na okolinu.

U radu je dat pregled najčešće korištenih ambalažnih materijala za pakovanje prehrambenih proizvoda. Date su definicije i razičiti pojmovi u vezi ekološkog statusa ambalažnih materijala. Takođe je razmatran životni ciklus amalažnih materijala i dat je pregled mogućnosti postupaka sa odbačenom ambalažom.

Ključne reči: ambalaža, pakovanje, hrana, održivost, ekologija

FORMULATION OF NEW DIETS FOR SUSTAINABLE POULTRY FARMING

FORMULISANJE NOVIH OBROKA ZA ODRŽIVI UZGOJ ŽIVINE

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SUMMARY

Knowledge of feeding strategies to increase nutrient utilization by use of good quality alternative raw materials and feed additives such as amino acids and enzymes is important for sustainable animal production. The aim of current investigation was to formulate new diets by using sunflower meal as an alternative raw material and amino acids and different combination of enzymes added. Five broiler diets were tested. The first was a commercial diet based on corn and soybean meal and in the others 20% of soybean meal was replaced with sunflower meal containing 44% of crude protein. The treatments were as follows: a-soybean meal without supplement; b-sunflower meal without supplement; c-sunflower meal with supplement l-lysine hcl; d-sunflower meal with supplement l-lysine hcl and enzyme complex containing protease, hemicellulase, pectinase and β -glukanase; e-sunflower meal with supplement l-lysine hcl and phytase and 30% lower phosphorous content. Supplement l-lysine hcl improved production performances of broilers. In treatment c, live weight and feed conversion ratio (fcr) was significantly better ($p < 0.01$) in comparison with treatment b and better but not significantly in comparison with treatment a. Both enzymatic supplements positively influenced live weight and fcr in treatments d and e. There was no significant differences between this two treatments but significant differences ($p < 0.01$) were found for live weight and fcr between treatment b and treatments d and e. Significantly positive ($p < 0.01$) effect of added enzymes was found in treatments d and e in comparison with treatment a. It was also found that the treatment e with reduced phosphorous level and added l-lysine hcl and phytase decrease the level of phosphorous in broiler feces up to 20%. Supplementation of poultry diets containing sunflower meal by l-lysine hcl and enzyme complex or phytase increasingly contribute to sustainable poultry farming by enhancing production efficiency, increasing the effectiveness of nutrient utilization and upgrading in environmental protection.

Key words: broiler, poultry, sunflower meal, amino acid, enzymes, phytase

REZIME

Saznanja vezana za strategiju ishrane kojom se povećava iskoristljivost hraniva uz upotrebu kvalitetnih alternativnih sirovina i aditiva za hranu za životinje, kao što su amino kiseline i enzimi, su značajna za održivu proizvodnju u stočarstvu. Cilj sadašnjih istraživanja je bila formulacija novih vrsta obroka korišćenjem suncokretove sačme kao alternativne sirovine i amino kiselina i različitih kombinacija dodatih enzima. testirano je 5 vrsta obroka za ishranu brojlera. Prvi je bio komercijalna hrana za brojlere bazira na kukuruzu i sojinoj sačmi dok je u ostalim obrocima 20% sojine sačme zamenjeno suncokretovom sačmom sa sadržajem od 44% sirovih proteina. Tretmani su kreirani po sledećoj šemi: A - sojina sačma bez dodataka; B-

suncokretova sačma bez dodataka; C- suncokretova sačma sa dodatkom l-lizina hcl; D- suncokretova sačma sa dodatkom l-lizina HCl i kompleksa enzima koji sadrži proteazu, hemicelulazu, pektinazu i β glukanazu; e-suncokretova sačma sa dodatkom l-lizina hcl i fitaze i sa 30% manjim sadržajem fosfora. Dodatak l-lizina hcl je poboljšao proizvodne karakteristike brojlera. u tretmanu C, masa živih pilića i konverzija hrane su signifikantno poboljšane ($p < 0,01$) u odnosu na tretman B, i poboljšane ali ne signifikantno u odnosu na tretman A. Oba enzimska dodatka su pozitivno uticala na masu živih pilića i konverziju hrane u tretmanima d i e. Nije postojala signifikantna razlika između ova dva tretmana ali je utvrđena visoko signifikantna razlika ($p < 0,01$) za masu živih pilića i konverziju hrane između tretmana B i tretmana D i E. Signifikantno pozitivni ($p < 0,01$) efekti dodatih enzima su utvrđeni u tretmanima D i E i u odnosu na tretman a. utvrđeno je takođe da tretman e sa smanjenim sadržajem fosfora i dodatkom l-lizina hcl i fitaze smanjuje nivo fosfora u fecesu brojlera do 20%. Dopunjavanje obroka za piliće koji sadrže suncokretovu sačmu l-lizinom HCl i kompleksom enzima ili fitazom ima veliki uticaj na održivi uzgoj živine zbog povećanja efikasnosti i boljih efekata u iskorišćenju hraniva i unapređenja u zaštiti okoline.

ključne reči: brojler, živina, suncokretova sačma, amino kiseline, enzimi, fitaza

FOOD AND WELL-BEING UNDER A GLOBAL PERSPECTIVE

HRANA I DOBROBIT IZ GLOBALNE PERSPEKTIVE

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SUMMARY

While a tremendous amount of human and financial resources have been put during the last decades into the production-end of food, aiming to improve safety, quality and productivity or minimize cost, the world today is increasingly suffering from food. Millions of people are literally killing themselves by making wrong use of food, leading to obesity and nutrition-related diseases. At the same time millions of people keep suffering from lack of food, leading to starvation and death before reaching adult age. Although the community of agricultural and food sciences has made great progress with respect to the production and processing, there is a score of major problems to be faced in the food consumption. Parallel to striving for better-safer-healthier food, the community of Food Sciences is faced with the challenge to help an average consumer on education how to select, handle, store and use food for safe and healthy eating. A crucial issue in this venture is production of effective teaching tools for each and every level of education, including education of the general public. A second crucial issue is to sensitize and train educators to carry out their invaluable task of diffusing this information throughout the entire educational ladder. The need to reshape and reform public education to accommodate this task is obvious. What is also obvious is the need for medical professionals to recognize “healthy eating” (and exercise) as the most valuable tool in preventive medical care. Unfortunately, the response of the medical community to this need has been rather slow and far from being systematic. This presentation will concentrate on challenges and opportunities for the Food Scientists/Engineers: to contribute towards a society of well-informed, self-protected, active and considerate citizens; to support public (food-related) education and actively participate in the fight against obesity and nutrition-related diseases; to intervene in decision making bodies and underline the importance of education on nutrition and food; to invent avenues and possibilities of contributing in the fight against world hunger; all in all, to contribute towards a healthier world, a world that will not be split between obesity and starvation.

Key words: food and well-being, consumer education, world hunger, nutrition-related diseases, starvation, food education.

IZVOD

I pored toga što su u poslednjoj deceniji uloženi značajni ljudski naponi i ogromna finansijska sredstva u proizvodnju hrane, i pri tome imajući za cilj poboljšanje njene sigurnosti, i kvaliteta, te samnjivanje proškova proizvodnje, današnji svet sve više pati zbog hrane. Milioni ljudi bukvalno ubijaju sebe lošim izborom hrane, što vodi ka gojaznosti i pojavi bolesti izazvanih hranom. U isto vreme milioni ljudi pate od nedostatka hrane, što vodi ka izgladnjivanju i smrti pre nego što dođu u odraslo doba. Mada je zajednica naučnika u svetu koja se bavi proizvodnjom i preradom hrane učinila ogroman napredak, još uvek postoje značajni problemi u konzumiranju sa kojima se treba suočiti. Paralelno sa stremljenjima da se proizvede bolja-sigurnija-zdravija hrana, naučna zajednica u oblasti prerade hrane mora da pomogne prosečnom konzumentu hrane kako da izabere, rukuje, čuva i koristi hranu radi sigurnije i zdravije

ishrane. Krucijalna odluka u ovom poduhvatu je proizvodnja efektivnih metoda učenja različitih nivoa radi edukacije potrošača, uključujući obrazovanje široke publike. Druga krucijalna odluka koji treba sprovesti je obuka predavača kako bi se lakše nosili sa širenjem informacija kroz celu obrazovnu mrežu. Potreba da se reoblikuje i reformiše obrazovanje u ovoj oblasti je očigledan zadatak. Ono što je takođe očigledno je potreba da i medicinski profesionalci prepoznaju ovaj zadatak „zdrave ishrane”, kao najvažnije oruđe u preventivi bolesti. Nažalost, odaziv medicinske zajednice na ovakvu potrebu je još uvek spor i daleko od toga da bude sistematičan. Ova prezentacija će se koncentrisati na izazove i mogućnosti koje zajednica proizvođača i prerađivača hrane treba da realizuje u smislu stvaranja društva koje je dobro informisano, koje može samo da se zaštiti i koje je aktivno na planu obrazovanja, te se aktivno uključuje u borbu protiv gojaznosti i bolesti izazvanih neadekvatnom ishranom i koje može da interveniše na odluke, koje shvata značaj obrazovanja o hranidbenoj vrednosti ishrane, koje može da pronađe načine osвете u borbe protiv gladi u svetu, sve u svemu, koje može da doprinese zdravijem svetskom stanovništvu i svetu koje neće biti podeljeno na pне koji su gojazni i one koji gladuju.

Ključne reči: hrana i dobrobit, obrazovanje potrošača, glad u svetu, bolesti izazvane ishranom, glad, kultura ishrane.

VISCOSITY CHANGE OF SUGAR BEET MOLASSES WHILE AD- DING STARCH

PROMENA VISKOZNOSTI MELASE ŠEĆERNE REPE PRI DODA- VANJU SKROBA

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SUMMARY

Viscosity change of sugar beet molasses while adding different amount of starch, up to 2% and temperature diapason of 40-60 °c was studied. Results shows that system has non – newtonian fluid characteristics. Coefficient of consistency decreased to a great extent when temperature was increased. Influence of added starch wasn't significant as temperature change, but the increase of the coefficient of consistency was achieved. Arrhenius's exponential curve equation for viscosity and temperature and power law rheological model, contingent shear stress upon shearing velocity, was used for the description of combined influence temperature and starch on viscosity change of sugar beet molasses. Recommended equation fits with experimental results in a satisfactory level, and can be used for the description of rheological changes in system.

ECONOMIC EFFICIENCY OF FRUIT PRODUCTS PRODUCTION

EKONOMSKA EFIKASNOST PROIZVODNJE PRERAĐEVINA OD VOĆA

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SUMMARY

Food processing industry is an important factor of market stabilization, development and further advancement of fruit production. In order to achieve this, the existing plants for industrial processing are to be better equipped, modernized, specialized to enable the realization of the planned production structure and introduce new products of higher processing phases. By increasing the level of final product processing and their export, it will be possible to achieve better production and economic outputs in relation to the export of raw materials (fresh and frozen fruits). Due to the fact that research undertaken so far has been aimed at determining economic effects in primary production, this paper is an analysis of basic economic indicators in fruit products production on the sampled object of processing within a three-year period (2005-2007).

Key words: fruit products production, fruit processing plant, income, production costs, selling price, economic result.

REZIME

Industrija za preradu voća je značajan činilac stabilizacije tržišta, razvoja i daljeg unapređenja voćarske proizvodnje. Da bi mogla obaviti ovu ulogu, postojeće pogone za industrijsku preradu je potrebno bolje opremiti, osavremeniti i specijalizovati radi ostvarivanja planirane strukture proizvodnje i osvajanja novih proizvoda viših faza prerade. Povećanjem stepena prerade finalnih proizvoda od voća i izvozom istih, mogu se ostvariti povoljniji proizvodno-ekonomski rezultati u odnosu na izvoz sirovine (svežeg i zamrznutog voća). Sa obzirom da su dosadašnja istraživanja bila usmerena na utvrđivanje ekonomskih efekata u primarnoj proizvodnji, u ovom radu se analiziraju osnovni ekonomski indikatori u proizvodnji prerađevina od voća, na uzorkovanom objektu prerade, u trogodišnjem periodu (2005 – 2007).

Ključne reči: proizvodnja prerađevina od voća, troškovi proizvodnje, vrednost proizvodnje, finansijski rezultat.

**THE DRYING OF THE SOUR CHERRY DEPENDING OF A PRE-
TREATMENT, THE RATE OF DRYING AND REHYDRATION**

**SUŠENJE VIŠNJE U ZAVISNOSTI OD PRETRETMANA, BRZINA
SUŠENJA I REDEHIDRACIJA**

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SUMMARY

The dehydration of fruit is one of the ways of its preserving and keeping in a longer period of time. The dehydration of cherry, fresh and frozen, in a convective drying machine of a horizontal type is shown in this work. Five series of dehydration of fresh fruit and five series of dehydration of frozen fruit are done, with the same pre- and post-treatment, which is: without treatment, bleaching in water with the addition of vitamin C, bleaching in water with the addition of lemon acid, bleaching in water with the addition of vinebearing, and bleaching in water with the addition of clay. The comparison of the dehydration process of fresh cherries and frozen cherries is presented. The process of dehydration of fresh cherries lasted 360 minutes, while the process of dehydration of frozen cherries lasted 315 minutes, with the starting temperature of the process of 62 C and the finishing temperature of 72 C. It was shown the way of changing the speed of dehydration within time. The process of rehydration was determined.

VARIATIONS IN QUALITY PARAMETERS OF FORAGE AND MEDIUM QUALITY WINTER WHEAT VARIETIES IN STORAGE IN DIFFERENT YEARS

PROMENE U KVALITETU SILAŽE I VARIJETETA ZIMSKE PŠEN- ICE PRI SKLADIŠTENJU U ZAVISNOSTI OD GODINE PROIZVOD- NJE

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SUMMARY

We have analysed the effect of storage time on qualitative (moisture and protein content, Hagberg's falling number, wet gluten content, alveographic values) and microbiological changes of various fodder winter wheat varieties in three different years (2005-2007). Storage conditions were optimal, after harvesting the wheat samples were stored in sacks.

The examined winter wheat varieties retained their *moisture, protein content and their Hagberg's falling number*, they did not change during storage in none of the years in the examined 4 month long storing periods. A slight growth could be experienced in the *wet gluten contents* of all the four winter wheat varieties during storage. This result proved the theory of after-ripening, when gluten improves qualitatively and quantitatively as well. The value of the quantitative growth was about 10% for all the four winter wheat varieties all the years.

We placed a special emphasis on measuring the *alveographic W* (10^4 J) values. All the four winter wheat varieties showed decreasing values of about 20-40% all the years. *Microbiological examinations* on the four winter wheat varieties showed that mould, mould flora and total germ count remained balanced with some slight variations and they did not change in terms of time under optimal storage conditions.

THE DRYING OF THE CHERRY DEPENDING OF A PRETREAT- MENT, THE RATE OF DRYING AND REHYDRATION

SUŠENJE VIŠNJE U ZAVISNOSTI OD PREDTRETMANA BRZINA SUŠENJA I REHIDRATACIJA

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SUMMARY

The drying of fruits is one of the ways of its preserving and keeping in a longer period of time. The drying of cherry, fresh and frozen, in a convective drying machine of a horizontal type is shown in this work. Five series of drying of fresh fruits and five series of drying of frozen fruit are done, with the same pre- and post-treatment, which is: without a treatment, bleaching in water with the addition of vitamin C, bleaching in water with the addition of lemon acid, bleaching in water with the addition of vinebearing, and bleaching in water with the addition of clay. The comparison of the drying process of fresh cherries and frozen cherries is presented. The process of drying of fresh cherries lasted 360 minutes, while the process of drying of frozen cherries lasted 315 minutes, with the starting temperature of the process of 62°C and the finishing temperature of 72° C. It was shown the way of changing the speed of drying within time. The process of re-hydration was determined.

Key words: drying, cherry, pre-treatment, freezing, the speed of drying, re-hydration.

ECONOMIC DETERMINANTS FRUITS QUALITY

EKONOMSKE DETERMINANTE KVALITETA VOĆA

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SUMMARY

The quality of fruits is often defined as the sum of the differently associated fruit properties - external and internal mechanical, physical, chemical, organoleptic, from which certain state and favourableness emanate in sense of meeting the technological and nutritive requirements of the fruit as food. The properties which contribute most to the quality of fruit are: sensuous, organoleptic - especially ratio of sugar and acid, flavour and its significance and chemical-biological - content of vitamins, microelements and enzymes, as well as absence of pesticide residues. The quality of fruit depends both on favourable characteristics of fruits for satisfying physiological needs of human organism, on the one hand, and causing a significant level of pleasant feeling while being used, on the other hand. Bearing in mind the increasing demands set by the customers and international quality standards, the paper deals with economic aspects of the quality concept of agricultural-alimentary products, with special emphasis on fruit quality.

Key words: quality, standards, economic determinants, fruits.

REZIME

Kvalitet voća se najčešće definiše kao suma različito povezanih svojstava plodova - spoljašnjih i unutrašnjih, mehaničkih, fizičkih, hemijskih i organoleptičkih, iz kojih proističe određeno stanje i povoljnost u smislu zadovoljenja tehnoloških i nutritivnih vrednosti voća kao hrane. Svojstva koja najviše doprinose kvalitetu voća su: estetska, organoleptička - naročito odnos šećera i kiselina, arome i njena izraženost i hemijsko-biološka - sadržaj vitamina, mikroelemenata i enzima, kao i odsustvo štetnih supstanci rezidua pesticida. Znači, kvalitet voća je uslovljen prvenstveno povoljnošću plodova da što uspešnije zadovoljavaju fiziološke potrebe ljudskog organizma, uz istovremeno postizanje značajnog stepena prijatnosti pri njihovom neposrednom korišćenju.

Polazeći od sve većih zahteva potrošača i međunarodnih standarda kvaliteta, u radu će biti sagledani ekonomski aspekti pojma kvaliteta poljoprivredno-prehrambenih proizvoda, s posebnim osvrtom na kvalitet voća.

Ključne reči: kvalitet, standardi, ekonomske determinante, voće.

INFLUENCE OF MONO- AND DOUBLE- EDIBLE STARCH COATING ON IMPROVING OF OSMOTIC DEHYDRATION OF APPLE IN SACCHAROSE SOLUTION AND SUGAR BEET MOLASSES

UTICAJ JEDNOSTRUKIH I DVOSTRUKIH JESTIVIH SKROBNIH PREVLAKA NA POBOLJŠANJE OSMOTSKE DEHIDRATACIJE JABUKE U RASTVORIMA SAHAROZE I MELASI ŠEĆERNE REPE

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SUMMARY

The effect of edible starch coatings was studied with the objective to achieve higher efficiency of osmotic dehydration process of the apple. This study encompassed treatments of apple with 3% maize starch solution applied in the form of single and double coatings. The aim of application of edible coatings during osmotic dehydration was to promote water loss from cells to surrounding osmotic solution and to prevent solid uptake from osmotic solution to samples, on the other hand. Samples of apple were dehydrated in 70% saccharose and 80% sugar beet molasses as osmotic agent, during 5 h, at 55°C and normal pressure. Insertion of edible starch coatings achieves higher water loss and reduction of solid gain in apples. It was concluded that double-coated samples in sugar beet molasses give best results.

Key words: Osmotic dehydration, apple, edible coating, sugar beet molasses, saccharose solution

REZIME

Da bi se postigla što veća efikasnost pri osmotskoj dehidraciji jabuke ispitana je mogućnost primene jestivih skrobnih prevlaka. U radu je korišćen 3% rastvor kukuruznog skroba u vidu jednostrukih i dvostrukih prevlaka. Upotrebom jestivih prevlaka teži se povećanju difuzije vode iz uzorka u okolni osmotski rastvor, s jedne strane, i onemogućavanje prodiranja materija iz osmotskog rastvora u uzorke s druge strane. Osmotska dehidracija je obavljena u rastvorima 70% saharoze i 80% melasi šećerne repe, u trajanju od 5 sati, na temperaturi 55°C i atmosferskom pritisku. Primena jestivih prevlaka dovodi do povećanja gubitka vlage i smanjenja priraštaja suve materije u uzorcima jabuke. Ustanovljeno je da se upotrebom dvostruke prevlake, na uzorcima jabuke koji su dehidrirani u melasi šećerne repe, postižu najbolji rezultati.

Gljučne reči: Osmotska dehidracija, jabuka, jestiva skrobna prevlaka, melasa šećerne repe, saharoza

ESTIMATION OF MOISTURE DIFFUSIVITY OF BANANA

PROCENA KOEFICIJENTA DIFUZIJE BANANE

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SUMMARY

In this paper, the solution of the inverse problem of estimating the temperature dependent moisture diffusivity is presented. The present parameter estimation problem is solved by using the Levenberg-Marquardt method of minimization of the least-squares norm, by using simulated experimental data with random errors. Instead of actual temperature measurements, the temperature response during convective drying is obtained using the numerical solution of the non-linear one dimensional Luikov's equations. In order to simulate real measurements, a normally distributed error was added to the numerical temperature response. As a representative drying body, banana with known thermophysical properties has been chosen. In order to investigate the influence of drying time, determinant of the sensitivity matrix has been calculated.

Key words: moisture diffusivity, drying, banana.

THE EFFECTS OF SOLVENTS ON THE PHENOLIC CONTENTS AND ANTIOXIDANT ACTIVITIES OF PLANT BY-PRODUCTS

UTICAJ RASTVARAČA NA SADRŽAJ FENOLA U NUZPROIZ- VODINA BILJAKA I NJEGOVO ANTINUTRITIVNO DELOVANJE

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SUMMARY

Growing interest in the substitution of synthetic food antioxidants by natural ones has fostered research on vegetable sources and screening of raw materials for identifying new antioxidants. Food processing industries generate substantial quantities of phenolics-rich by-products, which could be valuable natural sources of antioxidants. Practical aspects of extraction and production of sufficient amounts of natural antioxidants from most of these sources remain to be elucidated. The aim of this work was to compare the effects of different extracting solvents on total phenolic content and antioxidant activities of potato peels, sugar beet pulp, and sesame cake. Antioxidant activities were evaluated by 2,2-azinobis(3-ethylbenzthiazoline sulphonate) (ABTS) radical scavenging activity, 1,1-diphenyl-2-picrylhydrazyl (DPPH) radical scavenging capacity, and β -carotene/linoleic acid, and compared with that of butylated hydroxyl-anisole (BHA), butylated hydroxyl-toluene (BHT) and tert-butyl hydroquinone (TBHQ). The results showed that solvents with different polarities influenced significantly antioxidant activity. A few of these extracts are as strong as some common synthetic antioxidants.

Keywords: By-products; Total phenolics content; Antioxidant activity; Solvent polarity

QUALITY ASSURING IN MILK INDUSTRY BY CAPITALIZATION OF THE SKIMMED MILK

OBEZBEĐENJE KVALITETA U INDUSTRIJI PROIZBODNJE MLEKA KAPITALIZACIJOM OBRANOG MLEKA

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SUMMARY

One of the main aspect that must to be taken in consideration in food technologies is the capitalization of the secondary products and offal's resulted in the process. In this mode is protected the environment as well as the process quality by obtaining of a great number of food products.

In the milk industry results some secondary products as: skimmed milk, butter-milk, and whey, that are obtained at the milk processing for cheeses and casein. This paper will present some ways for capitalization of the skimmed milk as well as the technological aspects for each process.

Key words: skimmed milk, casein, proteic co-precipitate, caseinates

BIO-ALCOHOL OBTAINING FROM THE RAW MATERIALS WITH STARCH

DOBIJANJE ALKOHOLA IZ SIROVINA SA DODATKOM SKROBA

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SUMMARY

One of the way for obtaining of bio-alcohol is from raw materials with starch such as potatoes and cereals. In this paper are presented some aspects about the raw material's characteristics, the main technological processes for alcohol obtaining, some technological processes with their advantages and disadvantages, aspects regarding the process quality and efficiency.

Key words: starch molasses, starcharification, enzymes, marc, sucrose, yeasts

KINETICS OF THE COMBINED DRYING TECHNOLOGY OF PEAR SLICE (PYRUS)

KINETIKA KOMBINOVANE TEHNOLOGIJE SUŠENJA KRIŠKI KRUŠKE (PYRUS)

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SUMMARY

During the year 2008, a set of experiments of combined technology, which involves the drying of a pear slice, have been conducted. The combination consisted of osmotic and convective drying. The aim of the research was measuring the influence of analysed factors of osmotic and convective drying on the change of moisture of the pear and increase of dry matter. The factors of osmotic drying were temperature and solution concentration, and factors of convective drying were temperature and air velocity in front of the layer of the material. During the osmotic drying, the most significant change concerning moisture and the increase of dry matter happened in the first 100 minutes of the process. A change in moisture is also detected later in the process, but the velocity of that change decreased. In 180 minutes the moisture decreased from the initial value of 0,82 kg/kg to 0,775 kg/kg for solution temperature of 60°C and solution concentration of 50°Bx and 0,776 kg/kg for solution temperature of 40°C and solution concentration of 50°Bx. Maximum recorded increase of dry matter equaled 0,036 kg/kg for the solution temperature of 60°C. Within the period of 24 hours of convective drying, the biggest decrease in moisture was achieved in air temperature of 60°C and air velocity of 1,5 m/s. The moisture of the material decreased from the initial value of 0,776 kg/kg to 0,453 kg/kg, and tissue temperature equaled 57,34°C. Evaluation of the chosen factor levels influences of convective drying on the speed of drying by dispersive analysis was conducted. The results of dispersive analysis pointed out the significant influence of chosen levels of air temperature and decreased influence of chosen levels of air velocity on the speed of drying.

Key words: pear, drying kinetics, convective drying, osmotic drying.

REZIME

U toku 2008. godine obavljen je set eksperimenata kombinovane tehnologije sušenja ploda kruške. Kombinacija se sastojala od osmotskog i konvektivnog sušenja. Cilj istraživanja je bio merenje uticaja analiziranih faktora osmotskog i konvektivnog sušenja na promenu vlažnosti kruške i povećanja suve materije. Faktori osmotskog sušenja bili su temperatura i koncentracija rastvora, a faktori konvektivnog sušenja bili su temperatura i brzina vazduha ispred sloja materijala. Tokom osmotskog sušenja najznačajnija promena vlažnosti i povećanje suve materije dogodila se u prvih 100 min procesa. Uočava se i kasnije promena vlažnosti ali brzina te promene je sve manja. Po isteku 180 min vlažnost se snizila sa početnih 0,82 kg/kg na 0,775 kg/kg za temperaturu rastvora 60°C i koncentraciju rastvora 50°Bx i 0,776 kg/kg za temperaturu rastvora 40°C i koncentraciju rastvora 50°Bx. Maksimalno zabeleženo povećanje suve materije iznosilo je 0,036 kg/kg za temperaturu rastvora 60°C. Tokom 24 h konvektivnog sušenja najveće sniženje vlažnosti postignuto je pri temperaturi vazduha 60°C i brzini vazduha 1,5 m/s. Vlažnost materijala se snizila sa početne 0,776 na 0,453 kg/kg, a temperatura tkiva je iznosila 57,34°C. Obavljena je ocena uticaja izabranih nivoa faktora konvektivnog sušenja na brzinu sušenja disperzionom analizom. Rezultati disperzione analize su ukazali na značajan uticaj izabranih nivoa temperature vazduha i smanjen uticaj izabranih nivoa brzine vazduha na brzinu sušenja.

Ključne reči: kruška, kinetika sušenja, konvektivno sušenje, osmotsko sušenje.

TEHNOLOGIJA OSMOTSKOG TRETMANA I PROCESNA OPREMA

OSMOTIC TREATMENT TECHNOLOGY AND EQUIPMENT

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REZIME

U radu su prikazani tehnološki postupci i procesna oprema koja omogućava realizaciju procesa osmotskog tretmana (OT) na industrijskoj proizvodnoj skali. Za proveru idustrijske prototipne instalacije izabrani su tehnološki postupci proizvodnje sušenog voća, višnje i šljive. Mašine i uređaji tehnološke linije su specificirani, a radni procesni parametri se definisni. Osnovna tehnička rešenja i konstrukcija uređaja za kontinualno i kontrolisno izvođenje procesa osmotskog tretmana zaštićeni su patentima. Osobnosti rada uređaja su ispitivana i potvrđena na jedinici poluindustrijske skale. Takođe su ova ispitivanja pokazala da, se procesi osmotskog tretmana sa uspehom mogu primeniti na praktično sve voćne vrste.

Ključne reči: osmotski tretman, procesna oprema, industrijski prototip, jedinica za kontinualno i kontrolisno izvođenje procesa, kontaktor za osmotski tretman, kombinovanje osmotskog tretmana i konvektivnog sušenja voća.

SUMMARY

In this paper the processing technology and equipment that may be applied on the industrial production scale for realization of Osmotic Treatment (OT) processes were presented. For testing of the industrial prototype of OT unit, processing of dry cherries and plumes were chosen. Machines and Appliances of the processing line were specified and processes working parameters were defined. Technical solutions and construction of the OT Contactor were patented. The very specific features of the Appliance have been approved during experimental long time runs, realized by use of the pilot plant scale unit. Pilot-plant experimental investigation also approved that, by the use of the OT Contactor, OT processes can be successfully applied practically on all known fruit commodities.

Key words: Osmotic Treatment, process equipment, industrial scale prototype, unit for realization of continuous and controlled Osmotic Treatment processes, drying fruit by combining process of OT and convective air drying.

THE SEED PRODUCTION OF EARLY MATURITY ZP MAIZE HYBRIDS IN STUBBLE CROP SOWING

PROIZVODNJA SEMENA RANIH ZP HIBRIDA KUKURUZA U POSTRNOJ SETVI

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SUMMARY

A modern technological process of the maize seed production is developed in Serbia. This production is supported by favourable climatic and soil conditions, very skilled staff, contemporary processing plants and three laboratories that test seed according to international ISTA standards. A need for greater areas on which this production can be successfully organised occurs sometimes. Therefore, the Maize Research Institute, Zemun Polje, for the first time, organised the seed production of ZP maize hybrids of early maturity (FAO 200) in stubble crop sowing in the estate "Eliksir Agrar" in Prigrevica near Sombor in 2008.

The production of hybrids ZPTC 209 and ZPTC 260 was established on the area of 40 ha each. Climatic conditions in 2008 were satisfactory in relation to the temperature, but the precipitation distribution was unfavourable, hence six irrigations with the norm of 30 mm were applied. Total of 218 t of ZPTC 209 ears with 44% grain moisture and 203 t of ZPTC 260 ears with 42-44% grain moisture were harvested. Due to a very high grain moisture content the duration of drying was from 157 to 165 hours and energy consumption was greater by approximately 60-70% and twice as much time was used, than when maize is dried with the grain moisture content of 20-25%. The obtained average seed yield amounted to 2.1 t ha⁻¹ and 1.8 t ha⁻¹ in ZPTC 209 and ZPTC 260, respectively. The hybrid ZPTC 209 had 68% seed fractions of 6.5-8.4 mm and 32% fractions of 8.5-11.0 mm.

Key words: maize, stubble crop sowing, yield, hybrid maize, ZPTC 209, ZPTC 260.

REZIME

U Srbiji je razvijen savremen tehnološki proces proizvodnje semena kukuruza. Za ovu proizvodnju postoje povoljni klimatski i zemljišni uslovi, vrlo kvalifikovani kadrovi, moderni doradni centari i tri laboratorije koje vrše kontrolu kvaliteta semena po međunarodnim ISTA standardima. Ponekad se javi potreba za većim površinama od onih na kojima se ova proizvodnja može uspešno organizovati. Zbog toga je Instituta za kukuruz „Zemun Polje“, po prvi put, organizovao proizvodnju semena ranih ZP hibrida kukuruza (FAO 200), na imanju „Eliksir agrar“ iz Prigrevice kod Sombora u 2008. godini, u postrnoj setvi.

Proizvodnja je zasnovana na po 40ha, hibrida ZPTC 209 i ZPTC 260. Klimatski uslovi u 2008.godini bili su zadovoljavajući sa aspekta temperatura, ali je raspored padavina bio nepovoljan, te je primenjeno šest navodnjavanja sa po 30mm. Ubrano je 218t klipa ZPTC 209 sa 44% vlage zrna i 203t klipa ZPTC 260 sa 42-44% vlage zrna. Zbog veoma visokog sadržaja vlage zrna sušenje je trajalo od 157 do 165 časova i potrošeno oko 50-60% više energije i dvostruko više vremena, nego kada se kukuruz suši sa vlagom od 20-25%. Ostvaren je prosečan prinos semena od 2,1t/ha ZPTC 209 i 1,8t/ha ZPTC 260. Hibrid ZPTC 209 imao je 68% frakcije semena 6,5-8,4mm i 32% frakcije 8,5-11,0mm. Hibrid ZPTC 260 imao je 58% frakcije semena 6,5-8,4mm i 42% frakcije 8,5-11,0mm.

Ključne reči: kukuruz, postrna setva, prinos, hibridni kukuruz, ZPTC 209, ZPTC 260.

PHOTOSENSITIZATION AS A NOVEL APPROACH TO DECON- TAMINATE FRUITS AND VEGETABLES

FOTOSENZITIVNOST KAO NOVI PRISTUP DEKONTAMINACIJI VOĆA I POVRĆA

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SUMMARY

Various novel technologies for post harvest processing of food products, such as irradiation, pulsed light, ozone, electrolyzed oxidizing water, etc., have been investigated. Photosensitization as an emerging food safety technology specifically deals with a rapid, environmentally and cost-effective microbial inactivation.

A significant inactivation of *Bacillus cereus* inoculated on the surface of fruits or vegetables could be achieved after a chlorophyll salt based photosensitization treatment (2-3 log (cfu/g)). In addition, naturally distributed aerobic mesophils were reduced by the same rate as well. Moreover, the shelf-life of treated nectarines, cherry tomatoes, iceberg lettuce, Chinese cabbage can be extended.

Summarizing, photosensitization as a novel biophotonic technology has the potential to be an effective antimicrobial tool that can be used to inactivate harmful and pathogenic microorganisms on the surfaces of fruits and vegetables, expanding significantly their shelf-life.

Keywords: food pathogens, preservation, photosensitization, fruits, vegetables

CONTROL OF FOOD PATHOGENS BY CHLOROPHYLL-BASED PHOTOSENSITIZATION IN VITRO

KONTROLA PATOGENA HRANE POMOĆU HLOROFILA – FOTO SENZITIVNOST IN VITRO

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SUMMARY

Biophotonic technology based on photosensitization might serve as an effective, environmentally friendly and promising antibacterial tool. Data obtained indicate, that most important food pathogens *Listeria monocytogenes*, *Bacillus cereus* can be inactivated by chlorophyll derivative-based photosensitization. The inactivation of these microorganisms was very significant and reached 6 orders of magnitude in vitro. *Salmonella Typhimurium* was more resistant to this treatment. When pathogen *Bacillus cereus* was inoculated on the food matrix the inactivation was lower (3-4 orders of magnitude). It is important to note, that *Bacillus* spores are susceptible to this treatment as well.

Summarizing, chlorophyll-based photosensitization has potential to be effective antimicrobial tool and can be used to inactivate harmful and pathogenic microorganisms in different environments.

Keywords: *Listeria*, *Bacillus*, decontamination, food safety.

**EXAMINATION OF EXTENSOGRAFICAL PARAMETERS OF
WINTER WHEAT (TRITICUM AESTIVUM) FLOUR**
**PROUČAVANJE EKTENZOGRAFIČKIH PARAMETARA BRAŠNA
OZIME PŠENICE (TRITICUM AESTIVUM)**

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SUMMARY

In the trade of European Union principally the analysis of alveographical and extenso-
graphical parameters mean the acceptance system.

We analysed the extensographical parameters of 10 winter wheat varieties breed by the
Cereal Research Non Profit Company, Hungary and we made a comparison among the results
in 2005-2007 years. We established the following results by Brabender Extensograph: the re-
sistance of extension, the extensibility and the energy in 45, 90 and 135 min present close,
positive correlation to each other. The extensibility is in close, positive correlation with en-
ergy, too. There is no correlation between the resistance of extension and extensibility and the
extensibility and the energy in 135 min.

We analysed by SMS2 Texture Analyser: there is no correlation among the parameters.
At present in the standards there is no limit for extensographical parameters. The costumers
and producte firm dictate the limits and write their +claims in the specifications. We estab-
lished according to specification of Extensograph of same multinational firms and closed the
special Hungarian Pannon Wheat Programm, that we can categorize the analysed varieties in
Pannon standard category.

Key words: winter wheat flavor, extensographical.

AGRO-PHYSICAL CHARACTERISTICS OF CARROT ROOTS PRODUCED IN MINI-BEDS

AGROFIZIČKE OSOBINE KORENA MRKVE PROIZVEDENE NA MINI GREDECAMA

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SUMMARY

The quality of soil tillage was evaluated by measuring the physical and mechanical properties of the soil, (structure coefficient, volumetric bulk density and penetrometric resistance of soil), on flat surface and after the mini-beds were formed, at various depths. Samples were taken according to standard ISO 10381-6. The evaluation showed a significant statistical difference at 0.95 confidence interval in the 10–25 cm layer.

During the vegetation period, agro-physical properties of carrot root were monitored. In the mini-beds, carrot root length was 188.5, while on the flat soil it was 141.7 mm. Maximal root diameter in mini-bed was 26.8, while on the flat soil it was 30.7 mm. Average mass of carrot root in mini-bed was 89.2 and on the flat soil 76.8 g. Statistically significant differences on the 0.95 interval in carrot yield were recorded twelve weeks after sowing. Maximum difference in the yield was recorded after eighteen weeks, before harvest. Mini-beds yielded 89.2 t/ha of carrot while the flat soil yielded 63.6 t/ha.

Key words: dimensions and yield of carrot root, mini-bed former machine.

REZIME

Kvalitet obrade zemljišta ocenjen je merenjem fizičkih i mehaničkih osobina zemljišta (koeficijent strukturalnosti, zapreminska specifična masa i otpor zemljišta), na ravnoj površini i nakon formiranja mini gredica, kao i sa promenom dubine. Uzimanje uzoraka zemljišta izvedeno je po standardu ISO 10381-6. Rezultati su pokazali statistički značajne razlike za interval poverenja 0,95 u sloju 10–25 cm.

U toku vegetacionog perioda praćene su agrofizičke osobine korena mrkve (EU No 730/99). Na mini gredicama formiran je koren dužine 188,5 mm, a na ravnom zemljištu 141,7 mm. Maksimalni prečnik na mini gredicama imao je vrednost 26,8, a na ravnom zemljištu 30,7 mm. Prosečna masa jednog korena mrkve na mini gredicama bila je 89,2, a na ravnom zemljištu 76,8 g. Statistički značajne razlike u prinosu mrkve pojavile su se nakon dvanaeste nedelje vegetacije, a maksimalna razlika u prinosu izmerena je u osamnaestoj nedelji vegetacije, pred ubiranje. Na mini gredicama ostvaren je prinos korena mrkve 89,2 t/ha, a na ravnom zemljištu 63,6 t/ha.

Ključne reči: dimenzije i prinos korena mrkve, mašina za formiranje mini gredica.

TEXTURE OF BREAD SUPPLEMENTED WITH FRUITS AND VEGETABLES TREATED BY OSMOTIC DEHYDRATION IN SUGAR BEET MOLASSES

TEKSTURA HLEBOVA SA DODATKOM OSMOTSKI DEHIDRIRANOG VOĆA I POVRĆA U MELASI ŠEĆERNE REPE

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SUMMARY

The concept of texture profiling is based on the same elements as in flavour profiling and include all the mechanical, geometrical and surface attributes of a product perceptible by tactile, visual and auditory receptors. The mechanical attributes are those related to the reaction of the product to press: they are divided in five primary characteristics (hardness, cohesiveness, viscosity, springiness and adheiveness) and three secondary (brittleness, chewiness and gumminess). The geometrical attribute are those related to the size, shape and arrangement of particles within a product. The surface attributes are those related to the sensations produced by moisture and/or fat content. In the mouth they are also related to the way in which these constituents are released. Texture of bread with addition fruits (apple, plum) and vegetables (carrot, cabbage) dehydrated in sugar beet molasses was investigated (crust and crumb) sensory (chewiness, grain structure, elasticity) and instrumentaly (Warner Vratzler, penetrometer).

Sensory and instrumentaly properties were correlated. It found differences between textures of breads due kinds and quantity of fruits and vegetables osmotically dehydrated in sugar beet molasses.

Key words: Texture, sugar beet molasses, osmotically dehydrated fruits and vegetables, bread.

REZIME

Koncept profila teksture zasnovan je na istim elementima kao i profil ukusnosti i obuhvata sva mehanička, geometrijska i svojstva površine proizvoda. Navedene osobine mogu da se opaze taktilnim, vizuelnim i auditivnim receptorima. Mehanička svojstva su ona koja su u vezi sa reakcijom proizvoda na pritisak; podeljena su na pet primarnih (tvrdoća, kohezivnost, viskoznost, elastičnost i adhezivnost) i tri sekundarna parametra (lomljivost, žvakljivost, gumoznost). Geometrijska svojstva su ona koja su u vezi sa veličinom, oblikom i uređenošću čestica u proizvodu. Svojstva površine su svojstva koja se odnose na osećaje koje izazivaju sadržaj vlage i/ili lipida; odnose se i na način na koji se vlaga ili lipidi oslobadjaju u ustima. U radu su ispitani uzorci hlebova sa dodatkom osmotski dehidriranog voća i povrća u melasi šećerne repe. Tekstura je određivana i senzorski ocenjivana na kori i sredini hlebova preko više pokazatelja (senzorski: žvakljivost, poroznost, elastičnost; instrumentalno: Warner Bratzler, penetrometar).

Utvrđena je korelacija između senzorskih i instrumentalnih određivanja, a utvrđena i razlika između teksture hlebova zavisno od vrste i količine osmotski dehidriranog voća i povrća.

Gljučne reci: Tekstura, melasa šećerne repe, osmotski dehidrirano voće i povrće, hleb.

**PRODUCTION OF PHENOLIC ACIDS AND ANTHOCYANINS IN
VITIS VINIFERA CELL CULTURE**

**STVARANJE FENOLNIH KISELINA I ANTICIJANINAU ĆELIJAMA
GROŽĐA (*VITIS VINIFERA*)**

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SUMMARY

Within the plant kingdom there are many compounds such as alkaloids, glucosinolates and polyphenolics serving within the plant defence system against pathogen attack and herbivores. Plant cell cultures can be a valuable source for the production of such secondary metabolites for the pharmaceutical industry. High yields gained from *in-vitro* cultures are of economically importance for novel drugs, insecticides, dyes, flavours, and fragrances. The present study focuses on secondary metabolites produced in *Vitis vinifera* cell cultures. We are focussing on the production of phenolic acids and anthocyanins. Through the application of different cell stressors (e.g. pulsed electric fields) we try to enhance the production of these secondary metabolites. The present paper described first results of such technology.

Key words: phenolic acids, anthocyanins, *vitis vinifera*, cell culture.

ACETALDEHYDE PRODUCTION DURING THE FORMATION OF PET BOTTLES USED FOR WATER BOTTLING

PROIZVODNJA ACETILDEHIDA TOKOM OBLIKOVANJA PET AMBALAŽE ZA FLAŠIRANJE VODE

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SUMMARY

Polyethylene terephthalate (PET) is currently used in the food industry, especially for bottling water and other beverages. However, PET is rather sensitive to heat and oxidation. Acetaldehyde is present in PET as a thermal degradation product formed during the melt condensation reaction and melt processing of PET. Acetaldehyde itself is also unstable. It readily oxidizes and polymerizes when exposed to air. Acetaldehyde possesses a distinct odour and taste, generally described as sweet plastic-like, with a low sensory detection threshold. The odour detection threshold of acetaldehyde in still water ranges between 20 and 40 µg/l. With the headspace technique a detection limit of acetaldehyde in water of 1 µg/l has been achieved. During injection - blowing, degradation reactions generate by- products, which can leach out, either by evaporation (if they are volatile), or by diffusion into the liquid content after bottling. Acetaldehyde (AA) seems to be the major of these undesired contaminants. The aim of this review is to identify the conditions that promote formation and migration of acetaldehyde during bottle formation, bottling and storage of liquids and to quantify the effects of crucial production factors, such as temperature, degradation atmosphere, time of degradation and drying, production speed, quality of PET and other process or storage parameters.

Key Words: Acetaldehyde, PET, water bottling.

**ENHANCED ANTHOCYANIN PRODUCTION OF GRAPE
(VITIS VINIFERA) ASSISTED BY ELICITORS AND HIGH PULSED
ELECTRIC FIELDS**

**POVEĆANA PRODUKCIJA ANTOCIJANA GROŽĐA (VITIS
VINIFERA) POMOĆU ELICITORA I PULSIRAJUĆEG
ELEKTRIČNOG POLJA VISOKE FREKVENCIJE**

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SUMMARY

Plants are an important source for a variety of secondary metabolites used for various purposes including pharmacy, medicine and industry. Nowadays, plant cell suspension cultures and immobilized cells are being utilized for the higher yield and quality of the products than extraction of whole plants. Anthocyanins are compounds that provide some of the coloring pigment of plants, flowers and fruits. Anthocyanin from grape cell cultures can be used as a natural alternative to synthetic dyes, particularly because of their various health-promoting properties.

The present study was concentrated on the production of anthocyanin in suspension culture of *Vitis Vinifera* by exposing them to elicitors: ethaphon and high pulsed electric fields. The samples are treated by ethaphon, HPEF and the combination of ethaphon and HPEF. The results indicated a higher accumulation of anthocyanin in elicited cultures with the treatment of ethaphon and HPEF altogether than in the control ones.

Key words: Anthocyanin, High pulsed electric fields, Grape

EFFECT OF FREEZING, DESICCATION AND LIOFILISATION ON THE BIOLOGICALLY ACTIVE COMPOUNDS OF FRUITS AND VEGETABLES

UTICAJ ZAMRZAVANJA, DESIKACIJE I LIOFILIZACIJE NA BIO- LOŠKI AKTIVNA JEDINJENJA VOĆA I POVRĆA

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SUMMARY

Production technologies have significant effect on the high biologic value organic components of fruits and vegetables, while one of the most important tasks of food processing is the preservation of these valuable compounds. Unfortunately, vitamins, antioxidants, taste, aroma and other organic compounds are not resistant to thermal stresses, so in several cases the traditional processing technologies cause significant quality losses.

In this study we have examined the effect of different preservation technologies - freezing, traditional drying (desiccation) and freeze drying (lyophilisation) - on the quality changes of vegetables (parsley and green pepper) and fruits (apple and lemon). Examined parameters were c-vitamin contents, antioxidant capacities and bioflavonoid contents. We both examined the quality changes compare to the fresh raw material and the differences between different processing technologies after a two month long storing period.

Key words: freezing, desiccation, lyophilisation, fruits, vegetables.

UPGRADED TECHNOLOGY FOR SUSTAINABLE SUNFLOWER MEAL PRODUCTION

UNAPREĐENA TEHNOLOGIJA ZA ODRŽIVU PROIZVODNJU SUNCOKRETOVE SAČME

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SUMMARY

Since the amount of hull reduces the nutritive value of sunflower meal proteins, the aim of this study was to investigate some of the possibilities for separating the hull and increasing the yield of protein fractions during the process of separation. The production parameters of the existing procedure without separation, procedure with centrifugal separation and the procedure with centrifugal separation of sunflower meal with preliminary treatments by crusher head ("Roscamp" type CHHD 36) were investigated. The preliminary treating was applied in order to crush the existing conglomerates and enable the subsequent separation of kernels from hulls adhered. Preliminary treating and latter centrifugal separation on screens with different openings (Ø 1.5, 1.8 and 2.0 mm) allow higher yield of high protein fractions by 24.0, 25.2 and 34.6% and only by 1.2, 1.4 and 1.7% respectively lower crude protein content. Compared to the existing processing procedures without separation, the procedures using centrifugal separation rendered the yield and quality of high protein fractions. According to the procedure with centrifugal separation, procedure using preliminary treatment by crusher head and centrifugal separation influenced the better yield of high protein sunflower meal but something less crude protein content. Produced high protein sunflower meals are comparable to adequate soybean products in chemical composition and in nutritional value and are suitable in feeding of younger and more sensitive animals.

Key words: sunflower meal, hull, separation, crusher head, sieving

REZIME

Pošto količina ljuske smanjuje nutritivnu vrednost proteina suncokretove sačme, cilj ovog rada je bio da se ispita neke mogućnosti za izdvajanje ljuske i povećanje prinosa i kvaliteta proteinske frakcije u procesu separacije. Ispitivani su proizvodni parametri postojećeg procesa prerade suncokretove sačme centrifugalnom separacijom i procesa centrifugalne separacije nakon prethodne dorade na udarnoj drobilici ("Roscamp" tip CHHD 36). Prethodna dorada je preduzeta u nameri da se izdobre prisutne grudve i da se omogući kasnije razdvajanje jezgra od slepljene ljuske. Prethodna dorada i kasnije frakcionisanje na centrifugalnom separatoru na sitima sa različitim prečnicima otvora (Ø 1.5, 1.8 and 2.0 mm) omogućuju veći prinos visokoproteinske frakcije za 24.0, 25.2 i 34.6% uz samo 1.2, 1.4 i 1.7% niži sadržaj sirovih proteina. U poređenju sa postojećim procesom proizvodnje bez separacije, procesom sa centrifugalnom separacijom povećava se prinos i kvalitet visokoproteinske frakcije. U odnosu na postupak sa centrifugalnom separacijom, proces koji koristi udarnu drobilicu i centrifugalnu separaciju utiče na bolji prinos visokoproteinske suncokretove sačme ali uz nešto manji sadržaj sirovih proteina. Proizvedene visokoproteinske suncokretove sačme su uporedljive sa odgovarajućim proizvodima od soje po hemijskom sastavu i nutritivnoj vrednosti i pogodne su za ishranu mlađih i osetljivijih životinja.

Ključne reči: suncokretova sačma, ljuska, separacija, udarna drobilica, prosejavanje

ISEKI_FOOD: ROLE IN EUROPEAN FOOD TECHNOLOGY DE- VELOPMENT

ISEKI_FOOD: ULOGA U RAZVOJU EVROPSKIH PREHRAMBENIH TEHNOLOGIJA

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SUMMARY

ISEKI_Food (Integrating Safety and Environment Knowledge In Food towards European Sustainable Development) (<https://www.iseki-food.eu/>) was designed as a network of University and Research Institutions, Professional Associations, Industrial partners and Students Associations to foster collaboration on a variety of joint interest projects. Several European and 6 global academic networks projects received funding between 1998 and 2011 from the European Commission.

To ensure the sustainability of the network activities the ISEKI_Food Association (<https://www.iseki-food.net/>) was founded in 2005 to be a leading network for all stakeholders in the food supply chain with regard to education, legislation and communication.

The main objectives of the network are to contribute to the European Higher Education Area (EHEA) in the field of Food Studies by internationalization and enhancement of quality. The workplan is fostering innovative developments, enhancement of food studies quality, and improvement of European higher education international attractiveness.

More specific objectives are: 1) Creation of a Virtual Networking Environment (VNE) for International Cooperation and Mobility; 2) The European Quality Assurance System for Food Study Programmes (EQAS_Food); 3) Facilitating/ Promoting/ Fostering Lifelong Learning in Higher Education (APEL); 4) Innovation in Food Study materials; 5) Development of a Platform for the International Cooperation and Mobility in the field of Food (PICAM_Food); and 6) Exploitation of research results especially to small and medium enterprises (SME's).

Key words: Food Studies, Higher Education Area, Internationalization, Quality Assurance.

DEVELOPMENT POSSIBILITY OF LATE PEAR ASSORTMENT IN HUNGARY

MOGUĆNOST RAZVOJA SORTIMENTA KASNIH SORTI KRUŠAKA U MAĐARSKOJ

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SUMMARY

To find a late-ripening, high-quality, well-adopted pear variety poses a fundamental problem for the Hungarian production. We have executed organoleptic judging to observe the consumer demand for the new type of winter pears.

We performed our pear variety researches in Zala-country, one of the most important pear-growing region of Hungary. The novelty varieties were compared with the '*Beurré Bosc*' based on organoleptic judging by the size and shape of the fruit, the colour and texture of the skin, and the firmness and flavour of the fruit flesh. '*Bronzovaja*' and '*Noyarbskaja*' originated from Moldova seem to be promising varieties for growers as a result of the experiment.

Key words: pear, variety, organoleptic judging, market value, consumer habit.

EFFECTS OF PECTINASE AND CELLULASE ENZYMES ON THE BLACKCURRANT JUICE BY REVERSE OSMOSIS

UTICAJ PEKTINSKIH I CELULOZNIH ENZIMA NA SOK RIBIZLE U REVERZNOJ OSMOZI

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SUMMARY

Our aim was to prepare concentrated blackcurrent juice by reverse osmosis and preserving the valuable components of the berry. The blackcurrant is an important and popular fruit which has great biological impact. Our aim was to prepare concentrated blackcurrent juice by reverse osmosis and preserving the valuable components of the berry.

Paterson Candy International (PCI) apparatus was used for the concentration equipped with tubular B1 module., i.e. RO membrane was applied, the active membrane area was 0,9 m². The concentration of the juice was carried out on 20 °C, on 60 bar.

The aim of this study was to examine the effect of the different enzyme pretreatment and to examine the applicability of the reverse osmosis for the concentration of blackcurrant juice. The blackcurrant juices were pretreating by two enzyme Pectinase, Novozyme. The effects of enzymatic pretreatment on the permeate flux have been evaluated by two enzymes (Pectinase from *Aspergillus Aculeatus*, Cellobiase from *Aspergillus niger*). For the control sample, the permeate flux was the lowest and the maximum TSS of the concentrate reached was the lowest at 22,5 °Brix. The highest permeate flux was achieved during the concentration of juice that has been previously pretreated by Cellobiase from *Aspergillus niger*.

Key words: blackcurrent, reverse osmosis, pectinase and cellulose enzymes.

QUALITY OF DIETARY PROBIOTIC YOGHURT PRODUCED BY USING TRANSGLUTAMINASE

KVALITET DIJETALNOG PROBIOTSKOG JOGURTA PROIZVE- DENOŠ UZ PRIMENU TRANSGLUTAMINAZE

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SUMMARY

Milk industry uses different techniques for improving physico-chemical properties of low fat yoghurt. Application of transglutaminase in low fat yoghurt manufacture is one of the recent modern techniques. The enzyme transglutaminase is transferase that forms both inter- and intra-molecular isopeptid bonds in and between many proteins by cross-linking of the amino acid residues.

The aim of this study was to determine the effect of the different quantities of transglutaminase (0.02%, 0.06% i 0.12%) as well as conditions of its application (direct or after activation of enzyme) on improvement physico-chemical properties of yoghurt manufactured from two kinds of low fat milk (0.1% w/w fat and 0.5% w/w fat) after production and during of storage. The fermentation in both series started after the adequate amounts of probiotic starter culture ABT-4 (Lactobacillus acidophilus-5, Bifidobacterium-12 i Streptococcus thermophilus, Chr. Hansen A/S Denmark) were added to the milk at 43 °C. The results of analyses, after production of yoghurts, show that the least value of whey separation in yoghurts manufactured with activation of transglutaminase. Also, transglutaminase amount didn't affect on value of whey separation. Differences of whey separation values among the yoghurts with 0.1% and 0.5% w/w fat wasn't significant.

It was found out that yoghurts produced with transglutaminase had much better physical and sensory characteristics, compared to yoghurts produced without addition enzyme.

Key words: probiotic yoghurt, using transglutaminase.

HELJDINO BRAŠNO U PROIZVODNJI INTEGRALNOG KEKSA

BUCKWHEAT IN THE WHOLEGRAIN CRACKER PRODUCTION

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REZIME

Keks, kao brašeno-konditorski proizvod, se ubraja u koncentrovanu hranu zbog značajne energetske i hranljive vrednosti. Korišćenjem novih sirovina u proizvodnji keksa može se ostvariti novi senzorni kvalitet (miris i ukus) i dobiti nutritivno vredan proizvod. Jedna takva sirovina, značajna po hemijskom sastavu odnosno biološkoj vrednosti je integralno heljdino brašno. Sastav heljdinog zrna je takav da se u njemu nalazi biološko vredni proteini i vitamini, a pri tome ne sadrži gluten, što proizvode od heljde svrstava u funkcionalne. Heljda je dobar izvor bioflavonoida rutina, kvercetina, kemferol-3-rutinozida, a u tragovima sadrži flavonol triglikozid. Cilj ovog rada je bio da se sagleda uticaj integralnog heljdinog brašna na termička i mehanička svojstva testa i senzorni kvalitet slanog keksa u odnosu na integralno pšenično brašno. Reološka svojstva heljdinog brašna su ispitana na Miksolab-u kako bi se procenila pecivna svojstva ispitnog proizvoda. Heljdino integralno brašno značajno utiče na čvrstoću i elastičnost testa tokom zagrevanja. U toku razvoja novog brašeno-konditorskog proizvoda radilo se na iznalaženju povoljnog odnosa integralnog heljdinog brašna, instant kukuruzne krupice i masnoće bez trans masnih kiselina u cilju ostvarivanja optimalnih nutritivnih i senzorskih svojstava proizvoda pri njegovom konzumiranju. Na osnovu kvaliteta integralnog heljdinog brašna kao osnovne sirovine i postavljenog cilja u odnosu na kvalitet gotovog proizvoda razrađen je sirovinski sastav testa, tehnološki proces pripreme i vođenje testa kao i režim pečenja u cilju postizanja optimalnog senzornog kvaliteta.

Cljučne reči: heljda, integralni heljdin keks, termo-mehaničke osobine testa, senzorska svojstva.

SUMMARY

Crackers represent concentrated food because of significant energy content and nutritional value. The application of new ingredients in the production of crackers can expand the products range giving cracker products new sensory quality and higher nutritional values. Such an ingredient, containing many important nutrients, is wholegrain buckwheat flour. Buckwheat grain contains a large amount of proteins, starch, vitamins and does not contain gluten, which classify buckwheat products as functional ones. Also, buckwheat grains have been well known as a plant source of rutin, quercetin, kaempferol-3-rutinoside, and a trace quantity of flavonol triglycoside. The aim of the present study was to investigate the effect of wholegrain buckwheat flour on thermo-mechanic properties of dough and sensory quality of salty cracker as compared to wholegrain wheat flour. Rheological properties of buckwheat flour dough were tested on Mixolab in order to predict baking characteristics of investigated buckwheat products. The wholegrain buckwheat flour significantly affected the dough hardness and elasticity during heating. The scope of a novel bakery product development was the optimization of wholegrain buckwheat flour share in a combination with instant corn grits and trans-fatty free margarine, in order to achieve the most acceptable nutritive and sensory quality. Based on the quality of wholegrain buckwheat flour and the desired final product quality, the technology development procedure, dough preparation and baking conditions were developed in order to make a functional product with optimum sensory quality.

Key words: Buckweat, Wholegrain buckwheat cracker, thermo-mechanical dough properties, sensory properties.

GENETICALLY MODIFIED ORGANISMS (GMOS) - THE FUTURE OF MANKIND OR FALSE HOPE

GENETIČKI MODIFIKOVANI ORGANIZMI (GMO) - BUDUĆNOST ČOVEČANSTVA ILI ZABLUDA

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SUMMARY

The world population currently exceeds 6 billion, and by the year 2050 or thereabouts it will have reached 9 billion according to estimates. Over 800 million people in the world suffer from hunger. Global food production can be increased by better use of available resources, increased food production in water systems such as oceans, seas, rivers, and lakes, use of intensive crop growing technologies, and improved efficiency of conventional breeding methods in agriculture and animal husbandry. All these approaches, however, have their limiting factors. Added to this are problems caused by the loss of arable land that is taking place around the world every day. The modern biotechnology methods began to be used in the 1970s as a result of the knowledge that had accumulated by that time in the field of molecular biotechnology. These methods open up great possibilities for increased food production, obtainment of new sources of energy and raw materials, implementation of new technological procedures, and use in human genetics. Recombinant DNA techniques have made possible the manipulation of genetic material, i.e. the transfer of a trait of interest from one biological species to another and its expression in the host species. The procedure by which this is carried out is called genetic engineering and the resultant organisms are called genetically modified organisms (GMOs). The first genetic transformations have been performed on microorganisms as the most numerous forms of life on planet Earth. A number of useful microbial genetic transformations have been attained thus far (obtainment of human protein, insulin, serum albumin, biodegradable plastics, microdiesel, and a host of others).

Genetic engineering has found many applications in plant breeding. It is estimated that about 100 million hectares worldwide were sown to transgenic plants in 2008 alone. Genetic transformations have been made in a number of crop species, including maize, soybean, cotton, wheat, rice, sugar beet, potato, rapeseed, melon, tomato, and various flower species. The most widely grown transgenic plants are those possessing tolerance to particular herbicides, followed by those having resistance to insects of the orders Lepidoptera and Coleoptera. In animals, significant results when it comes to genetic modifications have been achieved in mice, rabbits, antelopes, goats, pigs, sheep, cows, and some other species. Genetic modifications are also used in medicine and pharmacology when defective and normal genes responsible for certain hereditary diseases are isolated and applied in the form of gene therapy. Advocates and opponents of GMOs have been debating a number of ethical and bioethical issues concerning the correct selection and use of genetic modifications. Despite the fact that many valid arguments can be made against the use of GMOs, the prevailing outlook is that, if used correctly, GMOs can contribute greatly to human progress and can provide real hope for the future of mankind.

Key words: GMO, genetic engineering, DNA, gene, microorganisms, plants, animals, human genetics.

IZVOD

Sadašnja ljudska populacija na planeti zemlji prelazi 6 milijardi, a prognoze su da će 2050. godine dostići 9 milijardi. Od sadašnje ljudske populacije preko 800 miliona praktično gladauje. Boljim korišćenjem raspoloživih resursa, većom proizvodnjom hrane u vodnim sistemima (okeanima, morima, rekama i jezerima), primenom intenzivnih tehnologija gajenja biljaka, efikasnijim metodama konvencionalnog oplemenjivanja biljaka i životinja moguće je povećati proizvodnju hrane na globalnom nivou, ali sve ove mogućnosti imaju svoje limitirajuće faktore. Ovome treba pridodati i svakodnevno smanjenje obradivih površina u svetu. Zahvaljujući nagomilanom znanju u oblasti molekularne biotehnologije tokom 70-tih godina dvadesetog veka prišlo se korišćenju modernih metoda biotehnologije koje stvaraju velike mogućnosti u proizvodnji hrane, dobijanju novih izvora energije i realizaciji novih tehnoloških postupaka, kao i primenu u humanoj genetici. Tehnologijom rekombinantne DNK, omogućena je manipulacija genetičkog materijala, odnosno prenos osobine od interesa iz jedne biološke vrste u drugu i njena ekspresija u vrstu domaćina. Postupak kojim se ovo realizuje naziva se genetički inženjering, a tako nastali organizmi nazivaju se genetički modifikovani organizmi (GMO). Prve genetičke transformacije su urađene kod mikroorganizama, kao najbrojnijim živim sistemima na planeti Zemlji. Kod mikroorganizama je realizovano više korisnih genetičkih transformacija (dobijanje humanog insulina, serum albumina, biodegradabilne plastike, mikrodizel i niz drugih). Veliku primenu je našao genetički inženjering u oplemenjivanju biljaka. Računa se da je u svetu u 2008. godini, sa transgenim biljakama bilo posejano oko 100 miliona hektara. Genetičke transformacije su urađene kod većeg broja pojedinih biljaka (kukuruz, soja, pamuk, pšenica, pirinač, šećerna repa, krompir, uljana repica, dinja, paradajz, različite vrste cveća i druge). Od transgenih biljaka najviše se gaje biljne vrste tolerantne prema određenim herbicidima, a na drugom mestu su otporne prema insektima iz reda Lepidoptera i Coleoptera. Kod životinja postignuti su značajni rezultati kada su u pitanju genetičke modifikacije koje su realizovane kod miševa, zečeva, antilopa, koza, svinja, ovaca, krava i nekih drugih životinjskih vrsta. Genetičke modifikacije se izvode u medicini izolovanjem defektnih i normalnih gena odgovornih za određene nasledne bolesti i njihove primene putem genske terapije, kao i u farmaciji. Protivnici, ali i pristalice GMO pokrenuli su više etičkih i bioetičkih pitanja u cilju pravilnog izbora i korišćenja određenih genetičkih modifikacija. Uvažavajući sve argumente protiv GMO, može se konstatovati da će njihovo pravilno korišćenje mnogo doprineti napretku čovečanstva, a nisu nikakva zabluda.

Ključne reči: GMO, genetički inženjering, DNK, gen, mikroorganizmi, biljke, životinje, humana genetika, etika i bioetika.

EFFECT OF MILLING, GRINDING AND SIEVING ON SOME QUALITY PARAMETERS OF WHEAT FLOUR

UTICAJ MLEVENJA, USITNJAVANJA I PROSEJAVANJA NA NEKE PARAMETRE KVALITETA PŠENIČNOG BRAŠNA

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SUMMARY

Wheat is one of the most important cereals in the world and the bread made of its flour belongs to the everyday life of human mankind. The Hungarian standard relating to the laboratory production of wheat flour (MSZ 6367/9-1989) does not mention the type of laboratory mill used for milling, and it only builds up some general criteria, such as: the laboratory mill should be provided with four differently nicked barrels, a sieve with appropriate hole sizes, and also with the separated collections of the pilot flour and the bran. Our study was started at this point and the answers for the following questions were aimed to be found: do the flour patterns studied and produced with different grinding and sieving techniques, widely used in laboratory mills of the same wheat pattern show any alterations after the impact of the formula production as regards chemical constitutions (protein content, wet gluten content). Various flours and whole grains of the wheat patterns sieved with different particle sizes were studied in this experiment. The results our research confirm that the quality of wheat flour can be modified by different methods of pattern production.

Key words: milling, grinding, sieving.

INTERNET POSSIBILITY IN LABVIEW SOFTWARE PACKAGE

INTERNET MOGUĆNOSTI RADA U LabVIEW PROGRAMSKOM PAKETU

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SUMMARY

The topic of this paper refers to the possibility of application of Internet technologies in the LabVIEW software package, in order to realize remote measurements in agricultural technique. The main methods as well as all the advantages and disadvantages in their use are discussed and evaluated.

In this technology, which fully supports the LabVIEW software package includes: Remote viewing using LabVIEW built-in Web Server, CGI (Common Gateway Interface) technology, DataSocket technology and, Client-Server communication with built in TCP/IP protocol.

The paper also gives a review of Virtual Instrumentation, new ways of measuring and analysis of signals, which is very suitable for use in processing technique, especially when it comes to remote measurements via the Internet.

Key words: Virtual Instrumentation, remote measurements, Internet technologies, LabVIEW software package, processing technique

REZIME

Tema ovog rada odnosi se na mogućnosti primene Internet tehnologija u LabVIEW programskom paketu, radi realizacije udaljenih merenja u poljoprivrednoj tehnici. Glavne metode kao i sve prednosti i nedostaci prilikom njihovog korišćenja prodiskutovane su i ocenjene.

U ove tehnologije koje u potpunosti podržava programski paket LabVIEW spadaju: Udaljeni pregled sa ugrađenim LabVIEW Web Serverom, CGI tehnologije, DataSocket tehnologije i Client-Server komunikacija sa ugrađenim TCP/IP protokolom.

U radu je takođe dat i prikaz Virtualne Instrumentacije, novog načina merenja i analize signala, koji je veoma pogodan za primenu u procesnoj tehnici, posebno kada su u pitanju udaljena merenja preko Interneta.

Ključne reči: virtualna instrumentacija, merenje na daljinu, Internet tehnologije, LabVIEW programski paket, procesna tehnika

ABOUT MILLING SYSTEM FOR LIGNO-CELLULOSIC BIOMASS FROM FORESTS AND URBAN PARKS

SISTEMI SITNENJA LIGNOCELULOZNE BIOMASE ŠUMA I UR- BANIH PARKOVA

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SUMMARY

This paper presents some considerations on milling systems for ligno-cellulosic biomass destined for fermentative production of ethyl-alcohol based on new approach according to specifically conditions.

The objectives of present paper are: estimation on possibilities to identify optimum ways and solutions, insuring of maximum fiability and maintenance; finding practical solution for manufacturing; estimating the potential problems for implementation in Romania as industrial application, by using integrated engineering.

There are presented the advantage and disadvantage of the use of proposed solution and economic implications. Special part is destined on designing of original specific equipment.

The result of present paper is a new solution for one milling system, simple, efficient and easy to manufacture and use. Proposed solution suppose a new cutting system which can grinds different size of raw materials (different size dry branches, leafs etc.). The testing results are also presented in the paper.

Key words: miling system, lingo-celluosic, biomass.

THE USAGE OF VACUUM IMPREGNATION FOR IMPROVING THE QUALITY OF DRIED VEGETABLES

UPOTREBA VAKUM IMPREGNACIJE ZA UNAPREĐENJE KVALITETA SUŠENOG POVRĆA

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SUMMARY

Our goal in this study is to point out a possibility of improving the quality of the dried vegetables with the help of a new technology, vacuum impregnation.

As we all know, a large proportion of vegetal products are characterized through a high level of sensitivity towards environmental factors and towards the alterations they are subjected to during the processing. This leads to their degradation in terms of both sensorial and nutritional point of view.

The vegetable products which were studied had been impregnated under a vacuum pressure of 300-500 mbar for 10 min, with a solution of ascorbic acid and afterwards they were dried under different conditions. During the exsiccation, as well as after the process reached its end, ascorbic acid stability, color and selected physicochemical properties of vegetable products were analyzed.

Key words: vacuum impregnation, vegetable products, drying.

DRYING MEDIUM PARAMETERS CALCULATION

PRORAČUNA PARAMETARA MEDIJUMA ZA SUŠENJE

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SUMMARY

Natural gas is used as a heat source in the majority of modern drying plants in agriculture. Input gas mixture creates natural gas and atmospheric air. With burning the composition of this mixture changes. Drying medium is a mixture of hot combustion gases from natural gas and of added atmospheric air. Thermic parameters of natural gas and of atmospheric air are permanently constant.

Authors present their method of calculation of thermodynamic parameters of drying medium. Authors elaborated a computer program in Q-Basic for this calculations for drying medium with temperatures in the range 100 – 200 °C.

Key words: natural gas, drying medium, computer program.

MONITORING OF FOOD MATERIALS THERMAL BEHAVIOUR

MONITORING TERMIČKIH OSOBINA PREHRAMBENIH MATERIJALA

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SUMMARY

The brief characterization of food materials is presented. Physical processes running in materials during thermal food processing are reviewed. Some of the thermal processes are described in details. Basic thermophysical parameters – the specific heat, the thermal conductivity, the thermal diffusivity, the heat transfer coefficient – are defined and overview of measurement methods is given. Principle of the thermal conductivity measurement method – hot-wire method, which is suitable for some kind of food materials and experimental apparatus is described in details.

Methods of the thermal analysis – thermogravimetry and differential scanning calorimetry are presented and principles of the modern measuring equipments – DSC calorimeter and TGA analyser are described. Some results of the specific heat at the constant pressure, the thermal conductivity and the thermal diffusivity measurement of food materials are presented. Temperature dependencies of the thermal conductivity and the specific heat are shown and physical interpretation of obtained experimental data is given. Other possibilities and intentions of physical properties measurement and study of temperature influence on some kind of food materials are drafted.

Key words: thermal processing, thermogravimetry, differential, scanning calorimetry.

SENSITIVE AND DIFFERENTIAL ANALYSIS COSTS OF ENERGY

USAGE OF STRAW COMPILED BY ROLLED BALES SYSTEM

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SUMMARY

Basic parameter which largely determines cost-effectiveness of exploitation of harvest residuals for energy purposes used system rolled bales is the ratio between the price of energy thus generated and the price of energy from alternative sources, or coal in this case. Since classical cost analysis yields only static picture, quality assessment is possible through sensitive and differential cost analysis. Sensitive analysis indicates that, economically, the present harvesting system is relatively resistant to price fluctuations for crucial inputs. On the other hand, there is a relatively high sensitivity to changes in efficiency of drive and attachment units. Differential calculation yields the sum of differential costs which is 43% lower than the total costs. According to that, there are visible economic advantages to using straw as energy resource.

Key words: rolled bales, energy, costs, sensitive analysis, differential analysis.

**MECHANICAL PROPERTIES OF WHEY PROTEIN ISOLATE
FILMS CONTAINING ANTIMICROBIALS AND THEIR
INHIBITORY ACTION ON SPOILAGE FLORA OF FRESH BEEF**

**: FIZIČKO-HEMIJSKE OSOBINE IZOLOVANOG FILMA
PROTEINA SURUTKE KOJI SADRŽI ANTIMIKROBSKE AGENSE I
NJIHOVA ANTIMIKROBSKA AKTIVNOST PROTIV KVARENJA
FLORE SVEŽE GOVEDINE**

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SUMMARY

Antimicrobial films were prepared by incorporating different levels of antimicrobial agents such as oregano oil, sodium lactate (NaL) and ϵ -polylysine (ϵ -PL) into sorbitol-plasticized whey protein isolate (WPI) films. A decrease of Young modulus (E) and maximum tensile strength (σ_{max}) accompanied with an increase in elongation at break (% EB) was observed with the use of the antimicrobial compounds. Wrapping of beef cuts with the antimicrobial films resulted in significant inhibition of total flora (Total Viable Count, TVC). Moreover, the pseudomonads were significantly reduced with the use of all antimicrobial containing films. These results pointed to the effectiveness of antimicrobial whey protein films in extending the shelf life of fresh beef.

Key words: whey protein films, mechanical properties, beef, antimicrobial activity.

FILTRATION TREATMENTS OF EXHAUST AIR FROM HOG BUILDINGS

FILTERSKI TRETMANI IZDUVNOG VAZDUHA IZ OBJEKATA U SVINJARSTVU

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SUMMARY

The paper presents evaluated results of permeable polyethylene board filter with natural zeolite particles in regard to its odor reduction capabilities in swine building and dynamic air purifier in laboratory ambient conditions. NH₃ and H₂S concentrations with PF were reduced into ranges of 21 to 53% and 32 to 54%, respectively. Odor concentrations near the filter were evaluated as being of very low intensity compared to very strong in the untreated exhaust air. Observed NH₃ concentrations with maximal ventilation system capacity of dynamic air purifier DF, in intervals of 5-45 ppm were effectively reduced by 73 and 59% in time period of 55-95 s, respectively. For minimal ventilation system capacity, those values were significantly reduced by rate of 62 to 48% in period of 30 to 48 s, respectively. Applied system of controlled mechanic-pneumatic irritation of slurry sampling was providing H₂S concentration rates in active laboratory air volume of 2 to 8 ppm. Reduction level of 68 to 95% was achieved with laboratory adjustable ventilation system capacity. Reduction of ventilation system capacity caused parallel reduction of DF filtration efficiency.

Key words: swine building, ambient air, dynamic filter, zeolite, polyethylene.

REZIME

U radu su prikazani rezultati ocenjivanja propustljivog polietilenski pločastog filtera sa frakcijama prirodnog zeolita (PF) u odnosu na ocenjivanu moć redukcije mirisa iz svinjarskog objekta i dinamičkog prečistača vazduha (DF) u uslovima laboratorijski kontrolisanog ambijenta. Koncentracije amonijaka i H₂S sa PF redukovane su u opsezima 21-53% i 32-54%, respektivno. Koncentracije mirisa ocenjivane su u zoni filtera pri njegovom niskom intenzitetu u poređenju sa intenzitetom netretiranog izduvnog vazduha. Panelisti intenziteta mirisa ukazali su na njegovu signifikantnu redukciju iz izduvnog u poređenju sa netretiranim ambijentalnim vazduhom. Posmatrane NH₃ koncentracije pri maksimalnom kapacitetu ventilacionog sistema DF, u intervalima od 5-45 ppm efikasno su redukovane sa 73-59% u vremenskom intervalu 55-95 s, respektivno. Pri minimalnom kapacitetu ventilacionog sistema DF, ove vrednosti signifikantno su redukovane sa stopom 62-48% u periodu 30-48 s, respektivno. Primenjen sistem kontrolisane mehaničko-pneumatske iritacije uzoraka tečnog stajnjaka obezbeđivao je H₂S koncentracije u aktivnoj zapremini laboratorije od 2-8 ppm. Nivo redukcije od 68-95% ostvaren je pri promenljivom kapacitetu ventilacionog sistema DF. Redukcija kapaciteta ventilacionog sistema izazvala je paralelno redukciju efikasnosti DF.

Ključne reči: svinjarski objekat, ambientalni vazduh, dinamički filter, zeolit, polietilen.

THE POSSIBILITY OF APPLICATION OF EXTRUSION PROCEDURE TO LIGHT BUCKWHEAT FLOUR AND WHOLE-MILLED CORN MIXTURE

MOGUĆNOST PRIMENE EKSTRUDIRANJA NA SMEŠU HELJDI-NOG BRAŠNA OD OLJUŠTENOG ZRNA SA MLEVENIM KUKURUZOM

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SUMMARY

The possibility of application of extrusion procedure for treating light buckwheat flour, which is known as the source of potent antioxidants that contribute to the health benefits to the consumers oriented to buckwheat based foods is shown in this paper. Physico-chemical properties of light buckwheat flour, whole-milled corn and extrudates obtained after thermal treatment of buckwheat flour and corn mixture (ratio 1:9) at 115 and 150°C are also presented in the paper.

The obtained results show that extrusion can be used to produce stable extrudates from buckwheat flour and whole-milled corn mixture (ratio 1:9). Nutritive value of extrudates was changed in comparison with the raw materials. Significant changes were detected in fat content, total and reduced sugar content, and physical parameters such as test weight.

Key word: buckwheat flour, extrusion, corn.

REZIME

U ovom radu prikazna je mogućnost primene postupka ekstrudiranja brašna od oljuštenog zrna heljde, koje odlikuje dokazana antioksidativna aktivnost, presudna u doprinosu poboljšanja zdravlja ljudi koji konzumiraju hranu na bazi heljde, koja nije u dovoljnoj meri zastupljena u prehrambenoj industriji. U radu su prikazane fizičko-hemijske karakteristike brašna od oljuštenog zrna heljde, mlevenog kukuruza i ekstrudata smeše brašna od oljuštenog zrna heljde i mlevenog kukuruza (1:9) nakon ekstrudiranja na 115 °C i 150 °C.

Rezultati istraživanja pokazuju da se primenom procesa ekstrudiranja mogu dobiti stabilne ekstrudirane smeše od brašna od oljuštenog zrna heljde i mlevenog kukuruza (1:9). Nutritivna vrednost ekstrudata je promenjena u odnosu na polaznu smešu, koja nije bila podvrgnuta termičkom tretmanu, a značajne promene su zabeležene kod sadržaja masti, sadržaja ukupnih i redukujućih šećera, kao i fizičkih parametara, kao što je nasipna masa.

Gljučne reči: brašno od heljde, ekstrudiranje, kukuruz.

PTEP 2009

- NACIONALNI DEO -

- NATIONAL PART -

(Po abecednom redu – In alphabetical order)

REZULTATI UTICAJA SREDSTVA ZA ZAPRAŠIVANJE NA KVALITET SEMENA SUNCOKRETA U KONTROLNOM OGLEDU

THE RESULTS OF THE INFLUENCE OF SEED PROTECTANT MATERIAL ON THE QUALITY OF SUNFLOWER SEEDS IN THE CONTROL EXPERIMENT

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REZIME

Za nesmetano klijanje i efikasno nicanje semena industrijski gajenih poljoprivrednih biljaka, potrebno je obezbediti određene uslove. Prvi od njih je hemijska zaštita semena od napada patogeni i primarnih zaraza u najosetljivijim fazama razvoja biljaka. U Institutu za ratarstvo i povrtarstvo iz Novog Sada sistematično praćenje efikasnosti sredstava za zaprašivanje semena i njihov uticaj na kvalitet semena započeo je devedesetih godina prošlog veka. Prve ogledne sa ciljem praćenja efikasnosti sredstava za zaprašivanje postavili su Stevan Maširević i Đilvesi Karlo dipl. ing. početkom 1990-ih godina u Zavodu za uljane kulture. Od tog vremena redovno se prati uticaj sredstava za zaprašivanje na kvalitet semena suncokreta, kako klasičnih tako i novih hibrida. U 2006. godini postavljeni su ogledi na dva klasična i jednim novim hibridom suncokreta radi utvrđivanja uticaja sredstva za zaprašivanje na kvalitet semena. Posebno je interesantno bilo utvrditi uticaj hemije na seme novog hibrida koji je priznat pod imenom "RIMI", a otporan je na totalne herbicide čije aktivne materije spadaju u grupu imidazolinona, kao što je PULSAR 40.

Ključne reči: hemijska zaštitna sredstva, patogeni, primarna zaraza, zaprašivanje semena, klijanje.

SUMMARY

Certain conditions need to be created for the undisturbed and efficient germination of the seeds of industrially cultivated agricultural plants. The first of these conditions is the chemical protection of the seed from pathogen attack and primary infection in the most sensitive stages of the plant's development. At the Institute of Field and Vegetable crops in Novi Sad, the systematic monitoring of the efficiency of seed protectant material and its influence on the quality of the seeds, began in the 90s. The first experiments with the goal of monitoring the efficiency of the seed protectant material were conducted by Prof. Dr Stevan Maširević and Đilvesi Karlo dipl. ing. during the early 1990s at the Department of Oil crops. Since then, the influence of the seed protectant material on the quality of sunflower seeds, has been monitored regularly, both of the traditional and of the new hybrids. In 2006, experiments have been conducted with two traditional and one new sunflower hybrid, with the goal of determining the influence of the seed protectant material on the quality of the seeds. It was particularly interesting to determine the influence of the chemicals on the seeds of the new acknowledged hybrid called 'RIMI', which is resistant to total herbicides, whose active matters belong to the group of imidazolinon, like PULSAR 40.

Key words: chemical protectants, pathogens, primary infection, seed dusting, incrusting mass, germination.

EFEKAT RAZLIČITIH FAZA DORADE NA ČISTOĆU SEMENA LUCERKE

EFFECTS OF DIFERENT PROCESSING STAGES ON ALFALFA SEED PURITY

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REZIME

U ovom radu ispitivana je čistoća semena lucerke nakon svake faze dorade do postizanja parametara koji su propisani pravilima o kvalitetu poljoprivrednog bilja. Naturalni semenski materijal primljen je na doradu sa ekstremno velikim vrednostima primesa (delovi stabljika, mahune i korovi). Nakon svake faze dorade (selektor, trifolin) ispitivana je čistoća semena i sastav primesa. Utvrđen je i efekat korišćenja metalnog praha u kombinaciji sa vodom i uljem i metalnog praha sa vodom pri izdvajanju semena lucerke od *Cuscuta* spp. Ispitivanja su obavljena na devet partija semena lucerke, proizvedene na istoj lokaciji u istoj godini.

Rezultati ispitivanja pokazuju koliko je koja faza dorade doprinela povećanju čistoće u partiji semena kao i pri kojoj kombinaciji metalnog praha, vode i ulja je smanjena ili je potpuno izbačena *Cuscuta* spp.

Ključne reči: lucerka, dorada, čistoća semena i primese

SUMMARY

In this study we tested purity of alfalfa seed after each processing stage required by regulations on agricultural plants quality. Unprocessed seed come from production field with extremely high content of impurities (plant parts, pods and weeds). After each processing stage (cleaning, magnet machine) we tested purity of seed and we analysed structure of impurities. We also tested influence of use Fe powder with water and oil and Fe powder with only water in process of cleaning *Cuscuta* spp from alfalfa seed. Testing was done on nine alfalfa seed lots, produced in the same field during the same year.

Results of study show how much each processing stage improved purity of each alfalfa seed lot and with what combination of Fe powder, water and oil we got the seed without *Cuscuta* spp.

Key words: alfalfa, processing, seed purity and impurity

ODLOŽENA ŽETVA *Miscanthus* × *Giganteus* – UTICAJ NA KVALITET I KOLIČINU OBRAZOVANE BIOMASE

POSTPONED HARVEST OF *Miscanthus* × *Giganteus* - INFLUENCE ON THE QUALITY AND QUANTITY OF ACCUMULATED BIOMASS

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REZIME

Miskantus ili kineska šaš (*Miscanthus*×*giganteus* Greef et Deu.) predstavlja nov višegodišnji usev za proizvodnju biomase, koja se koristi kao energetska sirovina za sagorevanje u kotlovima. Kvalitet ove sirovine zavisi prvenstveno od sadržaja vlage i azota u njoj. Poljski ogledi su izvedeni na gajnjači (eutrični kambisol). U toku perioda intenzivnog rasta i razvoja (od kraja aprila do početka oktobra) usev odlikuje visok sadržaj vlage (50-65%) i visok sadržaj azota ($\geq 1\%$). Krajem septembra usev miskantusa obrazuje maksimalnu biomasu nadzemnog dela. Prelaskom u fazu zimskog mirovanja (od kraja oktobra do početka aprila) sadržaj vlage u usevu se postepeno smanjuje sušenjem stabala i listova. Procentualni sadržaj N, P i K u usevu se, takođe, smanjuje, delom zbog opadanja listova i vrhova stabljika, a delom zbog premeštanja hraniva iz nadzemnih vegetativnih organa u rizome. Pomeranjem vremena žetve na period: kraj decembra do kraja marta, ukupna biomasa miskantusa se smanjuje, ali usled manjeg sadržaja vode ($\leq 30\%$) i manje količine azotnih materija ($< 0,7\%$) dobijena biomasa je kvalitetnija za sagorevanje.

Ključne reči: miskantus, biomasa, energetski usev, žetva.

SUMMARY

Miscanthus×*giganteus* Greef et Deu. is a new perennial crop for the production of biomass, utilized as an energy source for combustion in boilers. The quality of this raw material depends mostly on water and nitrogen contents. Field trials were carried out at eutric cambisol. During the interval of intensive growth and development (since the beginning of April till the end of October) miscanthus plants were characterized with high water content (50-65%) and high nitrogen content ($\geq 1\%$). At the end of September maximal biomass of the miscanthus aboveground parts was achieved. With the shift to the stage of winter dormancy (since the end of October till the beginning of April) water content in the crop was gradually decreased by stem and leaf drying. N, P and K contents in the crop were also decreased, partly due to defoliation and falling off of stem tops, and partly due to nutrients transport from aboveground parts to the rhizomes. Postponing of the harvest to the interval between the end of December and the end of March, resulted in decreased total biomass of miscanthus, but due to decreased water content ($\leq 30\%$) and nitrogen compound quantity ($< 0,7\%$) the obtained biomass was more convenient as a combustion fuel.

Key words: miscanthus, biomass, energy crops, harvesting.

KONTINUALNO MERENJE NIVOVA ZRNASTIH I PRAŠKASTIH MATERIJALA U PROCESNOJ INDUSTRIJI

CONTINUOUS LEVEL MEASUREMENT OF POWDERS AND GRANULES IN PROCESSING INDUSTRY

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REZIME

U cilju efikasnijeg praćenja zaliha materijala, sve češće se nameće potreba za kontinualnim merenjem nivoa različitih zrnastih i praškastih materijala koji se koriste u procesnoj industriji. Postoje različite metode i različita merila koja se koriste za kontinualno merenje nivoa zrnastih i praškastih materijala. Konkretn izbor merne metode i merila zavisi od konkretnog slučaja. U radu je dat pregled aktuelnih metoda za kontinualno merenje nivoa zrnastih i praškastih materijala sa posebnim osvrtom na ultrazvučnu i radarsku metodu kao dve najčešće korišćene u praksi.

Ključne reči: merenje, nivo, ultrazvuk, radar.

SUMMARY

In order to achieve more efficiency monitoring of different materials in form of powder and granules, there is a requirement for continuous level measuring of powders and granules, used in process industry. There are different methods and devices available for continuous level measurement of powders and granulates. Proper selection of method and appropriate transmitters depends on many application data. This paper gives brief review of actual methods for continuous level measurement of powders and granulates with focus on ultrasound and radar methods most frequently used in process industry.

Key words: measurement, level, ultrasound, radar.

PROMENA KVALITETA SEMENA SOJE U ZAVISNOSTI OD TIPA SKLADIŠTA I SADRŽAJA VLAGE NATURALNOG SEMENA

CHANGES IN SOYBEAN SEED QUALITY DEPENDING ON A STORAGE TIPE AND NATURAL MOISTURE CONTENT

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REZIME

S obzirom da u našim doradnim centrima postoji nekoliko tipova skladišta u kojima se čuva seme soje pre dorade, neophodno je poznavati koji tipovi skladišta utiču više ili manje na kvalitet semena, odnosno koja su skladišta povoljna za čuvanje semena. Ovo pitanje je od izuzetnog značaja kod soje jer je poznato da ona spada u grupu biljaka čije se seme veoma teško čuva. Istraživanje je obuhvatilo šest tipova skladištenja semena soje pre dorade (podni magacin, skladište sa betonskim ćelijama, skladište sa metalnim ćelijama, skladište sa “Kongskilde” ćelijama, seme skladišteno u velike transportne, “džambo”, vreće), kao i kontrolu, odnosno seme soje koje je odmah posle žetve doradivano. Dobijeni rezultati ukazuju na postojanje razlike u kvalitetu doradenog semena soje, u zavisnosti od tipa skladištenja pre dorade. Takođe je ispitivan i uticaj sadržaja vlage u semenu soje prilikom žetve na kvalitet doradenog semena, pri čemu je utvrđen veći uticaj kod semena sa nižom vlažnošću.

Ključne reči: soja, kvalitet semena, skladištenje.

SUMMARY

In our processing centre there are several storage types for soybean seed storage and it is very important to know which storage type exerts the most significant influence on seed quality, i.e. which storage type is appropriate for seed storage. This matter is most important for soybean because soybean seed is very difficult for storage. Six types of storage of soybean seed prior to processing were investigated (ground storage, storage with concrete cell, storage with metal cell, storage with “Kongskilde” cell, seed storage in large transport, “jambo” bags, and control, soybean seed processed directly after harvesting). Obtained results revealed that there were differences in quality of processed soybean seed depending on the storage type. Also, the influence of moisture content of harvested seed on quality of processed seed was observed, and higher influence was noticed in seed with low moisture.

Key words: soybean, seed quality, storage.

**PREDNOSTI KORIŠĆENJA VIRTUALNIH INSTRUMENATA
U ODNOSU NA TRADICIONALNE INSTRUMENTE**

**ADVANTAGES OF USING VIRTUAL INSTRUMENTS IN RELATION
TO THE TRADITIONAL INSTRUMENTS**

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REZIME

Tema ovog rada odnosi se na uporednu analizu korišćenja Virtualnih Instrumenata (VI) i Tradicionalnih Instrumenata (TI) u poljoprivrednoj procesnoj tehnici. U radu su razmatrane dobre i loše osobine i jedne i druge vrste instrumentacije a dat je i hronološki razvoj i jedne i druge tehnike. U radu je takođe dat i prikaz nekoliko vrsta uređaja koji se koriste u Virtualnoj Instrumentaciji. Takođe je dat opis i detaljan način rada LabVIEW programskog paketa koji čini neraskidivi deo Virtualne Instrumentacije.

Ključne reči: virtualni instrumenti, poljoprivreda, procesna tehnika, LavVIEW

SUMMARY

The paper refers to the comparative analysis of use Virtual instruments (VI), and traditional instruments (TI) in the agricultural processing technology. The paper discussed the good and bad features of both types of instrumentation and there is a chronological development of both techniques. The paper is also given, and the several types of devices that are used in Virtual Instrumentation. It is also given a description and a detailed profile LabVIEW software package, which makes the unbreakable part of virtual instrumentation.

Key words: virtual instruments, agriculture, processing technology, LabVIEW

AUTOMATIZACIJA TEHNOLOŠKIH PROCESA U SKLADIŠNO-DISTRIBUTIVNOM CENTRU

THE AUTOMATIZATION OF TECHNOLOGICAL PROCESSES IN A STORAGE-DISTRIBUTIVE CENTRE

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REZIME

Savremena, visoko-regalna skladišta sa više hiljada paletnih mesta zahtevaju savremenu logističku podršku i automatizaciju tehnoloških procesa. To podrazumeva da svaka paletna lokacija kao i svaki artikal moraju biti obeleženi jedinstvenim barkod oznakama. Time se ubrzava skladištenje artikala i sprečava njihovo nenamerno odlaganje na pogrešnu lokaciju i dobijaju se parametri o artiklima (količina, vrsta pakovanja i dr.). Skladišni prostor mora biti pokriven signalom bežične mreže pomoću koje su ručni računari u vezi sa softverom. Postavljanje pristupnih tačaka (access point-a) mora biti tako organizovano da svaki deo skladišta bude pokriven signalom bežične mreže kako se ne bi desilo da računari ostanu bez signala.

Ključne reči: visoko-regalna skladišta, barkod, bežična mreža, pristupne tačke.

SUMMARY

Modern, high-shelf warehouse with thousands of pallet positions require modern logistical support and automation of technological processes. This implies that every pallet location and each item must be marked with unique bar code labels. This will speed up storage products, and prevents their deliberate disposal at the wrong location and get the parameters of the items (quantity, type of packaging, etc.). Storage space must be covered by the signal using a wireless network, which is handheld by computers in conjunction with the software. Setting up access points (access point-a) must be organized so that each part of the warehouse is covered by wireless network signal in order not to happened to computers remain without signals.

Key words: high-shelf warehouse, bar code labels, wireless network, access points.

POREĐENJE KONVEKTIVNOG NAČINA SUŠENJA VIŠNJE I MALINE - SLIČNOSTI I RAZLIKE

THE COMPARISON OF THE CONVECTIVE DRYING OF CHERRIES AND RASPBERRIES - SIMILARITIES AND DIFFERENCES

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REZIME

Sušenje voća jedan je od načina za njegovo konzervisanje i čuvanje u dužem vremenskom periodu. U radu je dat prikaz sušenja višnje i maline u konvektivnoj sušari, horizontalog tipa. Rađene su tri serije sušenja kod višnje i maline. Prva serija kod višnje i maline bila je bez tretman, druga blanširanje sa limontusom i treća blanširanje sa vinobranom. Dato je upoređivanje procesa sušenja višnje i maline, odnosno prikazano je kako se menja masa, tj. sadržaj vlage kod ovog voća. Upoređivanjem se moglo zaključiti koje voće je naj prinosnije za proces sušenja, s'obzirom da je odnos suvih:svežih višnji 10:1, suvih:svežih malina 8:1.

Cljučne reči: sušenje, višnja, malina, predtretman

SUMMARY

Drying of fruits is one way of their conservation and preserving in a longer period of time. The process of drying cherries and raspberries in the convective drying machine of a horizontal type is shown in this work. Three series of drying cherries and raspberries are done. The first serial with cherries and raspberries was without a treatment, the second one was bleaching with the lemon acid, and the third one was bleaching with the vinegar. The processes of drying cherries and raspberries are compared, i.e. the change of a mass is presented, that is to say, the amount of moisture within these fruits. Comparing these results, one can come to the conclusion which fruits are the most lucrative for the process of drying, considering the relation of the dried:fresh cherries 10:1, and dried:fresh raspberries 8:1.

Key words: desaturation, cherry, raspberry, pre-treatment

ZAVISNOST ROKA SETVE NA PRINOS KLIPA I PROCENAT HIBRIDNOG SEMENA KOD LINIJA SEMENSKOG KUKURUZA

EFFECT OF SEEDING PERIOD ON EAR CORN YIELD AND PERCENTAGE OF HYBRID SEEDS IN THREE LINES OF CORN SEED

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REZIME

Istraživanja u trajanju od dve godine izvedena su na dve lokacije. U oglecima je ispitivan uticaj tri roka setve na prinos klipa i procenat hibridnog semena tri linije semenskog kukuruza, u svojstvu majke (L1-FAO 400, L2-FAO 500, L3-FAO 600), i linije oca (L4). Nakon berbe utvrđen je prinos klipa i procenat hibridnog semena. Utvrđen je statistički značajan uticaj rokova setve i linija na prinos klipa i procenat hibridnog semena kukuruza.

U prvoj godini ispitivanja prosečan prinos klipa kretao se od 0,69 - 3,66 t/ha u zavisnosti od roka setve i linije, dok se procenat hibridnog semena u odnosu na klip kretao od 63,3 - 81,9 %. U drugoj godini efekat rokova setve je bio značajno bolji u odnosu na prvu godinu ispitivanja, prinos klipa se kretao od 5,27 - 8,12 t/ha. Procenat hibridnog semena bio je u granicama od 77,0 - 81,1%.

Ključne reči: semenski kukuruz, linije, prinos klipa, procenat hibridnog semena

SUMMARY

The two-year studies were performed in two locations. The effects of three sowing dates and the percent of hybrid seeds of the three seed maize inbred lines as a female component (L1-FAO 400, L2-FAO 500, L3-FAO 600) and an inbred as a male component (L4) were observed in this trial. The ear corn yield and the percent of hybrid seed were determined after harvest. A statistically significant effect of sowing dates and inbred on the ear yield and the percent of seed maize hybrid was established.

During the first year of investigation, the average ear yield ranged from 0,69 - 3,66 t/ha depending on the sowing date and inbred, while the percent of hybrid seed in relation to the ear varied from 63,3 – 81,1%. During the second year, the corresponded values varied from 5,27 – 8,12 t/ha and from 77,0 – 81,1%.

Key words: seed maize, inbrds, ear yield, hybrid seed percent.

EKONOMSKI EFEKTI INVESTICIJA U REČNU LUKU I SILOSA ZA ŽITARICE

ECONOMICS EFFECTS OF INVESTMENT IN RIVER PORT AND GRAIN SILO

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REZIME

Potreba za skladištenjem gotovih proizvoda proizilazi iz potrebe da se odloži prodaja, sa osnovnom idejom da se ostvare bolji ekonomski efekti, odnosno veća dobit. Skladištenje je naročito značajno kod poljoprivrednih proizvoda koji su sezonskog karaktera i pristižu jednom godišnje, a predmet su trgovine tokom cele godine. Cilj ovog rada je da se utvrdi ekonomska opravdanost skladištenja kukuruza i pšenice, na bazi analize sezonskih kolebanja cena ovih proizvoda i troškova skladištenja u silosima u Vojvodini.

Ključne reči: pšenica, kukuruz, ekonomska efektivnost skladištenja.

SUMMARY

Needs for storage of production outputs, come from needs for delay selling, with the main idea - to get better economic effect (profit). Storage is a specially important for agricultural products, which have seasonal characteristics (come ones a year, but they are object of trade during the all year).

The objective of this paper is to calculate economic result of storage of corn and wheat in the grain silos, based on analysis of seasonal price movements, and costs of storage, in Vojvodina region.

Key words: wheat, corn, economics effects of storage.

ZP HIBRIDI KUKURUZ KAO SIROVINA ZA PROIZVODNJU BIOETANOLA

ZP MAIZE HYBRIDS AS A RAW MATERIAL FOR THE BIOETHANOL PRODUCTION

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REZIME

Interesovanje za kukuruz kao etanol produkujuću biljku uzrokovano je energetsom krizom i obnovljeno je još početkom 1970-ih godina. Poslednjih desetak godina proizvodnja bioetanola za gorivo je u sve većoj ekspanziji. Obnovljivost kukuruza kao sirovine i sve veća zagađenost životne sredine produktima nafte predstavljaju dva osnovna razloga da on postaje jedna od glavnih sirovina za proizvodnju energije.

Sagledavajući perspektivu razvoja istraživačkog rada na unapređenju korišćenja kukuruza za cilj ovog rada je postavljeno da se ispita kvalitet zrna i pogodnost ZP hibrida kukuruza različite genetičke osnove za proizvodnju bioetanola. U radu su prikazani rezultati ispitivanja hemijskog sastava, fizičkih i fermentacionih karakteristika zrna odabranih ZP hibrida kukuruza.

Ključne reči: bioetanol, ZP kukuruzni hibridi, hidroliza, fermentacija.

SUMMARY

The interest in maize as an ethanol producing plant was caused by the energetic crisis and restored as early as the beginning of the 1970s. The production of bioethanol as a fuel has been expanding for the last ten years. Renewability of maize as a raw material and growing environmental pollution by oil products represent two principal reasons for maize becoming one of the major raw materials for the energy production.

According to the insight into the development of the research work on the improvement of maize utilisation, the objective of the present study was set up. The objective was to observe grain quality and fitness of ZP maize hybrids of a different genetic background in order to use them in the bioethanol production. The results obtained on the chemical composition, physical and fermentable properties of grain of selected ZP maize hybrids were presented in this study.

Key words: bioethanol, ZP maize hybrids; hydrolysis, fermentation.

PRIMENA SUŠENJA POSLE PILIRANJA SEMENA ŠEĆERNE REPE PRI NANOŠENJU INSEKTICIDA

DRYING OF SUGAR BEET SEED PELLETING BEFORE INSECTICIDE APPLICATION

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REZIME

Posle piliranja semena šećerne repe (*Beta vulgaris* L.) novim tehnologijama nanosi se insekticid. Prilikom nanošenja insekticida primenjuje se novi postupak, koji zahteva sušenje pilete semena šećerne repe. Po starom metodu nije bilo sušenja pilete semena šećerne repe. Ugrađivanjem novih elemenata i naknadnim sušenjem semena ostvarili su se novi rezultati kvaliteta semena šećerne repe. Sa novim rezultatima kvaliteta semena: energije klijanja i klijavosti, ostvarena je značajna razlika u odnosu na stari metod nanošenja insekticida na pilirano seme šećerne repe. Dobijeno seme šećerne repe testirano je u laboratoriskim i poljskim uslovima. Rezultati takvog testiranja, pokazuju da nema značajnih razlika u kvalitetu semena (energija klijanja i klijavosti), što potvrđuje kao ispravnu novu metodu nanošenja insekticida na pilirano seme šećerne repe. Primenom dodatnog sušenja semena u postupku nanošenja insekticida, smanjuje se rizik eventualnog štetnog efekta insekticida na kvalitet semena i obezbeđuje čvrstoća pilete (ne dolazi do raspadanja pilete) i omogućuje laku setvu šećerne repe na konačan razmak. Novi način nanošenja insekticida primenjen je i kod inkrustiranog semena šećerne repe. Dobijeni rezultati su slični kao i kod piliranog semena, s tim da je još značajnija razlika u energiji klijanja i klijavosti. Autori rada zadržavaju pravo detaljnijih postupaka rada usled zaštite licencnog prava kod Zavoda za intelektualnu svojinu.

Gljučne reči: *Beta vulgaris* L, pilirano seme, energija klijanja, klijavost.

SUMMARY

The latest technologies for seed processing in sugar beet (*Beta vulgaris* L.) call for the pelleting of seeds before insecticide application. The application of insecticide involves a new procedure that requires that the seed pelleting be dried before the insecticide is applied, which was not the case with the previous techniques. In the present study, the new procedure resulted in significant improvements in seed quality (germination energy and germinability) compared with the previously used methods. This was the case both in laboratory and field conditions, which confirms the superiority of the new method of insecticide application. We tested the new technique on both encrusted sugar beet seeds and pelleted one and the improvements in germinability and germination energy were significant. The methods section of the paper does not describe all the procedures used in the study due to them being protected by copyright.

Key words: *Beta vulgaris* L, seed pelleting, germination energy, germinability.

INTEGRACIJA, LOGISTIČKA ORGANIZACIJA I KLASITERI

INTEGRATION, LOGISTICS ORGANIZATION AND CLUSTERS

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REZIME

U procesima globalizacije svetske proizvodnje hrane i sve oštrije konkurencije kako na svetskom, tako i na domaćem tržištu, koja nužno postaje sve otvoreniji, procesi reorganizacije idu u pravcu povećanja efikasnosti i efektivnosti proizvodnje u celom lancu proizvodnje hrane. Osim stalnih inovacija i proširenja asortimana finalnih proizvoda – prehrambenih artikala, neizbežno je u celom vertikumu od njive do potrošača preduzeti mere racionalizacije i smanjenja troškova. Ogromne su rezerve u uspostavljanju racionalnijih veza između privrednih subjekata u efikasnijem protoku materijala i informacija. Na osnovu tih saznanja sve više se razvija kooperacija, horizontalna i vertikalna integracija proizvođača. Logistička organizacija, efikasan protok sirovina, poluproizvoda i gotovih proizvoda postaje nužnost u borbi za konkurentnost i vrlo često prekoračuje i državne granice, u okvirima međunarodne saradnje.

Ključne reči: Logistika, integracija, inovacija, racionalizacija, klasteri

SUMMARY

In the progression of the globalization improvement of the effectiveness is the main task of the reorganization processes in the food -production according to competition on the world and opened home market too.

Beyond continuous processes of innovation and assortment of the final product – foodstuff, in the whole chain of the food -production from the fields to the consumers, rationalization and saving on the expenses is unavoidable. There are very important reserves in the connections between subjects of the food - production and effectiveness of the flow of the material and information.

According to recognition of the processes cooperation, horizontal and vertical integration of the subjects of the food production, logistic as philosophy of organization, effective flow of primary commodities, semi and final products is inevitable in the struggle of competition on the home market and international cooperation.

Key words: Logistics, integration, innovation, rationalization, clusters

**PRIMENA SCADA I LEVEL 2 SISTEMA U UPRAVLJANJU
PROIZVODNIM PROCESOM U INSTITUTU ZA KUKURUZ
ZEMUN POLJE**

**IMPLEMENTATION OF SCADA AND LEVEL 2 CONTROL SYSTEM
IN MAIZE RESEARCH INSTITUTE „ZEMUN POLJE“**

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REZIME

U Intitutu za kukuruz Zemun Polje instaliran je i pušten u rad sistem za nadzor i upravljanje Doradnim centrom poslednje generacije. Upravljački sistem je baziran na Siemens PLC kontroleru, Wonderware Intouch SCADA i Level 2 softveru razvijenom za potrebe IK Zemun. Novi računarski sistem omogućava direktno upravljanje svim funkcijama sistema iz kontrolne sobe preko računara, praćenje toka materijala (semena), brzu dijagnostiku i uklanjanje zastoja, mogućnost zadavanja nekoliko tehnoloških receptura u isto vreme. Oformljena je ORACLE baza podataka kompletne proizvodnje. Ušteda energije ostvarena je primenom frekventno regulisanih elektromotornih pogona. Novim Level 2 / MES (Manufacturing Execution System) sistemom integrisani su proizvodnja i menadžment u jedinstven informacioni sistem. Level 2 omogućuje pristup i analizu podataka u realnom vremenu kao i analizu arhiviranih podataka (kvalitativnu, tehnološku, inženjersku), kao i generisanje izveštaja o samom tehnološkom procesu od prihvatanja semena, transporta, čišćenja, preko sušenja, skladištenja pa sve do vreće na paleti.

Ključne reči: automatizacija industrijskih procesa, Level 2, PLC, SCADA.

SUMMARY

A system for supervision and control of Processing Plant in Maize Research Institute Zemun Polje has been installed and fully commissioned. The control system is based on Siemens PLC controller, Wonderware InTouch SCADA and Level 2 software developed exclusively to encounter the needs of IK Zemun. New computer system provides direct controlling of all the functions of the system from centralized control room, tracking of material flow (seed), fast diagnostics and downtime management, possibility of handling few recipes simultaneously. ORACLE database has been formed containing all production data in the plant. Energy savings have been achieved by applying frequently-controlled electrical drives. With new Level 2/ MES (Manufacturing Execution System) the production and management level are now joined in unique information system. Besides direct access to data and the real time analysis as well as analysis of archived data, Level 2 also enables generating several report types (quality, technological, engineering), from material (seed) acception, to transport, cleaning, drying and storing until the palet bag.

Key words: industrial process automation, Level 2, PLC, SCADA.

MOGUĆNOST PROIZVODNJE SIROVINA ZA BIODIZEL U POLJOPRIVREDI VOJVODINE/SRBIJE

POTENTIALS FOR PRODUCTION OF BIODIESEL RAW MATERIALS IN AGRICULTURE OF VOJVODINA/SERBIA

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REZIME

Podaci o površinama na kojima se uzgajaju uljarice, prinosima zrna i ulja sa njih u Vojvodini, Srbiji i Evropskoj uniji, iskorišćeni su za razmatranja o potencijalnoj proizvodnji biodizela u Vojvodini/Srbiji. Na osnovu tih i drugih podataka sagledane su dileme i perspektive o mogućoj budućoj proizvodnji sirovina za biodizel u Vojvodini/Srbiji.

Uvažavajući pravila plodoređa, kao i potrebnu površinu pod uljaricama za prehranu stanovništva, potrebe stočarstva i proizvodnju semena za reprodukciju, raspoloživa površina za proizvodnju sirovina za biodizel u Srbiji iznosi 350.000 ha. U Vojvodini se uljarice gaje na 320.000 ha, što čini 20% oranica Vojvodine. To znači da se u Vojvodini ne može očekivati značajnije povećanje površina pod uljaricama, odnosno, da se najveći deo (oko 90%) potencijalnih površina za gajenje sirovina za biodizel nalazi u Centralnoj Srbiji. U zavisnosti od načina iskorišćavanja sa potencijalne setvene površine pod uljaricama za proizvodnju biodizela od 350.000 ha mogu se obezbediti sirovine za proizvodnju od 212.800 t do 250.600 t biodizela, što je 13,49 do 15,88% ukupne domaće potrošnje dizel goriva. Ovo predstavlja samo teorijski potencijal proizvodnje biodizela u Srbiji dok realni zavisi on niza agrotehničkih, ekonomskih pa i političkih faktora. Mogući prinos biodizela po 1 ha uljarica u Srbiji znatno zaostaje za prinosom biodizela po 1 ha uljarica u EU, pa je osnovni zadatak povećati prinose zrna uljarica.

Ključne reči: biodizel, sirovina, poljoprivreda.

SUMMARY

The data on areas under oilseed crops, grain and oil yield in Vojvodina, Serbia and EU, were used in this study on biodiesel production potentials in Vojvodina/Serbia. Based on this data, dilemmas and perspectives of production of biodiesel raw materials in Vojvodina/Serbia were reviewed. Considering the rules of crop rotation, the area needed for food, cattle feed and seed production, the theoretic potential area in Serbia for oilseed crops growing designated for biodiesel production is estimated at around 350,000 ha. In Vojvodina oilseed crops are produced on 320,000 ha, which makes up 20% of its total arable area. This means that one cannot expect substantial increase of areas under oilseed crops in Vojvodina. In other words, the largest share (approx. 90%) of potential areas for production of biodiesel raw materials is located in central Serbia. Depending on exploitation, the potential area of 350,000 ha under oilseed rape for biodiesel production could yield raw material sufficient for production of 212,800 to 250,600 t of biodiesel, which makes up 13.49 to 15.88% of the total domestic consumption of diesel fuel. The presented data only address the theoretical potentials of Serbia for biodiesel production, while the realistic depends on several factors, including agro-technical, economic, but political as well. The yield per 1 ha of oilseed crops in Serbia substantially lags behind its EU equivalent. This means that the main task is to increase yield of oilseed crops.

Key words: biodiesel, raw material, agriculture.

ANALIZA RENTABILNOSTI POLJOPRIVREDNIH PREDUZEĆA VOJVODINE (2003-2007)

THE ANALYSIS OF PROFITABILITY OF AGRICULTURAL ENTERPRISES IN VOJVODINA (2003-2007)

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REZIME

U radu je izvršena komparativna analiza osnovnih pokazatelja finansijskog rezultata i finansijskog položaja poljoprivrednih preduzeća i zadruga Vojvodine. Obuhvaćen je petogodišnji period (2003-2007), pri čemu su kao osnovni izvor podataka korišćeni zbirni bilansi. U cilju kompletne ocene posmatranih parametara, pored vremenskog, vršeno je i poređenje sa prehrambenom industrijom. U posmatranom periodu je na području AP Vojvodine poslovalo između 1.330 (2003) i 1.677 (2007) preduzeća. Istovremeno je broj zaposlenih opao sa 41.128 na 28.863 radnika, ili za oko 30%.

Poljoprivredna preduzeća, posmatrana zbirno, zabeležila su gubitak u prve tri godine posmatranog perioda. Stope prinosa na ukupan uloženi kapital takođe su vrlo skromne (od -3,29% do 4,62%). Finansijska ravnoteža poljoprivrednih preduzeća je izrazito poremećena, usled čega se javljaju problemi sa održavanjem likvidnosti. Preduzećima nedostaje oko 29,8 milijardi dinara dugoročno raspoloživih izvora samo za uspostavljanje finansijske ravnoteže. Nominalna vrednost neto sopstvenog kapitala poljoprivrednih preduzeća uvećana je za 45,9% u posmatranom periodu, ali je istovremeno njeno realna vrednost umanjena za 27,2 indeksnih poena.

Ključne reči: poljoprivreda, uspeh, analiza, bilans, profitability.

SUMMARY

The paper gives a comparative analysis of main indicators of agricultural enterprises' financial result and financial position in Vojvodina, over the five-year period (2003-2007). Cumulative balances have been used as basic data sources. The agricultural enterprises' performance results compared with those of food industry companies. Over the period observed, there were between 1.330 (2003) and 1.677 (2007) agricultural enterprises operating in the Province of Vojvodina. In the same period, the number of the employed has reduced from 41.128 to 28.863 (reduction about 30%).

The analysis of financial results shows that agricultural enterprises (in total) realized negative net financial result during the three first years. The rates of income on the gross invested capital are also very modest (-3,29 – 4,62%). The financial standing is characterized by extremely unfavourable financial balance, and its consequence is deep non-liquidity inside agricultural companies. The companies are missing about 29,8 billion dinars of long-term available resources only for the establishment of financial balance. The net capital value of agricultural company's has been enlarged for about 26%, and the real value of net capital has been decrease for 27,2 index points.

Key words: agriculture, succes, analysis, balance, profitability.