

Editorial: RASPOR, P.: Faces of foods on the world of food systems. pp. 247-249.
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KRALIK, G., CSAPÓ, J. & CRNJAC, T.: Feeding rapeseed oil to increase the n-3 pufa of pork: fatty acid composition of muscle and adipose tissue. Pp. 251-258. gkralik@pfos.hr

Sixty LWxGL pigs were divided into 3 groups (20 pigs in each group). The aim of this research was to determine what effect does the rapeseed oil added to diets (0%, 3% and 6%) has on the enrichment of muscle and adipose tissue with α -linolenic acid, C18:3, n-3, during the fattening of pigs from 30 up to 100 kg. Moreover, the intent was to lower the PUFA n-6/PUFA n-3 ratio in the samples of *Musculus longissimus dorsi* (muscle tissue with belonging adipose tissue). Research results showed that the rapeseed oil added to pigs' diets increased the content of ALA ($P < 0.01$) in the total amount of fatty acids of both tissues, i.e. in the muscle tissue by 69.56% and 130.43%, respectively, and in adipose tissue by 60.29% and 139.70%, respectively. At the same time, the PUFA n-6 / PUFA n-3 ratio was lowered in both tissues. It was statistically observed that the DHA content in fatty acids of muscle tissue also significantly increased ($P < 0.01$), which supports the fact that pigs can synthesize DHA *in vivo*, if the feed contains enough amount of precursors.

Keywords: pig, *Musculus longissimus dorsi*, fatty acid composition, PUFA n-3, ALA, PUFA n-6

ORAK, H.H.: Effect of different blanching methods on peroxidase and lipoxygenase activity of broccoli and comparison of some nutritional values at enzymes inactivation levels. pp. 259-268, horak@trakya.edu.tr

Peroxidase (POD) and Lipoxygenase (LOX) inactivation temperature and time were investigated on broccoli florets at different blanching treatments. In addition, retention of nutritional components, which reduced POD and LOX activities, was compared. LOX inactivation required 14 min at 70°C, 6 min at 80°C, 1½ min at 90°C, 1 min at 100°C water blanching and 1 min for steam blanching, 2 min in microwave without water and 6 min with microwave and water. The highest nutritional content of broccoli was evaluated in microwave blanching without water by comparison to all treatments. The decline of nitrate and nitrite value of broccoli was higher under longer time blanching than under higher temperature blanching.

Keywords: broccoli, peroxidase, lipoxygenase, blanching, chlorophyll, ascorbic acid

SABO, M., JUG, D. & UGARCIC-HARDI, Z.: Effect of reduced tillage on wheat quality traits. Pp. 269-279, mirjana.sabo@ptfos.hr

The effect of tillage systems (TS) on wheat quality traits including grain yield, thousand kernels weight, hectoliter mass, flour extraction rate and flour rheological properties were

evaluated. Five different TS were compared in winter wheat (*Triticum aestivum* L.) production on one experimental field (chernosem) located in the Baranya region, north-eastern Croatia from 1998 to 2001. Tillage systems included conventional tillage (CT), disc harrowing, fine till (DHF), soil loosening (SL) + disc harrowing (DH), disc harrowing, coarse till (DHC) and no-tillage (NT). The most stable grain yield was obtained by DHF and CT in all three experimental years. There was no striking regularity with regard to applied TS and hectoliter mass and thousand kernels weight. The biggest difference of hectoliter mass was determined between CT and NT. TS had significant influence on the flour extraction rate in all three experimental years. The influence of TS on farinographic parameters was significant for all three experimental years for the quality number. Quality number was greater under CT than under other TS. Tillage effect on extensographic and amylographic parameters in the 3-year average did not show statistically significant differences. To sum up, since disc harrowing (DHF) and (DHC) followed by soil loosening with chisel produced equal grain yield and wheat quality parameters were slightly better than conventional tillage, these systems could be presented as an even handed replacement for ploughing.

Keywords: reduced tillage, wheat quality traits, rheological properties, yield, flour extension

RAPAVI, E., GONZÁLEZ-CABELLO, R., SZENTMIHÁLYI, K., SZÉKELY, E. & BLÁZOVICS, A.: The effect of calyx infusion of *Hibiscus sabdariffa* L. on T-cells-mediated immune response in mitogen-induced blastogenesis of human lymphocytes in vitro. Pp. 281-288, raperika@freemail.hu, blaz@bel2.sote.hu

Free radical production and disturbance in the redox status may modulate the expression of a variety of immune and inflammatory molecules. Antioxidants could inhibit the proliferation of T lymphocytes induced by mitogens. The aim of this study was to investigate the effect of the infusion of dried calyx of *Hibiscus sabdariffa* L. on T-cell-mediated immune response. We examined the effect of the infusion on spontaneous and mitogen-induced blast transformation of human lymphocytes in vitro. Peripheral blood lymphocytes from heparinised venous blood of healthy subjects (n=17) were examined. Five and 10 $\mu\text{g ml}^{-1}$ phytohemagglutinin (PHA) and 5 $\mu\text{g ml}^{-1}$ pokeweed mitogen (PWM) were added. Depending on the concentration, calyx infusion of *H. sabdariffa* decreased mitogen-induced blastogenesis in normal subjects. It did not affect, however, the level of spontaneous proliferation of human lymphocytes in vitro. The infusion of hibisci flos may alleviate over-stimulated condition of the immune system in hypersensitivity conditions.

Keywords: blast transformation, polyphenols, *Hibiscus sabdariffa* L., antioxidants

VARGA, J., KOCSUBÉ, S., KONCZ, Z. & TÉREN, J.: Mycobiota and ochratoxin A in raisins purchased in Hungary. Pp. 289-294, jvarga@bio.u-szeged.hu

Ochratoxin A is a mycotoxin produced by *Aspergillus* and *Penicillium* species. This mycotoxin is a common contaminant of various foods including cereal products, spices, dried fruits, coffee, beer and wine. Besides cereal products, goods of grape origin contribute significantly to ochratoxin exposure of humans. The ochratoxin content and mycobiota of raisins purchased in Hungarian outlets were examined in this study. Ochratoxin A content was

examined by an immunochemical technique, and the results were confirmed by HPLC analysis using fluorescent detection. Altogether 20 raisin samples were analyzed. Ochratoxin A was detected in all but two samples with ochratoxin concentrations ranging from 0 to 6.2 mg kg⁻¹. The most heavily contaminated raisin sample came from Iran. However, none of the raisins contained ochratoxin A above 10 mg kg⁻¹, the European Community maximum allowable limit in raisins. The mycobiota of raisin samples was also examined to clarify which species could be responsible for ochratoxin A contamination. All except three raisin samples were contaminated with black aspergilli, some of which produced ochratoxin A. Besides *A. carbonarius*, ochratoxin producing *A. tubingensis* isolates dominated in the samples.

Keywords: HPLC, Hungary, immunochemistry, ochratoxin A, raisins

VARGA, ZS., PÁLVÖLGYI, M., JUHÁSZ-ROMÁN, M. & M. TÓTH-MARKUS, M.: Development of therapeutic kefir-like products with low galactose content for patients with galactose intolerance. Pp. 295-304, vargazs@se-efk.hu

Galactosaemia is a rare, life-threatening inborn error. It is treated by life-long galactose restriction. People with galactose intolerance cannot consume milk and milk products. The aim of this work was to produce fermented milk products with low galactose content.

Lactose hydrolysed milk and two types of mixture of lactose hydrolysed milk supplemented with galactose free nutriment (Pregomin and Nutrilon) were fermented in a 2:1 ratio.

For fermentation traditional kefir culture (*Lactococcus lactis* sp. *lactis* + *Lactococcus lactis* sp. *cremoris* + *Lactobacillus casei* + *Lactobacillus kefir* + *Candida kefir*) was used. Number of viable cells, pH and galactose level were measured. Data were evaluated by one-way analysis of variance and t-test.

Level of galactose reduction was measured by UV spectrometry for the determination of lactose and D-galactose in foodstuffs (Boehringer Mannheim enzyme test). Galactose content was below 200 mg/100 cm³ in the mixtures of lactose hydrolysed milk and galactose free nutriment after 48 h of fermentation. So, the kefir-like products based on mixed milk with nutriment are suitable for use in the diet of patients suffering from galactosaemia.

Keywords: galactosaemia, galactose, fermented dairy product, galactose free nutriment

ANDRÁSSY, É., FARKAS, J., SEREGÉLY, ZS., DALMADI, I., TUBOLY, E. & LEBOVICS, V.: Changes of hen eggs and their components caused by non-thermal pasteurizing treatments. Ii. Some non-microbiological effects of gamma irradiation or hydrostatic pressure processing on liquid egg white and egg yolk. Pp. 305-318, j.farkas@cfri.hu

Experiments were performed to study changes caused by irradiation or high hydrostatic pressure pasteurization of liquid egg white by differential scanning calorimetry, spectrofluorimetry, electronic nose measurements and NIR-spectrometry. The non-thermal

pasteurization treatments were also assessed in relation to loss of carotenoid content, and lipid- and cholesterol oxidation of liquid egg yolk. Unlike radiation pasteurization, high pressure processing caused protein denaturation in egg white, which manifested in changes of its DSC-thermogram and intrinsic tryptophan fluorescence. Electronic nose testing showed changes of the head-space volatile composition of egg albumen, particularly as a function of radiation treatment. Both treatments caused changes in the NIR-spectrometric „fingerprint” of the liquid egg white. Various chemometric analyses of the results of the latter instrumental methods, particularly statistical techniques developed by the group of one of the co-authors of this article, demonstrated the potential for detection and characterization of the applied non-thermal processing techniques on liquid egg white. Irradiation induced more carotenoid degradation and lipid oxidation in liquid egg yolk than pressure processing.

Keywords: egg white and egg yolk; gamma irradiation, high hydrostatic pressure, differential scanning calorimetry, spectrofluorimetry, electronic nose, NIR-spectrometry, chemometric techniques, carotenoids, lipid-oxidation

JEVŠNIK, M., HLEBEC, V.& RASPOR, P.: Meta-analysis as a tool for barriers identification during HACCP implementation to improve food safety. Pp. 319-353, peter.raspor@bf.uni-lj.si; jevsnikmojca@volja.net

The objectives of the study were twofold, i.e. to evaluate methodological approaches of analyzed papers and to identify, cluster, and classify barriers to HACCP system implementation using meta-analysis as methodological tool. Hazard Analysis and Critical Control Point (HACCP) is a science-based system of risk management designed to control food safety. HACCP is based on seven basic principles, which present an important tool in combating food borne disease. Articles for analysis were initially selected in the major on-line database for the field, namely "Food Science and Technology Abstract". Other databases were also used, including Commonwealth Agricultural Bureau and Co-operative Online Bibliographic System and Services. Selection was based on scientific excellence of the journal as well as on the method applied within the study. Main keywords to select appropriate scientific and technical articles were "HACCP", "barrier" and "implementation". Main results of methodological inquiry revealed that the most frequent methods used in scientific articles were quantitative ones. Among qualitative methods, the "narrative interview" was used most often, while among quantitative methods survey was used most frequently. Whereas narrative interview enables in-depth analysis of implicit role of individual actor in HACCP system, survey methods estimate frequency distributions of particular behaviours or attitudes in observed population. Lately, when analyzing implicit role of an individual in ensuring food safety, a psychological approach became important. The main goal of methodological analysis is to propose advances in research models that would tackle both qualitative and quantitative issues at the same time and offer new insights into barriers in HACCP system implementation. After analyzing the barriers to efficiency of the system, we identified elements that enabled us to cluster barriers into groups and identify the influence of specific elements on HACCP system efficiency. This paper is offering a novel approach to terminological classification of identified barriers, which will open new dimensions in assuring common language among food safety professionals in the future.

Keywords: meta-analysis, HACCP, efficiency, barriers, research

NAGY, A., BARÁTH, Á., PAUK, J. & GELENCSÉR, É.: Nutritional evaluation of the proteins of broad range herbicide resistant spring wheat lines (*Triticum aestivum* L.) I. Protein quality. Pp.355-362, a.nagy@cfri.hu

The authors have developed transgenic wheat lines with broad range of herbicide resistance. The transgenic wheat, containing bacterial derived alien gene (bar) regulated under the maize ubiquitin promoter, is resistant to glyphosate (phosphinotrichin) agent family. The presence of bar gene expression product (phosphinotrichin acetyl transferase enzyme, PAT) was confirmed by PAT-specific ELISA (Enzyme Linked Immuno Sorbent Assay). The qualitative and quantitative chemical composition of the transgenic wheat lines in comparison with their non-transgenic counterpart (year 2000-2002) and protein utilization of the wheat wholemeal flours (year 2002) were summarized. Nutritional evaluation of the protein was based on a rat model by using N-balance experiments. Among the protein sources, heat-treated samples were also introduced into the experimental diets. It was found that heat denaturation of the proteins led to results with somewhat increased biological value indices. The introduction of GM technology did not affect food intake or nutritional performance of the rats.

Keywords:transgenic wheat, herbicide resistance, PAT-expression, amino acid, protein utilization