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## **Isolation and Identification of Anthocyanins in the Fruit Peels of Starkrimson and Marx Red Bartlett Common Pear Cultivars and Their Bud Mutants**

Z. Chikwambi and M. Muchuweti

Anthocyanins and anthocyanidins were determined in 3 varieties of common pears (*Pyrus communis* L.), Starkrimson, Clapps Favourite and Marx red Bartlett. The pigments were extracted from the fruit peel with 0.5% HCl in methanol and the extracts were hydrolysed and then applied on 3 mm cellulose paper chromatograms. The chromatograms were developed subsequently in one direction, using formic acid, hydrochloric acid, water (5:2:3) v/v, or n-Butanol-Acetic acid-Water (BAW) (4:1:5 v/v). There was only one anthocyanidin present, namely cyanidin (Cy), which was identified according to their  $R_f$  values, UV-vis and IT-IR spectrum. The results show that the analysed common pear varieties contained cyanidin rhamnosyl, Starkrimson mutant and Starkrimson wild type and cyanidin xylosyl, Clapps Favourite and Marx Red Bartlett.  $R_f$  values and spectral characteristics that were determined were compared to standards. The results obtained justify the conclusion that the compound responsible for the red pigmentation in pear fruit of the varieties analysed is a cyanidin-glycoside. (*American Journal of Food Technology* 3 (1): 1-12, 2008; doi: 10.3923/ajft.2008.1.12)

## **Status of Post harvest Technology of Aonla in India-A Review**

R.K. Goyal, R.T. Patil, A.R.P. Kingsly, Himanshu Walia and Pradeep Kumar

Aonla is an important fruit crop indigenous to Indian sub-continent, which can be grown successfully in dry and neglected regions. The area under aonla has been expanding rapidly in the last couple of years. The growing popularity for alternate medicines, health foods and herbal products are enhancing the requirement for aonla fruit. The raw fruit, due to its high acidic nature and astringent taste, is unacceptable to consumers. The chemical composition of aonla fruits is influenced by environmental factors. Aonla fruit is highly nutritive with a great medicinal use and the richest source of vitamin C. The pulp of fresh fruit contains 200-900 mg of vitamin C. As aonla fruits are highly perishable in nature, its storage is very limited. The main objective of the review is to highlight its uses, existing processing methods and their limitations and further propose to develop pilot plant for aonla processing. (*American Journal of Food Technology* 3 (1): 13-23, 2008; doi: 10.3923/ajft.2008.13.23)

## **Effect of Germination Time and Type of Illumination on Proximate Composition of Chickpea Seed (*Cicer arietinum* L.)**

Amal Badshah Khattak, Aurang Zeb, Nizakat Bibi and Mohammad Saeed Khattak

Impact of germination time and type of illumination on proximate composition of chickpea seed was investigated. Germination time and type of illumination had highly significant influence ( $p < 0.001$ ) on the level of moisture, protein, fat, fiber, ash and Nitrogen Free Extract (NFE) contents. Increase in germination time was associated with increase in moisture, protein, ash and fat contents and decrease in fiber and NFE contents. Moisture accumulation increased significantly ( $p < 0.001$ ) with dark, fluorescent light and  $\gamma$ -irradiated seed sprouts, while green, blue and yellow lights have significant ( $p < 0.001$ ) promotional effects on protein and fiber contents. Germination of  $\gamma$ -irradiated chickpea seed had significant ( $p < 0.001$ ) promotional effect on ash and fat contents, while dark, fluorescent and yellow lights on NFE content. Interaction of the treatments (germination time X type of illumination) on all the parameters studied was also highly significant ( $p < 0.001$ ). (*American Journal of Food Technology* 3 (1): 24-32, 2008; doi: 10.3923/ajft.2008.24.32)

## **Effect of Temperature on Biochemical Changes Induced by *Bacillus subtilis* (SDA3) During Starter Culture Fermentation of Soybean into Condiment (Soy-Daddawa)**

B.O. Omafuvbe

In an attempt to upgrade the traditional fermentation technology of soybean into daddawa, the effect of fermentation temperature on the biochemical and organoleptic properties of soy-daddawa produced by starter culture was studied. *Bacillus subtilis* SDA3 previously selected as a good starter for soy-daddawa production was used to ferment sterile dehulled cooked soybeans at 25, 30, 35 and 40°C for 72 h. The viable cell counts of *B. subtilis* SDA3 increased throughout the 72 h fermentation process at 25 to 35°C while the counts decreased after the 24th h at 40°C fermentation. pH value increased throughout the fermentation with a rather low increase in the fermentation at 25°C. Relative proteolytic activity increased with fermentation, attained a peak at 48h and then dropped in fermentations at 30-40°C. Proteolytic activity which was not detected by the 12th h increased thereafter till the end of the fermentation at 25°C. Free

amino acid content increased throughout the 72 h fermentation at 30-40°C while an initial drop was observed in the first 12 h with subsequent increase till the end of the fermentation at 25°C. Alpha amylase activity increased, attained a peak at the 48 h and then dropped in 30 and 35°C fermentations. Alpha amylase activity increased throughout the 72 h fermentation at 25°C while at 40°C, the activity attained a peak at the 24th h and then dropped. Fermentation at 35°C gave the highest levels of proteolytic and alpha amylase activities, pH and free amino acids in soybean inoculated with *B. subtilis* SDA3. Organoleptically, soybean fermented by *B. subtilis* SDA3 at 35°C produced the best quality soy-daddawa as judged by a panel of regular soy-daddawa consumers. Fermentation at 35°C was therefore chosen as the optimised temperature for the production of soy-daddawa by *B. subtilis* SDA3 starter culture. (*American Journal of Food Technology* 3 (1): 33-41, 2008; doi: 10.3923/ajft.2008.33.41)

### **Effect of Dietary Levels of Cooked *Lablab purpureus* Beans on the Performance of Broiler Chickens**

F.O. Abeke, S.O. Ogundipe, A.A. Sekoni, I.I. Dafwang, I.A. Adeyinka, O.O. Oni and <sup>1</sup>A. Abeke

A study was conducted to determine the response of broiler starter and finisher chicks to dietary levels of *Lablab purpureus* beans processed by boiling in water for 30 min at 100°C. For both the starter and the finisher phases, seven isonitrogenous diets containing 23.78% crude protein for the starter and 20.91% crude protein for the finisher were formulated to contain lablab seed meal at 0.0, 5.0, 10.0, 15.0, 20.0, 25.0 and 30.0% levels respectively. Diet 1, in each phase had no lablab and served as the control. Each dietary treatment for the starter and the finisher phases was replicated three times in a completely randomized design. There were 25 birds per replicate. Feed and water were given *ad libitum*. The experiment lasted from 0 to 4 weeks for the starter phase and from 5 to 8 weeks for the finisher phase. Results obtained for the starter phase shows significant ( $p < 0.05$ ) depression in final weight, weight gain, feed intake, feed efficiency and feed-gain ratio. These parameters decreased as the level of lablab seeds in the diets increased. However, feed cost (₦/kg feed and ₦/bird) were significantly ( $p < 0.05$ ) reduced as the level of lablab seed meal increased in the starter diets. The results obtained for the finisher phase also showed a similar trend. While there were significant ( $p < 0.05$ ) decreases in final weight, weight gain, feed intake and feed efficiency as the level of lablab seed meal increased in the diets, feed cost (₦/kg feed and ₦/bird) were significantly ( $p < 0.05$ ) lowered. Parameters

measured for carcass analysis such as live weight and weights of the breast, thigh, wing, neck, legs and head showed a significant ( $p < 0.05$ ) decrease as the dietary levels of lablab seed meal increased. The PCV, Hb and the TP status of the blood indicated significant ( $p < 0.05$ ) decreases as the levels of lablab in the diets increased. However, *Lablab purpureus* beans can be included up to 5% level in broiler starter and up to 10% level in broiler finisher diets without any adverse effect on the performance of the birds. (*American Journal of Food Technology* 3 (1): 42-49, 2008; doi: 10.3923/ajft.2008.42.49)

### **Impact of Indigenous Fibre Rich Premix Supplementation on Blood Glucose Levels in Diabetics**

Rajvinder K. Kang, Rita Jain and D. Mridula

A premix, containing different proportion of locally available ingredients namely wheat, bengal gram, dried peas, defatted soyflour, barley and fenugreek seeds, was administered to 30 NIDDM subjects, equal number of both sexes to find out the impact of administering indigenous fibre rich therapeutic premix on blood glucose levels. The study was conducted in Amritsar city, India. The premix was given during breakfast in the form of chapattis for 90 days without disturbing the daily dietary pattern of the selected diabetic subjects. The study revealed that there was a significant reduction in fasting and post prandial blood glucose levels after 90 days of the premix supplementation. After the premix supplementation, the dose of oral hypoglycaemic drug was also reduced. All the subjects reported that there was decrease in the diabetic symptoms experienced by them at the end of the period of premix supplementation. The study thus indicated that the blood glucose level in diabetic patients could be reduced efficiently and gradually through the daily intake of less expensive premix, which can be easily prepared at home. (*American Journal of Food Technology* 3 (1): 50-55, 2008; doi: 10.3923/ajft.2008.50.55)

### **Effect of Humectants on the Quality of Pork Sausages**

R. Thomas, A.S.R. Anjaneyulu, S.K. Mendiratta and N. Kondaiah

The study was conducted to optimize the water activity hurdle during the process of development of shelf stable pork sausages using hurdle technology. The humectants used were Skim Milk Powder (SMP) and Textured Soy Protein (TSP). Different parameters evaluated were pH, emulsion stability, cooking yield,

moisture, protein and fat contents, water activity, shear force, Lovibond tintometer colour scores, texture profiles and sensory attributes. Incorporation of TSP significantly improved the colour and texture profiles of pork sausages, however, above 3% level it adversely affected different sensory attributes especially flavour. Texture profile analysis and sensory evaluation indicated that SMP at 2% level had no adverse effect on the texture of pork sausages. Also, addition of 3% TSP and 2% SMP together had no significant ( $p > 0.05$ ) advantages in improving most of the processing and quality characteristics of pork sausages over 3% TSP addition alone. In both the above treatments the water activity of pork sausages decreased to 0.93 from 0.95. (*American Journal of Food Technology* 3 (2): 56-67, 2008; *doi*: 10.3923/ajft.2008.56.67)

### **Effect of pH and Water Activity in Generation of Selected Meaty Aroma Compounds in a Meat Model System**

V.K. Modi, R. Linforth and A.J. Taylor

Longissimus dorsi post rigor minced beef meat was washed repeatedly with 0.02 M phosphate buffer (pH 6.8) to obtain pigment-free muscle fibers. The resultant muscle fiber was freeze dried and used as a meat model system. The results were compared with or without an aqueous model system containing a mixture of cysteine, thiamine and ribose reaction mixture. Gas chromatography-Mass spectrophotometry was used to study the effect of pH and water activity on the generation of volatiles in model systems. Seven sulphur-containing meaty aroma volatiles were identified in the meat fiber model system by odour port analyser and the generated mass spectra. The generation of volatile in reaction mixture as well as in meat fiber model system were strongly influenced by pH. The intensity of 2-methyl tetrahydrothioph-ene-3-one was low ( $p \leq 0.05$ ) at lower pH. The generation of 2-methyl-3-furanthiol and bis-(2-methyl-3-furyl) was more ( $p \leq 0.05$ ) in reaction mixture model system at a pH 5.5 and 6.5 than at lower pH. However, the increase in generation of 2-methyl thiophene in model systems studied was dependent ( $p \leq 0.05$ ) on the increase of pH. The volatiles, 2-methyl-4-5-dihydrothiophene, 2-methyl-3-(methylthio)furan and 2-methyl-3-thiophenethiol were not detected at low pH in a meat fiber model system. However, their generation in reaction mixture and meat fiber containing reaction mixture system was observed. The formation of 2-methyl-3-furanthiol and bis-(2-methyl-3-furyl) was favoured ( $p \leq 0.05$ ) by higher  $a_w$  whereas, the formation of thiophene was maximum at  $a_w$  0.80. At higher  $a_w$ , an inverse relationship between  $a_w$  and quantity of thiophene was observed. (*American Journal of Food Technology* 3 (2): 68-78, 2008; *doi*: 10.3923/ajft.2008.68.78)

## **Some Technologic Proprieties of Common Date (*Phoenix dactylifera* L.) Fruits**

Salem Benamara, Hassina Gougam, Hayet Amellal, Amrane Djouab, Adiba Benahmed and Yassine Noui

Mech-Degla, Degla-Beida and Frezza are the common (or dried) varieties studied in this research. On average, their water and sugar contents are of 15 and 80% dry basis (db), respectively. In this paper we report on their technological abilities. The experimental study consist the following: complementary vacuum (200 mbars) air-drying at 60°C, soaking in citrus juices, double fermentation (alcoholic and acetic) and water-alcohol extract preparation. The three previously quoted varieties show an interesting drying ability since they water content has been reduced to 5-7% (db) without apparent browning, which allows the possibility to produce first fruit powder then tablets. In order to formulate biologic vinegar and to optimize the traditional process as has traditionally applied in Algerian Sahara, the dates have been submitted to the spontaneous double fermentation: alcoholic and acetic. Using oxygenation during 4 h after 14 days of anaerobic fermentation, the acetic acid content reaches a value above 7 g/100 mL (in the Mech-Degla case). The swelling power (more than 50% in relation to the initial fruit's weight) of Mech-Degla dates immersed in citrus juices as well as the brix degree variation in liquid phase (on average 25%) were also analyzed. Results indicate also the possibility to produce the dates in their auto induced syrup. In addition, the water-alcohol extract obtained reveals an antioxidant activity of about 52%. (*American Journal of Food Technology* 3 (2): 79-88, 2008; doi: 10.3923/ajft.2008.79.88)

## **Effect of Different Levels of Emulsion pH Adjusted with Lactic Acid and Glucono-Delta-Lactone on the Quality of Pork Sausages**

R. Thomas, A.S.R. Anjaneyulu, S.K. Mendiratta and N. Kondaiah

The study was aimed at optimizing the pH hurdle during the process of development of shelf stable pork sausages using hurdle technology. The acidulants used were 0.5 N Lactic Acid (LA) and Glucono-Delta-Lactone (GDL). Different parameters evaluated were pH, emulsion stability, cooking yield, moisture, protein and fat contents, shear force, lovibond tintometer colour scores, texture profiles and sensory attributes. Reduction in emulsion pH by the addition of LA and/or

GDL significantly ( $p < 0.05$ ) influenced the processing and quality parameters of pork sausages. Emulsion pH below 5.90 (i.e., pH of cooked product  $\sim 6.00$ ) by the addition of 0.5 N LA affected different sensory attributes adversely. Similarly, incorporation of GDL at or above 0.3% adversely affected most of the quality and sensory attributes of pork sausages. It was observed that the pH of  $\sim 5.90$  in emulsion achieved by a combination of LA and GDL resulted in better quality characteristics in pork sausages compared to the same pH level attained by either LA or GDL alone. (*American Journal of Food Technology* 3 (2): 89-99, 2008; doi: 10.3923/ajft.2008.89.99)

### **Microwave/Vacuum Drying of Cranberries (*Vaccinium macrocarpon*)**

P.S. Sunjka, V. Orsat and G.S.V. Raghavan

Mechanically pretreated (cut) and osmotically dehydrated cranberries (*Vaccinium macrocarpon*) were dried using microwaves (MW) under subatmospheric pressure. Two MW modes were tested (continuous and pulsed), two combinations of pulsed MW mode (30 sec on/30 sec off, 30 sec on/45 sec off) and three MW power levels (1.00, 1.25 and 1.50 W g<sup>-1</sup> of initial sample mass). Three vacuum levels were compared one to another (3.4, 18.6 and 33.8 kPa of absolute pressure). Several process and quality parameters such as time of drying, colour, toughness and rehydration ratio were measured and calculated in order to evaluate different drying conditions. Methods with higher overall MW input (1.25 and 1.5 W g<sup>-1</sup>) and longer power-off time (45 sec) combined with high vacuum (3.4 kPa) offered high quality dried berries (colour parameters similar to those of fresh fruit, soft and chewable texture, juiciness and good rehydration properties). (*American Journal of Food Technology* 3 (2): 100-108, 2008; doi: 10.3923/ajft.2008.100.108)

### **Energy and Macronutrients Intake in Two Age Groups of Black South African Women**

Z. Hattingh, C.M. Walsh and O.O. Oguntibeju

The transition to a more westernized diets, became evident in the macronutrient intake of women in this study. The consumption of an energy-dense and diverse diet, typical of this transition, contributed to the high mean total energy and protein intakes. High mean total carbohydrate intakes, a staple diet of cereals and grains



was also reported. The adequate intake of dietary fibre by the population group in this study was in contrast with international studies that reported that westernization leads to increased consumption of fibre-depleted carbohydrates. The high total fat intake observed in this study may be ascribed to the increasing preference for cheaper red meat, offal, eggs, full-cream milk, cheese, brick margarine and meat drippings used in food preparation. The inclusion of these foods in the diet could explain the high total cholesterol intake reported in this study. Although the food trends of the studied group of women tended to move towards a more westernized style, traditional foods have not been totally eliminated. It is thus clear that urbanisation in this study group has led to high consumption rates of carbonated drinks, cold drinks, coffee, tea and commercial beer. A cereal-based diet was still taken; unfortunately, many of these foods were consumed in the refined form. (*American Journal of Food Technology* 3 (2): 109-117, 2008; doi: 10.3923/ajft.2008.109.117)

### **Irradiation and Packaging-Food Safety Aspects and Shelf Life Extension of Solar Dried Garlic (*Allium sativum*) Powder**

Nizakat Bib, Amal Badshah Khattak, Aurang Zeb and Zahid Mehmood

Influence of gamma irradiation and packaging material on physicochemical characteristics (moisture, protein, ascorbic acid, pH, mineral contents and browning value) and shelf life extension of garlic powder was investigated. Garlic cloves were meshed with skin, dried in solar dryer and then ground to 100 mesh. The dry powder was packed in polyethylene pouches of 0.015 (PE1), 0.03 mm (PE2) and polypropylene bottles (PP) of 0.1 mm thickness. One part of the packed samples was irradiated with 1.0 k Gy gamma rays and the other one kept as control. The data revealed no effect of irradiation on moisture (8.02-8.29%) and protein (13.00-13.30%) content during storage. The ascorbic acid content decreased from 20.82 to 19.56 mg 100 g<sup>-1</sup> in irradiated and control samples and maximum retention of this vitamin was noted in samples packaged in polypropylene bottles. The effect of irradiation and packaging material on mineral content in garlic powder was also non-significant. The browning value increased from 0.17-0.22 ΔA420 in irradiated and control samples. Irradiation improved the microbial quality of the product in all the packaging materials throughout the entire storage period. It is inferred from this study that the irradiated solar dried garlic powder packaged in polypropylene (PP) pouches can be stored beyond 5 months with no significant change in quality, appearance and nutrients. (*American Journal of Food Technology* 3 (2): 118-126, 2008; doi: 10.3923/ajft.2008.118.126)

## **Screening of Stabilizers for Peanut Milk Based Set Yoghurt by Assessment of Whey Separation, Gel Firmness and Sensory Quality of the Yoghurt**

Joel Isanga and Guo-Nong Zhang

Seven stabilizers were assessed for their suitability and compatibility to peanut milk based set yoghurt. For the sake of screening, the concentration of the stabilizers added was fixed at 0.2% (w/v). Peanut milk based yoghurt was prepared from a mixture of 60% peanut milk and 40% cow milk. Whey separation, gel firmness and sensory quality of the yoghurt were the quality attributes used for screening the stabilizers. Yoghurt containing  $\kappa$ -carrageenan and gelatin had a firm gel with little or no whey at the top, respectively. Yoghurt containing the other five stabilizers (High methoxy pectin, Propylene glycole alginate, Carboxy methyl cellulose, Xanthan gum and Guar gum) all formed weak gels with little or excessive whey at the top. The yoghurt containing gelatin had higher sensory scores for all the three sensory attributes (Appearance, texture and overall acceptability) as compared to the other stabilizers assessed in this study. Therefore, gelatin was found to be the most appropriate stabilizer compatible to a peanut milk based yoghurt system. (*American Journal of Food Technology* 3 (2): 127-133, 2008; doi: 10.3923/ajft.2008.127.133)

## **Physico-Chemical and Functional Quality of Buffalo Head Meat and Heart Meat**

A.K. Verma, V. Lakshmanan, Arun K. Das, S.K. Mendiratta and A.S.R. Anjaneyulu

In the present study, physico-chemical and functional properties of buffalo head meat; heart meat and buffalo skeletal meat were estimated and compared. Moisture content of buffalo heart meat (78.42%) and head meat (76.94%) was significantly ( $p < 0.05$ ) higher than buffalo skeletal meat (75.85%). Buffalo heart meat had significantly lower protein content (15.49%) than head meat (19.25%) and skeletal meat (19.84%). Fat and ash content of buffalo skeletal meat, head meat and heart meat did not differ significantly among themselves. pH of buffalo head meat (6.41) was significantly higher than skeletal meat (5.85) and heart meat (5.80). Salt extractable protein of head meat (12.02%) was significantly ( $p < 0.05$ ) higher than skeletal meat (8.25%) and heart meat (8.52%). Heart meat had significantly ( $p < 0.05$ ) lower water holding capacity than skeletal and head meat. Shear force value and emulsifying capacity of heart meat were significantly

( $p < 0.05$ ) lower than skeletal and head meat. There was a significant difference in total pigment content between head (398.82 ppm), heart (338.98 ppm) and skeletal meat (243.89 ppm). (*American Journal of Food Technology* 3 (2): 134-140, 2008; doi: 10.3923/ajft.2008.134.140)

### **The Nutritive Value of *Cucumis melo* var. *agrestis* Scrad (Cucurbitaceae) Seeds and Oil in Nigeria**

A.A. Adekunle and O.A. Oluwo

This study investigated the biochemical properties of the *Cucumis melo* var. *agrestis* seed and its oil. Also the effect of fungi on the biochemical properties of artificially infected oil after 14 days of incubation was determined. Eight fungi were isolated from diseased *C. melo* var *agrestis* seed during a six months period and monthly sampling from 3 markets in Lagos state, Nigeria. The fungi include *Aspergillus flavus*, *A. niger*, *A. wentii*, *Botrodiploia theobromae*, *Mucor* sp. *Penicillium pinophyllum*, *Phycomyces* sp. and *Rhizopus* sp. The moisture content of the usually healthy melon seeds was  $4.50 \pm 0.73\%$  and oil yield was  $59.46 \pm 1.29\%$ . The seeds also contained  $30.40 \pm 1.09\%$  carbohydrate and  $3.89 \pm 0.55\%$  protein. The extracted oil was edible and non-rancid with free fatty acid value of  $1.94 \pm 0.34\%$ ; peroxide value of  $8.00 \pm 0.56$  meq  $\text{kg}^{-1}$ , iodine value of  $10.50 \pm 0.81$  and saponification value of  $193.0 \pm 12.24$  meq  $\text{kg}^{-1}$ . The fungi artificially inoculated on the oil changed its biochemical properties, turning the oil rancid. The melon seed sampled did not contain heavy metal lethal to human health. (*American Journal of Food Technology* 3 (2): 141-146, 2008; doi: 10.3923/ajft.2008.141.146)

### **Effect of Pasteurization and Chemical Preservatives on the Quality and Shelf Stability of Apple Juice**

Zahid Mehmood, Alam Zeb, Mohammad Ayub, Nizakat Bibi, Amal Badshah and Ihsanullah

Effect of pasteurization and chemical preservatives on preservation of apple juice at ambient temperature for 3 months was investigated. The treatments studied were control ( $T_0$ ), pasteurization alone ( $T_1$ ), Un-pasteurized + 0.1% potassium sorbate ( $T_2$ ), pasteurized + 0.1% potassium sorbate ( $T_3$ ), un-pasteurized + 0.1% sodium benzoate ( $T_4$ ), pasteurized + 0.1% sodium benzoate ( $T_5$ ), un-pasteurized + 0.05% potassium sorbate 0.05% sodium benzoate ( $T_6$ ), pasteurized + 0.05% potassium sorbate 0.05% sodium benzoate ( $T_7$ ), un-pasteurized + 0.1% potassium

sorbate 0.1% sodium benzoate (T<sub>8</sub>), pasteurized + 0.1% potassium sorbate 0.1% sodium benzoate (T<sub>9</sub>). Ascorbic acid decreased significantly in T<sub>0</sub>, T<sub>1</sub>, T<sub>3</sub> and T<sub>5</sub> while in the effect of rest of the treatment it was non-significant. With storage the ascorbic acid content decreased from 3.31 to 1.00 mg 100 g<sup>-1</sup>. Treatments and storage period have a significant effect on percent acidity. Lowest value for acidity was observed in T<sub>8</sub> and T<sub>9</sub> (0.41%) and highest in control (0.52%). It increased from 0.34 to 0.52% with 0 to 90 days storage, respectively. Maximum values for pH were noted in T<sub>9</sub> (3.64) and minimum in T<sub>0</sub> (3.07). However, with storage time, pH values decreased consistently with the advancement of storage time. Reducing sugars increased from 7.12 to 7.65% with the passage of storage time while the reverse was true for the non-reducing sugars. T<sub>0</sub> and T<sub>1</sub> have maximum non-reducing and minimum reducing sugars. Effect of treatments on non-reducing was more profound as compared to reducing sugars. As might be expected, sensory quality (color and flavor), decreased with increase in storage time, however, the remained within the acceptable. Treatments T<sub>6</sub>, T<sub>7</sub>, T<sub>8</sub> and T<sub>9</sub> were more effective in maintaining the sensory quality compared to other one. Minimum microbial load was observed in T<sub>9</sub> and maximum in T<sub>0</sub> and T<sub>1</sub> (uncountable). Among all the treatments T<sub>9</sub> was most effective in retaining nutritional, hygienic and sensory quality of apple juice. (*American Journal of Food Technology* 3 (2): 147-153, 2008; doi: 10.3923/ajft.2008.147.153)

## **Changes in the Acid Value of Butter During Storage at Different Temperatures as Assessed by Standard Methods or by FT-IR Spectroscopy**

Piotr Koczoń, Eliza Gruczyńska and Bolesław Kowalski

Three different types of polish commercial butters, namely: light, regular and high fat content were under study. Studied samples were stored at two different temperatures (5 or 20°C) for a period of 8 weeks. Measurements of the content of fat, water, Acid Value (AV) and Peroxide Value (PV) were determined in the fresh butter and at one week interval. The AV and PV were determined by the conventional titrimetric method. IR spectra of every sample were registered. The relation between the AV values obtained by titration and by spectral measurements were studied by the Partially Least Square (PLS) regression, to built a statistical model for rapid determination of acid value. Two independent models, one for light type butters (model I) and the second one for regular and high fat content butters (model II) were calibrated. The characteristic parameters of the models are: R<sup>2</sup> = 0.97, PRESS (Prediction Residual Error Sum of Squares) = 2.91, factors number = 5 and R<sup>2</sup> = 0.84, PRESS = 3.64, factors number = 6,

for model I and model II, respectively. The developed models correctly predict acid values of unknown samples of different types of butters. (*American Journal of Food Technology* 3 (3): 154-163, 2008; doi: 10.3923/ajft.2008.154.163)

### **An Investigation on Factors Affecting Recovery of Antioxidant Phenolics and Anthocyanins from Red Grape (*Vitis vinifera* L.) Pomace Employing Water/Ethanol-Based Solutions**

Dimitris P. Makris, George Boskou, Antonia Chiou and Nikolaos K. Andrikopoulos

Extractions were performed using non-toxic media composed of water/ethanol mixtures and hydrochloric, acetic or tartaric acid. Recovery efficiency was assessed by monitoring the antiradical activity ( $A_{AR}$ ) of extracts and several indices related to their polyphenolic composition, including total polyphenol, total flavonoid, total flavanol, total anthocyanin and condensed tannin (proanthocyanidin) content. Extracts with the highest  $A_{AR}$  values were obtained with 57% ethanol, a solvent system that was also favourable in obtaining high total polyphenol and total flavonoid yields, which amounted 7259 and 7222 mg/100 g dry weight, respectively. The highest anthocyanin yield was however achieved with 85.5% ethanol (266.2 mg/100 g dry weight). None of the acidification agents used provided extracts with increased polyphenol levels and  $A_{AR}$ . Addition of  $SO_2$  (0.01%, w/v) to 57% ethanol, however, resulted in maximisation of  $A_{AR}$  (2.9 mM TRE/g dry weight), although anthocyanin recovery was not maximal (186.9 mg/100 g dry weight). It is suggested that efficient recovery of antioxidant phenolics and anthocyanins from by-products of red vinification can be achieved employing simple extracting media composed of ethanol, but more active, in terms of antioxidant activity, extracts can be obtained with addition of a low amount of  $SO_2$ . Ethanol is a bio-solvent that can also be obtained from wine-industry wastes and thus the implementation of similar techniques may potentially provide the basis for a sustainable process of integrated exploitation of vinification by-products. (*American Journal of Food Technology* 3 (3): 164-173, 2008; doi: 10.3923/ajft.2008.164.173)

### **A Computerized Procedure for Estimating Chemical Changes in Thermal Processing Systems**

A.E. Labropoulos and T.H. Varzakas

Chemical changes caused by heating in a continuous flow, helically coiled tube indirect UHT process system were evaluated and compared to a non-flow, vat

process system. On the basis of known formulas for evaluating bacterial destruction, a computerized procedure was developed to estimate the rates (R) and accumulated values ( $L_d$ ) of chemical changes in the various stages of the UHT and vat thermal processes. Data were based on 149°C for 3.3 sec holding time in the continuous flow UHT process and compared to 82°C for 30 min holding time in the non-flow vat process system. The heat effect of the above heat treatments based on the 121°C reference temperature and a z-value of 7.2°C was approximately equal to 1.0 for the non-flow vat process and equal to 0.8 for the continuous UHT process. For UHT and vat processes that have  $L_d$  values equal to 1.0, the residence times in the holding sections were, 4.2 sec and 30 min, respectively. Approximately 10% of the overall chemical changes occurred during the heating period for both processes, 86.1% approximately during the holding periods and 1.5 and 6%, respectively in the UHT and vat processes during cooling. (*American Journal of Food Technology* 3 (3): 174-182, 2008; doi: 10.3923/ajft.2008.174.182)

### **Benzoate and Synthetic Color Risk Assessment of Fast Food Sauces Served at Street Food Joints of Lucknow, India**

Sumita Dixit, Krishn Kant Mishra, Subhash K. Khanna and Mukul Das

Quality compliance of benzoate and food colors in the two common fast food accessories, namely tomato and chilli sauces, served at Street Food Joints (SFJs) has been evaluated and compared with the counterpart branded products. Both sauces served at SFJs employed excessive amounts of benzoic acid in comparison with branded products ( $p < 0.05$ ). In spite of ban, presence of artificial colors such as Amaranth, Carmoisine, Erythrosine, Ponceau 4R, Sunset Yellow and Tartrazine were noted in a vast majority of SFJ sauce samples. All branded sauces, however, adhered to the prescribed limit of benzoate and contained no artificial color. Intake estimates for benzoate and one of the colors, Sunset Yellow, in high consumers among children are likely to saturate 33 and 20% of the ADI at 95th percentile levels, respectively, which appears to be on higher side considering intake from a single commodity. Street Food Joints (SFJs) cater to the demand of floating domestic/foreign tourist populations and serve as a source of employment generation. This sector needs some assistance to enable them to survive in the competitive markets but not at the cost of quality. Effective risk communication and food safety awareness measures designed for street vending outlets are required so that such lapses of street vending outlets could be minimized. (*American Journal of Food Technology* 3 (3): 183-191, 2008; doi: 10.3923/ajft.2008.183.191)

## **Presence of Heavy Metals in Pork Products in Chennai (India)**

D. Santhi, V. Balakrishnan, A. Kalaikannan and K.T. Radhakrishnan

The presence of heavy metals in frozen and canned commercial pork products obtained from retail outlets of Chennai city was determined, by atomic absorption spectrophotometry using dry ashing method. The samples had cadmium from 0.038 to 0.545 mg kg<sup>-1</sup>, chromium up to 2.244 mg kg<sup>-1</sup>, copper up to 2.847 mg kg<sup>-1</sup>, lead up to 6.290 mg kg<sup>-1</sup> and zinc from 6.927 to 144.575 mg kg<sup>-1</sup>. Generally, heavily spiced products had higher levels of heavy metals. Levels of cadmium exceeded the Maximum Permissible Level (MPL) of 0.1 mg kg<sup>-1</sup> in 95.83% of the samples as stipulated by Food and Agriculture Organization (0.1 mg kg<sup>-1</sup>), whereas no samples had copper content exceeding MPL (20 ppm) specified by Meat Food Products Order (MFPO), 25.0% of the samples had lead content exceeding the limit specified by MFPO (2.5 ppm) and 20.83% of the samples had zinc values exceeding the MPL of MFPO (50 ppm). The results of this study demonstrate the need for good manufacturing practices (GMP's) and HACCP to control these heavy metals in pork products. (*American Journal of Food Technology* 3 (3): 192-199, 2008; *doi*: 10.3923/ajft.2008.192.199)

## **Comparative Study on the Agronomic, Nutritional Values and Consumer Acceptability of FHIA-21 (Tetraploid Hybrid) and Apem (Triploid French Plantain) in Ghana**

B.M. Dzomeku, R.K. Bam, E. Adu-Kwarteng, A.A. Ankomah and S.K. Darkey

The agronomic, nutritional composition of the green stages of fruit and the consumer acceptance of FHIA-21 (tetraploid hybrid plantain) from Honduran Agricultural Research Foundation was conducted in the forest region of Ghana. The standard AOAC methods were used to determine the moisture, crude protein, ash, crude fibre, potassium, iron, calcium, carbohydrate, sodium and crude fat. Pulp colour was measured with a Chromatometer. Results on the agronomy indicated that the hybrid was very tolerant to the black Sigatoka disease with high number of functional leaves at flowering and at harvest. The crop cycle was comparable to that of False Horn plantains. The yield performance of the hybrid was high ranging from 34-38 t ha<sup>-1</sup> across the locations. The yield values have been stable over the three-year study period. In addition, the FHIA hybrid plants were relatively short. The physio-chemical composition results showed that the hybrid had high fat (1.94%) and water (60%) contents. The potassium content was also high (1060 mg/100 g dry weight) however, the iron content

(0.45 mg/100 g dry weight) was low. The high potassium level in the hybrid may be an advantage for use as a therapy. The tetraploid hybrid had bright orange pulp colour which was indicative of the presence of provitamins and carotenoids. The consumer acceptability results revealed that FHIA-21 compared favourably with the local triploid (Apem). The hybrid was accepted for ampesi, fufu and ripe fried plantain. However acceptability of the hybrid as ripe fried plantain was at ripening stages 3 and 4. Beyond these stages of ripening, the hybrid could only be used for processed (mashed) food recipes. (*American Journal of Food Technology* 3 (3): 200-206, 2008; *doi*: 10.3923/ajft.2008.200.206)

### **Effects of Dietary Garlic Powder on Cholesterol Concentration in Native Desi Laying Hens**

Sohail Hassan Khan, Shamsul Hasan, Rozina Sardar and Muhammad Ashraf Anjum

The research was conducted to evaluate the potential for local dietary garlic to influence egg yolk and blood cholesterol concentrations and overall performance of native desi layers. Forty 30-week-old desi layers (ten hens per diet) were caged individually and fed diets supplemented with 0 (control), 2, 6 and 8% oven dried garlic powder (at low temperature i.e., 55°C) for 6 week. The results showed that differences among diets in weight gain and egg production were found significant ( $p < 0.01$ ) as averaged over 6 week. However, no differences ( $p > 0.05$ ) were observed among diets in feed intake, feed efficiency, egg weight and egg mass with increasing levels of dietary garlic. Serum and egg yolk cholesterol concentrations decreased ( $p < 0.05$ ) with increasing levels of dietary garlic. It may be concluded that dried garlic powder in the diets of desi laying hens reduced serum and yolk cholesterol concentrations and dietary garlic powder had better effects on layer performance. (*American Journal of Food Technology* 3 (3): 207-213, 2008; *doi*: 10.3923/ajft.2008.207.213)

### **Genotype-Environment Interaction (GXE) Effects on Some Major Rheological Properties of Cassava (*Manihot esculenta*, Crantz)**

E. Baafi and O. Safo-Kantanka

Trials were conducted at two different locations in the Forest and Transition ecozones of Ghana to determine the presence and relative importance of GXE interactions on rheological properties of cassava using 8 genotypes. Data collected



include solubility, swelling power, water-binding capacity (flour and starch) and swelling capacity and pH for the gari. The data were subjected to the Analysis of Variance (ANOVA) in a Factorial Randomised Complete Block Design (RCBD). Genotypic differences ( $p < 0.05$ ) were observed for all the traits studied except water-binding capacity and swelling power of starch. GXE interaction was significant ( $p < 0.05$ ) for all traits studied. These differential genotypic responses across locations means that the relative performance of varieties will differ across environments and this can complicate evaluation and selection of genotypes for specific domestic and industrial uses. Thus, indicating the importance of GXE interactions on cassava improvement and industry in Ghana. (*American Journal of Food Technology* 3 (3): 214-219, 2008; doi: 10.3923/ajft.2008.214.219)

### **Heavy Metal Composition of Some Imported Canned Fruit Drinks in Nigeria**

Chukwujindu M.A. Iwegbue, S.O. Nwozo, E.K. Ossai and G.E. Nwajei

Concentrations of cadmium, lead, chromium, nickel, copper, manganese and zinc in six brands of fruit drinks was investigated. The concentration of the heavy metals showed appreciable ( $p < 0.05$ ) variability within a brand except for Pb and Zn in orange brand. However, apparent and significant variability exist when brands are compared. The mean levels of the studied metals varies between 2.29-18.29 ppm for Fe, 1.41-7.19 ppm for Cu, 0.002-0.89 ppm for Cr, 0.06-1.93 ppm for Pb, 0.21-1.00 ppm for Ni, 0.006-11.29 ppm for Mn, 0.69-1.25 ppm for Zn and 0.002-0.49 ppm for Cd, the levels of these metals exceeded statutory safe limits except for Mn, Zn and Fe. (*American Journal of Food Technology* 3 (3): 220-223, 2008; doi: 10.3923/ajft.2008.220.223)

### **Effects of Steaming and Dehydration on Anthocyanins, Antioxidant Activity, Total Phenols and Color Characteristics of Purple-Fleshed Sweet Potatoes (*Ipomoea batatas*)**

J. Yang and R.L. Gadi

Purple-Fleshed Sweet Potatoes (PFSP) (*Ipomoea batatas*) are rich sources of acylated anthocyanins. Anthocyanin content, antioxidant activity and total phenols as well as color characteristics of PFSP were determined by UV/visible or fluorescence spectrophotometry and chromametry. The flesh of PFSP cultivar Terlaje produced in the Western Pacific contained total anthocyanins at

0.40 mg g<sup>-1</sup> fresh weight. PFSP Powders processed by directly freeze-drying or first steaming and then freeze- or hot air-drying contained anthocyanins at 0.94-0.97 mg g<sup>-1</sup>, Oxygen Radical Absorbance Capacity (ORAC) at 70.0-93.0 µmole Trolox g<sup>-1</sup>, Trolox Equivalent Antioxidant Capacity (TEAC) at 11.8-12.7 µmole Trolox g<sup>-1</sup> and total phenols at 4-5 mg gallic acid g<sup>-1</sup> dry weight. PFSP powder processed by hot air-drying without steaming lost 65% of anthocyanin content, 35% of antioxidant activity and 40% of total phenols. Steaming of PFSP roots at atmosphere pressure for 0.5 h increased 40% of anthocyanin content and enhanced the purple color of PFSP. Dehydration at 60°C for 24 h retained anthocyanin content and purple color of steamed PFSP. Both steaming and dehydration increased the percentage of polymeric anthocyanins in PFSP. The results suggested the PFSP powders exhibited potentials as colorants and nutraceutical ingredients for formulated foods. (*American Journal of Food Technology* 3 (4): 224-234, 2008; doi: 10.3923/ajft.2008.224.234)

### **Vegetable (*Telfairia occidentalis*) Leaf Meal as Dietary Protein Supplement in Laying Hens: Egg Laying Performance, Egg Quality and Hematological Implications**

A.O. Fasuyi and O.P. Olorunfemi

The objective of this study was to investigate by evaluating the bio-nutritional potency of leaf meal prepared from *Telfairia occidentalis* as a protein supplement in laying hens. An experiment was carried out with Hy-line Variety Brown layer birds beginning at the first phase of egg lay spanning a period of 3 months. Four isonitrogenous and isocaloric diets were formulated in which the major difference was the percentage inclusion levels of the *Telfairia occidentalis* leaf meal (TOLM) at 0, 10, 15, 20% in diets 1, 2, 3 and 4, respectively. There were no statistically significant differences ( $p > 0.05$ ) in the body weight changes, egg weight, albumen height and shell thickness. The mean egg weight values ranged between 63.20±1.85 and 66.55±3.14 g while albumen height ranged between 4.97±0.26 and 5.30±1.07 mm. The shell thickness also ranged from 0.47±0.09 to 0.52±0.08 mm. However, the yolk colour scores showed significant differences ( $p < 0.05$ ) among eggs collected from the different diets with yolk colouration of eggs from diets 3 and 4 having the deepest yellowish colouration. The Haugh unit (Hu) values calculated for all experimental hens on all diets were statistically similar ( $p > 0.05$ ). The hen day production of hens on diet 3 (15% TOLM inclusion) was consistently higher than others at an average of 63.54±7.38%. Hematological investigation did not reveal any deleterious effects on the performance and no physical health

hazards were observed in all experimental hens. It is evident that TOLM if well prepared could be a potential source of plant protein particularly at 15% inclusion level in poultry layer diets. (*American Journal of Food Technology* 3 (4): 235-245, 2008; **doi:** 10.3923/ajft.2008.235.245)

### **Determination of Total Serum Protein Levels Fed by Hot Smoked Rainbow Trout (*Oncorhynchus mykiss*) Diets in Rats**

Süleyman Kaleli, Mustafa Ünlüsayın, Şengül Bilgin, Levent Izci and Ali Günlü

The effects on total serum protein levels of rats fed by hot smoked Rainbow trout (*Oncorhynchus mykiss*) were investigated. Four diets containing fresh and hot smoked rainbow trout flesh and vitamin were prepared and commercial pellet food purchased. Four groups of female Wistar rats were fed with the diets for 28 days. Total serum protein and detection of protein bands using sodium dodecyl sulfate polyacrylamide gel electrophoresis (SDS-Page) were evaluated. The total serum protein level of rat fed by hot smoked rainbow trout flesh+vitamin diet were increased significantly according to the other groups ( $p<0.017$ ,  $p<0.002$ ). Eight protein bands were visualised on rat gels. The molecular weights of protein bands detected were 166, 112, 90, 63, 47, 45, 36 and 14 kDa, respectively. (*American Journal of Food Technology* 3 (4): 246-251, 2008; **doi:** 10.3923/ajft.2008.246.251)

### **Immobilization of *Aspergillus niger* in Polyurethane Foam for Citric Acid Production from Carob Pod Extract**

T. Pramod and K. Lingappa

*Aspergillus niger* strains MTCC 281 and KLP20 immobilized on polyurethane foam were utilized for the batch fermentation of citric acid from carob pod extract. Carob pods are the fruits of carob tree (*Ceratonia siliqua*). Carob pod extract with 40-50% sugars were inoculated with immobilized polyurethane foam and incubated at 30°C. Maximum citric acid yields of 23 and 33 g L<sup>-1</sup> with free and immobilized cells in case of *A. niger* MTCC 281 and 27 and 38 g L<sup>-1</sup> in case of *A. niger* KLP20 were obtained after 72 h of fermentation. From the studies *A. niger* KLP20 seems to be a potential strain among the two strains for the maximum citric acid production. (*American Journal of Food Technology* 3 (4): 252-256, 2008; **doi:** 10.3923/ajft.2008.252.256)

## **Starch Gelatinization, Total Bacterial Counts and Sensory Evaluation of Deep Fried Cassava Balls (Akara-Akpu)**

C.E. Chinma and M.A. Igyor

Two frying variables (Oil temperature and frying time) at three levels each, were studied to determine effects on degree of starch gelatinization, consumer response and microbial quality of fried cassava balls (Akara-akpu). Results showed that the degree of starch gelatinization of Akara-akpu increased with increasing oil temperature ( $^{\circ}\text{C}$ ), time and moisture content of Akara-akpu paste. Optimum starch gelatinization value of 29.62-34.41% was established for Akara-akpu samples. Based on consumer panel results, oil temperature of  $160^{\circ}\text{C}$  at 5 min and  $180^{\circ}\text{C}$  at 4 min should be used to produce acceptable Akara-akpu. It was evident that higher sensory scores in terms of crunchiness, overall quality and willingness to purchase were obtained at the established optimum gelatinization range. (*American Journal of Food Technology* 3 (4): 257-263, 2008; doi: 10.3923/ajft.2008.257.263)

## **Nutritional Evaluation and Functional Properties of *Clarias lazera* (African Catfish) from River Tammah in Nasarawa State, Nigeria**

M.O. Aremu and O.E. Ekunode

Evaluation of nutritional composition was carried out on *Clarias lazera* fish while functional properties were also investigated. The proximate composition were total ash (8.6%), moisture (7.5%), crude protein (73%), crude fat (8.3%) and carbohydrate (2.5%); crude fibre was not in the detectable range. The available energy was high (1.59 MJ/100 g). The proportion of energy due to protein and fat were 78.0 and 2.7%, respectively. The fish sample was low in sodium Na, potassium (K), magnesium (Mg), iron (Fe), zinc (Zn), manganese (Mn), copper (Cu), chromium (Cr) and lead (Pb). Calcium (Ca) was the most highly concentrated mineral (63.7 mg/100 g sample). The total amino acid was 925.2 mg  $\text{g}^{-1}$  crude protein while lysine (Lys) was the most highly concentrated essential amino acid (79.0 mg  $\text{g}^{-1}$ ). The fish sample had a balanced content of essential amino acid in isoleucine (Ile), leucine (Leu), lysine (Lys), methionine (Met) + cystine (Cys), phenylalanine (Phe) + tyrosine (Tyr) and threonine (Thr), with respect to the FAO pattern while supplementation may be required only in valine (Val). The calculated isoelectric point (pI) was 5.6, Predicted Protein Efficiency Ratio (P-PER) was 26.1 and first limiting amino acid was Val. Results of functional properties were: foaming capacity (4.9%), foaming stability (3.7%, 8 h), water

absorption capacity (280.5%), oil absorption capacity (280.6%), oil emulsion capacity (20.0%), oil emulsion stability (19.5, 12 h), lowest gelation concentration (10.0%) and bulk density ( $470 \text{ g L}^{-1}$ ). The results showed that *Clarias lazera* could be a good source of most of the parameters determined in this study. (*American Journal of Food Technology* 3 (4): 264-274, 2008; doi: 10.3923/ajft.2008.264.274)

### **Prediction of Solubility of Solid Biomolecules in Supercritical Solvents Using Group Contribution Methods and Equations of State**

Araya Ajcharyapagorn, Peter L. Douglas, Supaporn Douglas, Suwassa Pongamphai and Wittaya Teppaitoon

The purpose of this study is to present a method to estimate the solubility of solid solutes in supercritical fluids when only the molecule structure is known. The solubility of solid solutes in a supercritical fluid is an important thermo-physical property that needs to be determined if one is to develop a generic supercritical fluid extraction model. Due to the general lack of solubility data and/or pure component property data needed to estimate solubility, a need exists to develop methods to estimate the solubility of solid solutes in a supercritical solvents using limited information. Group contribution methods were used to estimate pure component properties, equations of state (Lee-Kesler-Plocker (LKP) and Mohsen-Nia-Moddaress-Mansoori (MMM) were then used to estimate the PVT behaviour of the solvent and the fugacity coefficient of solute in the solute-solvent mixture. The solubilities of  $\beta$ -carotene, cholesterol, nimodipine and nimbin in supercritical solvents were determined. Our results show that the LKP model provides the best fit for  $\beta$ -carotene and nimodipine in  $\text{SCCO}_2$  and the MMM model is best for cholesterol in  $\text{SCCO}_2$  and  $\text{SCC}_2\text{H}_6$  and for nimbin in  $\text{SCCO}_2$ . The Aromaticity Index (AI) seems to be an important parameter for determining which model will perform best; based on the systems analysed here, one should use the LKP EOS when  $\text{AI} > 0.3$ , otherwise use the MMM EOS. (*American Journal of Food Technology* 3 (5): 275-293, 2008; doi: 10.3923/ajft.2008.275.293)

### **Rheology of Defatted Ultrafiltration-Diafiltration Soy Proteins**

Jingyuan Xu, Abdellatif A. Mohamed, Mila P. Hojilla-Evangelista and David J. Sessa

The linear and non-linear rheological properties of defatted soy proteins produced by ultrafiltration-diafiltration were investigated at three temperatures. Five

concentrations ranging from 10 to 30% of the defatted Ultrafiltered-Diafiltered (UD) soy proteins were prepared. The properties of defatted UD soy proteins depended on concentration and temperature. At 10%, defatted UD soy proteins exhibited almost viscous fluid behavior. When concentration increased or temperature decreased, the properties of soy proteins shifted into viscoelastic. The higher the concentration or the lower the temperature, the stronger of the viscoelasticity was for the soy proteins. The non-linear rheological properties were also concentration and temperature dependent. The non-linear steady shear measurements for the defatted UD soy proteins exhibited shear-thinning behavior, which can be described by a power law constitutive model. The trend of the power law exponent shift is very consistent with the linear viscoelastic behavior change with the soy proteins concentration and temperature. The results of this study can be used to direct further food and non-food applications for defatted UD soy proteins. (*American Journal of Food Technology* 3 (5): 294-302, 2008; *doi*: 10.3923/ajft.2008.294.302)

### **Serrobiochemical Effects of Potassium Bromate on Wistar Albino Rats**

Afaf I. Abuelgasim, Rehab Omer and B. ELmahdi

The present study aimed to clarify the toxic effect of potassium bromate in Wistar albino rats. Thirty rats were divided into 5 groups. The first group served as control and the other four groups received potassium bromate orally at doses 50, 100, 200 and 400 mg kg<sup>-1</sup> body weight (b.wt.) for 21 days. Rats received 400 mg kg<sup>-1</sup> b.wt. died within 3 days and those received 200 mg kg<sup>-1</sup> b.wt. died on the 18th day post treatment. The body weights of rats treated with potassium bromate were not affected but the relative weights of the kidney and liver were significantly increased ( $p < 0.05$ ) in the group of rats received 100 mg kg<sup>-1</sup> b.wt. potassium bromate compared to the control group. Clinically difficulty in breathing and depression occurred in those rats received 100 and 200 mg kg<sup>-1</sup> b.wt. of potassium bromate. A significant ( $p < 0.05$ ) increase of urea, creatinine and potassium beside a decrease in Na level was evident in the groups received 100 and 200 mg kg<sup>-1</sup> b.wt. of potassium bromate. Histopathological examination of the groups of rats received 100, 200 and 400 mg kg<sup>-1</sup> b.wt. showed generalized congestion, haemorrhage and degenerative changes in the kidney and liver. Also increased intestinal goblet cells, stomach epithelium desquamation, pneumonia, haemorrhage, neuronal degeneration and vaculation of the brain were evident. The

group of rats received 50 mg kg<sup>-1</sup> b.wt. of potassium bromate was not affected compared to the control. (*American Journal of Food Technology* 3 (5): 303-309, 2008; *doi*: 10.3923/ajft.2008.303.309)

### **Effect of Potassium Bromate on Liver and Blood Constituents of Wistar Albino Rats**

Rehab Omer, Afaf I. Abuelgasim and B. ELMahdi

Twenty four Wistar albino rats were divided into 4 groups and treated orally with potassium bromate at doses of 0, 50, 100 and 200 mg kg<sup>-1</sup> body weight (b.wt.) for 21 days. Rats received 200 mg kg<sup>-1</sup> b.wt. died within 18 days. A significant reduction in Hb, PCV and MCHC values were observed in animals received 200 mg kg<sup>-1</sup> b.wt. in the second week while no changes occurred in the groups treated with 50 and 100 mg kg<sup>-1</sup> b.wt. The activity of alanine transaminase (ALT) was significantly increased in rats received 100 and 200 mg kg<sup>-1</sup> b.wt. of potassium bromate from the first week, while total protein and albumin were significantly decreased from the first week in animals treated with 200 mg kg<sup>-1</sup> b.wt. and the second week at the dose 100 mg kg<sup>-1</sup> b.wt. Histologically liver degeneration and haemorrhage was evident in the groups treated with 100 and 200 mg kg<sup>-1</sup> b.wt. The dose of 50 mg kg<sup>-1</sup> b.wt. did not cause any changes compared to the control. (*American Journal of Food Technology* 3 (5): 310-314, 2008; *doi*: 10.3923/ajft.2008.310.314)

### **Obtaining Oligopeptides from Whey: Use of Subtilisin and Pancreatin**

Mariana Wanessa Santana de Souza, Eliza Augusta Rolim Biasutti, Raquel Linhares Carreira, Wendel de Oliveira Afonso, Viviane Dias Medeiros Silva and Marialice Pinto Coelho Silvestre

The whey hydrolysis was optimized aiming the production of oligopeptides. The use of a subtilisin and a pancreatin as well as the effect of the substrate concentration (SC) and enzyme:substrate ratio (E:S) were tested. The whey hydrolysates were fractionated by size-exclusion-HPLC and the rapid Correct Fraction Area method was used for quantifying peptides and free amino acids. Both enzymes were efficient for producing oligopeptides and the values reached 41.42 and 37.12%, for subtilisin and pancreatin, respectively. For subtilisin, the

best peptide profile was obtained for a SC of 15% with an E:S of 1:100, while for pancreatin this same result was observed for a SC of 10% with E:S of either 1:100 or 2:100, as well as for a SC of 15% with E:S of 1:100, 2:100 and 4:100. (*American Journal of Food Technology* 3 (5): 315-324, 2008; doi: 10.3923/ajft.2008.315.324)

### **Antioxidative Potential of *Ocimum gratissimum* and *Ocimum canum* Leaf Polyphenols and Protective Effects on Some Pro-Oxidants Induced Lipid Peroxidation in Rat Brain: An *in vitro* Study**

Ganiyu Oboh

This study seeks to determine the antioxidant properties and the ability of polyphenol extracts from *Ocimum gratissimum* (OGP) and *Ocimum canum* (OCP) leaves (commonly used Spices in Tropical Africa, Asia and South America) to inhibit some pro-oxidants ( $\text{Fe}^{2+}$  and sodium nitroprusside) induced lipid peroxidation in rat's brain homogenates-*in vitro*. The free soluble polyphenols were extracted with 80% acetone; thereafter the ability of the extracts to inhibit 25  $\mu\text{M}$   $\text{FeSO}_4$  and 7.0  $\mu\text{M}$  sodium nitroprusside induced lipid peroxidation in isolated rat's brain was determined. The antioxidant properties of the extracts as typified by their total phenol content, 1, 1-diphenyl-2-picrylhydrazyl (DPPH) free radical scavenging ability, reducing power and Fe (II) chelating ability were also determined. The results of the study revealed that both pro-oxidants [ $\text{Fe}^{2+}$  (256%) and sodium nitroprusside (160%)] caused a significant increase ( $p < 0.05$ ) in the malondialdehyde (MDA) content of the brain. However, polyphenol extracts (0.4-1.6  $\mu\text{g mL}^{-1}$ ) from both species of *Ocimum* caused a dose-dependent significant decrease ( $p < 0.05$ ) in the malondialdehyde (MDA) contents of the brain. However, polyphenol from *Ocimum canum* had a significantly higher ( $p < 0.05$ ) inhibitory effect on both Fe (II) and sodium nitroprusside induced lipid peroxidation in the rat's brain homogenates than that of *Ocimum gratissimum*. This higher inhibitory effect of *Ocimum canum* could be attributed to its significantly higher ( $p < 0.05$ ) total phenol content, Fe (II) chelating ability, reducing power and free radical scavenging ability. Therefore, Fe (II) and sodium nitroprusside induced oxidative stress in the brain could be potentially prevented/ managed by dietary intake of *Ocimum gratissimum* (OGP) and *Ocimum canum* (OCP) leaves, however *Ocimum canum* (OCP) leaf extract is more active. These antioxidant properties of the *Ocimum* spp. polyphenol may have contributed to the use of the leaves in the treatment of mental illness in folk medicine. (*American Journal of Food Technology* 3 (5): 325-334, 2008; doi: 10.3923/ajft.2008.325.334)



## **The Effects of Nettle (*Urtica dioica* L.) on Chemical Properties of Rainbow Trout (*Oncorhynchus mykiss*) Fillets**

Şükriye Arashisar, Olcay Hisar, Güzin Kaban, Mükerrerem Kaya, İlhami Gülçin and Telat Yanik

The effects of nettle (*Urtica dioica* L.), containing natural antioxidants, on chemical properties of rainbow trout (*Oncorhynchus mykiss*) fillets were investigated. Thiobarbituric acid reactive substance (TBARS), total antioxidant activity, total volatile bases nitrogen (TVB-N) and pH values were measured from rainbow trout fillets treated with nettle at three concentrations (0.4, 0.8 and 1.6), without nettle as control and 0.8% propyl gallate (positive control) during 9 days of storage at  $4\pm 1^\circ\text{C}$ . The storage time and antioxidant treatment caused significant ( $p < 0.05$ ) changes in TBARS, total antioxidant activity, TVB-N and pH values. TBARS values in fillets of control group exceeded the acceptable level ( $20 \mu\text{mol kg}^{-1}$ ) on the 5th day. However, fillets treated with nettle at three concentrations and propyl gallate did not reach this degree during the experimental period. The fillets treated with 0.4% of nettle exhibited most effective and powerful antioxidant activity. The antioxidant activity of samples decreased with increasing nettle concentrations. However, the samples treated with 0.4 and 0.8% of nettle showed higher antioxidant activities than that 0.8% of propyl gallate. TVB-N values in fillets of control group reach above  $25 \text{ mg}/100 \text{ g}$  on the 3rd day. However, nettle and propyl gallate groups were reached above this level on 5th day. Considering present data, it was concluded that using nettle containing natural antioxidants might cause a distinct beneficial reduction in lipid oxidation and extend storage time of aerobically packaged rainbow trout fillets. (*American Journal of Food Technology* 3 (5): 335-340, 2008; doi: 10.3923/ajft.2008.335.340)

## **Quantitative Analysis of Phthalates Plasticizers in Traditional Egyptian Foods (Koushary and Foul Medams), Black Tea, Instant Coffee and Bottled Waters by Solid Phase Extraction-Capillary Gas Chromatography-Mass Spectroscopy**

Mahmoud A. Mohamed and Abdallah S. Ammar

In the present study, method of solid-phase extraction followed by capillary gas chromatography coupled to mass spectrometry (SPE-GC-MS) was used for quantitative analysis of trace levels of phthalates in the most tow Egyptians traditional food (foul medams and koushary) and drinks (black tea and instant black coffee) and bottled water samples. Method performance was evaluated in

terms of accuracy, linearity, limits of detection and recovery. Also the practical application of extraction and analysis method was explained. (*American Journal of Food Technology* 3 (5): 341-346, 2008; doi: 10.3923/ajft.2008.341.346)

### **Acrylamide Levels in Selected Foods in Saudi Arabia with Reference to Health-Risk Assessment of Dietary Acrylamide Intake**

M.S. Tawfik and M.G. El-Ziney

The acrylamide (AA) levels in marketing foods in gulf area are not investigated yet. An LC-MS/MS method for the determination of acrylamide in some selected food (local/imported) has been described. The samples were pre-dried, crushed/minced, degreased and mixed with [ $D_3$ ] acrylamide internal standard then acrylamide was water extracted at 60°C in a ultrasonic bath. The aqueous solution was clean-up using a Carrez-Precipitation followed by centrifugation. The clean-up extract was then analyzed by LC-MS/MS. The method was applicable to detect acrylamide in different food types. The detection limit was as low as 30  $\mu\text{g kg}^{-1}$ . The AA level in different food groups were in order, mashed-roasted potato > fried pasta > soluble coffee > biscuits > potato chips > cocoa powder > crisp bread > fired rice > roasted Turkish coffee > cereal breakfast (corn) > butter cookies. The highest value of acrylamide (8974  $\mu\text{g kg}^{-1}$ ) was detected in mashed-roasted potato, whereas the lowest value was detected in butter cookies (151  $\mu\text{g kg}^{-1}$ ). The calculated average daily intake amounted to 34.03  $\mu\text{g AA/person/day}$  which corresponds to 0.57  $\mu\text{g kg}^{-1}$  body weight/day (body weight 60 kg). The outcome of this study has strongly recommended the necessity to conduct a large-scale survey in order to evaluate the levels of acrylamide in traditional foods. Thus, the true risk levels related to AA intake will be accurately estimated. (*American Journal of Food Technology* 3 (6): 347-353, 2008; doi: 10.3923/ajft.2008.347.353)

### **Effects of Temperature and Salts on Growth of Halotolerant *Debaryomyces nepalensis* NCYC 3413**

Sathyanarayana N. Gummadi and Sawan Kumar

The effect of temperature and salts on the growth of halotolerant yeast, *Debaryomyces nepalensis* was studied by growing cells in shake flask on rotary shaker and cell growth was measured. Specific growth rate ( $\mu$ ) of *D. nepalensis*

increased with increase in temperature from 15 to 35°C and then decreased with increase in temperature beyond 35°C when grown in presence and absence of different salts. At 40°C, both NaCl and KCl at 1.0 M concentration enhanced the specific growth rate. *D. nepalensis* showed synergistic effect on thermal and salt stress when grown at 35-40°C (0.5 M NaCl) and 30-40°C (0.5 and 1.0 M KCl). The organism was able to revert its specific growth rate when temperature was shifted from 20°C to its optimum temperature for growth (30°C) only in the presence of salts, which was not observed in the absence of salts. However, the same phenomenon was not observed when the temperature was shifted from 40 to 30°C. Decrease in activation energy was observed for growth at salt concentration beyond 0.5 M of NaCl and KCl. (*American Journal of Food Technology* 3 (6): 354-360, 2008; doi: 10.3923/ajft.2008.354.360)

### **A Novel Modulatory Role of Vitamin D<sub>3</sub> in Exercise-Induced Apoptosis of Rat Skeletal Muscle**

Vijay Kumar, Sutapa Mukhopadhyay, Preetmohinder Singh Bedi, Gurfateh Singh and Pitchai Balakumar

The present study has been designed to investigate the possible modulating role of vitamin D<sub>3</sub> on chronic exercise-induced apoptosis in skeletal (gastrocnemius) muscle of rats. Rats were run for 8 weeks on a treadmill at a speed of 36 m min<sup>-1</sup> to induce apoptosis in their skeletal muscle. Vitamin D<sub>3</sub> (0.03 µg/100 g and 0.06 µg/100 g, s.c.) treatment, thrice weekly, was started three days prior to subjecting the animals to chronic exercise and was continued for 8 weeks of the experimental protocol. Oxidative stress was assessed by measuring the levels of TBARS, super oxide anion generation and reduced glutathione in gastrocnemius muscle. Further, serum level of corticosterone (glucocorticoid), a potent indicator of stress, was measured. Moreover, the apoptotic cell death was assessed using DNA gel electrophoresis. Chronic treadmill exercise produced profound DNA smearing. The levels of TBARS, super oxide anion generation and serum corticosterone were noted to be increased and the level of GSH was noted to be decreased in rats subjected to chronic treadmill exercise. However, treatment with vitamin D<sub>3</sub> markedly reduced DNA smearing. Moreover, the chronic exercise-induced increases in TBARS level, superoxide anion generation and corticosterone levels were significantly attenuated by treatment with vitamin D<sub>3</sub>. In addition, vitamin D<sub>3</sub> markedly increased the exercise-induced decrease in GSH level. It suggests that antioxidant potential of vitamin D<sub>3</sub> and its novel efficacy in modulating exercise-

induced corticosterone levels in rats may contribute to its anti-apoptotic effect. (*American Journal of Food Technology* 3 (6): 361-372, 2008; doi: 10.3923/ajft.2008.361.372)

### **Malting Germination Effect on Rheological Properties and Cooking Time of Millet (*P. typhoides*) and Sorghum (*S. bicolor*) Flours and Rolled Flour Products (Arraw)**

Cheikh Ndiaye, Shi-Ying Xu, Paul Marie Ngom and Ababacar Sadikh Ndoye

The aim of this study was to reduce the cooking time of rolled flour products Arraw using incorporated germinated millet and sorghum flours separately. Rolled flour products Arraw were made by adding 5 and 10% shelled germinated flour. Physico-chemical analysis showed 40.78 and 42.87% starch degradation, 10.23 and 11.48% increase of total sugar and 7.39 and 8.95% for the reducing sugar after 3 and 4 days of millet flour germination respectively. For the sorghum, 14.19 and 24.73% starch degradation after 3 and 4 days of germination respectively were observed. Correlation was found between germination time, shear stress and porridge viscosity. Moreover, reduced cooking time was observed according to the diameters ( $p < 0.05$ ) of Arraw and the percentage of germinated flour. However, Arraw produced by adding 5 or 10% of 4 days germinated millet flour significantly reduced the cooking time, while the viscosity was under the limit of consumer's acceptability. (*American Journal of Food Technology* 3 (6): 373-383, 2008; doi: 10.3923/ajft.2008.373.383)

### **Utilization of Different Wall Materials to Microencapsulate Fish Oil Evaluation of its Behavior in Bread Products**

G. Davidov-Pardo, P. Rocchia, D. Salgado, A.E. León and R. Pedroza-Islas

The aim of this study was to assess the possibility of adding fish oil microcapsules to bread products in order to evaluate four different types of wall material: methyl cellulose (M), soybean protein isolates (S), calcium-gelatin casein (CG) and whey protein concentrate (W). The M, W and CG microcapsules were made by the spray drying method, whereas S microcapsules were made by polymerization with transglutaminase. Both, the microencapsulation efficiency and the microcapsule morphology were determined. The microcapsules were added to bread and this was evaluated by a triangle sensory test and a rheological test. In conclusion, it is possible to add fish oil to bread products with no significant modification of their

sensory characteristics using the M and S treatments, being the spray drying method the one with greater potential due to more efficiently encapsulated fish oil and better performance. (*American Journal of Food Technology* 3 (6): 384-393, 2008; *doi*: 10.3923/ajft.2008.384.393)

### **Antidiabetic Effect of *Nono* (A Nigerian Fermented Milk) on Alloxan-Induced Diabetic Rats**

S.A. Laleye, A.P. Igbakin and J.A. Akinyanju

The effect of *Nono* (a Nigerian fermented milk) on diabetic situation in rats, induced by intraperitoneal injection of alloxan monohydrate is reported. *Nono* administration for 4 weeks lowered the raised plasma glucose concentration of diabetic rats; restoring it to the non diabetic rat level. The low tissue protein and raised plasma protein concentrations; hyperlipidemia; and hypercholesterolemia consequential on diabetic induction were reversed to the normal level by the *Nono* administration. The reversals of these effects of diabetes may be due to the lowering of the plasma glucose concentration by *Nono* or direct activity of either the bacteria or milk components of *Nono* on these substances. The results indicate that consumption of *Nono* produced by wild strain lactic acid bacteria may be helpful in the management of diabetes. (*American Journal of Food Technology* 3 (6): 394-398, 2008; *doi*: 10.3923/ajft.2008.394.398)

### **Evaluation of Some Probiotic Fermented Milk Products From Al-Ahsa Markets, Saudi Arabia**

M.M. Al-Otaibi

Eight commercial probiotic fermented milk products (six full fat and two low fat) from Al-Ahsa markets were evaluated for chemical, microbiological and sensory properties. The chemical composition parameters ranged from 0.9-1.2% fat (low fat products), 3.0-3.9% fat (full fat products), 3.1-4.7% protein, 0.7-1.2% ash and 7.5-3.7% carbohydrate in all the milk products. The pH values of all the products decreased significantly from the production day to the end of storage period. With respect to the microbiological side, the coliform bacteria, moulds and yeasts counts were not detected in all the products during the refrigerated storage at  $5 \pm 1^\circ\text{C}$ . However, seven out of eight products contained over  $10^6$  cfu  $\text{mL}^{-1}$  of bifidobacteria on the production day. Only two of these products maintained  $10^6$  cfu  $\text{mL}^{-1}$  viable count of bifidobacteria till the end of cold storage

period. On the other hand, three out of eight products showed the highest number of *L. acidophilus* viable count (above  $10^8$  cfu mL<sup>-1</sup>) on production day. The results of sensory evaluation showed that all the tested products obtained high scores for flavor, appearance, texture or consistency and smell (odor) properties during the storage period. These results suggest that for optimum benefits, the probiotic fermented milk products with live probiotic bacteria should be consumed within one week of their production date. The research provided useful information to the dairy industries to develop new technology to ensure the supply of high quality milk products to the consumers. (*American Journal of Food Technology* 4 (1): 1-8, 2009; doi: 10.3923/ajft.2009.1.8)

### **Starch Blocking Stability of the *Phaseolus vulgaris* Alpha-Amylase Inhibitor ( $\alpha$ -AI1)**

Wokadala C. Obiro, Tao Zhang and Bo Jiang

The starch blocking stability of speckled kidney beans (*Phaseolus vulgaris*) alpha-amylase inhibitor ( $\alpha$ -AI1) for application as a nutraceutical additive against diabetes and obesity was assessed. The inhibitor was purified to 0.09% w/w of seed flour using pH fractionation, alcohol precipitation (75%), DEAE-Sepharose CL-6B and Sephacryl S-200 chromatography. The interactive effect of pH (A), temperature (B) and time (C) on residual inhibitory activity was modeled using Response surface methodology with the Box-Behnken design. Intrinsic fluorescence and ANS-assisted surface hydrophobicity indicated activity loss is accompanied with tertiary structural unfolding. Chaotropic salts at high (1.0 M) and kosmotropic salts at low (0.1-0.01 M) concentration stabilized the inhibitor in the order  $\text{CH}_3\text{COO}^- > \text{Cl}^- > \text{Br}^- > \text{I}^- > \text{SCN}^-$  and vice-versa, respectively. (*American Journal of Food Technology* 4 (1): 9-19, 2009; doi: 10.3923/ajft.2009.9.19)

### **Optimization of Xylanase Production from *Fusarium solani* F7**

V.K. Gupta, R. Gaur, N. Gautam, P. Kumar, I.J. Yadav and N.S. Darmwal

The purpose of this study was to characterization of xylanase producing *Fusarium solani* isolate and optimization of cultural conditions for xylanase enzyme production. Screening of *Fusarium solani* isolate was based on the diameter of the clear zone formation in oat spelt xylan agar plates, *Fusarium solani* isolate F7

was selected and optimized for xylanase enzyme production using cheaper substrate like wheat straw, rice straw, rice bran and wood husk. Maximum enzyme activity was observed in wheat straw ( $78.32 \text{ U mL}^{-1}$ ). Optimum pH and temperature for xylanase activity were found to be 5.5 and  $30^\circ\text{C}$  at 3% substrate concentration. In purification step, 75% ammonium sulphate saturation was found to be suitable giving maximum xylanase activity. Purified xylanase yielded single band with a molecular weight of 89 kDa. The use of wheat straw as a major carbon source is particularly valuable because oat spelt xylan is very expensive, The *Fusarium solani* F7 isolate proved to be a promising microorganism for xylanase production. (*American Journal of Food Technology* 4 (1): 20-29, 2009; doi: 10.3923/ajft.2009.20.29)

### **Nutritional Quality of 1st Generation Quality Protein Maize Diet and its Effect on Some Biological Indices of Albino Wistar Rats**

I.O. Williams, M.A. Agiang, O.O. Ekpe, U.I. Aletan, E.O. Edet and I.J. Atangwho

Twenty male albino rats of the Wistar strain were placed in four experimental groups of five rats each. Group A (Reference group) received a standard protein diet, Group B received a basal or protein-free diet, Group C received the F<sub>1</sub>-QPM diet, while Group D received common maize (CM) diet. Water and feed were allowed *ad libitum*. Rats were fed for 21 days at the expiration of which indices of protein nutritional quality viz PER, NPU, NPR, TD and BV, were evaluated. The results showed that Group C rats had a higher ( $p < 0.05$ ) protein efficiency ratio (PER) value of  $0.97 \pm 0.06$  compared to rats in Group D ( $0.48 \pm 0.28$ ). Similarly, net protein utilization (NPU) value of  $80.67 \pm 3.21\%$  for group C was significantly ( $p < 0.05$ ) higher than for group D ( $41.83 \pm 5.48$ ). The same trend was observed for true digestibility (TD) and biological value (BV). The values were TD ( $89.27 \pm 0.55\%$  for Group C and  $81.59 \pm 0.11\%$  for Group D) and BV ( $90.30 \pm 2.56\%$  for Group C and  $51.00 \pm 6.10\%$  for Group D) respectively. Values of net protein ratio (NPR) obtained also followed the same trend ( $1.85 \pm 0.06$  for Group C and  $1.61 \pm 0.39$  for Group D) but not significantly different ( $p > 0.05$ ). Additionally, the protein contents of the F<sub>1</sub>-QPM and CM diets compared showed that though F<sub>1</sub>-QPM had a higher level of protein ( $11.80 \pm 2.84\%$ ) than CM ( $10.67 \pm 0.31\%$ ), the difference was not significant ( $p > 0.05$ ). Quality protein maize (QPM) maintained its high nutritional quality in

spite of change in environment. Increased cultivation and utilization of QPM is recommended as this could help to alleviate hunger and protein malnutrition in developing countries. (*American Journal of Food Technology* 4 (1): 30-35, 2009; doi: 10.3923/ajft.2009.30.35)

### **Production of Antioxidants by *Marasmiellus* sp. via Solid Substrate Fermentation**

M. Daker, N. Abdullah, S. Vikineswary and U.R. Kuppusamy

This study was aimed to evaluate the antioxidant properties of methanol extracts of fermented substrates optimised for antioxidant production by *Marasmiellus* sp. KUM 50061 mycelial biomass. Extract of fermented maize supplemented with (w/w) malt extract 4%, yeast extract 4% and rice bran 4% exhibited the highest 1,1-diphenyl-2-picrylhydrazyl radical scavenging ability. The effective concentration of extract to scavenge 50% radicals was 1.875 mg mL<sup>-1</sup>. This formulation was chosen as the optimum substrate for antioxidant production by *Marasmiellus* sp. KUM 50061 mycelial biomass. The thiobarbituric acid reactive substance (TBARS) assay showed that the effective concentration to inhibit lipid peroxidation of buffered egg yolk by 50% was 6.00 mg mL<sup>-1</sup>. Total phenolics amounted to 31.41±1.56 mg GAE g<sup>-1</sup> extract as measured by the Folin-Ciocalteu method. (*American Journal of Food Technology* 4 (1): 36-46, 2009; doi: 10.3923/ajft.2009.36.46)

### **Study on the Effect of Control Variables on the Extraction of Peanut Protein Isolates from Peanut Meal (*Arachis hypogaea* L.)**

R.J. Kain, Z. Chen, T.S. Sonda and J.C. Abu-Kpawoh

The effect of control variables involved in the extraction of proteins and preparation of protein isolate from peanut meal flour have been investigated and optimized. These control variables include: temperature of the extraction medium, sample/water ratio, extraction time, effect of successive extraction steps and centrifugal speed. The pH-dependent protein solubility profile revealed that the region of minimum solubility (isoelectric point) of the proteins was at pH 4.5. The solubility reduced as the pH increased until it reached the isoelectric point which was followed by progressive increase in solubility with further increase in pH. The



effect of temperature on the extraction of proteins indicated a slight decrease in the protein yield of about 17.6 and 15.0% as the temperature was increased from 40 to 60°C in both cold and heat pressed protein isolates, respectively. Protein yields in both samples were adversely affected at an increased temperature of 70°C. There was an increase in the yield of proteins with decreasing solid-water ratio while the yield of proteins increased as the centrifugal speed was increased. (*American Journal of Food Technology* 4 (1): 47-55, 2009; doi: 10.3923/ajft.2009.47.55)

### **Determination of Amitraz Residue by Headspace Gas Chromatography in Honey and Beeswax Samples from Iran**

J. Salar Amoli, J. Hasan and M. Hejazy

In this study, 70 samples of honey and beeswax from different beehives (Eastern and Western Azerbaijan, Ardabil territory, Iran), markets and store shelves of (Tehran, Iran) were collected during 2006-2007 and analysis for detection of amitraz and DMA residues by static headspace solvent microextraction Gas chromatography with Thermionic Specific Detector (GC/TSD). It could be concluded that according to EU standard (MRL = 200 µg kg<sup>-1</sup>) all the samples of honey could be declared as appropriate for human consumption. (*American Journal of Food Technology* 4 (1): 56-59, 2009; doi: 10.3923/ajft.2009.56.59)

### **Improvement of Protein Content of Garri by Inoculation of Cassava Mash with Biomass from Palm Wine**

F.C. Ogbo, J.A. Onuegbu and O.K. Achi

This study was done to determine the suitability of the biomass contained in the dregs of palm wine, an alcoholic beverage, as an alternative to pure cultures of microorganisms suggested earlier as inocula for improving the protein and amino acid content of garri. Garri was prepared from cassava mash inoculated with 0, 1, 5 and 10% (v/w) of palm wine dregs just before dewatering and fermentation and analyzed for protein content and other characteristics. Inoculation with palm wine dregs increased microbial activity in cassava mash, particularly the activity of lactic acid bacteria. Protein composition of garri was improved and detoxification of cyanogenic glucosides was enhanced. Inoculation adversely affected

mineral composition. Organoleptic analysis showed that inoculation did not reduce acceptability of garri at  $p < 0.05$ . (*American Journal of Food Technology* 4 (2): 60-65, 2009; doi: 10.3923/ajft.2009.60.65)

### **Influence of Different Drying Methods and Storage on the Quality of Indian Spinach (*Basella rubra* L.)**

O.O. Oladele and A.T. Aborisade

This study reports the effects of drying methods on nutrient retention in a leaf vegetable during storage. The leaves of Indian Spinach were dried to 3.50-4.0% moisture content in the sun (35°), shade (28°C) and oven (45°C) and then stored in polyethylene wrappers. Their moisture, ascorbic acid, minerals and total chlorophyll contents were determined after drying and during storage. There was minimal moisture gain during the twelve week storage period being less than 1% in all three drying methods. Ascorbic acid decreased by 43-48% as a result of drying but storage for twelve weeks did not result into much further loss. Shade-dried leaves retained ascorbic acid in the least. Chlorophyll and minerals contents also decreased slightly with drying and storage. Shade-dried leaves were lowest in Ca, Mg, K, Na, Fe, Mn and Zn. The contents of Ca and Mg in shade dried leaves increased in storage while K, Mn and Zn decreased. Manganese was the most critically reduced element by both drying and storage with shade dried leaves losing 73.2, 81.6% at drying and 12 weeks later. Comparative figures for sun and oven dried leaves were 49.2, 47.6, 50 and 62.6% for the same periods. The greatest reduction in Zn content also occurred with shade drying. Sun drying resulted into more nutrient retention while there was only marginal difference in ascorbic acid content by the three techniques. Chlorophyll content was not much affected by both drying and storage and shade dried leaves retained chlorophyll more than those dried in the sun and oven. (*American Journal of Food Technology* 4 (2): 66-70, 2009; doi: 10.3923/ajft.2009.66.70)

### **Effect of Enzyme Type, Mode of Enzyme Action and Temperature on the Obtention of Low Phenylalanine Hydrolysates from Wheat Flour**

R.L. Carreira, C.S. Ramos, L.A. Mundim, M.R. Silva, V.D.M. Silva and M.P.C. Silvestre

With the aim of obtaining wheat flour with low phenylalanine (Phe) content, protein extracts were prepared using an enzymatic method with a protease from *Bacillus*

*licheniformis*. Then, the protein extracts were hydrolyzed by the action of one commercial enzyme (pancreatin or Panc) and a crude enzymatic extract obtained from pineapple peel (CE). The effect of some parameters was evaluated, such as enzyme type, mode (isolated or successive association), order of enzyme action and temperature (30, 35, 40, 50 and 70°C). The Activated Carbon (AC) was used as adsorbent and the efficiency of Phe removal was evaluated by second derivative spectrophotometry, measuring Phe content in wheat flour and in its hydrolysates after AC treatment. The results showed that the use of CE followed by Panc at 50°C was the most advantageous condition, leading to a Phe removal of 66.3% and a final Phe content of 522.4 mg kg<sup>-1</sup> of hydrolysates. (*American Journal of Food Technology* 4 (2): 71-78, 2009; doi: 10.3923/ajft.2009.71.78)

### **Effects of Preheated Treatments on Physicochemical Properties of Resistant Starch Type III from Pullulanase Hydrolysis of High Amylose Rice Starch**

J. Pongjanta, A. Utaipattanaceep, O. Naivikul and K. Piyachomkwan

In this study, the effects of preheated treatments on physicochemical properties of resistant starch type III formation by pullulanase hydrolysis of High Amylose Rice Starch (HARS) were investigated. A debranching enzyme (Pullulanase, 8 U g<sup>-1</sup> starch at 55°C for 0-48 h) was introduced to modify the amylopectin molecules of 15% (w/w) HARS suspension (32.10%, amylose content) which had been preheated at 95 and 121°C for 30 min. Retrogradation gels of debranched starches with different degrees of hydrolysis (0.14 to 3.10%) were then induced at 4°C for 16 h. Afterward, one cycle of the freeze-thaw process (-10/30°C) was applied to promote syneresis of the retrograded starches. Results show that pullulanase hydrolysis enhanced the degree of syneresis (33.22, 45.27 and 58.91% for non-debranched and debranched starches which had been preheated at 95 and 121°C for 48 h, respectively). The debranched starches with higher degree of hydrolysis provided products with higher resistant starch contents. The resistant starch content increased quadrupled with debranching and the freeze-thaw process (4.07 to 10.68% and 5.12 to 19.32% for 0 to 48 h pullulanase hydrolysis of HARS preheated at 95 and 121°C, respectively). Results had shown that after debranching and retrogradation, the HARS molecules had rearranged and changed their crystal pattern from A to V-type pattern, as revealed by X-ray diffraction analysis. *In vitro* starch hydrolysis index of the RS III samples from 0 to 48 h of pullulanase hydrolysis of the HARS which had been preheated

at 95 and 121°C were reduced from 71.591 to 41.69% and 68.66 to 26.83%, respectively. (*American Journal of Food Technology* 4 (2): 79-89, 2009; doi: 10.3923/ajft.2009.79.89)

### **Fatty Acids Profile of Tropical Bagridae Catfish (*Mystus nemurus*) During Storage**

Willy Pranata Widjaja, A.S. Abdulamir, Nazamid B. Saari, Fatimah Bt. Abu Bakar and Zamri B. Ishak

Changes in the fatty acid composition of the fresh water catfish (*Mystus nemurus*) stored in 10°C and ice (0±2°C) for 1, 10 and 20 days were monitored. A total of 22 fatty acids were found to be present in the studied samples. The main saturated fatty acids (SFA) were palmitic (17.99%), tridecanoic (16.59%), stearic (4.40%) and myristic (2.61%). The monounsaturated fatty acids (MUFA) were dominated largely by the oleic acid (24.84%) and palmitoleic acid (4.66%). The long-chain polyunsaturated fatty acids (PUFA) were also present in significant amounts, composed of eicosapentaenoic (2.65%) and docosahexaenoic (4.44%). Results also revealed that saturated and monounsaturated fatty acid significantly increased ( $p < 0.05$ ) during storage while polyunsaturated decreased. This should attract attention to the importance of the proper and short period storage to retain the best quality of fish meat and its lipid contents. (*American Journal of Food Technology* 4 (2): 90-95, 2009; doi: 10.3923/ajft.2009.90.95)

### ***In vivo* Evaluation of Cross-Linked Milk and Wheat Proteins Mediated by Microbial Transglutaminase in White Wistar Rats**

Claucia Fernanda Volken de Souza, Janaina Guimarães Venzke, Simone Hickmann Flôres and Marco Antônio Záchia Ayub

The present study was designed to evaluate the *in vivo* nutritional quality of the modified proteins of milk and wheat by cross-linking with microbial transglutaminase (TGase). White Wistar rats were divided into six groups receiving diets that contained casein, cross-linked milk protein, milk protein, cross-linked wheat protein, wheat protein, or a protein free diet. Results showed that cross-linked milk and wheat proteins can support growth, with the animals showing a positive nitrogen balance. Protein true digestibility was similar between casein and non-cross-linked milk protein diets. It was also observed that milk and wheat

proteins were not affected by cross-linking concerning several quality parameters: protein efficiency ratio, food efficiency ratio, food transformation index, apparent nitrogen digestibility, true digestibility, biological value, net protein utilization, net protein ratio and protein retention efficiency. Based on these results, it can be suggested that the use of microbial TGase does not affect the nutritional quality of milk or wheat proteins, while improving their physicochemical properties. (*American Journal of Food Technology* 4 (3): 96-107, 2009; doi: 10.3923/ajft.2009.96.107)

### **Nutritional Evaluation of *Amaranthus cruentus* Leaf Meal Based Broiler Diets Supplemented with Cellulase/Glucanase/Xylanase Enzymes**

A.O. Fasuyi and A.O. Akindahunsi

Sundried leaves of *Amaranthus cruentus* (*Amaranthus cruentus* leaf meal, ACLM) were milled and analyzed for their proximate composition. Crude protein was 23.0±0.55%; crude fat, 5.4±0.1%; crude fibre, 8.8±0.02%; ash, 19.3±0.01% and gross energy, 3.3±0.01 kcal g<sup>-1</sup>; metabolizable energy, 2.8±0.21 kcal g<sup>-1</sup> all on dry matter basis. Minerals, amino acids and antinutrients were also determined. Methionine and to a lesser extent, lysine, arginine, leucine and aspartate were high. The ACLM was incorporated into formulated broiler starter diets at varying inclusion levels of 0, 5, 15 and 25%. The diets were duplicated with a set supplemented with Roxazyme G2 in a 2×4 factorial experiment. All the 8 diets including the control diets were formulated isocaloric and isonitrogenous and fed to the experimental chicks (n = 288) from day 3 to day 24. Statistical main effects indicated that broiler chicks in which ACLM was incorporated at 5% inclusion level in their diet with Roxazyme G2 supplementation was found to have the highest weight gain. Feed consumption value is found to be highest in chicks fed diet 8 at 25% inclusion level of ACLM with Roxazyme G2 supplementation. The feed conversion value obtained for birds on diet 4 with Roxazyme G2 supplementation was the best. Broiler chicks on diet 4 also had the best value for Protein Efficiency Ratio (PER). There were no significant differences (p>0.05) in all the hematological parameters investigated. The additive inclusion of Roxazyme G2 in broiler diets can further increase the use of ACLM as a protein source effectively at 5%. There were no deleterious effects even up to 25% ACLM inclusion level with enzyme supplementation. (*American Journal of Food Technology*, 4 (3): 108-118, 2009; doi: 10.3923/ajft.2009.108.118)

## **Kinetics of Moisture Uptake of Osmo-Foam-Mat Dried Mango Powders and Application of Sorption Isotherms to Shelf-Life Prediction**

J.S. Alakali, C.C. Ariaahu and E.I. Kucha

The kinetics of moisture uptake by foam-mat dried powder from mango pulp was evaluated at four temperatures (10, 20, 30 and 40°C) and two relative humidities (55 and 80%), while moisture sorption data for shelf life prediction was determined at the same temperatures and eight water activities ranging from 0.032-0.925. Result show that the rate of moisture uptake was highly in the first 2 to 4 h at any given storage temperature and relative humidity. Moisture uptake generally decreased with increase in storage temperature but did not show a defined trend after the first few hours. The rate of moisture uptake was higher at 55 than at 80% storage relative humidities. Effective diffusivities of samples incorporated with foam stabilizes were higher due to high porosity. Moisture uptake obeyed the penetration theory indicating that the process was Fickian. Predicted shelf-life of the powders generally decreased with increased storage relative humidity and temperature. The predicted shelf-life of the powders was generally above 365 days. The shelf life of powders incorporated with foam stabilizers was generally shorter as they had lower equilibrium moisture content. Predicted shelf life of the powders was longer in packaging materials of low permeability to thickness ratio. (*American Journal of Food Technology*, 4 (3): 119-125, 2009; *doi*: 10.3923/ajft.2009.119.125)

## ***In vitro* Binding Capacity of Cholesterol and Bile Salts by Partially Depolymerized Chitosans**

Mamadouba Bangoura, Xia Wenshui and Zhang Jiali

Orthogonal design was used to optimize the binding capacity of Sodium Chololate (SC) and Sodium Deoxycholate (SD) by nine partially depolymerized chitosans obtained from a native chitosan using sodium nitrite (NaNO<sub>2</sub>). The effects of sodium treatment on depolymerization of chitosan were investigated by measuring the molecular weight, viscosity and reducing sugar of chitosan. Depolymerization for 3 h reduced the molecular weight of the chitosan by 91% (26 kDa) compared to the native chitosan (458 kDa) with a decrease in viscosity of the chitosan solution and increased reducing sugar. The binding capacity of total cholesterol, SC and SD by chitosan samples were measured *in vitro* by enzymatic and HPLC

methods, respectively. The optimized conditions were sodium nitrite (0.4%, w/v), acetic acid (1 and 2%, v/v), chitosan (3%, w/v) and reaction time (1 h) at room temperature, sodium chelate  $69 \mu\text{mol g}^{-1}$  chitosan and deoxycholate  $125 \mu\text{mol g}^{-1}$  chitosan. The strongest binding capacity of sodium deoxycholate and total cholesterol was observed with partially depolymerized chitosan (average molecular weight 52 kDa) compared to the native chitosan. (*American Journal of Food Technology*, 4 (3): 126-135, 2009; doi: 10.3923/ajft.2009.126.135)

### **Effects of Different Final Cooking Methods on Physico-chemical Properties of Breaded Fish Fillets**

Y. Moradi, J. Bakar, S.H. Syed Muhamad and Y. Che Man

Breaded black pomfret (*Parastromateus niager*) fillets were pre-fried for 30 sec in sunflower oil and palm olein and stored at  $-20^{\circ}\text{C}$  for one week prior to the final cooking. They were finally cooked by microwave, oven and deep-fat frying. Moisture loss, fat uptake, fatty acid, texture and color of the pre-fried and all completely cooked samples were evaluated. Final cooking methods resulted in the change in the fat and fatty acid composition of the pre-fried fillets. The least changes were observed in the oven cooked samples. Eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) in oven cooked samples were significantly ( $p < 0.05$ ) higher than the other cooked samples. They also had lower ratio of n-6/n-3 and lower thermal oxidation. The hardness was found highest in the final fried and lowest in the microwaved samples. Significant differences on the color of the final cooked samples were obtained among the different cooking methods. (*American Journal of Food Technology* 4 (4): 136-145, 2009; doi: 10.3923/ajft.2009.136.145)

### **Effect of Stem Bromelain on the Browning of Apple Juice**

B.N. Tochi, Z. Wang, Shi Ying Xu and W. Zhang

The effectiveness of pineapple stem protease (bromelain) in enzymatic browning inhibition was evaluated on apple juice and compared with that of L-cysteine and ascorbic acid at  $25 \pm 1^{\circ}\text{C}$ . The relative effectiveness of these anti-browning agents was determined in terms of color ( $L^*$ ) and enzymatic activity measurements with respect to time. L-cysteine at 0.7 and 1.0 mM concentrations gave the best results though the latter is associated with undesirable odor and bleaching effect. Ascorbic acid seemed to be only effective within the first 5 h after which its effectiveness dropped sharply. Stem bromelain, as compared to both L-cysteine and ascorbic

acid, was found weakest in enzymatic browning inhibition hence considered ineffective. (*American Journal of Food Technology* 4 (4): 146-153, 2009; doi: 10.3923/ajft.2009.146.153)

### **Mineral and Proximate Composition of Cashew Apple (*Anarcadium occidentale* L.) Juice from Northern Savannah, Forest and Coastal Savannah Regions in Ghana**

S.T. Lowor and C.K. Agyente-Badu

In this study, variations in the mineral, phenol, tannin, vitamin C and sugar composition of cashew apple juice from three agro-ecological zones (Northern Savannah, Forest and Coastal Savannah) of Ghana were investigated. The mean proximate composition (mg/100 mL) was as follows: phenolics (269.5), condensed tannins (266.0), Vitamin C (231.4) and sugars (12.05 mg mL<sup>-1</sup>). The mineral composition (mg/100 mL) showed potassium (76.0) to be the highest, followed by calcium (43.0), magnesium (10.92), phosphorous (0.79) and sodium (0.41). Zinc, copper and iron concentrations were much lower and ranged from 0.05-0.08 mg/100 mL. The physicochemical properties of the juice were as follows: pH (4.31), colour (light yellow for juice from yellow apples and yellow with traces of red pigments for juice from red apples). Phenol and tannin contents in the juice showed significant ( $p < 0.05$ ) variation among the ecological zones. Thus, apples from the Forest transitional zone appear to be better for juice extraction because of their relatively low tannin, higher pH, higher sugar and less phenolic content. No significant differences in the quantitative composition of calcium, iron, zinc and phosphorus could be attributed to the ecological zone or colour from which the juice was extracted. (*American Journal of Food Technology* 4 (4): 154-161, 2009; doi: 10.3923/ajft.2009.154.161)

### **Preparation and Characterization of Highly Flexible Chitosan Films for Use as Food Packaging**

N. Niamsa and Y. Baimark

Highly flexible chitosan films were prepared by film casting of chitosan solutions by using lactic acid solutions as the solvents compare to acetic acid solution. Influences of chitosan molecular weights (100 and 740 kDa), lactic acid concentrations (1.0, 1.5 and 2.0% w/v) and lactic acid configurations (L- and DL-forms) on film characteristics were investigated. Fourier transform infrared (FTIR) spectra of the films showed that there were intermolecular bonds between



chitosan film matrices and lactic acids. Tensile strengths at break of the films decreased and percent elongations increased when the lactic acid was used instead of acetic acid for dissolving chitosan. Flexibility of the chitosan films increased with the lactic acid ratio for the both L- and DL-lactic acids. The L-lactic acid showed higher plasticization effect than the DL-lactic acid. Film transparency did not change, whereas wettability of the chitosan films increased as the lactic acid ratio increased. (*American Journal of Food Technology* 4 (4): 162-169, 2009; doi: 10.3923/ajft.2009.162.169)

### **Steamed-Dried Squashes (*Cucurbita* sp.) Can Contribute to Alleviate Vitamin A Deficiency**

A. Demasse Mawamba, I. Gouado, M. Leng, I. Somé Touridomon and F. Tchounanguépo Mbiapo

To promote the consumption of squashes flesh, the vitamin A potential of steamed-dried squashes from Cameroon was evaluated in determining the beta-carotene content through HPLC method in raw, steamed and steamed-dried peeled flesh of three squashes species: *Cucurbita moshata* cv. Dickinson, *Cucurbita maxima* cv. Hungarian Blue and *Cucurbita pepo* cv. Sacred Indian Rattle. The vitamin C and total lipids contents were also titrated with 2, 6 dichlorophenol indophenol dye and extracted with hexane in a soxhlet apparatus for 6 h, respectively. The moisture content was estimated by drying in an oven at 105°C until constant weight. The beta-carotene contents of dried steamed squashes were 2834.75±11.22; 3043.91±1.65 and 5917.83±720.49 µg/100 g serving of *C. pepo*, *C. moshata* and *C. maxima*, respectively. The vitamin C contents ranged from 5.70±0.32 µg/100 g serving (*C. moshata*) to 11.81±0.19 µg/100 g serving (*C. maxima*). Total lipids ranged from 6.22±0.00 g/100 g serving (*C. pepo*) to 7.09±0.11 g/100 g serving (*C. moshata*) and the water remaining ranged from 6.39±1.18 g/100 g serving (*C. maxima*) to 8.19±0.70 serving (*C. pepo*). Drying of steamed squashes seemed to result in a significant concentration of beta-carotene content (71 and 89 times higher than those of steamed squashes). The same effect was observed for the vitamin C content (about 1.7 times) and the total lipid content (6 to 12 times). These results suggest that as a ready to eat product, steamed-dried squashes could contribute to fight against vitamin A deficiency if they are well conserved. (*American Journal of Food Technology* 4 (4): 170-176, 2009; doi: 10.3923/ajft.2009.170.176)

## Acrylamide Status in Selected Traditional Saudi Foods and Infant Milk and Foods with Estimation of Daily Exposure

M.G. El-Ziney, A.A. Al-Turki and M.S. Tawfik

This study reports the results of the survey study on acrylamide levels in selected traditional foods and infant powder milk and cereal based foods obtained from the Saudi market. Food samples divided into twelve groups. An LC-MS/MS method for the determination of acrylamide (AA) has been described. The samples were pre-dried, crushed/minced, degreased and mixed with D<sub>3</sub> acrylamide internal standard then acrylamide was water extracted at 60°C. The aqueous solution was clean-up using a Carrez-Precipitation followed by centrifugation. The clean-up extract was then analyzed by LC-MS/MS. The method was applicable to detect AA in different food types at concentration of  $\approx 30 \mu\text{g kg}^{-1}$ . The extraction method was developed to enable detecting of traces of AA. A second sensitive extraction method was followed in order to allow a concentration of AA as low as  $1\text{-}5 \mu\text{g kg}^{-1}$ . In general, the acrylamide (AA) level in different food groups were in order, grilled egg-plant > coffee (soluble) > extruded maize > cookies (korse Omer, tweel) and biscuit > extruded maize (cheese) and cookies > French fries > sweet (zalabia) > bread and cooked palm date (Hunaini) > out layer of fried fish > infant powder milk and cereal foods. The highest value of acrylamide ( $950 \mu\text{g kg}^{-1}$ ) was detected in grilled egg-plant whereas the lowest value was detected in baby powder milk ( $3.4 \mu\text{g kg}^{-1}$ ). The calculated daily intake amounted to  $60 \mu\text{g AA/person/day}$  which corresponds to  $0.86 \mu\text{g kg}^{-1} \text{ b.wt. day}^{-1}$  (body weight of 70 kg). The average daily AA dietary intake of different infant milk brands, analyzed in the present study, during the first six months of birth amounted to  $0.63 \mu\text{g day}^{-1}$ . This is corresponding to  $0.075 \mu\text{g AA kg}^{-1} \text{ b.wt. day}^{-1}$  (body weight of 8 kg). The outcome of this study has strongly recommended the necessity to conduct a large-scale survey in order to evaluate the levels of acrylamide in traditional foods. Thus, the true risk levels related to AA intake will be accurately estimated. (*American Journal of Food Technology* 4 (5): 177-191, 2009; doi: 10.3923/ajft.2009.177.191)

## *In vitro* Antimicrobial Evaluation of *Zingiber officinale*, *Curcuma longa* and *Alpinia galanga* Extracts as Natural Food Preservatives

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In the present study, antimicrobial activity of various extracts of *Zingiber officinale*, *Curcuma longa* and *Alpinia galanga* were screened against the

common food borne bacteria such as *Escherichia coli*, *Salmonella enteritidis*, *Clostridium perfringens*, *Staphylococcus aureus*, *Campylobacter jejuni*, *Bacillus cereus* and fungi such as *Saccharomyces cerevisiae*, *Hansenula anomala*, *Mucor mucedo*, *Candida albicans* using disc diffusion method. All the extracts showed significant antibacterial and antifungal properties. The methanol extracts ( $100 \mu\text{g mL}^{-1}$ ) revealed maximum zone of inhibition ( $p < 0.001$ ). *Zingiber officinale* and *Curcuma longa* possessed considerably greater activity than *Alpinia galanga*. These findings established the potential of the selected rhizomes of Zingiberaceae family as effective natural food preservatives. (*American Journal of Food Technology* 4 (5): 192-200, 2009; doi: 10.3923/ajft.2009.192.200)

### **Effect of *Lactobacillus lactis cremoris* Isolated from Kefir against Food Spoilage Bacteria**

A. Raja, P. Gajalakshmi, M. Mohamed Mahroop Raja and M. Mohamed Imran

The present study aims to control the food spoilage bacteria associated with food poisoning by LAB where it was isolated from kefir and identified as *Lactobacillus lactis cremoris*. Kefir is a delicious drink with probiotic activity. Nearly ten different food spoilage Bacteria's were isolated from spoiled food and it was used as test organisms. The susceptibility of test organisms towards the LAB was screened by the study of its effect of temperature, pH and Agitation. All the test organisms were labile to LAB. In this study, the LAB metabolite which is responsible for antibacterial activity shows its thermo tolerant even at  $100^{\circ}\text{C}$  for one hour. The activity of extract was very efficient at pH 4.5 and 6.5 and was ineffective at pH 8.5. The HPLC studies shows presence of bacteriocin and 68% was recovered. From this study we conclude that the lactic acid bacteria isolated from kefir which helps to control food spoilage and potential remedy to the food industries. The ability of the isolated LAB can produce heat stable as well as its acid tolerant which helps to prevent the contamination produced by endospore formers and other acid producing bacteria's. (*American Journal of Food Technology* 4 (5): 201-209, 2009; doi: 10.3923/ajft.2009.201.209)

### **Development of a Milk Drink Added of Conjugated Linoleic Acid: Use of a Sensory Evaluation**

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Three sensory tests had been applied to evaluate a chocolate flavor milk drink added of Conjugated Linoleic Acid (CLA) aiming at the selection of a final

formulation with the best sensory characteristics. Initially, the triangular test with the samples added of CLA (CLABE) or canola (CANBE) were assessed by an untrained sensory panel comprising 20 assessors. An affective test with 66 probable milk drink consumers was carried out with CLABE or CANBE. In the third stage, 100 assessors had evaluated the sensory acceptance and the purchase intention of two chocolate flavor milk drinks added of 1.25% (1.25% CLABE) and 2.5% (2.5% CLABE) of CLA. In the triangular test, the assessors noticed the difference between prepared drinks ( $p < 0.5$ ). In the acceptance test, the CANBE was preferred to CLABE. However, 53% of the interviewed people affirmed the interest in increasing the consumption of a milky product able to reduce body weight. In the acceptance test applied in the third stage, 1.25% CLABE was preferred to 2.5% CLABE. No statistic difference was observed between the two drinks for the purchase intention carried out at the same time of the sensory evaluation. However, the evaluation of this parameter almost doubled, passing from 16 to 31% for the point certainly I would buy, when the assessors was informed that the CLA added drink could help in the reduction of the body weight. (*American Journal of Food Technology* 4 (5): 210-217, 2009; *doi*: 10.3923/ajft.2009.210.217)

### **Nutritional Analysis and Stability Studies of Some Natural and Synthetic Food Colourants**

O.O. Oluwaniyi, O.O. Dosumu, G.V. Awolola and A.F. Abdulraheem

The pH, titratable acidities, proximate and mineral compositions of two natural colourants and three synthetic colourants were determined. The pH and titratable acidity were determined over a period of 14 days at 24 h intervals. The natural colourants were the calyxes of *Hibiscus sabdariffa* (SL) and the stem of *Sorghum bicolor* (KD), while the synthetic colourants were Egg Yellow (EY), Chocolate Brown (CB) and Dark Orange (DO). The pH of all samples increased as the number of days increased. The pH of SL was considerable lower than that of other colourants in this study (from 1.6 on day 1 to 2.7 on day 14) thus suggesting high acidity while the other colourants had basic pH (5.6-6.2 on day 1 to 7.4-8.4 on day 14). The natural colourants had higher moisture, lipid, carbohydrate and fibre contents while the synthetic colourants were very high in ash content. The protein contents of the colourants were fairly uniform irrespective of their sources. The synthetic colourants were particularly high in K and Mg while the natural colourants were rich in Ca. (*American Journal of Food Technology* 4 (5): 218-225, 2009; *doi*: 10.3923/ajft.2009.218.225)

## **Optimization of Enzymatic Hydrolysis of Defatted Sesame Flour by Different Proteases and their Effect on the Functional Properties of the Resulting Protein Hydrolysate**

Philip John Kanu, Jestina Baby Kanu, Edward H. Sandy, Joseph B.A. Kande, Philip M.P. Mornya and Zhou Huiming

Sesame Protein Hydrolysate (SPH) was prepared from defatted sesame (*Sesamum indicum* L.) flour (DSF) after screening with different proteases. The proteases under different conditions showed varied effects on the protein recovery process. For example, Alcalase® 2.4 L produced the highest degree of protein recovery (96.68%) at 60°C and pH 8 followed by Flavourzyme (69.76%). However, at 50°C and pH 7, the highest protein recovery was noted for Flavourzyme (79.28%) followed by Alcalase 2.4 L (77.62%). The hydrolysis conditions (Temperature T, pH, Enzyme/Substrate E/S, time t) were engineered to optimize the degree of hydrolysis (DH) with the process studied using the Response Surface Methodology (RSM). The DH ranged from 1.19 to 18.8% while the solubility of the Defatted Sesame Protein Isolate (DSPI) increased with increase in pH. The SPH was observed to be a better emulsifier with significantly higher foaming properties, water and oil capacities compared to the untreated DSF. Nonetheless, the stability of the resulting foam diminished on standing over time. The Sesame protein hydrolysate obtained using Alcalase was noted to have better functional attributes compared to that obtained using Flavourzyme. (*American Journal of Food Technology* 4 (6): 226-240, 2009; doi: 10.3923/ajft.2009.226.240)

## **Phenolics, Selenium, Vitamin C, Amino Acids and Pungency Levels and Antioxidant Activities of Two Egyptian Onion Varieties**

Y.A. Elhassaneen and M.I. Sanad

Selenium, vitamin C, pungency, amino acids, phenolics content and antioxidant activities of two Egyptian onion varieties, namely white (Giza-6) and red (Beheri) onions have been studied. Data analysis showed that the red variety presents higher values for selenium, vitamin C and sulphur-containing amino acids. Concerning pungency, white onion can be classified as intermediate pungency (8.24 µmol of Pyruvic acid/100 g fresh wt.) and red as pungent (11.37 µmol of pyruvic acid/100 g fresh wt.). The phenolic acids, flavonols, anthocyanins and total

phenolics content in red variety (81.59, 70.38, 7.56 and 187.17 mg/100 g fresh wt., respectively) were higher than for white variety (72.47, 32.49, 4.90 and 131.65 mg/100 g fresh wt., respectively). Consequently, antioxidant activity was higher for the red variety. Correlation analysis indicates that phenolic compounds beside other factors including Se and sulphur-containing amino acid contents play the major role in the antioxidant activity of onion bulbs. The antioxidant capacity of freeze dried powder from both onion varieties was also tested in sunflower oil-in-water emulsions and hydroperoxide formation was monitored during storage at 40°C. In accordance with differences in Se, sulphur-containing amino acid and phenolics content, Egyptian red onions had better antioxidant activity, while white onions was only effective in the early stages of the oxidation process. These data indicates that red variety has higher potential health benefits related to the presence of antioxidant compounds. (*American Journal of Food Technology* 4 (6): 241-254, 2009; doi: 10.3923/ajft.2009.241.254)

### **Comparative Study of Chemical Composition and Physicochemical Properties of Two Varieties of Defatted Foxtail Millet Flour Grown in China**

M.T. Kamara, Z. Huiming, Z. Kexue, I. Amadou and F. Tarawalie

In this study, we examined the chemical composition and physicochemical properties of two varieties defatted foxtail millet flour grown in China. The seeds were obtained, milled and sieved to produce flour. The flours were tagged DFMF<sub>W</sub> and DFMF<sub>Y</sub> for defatted foxtail millet flour white and defatted foxtail millet flour yellow, respectively. The protein contents of DFMF<sub>W</sub> and DFMF<sub>Y</sub> were 11.92 and 11.39, respectively. DFMF<sub>Y</sub> had higher mineral elements, ash and fat content than DFMF<sub>W</sub>. Essential amino acids were above the recommended amount by Food Agricultural organization/World Health Organization (FAO/WHO) for humans. The foxtail millet flours had molecular sizes below 14.4 kDa and above 97.0 kDa. They had similar solubility curves. Water binding capacity was in the range of 1.36 and 1.26 g g<sup>-1</sup>, while oil absorption capacity ranged between 0.78 and 0.50 g g<sup>-1</sup> for both DFMF<sub>W</sub> and DFMF<sub>Y</sub>, respectively. A low bulk density (0.27 and 0.23 g mL<sup>-1</sup>) and was also low in total phenolic assay (0.56 and 0.72 mg g<sup>-1</sup>) was observed for both DFMF<sub>W</sub> and DFMF<sub>Y</sub>, respectively. Foam capacity was 13.36 mL for DFMF<sub>W</sub> and 12.32 mL DFMF<sub>Y</sub>. Their infrared falls within (1600 and 600 cm<sup>-1</sup>) and both samples possessed O-H and C-H compounds. Defatted foxtail millet flour could be used in food formulation with less fear of retrogradation. (*American Journal of Food Technology* 4 (6): 255-267, 2009; doi: 10.3923/ajft.2009.255.267)

## **Characterization, *in vitro* Trypsin Digestibility and Antioxidant Activity of Fermented Soybean Protein Meal with *Lactobacillus plantarum* Lp6**

I. Amadou, S. Jin, M.T. Kamara, Y.H. Shi, O.S. Gbadamosi and Le Guo-Wei

In this study, soybean protein meal was subjected to solid state fermentation with *Lactobacillus plantarum* Lp6 either in the presence or absence of a protease. The extracts were investigated for changes in mineral composition, amino acid composition, *in vitro* trypsin digestibility, DPPH radical scavenging activities and electrophoretic pattern. The amino acid and mineral element compositions showed significant ( $p < 0.001$ ) variations among the samples. The Fermented Soybean Protein Meal (FSPM) with protease added (FSPMe) showed higher total free amino acid (4.8467 g/100 g sample) compared to 0.2523 g/100 g sample obtained for unfermented Soybean Protein Meal (SPM). The FSPMe had the highest *in vitro* trypsin digestibility and showed a single polypeptide with estimated molecular weight of 14.4 kDa in the sodium dodecyl sulfate polyacrylamide gel electrophoresis (SDS-PAGE) assay. (*American Journal of Food Technology* 4 (6): 268-276, 2009; **doi**: 10.3923/ajft.2009.268.276)