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## Abstracts



creased slightly with heating time at 100°C. Apparent viscosity of soymilk increased with heating time at 80 or 90°C and the largest change was found in soymilk of Japanese species after 30 min heating. The findings positively suggest that good soy gel can be obtained by heating the soymilk consisted of full-fat soy flours of Korean or Japanese species at 80 or 90°C for 30 or 40 min.

#### P01-5

##### EFFECTS OF CARROT POWDER ADDED TO DOUGH ON OXIDATION OF OIL AND FRIED PRODUCT DURING FRYING

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Effects of freeze-dried carrot powder added to dough on the thermooxidative stability of frying oil and fried product were studied by determining peroxide (POV), acid (AV) and p-anisidine (PAV) values, contents of polar compound and conjugated dienes, and fatty acid composition. Frying of samples made by sheeting flour dough and cutting to a shape of small square (2cmx2cm) was performed in soybean oil at 160°C for 1 min and repeated every 20 min for 20 hours. Addition of carrot powder to dough at 10, 20 and 30% resulted in significantly ( $p < 0.05$ ) higher POV, AV, PAV and conjugated dienes and polar compound formation both in frying oil and in fats of fried products. The least difference in oxidation from oils to have fried samples without carrot powder during frying was found in oils to have fried ones with carrot powder at 20%. This indicates that carrot powder can accelerate formation of peroxides and polar compounds such as aldehydes and ketones mainly due to higher oxidation of the oil. Increased hydrolysis of frying oil, mostly in forms of triacylglycerols, to produce more free fatty acids could be resulted from higher water content in samples with carrot powder. Also higher lipid oxidation observed in fried products is closely related with transfer of the frying oil to the product. The findings suggest that the addition of carrot powder to dough exert an adverse effect on the oxidation of oil during frying.

#### P01-6

##### EFFECT OF SPINACH POWDER ADDED TO DOUGH ON THERMOOXIDATIVE STABILITY OF FRYING OIL AND FRIED PRODUCT DURING FRYING

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Effects of freeze-dried spinach powder added to dough on oxidation of frying oil and fried product were studied by determining peroxide (POV), acid (AV) and p-anisidine (PAV) values, contents of polar compound and conjugated dienes, and fatty acid composition. Frying of samples made by sheeting flour dough and cutting to a shape of small square (2 cmx2 cm) was performed in soybean oil at 160°C for 1 min and repeated every 20 min for 20 hours. As the content of spinach powder in dough increased from 0 to 5, 15 and 25 %, POV decreased significantly ( $p < 0.05$ ). There was not much difference in polar compound formation in the oil by the addition of spinach powder to dough; however, there was a tendency to decrease. AV and formation of conjugated dienes in the oil increased when frying the samples with spinach powder. The oxidation of the oil during frying was

the lowest when spinach powder was added to dough at 15%. Similar tendency was shown in oxidation of fats in fried products and addition of spinach powder to dough at 15% caused the lowest oxidation in the products. The results strongly suggest that spinach powder is a good choice to make good quality of flour-based savory snacks due to its antioxidant activity on oil and fried products during frying as well as its excellent nutritional value to provide essential fatty acids, minerals and cellulose.

#### P01-7

##### SOLUBILIZATION OF OKARA PROTEIN FOR FOOD USES

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Due to excessive heat treatment during soymilk processing and thus with low solubility, okara protein is mostly used as animal feed. Since protein accounts for more than a third of okara on dry weight basis, ways to utilize okara as food ingredient is of much interest to many protein chemists. Protein content of okara and soybean 36% as compared to 38% of soybean. Insolubilization of okara protein was mostly due to disulfide bondings between cysteine residues. Hydrophobic interactions and hydrogen bondings were not involved in the insolubilization process. Solubility of okara protein in standard buffer (phosphate buffer, pH 8) was 5.07% versus soy protein of 106.1%. Isoelectric point of okara protein shifted to basic region as was found by solubility profile of the protein. Treating okara with protease (Alcalase, Nove) was effective in solubilizing okara protein and the solubility increased to 2%. Reaction temperature and time were 80°C and 50min, respectively. Cell wall degrading enzyme did not increase solubility of the protein, however. This research was showed that okara protein could be effectively solubilized for use as food ingredient.

#### P01-8

##### PHENOLIC COMPOUNDS IN THREE PORTUGUESE OLIVE FRUITS VARIETIES ATTACKED BY *BACTROCERA OLEAE* (GMEL.)

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Olive products (table olive and olive oil) are premium goods with an increasingly international market. They are also the major sources of farmer producers in the Trás-os-Montes region, north-eastern of Portugal. Olive crops are attacked by several pests and diseases, which affect the quantity and quality of those products. The olive fruit fly, *Bactrocera oleae* (Gmel) is the principal pest in the referred region. The three most important cultivars in the northeastern area of Portugal are Cobrançosa, Madural and Verdeal. The aim of the present study was to check the possible use of phenolics profile to differentiate these olive fruits cultivars, and to study the influence of the infestation of *Bactrocera oleae*

(Gmel) in the phenolics content of olive fruits. Olive fruits were harvested in November, immediately stored at  $-50^{\circ}\text{C}$  and lyophilized. Phenolics were extracted by a C18 Solid Phase Extraction procedure. The different extracts were analyzed by HPLC/DAD. Several differences were found between the analyzed olive fruit varieties and within the healthy and infested ones.

#### P01-9 CHEMICAL COMPOSITIONS OF PUMPKIN SEED SPROUTS

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The pumpkin seeds been used as a vermicide ethnically and eaten as a snack because of it's a lot of oil and good quality proteins. For application as a food, pumpkin seeds were sprouted and the changes of chemical compositions during sprouting were analyzed. The sprout was grown enough to eat after 8 days. The contents of crude protein and fat were gradually decreased, however, the contents of crude fiber, ash and carbohydrate were gradually increased at head part of pumpkin seed sprout. The contents of crude protein and fat were not significance and those of crude fiber, ash and carbohydrate were gradually increased at stem part. In fatty acids, the contents of linoleic acid and oleic acid were gradually decreased and those of palmitic acid and stearic acid were gradually increased at head part. During the sprouting, the bitter substances were detected and these might be a cause for reducing consumer acceptance. Therefore, these were isolated by chloroform/methanol(4/1) mixture and fractionated by hexane for removing the lipid from isolates. The aqueous fraction was separated by using thin layer chromatography(TLC) and obtained two different fractions of rf value 0.67 and 0.85. The rf value 0.85 fraction was more bitter than 0.67.

#### P01-10 COMPARISON OF ANALYTICAL METHOD AND CONTENTS OF SULFUR DIOXIDE IN FOODS

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This study was performed to establish an optimum analytical method for determination of naturally occurring sulfur dioxide in foods. Also the levels of sulfur dioxide in foods were examined to obtain the information for distinguish between natural occurrence and intentional addition of sulfur dioxide. The twenty species, 180 samples were collected and analyzed for sulfur dioxide by the Optimized Monier-Williams method, modified Rankine method, and Acid Distillation/Ion Exclusion Chromatography, respectively. And the twenty species of 180 Samples, fresh and freeze-drying, were analyzed by three method, respectively. As a result, the contents of sulfur dioxide in dry samples showed higher levels than fresh sample relatively. Sulfur dioxide in green onion, onion, cabbage and garlic showed higher levels than the others because of the naturally occurring sulfur containing compounds. To assay sulfite, the Optimized Monier-Williams method, which is the official analytical method of Korean Food Code, generally provides accurate results above  $10\text{mg SO}_2/\text{L}$  and was suitable for the analysis of sulfur dioxide in most matrixes. Acid Distillation/Ion Exclusion Chromatography was found to be reli-

able for the analysis of sulfur dioxide in sulfur containing foods such as green onion, onion and cabbage.

#### P01-11\* POTENT ANTIOXIDATIVE *O*- DIHYDROXYSOFLAVONES IN SOYBEAN PASTES AND THEIR EVALUATIONS

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Recently, new potent antioxidative *o*-dihydroxyisoflavones (ODI), 8-hydroxydaidzein (8-OHD), 8-hydroxygenistein (8-OHG) and 6-hydroxydaidzein (6-OHD), have been isolated from soybeans fermented with *Aspergillus* species. These ODI showed significantly stronger antioxidative activities ( $P < 0.01$ ) than those of daidzein and genistein, which are generally known to be antioxidative components in fermented soybean products. In this study, the formation and antioxidative evaluation of these ODI in soybean pastes were investigated. From HPLC analyses, these ODI were also present in rich enough amounts to exert antioxidative activities in fermented soybean pastes, especially in all soybean miso. However, any ODI was not detected in both rice/soybean miso and barley/soybean miso, which were used rice koji and barley koji, respectively. In the formation of ODI, it is necessary to be directly inoculated with of *A. oryzae* (tane-koji) to steamed soybeans. The antioxidative activities of soybean miso which contained ODI were generally stronger than those of other type of miso. There was a good correlation ( $r=0.812$ ) between ODI content and antioxidative activity. In further studies, the formations and changes of these ODI in the production of soybean miso were investigated. 8-OHD, 6-OHD and 8-OHG were formed from daidzein and genistein, respectively, by the hydroxylase produced from the koji fermentation during the stage of sporulation. These ODI were hardly decomposed and their contents were kept at almost constant levels throughout maturing periods of soybean miso. From these results, it is concluded that these ODI contribute to protecting from oxidative deterioration during the processing and storing of soybean miso. The physiological functions on these ODI will be also discussed.

#### P01-12 CONSTITUENTS OF THE ESSENTIAL OIL OF *CNIDIUM OFFICINALE* MAKINO, A KOREAN MEDICINAL PLANT

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The volatile flavor constituents of Chunkung (*Cnidium officinale* Makino), isolated by simultaneous steam-distillation extraction, were investigated by capillary GC and GC-MS. Chunkung is a perennial plant of the Umbelliferae family and is widely distributed in Korea. This plant is characterized by its conspicuous oriental flavor and contains a copious amount of phthalides in the essential oil. Chunkung is one of the important folk medicines for counteracting a variety of diseases, and is particularly used as a traditional oriental medicine in the treatment of female genital in-

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