Insecticides/Fungicides/Larvicides

**Toxicity of fatty acid salts to German and American cockroaches**

The toxicity of fatty acid salts to German, *Blattella germanica* (Linn.) and American cockroaches, *Periplaneta americana* (Linn.) was evaluated by the scientists at Gainesville, FL. Potassium and sodium laurate caused up to 95% mortality of German cockroaches and 100% mortality of American cockroaches. Even-numbered potassium fatty acid salts, C₈-C₁₈, were assessed for toxicity at 0.125, 0.25, 0.5, 1, and 2% concentrations by a 30-s immersion of cockroaches. The more soluble of the fatty acid salts at 2% concentration caused 65-95% mortality of German cockroaches and 100% mortality of American cockroaches. Potassium oleate, C₁₈, was most toxic to both German (LC₅₀ = 0.36%) and American (LC₅₀ = 0.17%) cockroaches. Fatty acid salt solutions on a substrate were tested by placing cockroaches in contact with treated floor tiles immediately after application (wet) or after the solutions had dried. Sodium laurate and potassium caprate caused mortality of German (62 ± 17.4 and 58 ± 12.6%, respectively) and American cockroaches (52 ± 18.5 and 28 ± 4.9%, respectively) on wet tiles, whereas potassium oleate caused mortality of German cockroaches (67 ± 14.1%) only. Dry fatty acids caused no mortality among exposed cockroaches. Fatty acid salt solutions can be effective in killing German and American cockroaches but only when insects are thoroughly wetted with 1-2% fatty acid salt solutions [Baldwin RW, Kachler PG and Perira RM, Toxicity of Fatty Acid Salts to German and American Cockroaches, *J Econ Entomol*, 2008, 101(4), 1384-1388].

Oils/Fats

**Separating tocotrienols from Palm oil by molecular distillation**

Crude palm oil contains approximately 1% minor components, including carotenoids and vitamin E (tocopherols and tocotrienols), which contribute to the stability and nutritional properties of palm oil. Palm oil is considered one of the best sources of vitamin E. The vitamin E content in palm oil is unique because it is composed of tocotrienols rather than tocopherols. Palm fatty acid distillate (PFAD) is the volatile organic material recovered as a valuable by-product in the deodorization of palm oil. Several processes have been proposed for recovering tocopherols and tocotrienols from PFAD. For this separation process, it is necessary to develop a processing procedure to extract the valuable tocotrienols and other minor components from PFAD using molecular distillation and scientists working at China and Canada attempted to do that. Molecular distillation occurs at low temperatures and reduces the problem of thermal decomposition. High vacuum also eliminates oxidation that might occur in the presence of air. The rate of evaporation is controlled by the rate at which the molecules escape from the free surface of the liquid and condense on the condenser. The effects of feed-flow rate and temperature of distillation on extraction of minor components from PFAD are based on concentrations, distribution coefficients and relative volatilities. The separation of tocotrienols from PFAD approached maximum values at low temperatures and fell drastically as temperature increased. For the optimum conditions for the extraction of tocotrienols with high yield and purity, it is necessary to determine the effect of processing variables on the extraction of minor components (i.e., tocotrienols, α-tocopherol) from the PFAD in terms of concentrations in the liquid and vapour phases, to reveal the behaviour of target components in the evaporation process, and to determine the evaporation and volatility properties of tocotrienols and other minor components from PFAD [Liu Donghong, Shi John, Posada Luidy Rodriguez, Kakud Yukio and Xue Sophia Jun, Separating Tocotrienols from Palm Oil by Molecular Distillation, *Food Rev Int*, 2008, 24 (4), 376-391].
Berry seeds: A source of specialty oils with high content of bioactives and nutritional value

The scientists at Ghent University, USA characterized selected berry seed oils from blackberry, blueberry, cranberry, strawberry, red raspberry and kiwi for their quality and nutritional characteristics. These oils are by-products of berry juice production that have only recently gained commercial interest. Free fatty acid content was below 1.6% for all examined oil samples. Peroxide value ranged between 0.6 and 4.4 mgO₂/kg oil for blackberry and kiwi seed oils, respectively and p-anisidine value varied from 6 in cranberry to 23 in strawberry. Linolenic acid content ranged from 17.5% in blackberry seed oil to 57.6% in kiwi seed oil. The oxidative stability of all oils was rather low (0.17h for kiwi to 8.4h for blackberry at 97.8°C). Phytosterol contents ranged between 403 and 692 mg/100g for blackberry and cranberry, respectively. The content of tocols (tocopherol + tocotrienol) varied from 34.4 for kiwi to 2,133 mg/kg for red raspberry seed oils. Thus in addition to their usage in cosmetics, these oils can be used for edible purposes [Van Hoed V, De Clercq N, Echim C, Andjelkovic M, Leber E, Dewettinck K and Verhé R, Berry seeds: A source of specialty oils with high content of bioactives and nutritional value, J Food Lipids, 2009, 16(1), 33-49].

Monitoring the adulteration of virgin coconut oil

The researchers at Malaysia studied the crystallization and melting enthalpy of virgin coconut oil adulterated with palm kernel oil (PKO) and soybean oil (SBO) by using differential scanning calorimetry. Virgin coconut oil was spiked separately with PKO and SBO from 2 to 40% (w/w) of adulterant oils. Fatty acids of all oils were determined to complement the differential scanning calorimetry data. The heating curve of SBO-adulterated samples showed the adulteration peak appearing at the lower temperature region at 10% adulteration level. Regression analyses using stepwise multiple linear regression were used to predict the percentage adulterant with R² of 0.9490. PKO-adulterated oils did not show any adulteration peak but demonstrated a gradual decrease in the peak height of the major exothermic peak [Marina AM, Che Man YB, Nazimah SAH and Amin I, Monitoring the adulteration of virgin coconut oil by selected vegetable oils using differential scanning calorimetry, J Food Lipids, 2009, 16(1), 50-61].

Partial hydrolysis of Soybean oil by phospholipase A₁ to produce diacylglycerol-enriched oil

Partial hydrolysis of soybean oil catalyzed by phospholipase A₁ (Lecitase Ultra) in a solvent-free system was carried out by researchers at China to produce a diacylglycerol (DAG)-enriched soybean oil. During experiment five reaction parameters of partial hydrolysis were investigated. The upper oil layer of the reaction mixture was molecularly distilled at 15°C to yield a DAG-enriched oil with 42.64 (wt%) of DAGs. DAG-enriched oil was distilled second time at 25°C to yield a DAG oil with 78.68 (wt%) of DAGs. The composition of acylglycerols in the DAG-enriched soybean oil was determined by high-performance liquid chromatography (HPLC) and HPLC/electrospray ionization/mass spectrometry. The released fatty acids from the partial phospholipase A₁ hydrolysis of soybean oil showed a higher saturated fatty acid content than that of the raw material. Compared with other lipase-catalyzed processes, this new phospholipase A₁ preparation has the advantage of reducing production of monoacylglycerol byproduct [Wang Yong, Zhao Mouming, Ou Shiyi and Song Keke, Partial hydrolysis of soybean oil by phospholipase A₁ to produce diacylglycerol-enriched oil, J Food Lipids, 2009, 16(1), 113-132].
Oils/Fats

Oxidative stability of palm- and soybean-based medium- and long-chain triacylglycerol (MLCT) oil blends

Medium- and long-chain triacylglycerols (MLCT) enzymatically esterified using Lipozyme RM IM lipase has very low oxidative stability as it does not contain any antioxidants. The researchers at Malaysia studied the ability of various antioxidants to increase the oxidative stability of palm- and soybean-based MLCT blends which assist to bring up the oxidative stability of both MLCT blends. The effectiveness of rosemary extracts, sage extracts, tert-butylhydroquinone (TBHQ) and mixtures of tert-butyl-4-hydroxyanisole (BHA) and tert-butyl-p-hydroxytoluene (BHT) in protecting against oxidation of various MLCT blends was investigated.

Blending of MLCT oil with either palmolein or soybean oil improved its smoke point values and oxidative stability. TBHQ addition to both palm- and soybean-based MLCT blends increased oxidative stability. Combination of BHA and BHT showed no significant improvement (P>0.05) in ability to protect blends from oxidation compared to natural antioxidants such as sage or rosemary extracts. Blended oils with 500 g/kg MLCT and 500 g/kg palm olein (MP5) were the most suitable for use at high temperature based on the fatty acid composition of the MLCT blends, which subsequently had an effect on thermal oxidative stability. In general, addition of either natural or synthetic antioxidant assisted in improving the antioxidative strength of both MLCT blends. MLCT blends with added TBHQ showed the highest thermal oxidative stability among the antioxidants used [Koh Soo Peng, Arifin Norlelawati, Lai Oi Ming, Yusoff Mohd Suria Affandi, Long Kamariah, Tan Chin Ping, Oxidative stability of palm- and soybean-based medium- and long-chain triacylglycerol (MLCT) oil blends, J Sci Food Agric, 2009, 89(3), 455-462].

Changes in fatty acid composition of coriander fruit during maturation

Coriander (Coriandrum sativum Linn.) fruits contain oils with a high concentration of the monounsaturated fatty acid, petroselinic acid. Recent studies on the compositional analysis of coriander fruits have described essential oil changes during maturation. Changes in fatty acids were investigated by researchers at Tunisia during maturation of coriander fruits cultivated in the North-East of Tunisia (Charfine). The fruits matured in 55 days after flowering (DAF). Oil and petroselinic acid synthesis proceeded at a steady rate up to 32 DAF. The first results showed a rapid oil accumulation started at newly formed fruits (9.6±0.2%) and continued until their full maturity (26.4±0.5%). During fruit maturation, fatty acid profiles varied significantly among the nine stages of maturity. At the 32th DAF, palmitoleic, gadoleic, erucic and docosahexanoic acids were not detected and petroselinic acid had a highest amount (84.8±4.5%). Fruits development resulted mainly in an increase of petroselinic acid and a decrease of palmitic acid (C16:0). At full maturity, the main fatty acids were petroselinic acid (80.9±5.7%), followed by linoleic (13.6±2.9%), palmitic (3.6±0.1%) and stearic (0.7±0.1%) acids. Saturated and polyunsaturated fatty acids decreased significantly and monounsaturated fatty acids increased during maturation of coriander fruit. Coriander fruits at the first four stages of maturity have a healthy nutritional value and the last five stages were with important economic and industrial applications. Results indicated that the variation in the fatty acid composition of coriander fruit during maturation may be useful in understanding the source of nutritionally and industrially important fatty acids in this fruit [Msada Kamel, Hosni Karim, Taarit Mouna Ben, Chahed Thouraya, Hammami Mohamed and Marzouk Brahim, Changes in fatty acid composition of coriander (Coriandrum sativum L.) fruit during maturation, Ind Crops Prod, 2009, 29 (2-3), 269-274].
Antiulcer activity of cod liver oil in rats

Cod liver oil is used widely as a dietary supplement. A study was carried out by scientists at India to evaluate the effect of cod liver oil (0.5 g/kg, p.o. and 1 g/kg, p.o.) on gastric and duodenal ulcers. The study was carried out on different gastric ulcer models such as acetic acid induced chronic gastric ulcers, pylorus ligation, indomethacin induced ulcers, stress induced ulcers and ethanol induced ulcers. The duodenal ulcers were induced using cysteamine hydrochloride (HCl). Ranitidine (50 mg/kg p.o.) and misoprostol (100 µg/kg, p.o.) were used as standard drugs. Both doses of cod liver oil showed gastric ulcer healing effect in acetic acid induced chronic gastric ulcers, produced gastric antisecretory effect in pylorus-ligated rats and also showed gastric cytoprotective effect in ethanol-induced and indomethacin-induced ulcer. Cod liver oil also produced a significant reduction in the development of stress induced gastric ulcers and cysteamine induced duodenal ulcer. The high dose of cod liver oil (1 g/kg, p.o.) was more effective compared to the low dose (0.5 g/kg, p.o.). Thus, cod liver oil increases healing of gastric ulcers and prevents the development of experimentally induced gastric and duodenal ulcers in rats [Khare Salaj, Asad Mohammed, Dhamanigi Sunil S and Satya Prasad V, Antiulcer activity of cod liver oil in rats, Indian J Pharmacol, 2008, 40 (5), 209-214].

Effect of microwave heating with different exposure times on physical and chemical parameters of olive oil

Researchers at Portugal in a study reflects the effect of different microwave heating times (1, 3, 5, 10 and 15 min) on physical and chemical characteristics of three Portuguese olive oils from three protected designation of origin (PDO), “Azeite de Trás-os-Montes PDO”, “Azeites da Beira Interior PDO” and “Azeite de Moura PDO”. The parameters evaluated were free acidity, peroxide value, specific extinction coefficients ($K_{232}$ and $K_{270}$), colour, and chlorophylls and carotenoids content. A differential pulse voltameter was also used to monitor the changes in $\alpha$-tocopherol content. The results showed that microwave heating produce losses in the quality of the different analysed olive oils. The heating time did not promote the occurrence of hydrolysis in the samples since no changes in free acidity values were found. All other parameters were affected by exposure time in a similar way: in the first 3 min no marked changes were observed, after that the quality of the oil decrease significantly. The microwave heating time also affects the total chlorophylls, carotenoids and $\alpha$-tocopherol contents which clearly decreased as long as the exposure time increases. After 15 min of heating the electrochemical signal, due to the $\alpha$-tocopherol, disappear completely in the voltamogram [Malheiro Ricardo, Oliveira Ivo, Vilas-Boas Miguel, Falcão Soraia, Bento Albino and Pereira José Alberto, Effect of microwave heating with different exposure times on physical and chemical parameters of olive oil, Food Chem Toxicol, 2009, 47 (1), 92-97].

Fatty acid profile and CLA isomers content of cow, ewe and goat milks processed by high pressure homogenization

High pressure homogenization (HPH) is a novel technology that promotes fat globule size reduction and microbial inactivation, but little research exists on the fate of milk fat lipids. Scientists working at Spain and USA studied the effect of HPH (0-350MPa) of raw cow, goat and ewe milks on the fatty acid total content and profile to elucidate whether this technology has a major impact on the lipid fraction of milk and especially on conjugated linoleic acid (CLA) isomers. Fatty acids in processed milks were determined by GC-FID and CLA isomers by Ag+HPLC. The results indicated that
Scientists at Faculty of Pharmaceutical Sciences, University of Nigeria, Nsukka, Nigeria conducted study on the kinetics of the autoxidation of *Terminalia catappa* Linn. (Indian Almond) oil with an aim to establish the stability and its suitability as potential pharmaceutical oil. Soxhlet extractor was used in the extraction of oil from milled seeds using petroleum ether (40-60°C). The optimal oil yield was 56.71±1.66% with a viscosity of 40.79±1.05 centipoises. Other parameters of the oil were found as follows; specific gravity-0.9248, refractive index-1.4646, acid value-3.35, peroxide value-8.6, saponification value-166.2 and unsaponifiable matter-1.46. The crude oil extract was water-degummed, bleached and deodorized to generate what we called refined oil. Autoxidation of the crude and refined *T. catappa* oil extract was done at five different temperatures of 0±0.1, 20±0.1, 40±0.1, 60±0.1 and 80±0.1°C and also in the presence of pure α-tocopherol at a concentration of 1.0% (w/v) by measuring peroxide value variations over 96 hours. In all evaluations, the refined oil exhibited lower tendency towards autoxidation but not at temperatures above 60±0.1°C. The use of Arrhenius equation revealed generally very low activation energies of 0.0261 cal/deg×mol and 0.0122 cal/deg×mol for crude oil and antioxidant-treated crude oil, respectively and 0.0690 cal/deg×mol and 0.0177 cal/deg×mol for the refined oil. The study indicates *T. catappa* seed oil to be potential pharmaceutical oil with excellent characteristics [Omeje EO, Okide GB, Esimone CO and Ajali U, Kinetics of autoxidation of an oil extract from *Terminalia catappa*, *Indian J Pharm Sci*, 2008, 70 (2), 260-262].

**Formulation and evaluation of exotic fat based cosmeceuticals for skin repair**

Mango butter was explored as a functional, natural supplement and active skin ingredient in skin care formulations by researchers at Department of Pharmaceutical Sciences and Technology, University Institute of Chemical Technology, Mumbai, India. A foot care cream was developed with mango butter to evaluate its medicinal value and protective function in skin repair. Qualitative comparison and clinical case studies of the product were carried out. Wound healing potential of foot care cream was investigated on the rat excision and incision wound models. Results of the clinical studies demonstrated complete repair of worn and cracked skin in all the human volunteers. Furthermore, foot care cream exhibited significant healing response in both the wound models. Thus, there is high potential for mango butter to yield excellent emolliency for better skin protection. Improving the product features and medicinal functionality further validate mango butter as a specialty excipient in development of cosmeceuticals and has an immense value for its commercialization [Mandawgade SD and Patravale Vandana B, Formulation and evaluation of exotic fat based cosmeceuticals for skin repair, *Indian J Pharm Sci*, 2008, 70 (4), 539-542].

**Kinetics of autoxidation of an oil extract from *Terminalia catappa* Linn.**

Scientists at Faculty of Pharmaceutical Sciences, University of Nigeria, Nsukka, Nigeria conducted study on the kinetics of the autoxidation of *Terminalia catappa* Linn. (Indian Almond) oil with an aim to establish the stability and its suitability as potential pharmaceutical oil. Soxhlet extractor was used in the extraction of oil from milled seeds using petroleum ether (40-60°C). The optimal oil yield was 56.71±1.66% with a viscosity of 40.79±1.05 centipoises. Other parameters of the oil were found as follows; specific gravity-0.9248, refractive index-1.4646, acid value-3.35, peroxide value-8.6, saponification value-166.2 and unsaponifiable matter-1.46. The crude oil extract was water-degummed, bleached and deodorized to generate what we called refined oil. Autoxidation of the crude and refined *T. catappa* oil extract was done at five different temperatures of 0±0.1, 20±0.1, 40±0.1, 60±0.1 and 80±0.1°C and also in the presence of pure α-tocopherol at a concentration of 1.0% (w/v) by measuring peroxide value variations over 96 hours. In all evaluations, the refined oil exhibited lower tendency towards autoxidation but not at temperatures above 60±0.1°C. The use of Arrhenius equation revealed generally very low activation energies of 0.0261 cal/deg×mol and 0.0122 cal/deg×mol for crude oil and antioxidant-treated crude oil, respectively and 0.0690 cal/deg×mol and 0.0177 cal/deg×mol for the refined oil. The study indicates *T. catappa* seed oil to be potential pharmaceutical oil with excellent characteristics [Omeje EO, Okide GB, Esimone CO and Ajali U, Kinetics of autoxidation of an oil extract from *Terminalia catappa*, *Indian J Pharm Sci*, 2008, 70 (2), 260-262].
Coriander essential oil is used as a flavour ingredient, but it also has a long history as a traditional medicine. It is obtained by steam distillation of the dried fully ripe fruits (seeds) of *Coriandrum sativum* Linn. The oil is a colourless or pale yellow liquid with a characteristic odour and mild, sweet, warm and aromatic flavour; linalool is the major constituent (~70%). Scientists working at United States reviewed previous works and assessed whether coriander oil is safe as a food ingredient. Based on the results of a 28 day oral gavage study in rats, a no observed effect level (NOEL) for coriander oil was approximately 160mg/kg/day. In a developmental toxicity study, the maternal no observed adverse effect level (NOAEL) of coriander oil was 250mg/kg/day and the developmental NOAEL was 500 mg/kg/day. Coriander oil is not clastogenic, but results of mutagenicity studies for the spice and some extracts are mixed; linalool is non-mutagenic. Coriander oil has broad-spectrum, antimicrobial activity. Coriander oil is irritating to rabbits, but not humans; it is not a sensitizer, although the whole spice may be. The data available on the toxicity of coriander oil are limited. However, coriander and its oil have a long history of dietary use, with no record of harm caused by consumption of these ingredients. Moreover, coriander oil has been in commercial use in the fragrance industry for at least 100 years, without any record of having caused adverse effects. In summary, based on the history of consumption of coriander oil without reported adverse effects, lack of its toxicity in limited studies and lack of toxicity of its major constituent, linalool, the use of coriander oil as an added food ingredient is considered safe at present levels of use [Burdock George A and Carabin Ioana G, Safety assessment of coriander (*Coriandrum sativum* L) essential oil as a food ingredient, *Food Chem Toxicol*, 2009, 47 (1), 22-34].

Production of lipase-catalyzed solid fat from mustard oil and palm

Solid fat was produced from mustard oil and palm stearin through lipase-catalyzed reaction, in which linoleic acid was intentionally incorporated. For optimizing the reaction condition of melting point and $\omega_3/\omega_6$ fatty acids, the researchers at South Korea employed response surface methodology (RSM) with three reaction variables such as substrate mole ratio of mustard oil (MO) to palm stearin (PS) ($X_1$), reaction temperature ($X_2$) and reaction time ($X_3$). The predictive model for melting point of solid fat was adequate and reproducible due to no significant lack of fit ($P = 0.0764$), $P$-value (0.0037) of the model and satisfactory level of coefficient of determination ($R^2 = 0.92$). For the $\omega_3/\omega_6$ ratio model, $R^2$ and $P$-value were 0.89 and 0.0132, respectively, but lack of fit was significant ($P = 0.0389$). The melting point of the produced solid fat was affected by substrate mole ratio, whereas reaction temperature and time had no significant effect. The $\omega_6/\omega_3$ ratio of solid fat was influenced by substrate mole ratio and reaction temperature but not by reaction time. Based on ridge analysis, lower ratio was predicted by decreasing substrate mole ratio and reaction time and by increasing reaction temperature. For producing solid fat with a specific melting point of 34.5°C, a combination of 1:2 ($X_1$), 65.17°C ($X_2$) and 21.46 h ($X_3$) was optimized and the optimization was confirmed under the same reaction conditions. The solid fat contained palmitic (37.8%), linoleic (24.8%), oleic (21.3%) and erucic acid (9.7%) and its solid fat content was 30.3% and 10.3% at 20 and 30°C, respectively [Alim Abdul Md, Lee Jeung Hee and Lee Ki-Teak, Production of lipase-catalyzed solid fat from mustard oil and palm stearin with linoleic acid by response surface methodology, *J Sci Food Agric*, 2009, 89(4),706-712].