Final Report

Plant-Derived Fatty Acid Oils as Used in Cosmetics

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ABSTRACT

The CIR Expert Panel assessed the safety of 244 Plant-Derived Fatty Acid Oils as used in cosmetics. Oils are used in a wide variety of cosmetic products for their skin conditioning, occlusive, emollient, and moisturizing properties. Since many of these oils are edible, and their systemic toxicity potential low, the review of the Panel focused on their potential dermal effects. The Expert Panel concluded that the 244 Plant-Derived Fatty Acid Oils are safe as used in cosmetics.

INTRODUCTION

Oils derived from edible vegetables, fruits, seeds, and tree and ground nuts have been safely consumed by humans for millennia. While nuts and some fruits and vegetables themselves may cause allergic reactions in certain individuals, the refined oils derived from these plants generally pose no significant safety concern following oral exposure, and their general biology is well characterized due to extensive use in food materials. Most of the ingredients in this report are mixtures of triglycerides containing fatty acids and fatty acid derivatives, the safety of which in cosmetics has been established. This safety assessment focused solely on the basic chemistry, manufacturing/production, uses, and irritation and sensitization data available on these oils as they are used in cosmetic ingredients.

Various oils have been used on the skin since antiquity. Initially used for anointing in religious ceremonies, oils and their components have also been long used on the skin for cosmetic purposes. They are used in a wide variety of cosmetic products for their skin conditioning, occlusive, emollient, moisturizing and other properties. The full list of ingredients in this report, which includes oils, hydrogenated oils, unsaponifiables, oil fatty acids, and salts of the fatty acids, is found in Table 1. While a large number of oils derived from plants are included in this literature review, there is a commonality in that they all are mixtures of triglycerides containing fatty acids and fatty acid derivatives, the safety of which in cosmetics have been established.

In preparing this report, numerous inconsistencies were noted with both taxonomic and INCI naming conventions. For example, this report includes the macadamia nut ingredients, Macadamia Integrifolia Seed Oil and Macadamia Ternifolia Seed Oil, which are described in the International Cosmetic Ingredient Dictionary and Handbook.[1] The species *M. integrifolia* is currently the only species of macadamia nut that is used for oil production. The name *M. ternifolia* is an old naming convention for the edible nut that is currently used to describe a non-cultivated, inedible species.[2,3] Macadamia Integrifolia Seed Oil and Macadamia Ternifolia Seed Oil are the same ingredient. Similar naming conflicts have been discovered with Triticum Vulgare (Wheat) Germ Oil and Triticum Aestivum (Wheat) Germ Oil, Orbignya Oleifera Seed Oil and Orbignya Speciosa Kernel Oil, and Moringa Pterygosperma Seed Oil and Moringa Oleifera Seed Oil, with these pairs being synonyms for each other. The shea plant also has two species names, *Butyrospermum parkii* and *Vitellaria paradoxa*. Only *B. parkii* (as Butyrospermum Parkii [Shea] Oil or Butter) is the current naming convention described by the cosmetics industry.

This report includes cosmetic ingredients that have been previously reviewed by the Cosmetic Ingredient Review Expert Panel. The ingredients, their conclusions, and published citations are found in Table 2. Previously reviewed fatty acids and glyceryl triesters are also found in Table 2.

CHEMISTRY

The group of ingredients characterized as fats and oils are the glyceryl esters of fatty acids (triglycerides) normally found in plants, including those which have been hydrogenated to reduce or eliminate unsaturation.[4] Figure 1 represents the general structure of fats and oils. The raw oil may include diglycerides, monoglycerides, free fatty acids, plant sterols, pigments, glucosides, proteins, natural antioxidants, vitamins and impurities.[5,6] The extent to which these components are removed during processing varies. The available information on chemical properties of oils in this report, including Food

Chemicals Codex specifications when provided, are found in Table 3.[7] The available fatty acid compositions for the oils in this report are found in Table 4.

The percentage of chemical constituents in individual oil types is dependent on the region where the oilseed plant is grown, individual cultivars, and plant genetics.[6] This is especially true with rapeseed, where the erucic acid content varies from 1% to 58.6%. Low erucic acid rapeseed oil is also known as canola oil.

The nutritional content of these oils varies with oil type. For example, sunflower oil contains high levels of vitamins A, D, and K, while palm oil is a rich source of vitamins A and E. Crude sunflower oil also has the highest content of vitamin E in the form of α-tocopherol amongst vegetable oils.[6]

Vegetable Oil and Hydrogenated Vegetable Oil are cosmetic labeling names for blends of plant-derived oils.[8] The composition of a blend is determined by the desired physical properties. Vegetable Oil and Hydrogenated Vegetable Oil may include, but are not limited to: Canola Oil, Brassica Campestris (Rapeseed) Oil, Carthamus Tinctorius (Safflower) Seed Oil, Helianthus Annuus (Sunflower) Seed Oil, Sesamum Indicum (Sesame) Seed Oil, Elaeis Guineensis (Palm) Oil, Elaeis Guineensis (Palm Kernel) Oil, Cocos Nucifera (Coconut) Oil, Gossypium Herbaceum (Cottonseed) Oil, Glycine Soja (Soybean) Oil, Zea Mays (Corn) Oil, Olea Europaea (Olive) Oil, Prunus Amygdalus Dulcis (Sweet Almond) Oil, and hydrogenated products of these oils.

Processing

The oil may be directly expressed from the source (seed or pulp) followed by solvent extraction. *Bailey's Industrial Oil and Fat Products* states that the removal of pigments and polar materials is mandatory for most cosmetic applications.[9] The process used for oil refining for foods may be adequate for this purpose, or additional steps may be required. Special refining methods to yield colorless and odorless oils are used by the cosmetic industry and include proprietary adsorption chromatography and supercritical fluid extractions.

The majority of the oils presented in this report are produced either from mechanical extraction or solvent extraction or a hybrid of both methods, known as prepress solvent extraction.[6] In solvent extraction, hexane is the most commonly used solvent, as it is economical and easily removed from the extracted oil. Seeds that are rich in oil can be cold pressed to extract oil without the use of solvents.[10]

After the initial extraction by methods such as solvent extraction, the crude (degummed) oil is often refined.[6] The first step is treating the oil with caustic soda to neutralize free fatty acids, hydrolyze phosphatides, and remove some colored pigments and unsaponifiable materials. Soap stock is usually a by-product of this step. The next step involves treating the neutralized oil with activated earth to further adsorb pigments. The last major step in refining oil is deodorizing, usually by a type of steam distillation, which is intended to remove all oxidative cleavage products that impart odor or flavor to the oil. Deodorization also removes tocopherols, sterols, and other minor constituents of free fatty acids and undesirable foreign materials. Figure 2 is a flowchart of the basic refinement process.

After deodorization, oils can be further processed by hydrogenation, which makes oil more resistant to oxidative and thermal damage, and by winterization, where oil is slowly cooled to promote formation of crystals that cause cloudiness, and then filtered to remove the crystals.

Cosmetic grade fatty acid plant oils may include a physical refining step that involves heating crude oil under vacuum.[10] This step allows for the removal of volatile components such as color compounds, odor compounds, and free fatty acids, which gives the refined oil a lighter color, less odor, and lower acid values.

Analytical Methods

Near infrared spectroscopy and gas chromatography have been used, respectively, to phenotype and analyze fatty acid profiles in shea fat (described as *Vitellaria paradoxa*, not *Butyrospermum parkii*).[11] The fatty acid composition of hazel seed oil (*Corylus avellana*, in crude form) has also been analyzed by gas chromatography.[12] The triacylglycerol and diacylglycerol composition oils from hazelnut, pistachio, almond, Brazil nut, and macadamia nuts have been characterized with high-performance liquid chromatography with atmospheric pressure chemical ionization and UV detection.[13] The triacylglycerol profile of Brazil nut oil has also been quantified using dry matrix-assisted laser desorption/ionization time-of flight mass spectrometry.[14]

Impurities

Proteins

Many edible fatty acid oils are derived from foods that are recognized as potent food allergens. It has been shown that an individual that is allergic to a food will generally not react to the refined oil, especially if the oil has been "hot-pressed" or has undergone more processing.[15,16] A prime example is Arachis Hypogaea (Peanut) Oil. Peanuts are extremely allergenic to a large population, but reaction to the oil is rare. In its safety assessment on Arachis Hypogaea (Peanut) Oil, the Expert Panel noted that the major concern associated with allergic reactions to peanuts is the protein.[17] The protein does not partition into the refined oil, and therefore the oil is safe for use in cosmetics. However, researchers have reported protein levels in processed oils. Halsey et al. reported that Lowry protein determinations of cold-pressed and refined sunflower oil found 2-8 µg/ml protein,[18] while Zitouni et al. reported trace amounts of protein in the refined oil.[19] Olszewski et al. found 0.1-0.2 µg protein per g of peanut oil,[20] while Ramazzotti et al. reported finding IgE responsive residual proteins in peanut oil extracts.[21] Porras et al. found soy protein in some samples of soy oil, but not others.[22] Awazuhara et al. reported 1.4-4.0 µg protein per 100 g of soy oil.[23] Although Paschke et al. found approximately 35 µg/l protein content in refined soybean oil, no IgE-binding activity was detectable.[24]

While the Panel has found a general lack of clinical effects for fatty acid oils already reviewed,[17,25-33] other groups have raised concerns. The European Medicines Agency (EMEA) Working Party on Herbal Medicinal Products concluded that soy and peanut products "should be treated as allergenic unless they have an analytically-monitored non-allergenic specification and a safe maximum daily dose."[34] The EMEA found that threshold concentrations for induction of a protein contact dermatitis were not available and recommended, "all medications for topical use containing soya or peanut products should be treated as allergenic."

Aflatoxin

Aflatoxins are metabolic products of the molds *Aspergillus flavus* and *Aspergillus parasiticus*. They are most often produced in stored agricultural crops (such as peanuts and other nut crops) when growth conditions and genetic requirements are favorable.[35-37] The International Agency for Research on Cancer (IARC) categorized aflatoxins as group 1 agents, "carcinogenic to humans".[38,39]

The United States government places the following limitations on peanuts to be considered "negative" for aflatoxin: $\leq$ 15 ppb for "peanuts which have been certified as meeting edible quality grade requirements" and $\leq$ 25 ppb for "non-edible quality categories" (7 CFR Sections 997.30 and 998.200).[40]

> A study reported that crude peanut oil (obtained by solvent extraction or hydraulic pressing) has reduced aflatoxin concentration compared to peanut kernels, and that subsequent processing (alkali refining and bleaching) reduces the concentration still further.[17] In one example, processed peanut oil from moldy peanuts (contaminated with 5500 ppb aflatoxin) had an aflatoxin concentration of < 1ppb. [From CIR assessment on Arachis Hypogaea (Peanut) Oil, 2001.][17]

In 50 samples of hazel nuts from Spain, all samples showed fungal contamination, but no aflatoxin contamination.[41] Of the 50 fungal strains identified, 25 were aflatoxigenic strains. In 20 hazel nut samples collected in Egypt, however, aflatoxin (25-175 µg/kg) was reported as a contaminant in 90% of samples. [From CIR assessment on Hazel Seed Oil, 2001.][42]

Aflatoxin contamination of raw and dried coconut copra has been reported.[33] Improper drying, handling, and storage greatly increase the possibility of contamination by aflatoxins growing on copra. Smoke drying of copra inhibited aflatoxin formation. [From CIR assessment on Cocos Nucifera (Coconut) Oil, 2008.][43]

Glycidol

Glycidol and glycidol fatty acid esters have been detected in refined fatty acid oils.[44-47]

USE

Cosmetic

There are 244 oil ingredients included in this safety assessment, 146 of which are reported to be used; 118 of the in-use ingredients have never been reviewed by CIR, while 28 have been reviewed previously. For the ingredients being reviewed for the first time, the frequency of use, as supplied to the Food and Drug Administration (FDA) by industry as part of the Voluntary Cosmetic Registration Program (VCRP),[48] and/or concentration of use, as supplied by industry in response to a Personal Care Products Council (Council) survey,[49-51] can be found in Table 5a. (Also included in Table 5a are three ingredients, Citrullus Vulgaris (Watermelon) Seed Oil, Macadamia Nut Oil, and Vaccinium Oxycoccos (Cranberry) Seed Oil, that do not have identifiable International Nomenclature Cosmetic Ingredient (INCI) names. While these ingredients are not part of this assessment, they are very similar to the oils that are identified and information on them is included in this report for completeness.) For the ingredients that have been reviewed previously, the current and historical[26-28,32,52-55] frequency and concentration of use is given in Table 5b. The 97 ingredients not currently reported to be used are listed in Table 5c. [48-51,56,57]

It should be noted that the names vegetable oil and hydrogenated vegetable oil, are used in cosmetic formulations, refer to a blend of plant-derived oils, and the composition of the blend varies.[8]

Of the oils included in this report, Butyrospermum Parkii (Shea) Butter has the most reported uses in cosmetic and personal care products, with a total of 1950; 1680 of those uses are in leave-on formulations. A recent survey of use concentrations for Butyrospermum Parkii (Shea) Butter reports a maximum use concentration of 60% in leave-on products as a cuticle softener, a manicuring application.[58] Helianthus Annuus (Sunflower) Seed Oil has the second greatest number of overall uses reported, with a total of 1414; 1054 of those uses are in leave-on formulations, having use concentrations up to 96%. Many other ingredients are used in an extensive number of formulations. For example, Prunus Amygdalus Dulcis (Sweet Almond) Oil, Olea Europaea (Olive) Fruit Oil, and Glycine Soja (Soybean) Oil have 1127, 915, and 912 uses, respectively. Most of the in-use ingredients have uses in both leave-on and rinse-off product types, many are used in products that are applied around the eye and some are used in a way they can possibly be ingested. Some are used in products that involve mucous membrane exposure, and a few are used in underarm deodorant formulations. Many of the products are used in formulations at relatively high concentrations. Olea Europaea (Olive) Fruit Oil is used at up to 100%, Persea Gratissima (Avocado) Oil is used at up to 98%, Helianthus Annuus (Sunflower) Seed Oil at up to 96%, and Glycine Soja (Soybean) Oil at 95%.

Oils are used in a wide variety of cosmetic products for their skin conditioning, occlusive, emollient, moisturizing and other properties.

Some of the oils included in this report are used in products that can be inhaled, and effects on the lungs that may be induced by aerosolized products containing these ingredients are of concern. The particle size of aerosol hair sprays and of

pump hair sprays is 38 μm and >80 μm, respectively, and is relatively large compared to respirable particle sizes (≤10 μm). Therefore, because of their size, most aerosol particles are deposited in the nasopharyngeal region and are not respirable.

None of the oils, hydrogenated oils, unsaponifiables, oil fatty acids, and salts of the fatty acids described in this report were restricted from use in any way under the rules governing cosmetic products in the European Union.[59]

Non-Cosmetic

The primary uses for plant-derived fatty acid oils are for cooking. Palm oil is the world's most widely consumed edible oil (41.7 million metric tons), followed by soybean oil, rapeseed oil, sunflower seed oil, cottonseed oil, peanut oil, palm kernel oil, coconut oil, ,and olive oil.[6,60] Non-food, non-cosmetic uses for edible fatty acid oils are found in Table 6.

ANIMAL TOXICOLOGY

Many of the fatty acid oils in this assessment are edible, and exposure to the oils from food use would result in a much larger systemic dose than that resulting from use in cosmetic products. Consequently, their systemic toxicity potential is not addressed in this report. The safety focus of use of these oils as cosmetic ingredients is on the potential for irritation and sensitization.

CARCINOGENICITY

The safety of glycidol fatty acid esters in refined vegetable oils was assessed by IARC. Glycidol was determined to be a Group2A (probably carcinogenic to humans) chemical while glycidol fatty acid esters was determined to be a Group 3 (not classifiable as to carcinogenicity to humans) chemical.[46,47]

The Federal Institute for Risk Assessment in Germany released a summary of their initial evaluation of the assessment of levels of glycidol fatty acid esters detected in refined vegetable fats.[45] While acknowledging that the levels of glycidol that may be released from glycidol fatty acid esters are not known, the evaluation noted that glycidol is classified as probably carcinogenic to humans. The evaluation was based on findings of the German Chemical and Veterinary Test Agency (CVUA) that noted that glycidol is converted to 3-chloropropanediol and it appeared to be the 3-chloropropanediol that was detected in the vegetable fat.[44] The levels of 3-chloropropanediol were negligible at the crude oil, degummed, neutralized, and bleached stages, but levels were significant at the deodorized stage.

Anacardium Occidentale (Cashew) Seed Oil

The modulatory effect of Anacardium Occidentale (Cashew) Seed Oil on antioxidant potential was investigated in female Swiss albino mice in a 120 day skin papillomagenesis study.[61] The mice were divided into 4 groups of 15 and 1 group of 10 (vehicle control). Test groups were as follows: Group I was the vehicle control, receiving 0.1 ml acetone; Group II was the positive control, receiving a single dose of 7,12-dimethylbenz(a)anthracene (DMBA) (0.005 mg/0.05 ml acetone) followed by applications of 2% croton oil 3 times a week until study termination; Group III received a single dose of DMBA followed by applications of 2.5% cashew nut kernel oil 3 times a week until study termination; Group IV received a single dose of DMBA followed by applications of 5% cashew nut kernel oil 3 times a week until study termination; and Group V was 5% cashew nut kernel oil applied until study termination. The oil was applied to the clipped dorsal scapular region that was 2 cm in diameter. Body weights were recorded at regular intervals. Skin papillomas greater than 1 mm in diameter at the application sites were recorded weekly and included in the data analysis if they persisted for more than 2 weeks. The positive control group yielded expected results (86% tumor incidence). No tumors were observed in the vehicle control or the other test groups. The authors concluded that cashew nut kernel oil did not exhibit any solitary carcinogenic activity.

IRRITATION AND SENSITIZATION

Dermal Effects

Non-Human

Dermal irritation and sensitization studies were performed in animals on a number of the plant-derived fatty acid oils, and the results were mostly negative in all of the studies. These studies are summarized in Table 7a. Photosensitization data, when available, are also included in Table 7a. None of the tested oils were phototoxic. Summary statements of non-human dermal studies from previous CIR reports on oils are provided in Table 7b.

Human

Plant-derived fatty acid oils are commonly believed to be safe for use on the skin.[9] de Groot notes that no documentation exists to show that high quality edible lipids cause adverse reactions in normal individuals (except for potential comedogenicity).[62] Very few reports of adverse reactions to cosmetic use of edible fatty acid oils have been reported.

Many plant-derived fatty acid oils are derived from foods that are recognized as potent food allergens. The allergic reactions are thought to be caused by the proteins present in the food. It has been shown that an individual that is allergic to a food will generally not react to the refined oil, especially if the oil has been "hot-pressed" or has undergone more processing.[15,16] In its safety assessment on Arachis Hypogaea (Peanut) Oil, the CIR Expert Panel noted that while peanuts are extremely allergenic to a large population, reaction to the oil is rare. Because the major concern associated with allergic reactions to peanuts is the protein[17] which does not partition into the refined oil; therefore the oil is safe for use in cosmetics. Crevel et al. also concluded that chemically refined peanut oil is safe for the majority of peanut allergic individuals.[16] They stated that "as peanut is acknowledged to be one of the most potent food allergens, it is reasonable to extrapolate the conclusions drawn up for peanut oil to other edible oils." However, they concede that validated analytical methodology for establishing the protein content of oil is needed.

In support of the conclusions stated earlier, Crevel et al. also examined the allergenicity of some other oils. Very few instances of allergic reactions to other major edible fatty acid oils have been reported. Even sesame oil, which differs from the other oils in that it is used as a flavorant and, therefore, is not as refined and is expected to contain significantly more protein that the other edible fatty acid oils, has had very few reports of allergic reaction. Additional studies demonstrating safety are summarized later in this section.[18,63]

A large number of clinical irritation and sensitization studies were made available on many of the oils, primarily in formulation, and these studies are summarized in Table 8a. All of the data indicated that the oils were not irritants or sensitizers. Summary statements of human dermal studies, including phototoxicity/photosensitization data, from previous CIR reports on oils are provided in Table 8b.

Mucosal Irritation

Non-Human

Ocular irritation studies were performed using animals on a number of plant-derived fatty acid oils. While the majority of the oils were non-irritating to mildly irritating, Crambe Abyssinica Seed Oil was an ocular irritant and Linum Usitatissimum (Linseed) Seed Oil was moderately irritating. Available ocular irritation studies are summarized in Table 9a. Summary statements of ocular irritation studies from previous CIR reports on oils are provided in Table 9b.

Human

In clinical ocular irritation studies, formulations containing Linum Usitatissimum (Linseed) Oil and Ribes Nigrum (Black Currant) Seed Oil did not produce adverse reactions, and were considered safe for contact lens wearers. These studies are also summarized in Table 9a.

CLINICAL USE

Clinical Trials/Case Studies

Case studies reporting various results have been summarized in Table 10 for a number of the oils included in this report.

SUMMARY

The report addresses the safety of Plant-Derived Fatty Acid Oils. These oils, which are derived from vegetable and fruit plants, are composed of mono-, di-, and, primarily, triglycerides, free fatty acids and other minor components, including natural antioxidants and fat-soluble vitamins. The percentage of chemical constituents and nutritional content of individual oil types is dependent on region where the oil plant is grown, individual cultivars, and plant genetics. Oils used in cosmetics are likely produced in the same manner as those used in the food industry. Oils may be expressed through mechanical or solvent extraction. The oils may undergo further refining, such as neutralizing, bleaching, and deodorizing, to remove pigments, odors, unsaponifiable materials, and other undesirables.

Individuals who have food allergies to a plant protein rarely exhibit allergic reactions when exposed to refined oils of the same plant. Data evaluation by the CIR Expert Panel regarding method of manufacture indicates that protein constituents do not partition into the refined oils. The CIR Expert Panel also has found a general lack of clinical effects for fatty acid oils that they have already reviewed; however, other researchers have raised concerns about the presence of residual proteins in oils, such as peanut and soy.

Glycidol fatty acid esters are possible impurities in refined vegetable oils. While the amount of glycidol that may be present with glycidol fatty acid esters is not known, the IARC has noted that glycidol is probably carcinogenic to humans and that glycidol fatty acid esters are not classifiable as to carcinogenicity in humans. Peanuts and soy may contain aflatoxins, metabolic products of certain molds that are carcinogenic to humans.

Of the oils described in this report, Butyrospermum Parkii (Shea) Butter has the most reported uses in cosmetic and personal care products with a total of 1950 and is used at a maximum concentration of 60%. Oils are used in a wide variety of cosmetic products, including use in hair spray and other aerosolized products. None of the oils, or the related counterparts, described in this report are restricted from use in the European Union.

Anacardium Occidentale (Cashew) Seed Oil was not a tumor promoter in a DMBA skin test system.

The safety focus of use of these oils as cosmetic ingredients is on the potential for irritation and sensitization. Undiluted, technical grade, Arachis Hypogaea (Peanut) Oil was moderately irritating to rabbits and guinea pig skin, and 5% aq. solutions of a bar soap containing 13% sodium cocoate had irritation scores of 1.6-4.0/8 in animal studies. However, the remaining animal and clinical irritation and/or sensitization studies conducted on a large number of the oils included in this report, primarily in formulation, did not report any significant irritation or sensitization reactions, indicating that refined oils derived from plants are not dermal irritants or sensitizers.

The phototoxic potential of formulations containing Butyrospermum Parkii (Shea) Butter and Elaeis Guineensis (Palm) Oil and of Oryza Sativa (Rice) Bran and (Rice) Germ Oil, neat, was evaluated in animal studies, and the phototoxic

potential of Cocos Nucifera (Coconut) Oil, Sodium Cocoate, Prunus Amygdalus Dulcis (Sweet) Almond Oil, and Oryza Sativa (Rice) Bran Oil was examined clinically. None of these ingredients were phototoxic.

The comedogenicity of Corylus Avellana (Hazel) Seed Oil was evaluated using rabbits, and a slight difference in the number and size of the pilosebaceous follicles and a slight excess of sebum and a dilation of the follicles was observed. In clinical testing with an eye mask containing 0.2% Ribes Nigrum (Black Currant) Seed Oil (undiluted), the formulation was non-comedogenic.

The ocular irritation potential of a number of the oils, mostly in formulation, was evaluated in testing using animals or alternative assays. The majority of the test results did not report significant ocular irritation. A lotion containing 1.5% Elaeis Guineensis (Palm) Oil was moderately irritating to rabbit eyes, and a mascara containing 9.4% Linum Usitatissimum (Linseed) Seed Oil was moderately irritating in an alternative assay.

In human testing, a mascara containing 9.4% Linum Usitatissimum (Linseed) Seed Oil did not produce ocular irritation or adverse effects in contact lenses wearers or subjects with sensitive eyes. An eye mask containing 0.2% Ribes Nigrum (Black Currant) Seed Oil (undiluted) was tested and considered safe for contact lens wearers.

DISCUSSION

Plant-derived fatty acid oils, oils which have been hydrogenated to reduce or eliminate unsaturation, fatty acid salts, and oil unsaponifiables were reviewed by the CIR Expert Panel. Most of theses ingredients in this report are mixtures of triglycerides containing fatty acids and fatty acid derivatives, the safety of which in cosmetics has been established. Upon review of these ingredients, the Panel expressed concern regarding pesticide residues and heavy metals that may be present in botanical ingredients. They stressed that the cosmetics industry should continue to use the necessary procedures to limit these impurities in the ingredient before blending into cosmetic formulations.

Additionally, the Panel considered the safety of glycidol and glycidol fatty acid esters in refined vegetable oils. While the Panel recognizes that these impurities may be carcinogenic, absorption through the skin would be very low and likely does not pose a significant hazard. Nonetheless, suppliers should take steps to eliminate or reduce the presence of glycidol and glycidol fatty acid esters in plant-based fatty acid oils that are used in cosmetic products. Aflatoxins, which are potent carcinogens, may be present in moldy nuts and coconut copra, but are not found in oils expressed from these nuts and copra. The Panel adopted the U.S. Department of Agriculture designation of $\leq$15 ppb as corresponding to "negative" aflatoxin content.

Certain of the plant-derived oils are used in cosmetic products that may be inhaled during their use. In practice, however, the particle sizes produced by the cosmetic aerosols are not respirable.

The Panel discussed the relationship between food allergies and exposure to refined oils. Individuals who have food allergies to a plant protein rarely exhibit allergic reactions when exposed to refined oils of the same plant. The Panel has found a general lack of clinical effects for plant-derived fatty acid oils already reviewed.

Fatty acid composition data were available for the majority of the oils included in this review and the Panel agreed that the composition data, in combination with the available data on method of manufacture, impurities, safety test data, a long history of safe use in foods, and an absence of adverse reactions in clinical experience, was a sufficient basis for determining safety. The Expert Panel did note that vegetable oil is a blend of a number of different oils, and that a specific composition of vegetable oil was not available. The Expert Panel determined that the safety of vegetable oil as used in cosmetic formulations has been established, providing that the blend contains oils for which the fatty acid composition is known.

Addtionally, while data on the fatty acid composition of Fragaria Vesca (Strawberry) Seed Oil and Fragaria Virginiana (Strawberry) Seed Oil were not available, data were available for Fragaria Ananassa (Strawberry) Seed Oil and Fragaria Chiloensis (Strawberry) Seed Oil. In that the fatty acid compositions of Fragaria Ananassa and Fragaria Chiloensis (Strawberry) Seed Oil were similar to each other, it was assumed that Fragaria Vesca and Fragaria Virginiana (Strawberry) Seed Oils would also have similar fatty acid compositions.

The Expert Panel also noted that arachidonic acid is a fatty acid constituent of Lycium Barbarum Seed Oil, Oryza Sativa (Rice) Germ Oil, and Sclerocarya Birrea Seed Oil. Although a previously published CIR evaluation concluded that insufficient data exist to support the safety of arachidonic acid in cosmetic products, the Panel was of the opinion that the concentration of use of these ingredients was sufficiently low that the amount of free arachidonic acid from these oils would not warrant concern.

Finally, the conclusion reached by the Panel on the safety of the plant-derived fatty acid oils supersedes the 2001 conclusion of insufficient data for Corylus Americana and Corylus Avellana (Hazel) Seed Oil.

CONCLUSION

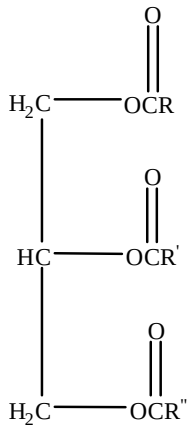
The CIR Expert Panel concluded that the 244 plant-derived fatty acid oils included in this review are safe in the present practices of use and concentration described in this safety assessment. Were the ingredients not in current use (as indicated by *) to be used in the future, the expectation is that they would be used in product categories and concentrations comparable to others in these groups. The ingredients found safe are:

Actinidia Chinensis (Kiwi) Seed Oil
Adansonia Digitata Oil
Adansonia Digitata Seed Oil*
Aleurites Moluccanus Bakoly Seed Oil*
Aleurities Moluccana Seed Oil
Amaranthus Hypochondriacus Seed Oil*
Anacardium Occidentale (Cashew) Seed Oil
Arachis Hypogaea (Peanut) Oil
Arctium Lappa Seed Oil*
Argania Spinosa Kernel Oil
Astrocaryum Murumuru Seed Butter
Avena Sativa (Oat) Kernel Oil
Babassu Acid*
Bassia Butyracea Seed Butter*
Bassia Latifolia Seed Butter
Bertholletia Excelsa Seed Oil
Borago Officinalis Seed Oil
Brassica Campestris (Rapeseed) Oil Unsaponifiables*
Brassica Campestris (Rapeseed) Seed Oil
Brassica Napus Seed Oil*
Brassica Oleracea Acephala Seed Oil*
Brassica Oleracea Italica (Broccoli) Seed Oil
Butyrospermum Parkii (Shea) Butter
Butyrospermum Parkii (Shea) Butter Unsaponifiables
Butyrospermum Parkii (Shea) Oil
Camelina Sativa Seed Oil
Camellia Japonica Seed Oil
Camellia Kissi Seed Oil
Camellia Oleifera Seed Oil
Camellia Sinensis Seed Oil
Canarium Indicum Seed Oil*
Canola Oil
Canola Oil Unsaponifiables
Carica Papaya Seed Oil
Carthamus Tinctorius (Safflower) Seed Oil
Carya Illinoensis (Pecan) Seed Oil*
Caryocar Brasiliense Fruit Oil
Chenopodium Quinoa Seed Oil
Citrullus Lanatus (Watermelon) Seed Oil
Citrus Aurantifolia (Lime) Seed Oil*
Citrus Aurantifolia (Lime) Seed Oil Unsaponifiables*
Citrus Aurantium Dulcis (Orange) Seed Oil*
Citrus Aurantium Dulcis (Orange) Seed Oil Unsaponifiables*
Citrus Grandis (Grapefruit) Seed Oil*
Citrus Grandis (Grapefruit) Seed Oil Unsaponifiables*
Citrus Limon (Lemon) Seed Oil*
Citrus Paradisi (Grapefruit) Seed Oil
Coconut Acid
Cocos Nucifera (Coconut) Oil
Cocos Nucifera (Coconut) Seed Butter*
Coix Lacryma-Jobi (Job's Tears) Seed Oil*
Corn Acid*
Corylus Americana (Hazel) Seed Oil
Corylus Avellana (Hazel) Seed Oil
Cottonseed Acid*
Crambe Abyssinica Seed Oil
Cucumis Sativus (Cucumber) Seed Oil
Cucurbita Pepo (Pumpkin) Seed Oil
Cynara Cardunculus Seed Oil*
Elaeis (Palm) Fruit Oil*
Elaeis Guineensis (Palm) Butter*
Elaeis Guineensis (Palm) Kernel Oil
Elaeis Guineensis (Palm) Oil
Elaeis Oleifera Kernel Oil
Euterpe Oleracea Fruit Oil
Fragaria Ananassa (Strawberry) Seed Oil*
Fragaria Chiloensis (Strawberry) Seed Oil*
Fragaria Vesca (Strawberry) Seed Oil*
Fragaria Virginiana (Strawberry) Seed Oil*
Garcinia Indica Seed Butter
Gevuina Avellana Seed Oil
Gevuina Avellana Oil

Glycine Soja (Soybean) Oil
Glycine Soja (Soybean) Oil Unsaponifiables
Gossypium Herbaceum (Cotton) Seed Oil
Guizotia Abyssinica Seed Oil*
Helianthus Annuus (Sunflower) Seed Oil
Helianthus Annuus (Sunflower) Seed Oil Unsaponifiables
Hippophae Rhamnoides Fruit Oil
Hippophae Rhamnoides Oil
Hippophae Rhamnoides Seed Oil*
Hydrogenated Adansonia Digitata Seed Oil*
Hydrogenated Apricot Kernel Oil
Hydrogenated Apricot Kernel Oil Unsaponifiables*
Hydrogenated Argania Spinosa Kernel Oil*
Hydrogenated Avocado Oil
Hydrogenated Black Currant Seed Oil*
Hydrogenated Camelina Sativa Seed Oil*
Hydrogenated Camellia Oleifera Seed Oil
Hydrogenated Canola Oil
Hydrogenated Coconut Acid
Hydrogenated Coconut Oil
Hydrogenated Cottonseed Oil
Hydrogenated Cranberry Seed Oil*
Hydrogenated Evening Primrose Oil
Hydrogenated Grapefruit Seed Oil*
Hydrogenated Grapefruit Seed Oil Unsaponifiables*
Hydrogenated Grapeseed Oil
Hydrogenated Hazelnut Oil*
Hydrogenated Kukui Nut Oil*
Hydrogenated Lime Seed Oil*
Hydrogenated Lime Seed Oil Unsaponifiables*
Hydrogenated Macadamia Seed Oil*
Hydrogenated Meadowfoam Seed Oil*
Hydrogenated Olive Oil
Hydrogenated Olive Oil Unsaponifiables
Hydrogenated Orange Seed Oil*
Hydrogenated Orange Seed Oil Unsaponifiables*
Hydrogenated Palm Acid*
Hydrogenated Palm Kernel Oil
Hydrogenated Palm Oil
Hydrogenated Passiflora Edulis Seed Oil*
Hydrogenated Peach Kernel Oil*
Hydrogenated Peanut Oil
Hydrogenated Pistachio Seed Oil*
Hydrogenated Pumpkin Seed Oil*
Hydrogenated Punica Granatum Seed Oil*
Hydrogenated Rapeseed Oil*
Hydrogenated Raspberry Seed Oil
Hydrogenated Rice Bran Oil*
Hydrogenated Rosa Canina Fruit Oil*
Hydrogenated Safflower Seed Oil*
Hydrogenated Sesame Seed Oil*
Hydrogenated Shea Butter
Hydrogenated Soybean Oil
Hydrogenated Sunflower Seed Oil
Hydrogenated Sweet Almond Oil
Hydrogenated Sweet Almond Oil Unsaponifiables*
Hydrogenated Vegetable Oil
Hydrogenated Wheat Germ Oil*
Hydrogenated Wheat Germ Oil Unsaponifiables*
Irvingia Gabonensis Kernel Butter
Juglans Regia (Walnut) Seed Oil
Limnanthes Alba (Meadowfoam) Seed Oil
Linseed Acid
Linum Usitatissimum (Linseed) Seed Oil
Luffa Cylindrica Seed Oil
Lupinus Albus Oil Unsaponifiables*
Lupinus Albus Seed Oil
Lycium Barbarum Seed Oil
Macadamia Integrifolia Seed Oil
Macadamia Ternifolia Seed Oil
Magnesium Cocoate
Mangifera Indica (Mango) Seed Butter
Mangifera Indica (Mango) Seed Oil
Morinda Citrifolia Seed Oil*
Moringa Oleifera Seed Oil
Moringa Pterygosperma Seed Oil
Oenothera Biennis (Evening Primrose) Oil
Olea Europaea (Olive) Husk Oil*
Olea Europaea (Olive) Oil Unsaponifiables
Olea Europaea (Olive) Fruit Oil
Olive Acid*
Orbignya Cohune Seed Oil
Orbignya Oleifera Seed Oil
Orbignya Speciosa Kernel Oil
Oryza Sativa (Rice) Bran Oil
Oryza Sativa (Rice) Germ Oil
Oryza Sativa (Rice) Seed Oil*
Palm Acid
Palm Kernel Acid
Passiflora Edulis Seed Oil
Peanut Acid*
Perilla Ocymoides Seed Oil
Persea Gratissima (Avocado) Butter
Persea Gratissima (Avocado) Oil
Persea Gratissima (Avocado) Oil Unsaponifiables
Pistacia Vera Seed Oil
Plukenetia Volubilis Seed Oil
Potassium Babassuate*
Potassium Cocoate
Potassium Cornate*
Potassium Hydrogenated Cocoate*
Potassium Hydrogenated Palmate*
Potassium Olivate
Potassium Palm Kernelate
Potassium Palmate
Potassium Peanutate
Potassium Rapeseedate*
Potassium Safflowerate*
Potassium Soyate*
Prunus Amygdalus Dulcis (Sweet Almond) Oil
Prunus Amygdalus Dulcis (Sweet Almond) Oil Unsaponifiables*
Prunus Armeniaca (Apricot) Kernel Oil
Prunus Armeniaca (Apricot) Kernel Oil Unsaponifiables*
Prunus Avium (Sweet Cherry) Seed Oil
Prunus Domestica Seed Oil
Prunus Persica (Peach) Kernel Oil
Punica Granatum Seed Oil
Pyrus Malus (Apple) Seed Oil
Rapeseed Acid*
Ribes Nigrum (Black Currant) Seed Oil
Ribes Rubrum (Currant) Seed Oil*
Rice Bran Acid*
Rosa Canina Fruit Oil
Rubus Chamaemorus Seed Oil
Rubus Idaeus (Raspberry) Seed Oil
Safflower Acid*
Schinziophyton Rautanenii Kernel Oil
Sclerocarya Birrea Seed Oil
Sesamum Indicum (Sesame) Oil Unsaponifiables
Sesamum Indicum (Sesame) Seed Butter*
Sesamum Indicum (Sesame) Seed Oil
Silybum Marianum Seed Oil [Thistle]

Sodium Astrocaryum Murumuruate
Sodium Avocadoate
Sodium Babassuate
Sodium Cocoa Butterate*
Sodium Cocoate
Sodium Grapeseedate
Sodium Hydrogenated Cocoate*
Sodium Hydrogenated Palmate*
Sodium Macadamiaseedate*
Sodium Mangoseedate
Sodium Olivate
Sodium Palm Kernelate
Sodium Palmate
Sodium Peanutate*
Sodium Rapeseedate*
Sodium Safflowerate*
Sodium Sesameseedate
Sodium Soyate*
Sodium Sweet Almondate
Sodium Theobroma Grandiflorum Seedate*
Solanum Lycopersicum (Tomato) Fruit Oil
Solanum Lycopersicum (Tomato) Seed Oil
Soy Acid*
Sunflower Seed Acid*
Theobroma Cacao (Cocoa) Seed Butter
Theobroma Grandiflorum Seed Butter
Torreya Nucifera Seed Oil*
Triticum Aestivum (Wheat) Germ Oil*
Triticum Vulgare (Wheat) Germ Oil
Triticum Vulgare (Wheat) Germ Oil Unsaponifiables*
Vaccinium Corymbosum (Blueberry) Seed Oil*
Vaccinium Macrocarpon (Cranberry) Seed Oil
Vaccinium Myrtillus Seed Oil
Vaccinium Vitis-Idaea Seed Oil
Vegetable (Olus) Oil
Vitis Vinifera (Grape) Seed Oil
Wheat Germ Acid
Zea Mays (Corn) Germ Oil
Zea Mays (Corn) Oil
Zea Mays (Corn) Oil Unsaponifiables

FIGURES AND TABLES



-OCR, -OCR', and -OCR" may be the same or different fatty acid radicals.

Figure 1. **General structure of fats and oils**
(Reference[4])

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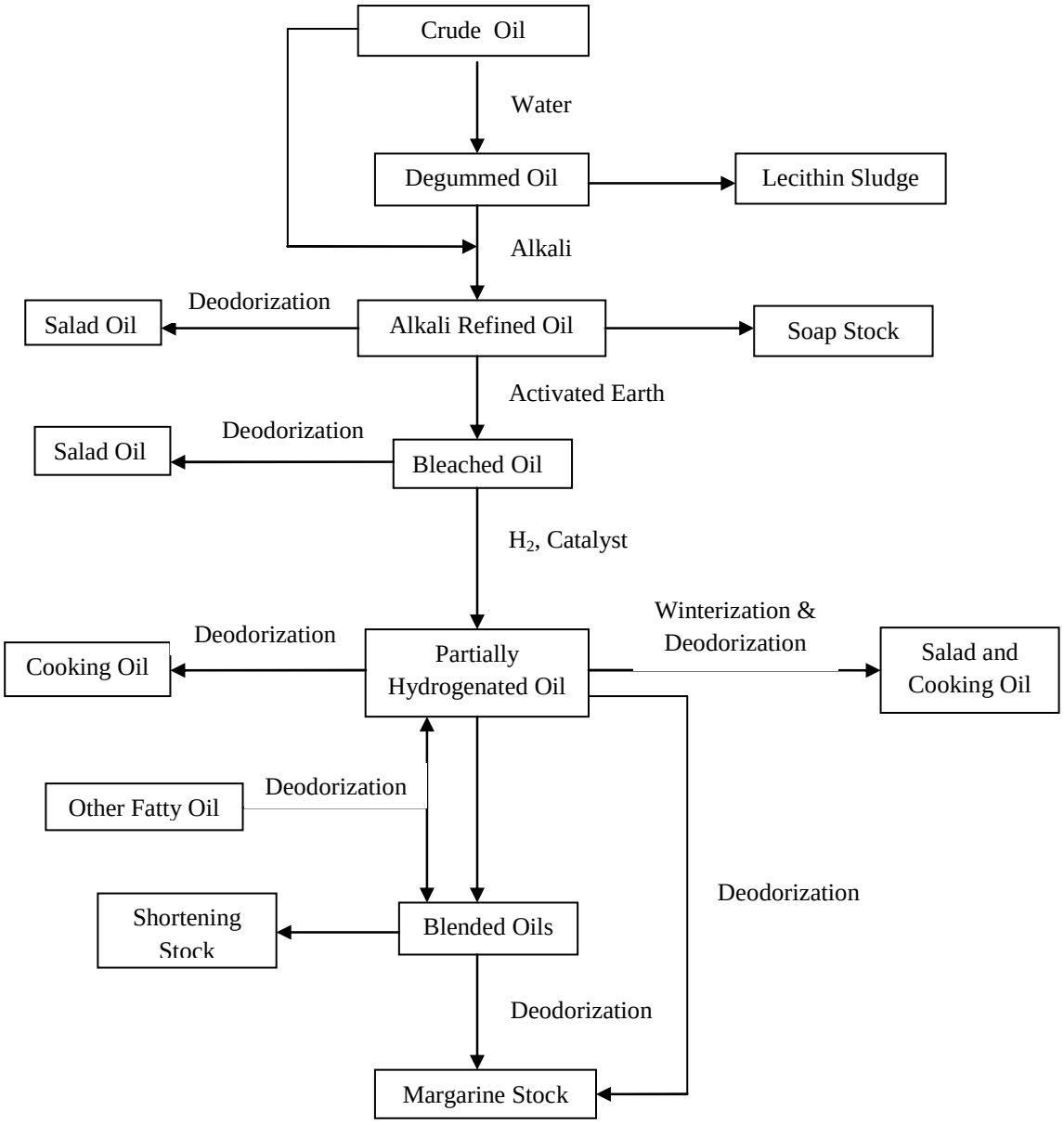

Figure 2. **Basic oil refinement flowchart**
(Reference.[6])

Table 1. **Plant-derived fatty acid oils**.

Actinidia Chinensis (Kiwi) Seed Oil
Adansonia Digitata Oil [Baobab]
  Adansonia Digitata Seed Oil
  Hydrogenated Adansonia Digitata Seed Oil
Aleurities Moluccana Seed Oil [Kukui] (CAS No. 8015-80-3)
  Hydrogenated Kukui Nut Oil
  Aleurites Moluccanus Bakoly Seed Oil
Amaranthus Hypochondriacus Seed Oil [Amaranth]
Anacardium Occidentale (Cashew) Seed Oil (CAS No. 8007-24-7)
Arachis Hypogaea (Peanut) Oil (CAS No. 8002-03-7)[a]
  Hydrogenated Peanut Oil (CAS No. 68425-36-5)
  Potassium Peanutate
  Sodium Peanutate
  Peanut Acid (CAS No. 91051-35-3)
Arctium Lappa Seed Oil [Burdock]
Argania Spinosa Kernel Oil [Argan]
  Hydrogenated Argania Spinosa Kernel Oil
Astrocaryum Murumuru Seed Butter [Murumuru]
  Sodium Astrocaryum Murumuruate
Avena Sativa (Oat) Kernel Oil
Bassia Butyracea Seed Butter
Bassia Latifolia Seed Butter [Mahwa]
Bertholletia Excelsa Seed Oil [Brazil]
Borago Officinalis Seed Oil [Borage] (CAS No. 225234-12-8)
Brassica Campestris (Rapeseed) Seed Oil
  Brassica Campestris (Rapeseed) Oil Unsaponifiables
  Hydrogenated Rapeseed Oil
  Rapeseed Acid
  Potassium Rapeseedate
  Sodium Rapeseedate
Brassica Napus Seed Oil [Rapeseed]
Brassica Oleracea Acephala Seed Oil [Kale]
Brassica Oleracea Italica (Broccoli) Seed Oil
Butyrospermum Parkii (Shea) Oil
  Butyrospermum Parkii (Shea) Butter (CAS No. 68920-03-6;194043-92-0)
  Butyrospermum Parkii (Shea) Butter Unsaponifiables
    (CAS No. 194043-92-0; 225234-14-0)
  Hydrogenated Shea Butter
Camelina Sativa Seed Oil [False Flax]
  Hydrogenated Camelina Sativa Seed Oil
Camellia Japonica Seed Oil
Camellia Kissi Seed Oil [Tea]
Camellia Oleifera Seed Oil [Tea Seed]
  Hydrogenated Camellia Oleifera Seed Oil
Camellia Sinensis Seed Oil
Canarium Indicum Seed Oil [Galip]
Canola Oil
  Canola Oil Unsaponifiables
  Hydrogenated Canola Oil
Carica Papaya Seed Oil [Papaya]
Carthamus Tinctorius (Safflower) Seed Oil
  Hydrogenated Safflower Seed Oil
  Potassium Safflowerate
  Sodium Safflowerate
  Safflower Acid
Carya Illinoensis (Pecan) Seed Oil
Caryocar Brasiliense Fruit Oil [Pequi]
Chenopodium Quinoa Seed Oil [Quinoa]
Citrullus Lanatus (Watermelon) Seed Oil
Citrus Aurantifolia (Lime) Seed Oil
  Citrus Aurantifolia (Lime) Seed Oil Unsaponifiables
  Hydrogenated Lime Seed Oil
  Hydrogenated Lime Seed Oil Unsaponifiables
Citrus Aurantium Dulcis (Orange) Seed Oil
  Citrus Aurantium Dulcis (Orange) Seed Oil Unsaponifiables
  Hydrogenated Orange Seed Oil
  Hydrogenated Orange Seed Oil Unsaponifiables
Citrus Grandis (Grapefruit) Seed Oil
  Citrus Grandis (Grapefruit) Seed Oil Unsaponifiables
  Hydrogenated Grapefruit Seed Oil
  Hydrogenated Grapefruit Seed Oil Unsaponifiables
Citrus Paradisi (Grapefruit) Seed Oil
Citrus Limon (Lemon) Seed Oil (CAS No. 85085-28-5)
Cocos Nucifera (Coconut) Oil (CAS No. 8001-31-8)
  Hydrogenated Coconut Oil (CAS No. 84836-98-6)
  Cocos Nucifera (Coconut) Seed Butter
  Magnesium Cocoate
  Potassium Cocoate (CAS No. 61789-30-8)
  Potassium Hydrogenated Cocoate
  Sodium Cocoate (CAS No. 61789-31-9)
  Sodium Hydrogenated Cocoate
  Coconut Acid (CAS No. 61788-47-4)
  Hydrogenated Coconut Acid (CAS No. 68938-15-8)
Coix Lacryma-Jobi (Job's Tears) Seed Oil
Corylus Americana (Hazel) Seed Oil
  Hydrogenated Hazelnut Oil
Corylus Avellana (Hazel) Seed Oil
Crambe Abyssinica Seed Oil [Abyssinian Mustard]
Cucumis Sativus (Cucumber) Seed Oil (CAS No. 70955-25-8)
Cucurbita Pepo (Pumpkin) Seed Oil (CAS No. 8016-49-7)
  Hydrogenated Pumpkin Seed Oil
Cynara Cardunculus Seed Oil [Artichoke] (CAS No. 923029-60-1)
Elaeis Guineensis (Palm) Oil (CAS No. 8002-75-3)
  Elaeis Guineensis (Palm) Kernel Oil (CAS No. 8023-79-8)

Table 1. Plant-derived Fatty Acid Oils

Hydrogenated Palm Kernel Oil (CAS No. 68990-82-9; 84540-04-5)
Elaeis (Palm) Fruit Oil
Hydrogenated Palm Oil (CAS No. 8033-29-2; 68514-74-9)
Elaeis Guineensis (Palm) Butter (CAS No. 8002-75-3)
Palm Kernel Acid
Potassium Palm Kernelate
Potassium Palmate
Potassium Hydrogenated Palmate
Sodium Palm Kernelate (CAS No. 61789-89-7)
Sodium Palmate (CAS No. 61790-79-2)
Sodium Hydrogenated Palmate
Palm Acid
Hydrogenated Palm Acid
Elaeis Oleifera Kernel Oil
Euterpe Oleracea Fruit Oil [Acai]
Fragaria Ananassa (Strawberry) Seed Oil
Fragaria Chiloensis (Strawberry) Seed Oil
Fragaria Vesca (Strawberry) Seed Oil
Fragaria Virginiana (Strawberry) Seed Oil
Garcinia Indica Seed Butter [Kokum]
Juglans Regia (Walnut) Seed Oil (CAS No. 8024-09-7)
Limnanthes Alba (Meadowfoam) Seed Oil (CAS No. 153065-40-8)
Hydrogenated Meadowfoam Seed Oil
Linum Usitatissimum (Linseed) Seed Oil (CAS No. 8001-26-1)
Linseed Acid (CAS No. 68424-45-3)
Luffa Cylindrica Seed Oil [Luffa]
Lupinus Albus Seed Oil [White Lupine]
Lupinus Albus Oil Unsaponifiables
Lycium Barbarum Seed Oil [Goji Berry]
Macadamia Integrifolia Seed Oil
Hydrogenated Macadamia Seed Oil
Macadamia Ternifolia Seed Oil (CAS No. 128497-20-1 or 129811-19-4)
Sodium Macadamiaseedate
Mangifera Indica (Mango) Seed Oil
Mangifera Indica (Mango) Seed Butter
Sodium Mangoseedate
Morinda Citrifolia Seed Oil [Noni]
Moringa Oleifera Seed Oil [Ben/Moringa]
Moringa Pterygosperma Seed Oil
Oenothera Biennis (Evening Primrose) Oil
Hydrogenated Evening Primrose Oil
Olea Europaea (Olive) Fruit Oil (CAS No. 8001-25-0)
Olea Europaea (Olive) Oil Unsaponifiables (CAS No. 156798-12-8)
Hydrogenated Olive Oil
Hydrogenated Olive Oil Unsaponifiables
Potassium Olivate (CAS No. 68154-77-8)
Sodium Olivate (CAS No. 64789-88-6)
Olea Europaea (Olive) Husk Oil
Olive Acid (CAS No. 92044-96-7)
Gevuina Avellana Oil [Chilean Hazel]
Gevuina Avellana Seed Oil
Glycine Soja (Soybean) Oil (CAS No. 8001-22-7)
Glycine Soja (Soybean) Oil Unsaponifiables (CAS No. 91770-67-1)
Hydrogenated Soybean Oil (CAS No. 8016-70-4)
Soy Acid (CAS No. 68308-53-2)
Potassium Soyate
Sodium Soyate
Gossypium Herbaceum (Cotton) Seed Oil (CAS No. 8001-29-4)
Hydrogenated Cottonseed Oil (CAS No. 68334-00-9)
Cottonseed Acid (CAS No. 68308-51-0)
Guizotia Abyssinica Seed Oil [Ramtil/Niger]
Helianthus Annuus (Sunflower) Seed Oil (CAS No. 8001-21-6)
Helianthus Annuus (Sunflower) Seed Oil Unsaponifiables
Hydrogenated Sunflower Seed Oil
Sunflower Seed Acid (CAS No. 84625-38-7)
Hippophae Rhamnoides Oil [Sea-Buckthorn]
Hippophae Rhamnoides Fruit Oil [Sea-Buckthorn]
Hippophae Rhamnoides Seed Oil [Sea-Buckthorn]
Irvingia Gabonensis Kernel Butter [Dika] (CAS No. 192230-28-7)
Orbignya Cohune Seed Oil [Cohune]
Orbignya Oleifera Seed Oil [Babassu] (CAS No. 91078-92-1)
Potassium Babassuate
Sodium Babassuate
Babassu Acid
Orbignya Speciosa Kernel Oil
Oryza Sativa (Rice) Bran Oil (CAS No. 68553-81-1; 84696-37-7)
Hydrogenated Rice Bran Oil
Oryza Sativa (Rice) Germ Oil
Oryza Sativa (Rice) Seed Oil
Rice Bran Acid (CAS No. 93165-33-4)
Passiflora Edulis Seed Oil [Passion Fruit] (CAS No. 87676-26-1)
Hydrogenated Passiflora Edulis Seed Oil
Perilla Ocymoides Seed Oil [Perilla]
Persea Gratissima (Avocado) Oil (CAS No. 8024-32-6)
Persea Gratissima (Avocado) Oil Unsaponifiables (CAS No. 91770-40-0)
Hydrogenated Avocado Oil
Persea Gratissima (Avocado) Butter
Sodium Avocadoate
Pistacia Vera Seed Oil [Pistachio] (CAS No. 90082-81-8; 129871-01-8)
Hydrogenated Pistachio Seed Oil
Plukenetia Volubilis Seed Oil [Sacha Inchi]
Prunus Amygdalus Dulcis (Sweet Almond) Oil
(CAS No. 8007-69-0; 90320-37-9)
Prunus Amygdalus Dulcis (Sweet Almond) Oil Unsaponifiables
Hydrogenated Sweet Almond Oil
Hydrogenated Sweet Almond Oil Unsaponifiables
Sodium Sweet Almondate
Prunus Armeniaca (Apricot) Kernel Oil (CAS No. 72869-69-3)

Table 1. Plant-derived Fatty Acid Oils

Prunus Armeniaca (Apricot) Kernel Oil Unsaponifiables
Hydrogenated Apricot Kernel Oil
Hydrogenated Apricot Kernel Oil Unsaponifiables
Prunus Avium (Sweet Cherry) Seed Oil
Prunus Domestica Seed Oil [Prune/Plum]
Prunus Persica (Peach) Kernel Oil (CAS No. 8002-78-6; 8023-98-1)
Hydrogenated Peach Kernel Oil
Punica Granatum Seed Oil [Pomegranate]
Hydrogenated Punica Granatum Seed Oil
Pyrus Malus (Apple) Seed Oil
Ribes Nigrum (Black Currant) Seed Oil (CAS No. 97676-19-2)
Hydrogenated Black Currant Seed Oil
Ribes Rubrum (Currant) Seed Oil
Rosa Canina Fruit Oil [Dog Rose]
Hydrogenated Rosa Canina Fruit Oil
Rubus Chamaemorus Seed Oil [Cloudberry]
Rubus Idaeus (Raspberry) Seed Oil
Hydrogenated Raspberry Seed Oil
Schinziophyton Rautanenii Kernel Oil [Mongongo]
Sclerocarya Birrea Seed Oil [Marula]
Sesamum Indicum (Sesame) Seed Oil (CAS No. 8008-74-0)
Sesamum Indicum (Sesame) Oil Unsaponifiables
Hydrogenated Sesame Seed Oil
Sesamum Indicum (Sesame) Seed Butter
Sodium Sesameseedate
Silybum Marianum Seed Oil [Thistle]
Solanum Lycopersicum (Tomato) Fruit Oil
Solanum Lycopersicum (Tomato) Seed Oil
Theobroma Cacao (Cocoa) Seed Butter (CAS No. 8002-31-1)
Sodium Cocoa Butterate
Theobroma Grandiflorum Seed Butter [Cupuacu] (CAS No. 394236-97-6)
Sodium Theobroma Grandiflorum Seedate
Torreya Nucifera Seed Oil [Kaya]
Triticum Vulgare (Wheat) Germ Oil (CAS No. 8006-95-9; 68917-73-7)
Triticum Aestivum (Wheat) Germ Oil
Triticum Vulgare (Wheat) Germ Oil Unsaponifiables
Hydrogenated Wheat Germ Oil Unsaponifiables
Hydrogenated Wheat Germ Oil
Wheat Germ Acid (CAS No. 68938-32-9)
Vaccinium Corymbosum (Blueberry) Seed Oil
Vaccinium Macrocarpon (Cranberry) Seed Oil
Hydrogenated Cranberry Seed Oil
Vaccinium Myrtillus Seed Oil [Bilberry] (CAS No. 1161921-09-0)
Vaccinium Vitis-Idaea Seed Oil [Ligonberry],
Vegetable (Olus) Oil
Hydrogenated Vegetable Oil
Vitis Vinifera (Grape) Seed Oil (CAS No. 8024-22-4)
Hydrogenated Grapeseed Oil
Sodium Grapeseedate
Zea Mays (Corn) Oil (CAS No. 8001-30-7)
Zea Mays (Corn) Oil Unsaponifiables
Zea Mays (Corn) Germ Oil
Potassium Cornate (CAS No. 61789-23-9)
Corn Acid (CAS No. 68308-50-9)

[a] Previously reviewed ingredients are in ***bold and italics***.

Table 2. **Previously reviewed oil and fatty acid ingredients.**

Ingredients	Publication Date	Conclusion
Oil Ingredients		
Arachis Hypogaea (Peanut) Oil (CAS No. 8002-03-7) Hydrogenated Peanut Oil (CAS No. 68425-36-5) Peanut Acid (CAS No. 91051-35-3)	IJT 20(S2):65-77, 2001	Safe
Carthamus Tinctorius (Safflower) Seed Oil (CAS No. 8001-23-8)	JACT 4(5):171-197, 1985; Re-reviewed, not reopened IJT 25(2):1-89, 2006	Safe
Cocos Nucifera (Coconut) Oil (CAS No. 8001-31-8) Coconut Acid (CAS No. 61788-47-4) Hydrogenated Coconut Acid (CAS No. 68938-15-8) Hydrogenated Coconut Oil (CAS No. 84836-98-6) Magnesium Cocoate Potassium Cocoate (CAS No. 61789-30-8) Potassium Hydrogenated Cocoate Sodium Cocoate (CAS No. 61789-31-9) Sodium Hydrogenated Cocoate	JACT 5(3):103-121, 1986; CIR Final Report, 2008	Safe
Corylus Americana (Hazel) Seed Oil Corylus Avellana (Hazel) Seed Oil	IJT 20 (S1):15-20, 2001	Insufficient data
Elaeis Guineensis (Palm) Oil (CAS No. 8002-75-3) Elaeis Guineensis (Palm) Kernel Oil (CAS No. 8023-79-8) Hydrogenated Palm Oil (CAS No. 8033-29-2; 68514-74-9) Hydrogenated Palm Kernel Oil (CAS No. 68990-82-9; 84540-04-5)	IJT 19(S2):7-28, 2000	Safe
Gossypium Herbaceum (Cotton) Seed Oil (CAS No. 8001-29-4) Cottonseed Acid (CAS No. 68308-51-0) Hydrogenated Cottonseed Oil (CAS No. 68334-00-9)	IJT 20(S2):21-29, 2001	Safe
Oryza Sativa (Rice) Bran Oil (CAS No. 68553-81-1; 84696-37-7) Oryza Sativa (Rice) Germ Oil Rice Bran Acid (CAS No. 93165-33-4)	IJT 25(S2):91-120, 2006	Safe
Prunus Amygdalus Dulcis (Sweet Almond) Oil (CAS No. 8007-69-0)	JACT 2(5):85-99, 1983; Re-reviewed, not reopened IJT 24 (S1):1-102, 2005	Safe
Sesamum Indicum (Sesame) Seed Oil (CAS No. 8008-74-0) Hydrogenated Sesame Seed Oil Sesamum Indicum (Sesame) Oil Unsaponifiables Sodium Sesameseedate	JACT 12(3):261-277, 1993; Amended Final Report, 2009	Safe
Zea Mays (Corn) Oil (CAS No. 8001-30-7) Zea Mays (Corn) Germ Oil Zea Mays (Corn) Oil Unsaponifiables Corn Acid (CAS No. 68308-50-9) Potassium Cornate (CAS No. 61789-23-9)	Final Report, 2008	Safe
Persea Gratissima (Avocado) Oil (CAS No. 8024-32-6)	JEPT 4(4):93-103, 1980; Re-reviewed, not reopened IJT 22(1):1-35, 2003	Safe
Triticum Vulgare (Wheat) Germ Oil (CAS No. 8006-95-9; 68917-73-7)	JEPT 4(4):33-45, 1980; Re-reviewed, not reopened IJT 22(1):1-35, 2003	Safe
Fatty Acids		
Arachidonic Acid (CAS No. 506-32-1)	JACT 12 (5):481-559, 1993	Insufficient data
Hydroxystearic Acid (CAS No. 106-14-9)	IJT 18(S1):1-10, 1999	Safe
Lauric Acid (CAS No. 143-07-7) Myristic Acid (CAS No. 544-63-8) Oleic Acid (CAS No. 112-80-1) Palmitic Acid (CAS No. 57-10-3) Stearic Acid (CAS No. 57-11-4)	JACT 6(3):321-401, 1987; Re-reviewed, not reopened IJT 25(2):1-89, 2006	Safe

Table 2. **Previously reviewed oil and fatty acid ingredients.**

Ingredients	Publication Date	Conclusion
Glyceryl Triesters		
Trilaurin		
Triarachidin		
Tribehenin		
Tricaprin		
Tricaprylin		
Trierucin		
Triheptanoin		
Triheptylundecanoin		
Triisononanoin		
Triisopalmitin		
Triisostearin		
Trilinolein	IJT 20 (S4):61-94, 2001	Safe
Trimyristin		
Trioctanoin		
Triolein		
Tripalmitin		
Tripalmitolein		
Triricinolein		
Tristearin		
Triundecanoin		
Glyceryl Triacetyl Hydroxystearate		
Glyceryl Triacetyl Ricinoleate		
Glyceryl Stearate Diacetate		

Table 3. **Chemical properties for plant-derived fatty acid oils.**

Properties and Constituents [a]	Actinidia Chinensis (Kiwi) Seed Oil[64]	Adansonia Digitata Oil [65,66]	Aleurites Moluccana Seed Oil [Kukui][67-70]	Anacardium Occidentale (Cashew) Seed Oil[71]	Arachis Hypogaea (Peanut) Oil[6,67,72-75]	Argania Spinosa Kernel Oil[76,77]	Astrocaryum Murumuru Seed Butter[6,78]
Appearance		Pale yellow	Clear yellow liquid		Light yellow	Yellow	Pale brown waxy solid at room temperature
Specific gravity			0.920-0.930 (20◦C)		0.912-0.920 (20◦C)	0.908-0.918 (20◦C)	0.890-0.910 (25◦C)
Refractive index			1.470-1.480 (20◦C)		1.46-1.475 (20◦C)		
Iodine value		65-95	130-175		74-107	95	15 max
Saponification value		190-210	185-210		180-208		270-350
Peroxide value (meq/kg)	44.37	5.0-10	5.0 max	0.22	0.39, 5.0 max	10.0 max	20.0 max
Melting point (◦C)							25-37
Unsaponifiable matter (%)			0.3 - 1		≤1.0		
Free fatty acids (%)	1.2	2.0 max as oleic acid	0.1-4		0.2-2.08		12.56 as oleic acid
Titer (◦C)					26-32		
Acid value					0.5	3-4	

Properties and Constituents	Avena Sativa (Oat) Kernel Oil[79]	Bertholletia Excelsa Seed Oil[71,80]	Borago Officinalis Seed Oil[81,82]	Brassica Campestris (Rapeseed) Seed Oil[6]	Hydrogenated Rapeseed Oil[7]	Rapeseed Acid[83]	Canola Oil[7]
Appearance	Yellow		Clear, pale yellow-golden		White waxy solid		Light yellow oil
Specific gravity	0.914-0.932 (25◦C)	1.473	0.918-0.928 (20◦C)				
Refractive index	1.469-1.471 (25◦C)	0.914 (20◦C)	1.474-1.479 (20◦C)				1.465-1.467 (40°C)
Iodine value		74.2	130-155	81-112	4 max	119-120 g/100 g	110-126
Saponification value	176-186	192.4	184-194	168-192			
Peroxide value (meq/kg)	0.6-1.1	0.16	10.0 max		2.0 max		10 max
Melting point (◦C)							
Unsaponifiable matter (%)	3.7-4.3			0.5 - 2			1.5 max
Free fatty acids (%)	0.1-0.3			1	2.0 max as oleic acid		0.1% max as oleic acid
Titer (◦C)							
Acid value			1.0 max			197-200 mg KOH/g	

Table 3. Chemical properties for plant-derived fatty acid oils (continued).

Properties and Constituents [a]	Brassica Oleracea Acephala Seed Oil[84]	Brassica Oleracea Italica (Broccoli) Seed Oil[85]	Butyrospermum Parkii (Shea) Butter[6,67,86-89]	Butyrospermum Parkii (Shea) Oil[7]	Camellia Oleifera Seed Oil[90,91]	Canarium Indicum Oil[92,93]	Carica Papaya Seed Oil[94,95]
Appearance	Yellow	Golden	Grey, tallow-like	Pale yellow	Clear, pale yellow or "water white"	Cream to golden	Pale yellow
Specific gravity	0.9010 (20◦C)	0.910-0.918 (20◦C)	0.918 (15◦C)				
Refractive index	1.4741 (23◦C)	1.465-1.475 (20◦C)	1.468 (25◦C)			1.45-1.47	
Iodine value	61.2	90-120	45-77	28 - 43	80-94		65-100
Saponification value	123.06		165-190	185-195	188-196		
Peroxide value (meq/kg)			5.0 max	≤ 10	10.0 max	≤ 20	10.0 max
Melting point (◦C)			32-46; 28-42 (slip)				
Unsaponifiable matter (%)	1.6		3-13	≤ 1.5	1.5 max	≤ 1	
Free fatty acids (%)			1.0 max as oleic acid	≤ 0.1 as oleic acid		0.2	0.8-3
Titer (◦C)			49-54				
Acid value	2.1	1.5	1.5		1.0 max	≤ 10	

Properties and Constituents	Carthamus Tinctorius (Safflower) Seed Oil[7]	Carya Illinoensis (Pecan) Seed Oil[67,71,80]	Caryocar Brasiliense Fruit Oil [Pequi][83,96]	Citrullus Lanatus (Watermelon) Seed Oil[6,97]	Citrus Aurantifolia (Lime) Seed Oil[98,99]	Citrus Aurantium Dulcis (Orange) Seed Oil[100,101]	Citrus Paradisi (Grapefruit) Seed Oil[102,103]
Appearance	Light yellow oil		Yellow[96]	Pale to golden yellow liquid	Clear yellow	Clear, light yellow	Clear yellow
Specific gravity		0.924 (25◦C)		0.8930-0.9166		0.910-0.920 (20◦C)	
Refractive index		1.472		1.4668		1.466-1.475 (20◦C)	
Iodine value	135-150	100 - 105	48.65-74.80[96] 50-70 g/100 g[83]	113-123		90-110	80-125
Saponification value		190	160.15-202[96] 190-210 mg KOH/g	193-195		185-200	
Peroxide value (meq/kg)	10 max	0.15	0.99-5.22[96] ≤20[83]	≤ 5.0	5.0 max	5-10	5-10
Melting point (◦C)							
Unsaponifiable matter (%)	1.5 max	0.35-40					
Free fatty acids (%)	0.1 max as oleic acid		0.98-2.85 (mg KOH/g) [96]	< 5.0 as oleic acid		0.5 as oleic acid	
Titer (◦C)							
Acid value			10 mg KOH/g max[83]		1.0 max	0.8 max	1.0 max

Table 3. Chemical properties for plant-derived fatty acid oils (continued).

Properties and Constituents [a]	Cocos Nucifera (Coconut) Oil[6,7,104]	Cucurbita Pepo (Pumpkin) Seed Oil[105,106]	Elaeis Guineensis (Palm) Oil[6,7]	Elaeis Guineensis (Palm) Kernel Oil[6,7]	Fragaria Ananassa (Strawberry) Seed Oil[6,107,108]	Fragaria Chiloensis (Strawberry) Seed Oil[109,110]	Garcinia Indica Seed Butter [Kokum][111-113]
Appearance	White to light yellow-tan	Dark green	Pale yellow to deep orange in color	Nearly colorless	Light golden/yellow to yellow	Light yellow with some green	
Specific gravity	0.917 - 0.919 (25◦/15.5◦C)		0.921-0.925 (40◦C)		0.93-0.95	0.912-0.930	
Refractive index	1.448 - 1.450 (40◦C)		1.453-1.458 (40◦C)			1.465-1.485	1.4565-1.4575 (40◦C)
Iodine value	6-11	110-330	44-58	14-33		170-190	30-50
Saponification value	248-265	174-197	195-205	245-255		180-195	185-195
Peroxide value (meq/kg)	≤ 10	5.0 max	10 max	10 max	< 15	10 max	
Melting point (◦C)	22 - 26		25-50	25-30			37-43; 27 (slip)
Unsaponifiable matter (%)	≤ 0.5	1.5	0.2-0.8	1.5 max			1.5 max; 18-20; 32-40
Free fatty acids (%)	≤ 0.1% as oleic acid; ≤ 0.07% as lauric acid	1.5 as oleic acid	0.1 max as oleic acid; 0.09 as palmitic acid	0.1 max as oleic acid; 0.07 max as lauric acid		3	0.1-1
Titer (◦C)	20 - 24						
Acid value					18 max		

Properties and Constituents	Glycine Soja (Soybean) Oil[6,7]	Gossypium Herbaceum (Cotton) Seed Oil[6,7]	Guizotia Abyssinica Seed Oil[6]	Hazel Seed Oil*[72,114-116]	Helianthus Annuus (Sunflower) Seed Oil[6,7]	Sunflower Seed Acid[83]	Hippophae Rhamnoides Fruit Oil[117]
Appearance	Light amber oil	Dark red-brown oil	Pale yellow with a bluish tint		Light amber oil		Orange-red
Specific gravity			0.910-0.928	0.912-0.917 (15.5◦C); 0.905-0.925 (20◦C)	0.894-0.899 (60◦C)		0.90
Refractive index			1.467-1.471	1.467-1.474 (20◦C)	1.4597-1.4745 (25◦C)		
Iodine value	120.9-151.4	90-113	126-139	83-100	128-144	125-140 g/100 g	
Saponification value		180-198	180-195	180-200	188-194		
Peroxide value (meq/kg)	10 max	10 max		0.43; 10.0 max	10 max		10 max
Melting point (◦C)					0		
Unsaponifiable matter (%)	0.3-0.6	1.5 max	0.5-1	≤ 1.0	0.3-0.5		
Free fatty acids (%)	0.05-0.7	0.1 max as oleic acid	0.4-3	0.2 max as oleic acid	0.1 max as oleic acid		
Titer (◦C)							
Acid value				≤ 0.5		125-140 mg KOH/g	18 max

*Information mainly on Corylus Avellena.

Table 3. Chemical properties for plant-derived fatty acid oils (continued).

Properties and Constituents [a]	Hippophae Rhamnoides Seed Oil[118-120]	Irvingia Gabonenesis Kernel Butter[121]	Juglans Regia (Walnut) Seed Oil[67,72,80]	Linum Usitatissimum (Linseed) Seed Oil[6]	Macadamia Nut Oil[72,80,122-124]	Mangifera Indica (Mango) Seed Oil[6]	Moringa Oleifera Seed Oil[125-127]
Appearance	Orange				Pale to golden yellow	Pale yellow to ivory cream color	
Specific gravity	0.890-0.955 (20◦C)		0.917 (25◦C)	0.927-0.931 (20◦C)	0.911-0.918 (20◦C)	0.91	0.908 (20◦C); 0.8933 (24◦C)
Refractive index	1.4650-1.4825 (20◦C)		1.475 (25◦C)	1.4786-1.4815	1.466-1.470 (20◦C)	1.456	1.4566 (40◦C)
Iodine value	130-200		150 - 162	170-204	62-82	32-93	66.47
Saponification value	184-210		190 - 197	189-196	190-200	190-195	164.27; 192
Peroxide value (meq/kg)	5-10 max		0.37		0.36; 10.0 max		0.45; 10.0
Melting point (◦C)				0		34-43	18.93
Unsaponifiable matter (%)	1.0	0.13	0.5	0.5-1.5	1.5	0.8-2.9	0.58
Free fatty acids (%)	2.0 max; 18 max	0.30	0.2 - 2.5	5	0.5 max; 1.0 max as oleic acid		2.55 as oleic acid
Titer (◦C)							
Acid value	15				1		

Properties and Constituents	Oenothera Biennis (Evening Primrose) Oil[128,129]	Olea Europaea (Olive) Fruit Oil[6]	Olea Europaea(Olive) Husk Oil[130]	Olive Acid[83]	Oryza Sativa (Rice) Bran Oil[131,132]	Oryza Sativa (Rice) Bran Oil[131,132]	Passiflora Edulis Seed Oil [Passion Fruit]
Appearance	Light yellow	Almost colorless to yellow, greenish, or brown in color			Light golden yellow	Light golden yellow	Golden-orange
Specific gravity	0.920-0.930 (20◦C)	0.914-0.918			0.916-0.922 (15.5◦C)	0.916-0.922 (15.5◦C)	0.917 (20◦C)
Refractive index	1.475-1.480 (20◦C)	1.469-1.484			1.470-1.473 (20◦C)	1.470-1.473 (20◦C)	1.468-1.473 (20◦C)
Iodine value	145-165	64-88; refined 75-94		85-91 g/100 g	92-115	92-115	119.9-129.29[133]
Saponification value	180-195	185-212; refined 184-186			180-195	180-195	176-187.4
Peroxide value (meq/kg)	10.0 max	20 max (refined)	14.33		10.0 max	10.0 max	1.37-2.23
Melting point (◦C)							
Unsaponifiable matter (%)		0.6-1.2; 1.5 max refined					0.9-2.86
Free fatty acids (%)		0.6-1.4; 0.3 max refined			1.0 as oleic acid	1.0 as oleic acid	
Titer (◦C)							
Acid value	1-2			190-201 mg KOG/g			2.11-2.36

Table 3. Chemical properties for plant-derived fatty acid oils (continued).

Properties and Constituents [a]	Persea Gratissima (Avocado) Oil[6]	Pistacia Vera Seed Oil [71]	Plukenetia Volubilis Seed Oil[134]	Prunus Amygdalus (Sweet Almond) Oil[6,67,72,135-137]	Prunus Armeniaca (Apricot) Kernel Oil	Prunus Avium (Sweet Cherry) Seed Oil[138,139]
Appearance			Yellow-amber	Colorless to pale yellow liquid		Clear light yellow
Specific gravity	0.910-0.916		0.90-0.93 (20◦C)	0.911-0.920 (20◦C)	0.923[6]	0.905-0.925 (20◦C)
Refractive index	1.461-1.465		1.478-1.481 (20◦C)	1.467-1.473 (20◦C)	1.4672-1.4722[6]	1.463-1.480 (20◦C)
Iodine value	71-95		180-200	93 - 106	81-123[6]	90-115
Saponification value	177-198		180-210	183 - 197	191[6]	105-135
Peroxide value (meq/kg)		0.22	0-15	0.19		10.0 max
Melting point (◦C)						
Unsaponifiable matter (%)				0.4-1.0	0.4-1.4	
Free fatty acids (%)				1.0 max		0.5% max
Titer (◦C)					0-6[140]	
Acid value			0-2	0.5		1.0 max

Properties and Constituents	Prunus Domestica Seed Oil[141,142]	Prunus Persica (Peach) Kernel Oil[6,143]	Punica Granatum Seed Oil[144,145]	Pyrus Malus (Apple) Seed Oil[146]	Ribes Nigrum (Black Currant) Seed Oil[147-149]	Ribes Rubrum (Currant) Seed Oil[150]
Appearance		Pale yellow (refined)	Golden to dark yellow		Pale yellow or slightly greenish	Pale yellow or slightly greenish
Specific gravity		0.910-0.920 (20◦C) refined	0.935 (15.5◦C)	0.902-0.903 (25◦C)	0.92	0.92
Refractive index				1.465-1.466 (40◦C)		
Iodine value	90-108	90-115 (refined)	190-230	94.14-101.15	145-185	
Saponification value				179.01-197.25		
Peroxide value (meq/kg)	10.0 max	5.0 max (refined)	10.0 max	2.43-2.52	1-10	10 max
Melting point (◦C)						
Unsaponifiable matter (%)						
Free fatty acids (%)	2.0 max as oleic acid		1.4; 5.0 max as oleic acid		0.2	
Titer (◦C)						
Acid value				4.036-4.323	3; 18 max	18 max

Table 3. Chemical properties for plant-derived fatty acid oils (continued).

Properties and Constituents [a]	Rubus Chamaemorus Seed Oil[151]	Rubus Idaeus (Raspberry) Seed Oil[152-154]	Schinziophyton Rautanenii Kernel Oil[155]	Sclerocarya Birrea Seed Oil [Marula][156]	Solanum Lycopersicum (Tomato) Seed Oil[157]	Theobroma Cacao (Cocoa) Seed Butter[6]
Appearance	Yellow-red	Yellow or yellow-red	Light yellow		Clear golden yellow to darker red	
Specific gravity	0.92	0.92			0.9135-0.9357	0.950-0.998
Refractive index			1.4830	1.46	1.4577-1.4771	1.453-1.458
Iodine value		175-195		100.25	105-130.5	35-40
Saponification value		180-200		162.70	156-194.9	190-200
Peroxide value (meq/kg)	10 max	5.0 max; 10 max	10 mg/kg	4.58		
Melting point (◦C)				26-28		33.5
Unsaponifiable matter (%)				3.06		
Free fatty acids (%)		1.5 max as oleic acid				
Titer (◦C)						
Acid value	18 max	18 max		33.70		

Properties and Constituents	Vaccinium Corymbosum (Blueberry) Seed Oil[64,158,159]	Vaccinium Macrocarpon (Cranberry) Seed Oil[6,64,160-163]	Vaccinium Myrtillus Seed Oil[164]	Vaccinium Vitis-Idaea Seed Oil[165]	Vitis Vinifera (Grape) Seed Oil[6]	Zea Mays (Corn) Oil[166,167]
Appearance	Green with yellow tint or dark green /brown	Pale yellow to greenish; light green	Pale yellow to greenish	Pale yellow		Clear, bright golden yellow
Specific gravity		0.923	0.93	0.92	0.91-0.93	0.920-0.928 (15.5◦C)
Refractive index					1.470-1.476	1.472-1.476 (20◦C)
Iodine value	155-175	140-180			125-143	103-128
Saponification value		170-200			176-206	185-195
Peroxide value (meq/kg)	20-24.62	< 15; 10 max	10 max	10 max		10.0 max
Melting point (◦C)						
Unsaponifiable matter (%)						
Free fatty acids (%)	0.67; 2.0 as oleic acid	0.7; 1.0 as oleic acid				
Titer (◦C)						
Acid value		2.0 max; 18 max	18 max	18 max		0.2 max

Table 4**. Total fatty acid composition of plant-derived fatty acid oils (%).**

Fatty Acids	Actinidia Chinensis (Kiwi) Seed Oil[64]	Adansonia Digitata Oil [Baobab] [65,66]	Aleurites Moluccana Seed Oil [Kukui][67,69,70]	Amaranthus Hypochondriacus Seed Oil [Amaranth][168]	Anacardium Occidentale (Cashew) Seed Oil[71]	Arachis Hypogaea (Peanut) Oil[6,73,74]	Arctium Lappa Seed Oil[169]	Argania Spinosa Kernel Oil [Argan][76,77]	Astrocaryum Murumuru Seed Butter [Murumuru][78]	Avena Sativa (Oat) Kernel Oil[79,170]
Caproic (C6)										
Caprylic (C8)									1.85	
Capric (C10)									1.85	
Lauric (C12)*	0.02								47.46	
Myristic (C14)	0.03				0.07		0.01		26	0.2-0.3
Myristoleic (C14:1)										
Palmitic (C16)	5.96	18-30	5-8	19 - 20	9.9	5-16	7.27	10-15	6.28	13.9-18.82
Palmitoleic (C16:1)		1	0.5		0.4		0.01			0.1-0.4
Heptadecanoic (C17:0)					0.1					
Stearic (C18)	3.09	2-8	0.1-6.7	3	8.7	1-6.5	32.56	5-6.5	2.65	0.8-2.79
Oleic (C18:1)	14.6	30-40	10-35	22 - 26	57.2	33.3-76	50.21	45-55	12.56	31.4-51.26
Linoleic (C18:2)	17.55	24-34	35-50	46 - 50	20.8	8-47.5	3.18	28-36	2.87	22.8-43.1
Linolenic (C18:3)	57.4	1-3	24-40		0.2	0-0.6				0.64-2.1
Arachidic (C20)	0.34		1.5		1	0.17-3	0.22			
Eicosenoic (C20:1)			1		0.3	0.33-3	0.33			0.5-1
Eicosadienoic (C20:2)										
Arachidonic (C20:4)										
Behenic (C22)					0.4	1-5				
Erucic (C22:1)					0.3	0.5				
Docosadienoic (C22:2)										
Docosahexaenoic (C22:6)										
Lignoceric (C24)						0.2-3	0.49			
Others						<C16:0 = 0.4	heptadecenoic=0.02; nonadecadienoic acid=2.99; heneicosanoic acid =1.07; dicosanoic acid=0.43			Arachidic (C20) + Eicosadienoic (C20:2)=0.1-0.3; C18:1, n-11=0.9-1.3

Table 4. Total fatty acid composition of plant-derived fatty acid oils (%) (continued).

Fatty Acids	Bassia Butyracea Seed Butter[a,111]	Bassia Latifolia Seed Butter [Mahwa][b,111]	Bertholletia Excelsa Seed Oil [Brazil][71]	Borago Officinalis Seed Oil [Borage] [81,82]	Brassica Campestris (Rapeseed) Seed Oil[6]	Rapeseed Acid[83]	Brassica Napus Seed Oil [Rapeseed][171]	Hydrogenated Rapeseed Oil[7]	Canola Oil[7]
Caproic (C6)									
Caprylic (C8)									
Capric (C10)									
Lauric (C12)									
Myristic (C14)			0.06			≤0.5		< 1.0	<0.2
Myristoleic (C14:1)									
Palmitic (C16)	60.8	23.7-24.7	13.5	9-13	1.5 - 3	≤8	2	3-5.0	<6.0
Palmitoleic (C16:1)			0.3			≤2			<1.0
Heptadecanoic (C17:0)			0.2						
Stearic (C18)	3.2	19.3-29.9	11.8	3-5	0.7 - 1.3	≤3	1	38-42	<2.5
Oleic (C18:1)	30.9	36.3-43.3	29.1	10-22	12.1 - 57.4	54-70	21	1	>50
Linoleic (C18:2)	4.9	11.6-15.8	42.8	33-46	11.4 - 22.1	18-24	20	< 1.0	<40.0
Linolenic (C18:3)			0.2	18-25	8.3 - 12.5	5-10	2		<14
Arachidic (C20)			0.5			≤6	1	8-10.0	<1.0
Eicosenoic (C20:1)			0.2	2-6	5.6 - 3.1			< 1.0	<2.0
Eicosadienoic (C20:2)									
Arachidonic (C20:4)									
Behenic (C22)			0.1					42-50	<0.5
Erucic (C22:1)			0.3	1-3.5	1 - 58.6		53	< 1.0	<2.0
Docosadienoic (C22:2)									
Docosahexaenoic (C22:6)									
Lignoceric (C24)							2	1-2.0	<0.2
Others				α-Linolenic (C18:3) = 0.4%; γ-Linolenic = 1-3.5%		<C14 = ≤0.5; >C18:3 = ≤5; >C20 = ≤6			<C14 = <0.1; C24:1 = <0.2

Table 4. Total fatty acid composition of plant-derived fatty acid oils (%) (continued).

Fatty Acids	Brassica Oleracea Acephala Seed Oil [Kale][84]	Brassica Oleracea Italica (Broccoli) Seed Oil[85]	Butyrospermum Parkii (Shea) Oil[7]	Butyrospermum Parkii (Shea) Butter[6,86-88]	Camelina Sativa Seed Oil [False Flax][172]	Camellia Japonica Seed Oil[173]	Camellia Kissi Seed Oil[173]	Camellia Oleifera Seed Oil [Tea Seed][90,91]	Camellia Sinensis Seed Oil[173]
Caproic (C6)									
Caprylic (C8)									
Capric (C10)									
Lauric (C12)									
Myristic (C14)				0.5					
Myristoleic (C14:1)									
Palmitic (C16)	4.4	0-5	3.8-4.1	3-9	7.8	7.9		6.1-15	8-10
Palmitoleic (C16:1)						0.16			
Heptadecanoic (C17:0)									
Stearic (C18)	0.7	0-5	41.2-56.8	30-50	2.96	2.46		0.8-2	1.5-3.5
Oleic (C18:1)	11.3	10-20	34.0-46.9	38-50	16.77	84.99	80	72-87	78-86
Linoleic (C18:2)	12.6	10-20	3.7-6.5	3-8	23.08	3.76		5.3-14.3	7-10
Linolenic (C18:3)	10.2	5-10		0.5 max	31.2				0.2-0.8
Arachidic (C20)	8.2		1-2	2.5-3		0.49			
Eicosenoic (C20:1)	0.4	5-10			11.99				
Eicosadienoic (C20:2)									
Arachidonic (C20:4)									
Behenic (C22)									
Erucic (C22:1)	51.8	40-50			2.8				
Docosadienoic (C22:2)									
Docosahexaenoic (C22:6)									
Lignoceric (C24)									
Others					3.4				

Table 4. Total fatty acid composition of plant-derived fatty acid oils (%) (continued).

Fatty Acids	Canarium Indicum Oil [Galip][92,93]	Carica Papaya Seed Oil [Papaya][94,95]	Carthamus Tinctorius (Safflower) Seed Oil[32,174]	Carya Illinoensis (Pecan) Seed Oil[67,71]	Caryocar Brasiliense Fruit Oil [Pequi][c,83,96]	Chenopodium Quinoa Seed Oil [Quinoa][175]	Citrullus Lanatus (Watermelon) Seed Oil[97]	Citrus Aurantifolia (Lime) Seed Oil[98,99]	Citrus Aurantium Dulcis (Orange) Seed Oil[100,101]
Caproic (C6)									
Caprylic (C8)									
Capric (C10)									
Lauric (C12)	≤ 2								
Myristic (C14)	≤ 2			Trace	0.5	0.2		1	
Myristoleic (C14:1)									
Palmitic (C16)	28-38	8-18	2	3-4.3	34.4-44.3	9.9 - 11	8.0 - 13.0	20-30	14-22
Palmitoleic (C16:1)	≤ 2	2		0.1	1.3	0.1	< 1.0		
Heptadecanoic (C17:0)	≤ 2			0.1					
Stearic (C18)	10-20	2-6		1.8-2	0.66-1.8	0.7 - 0.8	8.0 - 12.0	3-8	2-6
Oleic (C18:1)	30-40	60-77	26	40.6-79	54.55-57.4	22 – 50.2	15.0 - 30.0	20-38	26-35
Linoleic (C18:2)	12-22	3-25	68	16-50.3	0.84-2.8	1.2 – 56	55.0 - 65.0	30-45	35-45
Linolenic (C18:3)		0.8	Trace	0.7	0.18-1.0	0.7 – 7	< 1.0	5-15	2-6
Arachidic (C20)			Trace	Trace		0.7	< 1.0	2	0.5
Eicosenoic (C20:1)		2		1.2			< 1.0		
Eicosadienoic (C20:2)									
Arachidonic (C20:4)									
Behenic (C22)				0.2			< 1.0		
Erucic (C22:1)				0.3					
Docosadienoic (C22:2)									
Docosahexaenoic (C22:6)							< 2.0		
Lignoceric (C24)									
Others	Others = ≤ 2	α-Linolenic (C18:3) = 2%;					< 1.0		

Table 4. Total fatty acid composition of plant-derived fatty acid oils (%) (continued).

Fatty Acids	Citrus Grandis (Grapefruit) Seed Oil[102,103]	Citrus Limon (Lemon) Seed Oil[176]	Citrus Paradisi (Seed) Oil[177]	Cocos Nucifera (Coconut) Oil[33]	Coix Lacryma-Jobi (Job's Tears) Seed Oil[178]	Corylus Americana (Hazel) Seed Oil[171]	Corylus Avellana (Hazel) Seed Oil[12,114-116]	Crambe Abyssinica Seed Oil [Abyssinian Mustard][171,179]	Cucumis Sativus (Cucumber) Seed Oil[180]	Cucurbita Pepo (Pumpkin) Seed Oil[105,106]
Caproic (C6)				0-1						
Caprylic (C8)				5-9						
Capric (C10)				6-10				<0.01-0.11		
Lauric (C12)	1.5		2.95	44-52				<0.01-0.14		
Myristic (C14)	1		1.01	13-19			≤0.2	<0.01-0.43		
Myristoleic (C14:1)								<0.01-0.09		
Palmitic (C16)	18-30	18.8	36.25	8-11	16.0	6	4-9	0.81-5.55	9-13	10-16
Palmitoleic (C16:1)				0-1			0.2-1	<0.01-0.77		
Heptadecanoic (C17:0)		0.08					≤0.1			
Stearic (C18)	2-8	3.5	5.95	1-3	trace	3	1-6	0.6-10.42	6-9	3-7
Oleic (C18:1)	20-38	30.1	18.34	5-8	53	76	66-85	12.8-23.13	14-20	18-38
Linoleic (C18:2)	30-48	33.4	29.26	Trace-2.5	30.5	15	7-25	9.08-15.86	60-68	40-62
Linolenic (C18:3)	2-6	13.5	3.58		trace		≤0.6	3.27-9.43	<1	1
Arachidic (C20)		0.3	0.38				≤0.5	<0.01-1.19		
Eicosenoic (C20:1)		0.03	0.84				≤0.5	<0.01-6		
Eicosadienoic (C20:2)								<0.01-0.21		
Arachidonic (C20:4)								<0.01		
Behenic (C22)		0.08					≤0.3	<0.01-2.59		
Erucic (C22:1)							Trace-0.01	48.86-60		
Docosadienoic (C22:2)										
Docosahexaenoic (C22:6)								<0.01-1.34		
Lignoceric (C24)		0.2					0.01	<0.01-1.85		
Others		C23:0 = <0.01; C26:0 = 0.01	C12:1=1.44				C17:1 = ≤ 0.1	C20:3 = <0.01-0.19; C20:5 = <0.01-1.91		

Table 4. Total fatty acid composition of plant-derived fatty acid oils (%) (continued).

Fatty Acids	Cynara Cardunculus Seed Oil [Artichoke][181]	Elaeis Guineensis (Palm) Oil[26]	Elaeis Guineensis (Palm) Kernel Oil[26]	Elaeis Oleifera Kernel Oil[182]	Euterpe Oleracea Fruit Oil [Acai][183]	Fragaria Ananassa (Strawberry) Seed Oil[64,107,108]	Fragaria Chiloensis (Strawberry) Seed Oil[110]	Garcinia Indica Seed Butter [Kokum][d,121,184]	Gevuina Avellana Oil [Chilean Hazel][185]
Caproic (C6)			0.3	0.1					
Caprylic (C8)			4.4	0.9					
Capric (C10)			3.7	0.8					
Lauric (C12)		0.2	48.3	29.3					
Myristic (C14)		1.1	15.6	25.7		0.05			
Myristoleic (C14:1)									
Palmitic (C16)	12	44	7.8	10.1	22	4.32	3-5	2-8	1.9
Palmitoleic (C16:1)		0.1			2		0-0.2		22.7
Heptadecanoic (C17:0)									
Stearic (C18)	3	4.5	2	1.8	2	1.68	1-2	50-67.4	0.5
Oleic (C18:1)	25	39.2	15.1	26.4	60	10-20	15-18	27-42	39.4
Linoleic (C18:2)	60	10.1	2.7	4.5	12	28.5 – 50	40-46	0.5-2	5.6
Linolenic (C18:3)		0.4			Trace	25-40	30-36		0.1
Arachidic (C20)		0.4			2.5	0.71	0-0.2	0.7	1.4
Eicosenoic (C20:1)							0-0.2		3.1
Eicosadienoic (C20:2)									
Arachidonic (C20:4)									
Behenic (C22)									2.2
Erucic (C22:1)									
Docosadienoic (C22:2)									
Docosahexaenoic (C22:6)									
Lignoceric (C24)									0.5
Others			0.2	0.4		5.5 - 8.5	C18:3 w6=0-0.1		C18:1Δ12 = 6.2; C20:1Δ15 = 6.6; ; C22:1Δ17 = 7.9; ; C22:1Δ19 = 1.6

Table 4. Total fatty acid composition of plant-derived fatty acid oils (%) (continued).

Fatty Acids	Glycine Soja (Soybean) Oil[6]	Gossypium Herbaceum (Cotton) Seed Oil[27]	Guizotia Abyssinica Seed Oil [Ramtil/Niger][6]	Helianthus Annuus (Sunflower) Seed Oil[6]	Sunflower Seed Acid[83]	Hippophae Rhamnoides Fruit Oil[e,117,186]	Hippophae Rhamnoides Seed Oil[119,120,186]	Irvingia Gabonenesis Kernel Butter[121,121]	Juglans Regia (Walnut) Seed Oil[187]
Caproic (C6)									
Caprylic (C8)									
Capric (C10)									
Lauric (C12)								35-51.1	
Myristic (C14)		2			≤2	0.4-0.6		36.8-58	
Myristoleic (C14:1)						0.2			
Palmitic (C16)		21	5.0-13	5.0 - 7.2	6-11	24-42	5-11.3	3.9-5	3-7
Palmitoleic (C16:1)						24-42	4.4		
Heptadecanoic (C17:0)									
Stearic (C18)		Trace	2.0-11	2.0 - 6.5	3-7	0.9-2.1	2-5	0.4-0.7	0.5-3
Oleic (C18:1)	11.5 - 60.0	30	6.0-40	14.7 - 37.2	19-31	3-30	11-30	0.6-2.7	9-30
Linoleic (C18:2)	0000	45	45-77	51.5 - 73.5	57-66		28-45	0.60	57-76
Linolenic (C18:3)	2.9 - 12.1			Trace - 0.3	≤1	1.7-6.8	24.9-38	1.3	2-16
Arachidic (C20)		Trace		0.3 - 1	≤3				
Eicosenoic (C20:1)									
Eicosadienoic (C20:2)									
Arachidonic (C20:4)									
Behenic (C22)									
Erucic (C22:1)									
Docosadienoic (C22:2)									
Docosahexaenoic (C22:6)									
Lignoceric (C24)			2 max						
Others					>C20 = ≤3	Vakccenic C18:1(n-7) = 7.3-7.5; α-Linoleic C18:2 = 4.1-5.5	Vakccenic C18:1(n-7) = 3.2; α-Linoleic C18:2 = 34.1; Others = 3 max		

Table 4. Total fatty acid composition of plant-derived fatty acid oils (%) (continued)[a]

Fatty Acids	Limnanthes Alba (Meadowfoam) Seed Oil[6]	Linum Usitatissimum (Linseed) Seed Oil[6]	Luffa Cylindrica Seed Oil[188]	Lupinus Albus Seed Oil[189]	Lycium Barbarum Seed Oil[190]	Macadamia Integrifolia Seed Oil[f,2,122-124]	Mangifera Indica (Mango) Seed Oil[g,6]	Morinda Citrifolia Seed Oil[191]	Moringa Oleifera Seed Oil [Ben/Moringa][125,126,192]	Oenothera Biennis (Evening Primrose) Oil[128,129]
Caproic (C6)										
Caprylic (C8)								1.44		
Capric (C10)										
Lauric (C12)						0.1-1.4				
Myristic (C14)			0.1			0.7-1.5			Trace	
Myristoleic (C14:1)										
Palmitic (C16)		5.5	12.2	14.44-21.57		6-12	5-8	9.0	5-9.3	4-10
Palmitoleic (C16:1)			0.1	0.36-1.03		12-25		0.12	1.5-3	
Heptadecanoic (C17:0)								0.13		
Stearic (C18)		3.5	0.1	1.37-3.91	3	0.5-8	33-48	4.07	3-8	2-4
Oleic (C18:1)		19.1	19.6	42.78-52.87	19.1	50-67	35-50	17.45	65-80	5-12
Linoleic (C18:2)		15.3	59.7	9.20-17.23	68.3	1.5-5	4.0-8	59.45	1.5-5	60-85
Linolenic (C18:3)		57		4.81-9.02	2.8	0.5-1.9		0.27	1-1.5	
Arachidic (C20)				1.61-2.30		1.5-5	1-7	0.51	2-5	
Eicosenoic (C20:1)	52 - 77			3.86-5.30		1.5-3.1		0.2	2.5-4	
Eicosadienoic (C20:2)										
Arachidonic (C20:4)					0.68					
Behenic (C22)				4.75-5.99		0.3-1			8-8.6	
Erucic (C22:1)	8.0 - 29			0.51-1.47		1			3	
Docosadienoic (C22:2)	7.0 - 20									
Docosahexaenoic (C22:6)										
Lignoceric (C24)									Trace	
Others										α-Linolenic (C18:3) = 1% γ-Linolenic = 7-12%

Table 4. Total fatty acid composition of plant-derived fatty acid oils (%) (continued).

Fatty Acids	Olea Europaea (Olive) Oil[6]	Olea Europaea (Olive) Husk Oil[130]	Olive Acid[83]	Orbignya Cohune Seed Oil [Cohune][6]	Orbignya Oleifera Seed Oil [Babassu][6]	Orbignya Speciosa Kernel Oil[193]	Oryza Sativa (Rice) Bran Oil[132]	Oryza Sativa (Rice) Germ Oil[28]	Passiflora Edulis Seed Oil [Passion Fruit][133]
Caproic (C6)									
Caprylic (C8)				7.5	4 to 8	2-10			
Capric (C10)				6.5	4 to 8	2-12			
Lauric (C12)				46.5	44 - 47	35-50			
Myristic (C14)	Trace		≤1.0	16	15 - 20	12-25		6.92[28]	0.03
Myristoleic (C14:1)									
Palmitic (C16)	7.5 - 20	14.96	9-15	9.5	6 to 9	4-15	14	9.28	8.57
Palmitoleic (C16:1)	0.3 - 3.5	2.18	≤2					4.41[28]	0.23
Heptadecanoic (C17:0)			≤0.5						
Stearic (C18)	0.5 - 3.5	1	2-5	3	3 to 5	1-7	2	7.91[28]	1.66
Oleic (C18:1)	53 - 86	64.08	69-78	10	10 to 12	5-20	45	17.81[28]	16.25
Linoleic (C18:2)	3.5 - 20	16.09	8-14	1	1 to 3	<3	34	16.22[28]	72.69
Linolenic (C18:3)	0 - 1.5	0.71	≤3.5				1	15.56[28]	0.26
Arachidic (C20)	Trace							3.08[28]	
Eicosenoic (C20:1)									
Eicosadienoic (C20:2)									
Arachidonic (C20:4)								5.48[28]	
Behenic (C22)	Trace								
Erucic (C22:1)									
Docosadienoic (C22:2)									
Docosahexaenoic (C22:6)									
Lignoceric (C24)	Trace								
Others								Arachidontrienoic = 5.21[28]	Unspecified other fatty acids = 0.31

Table 4. Total fatty acid composition of plant-derived fatty acid oils (%) (continued).

Fatty Acids	Perilla Ocymoides Seed Oil [Perilla][6]	Persea Gratissima (Avocado) Oil[6]	Pistacia Vera Seed Oil [Pistachio][71]	Plukenetia Volubilis Seed Oil [Sacha Inchi][194]	Prunus Amygdalus (Sweet Almond) Oil[6,67,135-137,195]	Prunus Armeniaca (Apricot) Kernel Oil[140]	Prunus Avium (Sweet) Cherry Seed Oil[h,138,139]	Prunus Domestica Seed Oil [Prune/Plum][141,142]
Caproic (C6)								
Caprylic (C8)								
Capric (C10)								
Lauric (C12)								
Myristic (C14)			0.09	0.02	1			
Myristoleic (C14:1)								
Palmitic (C16)		13-17	7.4	4.72	4-9	4.6-6	4-10	4-9
Palmitoleic (C16:1)		3 - 5.1	0.7	0.04	0.8	1-2		1
Heptadecanoic (C17:0)				0.12	0.2			
Stearic (C18)			0.9	3.33	2-3	0.5-1.2	1-4	3
Oleic (C18:1)	14-23	67-72	58.2	10.46	62-86	58-65.7 (total 18:1) 29-33	23-55	60-80
Linoleic (C18:2)	16	10 to 12	30.3	37.64	20-30	28.5 (undef. 18:2)	30-55	15-25
Linolenic (C18:3)	63-70		0.4	48.96	0.4	05-1.0 (undef 18:3)	13	1
Arachidic (C20)			0.6	0.09	0.2	0.2	2	
Eicosenoic (C20:1)			0.6	0.3	0.3			
Eicosadienoic (C20:2)								
Arachidonic (C20:4)								
Behenic (C22)			0.3		0.2			
Erucic (C22:1)			0.6		0.1			
Docosadienoic (C22:2)								
Docosahexaenoic (C22:6)								
Lignoceric (C24)								
Others				C17:1 = 0.06; gamma C18:3 = 0.24;Others = 0.02	<C16:0 = 0.1	Oleic/Linoleic = 90-93%	Eleostearic (C18:3 conj) = 10%	

Table 4. Total fatty acid composition of plant-derived fatty acid oils (%) (continued).

Fatty Acids	Prunus Persica (Peach) Kernel Oil[143]	Punica Granatum Seed Oil [Pomegranate][144,145]	Pyrus Malus (Apple) Seed Oil[146]	Ribes Nigrum (Black Currant) Seed Oil[147-149]	Ribes Rubrum (Currant) Seed Oil[150,196]	Rosa Canina Seed Oil [Dog Rose][176,197]	Rubus Chamaemorus Seed Oil[151]	Rubus Idaeus (Raspberry) Seed Oil[64,152-154]
Caproic (C6)								
Caprylic (C8)								
Capric (C10)								
Lauric (C12)								
Myristic (C14)						0.11-0.21		0.07
Myristoleic (C14:1)								
Palmitic (C16)	2.0 - 7	1-10	6.51-6.60	6-10	4.6-4.8	1.71-4.6		2-2.43
Palmitoleic (C16:1)			0-0.05			0.24-1.01		
Heptadecanoic (C17:0)						0.04		
Stearic (C18)	0.5 - 3.5	1-5	1.75-1.96	1-4	2-3	1.69-2.47		0.9-1
Oleic (C18:1)	55 - 70	3-12	37.49-38.55	9-16	17.1-17.8	14.71-21.7	13-19	8-13
Linoleic (C18:2)	22 - 33	2-12	50.70-51.40	40-54	36-48	47.9-54.41	40-52	47-63
Linolenic (C18:3)	$\leq$ 1		0.19-0.30	11-18	15-30	16.42-21.8	27-38	25-40
Arachidic (C20)			1.49-1.54	1		1.0-2.61		0.37
Eicosenoic (C20:1)			0.51-0.56	3		0.3		
Eicosadienoic (C20:2)						0.07		
Arachidonic (C20:4)								
Behenic (C22)			0-0.40	1		0.1-0.64		
Erucic (C22:1)				1				
Docosadienoic (C22:2)								
Docosahexaenoic (C22:6)								
Lignoceric (C24)						0.04		
Others		Punicic (C18:3conj) = 60-80; Other C18:3conj = 18%		C18:3 (n-6) = 11-18 C18:4 (n-3) = 2-5	C18:1n-7 = 0.5-0.6; C18:3n-6 = 5.6-12; C18:4n-3 = 2-5; Others = 0-0.3	C17:1 = 0.01; C21:0= 0.01, C23:0 = 0.03		

Table 4. Total fatty acid composition of plant-derived fatty acid oils (%) (continued).

Fatty Acids	Schinziophyton Rautanenii Kernel Oil[155]	Sclerocarya Birrea Seed Oil [Marula][156,198]	Sesamum Indicum (Sesame) Seed Oil[25,55]	Silybum Marianum Seed Oil [Thistle][199]	Solanum Lycopersicum (Tomato) Seed Oil[157]	Solanum Lycopersicum (Tomato) Fruit Oil[i,200]	Theobroma Cacao (Cocoa) Seed Butter[6]	Theobroma Grandiflorum Seed Butter [Cupuacu][201]
Caproic (C6)		1.41						
Caprylic (C8)								
Capric (C10)								
Lauric (C12)					Trace-0.3			
Myristic (C14)		2.12	<0.5		1.5-2.3			Trace
Myristoleic (C14:1)					Trace			
Palmitic (C16)	8	9-12; 22.56	7.0 - 12.0	9.4	16.9-23.4	47	24-29	7.2
Palmitoleic (C16:1)		0.05 - 0.15	<0.5		3.3-6.8			0.1
Heptadecanoic (C17:0)								0.2
Stearic (C18)	9	5-8; 50.76	3.5 - 6.0	6.6	4.0-9.5	3	34-36	30.8
Oleic (C18:1)	15	4.13; 70 - 78	35 - 50	21.3	18.3-29.7	30	30-40	43.9
Linoleic (C18:2)	37	4.0 - 7.0	35 - 50	53.3	37.6-42.8	12	2.4	4.6
Linolenic (C18:3)	25	0.1 - 0.6	<1.0	trace	Trace-0.7			Trace
Arachidic (C20)		0.3 - 0.7	<1.0	3.8	0.8-1.3			11
Eicosenoic (C20:1)		0.1 - 0.5	<0.5	0.5				
Eicosadienoic (C20:2)								
Arachidonic (C20:4)		8.46						
Behenic (C22)		5.14	<0.5	2.4	Trace-0.7			
Erucic (C22:1)		0.1 - 0.5						
Docosadienoic (C22:2)								
Docosahexaenoic (C22:6)								
Lignoceric (C24)		4.13		0.7				
Others		Butyric = 0.35%	Trace of components below C14			Other (C14 + C20) = 8		

Table 4. Total fatty acid composition of plant-derived fatty acid oils (%) (continued).

Fatty Acids	Torreya Nucifera Seed Oil [Kaya][202]	Triticum Vulgare (Wheat) Germ Oil[30,52]	Vaccinium Corymbosum (Blueberry) Seed Oil[64,158,159]	Vaccinium Macrocarpon (Cranberry) Seed Oil[64,160-163]	Vaccinium Myrtillus Seed Oil [Bilberry][164,203]	Vaccinium Vitis-Idaea Seed Oil [Lingonberry][165,203]	Vitis Vinifera (Grape) Seed Oil[6]	Zea Mays (Corn) Oil[53,166,167]	Zea Mays (Corn) Oil[53,166,167]
Caproic (C6)									
Caprylic (C8)									
Capric (C10)									
Lauric (C12)			0.02	0.14					
Myristic (C14)	Trace		0.09	0.08	2.2-2.5	1.6-2.6		0.1 - 1.7	0.1 - 1.7
Myristoleic (C14:1)									
Palmitic (C16)	6.03	11.0 - 16	3-8	4-6	4.8-7.4	4.4-6.7	7-9.5	8-16.5	8-16.5
Palmitoleic (C16:1)	Trace							0.2 - 1.6	0.2 - 1.6
Heptadecanoic (C17:0)	Trace								
Stearic (C18)	2.51	1.0 - 6	0.5-3.5	1-1.25	2.2-2.5	1.2-1.9	3.5-5.5	0-4.5	0-4.5
Oleic (C18:1)	30.35	8.0 - 30	15-25	15-25.3	17.4-23	10-25	14-44	19 – 49	19 – 49
Linoleic (C18:2)	51.26	44 - 65	35-45	32-42	35-47.5	30-46.8	46-74	34-66	34-66
Linolenic (C18:3)	0.23	4.0 - 10	22-38	30-40	23.1-40	25.2-55		0-2	0-2
Arachidic (C20)			0.25	0.07				1	1
Eicosenoic (C20:1)	0.28							1	1
Eicosadienoic (C20:2)	0.98								
Arachidonic (C20:4)									
Behenic (C22)									
Erucic (C22:1)									
Docosadienoic (C22:2)									
Docosahexaenoic (C22:6)									
Lignoceric (C24)									
Others	C18:1 Δ11 = 0.57; C18:3 Δ5,9,12 = 0.08; C20:2 Δ 5,11 = 0.79; C20:3 Δ5,11,14 = 6.68; Others = 0.24	0 - 1.2 C20-22 Saturated acids		α-Linolenic (C18:3) = 34-35%					

[a]As Bassia Butyracea seed fat. [b]As Bassia Latifolia seed fat or Madhuca Indica seed fat. [c]As Caryocar Brasiliense pulp oil. [d]As Garcinia Indica seed fat. [e]As Hippophae pulp oil.
[f]Macadamia Integrifolia and Macadamia Ternifolia are synonyms; information is being reported under the more common name. [g]As mango kernel fat. [h]As cherry kernel oil. [i]With palm oil.

Table 5a. **Frequency and concentration of use according to duration and exposure - ingredients not previously reviewed by the CIR**

	No. of Uses	Conc of Use (%)	No. of Uses	Conc of Use (%)	No. of Uses	Conc of Use (%)	No. of Uses[48]	Conc of Use (%)	No. of Uses[48]	Conc of Use (%)	No. of Uses[48]	Conc of Use (%)
	Actinidia Chinensis (Kiwi) Seed Oil		**Adansonia Digitata Oil**		**Aleurities Moluccana Seed Oil**		**Anacardium Occidentale (Cashew) Seed Oil**		**Argania Spinosa Kernel Oil**		**Astrocaryum Murumuru Seed Butter**	
Totals*	**7**	**0.1**	**6**	**0.01**	**141**	**0.00001-5**	**10**	**0.002-1**	**100**	**0.001-10**	**192**	**0.001-7**
Duration of Use												
Leave-On	*5*	*NR*	*4*	*0.01*	*87*	*0.00002-5*	*9*	*0.04-1*	*87*	*0.001-10*	*171*	*0.001-7*
Rinse-Off	*2*	*0.1*	*2*	*NR*	*54*	*0.00001-3*	*1*	*0.002*	*13*	*0.001-2*	*21*	*0.001-0.2*
Exposure Type												
Eye Area	NR	NR	NR	NR	6	0.0001-0.005	NR	NR	11	0.1-1	21	0.06-0.5
Possible Ingestion	1	NR	NR	0.01	1	0.01	NR	NR	9	0.1-1	22	1-7
Inhalation	1	NR	NR	NR	15	0.1	NR	NR	NR	0.01	NR	NR
Dermal Contact	5	NR	5	0.01	76	0.00001-5	9	0.002-1	88	0.001-10	178	0.001-7
Deodorant (Underarm)	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.001	NR	NR
Hair - Non-Coloring	2	0.1	1	NR	58	0.00002-0.1	1	NR	8	0.01-1	11	0.001-0.2
Hair - Coloring	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.07-0.1	3	NR
Nail	NR	NR	NR	NR	4	NR	NR	NR	2	0.001-0..1	NR	NR
Mucous Membrane	NR	NR	NR	NR	5	0.00001-0.4	NR	NR	2	0.001-2	3	NR
Bath Products	NR	NR	NR	NR	6	0.01-0.3	NR	NR	1	0.05	NR	NR
Baby Products	NR	NR	1	NR	NR	NR	NR	NR	NR	NR	NR	NR

	Sodium Astrocaryum Murumuruate		**Avena Sativa (Oat) Kernel Oil**		**Bassia Latifolia Seed Butter**		**Bertholletia Excelsa Seed Oil**		**Borago Officinalis Seed Oil**		**Brassica Campestris (Rapeseed) Seed Oil**	
Totals	**NR**	**0.002-0.005**	**43**	**0.01-3**	**22**	**0.001-2**	**55**	**0.0003-0.5**	**180**	**0.001-1**	**27**	**0.007-17**
Duration of Use												
Leave-On	*NR*	*0.002*	*37*	*0.1-3*	*17*	*0.001-0.05*	*18*	*0.0003-0.5*	*160*	*0.001-1*	*23*	*0.007-17*
Rinse-Off	*NR*	*0.002-0.005*	*6*	*0.001-0.1*	*5*	*0.001-2*	*37*	*0.01-0.2*	*20*	*0.001-0.01*	*4*	*0.1-1*
Exposure Type												
Eye Area	NR	NR	NR	0.2	4	0.01	1	NR	7	0.001-0.5	2	NR
Possible Ingestion	NR	NR	NR	2	NR	NR	NR	NR	NR	0.01	1	9
Inhalation	NR	NR	NR	NR	NR	NR	1	NR	3	0.1	NR	NR
Dermal Contact	NR	0.002-0.005	41	0.001-3	22	00.01-2	29	0.0003-0.5	168	0.001-1	27	0.007-17
Deodorant (Underarm)	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Hair - Non-Coloring	NR	NR	2	0.1	NR	0.001-0.5	12	0.03-0.2	10	NR	NR	0.1
Hair - Coloring	NR	NR	NR	NR	NR	NR	14	NR	NR	NR	NR	NR
Nail	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Mucous Membrane	NR	0.002	2	0.01-0.1	5	NR	7	0.01	4	0.001-0.01	1	NR
Bath Products	NR	NR	1	NR	NR	NR	3	NR	1	NR	NR	NR
Baby Products	NR	NR	6	0.1	NR	NR	NR	NR	3	NR	NR	NR

Table 5a. Frequency and concentration of use according to duration and exposure. - ingredients not previously reviewed by the CIR (continued)

	No. of Uses	Conc of Use (%)	No. of Uses	Conc of Use (%)	No. of Uses	Conc of Use (%)	No. of Uses	Conc of Use (%)	No. of Uses	Conc of Use (%)	No. of Uses	Conc of Use (%)
	Hydrogenated Rapeseed Oil		**Brassica Oleracea Italica (Broccoli) Seed Oil**		**Butyrospermum Parkii (Shea) Oil**		**Butyrospermum Parkii (Shea) Butter**		**Butyrospermum Parkii (Shea) Butter Unsaponifiables**		**Hydrogenated Shea Butter**	
Totals	**1**	**0.3-4**	**NR**	**0.001-3**	**22**	**0.01-15**	**1950**	**0.0005-60**	**38**	**0.06-3**	**4**	**1**
Duration of Use												*1*
Leave-On	*NR*	*0.3-4*	*NR*	*3*	*16*	*0.01-15*	*1680*	*0.001-60*	*35*	*0.06-3*	*2*	*1*
Rinse-Off	*1*	*NR*	*NR*	*0.001-0.5*	*22*	*0.6-1*	*270*	*0.0005-30*	*3*	*NR*	*2*	*1*
Exposure Type												
Eye Area	NR	2	NR	NR	1	NR	108	0.1-8	7	0.2-0.7	NR	NR
Possible Ingestion	NR	NR	NR	NR	NR	15	128	0.5-26	2	3-Jan	NR	NR
Inhalation	NR	NR	NR	NR	NR	NR	17	0.001-3	NR	NR	NR	NR
Dermal Contact	1	0.3-4	NR	NR	22	0.6-15	1724	0.001-45	33	0.06-3	4	1
Deodorant (Underarm)	NR	NR	NR	NR	NR	NR	2	1	NR	NR	NR	NR
Hair - Non-Coloring	NR	NR	NR	NR	NR	NR	210	0.0005-3	5	2	NR	NR
Hair - Coloring	NR	NR	NR	0.001-3	NR	NR	4	NR	NR	NR	NR	NR
Nail	NR	NR	NR	NR	NR	0.01-1	7	0.01-60	NR	NR	NR	NR
Mucous Membrane	NR	NR	NR	NR	3	0.6	101	0.003-5	NR	NR	NR	NR
Bath Products	NR	NR	NR	NR	3	1	13	1	NR	NR	2	NR
Baby Products	NR	NR	NR	NR	NR	NR	24	0.01-5	NR	NR	NR	NR

	Camelina Sativa Seed Oil		**Camellia Japonica Seed Oil**		**Camellia Kissi Seed Oil**		**Camellia Oleifera Seed Oil**		**Hydrogenated Camellia Oleifera Seed Oil**		**Camellia Sinensis Seed Oil**	
Totals	**76**	**0.002-1**	**NR**	**0.01-0.2**	**47**	**0.1-10**	**25**	**0.003-3**	**1**	**NR**	**12**	**0.1**
Duration of Use												
Leave-On	*61*	*0.002-1*	*NR*	*0.01-0.2*	*34*	*0.1-10*	*23*	*0.003-3*	*1*	*NR*	*8*	*0.1*
Rinse-Off	*15*	*1*	*NR*	*0.1*	*13*	*0.1-3*	*2*	*0.01-0.1*	*NR*	*NR*	*4*	*0.1*
Exposure Type												
Eye Area	NR	0.05	NR	0.01	4	0.1	NR	2	NR	NR	NR	NR
Possible Ingestion	34	0.05-0.5	NR	0.1	1	0.1	3	3	NR	NR	1	0.1
Inhalation	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Dermal Contact	47	0.002-1	NR	0.01-0.2	36	0.1-10	23	0.003-3	1	NR	10	0.1
Deodorant (Underarm)	NR	NR	NR	0.01	NR	NR	NR	NR	NR	NR	NR	0.1
Hair - Non-Coloring	29	1	NR	0.1	11	0.1-1	2	2	NR	NR	2	0.1
Hair - Coloring	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Nail	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Mucous Membrane	NR	NR	NR	0.1	1	0.1	NR	0.01-0.1	NR	NR	2	0.1
Bath Products	NR	NR	NR	NR	1	0.3	NR	0.05	NR	NR	NR	NR
Baby Products	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR

Table 5a. Frequency and concentration of use according to duration and exposure. - ingredients not previously reviewed by the CIR (continued)

	No. of Uses	Conc of Use (%)	No. of Uses	Conc of Use (%)	No. of Uses	Conc of Use (%)	No. of Uses	Conc of Use (%)	No. of Uses	Conc of Use (%)	No. of Uses	Conc of Use (%)
	Canola Oil		Canola Oil Unsaponifiables		Hydrogenated Canola Oil		Carica Papaya Seed Oil		Caryocar Brasiliense Fruit Oil		Chenopodium Quinoa Seed Oil	
Totals	**132**	**0.0002-73**	**NR**	**0.001**	**3**	**NR**	**NR**	**0.1**	**31**	**0.0005-0.2**	**1**	**0.3**
Duration of Use												
Leave-On	*112*	*0.002-73*	*NR*	*NR*	*2*	*NR*	*NR*	*0.1*	*29*	*0.0005-2*	*1*	*NR*
Rinse-Off	*20*	*0.02-33*	*NR*	*0.0001*	*1*	*NR*	*NR*	*NR*	*2*	*NR*	*NR*	*0.3*
Exposure Type												
Eye Area	3	0.002-0.03	NR	NR	NR	NR	NR	NR	12	NR	NR	NR
Possible Ingestion	62	0.3-70	NR	NR	NR	NR	NR	NR	12	0.2	NR	NR
Inhalation	1	0.0002-17	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Dermal Contact	113	0.0002-73	NR	NR	3	NR	NR	0.1	30	0.0005-0.2	NR	NR
Deodorant (Underarm)	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Hair - Non-Coloring	19	0.006-24	NR	0.001	NR	NR	NR	NR	1	NR	1	NR
Hair - Coloring	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.3
Nail	NR	5	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Mucous Membrane	2	0.02-1	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Bath Products	1	1-33	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Baby Products	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR

	Citrullus Lanatus (Watermelon) Seed Oil		Citrullus Vulgaris (Watermelon) Seed Oil**		Citrus Limon (Lemon) Seed Oil		Citrus Paradisi (Grapefruit) Seed Oil		Crambe Abyssinica Seed Oil		Cucumis Sativus (Cucumber) Seed Oil	
Totals	**1**	**2**	**5**	**NR**	**6**	**6**	**NR**	**0.01-20**	**6**	**NR**	**6**	**NR**
Duration of Use												
Leave-On	*1*	*2*	*3*	*NR*	*5*	*5*	*NR*	*0.08-20*	*5*	*NR*	*5*	*NR*
Rinse-Off	*NR*	*NR*	*2*	*NR*	*1*	*1*	*NR*	*0.01-1*	*1*	*NR*	*1*	*NR*
Exposure Type												
Eye Area	NR	NR	NR	NR	NR	1	NR	NR	NR	NR	1	NR
Possible Ingestion	NR	NR	NR	NR	NR	NR	NR	5	NR	NR	NR	NR
Inhalation	NR	NR	NR	NR	NR	NR	NR	2	NR	NR	NR	NR
Dermal Contact	1	2	5	NR	6	5	NR	2-5	6	NR	5	NR
Deodorant (Underarm)	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Hair - Non-Coloring	NR	NR	NR	NR	NR	1	NR	0.01-20	NR	NR	1	NR
Hair - Coloring	NR	NR	NR	NR	NR	NR	NR	9	NR	NR	NR	NR
Nail	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Mucous Membrane	NR	NR	1	NR	1	NR	NR	NR	1	NR	NR	NR
Bath Products	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Baby Products	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR

Table 5a. Frequency and concentration of use according to duration and exposure. - ingredients not previously reviewed by the CIR (continued)

	No. of Uses	Conc of Use (%)	No. of Uses	Conc of Use (%)	No. of Uses	Conc of Use (%)	No. of Uses	Conc of Use (%)	No. of Uses	Conc of Use (%)	No. of Uses	Conc of Use (%)
	Cucurbita Pepo (Pumpkin) Seed Oil		Palm Kernel Acid		Potassium Palm Kernelate		Potassium Palmate		Sodium Palm Kernelate		Sodium Palmate	
Totals	**18**	**0.003-0.1**	**72**	**0.2-12**	**7**	**0.3-30**	**5**	**0.3-3**	**194**	**12-44**	**212**	**3-68**
Duration of Use												
Leave-On	*17*	*0.003-0.1*	*3*	*NR*	*NR*	*NR*	*NR*	*NR*	*10*	*NR*	*7*	*NR*
Rinse-Off	*1*	*NR*	*69*	*0.2-12*	*7*	*0.3-30*	*5*	*0.3-3*	*184*	*12-44*	*205*	*3-68*
Exposure Type												
Eye Area	1	0.003	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Possible Ingestion	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Inhalation	1	NR	NR	NR	NR	NR	NR	NR	1	NR	1	NR
Dermal Contact	18	0.003-0.1	71	0.2-12	7	0.3-30	5	0.3-3	194	12-44	212	3-68
Deodorant (Underarm)	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Hair - Non-Coloring	1	NR	1	NR	NR	NR	NR	NR	NR	NR	NR	NR
Hair - Coloring	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Nail	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Mucous Membrane	NR	NR	64	0.2-3	1	0.3-30	2	0.3-3	173	16-44	189	3-68
Bath Products	NR	NR	NR	NR	NR	NR	NR	NR	3	NR	1	NR
Baby Products	NR	NR	NR	NR	NR	NR	NR	NR	4	NR	3	NR

	Palm Acid		Elaeis Oleifera Kernel Oil		Euterpe Oleracea Fruit Oil		Garcinia Indica Seed Butter		Gevuina Avellana Oil		Glycine Soja (Soybean) Oil	
Totals	**33**	**1-17**	**5**	**NR**	**29**	**0.00001-0.5**	**30**	**0.1-2**	**5**	**0.002-0.2**	**912**	**0.0002-95**
Duration of Use												
Leave-On	*1*	*NR*	*NR*	*NR*	*19*	*0.00001-0.5*	*27*	*0.1-2*	*5*	*0.04-0.2*	*718*	*0.0005-95*
Rinse-Off	*32*	*1-17*	*5*	*NR*	*10*	*0.05*	*3*	*NR*	*NR*	*0.002-0.01*	*194*	*0.0002-95*
Exposure Type												
Eye Area	NR	NR	NR	NR	2	0.5	1	NR	NR	NR	53	0.04-2
Possible Ingestion	NR	NR	NR	NR	1	0.002	3	0.1-2	NR	NR	103	0.6-4
Inhalation	1	NR	NR	NR	1	NR	NR	NR	NR	NR	6	0.03-0.5
Dermal Contact	33	1-17	NR	NR	14	0.00001-0.5	30	0.1-2	4	0.002-0.2	800	0.0005-93
Deodorant (Underarm)	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.01-0.5
Hair - Non-Coloring	NR	NR	2	NR	15	NR	NR	NR	NR	NR	97	0.0002-95
Hair - Coloring	NR	NR	3	NR	NR	NR	NR	NR	NR	NR	5	NR
Nail	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	6	0.02-95
Mucous Membrane	31	1-4	NR	NR	3	NR	1	NR	NR	NR	70	0.01-52
Bath Products	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	19	0.1-78
Baby Products	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	21	2

Table 5a. Frequency and concentration of use according to duration and exposure. - ingredients not previously reviewed by the CIR (continued)

	No. of Uses	Conc of Use (%)	No. of Uses	Conc of Use (%)	No. of Uses	Conc of Use (%)	No. of Uses	Conc of Use (%)	No. of Uses	Conc of Use (%)	No. of Uses	Conc of Use (%)
	Glycine Soja (Soybean) Oil Unsaponifiables		**Hydrogenated Soybean Oil**		**Helianthus Annuus (Sunflower) Seed Oil**		**Helianthus Annuus (Sunflower) Seed Oil Unsaponifiables**		**Hydrogenated Sunflower Oil**		**Hippophae Rhamnoides Oil**	
Totals	**12**	**0.0001-0.2**	**36**	**0.001-42**	**1414**	**0.000007-96**	**10**	**0.005-2**	**NR**	**6-35**	**15**	**0.2-0.7**
Duration of Use												
Leave-On	*12*	*0.0001-0.2*	*33*	*0.001-39*	*1054*	*0.0002-96*	*10*	*0.005-2*	*NR*	*6-35*	*10*	*0.2-0.7*
Rinse-Off	*NR*	*NR*	*3*	*0.05-42*	*360*	*0.000007-92*	*NR*	*0.002*	*NR*	*15-35*	*5*	*0.2*
Exposure Type												
Eye Area	NR	NR	4	0.03-7	64	0.0005-19	2	0.02	NR	7	NR	NR
Possible Ingestion	NR	NR	3	0.1-39	260	0.08-41	NR	NR	NR	6	NR	NR
Inhalation	NR	NR	NR	NR	3	0.0002-85	NR	NR	NR	NR	NR	NR
Dermal Contact	12	0.0001-0.2	34	0.01-39	707	0.0002-96	10	0.005-2	NR	6-35	1	0.2-0.7
Deodorant (Underarm)	NR	NR	NR	NR	1	0.0003-4	NR	NR	NR	NR	NR	NR
Hair - Non-Coloring	NR	NR	1	0.1	179	0.000007-92	NR	NR	NR	NR	6	NR
Hair - Coloring	NR	NR	NR	NR	85	0.03-35	NR	NR	NR	15-35	NR	NR
Nail	NR	NR	NR	0.001-25	8	0.05-30	NR	NR	NR	NR	8	NR
Mucous Membrane	NR	NR	NR	0.05-6	52	0.0003-4	NR	0.002	NR	NR	1	0.2
Bath Products	NR	NR	NR	5-42	11	0.005-75	NR	NR	NR	NR	NR	NR
Baby Products	NR	NR	NR	NR	18	0.2	NR	NR	NR	NR	NR	NR

	Hippophae Rhamnoides Fruit Oil		**Irvingia Gabonensis Kernel Butter**		**Juglans Regia (Walnut) Seed Oil**		**Limnanthes Alba (Meadowfoam) Seed Oil**		**Linum Usitatissimum (Linseed) Seed Oil**		**Linseed Acid**	
Totals	**7**	**0.004-2**	**109**	**0.003-0.4**	**15**	**0.00003-0.2**	**316**	**0.002-74**	**102**	**0.001-10**	**3**	**NR**
Duration of Use												
Leave-On	*7*	*0.004-2*	*109*	*0.003-0.4*	*12*	*0.01-0.2*	*225*	*0.002-74*	*52*	*0.002-10*	*3*	*NR*
Rinse-Off	*NR*	*NR*	*NR*	*NR*	*3*	*0.00003-0.1*	*91*	*0.01-2*	*50*	*0.001-0.4*	*NR*	*NR*
Exposure Type												
Eye Area	1	NR	2	NR	1	NR	30	0.1-20	3	0.01	NR	NR
Possible Ingestion	NR	NR	64	0.003-0.3	NR	NR	67	0.6-26	NR	0.01	NR	NR
Inhalation	NR	NR	NR	NR	NR	NR	1	0.1-3	3	NR	NR	NR
Dermal Contact	6	2	108	0.003-0.4	15	0.003-0.2	211	0.002-74	58	0.003-4	3	NR
Deodorant (Underarm)	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.05-0.1	NR	NR
Hair - Non-Coloring	NR	NR	1	NR	NR	0.00003-0.1	47	0.1-1	42	0.001-0.1	NR	NR
Hair - Coloring	NR	NR	NR	NR	NR	NR	46	0.2-2	NR	NR	NR	NR
Nail	1	0.004	NR	NR	NR	NR	NR	0.5	2	0.002-0.05	NR	NR
Mucous Membrane	NR	NR	NR	NR	NR	NR	4	0.001-0.6	5	0.003-0.4	NR	NR
Bath Products	NR	NR	NR	NR	2	NR	2	0.5-0.9	1	0.02-0.2	NR	NR
Baby Products	NR	NR	NR	NR	NR	NR	1	NR	2	NR	1	NR

Table 5a. Frequency and concentration of use according to duration and exposure. - ingredients not previously reviewed by the CIR (continued)

	No. of Uses	Conc of Use (%)	No. of Uses	Conc of Use (%)	No. of Uses	Conc of Use (%)	No. of Uses	Conc of Use (%)	No. of Uses	Conc of Use (%)	No. of Uses	Conc of Use (%)
	Luffa Cylindrica Seed Oil		**Lupinus Albus Seed Oil**		**Lycium Barbarum Seed Oil**		**Macadamia Integrifolia Seed Oil**		**Macadamia Ternifolia Seed Oil**		**Macadamia Nut Oil****	
Totals	**21**	**0.01**	**1**	**NR**	**2**	**NR**	**41**	**0.00006-5**	**533**	**0.0003-30**	**208**	**NS**
Duration of Use												
Leave-On	*21*	*NR*	*1*	*NR*	*2*	*NR*	*25*	*0.00006-5*	*482*	*0.001-30*	*191*	*NS*
Rinse-Off	*NR*	*0.01*	*NR*	*NR*	*NR*	*NR*	*16*	*0.006-3*	*51*	*0.0003-10*	*17*	*NS*
Exposure Type												
Eye Area	1	NR	NR	NR	1	NR	3	0.1	16	0.1-15	22	NS
Possible Ingestion	9	NR	NR	NR	1	NR	4	1	33	0.1-30	11	NS
Inhalation	NR	NR	NR	NR	NR	NR	NR	0.5	12	0.007-16	2	NS
Dermal Contact	21	0.01	1	NR	2	NR	36	0.00006-5	493	0.001-30	170	NS
Deodorant (Underarm)	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NS
Hair - Non-Coloring	NR	NR	NR	NR	NR	NR	12	0.01-0.03	33	0.0003-16	9	NS
Hair - Coloring	NR	NR	NR	NR	NR	NR	NR	NR	3	0.02	NR	NS
Nail	NR	NR	NR	NR	NR	NR	NR	3	1	0.001-0.5	NR	NS
Mucous Membrane	NR	0.01	NR	NR	NR	NR	10	2	12	0.02-10	NR	NS
Bath Products	NR	NR	NR	NR	NR	NR	1	0.5	2	1-10	1	NS
Baby Products	NR	NR	NR	RN	NR	NR	NR	NR	4	NR	NR	NS

	Mangifera Indica (Mango) Seed Oil		**Mangifera Indica (Mango) Seed Butter**		**Sodium Mangoseedate**		**Moringa Oleifera Seed Oil**		**Moringa Pterygosperma Seed Oil**		**Oenothera Biennis (Evening Primrose) Oil**	
Totals	**72**	**0.003-6**	**175**	**0.0005-3**	**1**	**NR**	**NR**	**0.001**	**15**	**0.003-3**	**150**	**0.00002-58**
Duration of Use												
Leave-On	*64*	*0.003-6*	*134*	*0.01-5*	*NR*	*NR*	*NR*	*0.001*	*13*	*0.004-3*	*113*	*0.00002-58*
Rinse-Off	*8*	*0.05-0.2*	*41*	*0.0005-0.5*	*1*	*NR*	*NR*	*NR*	*2*	*0.003*	*37*	*0.002-0.2*
Exposure Type												
Eye Area	13	5	6	0.02	NR	NR	NR	NR	4	3	4	0.00002-0.5
Possible Ingestion	7	0.03-6	25	1-5	NR	NR	NR	NR	1	NR	14	0.1-15
Inhalation	1	NR	2	0.02	NR	NR	NR	NR	NR	NR	2	NR
Dermal Contact	60	0.003-6	147	0.0005-5	1	NR	NR	0.001	11	0.003-3	109	0.00002-58
Deodorant (Underarm)	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.2
Hair - Non-Coloring	12	0.05-0.2	12	0.02-0.5	NR	NR	NR	NR	1	0.02	37	0.05-0.1
Hair - Coloring	NR	0.05	16	NR	NR	NR	NR	NR	NR	NR	NR	NR
Nail	NR	NR	NR	0.5	NR	NR	NR	NR	NR	NR	4	0.001-3
Mucous Membrane	2	0.1	10	0.0005-0.5	1	NR	NR	NR	NR	0.003	4	0.1-0.2
Bath Products	NR	NR	1	NR	NR	NR	NR	NR	NR	NR	2	0.2
Baby Products	NR	NR	3	NR	NR	NR	NR	NR	NR	NR	3	NR

Table 5a. Frequency and concentration of use according to duration and exposure. - ingredients not previously reviewed by the CIR (continued)

	No. of Uses	Conc of Use (%)	No. of Uses	Conc of Use (%)	No. of Uses	Conc of Use (%)	No. of Uses	Conc of Use (%)	No. of Uses	Conc of Use (%)	No. of Uses	Conc of Use (%)
	Hydrogenated Evening Primrose Oil		**Olea Europaea (Olive) Fruit Oil**		**Olea Europaea (Olive) Oil Unsaponifiables**		**Hydrogenated Olive Oil**		**Hydrogenated Olive Oil Unsaponifiables**		**Potassium Olivate**	
Totals	**14**	**NR**	**915**	**0.0005-100**	**77**	**0.0001-3**	**50**	**0.0005-12**	**2**	**0.05-5**	**3**	**NR**
Duration of Use												
Leave-On	*14*	*NR*	*617*	*0.001-100*	*68*	*0.0001-3*	*36*	*0.1-12*	*2*	*0.05-5*	*NR*	*NR*
Rinse-Off	*NR*	*NR*	*298*	*0.0005-94*	*9*	*0.04-0.3*	*14*	*0.0005-0.1*	*NR*	*NR*	*3*	*NR*
Exposure Type												
Eye Area	1	NR	26	0.004-17	12	0.02-0.4	13	0.1-3	NR	0.3-2	NR	NR
Possible Ingestion	NR	NR	26	0.7-26	1	0.08	7	0.1-12	NR	NR	NR	NR
Inhalation	NR	NR	6	0.2-5	NR	3	NR	NR	NR	NR	NR	NR
Dermal Contact	14	NR	711	0.0005-100	67	0.0001-3	34	0.0005-12	2	0.05-5	3	NR
Deodorant (Underarm)	NR	NR	3	0.02-0.1	NR	NR	NR	NR	NR	NR	NR	NR
Hair - Non-Coloring	NR	NR	190	0.006-94	6	0.02-0.3	11	0.01-0.1	NR	NR	NR	NR
Hair - Coloring	NR	NR	NR	0.2-0.5	NR	NR	NR	NR	NR	NR	NR	NR
Nail	NR	NR	5	1-40	NR	NR	NR	NR	NR	NR	NR	NR
Mucous Membrane	NR	NR	121	0.0005-3	4	NR	1	0.0005	NR	NR	1	NR
Bath Products	NR	NR	14	0.9-17	NR	NR	NR	NR	NR	NR	NR	NR
Baby Products	NR	NR	9	0.2	NR	0.04	NR	0.4	NR	NR	NR	NR

	Sodium Olivate		**Orbignya Cohune Seed Oil**		**Orbignya Oleifera Seed Oil**		**Sodium Babassuate**		**Orbignya Speciosa Kernel Oil**		**Passiflora Edulis Seed Oil**	
Totals	**16**	**4-18**	**1**	**NR**	**161**	**0.0009-27**	**NR**	**8**	**8**	**0.5-0.9**	**62**	**0.0007-3**
Duration of Use												
Leave-On	*5*	*NR*	*NR*	*NR*	*118*	*0.0009-4*	*NR*	*NR*	*1*	*0.9*	*53*	*0.003-5*
Rinse-Off	*11*	*4-18*	*1*	*NR*	*43*	*0.01-27*	*NR*	*8*	*7*	*0.5*	*9*	*0.0007-0.005*
Exposure Type												
Eye Area	NR	NR	NR	NR	7	0.5-0.6	NR	NR	NR	NR	3	0.8
Possible Ingestion	NR	NR	NR	NR	57	0.001-2	NR	NR	NR	NR	14	0.6-3
Inhalation	NR	NR	NR	NR	5	0.02-2	NR	NR	NR	NR	3	NR
Dermal Contact	16	4-18	NR	NR	110	0.0009-27	NR	8	NR	NR	49	0.003-3
Deodorant (Underarm)	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.003
Hair - Non-Coloring	NR	NR	1	NR	43	0.02-2	NR	NR	5	0.5-0.9	10	0.007-0.5
Hair - Coloring	NR	NR	NR	NR	8	NR	NR	NR	3	NR	3	NR
Nail	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Mucous Membrane	9	4-18	NR	NR	5	27	NR	8	NR	NR	1	NR
Bath Products	NR	NR	NR	NR	2	0.01-0.1	NR	NR	NR	NR	NR	0.01-0.05
Baby Products	1	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR

Table 5a. Frequency and concentration of use according to duration and exposure. - ingredients not previously reviewed by the CIR (continued)

	No. of Uses	Conc of Use (%)	No. of Uses	Conc of Use (%)	No. of Uses	Conc of Use (%)	No. of Uses	Conc of Use (%)	No. of Uses	Conc of Use (%)	No. of Uses	Conc of Use (%)
	Perilla Ocymoides Seed Oil		**Persea Gratissima (Avocado) Oil Unsaponifiables**		**Hydrogenated Avocado Oil**		**Persea Gratissima (Avocado) Butter**		**Sodium Avocadoate**		**Pistacia Vera Seed Oil**	
Totals	**7**	**NR**	**63**	**0.2-6**	**11**	**0.5**	**15**	**NR**	**1**	**NR**	**158**	**0.003-1**
Duration of Use												
Leave-On	*5*	*NR*	*57*	*0.5-6*	*9*	*NR*	*15*	*NR*	*NR*	*NR*	*107*	*0.08-0.2*
Rinse-Off	*2*	*NR*	*6*	*0.2*	*2*	*0.5*	*NR*	*NR*	*1*	*NR*	*51*	*0.003-1*
Exposure Type												
Eye Area	2	NR	9	0.5	NR	NR	NR	NR	NR	NR	7	NR
Possible Ingestion	NR	NR	2	3	2	NR	11	NR	NR	NR	6	NR
Inhalation	NR	NR	4	NR	NR	NR	NR	NR	NR	NR	NR	NR
Dermal Contact	5	NR	56	0.2-3	8	NR	15	NR	1	NR	133	0.003-0.2
Deodorant (Underarm)	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Hair - Non-Coloring	2	NR	2	6	3	0.5	NR	NR	NR	NR	16	0.05-1
Hair - Coloring	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Nail	NR	NR	3	NR	NR	NR	NR	NR	NR	NR	NR	NR
Mucous Membrane	NR	NR	NR	NR	NR	NR	NR	NR	1	NR	19	NR
Bath Products	NR	NR	4	NR	NR	NR	NR	NR	NR	NR	8	NR
Baby Products	NR	NR	1	NR	NR	NR	NR	NR	NR	NR	3	NR

	Plukenetia Volubilis Seed Oil		**Hydrogenated Sweet Almond Oil**		**Sodium Sweet Almondate**		**Prunus Armeniaca (Apricot) Kernel Oil**		**Hydrogenated Apricot Kernel Oil**		**Prunus Avium (Sweet Cherry) Seed Oil**	
Totals	**13**	**0.05-0.6**	**21**	**0.5**	**4**	**15**	**588**	**0.00001-89**	**2**	**NR**	**2**	**0.01-0.02**
Duration of Use												
Leave-On	*12*	*0.05-0.6*	*13*	*0.5*	*4*	*NR*	*449*	*0.0001-40*	*2*	*NR*	*NR*	*NR*
Rinse-Off	*1*	*NR*	*8*	*0.5*	*NR*	*15*	*139*	*0.00001-89*	*NR*	*NR*	*2*	*0.01-0.02*
Exposure Type												
Eye Area	1	NR	NR	NR	NR	NR	25	0.002-18	NR	NR	NR	NR
Possible Ingestion	3	0.6	1	NR	NR	NR	38	0.001-5	NR	NR	NR	NR
Inhalation	NR	NR	NR	NR	NR	NR	5	0.0009-1	NR	NR	NR	NR
Dermal Contact	13	0.6	15	0.5	4	15	486	0.00001-18	2	NR	2	0.01-0.02
Deodorant (Underarm)	NR	NR	NR	NR	NR	NR	1	0.003-0.1	NR	NR	NR	NR
Hair - Non-Coloring	NR	NR	6	0.5	NR	NR	78	0.0001-89	NR	NR	NR	NR
Hair - Coloring	NR	NR	NR	NR	NR	NR	10	0.1	NR	NR	NR	NR
Nail	NR	0.05	NR	NR	NR	NR	10	0.002-40	NR	NR	NR	NR
Mucous Membrane	NR	NR	1	NR	NR	15	24	0.01-9	NR	NR	2	0.01-0.02
Bath Products	NR	NR	1	NR	NR	NR	8	4	NR	NR	NR	NR
Baby Products	NR	NR	NR	NR	NR	NR	7	NR	NR	NR	NR	NR

Table 5a. Frequency and concentration of use according to duration and exposure. - ingredients not previously reviewed by the CIR (continued)

	No. of Uses	Conc of Use (%)	No. of Uses	Conc of Use (%)	No. of Uses	Conc of Use (%)	No. of Uses	Conc of Use (%)	No. of Uses	Conc of Use (%)	No. of Uses	Conc of Use (%)
	Prunus Domestica Seed Oil		**Prunus Persica (Peach) Kernel Oil**		**Punica Granatum Seed Oil**		**Pyrus Malus (Apple) Seed Oil**		**Ribes Nigrum (Black Currant) Seed Oil**		**Rosa Canina Fruit Oil**	
Totals	**NR**	**0.04**	**22**	**0.003-22**	**46**	**0.001-1**	**8**	**NR**	**53**	**0.000001-0.3**	**121**	**0.001-19**
Duration of Use												
Leave-On	*NR*	*NR*	*16*	*0.05-22*	*44*	*0.001-1*	*8*	*NR*	*45*	*0.000001-0.3*	*106*	*0.001-19*
Rinse-Off	*NR*	*0.04*	*6*	*0.003-6*	*2*	*0.001-0.1*	*NR*	*NR*	*8*	*0.05*	*15*	*0.001-0.5*
Exposure Type												
Eye Area	NR	NR	NR	NR	2	NR	NR	NR	2	0.08	17	0.1-0.5
Possible Ingestion	NR	NR	NR	0.04-22	30	1	1	NR	7	0.03-0.1	7	0.001-2
Inhalation	NR	NR	NR	2	NR	NR	NR	NR	NR	NR	1	NR
Dermal Contact	NR	0.04	18	0.003-22	46	0.001-1	8	NR	43	0.000001-0.3	109	0.008-19
Deodorant (Underarm)	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Hair - Non-Coloring	NR	NR	4	NR	NR	NR	NR	NR	5	NR	9	0.001-0.5
Hair - Coloring	NR	NR	NR	0.1	NR	0.1	NR	NR	NR	NR	NR	NR
Nail	NR	NR	NR	NR	NR	0.001	NR	NR	5	0.2	1	0.1-2
Mucous Membrane	NR	NR	1	NR	2	0.001	NR	NR	2	NR	3	0.001
Bath Products	NR	NR	1	0.1-1	NR	NR	NR	NR	NR	NR	1	0.5
Baby Products	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR

	Rubus Chamaemorus Seed Oil		**Rubus Idaeus (Raspberry) Seed Oil**		**Schinziophyton Rautanenii Kernel Oil**		**Sclerocarya Birrea Seed Oil**		**Silybum Marianum Seed Oil**		**Solanum Lycopersicum (Tomato) Fruit Oil**	
Totals	**3**	**0.1**	**10**	**0.1-5**	**6**	**NR**	**29**	**1**	**NR**	**0.5**	**NR**	**0.01-1**
Duration of Use												
Leave-On	*3*	*0.1*	*8*	*0.1-5*	*4*	*NR*	*23*	*1*	*NR*	*0.5*	*NR*	*0.001-1*
Rinse-Off	*NR*	*NR*	*2*	*NR*	*2*	*NR*	*6*	*1*	*NR*	*NR*	*NR*	*NR*
Exposure Type												
Eye Area	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.01
Possible Ingestion	NR	NR	1	NR	NR	NR	6	NR	NR	NR	NR	0.001
Inhalation	NR	NR	NR	NR	NR	NR	2	NR	NR	NR	NR	NR
Dermal Contact	3	0.1	8	0.1-5	3	NR	23	1	NR	0.5	NR	0.001-1
Deodorant (Underarm)	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Hair - Non-Coloring	NR	NR	NR	NR	3	NR	6	1	NR	NR	NR	NR
Hair - Coloring	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Nail	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Mucous Membrane	NR	NR	2	NR	NR	NR	2	NR	NR	NR	NR	NR
Bath Products	NR	NR	1	NR	NR	NR	NR	NR	NR	NR	NR	NR
Baby Products	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR

Table 5a. Frequency and concentration of use according to duration and exposure. - ingredients not previously reviewed by the CIR (continued)

	No. of Uses	Conc of Use (%)	No. of Uses	Conc of Use (%)	No. of Uses	Conc of Use (%)	No. of Uses	Conc of Use (%)	No. of Uses	Conc of Use (%)	No. of Uses	Conc of Use (%)
	Solanum Lycopersicum (Tomato) Seed Oil		**Theobroma Cacao (Cocoa) Seed Butter**		**Theobroma Grandiflorum Seed Butter**		**Triticum Vulgare (Wheat) Germ Oil Unsaponifiables**		**Wheat Germ Acid**		**Vaccinium Macrocarpon (Cranberry) Seed Oil**	
Totals	**1**	**NR**	**442**	**0.000002-37**	**153**	**0.00005-7**	**17**	**0.2**	**16**	**NR**	**21**	**0.002-2**
Duration of Use												
Leave-On	*1*	*NR*	*367*	*0.000002-37*	*119*	*0.00005-7*	*17*	*0.2*	*3*	*NR*	*18*	*0.002-2*
Rinse-Off	*NR*	*NR*	*75*	*0.0001-2*	*34*	*0.001-1*	*NR*	*NR*	*13*	*NR*	*3*	*0.003-0.1*
Exposure Type												
Eye Area	NR	NR	11	0.0002-9	21	0.1-2	1	NR	NR	NR	2	NR
Possible Ingestion	NR	NR	33	37	49	7	NR	NR	NR	NR	NR	0.3
Inhalation	NR	NR	2	0.4	NR	NR	NR	NR	NR	NR	NR	NR
Dermal Contact	1	NR	417	0.000002-37	141	0.00005-7	17	0.2	NR	NR	17	0.002-2
Deodorant (Underarm)	NR	NR	NR	0.001-1	NR	0.1	NR	NR	NR	NR	NR	NR
Hair - Non-Coloring	NR	NR	24	0.01-2	9	0.001-1	NR	NR	16	NR	4	0.01-0.1
Hair - Coloring	NR	NR	NR	0.1	3	NR	NR	NR	NR	NR	NR	NR
Nail	NR	NR	NR	0.1-1	NR	NR	NR	NR	NR	NR	NR	NR
Mucous Membrane	NR	NR	35	0.02-2	19	0.05-0.1	NR	NR	NR	NR	1	0.003-0.1
Bath Products	NR	NR	4	0.1-1	4	NR	NR	NR	NR	NR	NR	NR
Baby Products	NR	NR	8	0.01	NR	NR	NR	NR	NR	NR	NR	NR

	Vaccinium Myrtillus Seed Oil		**Vaccinium Oxycoccos (Cranberry) Seed Oil****		**Vaccinium Vitis-Idaea Seed Oil**		**Vegetable (Olus) Oil**		**Hydrogenated Vegetable Oil**		**Vitis Vinifera (Grape) Seed Oil**	
Totals	**33**	**0.01-0.1**	**4**	**NS**	**9**	**NR**	**165**	**0.0005-31**	**457**	**0.0004-60**	**465**	**0.001-43**
Duration of Use												
Leave-On	*32*	*0.01-0.12*	*3*	*NS*	*9*	*NR*	*135*	*0.0005-11*	*439*	*0.0005-60*	*368*	*0.001-41*
Rinse-Off	*1*	*NR*	*1*	*NS*	*NR*	*NR*	*30*	*0.002-31*	*18*	*0.0004-8*	*97*	*0.001-43*
Exposure Type												
Eye Area	NR	NR	NR	NS	NR	NR	11	0.01-11	102	0.008-49	14	0.01-5
Possible Ingestion	29	0.01	NR	NS	NR	NR	74	0.03-11	216	0.8-60	34	0.03-7
Inhalation	NR	NR	NR	NS	NR	NR	1	0.0005-0.02	1	3	6	0.001-7
Dermal Contact	33	0.01-0.1	4	NS	1	NR	143	0.0005-31	450	0.005-60	401	0.001-41
Deodorant (Underarm)	NR	NR	NR	NS	NR	NR	NR	---	NR	NR	NR	0.001-0.2
Hair - Non-Coloring	NR	NR	NR	NS	NR	NR	2	0.02-2	2	0.0005-0.09	46	0.01-0.3
Hair - Coloring	NR	NR	NR	NS	NR	NR	18	---	NR	0.0004-1	10	43
Nail	NR	NR	NR	NS	8	NR	1	2	1	0.2	8	0.001-35
Mucous Membrane	NR	NR	NR	NS	NR	NR	1	0.03-2	2	2-4	21	0.001-7
Bath Products	NR	NR	NR	NS	NR	NR	2	0.002-0.02	NR	0.5	8	0.01-2
Baby Products	NR	NR	NR	NS	NR	NR	1	---	NR	NR	5	NR

Table 5a. Frequency and concentration of use according to duration and exposure. - ingredients not previously reviewed by the CIR (continued)

	No. of Uses	Conc of Use (%)	No. of Uses	Conc of Use (%)
	Hydrogenated Grapeseed Oil		**Sodium Grapeseedate**	
Totals	**7**	**0.3-0.5**	**4**	**NR**
Duration of Use				
Leave-On	*4*	*0.3-0.5*	*4*	*NR*
Rinse-Off	*3*	*0.5*	*NR*	*NR*
Exposure Type				
Eye Area	NR	NR	NR	NR
Possible Ingestion	1	0.5	NR	NR
Inhalation	NR	NR	NR	NR
Dermal Contact	5	0.5	NR	NR
Deodorant (Underarm)	NR	NR	NR	NR
Hair - Non-Coloring	1	NR	4	NR
Hair - Coloring	NR	NR	NR	NR
Nail	1	0.3	NR	NR
Mucous Membrane	1	NR	NR	NR
Bath Products	NR	NR	NR	NR
Baby Products	NR	NR	NR	NR

*Note - Because each ingredient may be used in cosmetics with multiple exposure types, the sum of all exposure types my not equal the sum of total uses.

NR - not reported to the VCRP or Council

NS - not surveyed

**not listed as an INCI name; included because of similarity

Table 5b. **Current and historical frequency and concentration of use according to duration and type of exposure - previously reviewed ingredients**

	# of Uses		*Conc. of Use (%)*		*# of Uses*		*Conc. of Use (%)*		*# of Uses*		*Conc. of Use (%)*		*# of Uses*		*Conc. of Use (%)*	
	Arachis Hypogaea (Peanut) Oil				**Hydrogenated Peanut Oil**				**Carthamus Tinctorius (Safflower) Seed Oil**				**Cocos Nucifera (Coconut) Oil**			
data year	*1998*	*2010*	*1984*	*2010*	*1998*	*2010*	*1998*	*2010*	*2002*	*2010*	*2003*	*2010*	*2007*	*2010*	*2008*	*2010*
Totals*	**22**	**74**	**mostly ≤25; >50 (1 use)**	**0.0001-30**	**19**	**12**	******	**2-5**	**142**	**508**	**0.00005-84**	**NS**	**626**	**798**	**0.0001-80**	**NS**
Duration of Use																
Leave-On	*14*	*59*	**	*0.0001-1*	*19*	*12*	**	*2-5*	*114*	*402*	*0.00005-84*	*NS*	*243*	*409*	*0.005-80*	*NS*
Rinse Off	*8*	*15*	**	*0.0002-30*	*NR*	*NR*	**	*NR*	*28*	*106*	*0.001-72*	*NS*	*383*	*389*	*0.0001-16*	*NS*
Exposure Type																***NS***
Eye Area	NR	4	**	NR	NR	NR	**	NR	5	15	1-6	NS	7	25	0.01-80	NS
Possible Ingestion	3	NR	**	NR	NR	NR	**	2	18	83	0.1-60	NS	19	44	0.2-51	NS
Inhalation	NR	2	**	NR	NR	NR	**	NR	3	5	5	NS	7	10	0.01-26	NS
Dermal Contact	19	53	**	0.0001-1	19	12	**	2-5	113	395	0.001-72	NS	380	548	0.005-80	NS
Deodorant (underarm)	NR	NR	**	NR	NR	NR	**	NR	NR	NR	NR	NS	NR	NR	0.1-16	NS
Hair - Non-Coloring	3	21	**	25-30	NR	NR	**	NR	28	79	0.00005-27	NS	97	176	0.0001-13	NS
Hair-Coloring	NR	NR	**	NR	NR	NR	**	NR	NR	20	1	NS	145	69	NR	NS
Nail	NR	NR	**	NR	NR	NR	**	NR	1	32	84	NS	2	5	0.005-2	NS
Mucous Membrane	4	2	**	NR	NR	NR	**	NR	NR	31	NR	NS	12	161	0.0005-16	NS
Bath Products	NR	NR	**	NR	NR	NR	**	NR	NR	3	7	NS	141	15	0.004-23	NS
Baby Products	NR	NR	**	NR	NR	NR	**	NR	NR	6	10	NS	12	15	0.010-0.3	NS

	Hydrogenated Coconut Oil				**Magnesium Cocoate**				**Potassium Cocoate**				**Sodium Cocoate**			
data year	*2007*	*2010*	*2008*	*2010*	*2007*	*2010*	*2008*	*2010*	*2007*	*2010*	*2008*	*2010*	*2007*	*2010*	*2008*	*2010*
Totals	**62**	**105**	**0.001-50**	**NS**	**11**	**9**	**NR**	**NS**	**24**	**40**	**0.003-40**	**NS**	**230**	**340**	**1-52**	**NS**
Duration of Use																
Leave-On	*55*	*79*	*0.001-50*	*NS*	*NR*	*NR*	*NR*	*NS*	*4*	*NR*	*28*	*NS*	*12*	*16*	*NR*	*NS*
Rinse-Off	*7*	*26*	*0.001-38*	*NS*	*11*	*9*	*NR*	*NS*	*20*	*40*	*0.03-40*	*NS*	*218*	*324*	*1-52*	*NS*
Exposure Type																
Eye Area	9	7	0.2-22	NS	NR	NR	NR	NS	NR	NR	NR	NS	NR	NR	NR	NS
Possible Ingestion	6	10	0.7-29	NS	NR	NR	NR	NS	NR	NR	NR	NS	NR	NR	NR	NS
Inhalation	NR	NR	0.3	NS	NR	NR	NR	NS	NR	NR	NR	NS	1	NR	NR	NS
Dermal Contact	3	102	0.001-25	NS	11	9	NR	NS	22	38	0.3-40	NS	175	269	1-52	NS
Deodorant (underarm)	NR	NR	NR	NS	NR	NR	NR	NS	NR	NR	NR	NS	NR	NR	NR	NS
Hair - Non-Coloring	3	3	0.001-2	NS	NR	NR	NR	NS	2	2	15	NS	55	71	2	NS
Hair-Coloring	NR	NR	0.5-0.6	NS	NR	NR	NR	NS	NR	NR	0.003	NS	NR	NR	NR	NS
Nail	NR	NR	0.8-25	NS	NR	NR	NR	NS	NR	NR	NR	NS	NR	NR	NR	NS
Mucous Membrane	NR	18	1-17	NS	NR	NR	NR	NS	NR	8	0.3	NS	1	238	1-2	NS
Bath Products	1	NR	0.5-39	NS	NR	NR	NR	NS	11	NR	0.3-40	NS	149	3	1-52	NS
Baby Products	1	1	2-50	NS	NR	NR	NR	NS	NR	NR	NR	NS	2	5	NR	NS

Table 5b. Current and historical frequency and concentration of use according to duration and type of exposure - previously reviewed ingredients (continued)

	# of Uses		*Conc. of Use (%)*		*# of Uses*		*Conc. of Use (%)*		*# of Uses*		*Conc. of Use (%)*		*# of Uses*		*Conc. of Use (%)*	
	Coconut Acid				**Hydrogenated Coconut Acid**				**Corylus Americana (Hazel) Seed Oil**				**Corylus Avellana (Hazel) Seed Oil**			
data year	*2007*	*2010*	*2008*	*2010*	*2007*	*2010*	*2008*	*2010*	*1998*[#]	*2010*	*1998*	*2010*	*1998*[#]	*2010*	*1997*	*2010*
Totals	**142**	**141**	**0.03-14**	**NS**	**NR**	**NR**	**6-10**	**NS**	**#**	**10**	******	**NR**	**85**	**150**	**≤100**	**0.005-98**
Duration of Use																
Leave-On	*18*	*17*	*NR*	*NS*	*NR*	*NR*	*6*	*NS*	*#*	*9*	**	*NR*	*74*	*131*	**	*0.005-98*
Rinse Off	*124*	*124*	*0.03-14*	*NS*	*NR*	*NR*	*10*	*NS*	*#*	*1*	**	*NR*	*11*	*19*	**	*0.005-5*
Exposure Type				***NS***				***NS***								
Eye Area	1	1	NR	NS	NR	NR	NR	NS	#	NR	**	NR	2	9	**	0.1
Possible Ingestion	NR	NR	NR	NS	NR	NR	NR	NS	#	NR	**	NR	NR	NR	**	14
Inhalation	NR	NR	NR	NS	NR	NR	NR	NS	#	NR	**	NR	NR	2	**	NR
Dermal Contact	140	140	0.04-14	NS	NR	NR	6-10	NS	#	10	**	NR	83	147	**	0.005-98
Deodorant (underarm)	NR	NR	NR	NS	NR	NR	NR	NS	#	NR	**	NR	NR	NR	**	NR
Hair - Non-Coloring	2	1	0.03-0.3	NS	NR	NR	NR	NS	#	NR	**	NR	1	2	**	NR
Hair-Coloring	NR	NR	NR	NS	NR	NR	NR	NS	#	NR	**	NR	NR	NR	**	NR
Nail	NR	NR	NR	NS	NR	NR	NR	NS	#	NR	**	NR	1	1	**	NR
Mucous Membrane	1	101	0.04-2	NS	NR	NR	NR	NS	#	1	**	NR	4	1	**	NR
Bath Products	93	NR	0.04-14	NS	NR	NR	NR	NS	#	NR	**	NR	2	2	**	NR
Baby Products	1	1	NR	NS	NR	NR	NR	NS	#	NR	**	NR	NR	1	**	NR

	Elaeis Guineensis (Palm) Oil				**Elaeis Guineensis (Palm) Kernel Oil**				**Hydrogenated Palm Kernel Oil**				**Hydrogenated Palm Oil**			
data year	*1997*	*2010*	*1997*	*2010*	*1997*	*2010*	*1997*	*2010*	*1997*	*2010*	*1997*	*2010*	*1997*	*2010*	*1997*	*2010*
Totals	**36**	**272**	******	**0.002-48**	**11**	**77**	******	**0.05-23**	**29**	**47**	******	**0.4-13**	**13**	**152**	******	**0.2-30**
Duration of Use																
Leave-On	*28*	*171*	**	*0.008-13*	*9*	*60*	**	*0.8-3*	*27*	*45*	**	*0.4-13*	*13*	*134*	**	*0.2-30*
Rinse-Off	*8*	*101*	**	*0.002-48*	*2*	*17*	**	*0.05-23*	*2*	*2*	**	*0.6-2*	*NR*	*18*	**	*2*
Exposure Type																
Eye Area	NR	12	**	0.04-2	NR	10	**	0.8	5	2	**	2-10	1	61	**	0.2-30
Possible Ingestion	NR	11	**	2	NR	6	**	NR	2	5	**	3-13	3	12	**	2-30
Inhalation	1	3	**	NR	NR	NR	**	NR	NR	1	**	NR	NR	NR	**	1
Dermal Contact	36	229	**	0.002-48	11	71	**	0.05-2	24	47	**	0.4-13	12	123	**	0.4-30
Deodorant (underarm)	NR	NR	**	NR	NR	NR	**	NR	NR	NR	**	NR	NR	NR	**	NR
Hair - Non-Coloring	NR	43	**	2-34	NR	6	**	0.9-23	NR	NR	**	NR	NR	NR	**	NR
Hair-Coloring	NR	NR	**	NR	NR	NR	**	NR	NR	NR	**	NR	NR	NR	**	NR
Nail	NR	NR	**	NR	NR	NR	**	3	NR	NR	**	NR	NR	NR	**	NR
Mucous Membrane	7	68	**	0.002-48	NR	10	**	0.05	2	2	**	0.9-2	NR	17	**	2
Bath Products	NR	NR	**	NR	NR	1	**	NR	NR	NR	**	NR	NR	NR	**	NR
Baby Products	1	2	**	NR	NR	NR	**	NR	NR	NR	**	NR	NR	NR	**	NR

Table 5b. Current and historical frequency and concentration of use according to duration and type of exposure - previously reviewed ingredients (continued)

	# of Uses		Conc. of Use (%)		# of Uses		Conc. of Use (%)		# of Uses		Conc. of Use (%)		# of Uses		Conc. of Use (%)	
	Gossypium Herbaceum (Cotton) Seed Oil				**Hydrogenated Cottonseed Oil**				**Oryza Sativa (Rice) Bran Oil**				**Oryza Sativa (Rice) Germ Oil**			
data year	*1998*	*2010*	*1998*	*2010*	*1998*	*2010*	*1998*	*2010*	*2002*	*2010*	*2000-2003*	*2010*	*2002*	*2010*	*2000-2003*	*2010*
Totals	**4**	**83**		**0.004-32**	**272**	**362**	******	**0.001-24**	**39**	**371**	**0.1-39**	**0.0003-78**	**6**	**34**	**0.1**	**0.003-3**
Duration of Use																
Leave-On	*1*	*68*		*0.08-32*	*272*	*358*	****	*0.001-24*	*32*	*267*	*0.1-8*	*0.0003-78*	*5*	*29*	*0.1*	*0.003-3*
Rinse Off	*3*	*15*	****	*0.004-29*	*NR*	*4*	****	*0.01-0.1*	*7*	*104*	*0.2-39*	*0.005-6*	*1*	*5*	*NR*	*0.003-3*
Exposure Type																
Eye Area	NR	4		0.1-11	116	155	**	0.5-24	NR	5	0.1-1	0.5-0.8	NR	2	NR	0.01-1
Possible Ingestion	NR	9	**	0.2-1	151	NR	**	8-12	NR	17	0.1-1	0.1-8	NR	4	NR	0.1-3
Inhalation	NR	12	**	0.2	NR	NR	**	NR	NR	11	NR	0.1	NR	NR	NR	NR
Dermal Contact	4	78	**	0.004-29	156	356	**	0.001-24	36	321	0.1-39	0.0003-27	6	32	0.1	0.003-3
Deodorant (underarm)	NR	1	**	0.2	NR	NR	**	NR	NR	NR	NR	0.5	NR	NR	NR	0.003
Hair - Non-Coloring	NR	2	**	NR	NR	4	**	0.01-0.1	3	42	0.3	0.005-0.5	NR	NR	NR	NR
Hair-Coloring	NR	NR	**	NR	NR	NR	**	NR	NR	NR	NR	0.3	NR	NR	NR	NR
Nail	NR	1	**	0.5-32	NR	NR	**	NR	2	5	NR	0.02-78	NR	NR	NR	NR
Mucous Membrane	NR	7	**	0.004-0.01	NR	NR	**	NR	NR	48	1	0.0006-6	NR	1	NR	0.003-0.005
Bath Products	NR	NR	**	NR	NR	NR	**	NR	1	17	1-39	0.2	NR	1	NR	0.5
Baby Products	NR	NR	**	NR	NR	8	**	NR	NR	1	NR	NR	NR	NR	NR	NR

	Persea Gratissima (Avocado) Oil				**Prunus Amygdalus Dulcis (Sweet Almond) Oil**				**Sesamum Indicum (Sesame) Seed Oil**				**Sesamum Indicum (Sesame) Oil Unsaponifiables**			
data year	*2001*	*2010*	*2001*	*2010*	*2002*	*2010*	*2002*	*2010*	*2009*	*2010*	*2008*	*2010*	*2009*	*2010*	*2008*	*2010*
Totals	**188**	**883**	**0.001-23**	**0.0001-98**	**375**	**1127**	**0.004-76**	**0.0001-77**	**402**	**480**	**0.0001-73**	**NS**	**6**	**17**	**0.01-0.03**	**NS**
Duration of Use																
Leave-On	*40*	*657*	*0.001-23*	*0.0005-98*	*302*	*791*	*0.004-76*	*0.001-77*	*313*	*374*	*0.0001-73*	*NS*	*NR*	*17*	*0.01-0.03*	*NS*
Rinse-Off	*148*	*226*	*0.1-5*	*0.0001-15*	*73*	*336*	*0.01-2*	*0.0001-43*	*89*	*106*	*0.001-68*	*NS*	*NR*	*NR*	*NR*	*NS*
Exposure Type																
Eye Area	8	24	0.1-3	0.05-2	6	28	0.4	0.1-22	11	14	0.0008-10	NS	NR	NR	0.01	NS
Possible Ingestion	29	60	0.7-21	0.05-26	3	55	0.5	0.1-19	57	52	0.1-16	NS	NR	11	0.03	NS
Inhalation	2	11	0.02-3	0.01-8	3	18	1-3	0.5-39	5	5	2	NS	NR	NR	NR	NS
Dermal Contact	165	685	0.001-23	0.0005--98	323	986	0.04-11	0.001-46	346	414	0.0008-73	NS	6	17	0.01-0.03	NS
Deodorant (underarm)	NR	NR	NR	0.1	NR	2	0.004	0.02-1	NR	NR	NR	NS	NR	NR	NR	NS
Hair - Non-Coloring	11	189	0.002-3	0.0001-41	46	116	0.3-3	0.001-19	50	59	0.0001-30[a]	NS	NR	NR	NR	NS
Hair-Coloring	8	NR	NR	0.3	2	2	0.1	0.02	NR	NR	0.03-0.8[b]	NS	NR	NR	NR	NS
Nail	4	7	0.4-19	0.001-34	4	13	1-76	0.001-77	6	7	≤1-10	NS	NR	NR	NR	NS
Mucous Membrane	NR	43	0.1-5	0.002-3	19	93	0.5	<0.1-23	4	28	NR	NS	NR	NR	NR	NS
Bath Products	5	25	0.1-5	0.6-6	10	41	0.01-0.1	0.1-43	27	5	0.09-68	NS	NR	NR	NR	NS
Baby Products	NR	9	NR	NR	7	14	NR	2-3	1	3	6	NS	NR	NR	NR	NS

Table 5b. Current and historical frequency and concentration of use according to duration and type of exposure - previously reviewed ingredients (continued)

	# of Uses		*Conc. of Use (%)*		*# of Uses*		*Conc. of Use (%)*		*# of Uses*		*Conc. of Use (%)*		*# of Uses*		*Conc. of Use (%)*	
	Triticum Vulgare (Wheat) Germ Oil				**Zea Mays (Corn) Oil**				**Zea Mays (Corn) Oil Unsaponifiables**				**Zea Mays (Corn) Germ Oil**			
data year	*2001*	*2010*	*2001*	*2010*	*2007*	*2010*	*2006*	*2010*	*2007*	*2010*	*2006*	*2010*	*2007*	*2010*	*2006*	*2010*
Totals	**303**	**527**	**0.00002-18**	**0.0001-28**	**498**	**598**	**0.00003-14**	**NS**	**7**	**1**	**NR**	**NS**	**37**	**53**	**0.2-25**	**NS**
Duration of Use																
Leave-On	*80*	*373*	*0.00002-18*	*0.0001-28*	*241*	*361*	*0.00003-14*	*NS*	*6*	*1*	*NR*	*NS*	*25*	*34*	*3-25*	*NS*
Rinse Off	*223*	*154*	*0.00002-5*	*0.001-2*	*257*	*237*	*0.001-0.07*	*NS*	*1*	*NR*	*NR*	*NS*	*12*	*19*	*0.2-3*	*NS*
Exposure Type																
Eye Area	9	12	0.00004-3	0.0001-0.5	39	35	0.0008-0.2	NS	NR	NR	NR	NS	NR	NR	NR	NS
Possible Ingestion	33	29	0.1-3	0.3-5	29	30	0.003-10	NS	NR	NR	NR	NS	NR	NR	NR	NS
Inhalation	2	7	0.0002-0.01	0.0001-0.0005	1	1	0.001-0.1	NS	NR	NR	NR	NS	NR	NR	NR	NS
Dermal Contact	220	360	0.00002-18	0.0005-23	276	371	0.00003-14	NS	7	1	NR	NS	31	50	3-25	NS
Deodorant (underarm)	NR	NR	0.02	NR	1	4	NR	NS	NR	NR	NR	NS	NR	NR	NR	NS
Hair - Non-Coloring	63	142	0.0001-2	0.0001-<1	38	40	0.0001-0.02	NS	NR	NR	NR	NS	4	3	0.2	NS
Hair-Coloring	12	20	0.1	0.01-0.2	182	183	0.004-0.007	NS	NR	NR	NR	NS	NR	NR	NR	NS
Nail	4	2	0.1-4	0.1-28	1	3	0.001-5	NS	NR	NR	NR	NS	NR	NR	NR	NS
Mucous Membrane	3	22	0.02-1	0.01-0.5	2	2	0.004-0.01	NS	NR	NR	NR	NS	4	3	3	NS
Bath Products	1	2	0.001-2	0.5	NR	NR	0.001-0.01	NS	NR	NR	NR	NS	3	4	NR	NS
Baby Products	1	9	0.5	NR	8	8	0.004	NS	NR	NR	NR	NS	2	4	NR	NS

*Note - Because each ingredient may be used in cosmetics with multiple exposure types, the sum of all exposure types may not equal the sum of total uses.

NR - not reported to the VCRP or the Council

NS - not surveyed; ingredients that were recently reviewed were not resurveyed for concentration of use

** concentration of use data were not given in the original report

- was not distinguished whether C. Americana or C. Avellana was reported; arbitrarily reported under C. Avellana (Hazel) Seed Oil for this table

[a] 15% after dilution.

[b] 0.4 after dilution.

Table 5c**. Ingredients with no reported use concentrations or uses.**

Adansonia Digitata Seed Oil
Aleurites Moluccanus Bakoly Seed Oil
Amaranthus Hypochondriacus Seed Oil
Arctium Lappa Seed Oil
Babassu Acid
Bassia Butyracea Seed Butter
Brassica Campestris (Rapeseed) Oil Unsaponifiables
Brassica Napus Seed Oil
Brassica Oleracea Acephala Seed Oil
Canarium Indicum Seed Oil
Carya Illinoensis (Pecan) Seed Oil
Citrus Aurantifolia (Lime) Seed Oil
Citrus Aurantifolia (Lime) Seed Oil Unsaponifiables
Citrus Aurantium Dulcis (Orange) Seed Oil
Citrus Aurantium Dulcis (Orange) Seed Oil Unsaponifiables
Citrus Grandis (Grapefruit) Seed Oil
Citrus Grandis (Grapefruit) Seed Oil Unsaponifiables
Cocos Nucifera (Coconut) Seed Butter
Coix Lacryma-Jobi (Job's Tears) Seed Oil
Corn Acid
Cottonseed Acid
Cynara Cardunculus Seed Oil
Elaeis (Palm) Fruit Oil
Elaeis Guineensis (Palm) Butter
Fragaria Ananassa (Strawberry) Seed Oil
Fragaria Chiloensis (Strawberry) Seed Oil
Fragaria Vesca (Strawberry) Seed Oil
Fragaria Virginiana (Strawberry) Seed Oil
Guizotia Abyssinica Seed Oil
Hippophae Rhamnoides Seed Oil
Hydrogenated Adansonia Digitata Seed Oil
Hydrogenated Apricot Kernel Oil Unsaponifiables
Hydrogenated Argania Spinosa Kernel Oil
Hydrogenated Black Currant Seed Oil
Hydrogenated Camelina Sativa Seed Oil
Hydrogenated Cranberry Seed Oil
Hydrogenated Grapefruit Seed Oil
Hydrogenated Grapefruit Seed Oil Unsaponifiables
Hydrogenated Hazelnut Oil
Hydrogenated Kukui Nut Oil
Hydrogenated Lime Seed Oil
Hydrogenated Lime Seed Oil Unsaponifiables
Hydrogenated Macadamia Seed Oil
Hydrogenated Meadowfoam Seed Oil
Hydrogenated Orange Seed Oil
Hydrogenated Orange Seed Oil Unsaponifiables
Hydrogenated Palm Acid
Hydrogenated Passiflora Edulis Seed Oil
Hydrogenated Peach Kernel Oil
Hydrogenated Pistachio Seed Oil
Hydrogenated Pumpkin Seed Oil
Hydrogenated Punica Granatum Seed Oil
Hydrogenated Raspberry Seed Oil
Hydrogenated Rice Bran Oil
Hydrogenated Rosa Canina Fruit Oil
Hydrogenated Safflower Seed Oil
Hydrogenated Sesame Seed Oil
Hydrogenated Sweet Almond Oil Unsaponifiables
Hydrogenated Wheat Germ Oil
Hydrogenated Wheat Germ Oil Unsaponifiables
Lupinus Albus Oil Unsaponifiables
Morinda Citrifolia Seed Oil
Olea Europaea (Olive) Husk Oil
Olive Acid
Oryza Sativa (Rice) Seed Oil
Peanut Acid
Potassium Babassuate
Potassium Cornate
Potassium Hydrogenated Cocoate
Potassium Hydrogenated Palmate
Potassium Peanutate
Potassium Rapeseedate
Potassium Safflowerate
Potassium Soyate
Prunus Amygdalus Dulcis (Sweet Almond) Oil Unsaponifiables
Prunus Armeniaca (Apricot) Kernel Oil Unsaponifiables
Rapeseed Acid
Ribes Rubrum (Currant) Seed Oil
Rice Bran Acid
Safflower Acid
Sesamum Indicum (Sesame) Seed Butter
Sodium Cocoa Butterate
Sodium Hydrogenated Cocoate
Sodium Hydrogenated Palmate
Sodium Macadamiaseedate
Sodium Peanutate
Sodium Rapeseedate
Sodium Safflowerate
Sodium Sesameseedate
Sodium Soyate
Sodium Theobroma Grandiflorum Seedate
Soy Acid
Sunflower Seed Acid
Torreya Nucifera Seed Oil
Triticum Aestivum (Wheat) Germ Oil
Triticum Vulgare (Wheat) Germ Oil Unsaponifiables
Vaccinium Corymbosum (Blueberry) Seed Oil

Table 6. **Examples of non-cosmetic uses of oils.**

Oil	**Use**[6,112,204-209]
Aleurities Moluccana Seed Oil [Kukui]	wood preservative, varnishes, paint oil, illumination, soap making, waterproofing paper, rubber substitute, insulating material
Arachis Hypogaea (Peanut) Oil	pharmaceutical, soap making, lubricants, emulsions for insect control, diesel engine fuel
Brassica Napus Seed Oil [Rapeseed]/Canola Oil	rubber additive · lubricants · fat liquoring of leather · varnishes and lacquers · textile chemicals · detergent additives · plasticizers · weed control
Butyrospermum Parkii (Shea) Oil	illumination
Camelina Sativa Seed Oil [False Flax]	drying oil · manufacturing of varnishes and paints
Citrullus Lanatus (Watermelon) Seed Oil	illumination
Cocos Nucifera (Coconut) Oil	lubricants, hydraulic fluid, paints, synthetic rubber, plastics, illumination
Elaeis Guineensis (Palm) Oil	crayon and candle manufacturing · tin plate industry
Elaeis Guineensis (Palm) Kernel Oil	detergent production · pharmaceutical · crayon and candle manufacturing · tin plate industry
Garcinia Indica Seed Butter [Kokum]	candle and soap making, sizing of cotton yarn, pharmaceutical
Guizotia Abyssinica Seed Oil [Niger/Ramtil]	paint · lubricant · pharmaceutical
Helianthus Annuus (Sunflower) Seed Oil	manufacturing of lacquers, copolymers, polyester films, modified resins, plasticizers, alkyl resins, other similar products
Juglans Regia (Walnut) Seed Oil	paints, soap making
Linum Usitatissimum (Linseed) Seed Oil	manufacturing of linoleum, cloth oil, printing and lithographic inks, core oils, linings, packings, oil-modified alkyd resins, caulking compounds, putties, leather-finishing compounds, lubricants, greases, polishes, pyrotechnic compositions · pigment binder in petrochemicals · concrete protector · stabilizer/plasticizer for vinyl plastics · industrial stains · jute textiles · drying oil in paints and varnishes
Mangifera Indica (Mango) Seed Butter	substitute for cocoa butter
Olea Europaea (Olive) Fruit Oil	textile industry · pharmaceutical
Orbignya Cohune Seed Oil	manufacturing of soaps, candles, and nightlights · cotton dyeing · ointment base · substitute for cocoa butter in food
Perilla Ocymoides Seed Oil [Perilla]	substitute for linseed oil in the manufacture of paints, varnishes, linoleum, oilclothes, and printing inks
Prunus Amygdalus Dulcis (Sweet Almond) Oil	pharmaceutical, energy source
Prunus Armeniaca (Apricot) Kernel Oil	pharmaceutical
Theobroma Cacao (Cocoa) Seed Butter	pharmaceutical
Vitis Vinifera (Grape) Seed Oil	substitute for linseed oil in the manufacture of paints, and varnishes

Table 7a. **Dermal effects – Non-Human studies**

Ingredient	Concentration	Animals	Procedure	Results	Reference
			Adansonia Digitata Seed Oil		
Adansonia Digitata (Baobab) Oil	100%		MatTek EpiDerm MTT viability assay; 100 µl of test material for 1-24 h	classified as non-irritating	210
			Arachis Hypogaea (Peanut) Oil		
Arachis Hypogaea (Peanut) Oil		Hartley and/or Himalayan guinea pigs	Single drops of a store-bought peanut oil were applied to clipped skin on the backs of 4 guinea pigs. Applications were made at 2-6 wk intervals, for a total of 7 applications over a 5-mo period. It appears that the test sites were not covered. The test sites were scored 24 h after application. Well-defined erythema was considered a positive reaction.	None of the animals had a positive reaction following the initial application. Two animals had positive reactions following application at wks 6 and 12, while one animal had a positive reaction following dosing at wk 12 only	17
			Butyrospermum Parkii (Shea) Butter		
Butyrospermum Parkii (Shea) Butter	not specified	3 male New Zealand White (NZW) rabbits	0.5 ml applied to the shaved dorso-lumbar region under an occlusive patch for 4 h	very slight erythema with or without edema was observed in 2 rabbits; resolved by day 3 or 4	211
Butyrospermum Parkii (Shea) Butter	induction: 75% challenge: 20 and 50%	10 female albino Hartley/Dunkin guinea pigs	maximization study with Freund's complete adjuvant (FCA) during induction	no evidence of delayed hypersensitivity	212
			Crambe Abyssinica Seed Oil		
Crambe Abyssinica Seed Oil	undiluted		dermal irritation study; details not provided	not a dermal irritant	213
			Hippophae Rhamnoides Seed Oil		
Hippophae Rhamnoides Seed Oil		albino rabbits, number not specified	0.5 ml applied under an occlusive patch for 4 h	no irritation	214
			Olea Europaea (Olive) Fruit Oil		
Olea Europaea (Olive) Fruit Oil		12 Harley and/or Himalayan guinea pigs	Single drops of a USP-grade olive oil that had been stored in its original metal container for 10 yrs were applied to a clipped area on the backs of 12 guinea pigs. (The composition of the oil was not determined.) Applications were made at 2-6 wk intervals over a period of 5 mos. Four guinea pigs were treated similarly using store-bought virgin olive oil.	None of the animals had a positive reaction following the initial application of either oil. With 10-yr-old olive oil, 11/12 of the animals had a positive reaction at some point. Some, but not all, of these guinea pigs reacted consistently following the first positive reaction; 2 animals had only 1 positive reaction; 2 guinea pigs in this group died by wk 16. In the group dosed with virgin olive oil, 1 animal had a positive reaction at wk 2 and 1 animal had a positive reaction at wks 4 and 6	215
		22 guinea pigs sensitive to the 10-yr-old USP olive oil	cross-reactivity to store-bought olive oil, another store-bought olive oil (not specified as virgin olive oil), corn oil, and peanut oil was determined. The 5 oils were applied simultaneously to the backs of the guinea pigs	18 of the animals reacted to the virgin olive oil, and 18 reacted to the other store-bought olive oil. (Overlap of these animals was not complete.) Cross-reactivity to corn or peanut oil was not observed.	
		8 sensitized and 4 non-sensitized guinea pigs	single drops of the unsaponifiable fraction of the 10-yr-old oil were applied	All of the sensitized animals reacted to the unsaponifiable fraction, while the non-sensitized animals did not.	
			Zea Mays (Corn) Oil		
corn oil, store-bought		6 Hartley and/or Himalayan guinea pigs	sensitization study, details not specified	0 of the animals had a positive reaction following the initial application; 2 animals had positive reactions following application at wks 4 and 6, while 1 animal had a positive reaction following application at wk 12	215

Table 7a. **Dermal effects – Non-Human studies**

Ingredient	Concentration	Animals	Procedure	Results	Reference
			PHOTOTOXICITY		
			Butyrospermum Parkii (Shea) Butter		
Butyrospermum Parkii (Shea) Butter	10 and 20% in acetone	10 Pirbright white guinea pigs	animals were treated with test compound, then irradiated with UV-B light for 80 seconds followed by UV-A light for 80 min	not phototoxic	216

Table 7b. Dermal effects – Non-Human studies- – summarized from previous CIR reports

Ingredient	Concentration	Animals	Procedure	Results	Reference
Arachis Hypogaea (Peanut) Oil					
Undiluted technical grade Arachis Hypogaea (Peanut) Oil was moderately irritating to rabbits and guinea pig skin and mildly irritating to rat skin following exposure; there was no indication that the test site was occluded. However, in a 48 h occlusive patch test using miniature swine, technical grade Arachis Hypogaea (Peanut) Oil was not irritating					17
Carthamus Tinctorius (Safflower) Oil					
Undiluted Carthamus Tinctorius (Safflower) Seed Oil was minimally irritating in a repeat open patch test using rabbits and was not a primary irritant or sensitizer in a maximization study using guinea pigs.					32
Cocos Nucifera (Coconut) Oil					
Undiluted Cocos Nucifera (Coconut) Oil was non- irritating to rabbit skin. In guinea pigs, undiluted Cocos Nucifera (Coconut) Oil was not a sensitizer in a Magnusson-Kligman maximization study.					33
Hydrogenated Coconut Oil					
Undiluted hydrogenated coconut oil was non-irritating to rabbit skin. In guinea pigs, undiluted hydrogenated coconut oil was not a sensitizer in a Buehler test.					33
Coconut Acid					
Undiluted coconut acid was minimally irritating to rabbit skin.					33
Sodium Cocoate					
In single-insult occlusive patch tests of a 5% aq. solution of a bar soap containing 13% sodium cocoate, scores of 1.6-4.0/8.0 were reported.					33
Elaeis Guineensis (Palm) Oil					
Undiluted Elaeis Guineensis (Palm) Oil was practically non- to minimally irritating to rabbit skin. Elaeis Guineensis (Palm) Oil, 5%, was non-allergenic in a maximization study.					26
Gossypium Herbaceum (Cotton) Seed Oil					
Cosmetic formulations containing 3.4-8.97% hydrogenated cottonseed oil were not irritating to rabbit skin.					27
Oryza Sativa (Rice) Bran Oil					
Undiluted Oryza Sativa (Rice) Bran Oil was not irritating to rabbits, and in a guinea pig maximization study, no reactions were observed when 5% was used at induction and 25% and 50% Oryza Sativa (Rice) Bran Oil were used at challenge. An Oryza Sativa (Rice) Bran Oil /Oryza Sativa (Rice) Germ Oil mixture, concentrations not stated, did not cause a contact allergy response. Undiluted hydrolyzed rice protein was also not irritating or sensitizing.					28
Oryza Sativa (Rice) Germ Oil					
Oryza Sativa (Rice) Germ Oil was not a primary dermal irritant.					28
Prunus Amygdalus Dulcis (Sweet Almond) Oil					
Undiluted Prunus Amygdalus Dulcis (Sweet Almond) Oil and two moisturizer formulations, each containing 25% Prunus Amygdalus Dulcis (Sweet Almond) Oil, were tested for skin irritancy in rabbits using occlusive patches. Undiluted Prunus Amygdalus Dulcis (Sweet Almond) Oil was nonirritating (PII = 0/4). The formulations containing 25% Prunus Amygdalus Dulcis (Sweet Almond) Oil were minimally irritating (PIIs = 0.28 and 0.72, respectively). In a 60-day cumulative irritation test, 10 and 100% Prunus Amygdalus Dulcis (Sweet Almond) Oil was applied to rabbits. When tested in 7 separate trials, 100% Prunus Amygdalus Dulcis (Sweet Almond) Oil produced mean maximum irritation indices (MMIIs) ranging from 0.34 to 1.34 (maximum score = 8). At a concentration of 10%, MMIIs for this ingredient ranged from 0-0.66. Results indicated that, when applied to the skin over a long period of time, Prunus Amygdalus Dulcis (Sweet Almond) Oil is slightly irritating; whereas, at 10% it is practically nonirritating. A maximization assay was used to determine the sensitizing potential of Prunus Amygdalus Dulcis (Sweet Almond) Oil. using guinea pigs. Intradermal induction used concentrations of 5% Amygdalus Dulcis (Sweet Almond) Oil, the dose-range phase of the experiment used a single dermal application of 5%, 10%, or 100% Prunus Amygdalus Dulcis (Sweet Almond) Oil, a booster induction injection of 100% Prunus Amygdalus Dulcis (Sweet Almond) Oil was applied occlusively for 48 h 1 wk later, challenge was with 5% Prunus Amygdalus Dulcis (Sweet Almond) Oil in petrolatum applied topically under occlusion for 24 h. Prunus Amygdalus Dulcis (Sweet Almond) Oil was non-sensitizing.					217

Table 7b. Dermal effects – Non-Human studies- – summarized from previous CIR reports

Ingredient	Concentration	Animals	Procedure	Results	Reference
Undiluted Prunus Amygdalus Dulcis (Sweet Almond) Oil was tested for irritancy in groups of 6 male albino rabbits. The test material was applied under occlusion to the clipped intact and abraded dorsal skin of each animal. Twenty-three hours later, patches were removed; sites were scored at 24 and 48 hours. The Primary Irritation Indices (PIIs) for seven test samples of Prunus Amygdalus Dulcis (Sweet Almond) Oil ranged from 0 to 0.18 (maximum score = 8), indicating that this ingredient is practically nonirritating to skin.					
Sesamum Indicum (Sesame) Seed Oil					
Undiluted Sesamum Indicum (Sesame) Seed Oil was non- or minimally irritating to rabbit skin.					55
Triticum Vulgare (Wheat) Germ Oil					
Triticum Vulgare (Wheat) Germ Oil, undiluted and at 2% in formulation, was non- to mildly irritating, and undiluted Triticum Vulgare (Wheat) Germ Oil was not sensitizing to guinea pigs.					30
PHOTOTOXICITY					
Elaeis Guineensis (Palm) Oil					
A facial lotion containing 1.5% Elaeis Guineensis (Palm) Oil was not phototoxic in the phototoxicity yeast assay.					26
Oryza Sativa (Rice) Bran Oil					
Oryza Sativa (Rice) Bran Oil, tested undiluted during induction at 10% at challenge, was not a photosensitizer in guinea pigs.					28
Oryza Sativa (Rice) Germ Oil					
Oryza Sativa (Rice) Germ Oil, ≤75%, was not phototoxic or photosensitizing.					28
COMEDOGENICITY					
Corylus Avellana (Hazel) Seed Oil					
A comedogenicity study was conducted in which 0.1 ml of Corylus Avellana (Hazel) Seed Oil (pH 6) was applied to the pinna of the ear of albino rabbits. No local irritation was noted at the application site. A "slight difference in the number and size of the pilosebaceous follicles" was noted via magnifying glass. A "slight excess of sebum and a dilation of the follicles" was noted upon microscopic examination of the treated areas					41

Table 8a. Dermal effects – Human studies

Ingredient and Concentration	Subjects Completed	Method	Results	Reference
Adansonia Digitata Seed Oil				
0.01% Adansonia Digitata Seed Oil in a lip product	106	HRIPT with 0.2 g test material, semi-occluded	not a dermal irritant or sensitizer	218
100% Adansonia Digitata Seed Oil	107	HRIPT with 0.02-0.05 ml test material, semi-occluded	not a dermal irritant or sensitizer	219
Aleurites Moluccana Seed Oil				
0.005% Aleurites Moluccana Seed Oil in scalp conditioner/hair wax	104	HRIPT; occlusive; applied neat	not a dermal irritant or sensitizer	220
~3% in a skin cleanser	110	modified HRIPT; semi-occlusive; 10% dilution in distilled water	not a dermal irritant or sensitizer	221
Arachis Hypogaea (Peanut) Oil				
dermatologic product containing 0.01% fluocinolone and refined Arachis Hypogaea (Peanut) Oil	peanut-sensitive subjects; 8 children, 6 adults	skin prick test with peanut extracts, a soln, of 50% glycerin (negative control), a solution of 1.8 mg/ml histamine phosphate in 50% glycerin (positive control), the complete test product, vehicle only (without fluocinolone), and refined Arachis Hypogaea (Peanut) Oil	1 child had a trace positive reaction	222
		patch test with product, vehicle only, and refined Arachis Hypogaea (Peanut) Oil	no reactions	
Argania Spinosa Kernel Oil				
5% Argania Spinosa Kernel Oil in a face serum	108	primary cutaneous irritation	no primary irritation	223
5% Argania Spinosa Kernel Oil in a face serum	108	HRIPT; occlusive; applied neat	not an irritant or a sensitizer	223
10% Argania Spinosa Kernel Oil in a skin salve	209	HRIPT; occlusive; applied neat	not a sensitizer	224
10% Argania Spinosa Kernel Oil in a skin salve	51	4-wk use test; applied to lips, hands/nails, elbows, knees, feet/heels	did not elicit significant dermal irritation or dryness; 2 subjects had level 1(mild, very slight erythema) on the lips, and 5 had level 1 erythema on the elbows, lips, or knees; 15 subjects reported subjective irritation	225
Astrocaryum Murumuru				
1% Astrocaryum Murumuru Seed Butter in a lipstick	97	HRIPT with 150 mg test material, semi-occluded	not a dermal irritant or sensitizer	226
4% Astrocaryum Murumuru Seed Butter in a lipstick	108	HRIPT, occluded	not a dermal irritant or sensitizer	227
4% Astrocaryum Murumuru Seed Butter in a lipstick	108	HRIPT, occluded	not a dermal irritant or sensitizer	228
4% Astrocaryum Murumuru Seed Butter in a lipstick	108	HRIPT, occluded	not a dermal irritant or sensitizer	229
4% Astrocaryum Murumuru Seed Butter in a lipstick	106	HRIPT, occluded	not a dermal irritant or sensitizer	230
4% Astrocaryum Murumuru Seed Butter in a lipstick	106	HRIPT, occluded	not a dermal irritant or sensitizer	231
4% Astrocaryum Murumuru Seed Butter in a lipstick	108	HRIPT, occluded	not a dermal irritant or sensitizer	232

Table 8a. Dermal effects – Human studies

Ingredient and Concentration	Subjects Completed	Method	Results	Reference
Avena Sativa (Oat) Kernel Oil				
3% Avena Sativa (Oat) Kernel Oil in a body and hand formulation	100	HRIPT with 0.2 ml, occluded	not a dermal irritant or sensitizer	[233]
Bassia Latifolia Seed Butter				
2% Bassia Latifolia Seed Butter in a body scrub	110	HRIPT with 1% aq. solution of the formulation, semi-occluded	not a dermal irritant or sensitizer	[234]
Borago Officinalis Seed Oil				
1% Borago Officinalis Seed Oil in a body and hand formulation	213	HRIPT with 0.2 g, occluded	not a dermal irritant or sensitizer	[235]
2% Borago Officinalis Seed Oil in a face serum	108	primary cutaneous irritation	no primary irritation	[223]
2% Borago Officinalis Seed Oil in a face serum	108	HRIPT; occlusive; applied neat	not an irritant or a sensitizer	[223]
Brassica Campestris (Rapeseed) Oil				
5% Hydrogenated Rapeseed Oil in a baby oil	105	HRIPT with 0.2 ml, semi-occluded	not a dermal irritant or sensitizer	[236]
Brassica Oleracea Italica (Broccoli) Seed Oil				
0.5% Brassica Oleracea Italica (Broccoli) Seed Oil in a hair conditioner	102	HRIPT with 150 µl of test material, 10% dilution, semi-occluded	not a dermal irritant or sensitizer	[237]
Butyrospermum Parkii (Shea) Butter				
Butyrospermum Parkii (Shea) Butter and fractions of unsaponifiable lipids from Butyrospermum Parkii (Shea) Butter; the "liquid" sample was obtained from a supplier; the unsaponifiable fraction was obtained through low temperature crystallization of the supplied sample	21	single applications to normal skin and sodium lauryl sulfate (SLS)-irritated skin; right volar forearm was treated with 50 µl of each test material in 12 mm Finn chambers for 48 h; the left volar forearm was treated with 50 µl of 14% aq. SLS for 7 h, rinsed, dried, and then treated with 50 µl of each test material for 17 h; cutaneous blood flow (CBF) and transepidermal water loss (TEWL) were measured	normal skin: barely perceptible erythema observed in a "small" number of subjects at 24 h after treatment with shea butter; no irritation to the shea unsaponifiable fraction; no sig. difference in CBF or TEWL SLS-treated skin: 2 subjects had a slight- and moderate reaction to the unsaponifiable fraction; no sig. difference in CBF or TEWL	[238]
0.1% Butyrospermum Parkii (Shea) Butter in a scalp conditioner	114	primary cutaneous irritation; formulation diluted to 1%	no primary irritation	[239]
2% Butyrospermum Parkii (Shea) Butter in a cream	119	primary cutaneous irritation	no primary irritation	[240]
0.1% Butyrospermum Parkii (Shea) Butter in a scalp conditioner	110	HRIPT; occlusive; formulation diluted to 1%	not a dermal irritant or sensitizer	[239]
2% Butyrospermum Parkii (Shea) Butter in a cream	118 (irritation)/ 116 (sensitization)	HRIPT; occlusive	not a dermal irritant or sensitizer	[240]
4% Butyrospermum Parkii (Shea) Butter in a face cream	51	HRIPT with 20 µl test material, occluded	not a dermal irritant or sensitizer	[241]
4% Butyrospermum Parkii (Shea) Butter in an eye cream	108	HRIPT with 20 µl test material, occluded	not a dermal irritant or sensitizer	[242]
23.5% Butyrospermum Parkii (Shea) Butter in a lip gloss	104	HRIPT	not a dermal irritant or sensitizer	[243]
23.7% Butyrospermum Parkii (Shea) Butter in a lip gloss	104	HRIPT	irritation on induction days 5-9 in one subject; no sensitization	[244]

Table 8a. Dermal effects – Human studies

Ingredient and Concentration	Subjects Completed	Method	Results	Reference
24.1% Butyrospermum Parkii (Shea) Butter in a lip wax	113	HRIPT	not a dermal irritant or sensitizer	[245]
24.1% Butyrospermum Parkii (Shea) Butter in a lip wax	2 runs	Episkin	average viability 67.3% - no irritation potential	[246]
24.7% Butyrospermum Parkii (Shea) Butter in a lip gloss	40	28-day use study, 2-6 times /day	1 subject with desquamation	[247]
45% Butyrospermum Parkii (Shea) Butter in a body/hand massage	109[a]	HRIPT	not a dermal irritant or sensitizer	[248]
45% Butyrospermum Parkii (Shea) Butter in a body/hand massage	109[a]	HRIPT	not a dermal irritant or sensitizer	[249]
45% Butyrospermum Parkii (Shea) Butter in a body/hand massage	109[a]	HRIPT	not a dermal irritant or sensitizer	[250]
45% Butyrospermum Parkii (Shea) Butter in a body/hand massage	109[a]	HRIPT	not a dermal irritant or sensitizer	[251]
45% Butyrospermum Parkii (Shea) Butter in a body/hand massage	31	2-week use study, 2 time per day	no erythema, edema, or dryness	[252]
60% Butyrospermum Parkii (Shea) Butter in a cuticle cream	111	HRIPT	not a dermal irritant or sensitizer	[253]
Camelina Sativa Seed Oil				
0.25% Camelina Sativa Seed Oil in a body powder	204	HRIPT with 0.1 g, semi-occluded	not a dermal sensitizer	[254]
7% Camelina Sativa Seed Oil in an oil treatment	103	HRIPT with 200 µl test material, semi-occluded	Grade 1 (mild erythema) reactions in 4 subjects for 1 or 2 patches in the induction phase, grade 1 (mild erythema in different subjects at the 48 h challenge reading. Study concluded test material was not a dermal irritant or sensitizer.	[255]
Camellia Sinensis Seed Oil				
0.0985% Camellia Sinensis Seed Oil in a lipstick	108	HRIPT with 0.2 g, occluded	not a dermal irritant or sensitizer	[256]
0.0985% Camellia Sinensis Seed Oil in a lipstick	108	HRIPT with 0.2 g, occluded	not a dermal irritant or sensitizer	[257]
Canola Oil				
74.7% Canola Oil in a body oil	101	HRIPT with 150 µl test material, semi-occluded	not a dermal irritant or sensitizer	[258]
Carthamus Tinctorius (Safflower) Oil				
5% Carthamus Tinctorius (Safflower) Seed Oil in a cleansing oil rinse-off	214	HRIPT with 0.2 ml of a 10% v/v aqueous solution, semi-occluded	3 subjects had a "?" reaction following a patch during the induction and 1 subject had definite erythema with no edema or damage to the epidermis (+D) following the 7th patch. No reactions were observed at a new test site. No other reactions were observed. Study concluded test material was not a dermal sensitizer.	[259]

Table 8a. Dermal effects – Human studies

Ingredient and Concentration	Subjects Completed	Method	Results	Reference
30% Carthamus Tinctorius (Safflower) Seed Oil in a massage oil	107	HRIPT with 0.2 ml test material, semi-occluded	1 subject had slight erythema following the 7th patch that did not reoccur, no other reactions observed. Not a dermal irritant or sensitizer.	260
Caryocar Brasiliense Fruit Oil				
0.1% Caryocar Brasiliense Fruit Oil in a lipstick	100	HRIPT with 200 mg test material, semi-occluded	not a dermal irritant or sensitizer	261
Chenopodium Quinoa Seed Oil				
1% Chenopodium Quinoa Seed Oil in a UV SPF cream	105	HRIPT with 0.02 ml test material, occluded	"An acceptable level of irritation" was observed in the induction phase consisting of grade 1 (mild erythema) in 39 subjects, with one additional subject exhibiting a grade 2 (moderate erythema) reaction. No evidence of skin sensitization was observed.	262
1% Chenopodium Quinoa Seed Oil in a UV SPF cream	102	HRIPT with 0.02 ml test material, occluded	"An acceptable level of irritation" was observed in the induction phase, with 54% of the subjects exhibiting a grade 1 (mild erythema) reaction and 3% of the subjects exhibiting a grade 2 (moderate erythema) reaction. One subject had a strong reaction to the 3rd induction patch and discontinued the induction phase after the 6th application. At challenge, the subject had only papules at 96 h. Due to reactions to other materials tested at the same time, it could not be determined if the test material was the causative agent. No evidence of skin sensitization was observed in the remaining subjects.	263
Citrullus Lanatus (Watermelon) Seed Oil				
2% Citrullus Lanatus (Watermelon) Seed Oil in a facial oil	105	HRIPT, semi-occluded	not a dermal irritant or sensitizer	264
Cocos Nucifera (Coconut) Fruit Oil				
0.15% Cocos Nucifera (Coconut) Oil in a scalp conditioner/hair wax	104	HRIPT; occlusive; applied neat	not a dermal irritant or sensitizer	220
31% Cocos Nucifera (Coconut) Oil in a lip balm	222	HRIPT with 0.2 g test material, occluded	2 subjects had low-level, transient (+) reactions during the induction, no other reactions were observed. Study concluded that test material was not a dermal sensitizer.	265
Corylus Avellana (Hazel Seed) Oil				
1% Corylus Avellana (Hazel) Seed Oil in a moisturizing cream	25	Amended Draize patch test, 10% standard concentration	Non-irritating	266

Table 8a. Dermal effects – Human studies

Ingredient and Concentration	Subjects Completed	Method	Results	Reference
1% Corylus Avellana (Hazel) Seed Oil in a moisturizing cream	32	60 day clinical study	"Fairly good acceptability"	267
5% Corylus Avellana (Hazel) Seed Oil in a massage oil	107	HRIPT with 0.2 ml test material, semi-occluded	1 subject had slight erythema following the 7th patch that did not reoccur, no other reactions observed. Not a dermal irritant or sensitizer.	260
		Crambe Abyssinica Seed Oil		
5% Crambe Abyssinica Seed Oil in a face and neck product	54	HRIPT; semi-occluded, undiluted	not a dermal irritant or sensitizer	268
100% Crambe Abyssinica Seed Oil in an unspecified product	107	HRIPT; undiluted	not a dermal irritant or sensitizer	213
		Elaeis Guineensis (Palm) Oil		
15.7% Sodium Palm Kernelate in a soap	42	28-day use test	good acceptability for use	269
61.6% Sodium Palmate in a soap	42	28-day use test	good acceptability for use	269
		Euterpe Oleracea Fruit Oil		
0.5% Euterpe Oleracea Fruit Oil in an eye treatment	104	HRIPT with 150 µl test material, semi-occluded	not a dermal irritant or sensitizer	270
		Glycine Soja (Soybean) Oil		
0.19% Glycine Soja (Soybean) Unsaponifiables in a face and neck product	50	HRIPT, occluded	not a dermal irritant or sensitizer	271
39% Hydrogenated Soybean Oil in a lipstick	108	HRIPT, occluded	not a dermal irritant or sensitizer	272
		Garcinia Indica Seed Butter		
0.3869% Garcinia Indica Seed Butter in a body and hand product	101	HRIPT, 0.2 g applied, occlusive	not a sensitizer; irritation was observed in one subject	273
		Gossypium Herbaceum (Cotton) Seed Oil		
3.6% Hydrogenated Cottonseed Oil in a lip balm	222	HRIPT with 0.2 g test material, occluded	2 subjects had low-level, transient (±) reactions during the induction, no other reactions were observed. Study concluded that test material was not a dermal sensitizer.	265
		Helianthus Annuus (Sunflower) Seed Oil		
6% Helianthus Annuus (Sunflower) Seed Oil in a skin cream	108	primary cutaneous irritation	no primary irritation	274
20% Helianthus Annuus (Sunflower) Seed Oil in a face serum	108	primary cutaneous irritation	no primary irritation	223
0.264% Helianthus Annuus (Sunflower) Seed Oil in a cream	57	HRIPT; Finn chambers, applied neat	not a dermal irritant or sensitizer	275
6% Helianthus Annuus (Sunflower) Seed Oil in a skin cream	106	HRIPT, occlusive	not a dermal irritant or sensitizer	274

Table 8a. Dermal effects – Human studies

Ingredient and Concentration	Subjects Completed	Method	Results	Reference
20% Helianthus Annuus (Sunflower) Seed Oil in a face serum	108	HRIPT; occlusive; applied neat	not an irritant or a sensitizer	[223]
1% Helianthus Annuus (Sunflower) Seed Oil in a soap	42	28-day use test	good acceptability for use	[269]
39.8% Helianthus Annuus (Sunflower) Seed Oil in a massage oil	107	HRIPT with 0.2 ml test material, semi-occluded	1 subject had slight erythema following the 7th patch that did not reoccur, no other reactions observed. Not a dermal irritant or sensitizer.	[260]
Helianthus Annuus (Sunflower) Seed Oil Unsaponifiables				
2% Helianthus Annuus (Sunflower) Seed Oil Unsaponifiables in a night product	100	HRIPT, semi-occluded	not a dermal irritant or sensitizer	[271]
2% Helianthus Annuus (Sunflower) Seed Oil Unsaponifiables in a face and neck product	100	HRIPT, semi-occluded	not a dermal irritant or sensitizer	[271]
Hippophae Rhamnoides Seed Oil				
5% Hippophae Rhamnoides Seed Oil	10	cutaneous local tolerance test, 0.02 ml single 48 h occlusive application	not an irritant; average irritation score of 0	[276]
Irvingia Gabonensis Kernel Butter				
0.31% Irvingia Gabonensis Kernel Butter in a face and neck product	52	HRIPT, occluded	not a dermal irritant or sensitizer	[271]
Limnanthes Alba (Meadowfoam) Seed Oil				
71.3% Limnanthes Alba (Meadowfoam) Seed Oil in a facial repair product	109	HRIPT, semi-occluded	7 subjects had ± on the first day of the induction only, no other reactions. Not a dermal irritant or sensitizer.	[277]
Linum Usitatissimum (Linseed) Seed Oil				
9.4% Linum Usitatissimum (Linseed) Seed Oil in mascara	105	HRIPT with 0.2 g test material, semi-occluded	not a dermal irritant or sensitizer	[278]
Luffa Cylindrica Seed Oil				
0.01% Luffa Cylindrica Seed Oil in a body wash	102	HRIPT; 0.2 ml of a 1% dilution using distilled water was applied to a 1" x 1" pad applied with a semi-occlusive patch	not a dermal irritant or sensitizer	[279]
Macadamia Ternifolia Seed Oil				
0.5% Macadamia Ternifolia Seed Oil in a cleansing oil rinse-off	214	HRIPT with 0.2 ml of a 10% v/v aqueous solution, semi-occluded	3 subjects had a "?" reaction following a patch during the induction and 1 subject had definite erythema with no edema or damage to the epidermis (+D) following the 7th patch. No reactions were observed at a new test site. No other reactions were observed. Study concluded test material was not a dermal sensitizer.	[259]
30% Macadamia Ternifolia Seed Oil in a body and hand product	55	HRIPT; semi-occluded, undiluted	not a dermal irritant or sensitizer	[268]

Table 8a. Dermal effects – Human studies

Ingredient and Concentration	Subjects Completed	Method	Results	Reference
Mangifera Indica (Mango) Seed Oil				
2% Mangifera Indica (Mango) Seed Oil in a lipstick	100	HRIPT with 150 µl test material, semi-occluded	not a dermal irritant or sensitizer	[280]
3.87% Mangifera Indica (Mango) Seed Oil in an eyeliner	102	HRIPT with 0.2 g of test material, semi-occluded	not a dermal irritant or sensitizer	[281]
Mangifera Indica (Mango) Seed Butter				
1% Mangifera Indica (Mango) Seed Butter in a facial lotion	100	HRIPT with 200 µl test material, semi-occluded	not a dermal irritant or sensitizer	[282]
9% Mangifera Indica (Mango) Seed Butter in a body product	102	HRIPT with 0.2 g, semi-occluded	not a sensitizer	[283]
Moringa Oleifera Seed Oil				
0.01% Moringa Oleifera Seed Oil in a cleansing oil rinse-off	214	HRIPT with 0.2 ml of a 10% v/v aqueous solution, semi-occluded	3 subjects had a "?" reaction following a patch during the induction and 1 subject had definite erythema with no edema or damage to the epidermis (+D) following the 7th patch. No reactions were observed at a new test site. No other reactions were observed. Study concluded test material was not a dermal sensitizer.	[259]
Moringa Pterygosperma Seed Oil				
3% Moringa Pterygosperma Seed Oil in an eye treatment	104	HRIPT with 150 µl test material, semi-occluded	not a dermal irritant or sensitizer	[284]
Oenothera Biennis (Evening Primrose) Oil				
1.99% Oenothera Biennis (Evening Primrose) Oil in a foundation	600	HRIPT, occluded	not a dermal irritant or sensitizer	[285]
Olea Europaea (Olive) Fruit Oil				
0.7% Olea Europaea (Olive) Fruit Oil in a scalp conditioner	114	primary cutaneous irritation; formulation diluted to 1%	no primary irritation	[239]
0.1595% Olea Europaea (Olive) Fruit Oil in a scalp conditioner/hair wax	104	HRIPT; occlusive; applied neat	not a dermal irritant or sensitizer	[220]
0.7% Olea Europaea (Olive) Fruit Oil in a scalp conditioner	110	HRIPT; occlusive; formulation diluted to 1%	not a dermal irritant or sensitizer	[239]
1.6% Olea Europaea (Olive) Fruit Oil in a body lotion	110	HRIPT with 0.02 ml test material , occluded	1 subject had slight erythema following the 7th patch that did not reoccur, no other reactions observed. Not a dermal irritant or sensitizer.	[286]
10% Olea Europaea (Olive) Fruit Oil in a skin salve	209	HRIPT; occlusive applied neat	not a sensitizer	[224]
22% Olea Europaea (Olive) Fruit Oil in a body moisturizer	105	HRIPT, semi-occluded	not a dermal irritant or sensitizer	[287]
58.7% Olea Europaea (Olive) Fruit Oil in a conditioning hair oil	102	HRIPT with 0.2 ml, semi-occluded	not a dermal irritant or sensitizer	[288]

Table 8a. Dermal effects – Human studies

Ingredient and Concentration	Subjects Completed	Method	Results	Reference
69.6% Olea Europaea (Olive) Fruit Oil in a foundation	209	HRIPT with 200 µl test material, occluded	not a dermal irritant or sensitizer	[289]
10% Olea Europaea (Olive) Oil in a skin salve	51	4-wk use test; applied to lips, hands/nails, elbows, knees, feet/heels	did not elicit significant dermal irritation or dryness; 2 subjects had level 1(mild, very slight erythema on the lips, and 5 had level 1 erythema on the elbows, lips, or knees; 15 subjects reported subjective irritation	[225]
Olea Europaea (Olive) Oil Unsaponfiables				
2.5% Olea Europaea (Olive) Oil Unsaponfiables in a bath body mist	107	HRIPT with 150 µl test material, semi-occluded	not a dermal irritant or sensitizer	[290]
Hydrogenated Olive Oil				
12% Hydrogenated Olive Oil in a lipstick	108	HRIPT, occluded	not a dermal irritant or sensitizer	[272]
Hydrogenated Olive Oil Unsaponifiables				
2% Hydrogenated Olive Oil Unsaponifiables in a face and neck product	50	HRIPT, occluded	not a dermal irritant or sensitizer	[271]
5% Hydrogenated Olive Oil Unsaponifiables in a skin cleansing product	57	HRIPT, semi-occluded, 10% dilution of product	not a dermal irritant or sensitizer	[271]
Sodium Olivate				
17.64% Sodium Olivate in a body bar soap	107	HRIPT, semi-occluded	not a dermal irritant or sensitizer	[291]
Orbignya Oleifera Seed Oil				
3.79% Orbignya Oleifera Seed Oil in a cream cleanser	104	HRIPT with 0.2 ml of a 10% dilution of formulation, semi-occluded	not a dermal irritant or sensitizer	[292]
Orbignya Speciosa Kernel Oil				
0.4125% Orbignya Speciosa Kernel Oil in a hair conditioner	104	modified HRIPT; semi-occlusive; 10% dilution in distilled water	not a dermal irritant or sensitizer	[293]
Persea Gratissima (Avocado) Oil				
0.2% Persea Gratissima (Avocado) Oil in a scalp conditioner	114	primary cutaneous irritation; formulation diluted to 1%	no primary irritation	[239]
0.2% Persea Gratissima (Avocado) Oil in a scalp conditioner	110	HRIPT; occlusive; formulation diluted to 1%	not a dermal irritant or sensitizer	[239]
10% Persea Gratissima (Avocado) Oil in a skin salve	51	4-wk use test; applied to lips, hands/nails, elbows, knees, feet/heels	did not elicit significant dermal irritation or dryness; 2 subjects had level 1(mild, very slight erythema on the lips, and 5 had level 1 erythema on the elbows, lips, or knees; 15 subjects reported subjective irritation	[225]

Table 8a. Dermal effects – Human studies

Ingredient and Concentration	Subjects Completed	Method	Results	Reference
Plukenetia Volubilis Seed Oil				
0.51% Plukenetia Volubilis Seed Oil in a lipstick	108	HRIPT; occlusive; applied neat	not an irritant or a sensitizer	294
Prunus Amygdalus Dulcis (Sweet Almond) Oil				
7% Prunus Amygdalus Dulcis (Sweet Almond) Oil in an oil treatment	103	HRIPT with 200 µl test material, semi-occluded	Grade 1 (mild erythema) reactions in 4 subjects for 1 or 2 patches in the induction phase, grade 1 (mild erythema in different subjects at the 48 h challenge reading. Study concluded test material was not a dermal irritant or sensitizer.	255
10% Prunus Amygdalus Dulcis (Sweet Almond) Oil in a face serum	108	primary cutaneous irritation	no primary irritation	223
10% Prunus Amygdalus Dulcis (Sweet Almond) Oil in a face serum	108	HRIPT; occlusive; applied neat	not an irritant or a sensitizer	223
10% Prunus Amygdalus Dulcis (Sweet Almond) Oil in a skin salve	209	HRIPT; occlusive applied neat	not a sensitizer	224
10% Prunus Amygdalus Dulcis (Sweet Almond) Oil in a skin salve	51	4-wk use test; applied to lips, hands/nails, elbows, knees, feet/heels	did not elicit significant dermal irritation or dryness; 2 subjects had level 1(mild, very slight erythema on the lips, and 5 had level 1 erythema on the elbows, lips, or knees; 15 subjects reported subjective irritation	225
15% Prunus Amygdalus Dulcis (Sweet Almond) Oil in a massage oil	107	HRIPT with 0.2 ml test material, semi-occluded	1 subject had slight erythema following the 7th patch that did not reoccur, no other reactions observed. Not a dermal irritant or sensitizer.	260
25% Prunus Amygdalus Dulcis (Sweet Almond) Oil in a lip balm	222	HRIPT with 0.2 g test material, occluded	2 subjects had low-level, transient (+) reactions during the induction, no other reactions were observed. Study concluded that test material was not a dermal sensitizer.	265
~31% Prunus Amygdalus Dulcis (Sweet Almond) Oil in a facial oil	108	modified HRIPT; semi-occlusive; applied neat	not a dermal irritant or sensitizer	295
45.25% Prunus Amygdalus Dulcis (Sweet Almond) Oil in a facial oil	109	HRIPT; semi-occlusive; applied neat	not a dermal irritant or sensitizer	296
46% Prunus Amygdalus Dulcis (Sweet Almond) Oil in a cuticle softener	106	modified Draize assay with an induction phase (3x/wk for 10 applications) and a challenge phase, applied neat, occlusive	not a dermal irritant or sensitizer	297
Prunus Armeniaca (Apricot) Kernel Oil				
2% Prunus Armeniaca (Apricot) Kernel Oil in a face cream	51	HRIPT with 20 µl test material, occluded	not a dermal irritant or sensitizer	241
2% Prunus Armeniaca (Apricot) Kernel Oil in an eye cream	108	HRIPT with 20 µl test material, occluded	not a dermal irritant or sensitizer	242
2.5% Prunus Armeniaca (Apricot) Kernel Oil in a cream	119	primary cutaneous irritation	no primary irritation	240

Table 8a. Dermal effects – Human studies

Ingredient and Concentration	Subjects Completed	Method	Results	Reference
19.749% Prunus Armeniaca (Apricot) Kernel Oil in a face serum	108	primary cutaneous irritation	no primary irritation	223
0.005% Prunus Armeniaca (Apricot) Kernel Oil in a scalp conditioner/hair wax	104	HRIPT; occlusive; applied neat	not a dermal irritant or sensitizer	220
1% Prunus Armeniaca (Apricot) Kernel Oil in a cream	57	HRIPT; Finn chambers, applied neat	not a dermal irritant or sensitizer	275
2.5% Prunus Armeniaca (Apricot) Kernel Oil in a cream	118 (irritation)/ 116 (sensitization)	HRIPT; occlusive	not a dermal irritant or a sensitizer	240
19.749% Prunus Armeniaca (Apricot) Kernel Oil in a face serum	108	HRIPT; occlusive; applied neat	not an irritant or a sensitizer	223
Prunus Domestica Seed Oil				
0.04% Prunus Domestica Seed Oil in a preshave lotion	105	HRIPT with 0.2 ml, occluded	not a sensitizer	298
Prunus Persica (Peach) Kernel Oil				
24% Prunus Persica (Peach) Kernel Oil in a lip balm	222	HRIPT with 0.2 g test material, occluded	2 subjects had low-level, transient (+) reactions during the induction, no other reactions were observed. Study concluded that test material was not a dermal sensitizer.	265
Ribes Nigrum (Black Currant) Seed Oil				
0.1% Ribes Nigrum (Black Currant) Oil in a scalp conditioner	114	primary cutaneous irritation; diluted to 1%	no primary irritation	239
0.25% Ribes Nigrum (Black Currant) Oil in a cream	119	primary cutaneous irritation	no primary irritation	240
0.1% Ribes Nigrum (Black Currant) Oil in a scalp conditioner	110	HRIPT; occlusive; diluted to 1%	not a dermal irritant or sensitizer	239
0.2% Ribes Nigrum (Black Currant) Seed Oil is an eye mask	228	HRIPT, occluded	4 subjects had "?" or "+" reaction during induction that were not considered clinically relevant, no other reactions observed. Not sensitizing	299
0.2% Ribes Nigrum (Black Currant) Oil in a skin cream	106	HRIPT, occlusive	not a dermal irritant or sensitizer	274
0.25% Ribes Nigrum (Black Currant) Oil in a cream	118 (irritation)/ 116 (sensitization)	HRIPT; occlusive	not a dermal irritant or a sensitizer	240
0.2% Ribes Nigrum (Black Currant) Seed Oil is an eye mask	195	4-week safety in-use study	No adverse reactions reported. Product considered suitable for sensitive skin.	300
Rosa Canina Fruit Oil				
0.39% Rosa Canina Fruit Oil in a skin cream	108	primary cutaneous irritation	no primary irritation	274
0.39% Rosa Canina Fruit Oil in a skin cream	106	HRIPT, occlusive	not a dermal irritant or sensitizer	274
Rubus Chamaemorus Seed Oil				
2.5% Rubus Chamaemorus Seed Oil in product	10	Single occlusive patch test for 48 h with 25 µl	not an irritant	301

Table 8a. Dermal effects – Human studies

Ingredient and Concentration	Subjects Completed	Method	Results	Reference
Rubus Idaeus (Raspberry) Seed Oil				
5% Rubus Idaeus (Raspberry) Seed Oil in a face and neck product	102	HRIPT, occluded	not a dermal irritant or sensitizer	271
Sesamum Indicum (Sesame) Seed Oil				
25% Sesamum Indicum (Sesame) Seed Oil in a face serum	108	primary cutaneous irritation	no primary irritation	223
8% Sesamum Indicum (Sesame) Seed Oil in a skin salve	209	HRIPT; occlusive applied neat	not a sensitizer	224
25% Sesamum Indicum (Sesame) Seed Oil in a face serum	108	HRIPT; occlusive; applied neat	not an irritant or a sensitizer	223
8% Sesamum Indicum (Sesame) Seed Oil in a skin salve	51	4-wk use test; applied to lips, hands/nails, elbows, knees, feet/heels	did not elicit significant dermal irritation or dryness; 2 subjects had level 1(mild, very slight erythema on the lips, and 5 had level 1 erythema on the elbows, lips, or knees; 15 subjects reported subjective irritation	225
Solanum Lycopersicum (Tomato) Seed Oil				
0.0023% Solanum Lycopersicum (Tomato) Seed Oil in a cream cleanser	104	HRIPT with 0.2 ml of a 10% dilution of the formulation, semi-occluded	not a dermal irritant or sensitizer	302
Theobroma Cacao (Cocoa) Seed Butter				
50.1% Theobroma Cacao (Cocoa) Seed Butter in a lip balm	106	HRIPT with 150 µl test material, semi-occluded	not a dermal irritant or sensitizer	303
Theobroma Grandiflorum Seed Butter[304]				
5% Theobroma Grandiflorum Seed Butter in a lip balm	106	HRIPT with 150 µl test material, semi-occluded	not a dermal irritant or sensitizer	305
Triticum Vulgare (Wheat) Germ Oil				
0.005% Triticum Vulgare (Wheat) Germ Oil in a scalp conditioner/hair wax	104	HRIPT; occlusive; applied neat	not a dermal irritant or sensitizer	220
Vaccinium Macrocarpon (Cranberry) Seed Oil				
0.04% Vaccinium Macrocarpon (Cranberry) Seed Oil in a face and neck product	53	HRIPT, occluded	not a dermal irritant or sensitizer	271
Vaccinium Myrtillus Seed Oil				
~1% Vaccinium Myrtillus Seed Oil in a facial oil	116	modified HRIPT; semi-occlusive; volatilized	not a dermal irritant or sensitizer	304
Vaccinium Vitis-Idaea Seed Oil				
5% Vaccinium Vitis-Idaea Seed Oil in product	10	Single occlusive patch test of 48 h with 0.02 ml	not an irritant	306
Vegetable Oil				
4% Vegetable Oil in a foundation	115	HRIPT, semi-occluded	1 subject had ± on the first day of the induction only, no other reactions. Not a dermal irritant or sensitizer.	307
4% Vegetable Oil in a lipstick	106	HRIPT with 0.2 g, occluded	not a dermal irritant or sensitizer	308
11% Vegetable Oil in an eye shadow	106	HRIPT, semi-occluded	not a dermal irritant or sensitizer	309

Table 8a. Dermal effects – Human studies

Ingredient and Concentration	Subjects Completed	Method	Results	Reference
Vitis Vinifera (Grape) Seed Oil				
39% Vitis Vinifera (Grape)Seed Oil in a preshave lotion	105	HRIPT with 0.2 ml, occluded	not a sensitizer	298
90% Vitis Vinifera (Grape) Seed Oil in a fragranced oil	105	HRIPT; semi-occluded; applied neat	not a dermal irritant or sensitizer	310
0.5% Hydrogenated Grapeseed Oil in a lip product	53	HRIPT; semi-occluded	not a dermal irritant or sensitizer	311
Zea Mays (Corn) Germ Oil				
20% Zea Mays (Corn) Germ Oil in a cleansing oil rinse-off	214	HRIPT with 0.2 ml of a 10% v/v aqueous solution, semi-occluded	3 subjects had a "?" reaction following a patch during the induction and 1 subject had definite erythema with no edema or damage to the epidermis (+D) following the 7th patch. No reactions were observed at a new test site. No other reactions were observed. Study concluded test material was not a dermal sensitizer.	259
COMEDOGENICITY				
Ribes Nigrum (Black Currant) Seed Oil				
0.2% Ribes Nigrum (Black Currant) Seed Oil in an eye mask formulation	6	applied undiluted; occlusive	avg. score of 0.00 comedones/cm^2; non-comedogenic	312

[a] Same 109 panelists tested these 4 formulations hat differed only in color and fragrance.

Table 8b. Dermal effects – Human studies – summarized from previous CIR reports

Ingredient and Concentration	Subjects Completed	Method	Results	Reference
Carthamus Tinctorius (Safflower) Oil				
Cosmetic formulations containing 3-5% Carthamus Tinctorius (Safflower) Seed Oil were not irritating to humans in occlusive patch tests and were not primary irritants or sensitizers in repeated insult patch tests.				32
Cocos Nucifera (Coconut) Fruit Oil				
An RIPT was performed using 103 subjects with a tanning butter containing 2.5% Cocos Nucifera (Coconut) Oil no erythematous reactions were seen at challenge; A bar soap containing 13% Cocos Nucifera (Coconut) Oil produced very mild irritation when tested as a 1% aq. solution on 106 subjects, and it was minimally to mildly irritating in a soap chamber test with a 8% aq. solution; the soap produced no unusual irritation response in a 2-wk normal use test; undiluted Cocos Nucifera (Coconut) Oil was not an allergen in 12 subjects.				*43*
Hydrogenated Coconut Oil				
Four lipstick formulations containing 10% hydrogenated coconut oil were tested with a single 48-h application on 204 females; there was no evidence of primary irritation and no indication of sensitization on retests performed 14 d later.				*43*
Potassium Cocoate				
In a test using 40 healthy subjects and 480 patients with active skin disease, 5% aq. potassium cocoate produced 5 positive responses.				*43*
Corylus Avellana (Hazel Seed) Oil				
A patch testing reference book by de Groot noted that the published literature does not contain recommended test concentrations concerning Hazel Seed Oil. To serve as a guide to the reader, de Groot reported that an unpublished (and at the time, ongoing) study found no irritant reaction in 1 to 20 patients suffering from or suspected to suffer from cosmetic product contact allergy who had been patch tested with 30% Hazel Seed Oil in petrolatum.				*41*
Elaeis Guineensis (Palm) Oil				
Elaeis Guineensis (Palm) Oil, 15% in petrolatum or cosmetic formulations containing 1.0-2.0%, was not an irritant or sensitizer in clinical studies. Bar soap flakes, tested at dilutions that contained ≤ 2.13% palm kernel oil, were not irritating or sensitizing.				26
Gossypium Herbaceum (Cotton) Seed Oil				
Patients that were hypersensitive to cottonseed proteins were not sensitive to cottonseed oil in a skin prick test				*27*
Hydrogenated Cottonseed Oil				
In a clinical patch test, the irritation potential of a cosmetic formulation containing 3.4% hydrogenated cottonseed oil was mildly low, and the severity of reaction to 10.4% hydrogenated cottonseed oil was acceptably low in a use study. Cosmetic formulations containing 10.6-20.86% hydrogenated cottonseed oil were not irritating or sensitizing.				*27*
Oryza Sativa (Rice) Bran Oil				
Rice is generally regarded as hypoallergenic, although some case studies of allergic reactions to raw rice have been reported. In clinical testing, formulations containing 1.04-8.0% Oryza Sativa (Rice) Bran Oil were not irritating or sensitizing. . Hydrolyzed rice protein was not irritating to human subjects.				*28*
Persea Gratissima (Avocado) Oil				
Persea Gratissima (Avocado) Oil was not an irritant or sensitizer when human subjects were patch tested with cosmetic formulations containing up to 10.7% Persea Gratissima (Avocado) Oil or in patch tests using 100% Persea Gratissima (Avocado) Oil.				31
Prunus Amygdalus Dulcis (Sweet Almond) Oil				
Undiluted Prunus Amygdalus Dulcis (Sweet Almond) Oil was non-irritating in a single insult patch test with 101 subjects, and it was non-irritating and non-sensitizing in an HRIPT using 52 subjects. Cosmetic formulations containing 0.1-25% were practically non-irritating and non-sensitizing in HRIPTs performed with 6906 subjects. In the Lanman-Maibach 21-day Cumulative Irritancy Assay, a moisturizer containing 25% Prunus Amygdalus Dulcis (Sweet Almond) Oil had a total irritancy score of 14/630.				217

Table 8b. Dermal effects – Human studies – summarized from previous CIR reports

Ingredient and Concentration	Subjects Completed	Method	Results	Reference
Sesamum Indicum (Sesame) Seed Oil				
In clinical testing, undiluted Sesamum Indicum (Sesame) Seed Oil was not irritating. Cosmetic formulations containing 8-14.3% Sesamum Indicum (Sesame) Seed Oil were non- to essentially non-irritating. Prophetic patch testing with formulations containing 10-11% Sesamum Indicum (Sesame) Seed Oil were not irritating with or without UV light. Patients with contact allergy to Sesamum Indicum (Sesame) Seed Oil were patch tested, and most had positive reactions to sesamol, sesamin, and sesamolin.				55
Triticum Vulgare (Wheat) Germ Oil				
In clinical testing, Triticum Vulgare (Wheat) Germ Oil was not an irritant or a sensitizer.				30
PHOTOTOXICITY/PHOTOSENSITIZATION				
Cocos Nucifera (Coconut) Oil				
Bar soaps made with 13% Cocos Nucifera (Coconut) Oil, tested as a 3% aqueous solution, tested using 10 subjects, and a similar soap, prepared as 1 or 3% aqueous solutions, tested on 52 panelists, did not produce any evidence of photosensitization.				33
Sodium Cocoate				
Bar soaps 13% sodium cocoate, prepared as a 3% aqueous solution, tested using 10 subjects did not produce any evidence of photosensitization.				33
Prunus Amygdalus Dulcis (Sweet Almond) Oil				
Formulations containing 0.1% - 2.0% Prunus Amygdalus Dulcis (Sweet Almond) Oil, tested for photosensitization in a total of 764 subjects, did not manifest photosensitivity in any of the test subjects.				217
Oryza Sativa (Rice) Bran Oil				
Formulations containing 1.04% Oryza Sativa (Rice) Bran Oil were not photosensitizing.				*28*

Table 9a. Ocular irritation – Non-Human and Human

Ingredient	Concentration	Test Group	Procedure	Results	Reference
NON-HUMAN					
Adansonia Digitata Seed Oil					
baobab oil	100%		MatTek EpiOcular MTT viability assay; 100 µl of test material for 16-256 min	non-irritating	210
Aleurites Moluccana Seed Oil					
Aleurites Moluccana oil			Draize test	not an ocular irritant	313
Aleurites Moluccana oil			in vitro conjunctival cell assay	not cytotoxic	313
Aleurites Moluccana oil			ocular burn treatment efficacy test	no adverse effects	314
Butyrospermum Parkii (Shea) Butter					
Butyrospermum Parkii (Shea) Butter	undiluted	3 male Kleinrussen Chbb:HM rabbits	0.1 ml instilled into the conjunctival sac of one eye for 24 h	not irritating; mild conjunctival reactions	315
Crambe Abyssinica Seed Oil					
Crambe Abyssinica Seed Oil	undiluted		details not provided	an ocular irritant, but not corrosive	213
Fragaria Ananassa (Strawberry) Seed Oil					
Fragaria Ananassa (Strawberry) Seed Oil	5-50% in a lipophilic solvent		neutral red release test	IC_{50} >50%; negligible cytotoxicity	316
Hippophae Rhamnoides Seed Oil					
Hippophae Rhamnoides Seed Oil	5-50% in a lipophilic solvent		neutral red release test	IC_{50} >50%; negligible cytotoxicity	317
Linum Usitatissimum (Linseed) Seed Oil					
mascara containing 9.4% Linum Usitatissimum (Linseed) Oil	diluted at 0-50% in mineral oil		neutral red release test	NR_{50}>50%; slightly cytotoxic	318
mascara containing 9.4% Linum Usitatissimum (Linseed) Oil	67.1% solution in mineral oil		hen's egg test-chorioallantoic membrane assay (HET-CAM)	moderately irritating	318
mascara containing 9.4% Linum Usitatissimum (Linseed) Oil	66.9% solution in mineral oil		reconstituted epithelial culture assay	slightly cytotoxic	318
Olea Europaea (Olive) Fruit Oil					
Olea Europaea (Olive) Fruit Oil, "high purity"	undiluted	rabbits; number not specified	Draize test	not irritating	313
Olea Europaea (Olive) Fruit Oil, "high purity"			in vitro study using human conjunctival epithelial cells	did not induce cellular necrosis or apoptosis	313
Ribes Nigrum (Black Currant) Seed Oil					
eye mask containing 0.2% Black Ribes (Black Currant) Seed Oil	50% dilution		HET-CAM assay	practically no irritation	319
Rubus Chamaemorus Seed Oil					
product containing 2.5% Rubus Chamaemorus Seed Oil			neutral red release assay	negligible cytotoxicity; product was considered well tolerated	320
Vaccinium Vitis-Idaea Seed Oil					
Vaccinium Vitis-Idaea Seed Oil	5-50% in a lipophilic solvent		neutral red release test	IC_{50}> 50%; negligible cytotoxicity	321

Table 9a. Ocular irritation – Non-Human and Human

Ingredient	Concentration	Test Group	Procedure	Results	Reference
			Zea Mays (Corn) Oil		
Zea Mays (Corn) Oil, "high purity"	undiluted	rabbits, number not specified	Draize test	not irritating	313
Zea Mays (Corn) Oil, "high purity"			in vitro study using human conjunctival epithelial cells	did not induce necrosis or apoptosis	313
			HUMAN STUDIES		
			Linum Usitatissimum (Linseed) Seed Oil		
9.4% Linum Usitatissimum (Linseed) Seed Oil in a mascara		33 female subjects	4 wk study; 16 wore contact lenses, 17 had "sensitive" eyes	no subjective irritation and no adverse reports; clinically safe for use by contact lens-wearers	322
			Ribes Nigrum (Black Currant) Seed Oil		
0.2% Ribes Nigrum (Black Currant) Seed Oil in an eye mask	undiluted	52 subjects	4-wk in-use study	no adverse reactions; safe for contact-lens wearers	323

Table 9b. Ocular irritation – Non-Human - summarized from previous CIR reports

Ingredient	Concentration	Test Group	Procedure	Results	Reference
Cocos Nucifera (Coconut) Oil					
Undiluted Cocos Nucifera (Coconut) Oil, instilled into rabbit eyes without rinsing, produced minimal eye irritation.					33
Hydrogenated Coconut Oil					
Undiluted hydrogenated coconut oil produced mild irritation in one study, minimal irritation in another, negligible or minimal irritation in eight additional tests. Two lipstick formulations containing 10% hydrogenated coconut oil both produced slight conjunctivitis.					33
Coconut Acid					
Undiluted coconut acid produced mild irritation in rabbit eyes in two studies and minimal irritation in a third.					33
Elaeis Guineensis (Palm) Oil					
Undiluted Elaeis Guineensis (Palm) Oil and cosmetic lotions and creams containing 1.5-2.0% Elaeis Guineensis (Palm) Oil were minimally irritating to the eyes of rabbits, while one lotion containing 1.5% Elaeis Guineensis (Palm) Oil was moderately irritating.					26
Hydrogenated Palm Oil					
Hydrogenated palm oil suppositories were mildly irritating to rabbit eyes.					26
Hydrogenated Cottonseed Oil					
Cosmetic formulations containing 3.4-12.3% hydrogenated cottonseed oil were mildly irritating to the eyes of rabbits.					27
Oryza Sativa (Rice) Bran Oil					
A mixture of Oryza Sativa (Rice) Bran Oil and Oryza Sativa (Rice) Germ Oil, concentrations not stated, were not irritating to rabbit eyes. Undiluted Oryza Sativa (Rice) Bran Oil was considered minimally irritating.					28
Oryza Sativa (Rice) Germ Oil					
Oryza Sativa (Rice) Germ Oil, concentration not stated, was not a primary irritant.					28
Prunus Amygdalus Dulcis (Sweet Almond) Oil					
The ocular irritation potential of undiluted Prunus Amygdalus Dulcis (Sweet Almond) Oil and cosmetic formulations containing up to 25% Prunus Amygdalus Dulcis (Sweet Almond) Oil were evaluated using rabbits. Undiluted Prunus Amygdalus Dulcis (Sweet Almond) Oil was practically nonirritating or minimally irritating, and formulations containing up to 25% Prunus Amygdalus Dulcis (Sweet Almond) Oil were nonirritating to minimally irritating. In most instances, reactions that occurred were limited to conjunctival irritation, which cleared by the third day of observation.					217
Sesame Indicum (Sesame) Seed Oil					
Undiluted Sesamum Indicum (Sesame) Seed Oil was non- to minimally irritating to rabbit eyes, and a lipstick containing 10-11% Sesamum Indicum (Sesame) Seed Oil was not an ocular irritant.					55
Triticum Vulgare (Wheat) Germ Oil					
Undiluted Triticum Vulgare (Wheat) Germ Oil was, at most, a minimal ocular irritant, and 2% in a water emulsion was not irritating.					30

Table 10. **Clinical Trials/Case Studies**

Ingredient	Patients/Condition	Effect/Observation	Reference
Aleurites Moluccana Seed Oil			
Aleurites Moluccana oil	15; mild, stable plaque psoriasis	efficacy study "just enough (oil) to moisten the plaque" was applied 3 x daily for 12 wks; no side effects or adverse events were reported.	324
Anacardium Occidentale (Cashew) Seed Oil			
Anacardium Occidentale (Cashew) Seed Oil	37-year-old male resin researcher	presentation of bullae on his right leg after dropping pure oil from a bottle on his right thigh; skin was thoroughly washed immediately; erythema developed 10 days after exposure Patch testing was performed with cashew nut oil 3% alcohol, cashew nut oil 0.3% alcohol, cashew nut oil 0.03% alcohol, and urushiol 0.01% petrolatum.; a "+" reaction was reported on day 2 and "++" reactions on days 3 and 4 to the 3% dilution,; a "+" reactions to the 0.3% dilution and urushiol was reported on days 2-4; a "?+" reaction was observed on days 2 and 3 and a "+" reaction was observed on day 4 to the 0.03% dilution	325
Cocos Nucifera (Coconut) Oil			
Cocos Nucifera (Coconut) Oil		*did not produce adverse effects in several therapeutic studies*	33
Glycine Soja (Soybean) Oil			
Glycine Soja (Soybean) Oil	7; history of immediate hypersensitivity reaction after the ingestion of soybeans	a double-blind crossover study; the patients were first skin tested by the puncture method with a crude whole soybean extract, a partially hydrogenated oil, a non-hydrogenated oil, and a cold-pressed soybean oil; olive oil from a retailer was used as a negative control. Since all 7 patients had negative skin tests to the oils and positive reactions to the crude soybean extract, they were challenged orally with capsules of each of the oils in random order on 4 separate days. None of the patients reacted to the oral challenges; the researchers remarked that while a reaction to the cold-pressed soybean oil did not occur in this study, cold-pressed oils may contain soybean protein and should be avoided	63
soy oil proteins	4; known allergy to soybean	Sera was used to examine the allergenicity; neither the IgE nor the IgG_4 in the sera reacted to protein in the soy oil	23
Helianthus Annuus (Sunflower) Oil			
refined and cold-pressed sunflower oils	patients had anaphylactic reactions following ingestion of sunflower seeds	no reactions were seen upon oral or open challenge with refined or cold-pressed sunflower oils, both of which were shown to contain detectable amounts of protein.	18
	1 woman; desensitized to mugwort (of the Compositae family) pollen for a yr, then had an anaphylactic reaction to sunflower (also of the Compositae family) seeds	a delayed positive reaction to sunflower oil in a skin prick test was discovered; prick test results with 10 control subjects were negative. In an oral challenge test, a delayed reaction was again observed, with symptoms occurring 2.25-8 h after administration.	326
Macadamia Seed Oil			
Macadamia Seed Oil in a lipstick (species description or concentration were not reported)	28-year-old woman; chelitis	Chelitis case reported after lipstick use; patient was patch tested with ingredients contained in the lipstick, Positive reactions to diisostearyl malate and Macadamia Seed Oil were reported; the condition . improved after discontinuing use of lipsticks containing these 2 ingredients	327
Olea Europaea (Olive) Fruit Oil			
Olea Europaea (Olive) Fruit Oil		Throughout the literature, it is stated that sensitization to Olea Europaea (Olive) Fruit Oil is considered rare. Case reports have been described, however, and generally involved patients with venous eczema, some type of dermatitis or lesion, or an occupational exposure. Patch testing with Olea Europaea (Olive) Fruit Oil produced positive reactions in most of these cases, and these results were usually regarded as allergenic. The concentrations of Olea Europaea (Olive) Fruit Oil tested were not always given, but when stated, test concentrations giving positive results, ranged from 30-100%. When the constituents of olive oil were tested as well, the results of that testing were negative.	328-335
Olea Europaea (Olive) Fruit Oil		Whether the reactions to olive oil were contact sensitization or irritation were investigated using open and occlusive testing. It was concluded that olive oil presented as a weak irritant rather than a contact sensitizer in the few case studies observed.	336

Table 10. **Clinical Trials/Case Studies**

Ingredient	Patients/Condition	Effect/Observation	Reference
Persea Gratissima (Avocado) Oil			
Persea Gratissima (Avocado) Oil	1 female; dermatitis around the eyes and earlobes	Patch testing with her sunscreen resulted in positive results. In subsequent patch testing of the individual ingredients, a positive reaction to undiluted oil, but not to the active ingredient, was observed; 20 controls subjects were used, and reactions to Persea Gratissima (Avocado) Oil were not seen	[337]
Sesamum Indicum (Sesame) Seed Oil			
Sesamum Indicum (Sesame) Seed Oil in an ointment	female	Pruritic erythema, papules, and vesicles appeared after application of the ointment; patch testing was performed with the ointment and with the individual ingredients, including undiluted Sesamum Indicum (Sesame) Seed Oil Both the ointment and Sesamum Indicum (Sesame) Seed Oil produced positive reactions on days 2, 3, 4, and 1; the other components did not cause a reaction Results were negative in patch testing of Sesamum Indicum (Sesame) Seed Oil using 20 healthy subjects.	[338]

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