DIETARY HYDROPHOBIC SORBENT COFFEE GROUNDS COMPOSITIONS AND METHODS OF USE THEREOF

FIELD OF THE INVENTION

The invention relates to compositions and methods concerning food products, including nutritional or dietary supplements comprising roasted coffee bean grounds. The roasted bean grounds may be spent or fresh and may be used in solid or liquid food products or supplements.

BACKGROUND OF THE INVENTION

Activated charcoals of various formulations were the first dietary hydrophobic sorbent compounds, and they have been extensively studied and used in animals and humans. Health benefits achieved with these compounds include systemic detoxification from hydrophobic compounds (NPL1), reduction of hyperlipidemia (NPL2), reduction of hypercholesterolemia (NPL3), reduction of obesity and reduction of insulin resistance through its pharmacological action of binding bile acids and lipid derivatives in the digestive tract (NPL4). Regarding its general capacity to adsorb oil, approximately 1 gram of powdered activated charcoal may adsorb ~95% of the oil from a 200 mL sample of a 0.8 g/L oil-water emulsion (156 mg oil adsorbed) (NPL5). This relatively low adsorption capacity is a drawback to using activated charcoal formulations for human or animal health-related applications. An immense dosage would be needed to produce health effects, perhaps, for example, requiring the daily use of 24 gram to 150 gram activated charcoal in humans (NPL1-3), or 160 gram/kg/day to 400 gram/kg/day of orally fed activated charcoal in mice (NPL4). Such dosage quantities may cause a variety of side effects, such as vomiting, constipation, slowed bowel movements, black stools, or intestinal blockage.

Other adsorbent materials considered for use as a dietary sorbent composition include hydrophobic chemically modified cellulose and hemicellulose fibers found in industrial waste streams. For example, roasted coffee bean grounds waste has been extensively studied since it is available in quantity and otherwise lacks utility and thus

presents a low-cost opportunity to gain benefit from a waste product. A drawback that must be overcome, though, is naïve roasted coffee bean grounds are generally recognized to lack oil adsorbent activity because they are strongly hydrophilic (NPL6). Alkaline treatment followed by fatty acid modification was reported to increase hydrophobicity; oil absorption capacity was reported to double to 2.8 gram oil per gram of modified roasted coffee grounds waste compared to untreated spent coffee grounds (NPL6). With more extensive hydrophobic modification, coffee grounds material was reported to adsorb 16 gram oil per gram of modified roasted coffee-derived fibers (NPL7). However, the process steps needed to prepare such chemically modified roasted coffee grounds represent additional burdens (time, energy, reagents, cost), and moreover may introduce toxic byproducts or uncharacterized new chemical entities with undefined dietary safety profile, making them unsuitable for human or animal consumption without adequate safety studies to obtain regulatory approval. Accordingly, there remains a need for dietary hydrophobic sorbent compositions and formulations that overcome and/or do not present the drawbacks mentioned above.

Upon diligent research and experimentation, I have found methods for preparing and using a non-chemically modified roasted coffee bean grounds preparation, from either fresh or spent sources of grounds, that displays hydrophobic sorbent activity. The compositions and methods disclosed herein have industrial utility as an alternative to the chemically modified coffee ground preparations and are useful as a dietary hydrophobic sorbent for humans and animals. One particular advantage concerning the compositions and methods of the subject invention is that the use of roasted coffee bean grounds without chemical processing that generally occurs in the art is that the composition itself is regarded as a food substance and generally recognized as safe from its historical use as a food or confectionary ingredient.

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SUMMARY OF THE INVENTION

The present disclosure is directed to food products, nutritional supplements, and dietary supplements suitable for human or animal consumption that comprise non-chemically modified roasted coffee bean grounds compositions that have hydrophobic sorbent activity. More specifically, compositions comprising fine coffee grounds, characterized in that the roasted coffee grounds have a median effective diameter of less than 425 μm and greater than 100 microns (hereinafter “fine coffee grounds” or “FCG”), can efficiently absorb hydrophobic compounds (e.g., oils) from oil-water mixtures. The inventor has surprisingly determined that roasted coffee grounds, which may be fresh or spent, of a suitably small particle size can readily absorb hydrophobic compounds, and that absorption characteristics are superior to that observed for coarser coffee grounds.

In certain preferred embodiments, the compositions comprising FCG may further include activated charcoal. Mixed compositions comprising FCG and activated charcoal may contain an equal weight ratio of the two substances in some embodiments and may contain greater proportion by weight of FCG compared to the activated charcoal in some embodiments. In an embodiment, the roasted coffee grounds are present in an amount greater than or equal to that of activated charcoal. As an exemplary embodiment, the roasted coffee grounds and activated charcoal are present in a weight ratio from 100:1 to 1:1.

The compositions comprising FCG, including those further containing activated charcoal, are generally intended to be orally ingested. Thus, the compositions disclosed herein may be prepared for consumption as a solid or as a liquid. Equivalently, such compositions may be formulated for administration as a solid oral dosage form or liquid oral dosage form.

It is an object of the invention to provide compositions useful to reduce the intake of or undesired effects due to certain hydrophobic compounds or oils in the diet of human beings or of animals. It is another object of the invention to provide compositions for use as foods or as supplements that, when administered can ameliorate certain conditions in humans or in animals associated with the ingestion of fats, fatty substances, and/or oils, such as, for example, food poisoning.

Without being limited by theory, the invention contemplates providing a composition prepared as a solid oral dosage form, such as a powder, pill, tablet, and the like, or a liquid oral dosage form, such as a suspension solution comprising fine coffee grounds and, optionally, activated charcoal, such that the contents of the dosage form are released in the stomach, pass through the stomach and intestines, and are then excreted. It is contemplated that by presenting FCG and, optionally, activated charcoal in the stomach space, foods and other ingested substances that are hydrophobic, including oils, fats, contaminants and the like, may be adsorbed by FCG. It is further contemplated that in the intestines, the FCG and, optionally, activated charcoal act to adsorb hydrophobic digestive substances such as bile acids and oil emulsions, before ultimately being excreted.

The present invention provides, in one embodiment, a hydrophobic sorbent composition comprising fine coffee grounds wherein the particle size distribution of the grounds has a median effective diameter in the range of about 10 microns to about 600 microns, and in other embodiments, in the range of about 100 μm to about 425 μm.

In one embodiment, the fine coffee grounds are prepared from dark roasted coffee beans. In another embodiment, the fine coffee grounds are prepared from medium roasted coffee beans. In another embodiment, the fine coffee grounds are fresh, and in yet another embodiment, the fine coffee grounds are spent. The present invention also contemplates providing fine coffee grounds comprising any combination of dark and medium roasted coffee beans, and further, comprising any combination of grounds that are fresh and spent.

The present invention further provides, in one embodiment, a hydrophobic sorbent composition comprising fine coffee grounds wherein the particle size distribution of the grounds has a median effective diameter in the range of about 100 μm to about 425 μm and activated charcoal powder.

In some embodiments, a hydrophobic sorbent composition of the present application further comprises a dietary polyphenol source. In some embodiments, the dietary polyphenol source is provided as a component of an extract from a natural source (*e.g.*, obtained from grape seeds, wine grapes, and the like). In certain embodiments, the hydrophobic sorbent composition comprises FCG, a dietary polyphenol source, and optionally, activated charcoal.

In some embodiments, a hydrophobic sorbent composition of the present application further comprises a probiotic. In some embodiments, the probiotic is one or more strain selected from *Lactobacillus Reuteri* and *Lactobacillus Plantarum*. In certain embodiments, the hydrophobic sorbent composition comprises FCG, at least one probiotic, and optionally, activated charcoal.

In some embodiments, a hydrophobic sorbent composition of the present application further comprises an antiacid agent. In certain embodiments, the hydrophobic sorbent composition comprises FCG, at least one antiacid agent, and optionally, activated charcoal.

The present invention further provides hydrophobic sorbent compositions in which the ingredients are formulated in a solid dosage form or liquid dosage form. The formulated compositions described herein function as a means for delivery of the ingredients, such as FGC and, optionally, activated charcoal, to the stomach and intestines. The corresponding structure or material for performing the function of delivering said component to the intestine is provided by each solid dosage form and liquid dosage form. For example, a solid dosage form may be prepared with a water-soluble binder ingredient, and a liquid dosage form may be prepared with the FGC as part of a suspension in the liquid dosage form.

The present invention further provides for hydrophobic sorbent compositions in solid dosage forms such as a pill, a capsule, granules, or a tablet. In certain embodiments, to aid in formulating particular dosage forms, one or more excipients, selected from fillers and/or binders and/or granulating agents and/or compression aids and/or disintegrants and/or lubricants and/or glidants, and/or coating agents may be included as an ingredient in such dosage forms according to the present invention.

The present invention further provides for hydrophobic sorbent compositions in solid dosage forms such as a powder. In certain embodiments, to aid in formulating such powder dosage forms, one or more of excipients selected from fillers and/or granulating agents and/or lubricants and/or glidants and/or coating agents may be included as an ingredient in such dosage forms according to the present invention.

The present invention further provides for hydrophobic sorbent compositions in liquid dosage forms. In certain embodiments, to aid in formulating such liquid dosage forms, one or more of excipients selected from fillers and/or binders and/or disintegrants and/or granulating agents and/or viscosity agents and/or buffers and/or preservatives and/or antioxidants may be included as an ingredient in such dosage forms according to the present invention.

Methods for providing FCG and, optionally, activated charcoal, to a person or an animal to benefit from its hydrophobic sorbent activity against hydrophobic food substances or hydrophobic contaminants are also provided. In one embodiment, the method comprises

administering to a human being or an animal in need of removing or reducing dietary hydrophobic substances, contaminants, toxins, or dietary oils in the body, a hydrophobic sorbent composition according to the present invention, that is prepared as a solid dosage form or a liquid dosage form suitable for intake orally as a food, a dietary supplement, or a nutritional supplement, as disclosed herein. In some embodiments, the method provides doses up to 20,000 mg, up to 10,000 mg, up to 7,500 mg, up to 5,000 mg, up to 2,500 mg, up to 1,000 mg, up to 500 mg, up to 250 mg, or up to 100 mg of FCGs in the solid dosage form(s) administered.

These and other objects and features of the invention will become apparent to one of ordinary skill in the art from the following detailed description of the invention and the claims.

BRIEF DESCRIPTION OF THE FIGURES

The present invention is further described by way of example in view of the following Figures.

Figure 1 shows an exemplary workflow for preparing coffee grounds samples using a sieving process and particle size distribution curves.

Figure 2 shows an exemplary workflow for preparing coffee grounds samples using Turkish-milled medium roasted coffee bean grounds and particle size distribution curves.

Figure 3 shows the results of an experiment testing the hydrophobicity of coffee grounds and a function of particle size.

Figure 4 shows the protocol used to prepare colorless and coffee-colored standards and to assess the capability of coffee grounds-containing test samples to absorb oil from an oil emulsion.

Figure 5 shows the ability of certain coffee ground compositions to remove oil from an emulsion.

Figure 6 shows the ability of certain coffee ground compositions to remove oil from an emulsion.

Figure 7 shows the ability of certain coffee ground compositions to remove oil from an emulsion.

Figure 8 shows an experiment using activated bamboo charcoal powder ("AC") to remove oil from an emulsion.

Figure 9 shows the ability of certain coffee ground/activated bamboo charcoal powder compositions to remove oil from an emulsion.

DETAILED DESCRIPTION OF THE INVENTION

The ingredients used in the compositions and formulations described herein are of a grade suitable for administration to humans or animals (e.g., for veterinary use) as a food, acceptable by regulatory authorities for use in nutritional or dietary supplement products, and in some instances includes pharmaceutical grades.

Abbreviations used herein include: "wt%" means percent by weight; "w/v" means a ratio or percentage determined on a weight-per-volume basis; "v/v" means a ratio or percentage determined on a volume-per-volume basis; "ED" means effective diameter and "MED" means median effective diameter, which terms are further described below.

In describing the present invention, various aspects are described and defined in detail, and each aspect so described and defined may be combined with any other aspect or aspects, unless stated otherwise or indicated to the contrary, in view of the understanding of a person of ordinary skill in the art.

Fine Coffee Grounds

Fine coffee grounds are obtained from coffee beans that have been roasted. Various degrees or levels of roasting are used to describe the roast, some levels are commonly referred to as light, medium, or dark. As greater incidents of coffee allergy are reported for green coffee beans, suitable coffee bean grounds are those that have been roasted beyond the green coffee bean phase. In preferred embodiments, coffee beans are roasted to at least the light, medium, or dark roast level. In other preferred embodiments, the coffee beans are roasted at least to what is referred to in the art as the "first crack."

Hydrophobic sorbent compositions of the present invention comprise fine coffee grounds prepared from roasted coffee beans, as described herein. Generally, the fine coffee

grounds are characterized by the particle size of the grounds, and further, characterized by the distribution of particle sizes in the grounds sample. There are numerous ways used to describe coffee grounds particle sizes, shapes, and distributions, and numerous techniques used for measuring such, including sieving, laser diffraction, and image analysis. As described herein, the particle size of any particle in the roasted coffee grounds may be characterized by its “effective diameter” (“ED”), as measured by image analysis, wherein the effective diameter is the diameter of a circle having the same area as the area of a particle as imaged. This parameter may also be referred to as the equivalent disc diameter. Repeating this measurement and calculation for a large set of particles being imaged allows the calculation of a “median effective diameter” (“MED”), which is the median value of the ED for a set of particles that are subjected to image analysis. The MED, as well as a histogram chart for the distribution of particle sizes or ED’s provides information about the particle size distribution of the roasted coffee grounds.

Fine coffee grounds having ED and MED values described herein exhibit hydrophobicity and the ability to absorb hydrophobic substances from oil-water mixtures. The ED value of the above-mentioned roasted coffee grounds is generally represented by a range, since the grinding or milling process results in a distribution of particle sizes. The bulk of particle sizes are generally in the range of about 30 microns to about 600 microns. For example, 80% of particles may have an ED between 30 microns and 600 microns, with about 10% of particles having a smaller ED and about 10% of particles having a larger ED. Other distribution profiles may be used, and in some embodiments the distributions may be skewed or bimodal, depending upon the grinding equipment and/or processing of the grounds, including mixing of batches, sieving, and the like. In one embodiment, coffee grounds may be subjected to a sieving or sifting process after grinding the coffee bean, such as, for example, obtaining extra course, course, medium course, medium, medium fine, fine, or extra fine grounds, and then passing the grounds through a sieve or sifter having a mesh size (opening) of 600 microns or smaller. In one exemplary embodiment, a #40 sieve has an

opening size of about 425 microns. The coffee grounds, such as, for example, extra fine grounds, may have a suitable MED even without sieving, however a sieving process may still be applied without limitation. The MED value of the roasted coffee grounds is generally in the range of between 10 microns to 600 microns, and in particular embodiments is generally in the range of between 100 microns to 425 microns.

Considering our findings that the particle size reduction to the fine coffee grounds resulted in increased hydrophobicity and more efficient oil emulsion removal, the MED value of the roasted coffee grounds may be up to about 500 microns, up to about 450 microns, up to about 400 microns, up to about 350 microns, up to about 300 microns, up to about 250 microns, up to about 200 microns, up to about 150 microns, up to about 100 microns, up to about 50 microns, or up to about 30 microns. Some food-grade roasted coffee grounds, particularly Turkish-milled coffee grounds was characterized with, for example, MED values of 250 and 308 microns**.** Any MED values in this range, or even lower, is acceptable so long as the roasted coffee grounds of the reduced MED value do not enter the circulatory system in substantial amount.

The ED value may be selected in the range that is acceptable to use in foods, nutritional supplements, or in pharmaceutical products. In some embodiments, the roasted coffee grounds may be fresh and dry, without extraction. In some embodiments, the roasted coffee grounds may be spent and dried, after extraction of its soluble components. Two or more coffee grounds types herein mentioned may be used together as the active coffee grounds ingredient in any proportion.

The amount of the fine coffee grounds included in a single dosage form is generally in the range of 10 to about 20,000 mg, whereby the fine coffee grounds may contain varying amounts of moisture. Thus, the amount of the fine coffee grounds used in a formulated composition may be higher or lower because amount of the fine coffee grounds must account for the weight of the moisture therein. Considering only the dry fine coffee grounds, the amount provided in a dosage form may be up to 20,000 mg, up to 10,000 mg, up to

7,500 mg, up to 5,000 mg, up to 2,500 mg, up to 1,000 mg, up to 500 mg, up to 250 mg, up to 100 mg, up to 50 mg, or up to 10 mg. Coffee grounds consists of indigestible plant fibers. As such, multiple doses of the fine coffee grounds may be consumed on daily basis by those desiring more aggressive removal of dietary hydrophobic substances or oils. Thus, any amount of fine coffee grounds in this range, or even higher, is acceptable so long as the amount provided does not cause intestinal blockage. Because the efficiency of dietary fat adsorption and removal will also vary with the formulation, the upper limit for the fine coffee grounds content in a particular formulation can be tested by methods known in the art to ascertain the level of fat removal provided by the formulation and adjust the upper limit for dosage form accordingly.

Spent coffee grounds is an abundant byproduct of coffee beverage production, and it is discarded mostly in hydrated forms. As such, the idea of using spent fine coffee grounds rather than the fresh fine coffee grounds in producing the hydrophobic adsorbent coffee grounds by ED reduction (and thereby MED reduction) may be considered for environmental and economic reasons. As the high moisture content of such spent coffee grounds is expected to reduce hydrophobicity of the spent coffee grounds at all ED, the moisture content is preferred to be low. In certain preferred embodiments the moisture content in a single dosage form made from spent fine coffee grounds may be up to 5 wt%, may be up to 4 wt%, may be up to 3 wt%, may be up to 2 wt%, may be up to 1 wt%, may be up to 0.5 wt%, or may be up to 0.1 wt%. Likewise, in certain preferred embodiments using fresh grounds, the moisture content in a single dosage form made from fresh fine coffee grounds may be up to 5 wt%, may be up to 4 wt%, may be up to 3 wt%, may be up to 2 wt%, may be up to 1 wt%, may be up to 0.5 wt%, or may be up to 0.1 wt%.

The amount of fine coffee grounds included in a solid dosage form as a powder is generally in the range of about 5 wt% to 90 wt% of the powder composition. In some embodiments the amount is about 20 wt% or about 70 wt%. The amount used is generally based on the desired consumption volume and the amount of excipients needed to provide

an acceptable formulated dosage form. Those of skill in the art can readily balance the amount of active ingredients versus the amount and type of excipients needed to obtain stable dosage forms that, for example, do not clump.

The amount of fine coffee grounds included in a solid dosage form as a pill, a capsule, granules, or a tablet is generally in the range of about 10 wt% to 80 wt% of the dosage form. In some embodiments the amount is about 20 wt% or about 40 wt%, or about 50 wt%, or about 60 wt%, or about 75 wt%. The amount used is generally based on the desired consumption volume and the amount of excipients needed to provide an acceptable formulated dosage form. Those of skill in the art can readily balance the amount of active ingredients versus the amount and type of excipients needed to obtain stable dosage forms.

The amount of fine coffee grounds included in a liquid dosage form is generally in the range of about 10 wt% to 70 wt%. In some embodiments the amount is about 20 wt% or about 40 wt%, or about 50 wt%, or about 60 wt%. The amount used is generally based on the desired texture and taste.

Activated Charcoal

Activated charcoal, also sometimes referred to as activated carbon, may be obtained from various carbon sources, including, for example, wood, sawdust, bamboo, coconut shell, or peat, by heating to high temperature and then activating the obtained material, typically using steam or hot air to create a powdered substance of high internal surface area. Various brands are commercially available that are suitable for ingestion, including for medical use.

In embodiments of the present invention, activated charcoal is combined with fine coffee grounds, wherein the two ingredients are presented as active ingredients in hydrophobic sorbent compositions for the absorption of hydrophobic substances in a person or animal. Generally, the amount of activated carbon is less than, or may be about equal to, the amount of fine coffee grounds in a dosage form. In various embodiments, the ratio by weight of activated carbon to fine coffee grounds is 1:1, or 1:5, or 1:10, or 1:50, or 1:100,

and may be present in smaller ratios. In these embodiments a finite amount of activated charcoal is considered beneficial in that the absorption profile against different hydrophobic substances is believed to differ from that provided by fine coffee grounds, and thus greater benefit is provided to the human or animal being administered the compositions. Conversely, the presence of fine coffee grounds in the combination of FCG and activated carbon has been observed to promote the sequestration of the activated carbon, such that it is believed that the activate charcoal is more readily cleared from the digestive tract for excretion and thus less likely to remain in the body and/or penetrate the circulatory system.

Formulations

The fine coffee grounds, and, optionally, activated charcoal can be formulated into solid oral dosage forms such as a pill, tablet, capsule, or related forms such as a minitablet, a caplet, and the like, or a powder, or into liquid oral dosage forms, such as a liquid suspension. As described herein, reference to active ingredients generally refers to the fine coffee grounds and, if present, to activated charcoal, in that in one aspect a desired function of the compositions is to absorb hydrophobic substances. The formulations according to the present inventions are not limited to coffee grounds and activated charcoal as hydrophobic sorbents; other such ingredients are not excluded. Moreover, other ingredients that may be included in formulations according to the present invention may, even if referred to as an excipient, nonetheless be active in the sense they have a physiological effect, though one that is not necessarily the absorption of hydrophobic substances.

Fine coffee grounds, and, optionally, activated charcoal are combined with excipients suitable for use in a dietary or nutritional supplement product, and suitable for making a particular solid dosage form, such as a pill, a capsule, granules, or a tablet, or a powder, and the like. Typical excipients include fillers, binders, disintegrants, glidants, lubricants, as well as buffers, preservatives, antioxidants, flavoring agents, sweeteners, coloring agents, and the like. The amount and type of excipient to be added can be selected for various purposes, such as improved integrity of the dosage for, improved bioavailability, stability, manufacturing,

coating, appearance, and/or compliance. Some excipients may serve more than one purpose and/or provide more than one improved characteristic.

Fillers may be water soluble or water insoluble, and one or more of each type may be combined. Examples of water-soluble fillers include, without limitation, sugars such as glucose, fructose, sucrose, mannose, dextrose, galactose, honey, and the like, and sugar alcohols, such as mannitol, sorbitol, xylitol, and the like, as known in the art. Examples of water insoluble fillers include, without limitation, waxes, long-chain fatty acids, talc, kaolin, silicon dioxide, titanium dioxide, alumina, starch, powdered cellulose, microcrystalline cellulose, and the like, as known in the art.

Binders include, without limitation, cellulose derivatives such as carboxymethylcellulose calcium, carboxymethylcellulose sodium, cellulose acetate phthalate, ethyl cellulose, hydroxyethyl cellulose, hydroxyethyl methyl cellulose, hydroxypropyl cellulose, hydroxypropyl methyl cellulose, methyl cellulose, microcrystalline cellulose, honey, polyvinyl pyrrolidone, as well as starches, saccharides, gelatin, natural or synthetic gums, and the like, as known in the art.

Disintegrants include, without limitation, carmellose, carmellose sodium, croscarmellose sodium, crospovidone, alginates, low substituted hydroxypropyl cellulose, hydropropyl starch, partially pregelatinized starch, and the like, as known in the art.

Glidants include, without limitation, silicas, silicates, talc, calcium phosphate, and the like, as known in the art.

Lubricants include, without limitation, alkali metal or alkaline earth metal stearates, oleates, benzoates, acetates, chloride, and the like, as known in the art.

Other types of excipients, such as buffers, preservatives, antioxidants, flavoring agents, sweeteners, and coloring agents are well known, and persons of ordinary skill in the art can readily select and apply such components to the formulations.

Other types of active ingredients, such as vitamins, minerals, polyphenols, nutrients, probiotics, prebiotics, herbal or plant extracts, charcoals, activated charcoals, dietary fibers, and other nutritional or dietary supplements that are amenable to absorption in the intestine may also be added to the powder, solid, or liquid compositions and formulation described herein without departing from the scope of the invention, unless stated otherwise.

In some embodiments, the hydrophobic sorbent composition of the present invention further comprises at least one polyphenolic compound. Polyphenols (also sometimes referred to as polyhydroxyphenols) suitable for use in the present application include those that are: 1) generally moderately water-soluble compounds; 2) with molecular weight of 500–4000 Da; 3) with 12 or more phenolic hydroxyl groups; and 4) with 5–7 aromatic rings per 1000 Da. In some embodiments, polyphenols suitable for use herein include those compounds that are derived from the shikimate/phenylpropanoid and/or the polyketide pathway, featuring more than one phenolic unit and deprived of nitrogen-based functions. Suitable polyphenols may meet one or both of the foregoing criteria.

In some embodiments, the at least one polyphenolic compound is provided as a component as an extract from a natural source. The natural source may be a plant, such as a fruit, vegetable, cereal, leguminous plant, herbs, or tea (such as green tea). Fruits, when used as the natural source, include any fruit varieties including (but not limited to) grapes (such as wine grapes), olives, and apples. Parts of the plant may be used to provide the extract, including the skins, seeds, pulp, juice, or any combinations thereof. For instance, the extract may be prepared from grape skins, grape seeds, grape pulp, grape juice, olive pulp, etc.

In some embodiments, the at least one polyphenolic compound is provided as a component as a grape extract. In some embodiments, the grape extract is a full spectrum grape extract and in some embodiments the extract is a grape seed extract. The grape extract can be produced from any grape variety. In some embodiments, the grape extract is

produced from a variety of grapes suitable for making red wine. The grape extract can be obtained from any source and can be freeze dried or fresh, as a solid or a liquid.

The amount of the polyphenolic compound employed may vary in the final composition. In general, when providing the polyphenolic compound as a component as an extract from a natural source, such extract may be present in an amount from about 0.1% to about 5%, by weight of the composition. When providing the at least one polyphenolic compound as a substantially pure compound, amounts of the polyphenolic compound comparable to the amount present in any of the foregoing ranges for a natural extract may be used.

In some embodiments, the hydrophobic sorbent composition of the present application further comprises at least one probiotic. Probiotic as used herein includes a bacterium that is beneficial to the health of the subject and, when accumulated in sufficient quantities, is beneficial in maintaining health. Specific examples of probiotics suitable for use herein include, but are not limited to, *Bacillus coagulans, Bacillus subtilis, Bacillus laterosporus, Bacillus laevolacticus*, *Sporolactobacillus inulinus, Lactobacillus acidophilus, Lactobacillus curvatus, Lactobacillus reuteri, Lactobacillus plantarum, Lactobacillus jenseni, Lactobacillus casei, Lactobacillus fermentum, Lactobacillus rhamnosus, Lactobacillus johnsonii, Lactobacillus salvalarius, Lactococcus lactis, Pedioccocus acidilacti, Pedioccocus pentosaceus, Pedioccocus urinae, Leuconostoc mesenteroides, Bacillus coagulans, Bacillus subtilis Lateral spore Bacillus laterosporus, Bacillus laevolacticus, Sporolactobacillus inulinus, Bifidobaterium bifidum, Bifidobacterium animalis (Bifidobaterium animalis), Bifidobaterium breve, Bifidobaterium infantis, Bifidobaterium lactis, Bifidobaterium longum* and a combination of any of the foregoing. In some embodiments, the at least one probiotic is selected from *Lactobacillus reuteri*, *Lactobacillus plantarum*, and combinations thereof. In some embodiments, the probiotic is a combination of *Lactobacillus reuteri* and *Lactobacillus plantarum.*

The amount of the probiotic employed may vary in the final composition. In general, the probiotic such as those described herein may be present in an amount from about 0.01% to about 5%, by weight of the composition. In some embodiments, the probiotic is present in an amount from about 0.02% to about 2.5% by weight. In some embodiments, the probiotic is present in an amount from about 0.1% to about 1.5% by weight. In some embodiments, the probiotic is present in an amount from about 0.3% to about 1% by weight.

The powder, solid, or liquid compositions and formulations described herein may alternatively comprise, consist of, or consist essentially of roasted coffee grounds, so long as it is consistent with the specification. The powder, solid, or liquid compositions and formulations may also lack or be substantially free of any component(s), e.g., active ingredient and/or excipient found in a prior art composition or that are otherwise not necessary to the disclosed invention.

Methods of Preparing Powder Dosage Forms

The fine coffee grounds, and optionally, activated charcoal, and the selected excipients may be sized, declumped, or powdered separately, in any subcombination, or in combination. The various components may be combined by dry mixing, or granulated by wet or dry granulation, spray, extrusion, rolling, or fluidized bed granulation, and thereafter may be optionally milled, or other such techniques as known in the art.

In one exemplary embodiment, the powder dosage form is prepared by combining fresh Turkish-milled medium roasted coffee grounds of 308 micron median effective diameter and activated charcoal powder, and one or more excipients, and thoroughly blending the ingredients into a homogenous powder composition. In another embodiment, the powder dosage form is a powder mixture of 270 micron median effective diameter dark roasted coffee grounds and activated charcoal powder, and one or more excipients, and thoroughly blended into a homogenous powder composition.

An exemplary powder dosage forms according to an embodiment of the invention are provided below in Example 9.

Methods of Preparing Solid Dosage Forms

The fine coffee grounds, and optionally, activated charcoal, and the selected excipients may be sized, declumped, or powdered individually, in any subcombination, or in combination. The various components may be combined by dry mixing, or granulated by wet or dry granulation, spray, extrusion, rolling, or fluidized bed granulation, and thereafter may be optionally milled, or other such techniques as known in the art.

The method for preparing solid dosage forms involves mixing together the desired amounts of fine coffee grounds, optionally, activated charcoal, and the excipients, which comprise one or more filler and/or one or more binder and/or one or more disintegrant and/or one or more lubricating agent and/or one or more glidant. When a granulating step is included, then any of the excipients may be added, in whole or in part, before, during, or after the granulating step. In some embodiments some or all of the lubricating agents are mixed in after a granulating step. In some of these embodiments, a glidant is also mixed in after the granulating step.

Where the granulation step involves using a solvent, such as water, or an organic solvent, or an aqueous organic solution, a binder such as honey or starch may be used to wet the blend of components as they are granulated, the resulting product is usually dried to remove residual solvent. Examples of organic solvents include ethanol and isopropanol, and the like, as known in the art. Preferably, substantially all of an organic solvent is removed in a drying step. When water or aqueous organic solution are part of the solvent used in a granulation step, preferably no more than 10 wt% or no more than 5 wt%, or no more than 2 wt% of the water is left after drying and proceeding to the next step.

The mixed granulated solids may be polished into small pills, or they may be formed into tablets by tableting the solids using compression, compaction, or molding. In some

embodiments, the tablets are coated for purposes of appearance, mechanical stability, chemical stability, and the like.

Alternatively, the mixed or granulated solids may be filled into a capsule or caplet and enclosed inside. The term capsule includes soft capsules, hard capsules, gel caps, vegetable capsules, and may be one-piece or two-piece capsules.

The size and shape of polished granules, tablets, or capsules are not particularly limited, and may be small or large, in view of the desired amount of active ingredient to be included in the dosage form and/or the types and amount of excipients desired for purposes of taste, visual appearance, stability, and the like.

Solid dosage forms may include binders in the formulation as a means to deliver the ingredients to the stomach space for release. In one exemplary embodiment, honey may be used as a binder.

In one exemplary embodiment, a method for preparing solid dosage forms comprises mixing fresh Turkish-milled medium roasted coffee grounds of 308 μm median effective diameter and activated charcoal powder, and one or more excipients, extruding the mixture into pellets, drying the pellets, and optionally adding additional excipient(s) with the dried pellets, and polishing the obtained composition into round pills. In another embodiment, the method comprises mixing fresh Turkish-milled medium roasted coffee grounds of 308 μm median effective diameter and activated charcoal powder and a natural polyphenol source, and one or more excipients, extruding the mixture into pellets, drying the pellets, and optionally adding additional excipient(s) with the dried pellets, and polishing the obtained composition into round pills. In another embodiment, the method comprises espresso-milling whole dark roasted coffee beans, sieving the milled coffee grounds using US#40 sieves to obtain dark roasted coffee grounds of 270 micron median effective diameter, mixing the dark roasted coffee grounds of 270 micron median effective diameter and activated charcoal powder, and one or more excipients, extruding the mixture into pellets, drying the pellets,

and optionally adding additional excipient(s) with the dried pellets, and polishing the obtained composition into round pills.

Additional exemplary solid dosage form compositions according to the present invention are provided below in Example 10 and Example 11.

Methods of Preparing Liquid Dosage Forms

One method for preparing liquid suspension dosage forms is by mixing the active ingredients, fine coffee grounds, and optionally, activated charcoal, with highly hygroscopic liquid excipient.

Suitable hygroscopic liquid excipient includes honey, agave syrup, and fructose syrup. These liquid excipients display stronger hygroscopic power and greater thickness when the moisture level is reduced, thus lower moisture level excipient is preferred. The strong hygroscopic power of these liquid suspension excipients helps protect the hydrophobicity of the roasted coffee grounds, while their thickness helps maintain the even suspension of the active ingredients in the liquid formulation.

When liquid dosage forms are constituted for use, fine coffee grounds are present in a concentration of about 0.1 wt% to about 50 wt%.

In one exemplary embodiment, a method for preparing liquid dosage forms comprises preparing a liquid suspension mixture or a gel suspension mixture with spent Turkish milled medium roasted coffee grounds of 196 μm median effective diameter and activated charcoal powder, and one or more suspension or gelling agents, and one or more stabilizers, and optionally one or more flavoring agents, and heat sterilized into a suspended liquid composition.

Dosing and Administration

The oral dosage forms described herein may be administered to provide an effective amount of roasted coffee grounds, and, optionally, activated charcoal, to human beings or animals who have a need to reduce hydrophobic compounds or oils in the digestive system.

For administration to humans, generally any of the dosage forms described herein may be ingested directly or added to foods, and typically such solid dosage and liquid dosage forms are taken orally per customary usage of dietary or nutritional supplements. For administration to animals, any of the dosage forms may be administered directly or added to animal feed for consumption. An effective amount means that the amount of roasted coffee grounds is sufficient to alleviate certain health symptoms that may include, but not limited to, gastrointestinal symptoms arising from hydrophobic food contaminants such as oxidized oils, saturated fats, environmental hormones, mycotoxins, dietary contaminant-related health symptoms including, but not limited to, nausea, vomiting, stomach sensitivity, upset stomach, indigestion, stomach pain, diarrhea, or constipation. Achieving an effective amount will depend on the formulation characteristics, and will vary by gender, age, condition, body weight, dietary predisposition, and genetic makeup of each individual. Individuals with higher body weight, for example, are administered an effective amount by using higher dosage strength formulations or multiple dosage forms of lower strength, may be administered an effective amount by using one or multiple dosage forms per day, up to, for examples about 100 mg, or 1,000 mg, or 5,000 mg, or 10,000 mg, or 15,000 mg, or 20,000 mg, or 30,000 mg, or 45,000 mg roasted coffee grounds per day. Multiple oral dosage forms may be administered without regard to mealtime.

EXAMPLES

The present invention is further described in view of the following examples, which are exemplary and offered to illustrate, but not to limit the scope of the claimed invention.

Example 1: Preparation of Coffee Grounds Samples.

Roasted coffee grounds test samples were prepared using dark roasted and medium roasted coffee beans. The median effective diameter of each sample was measured using image analysis software ("Coffee Grind," available at https://www.coffeegrind.app). The image analysis software determines the area of each particle and computes the diameter of

a circle having the same area, plots the histogram based on this “effective diameter,” and reports the median effective diameter.

A. First, as shown in Figure 1, a dark roasted whole coffee bean was used to prepare grounds at three particle sizes. Histograms of the particle size distribution for each sample are shown. Using a coffee grinder, the beans were subjected to a crude milling, producing grounds comprising particles having a median effective diameter of 1598 μm. A second sample of the beans was subjected to an espresso milling process, yielding grounds comprising particles having a median effective diameter of 924 μm. The third sample was obtained by passing some of the second sample through a sieve (US 40 sieve; 425 μm opening diameter), to obtain particles measured to have a median effective diameter of 270 μm. These three samples are referred to in subsequent Examples as DarkCf – 1598; DarkCf – 924; and DarkCf – 270; respectively.

B. Second, as shown in Figure 2, medium roasted coffee beans were subjected to an extra fine milling (also known as a Turkish milling), producing grounds comprising particles having a median effective diameter of 308 μm. Some of this first sample type was placed in a teabag, and the grounds were washed, six times, with hot water to simulate a steeping process. Grounds retained by the teabag were removed and dried in a microwave oven, to be used as a second sample type, and the grounds that flowed out of the teabag with the hot water wash were collected and dried in a microwave oven, to be used as a third sample type. The particles in the second (retained) and third (eluted) sample types had a median effective diameter of 460 μm and 196 μm, respectively. The histograms of the particle size distribution for each sample are shown in Figure 2. These three samples are referred to in subsequent Examples as MedCf – 308; MedCf:Wash – 460; and MedCf:Wash – 196; respectively.

Example 2: Hydrophobicity of coffee grounds as a function of particle size.

Roasted coffee grounds samples prepared according to Example 1A were used to evaluate the ability of each coffee grounds sample type to partition into the oil phase of an oil-water mixture. The three particle sizes of dark roasted coffee beans grounds were tested for hydrophobicity using a cooking oil/water mixture free of an emulsifier. The experiment is described, and the results are shown, in Figure 3. To a 2:5 oil-water mixture (10 mL cooking oil and 25 mL water), each coffee grounds sample (2 g) was added, vigorously mixed, and then left undisturbed for 12 hours at room temperature.

Even in the absence of emulsifying agents, DarkCf-270 coffee grounds predominantly partitioned into the top oil layer of the cooking oil-water mixture and remained stable in the oil layer after 12 hours of room temperature incubation, as is evident from the picture shown in Figure 3. Additional mixing at the end of the incubation period did not change the result. The two larger-sized dark roasted coffee grounds, DarkCf-924 and DarkCf-1598, partitioned nearly exclusively into the bottom water layer under the same conditions, indicating their hydrophilic nature. This comparison demonstrated the development of hydrophobicity upon particle size reduction to a median effective diameter of 270 μm.

Example 3: Protocol for emulsified cooking oil removal capacity.

The protocol for the qualitative comparisons discussed in Examples 4, 5, and 6 is illustrated in Figure 4. Briefly, two sets of emulsion standards, one colorless (without coffee grounds) and one coffee-colored (with coffee grounds) were prepared. For the colorless standards, an emulsifier, BKC (benzalkonium chloride) was added to water (30 mL) to make a 0.5% solution, then cooking oil was added to make 2%, 4%, and 8% (v/v) oil-water emulsions. A cooking oil-free sample (0% oil) was also prepared. Each solution was shaken vigorously for 30 seconds, filtered through a tea bag, the pH was confirmed to be neutral (~pH 7). Each solution was transferred to a reading cassette and photographed. For the coffee-colored standards, 1.5 g of coffee grounds MedCf-308 (see Example 1B) were added to 0.5% BKC solutions, incubated at room temperature for 12 hours and filtered through a

tea bag. Then the same procedure described above was followed: 2%, 4%, and 8% (v/v) solutions of cooking oil-water emulsions, along with a cooking oil-free (0%) sample were prepared, shaken vigorously for 30 seconds, filtered, checked for pH, transferred into reading cassettes, and photographed.

Oil removal tests were conducted by preparing 0.5% BKC solutions, adding cooking oil to make an 8% (v/v) oil-water emulsion, and then: adding the coffee grounds sample to be tested, shaking the emulsion mixture vigorously for 30 seconds, incubating at room temperature for 12 hours, filtering through a tea bag, confirming the pH is neutral, and transferring the solution to a reading cassette to be photographed.

Example 4: Emulsified cooking oil removal capacity.

The ability of DarkCf-270 and DarkCf-924 to remove oil from an oil-water emulsion was compared on a qualitative basis. The coffee grounds were prepared according to Example 1A, and the protocol was according to Example 3.

The ability of samples of 1.5g DarkCf-270 and 1.5g DarkCf-924 to remove cooking oil from an aqueous emulsion (8% (v/v) cooking oil and 0.5% (w/v) BKC emulsifier) was evaluated by observing light scattering of the solutions. The coffee grounds samples were compared with the coffee-colored standards. The experimental results are shown in Figure 5.

The photos of Figure 5 show the degree of light scattering observed when the reading cassettes with the samples and standards were back-lit. In the upper row of photos, the DarkCf-270 sample most closely resembled the 0% oil emulsion standard, implying the near complete removal of oil from the emulsion. In the middle row of photos, the DarkCf-924 sample most closely resembled the 2% oil emulsion standard, implying that the larger-sized grounds only achieved about 75% removal of the oil in the emulsion. The bottom row of photos in Figure 6 are underexposed pictures of the 0% and 2% (v/v) oil coffee-color emulsion standards, the DarkCf-270 sample, and the DarkCf-924 sample, respectively. The under-exposed photos confirmed the more efficient oil removal by the smaller-sized DarkCf-

270 grounds compared to the larger-sized DarkCf-924, suggesting the size reduction in dark roasted coffee grounds enhanced the oil removal capacity.

Example 5: Emulsified cooking oil removal capacity.

The ability spent coffee grounds, as represented by MedCf:Wash – 196 and MedCf:Wash – 460, to remove oil from an oil-water emulsion was compared on a qualitative basis. The coffee grounds were prepared according to Example 1B, and the protocol was according to Example 3.

The ability of samples of 1.5g MedCf:Wash – 196 and 1.5g MedCf:Wash – 460 to remove cooking oil from an aqueous emulsion (8% (v/v) cooking oil and 0.5% (w/v) BKC emulsifier) was evaluated by observing light scattering of the solutions. The coffee grounds samples were compared with the colorless standards. This experiment was performed to confirm that reduced particle size of the coffee grounds was primarily responsible for the observed enhancement in the oil removal capacity, rather than the degree of coffee bean roasting, or whether the coffee grounds were fresh or spent. The experimental results are shown in Figure 6.

The photos of Figure 6 show the degree of light scattering observed when the reading cassettes with the samples and colorless standards were back-lit. In the upper row of photos, the MedCf:Wash-196 sample most closely resembled the 0% oil emulsion standard, again implying nearly complete removal of the oil from the emulsion. In the middle row of photos, the MedCf:Wash-460 sample most closely resembled the 2% oil emulsion standard, implying that the larger-sized spent grounds only achieved about 75% removal of the oil from the emulsion. (Top) 8% oil emulsion after 12h treatment with 1.5g MedCf:Wash-196 μm, compared to 0%, 2%, 4% and 8% v/v oil colorless emulsion standards, photo at full exposure. (Middle) 8% oil emulsion after 12h treatment with 1.5g MedCf:Wash-460, compared to 0%, 2%, 4% and 8% v/v oil colorless emulsion standards, photo at full exposure. The bottom row photos in Figures 6 are under-exposed pictures of the 0% and 2%

(v/v) oil colorless emulsion standards, the MedCf:Wash-196 sample, and the MedCf:Wash-460 sample, respectively. The under-exposed photos confirmed the more efficient oil removal by the smaller-sized MedCf:Wash-196 grounds compared to the larger-sized MedCf:Wash-460 grounds. Also, because the transparency level of the MedCf:Wash-196 sample is similar to that achieved by the DarkCf-270 μm sample of Example 4, this demonstrates that neither the coffee bean roasting degree nor the fresh/spent status of the coffee bean grounds had a substantial effect on the oil emulsion removal performance.

Example 6: Emulsified cooking oil removal capacity.

The dose-dependency for removal of oil from an oil-water emulsion by a fresh medium roasted coffee grounds sample, MedCf-308, was evaluated. The coffee grounds were prepared according to Example 1B, and the protocol was according to Example 3. The experimental results are shown in Figure 7.

The ability of MedCf-308 to remove cooking oil from an aqueous emulsion (8% (v/v) cooking oil and 0.5% (w/v) BKC emulsifier) was tested using doses of 0.5 g, 1.0 g, and 1.5 g coffee grounds per 30 mL sample (0.5 g/30 mL, 1.0 g/30 mL, and 1.5 g/30 mL). The resulting sample solutions were compared with the 0% and 2% (v/v) oil coffee-colored emulsion standards. Photos of the back-lit solutions are shown in Figure 7.

All three of the doses tested demonstrated a significant drop in oil content from the starting level of an 8% oil emulsion to a level most closely resembling the 0% oil emulsion standard. Comparing amongst the three samples, the 0.5 g/30 mL MedCf-308 sample developed some visible, small oil droplets at the liquid's surface. This suggested that though generally effective, the lowest dose lacked a sufficient amount of grounds to sustainably retain the oil removal capacity of the doses that had two times or three times the amount of grounds. A qualitative assessment comparing the 1.0 g/30 mL and 1.5 g/30 mL samples was difficult due to the dose-dependent color development from the grounds, but both had substantially less visible oil in the sample.

Example 7: Oil removal capacity of activated carbon.

The ability of activated bamboo charcoal powder ("AC") to remove oil from an oil-water emulsion (8% (v/v) cooking oil with 0.5% (w/v) BKC emulsifier). The protocol was according to Example 3, except that AC was used in place of a coffee grounds sample. AC samples did not show significant reduction of oil from the emulsion. AC also did not display any preferential distribution between water or oil, and it did not appear to form any filterable, coagulated mass with oil, unlike the DarkCf-270, MedCf-308, or MedCf:Wash-196 samples (prepared in Example 1, even at the highest dose tested (1.5 g AC/30 mL oil-water emulsion). Ultimately, there was a sizeable layer of oil at top in each sample, although it was difficult to visually discern because the AC darkened the solution throughout. The experimental results are shown in Figure 8, though as described, it is difficult to visually observe the effect of the AC due to the coloration and lack of differential partitioning by the AC into the oil and water phases.

Example 8: Oil removal capacity of coffee grounds and activated carbon.

The ability of MedCf-308 combined with AC to remove oil from an oil-water emulsion was tested on a qualitative basis. The coffee grounds were prepared according to Example 1B, and the protocol was according to Example 3.

The ability of samples prepared with a 5:1 (w/w) mixture of MedCf-308 and AC to remove cooking oil from an aqueous emulsion (8% (v/v) oil and 0.5% (w/v) BKC emulsifier), wherein the mixture is added at a concentration of 0.5 g/30 mL, 1.0 g/30 mL, and 1.5 g/30 mL, was evaluated by observing light scattering of the solutions. The samples were compared with the coffee-colored standards. The experimental results are shown in Figure 9.

The samples were prepared by adding MedCf-308/AC to the emulsion, and within minutes AC coagulated with MedCf-308 and floated to the top of the mixing tube. The coagulated mass was effectively filtered away using tea bags, and produced clear, coffee-

colored samples with little AC remaining in the solution that would have otherwise caused the solution to be opaque (as described in Example 7). In the upper photo, the three samples are placed next to the 0% and 2% coffee color emulsion standards for comparison. The bottom photo is an underexposed picture of the MedCf-308/AC samples, clearly showing that a substantial portion of the oil was removed from the emulsion, and that very little AC remained the bulk solution.

Example 9: Powdered Compositions.

Three exemplary compositions according to various embodiments of the invention are shown in Table 1. The powder formulations are simple dry powder mixtures and provide 2.5 g of roasted coffee grounds having a median effective diameter ("MED") of 308 μm (using, e.g., a Turkish milled fresh medium roasted coffee powder) per serving. In Formulas 1, 2, and 3, each according to embodiments of the invention, to a mixture of coffee grounds and activated charcoal, and granulated sugar, are added grape seed extract, a probiotic, and berberine, respectively.

Table 1

	Formula 1		**Formula 2**		**Formula 3**	
Component	Amount (mg)	Weight%	Amount (mg)	Weight%	Amount (mg)	Weight%
Medium roasted coffee grounds (MED 308 μm)	2,500	58.0%	2,500	57.9%	2,500	57.9%
Activated charcoal	750	17.4%	750	17.4%	750	17.4%
Fine granulated sugar	1,000	23.2%	1,000	23.2%	1,000	23.2%
Grape seed extract	10	0.2%		--	--	--
Probiotic (Lp-115)	--	--	16	0.4%	--	--
Berberine	--	--	--	--	15	0.3%
Silicon dioxide	50	1.2%	50	1.2%	50	1.2%
Total	4,310	100.0%	4,316	100.0%	4,315	100.0%

Example 10: Nutritional Supplement Pills

Two exemplary compositions according to embodiments of the invention are shown in Table 2. The formulations provide 2.5 g of roasted coffee grounds having a median

effective diameter of 308 μm (using, e.g., a Turkish milled fresh medium roasted coffee powder) per serving, as well as activated charcoal, and grape seed extract. To these components, in Formula 4, honey is added as a binder, and in Formula 5, starch is added as a binder, to prepare a solid dosage form as a pill.

Table 2

	Formula 4		**Formula 5**	
Component	Amount (mg)	Weight%	Amount (mg)	Weight%
Medium roasted coffee grounds (MED 308 μm)	2,500	42.3%	2,500	58.7%
Activated charcoal	750	12.7%	750	17.6%
Grape seed extract	10	0.2%	10	0.2%
Probiotic (Lp-115)	--	--	--	--
Berberine	--	--	--	--
Honey	2,600	44.0%	--	--
Corn starch	--	--	1,000	23.5%
Silicon dioxide	50	0.8%	--	--
Total	5,910	100.0%	4,260	100.0%

Example 11: Method of Preparing a Roasted Coffee Grounds Nutritional Supplement Pills

Nutritional supplement pills with the compositions shown in Example 9 may be prepared according to any of the methods described herein. In one exemplary embodiment, all ingredients except for silicon dioxide and honey/corn starch are mixed dry. The mixed components are transferred to granulator and an appropriate amount of honey or hydrated corn starch is added and granulation is carried out. The obtained granulated mixture is extruded and shaped into round pills, and then dried at 60 degrees Celsius to yield a small pill composition with less than about 5 wt% water content. Silicon dioxide is optionally added to the dried pills and polished in obtaining the final product.

The foregoing invention having been described in detail and by way of examples and illustration, those of skill in the art will appreciate there are many embodiments of the disclosed invention, and that the compositions and examples disclosed herein should not be taken as limiting the scope of the disclosed invention.

CLAIMS

I claim:

1. A hydrophobic sorbent composition comprising fine coffee grounds, wherein the particle size distribution of the fine coffee grounds has a median effective diameter between 100 and 425 microns as measured by image analysis, and activated charcoal; wherein the fine coffee grounds and the activated charcoal are in a weight ratio from 100:1 to 1:1, and wherein the composition is suitable for human or animal consumption.

2. The composition of claim 1, wherein the fine coffee grounds are prepared from coffee beans selected from one or more of light roasted coffee beans and dark roasted coffee beans.

3. The composition of claim 1 or 2, wherein the fine coffee grounds are fresh.

4. The composition of claim 1 or 2, wherein the fine coffee grounds are spent.

5. The composition of any of claims 1-4, wherein the fine coffee grounds have been sized by sieving.

6. A dietary supplement for humans or animals, comprising the hydrophobic sorbent composition of any of claims 1-5, formulated as an oral dosage form.

7. The dietary supplement of claim 6, wherein the oral dosage form is a solid oral dosage form.

8. The dietary supplement of claim 6, wherein the oral dosage form is a solid oral dosage form selected from a powder, a pill, a capsule, granules, or a tablet.

9. The dietary supplement of claim 6, wherein the oral dosage form is a liquid oral dosage form.

10. The dietary supplement of claim 6, wherein the amount of fine coffee grounds in a single dosage form is from 10 mg to 20 g.

11. The dietary supplement of claim 10, wherein the supplement further comprises a sweetening agent.

12. The dietary supplement of claim 10 or 11, wherein the dosage form is a solid oral dosage form comprising at least one binder selected from honey and corn starch.

13. The dietary supplement of claim 10, 11, or 12, wherein the dosage form further comprises at least one excipient selected from any one or more of a vitamin, a mineral, a polyphenol, an herbal extract, a plant extract, a probiotic, and a prebiotic.

14. The dietary supplement of claim 13, wherein the dosage form further comprises grape seed extract.

15. The dietary supplement of claim 13, wherein the dosage form further comprises a probiotic.

16. The dietary supplement of claim 13, wherein the dosage form further comprises berberine.