

DESCRIPTION
COMPOSITION FOR INCREASING BIOAVAILABILITY AND
PROMOTING ABSORPTION OF GINSENOSIDES IN BLACK GINSENG
EXTRACT

5

Technical Field

[1] The present invention relates to a composition for increasing the bioavailability and promoting the absorption of ginsenosides in a black ginseng extract.

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Background Art

[2] Ginseng is a perennial herb belonging to the genus Panax of the Araliaceae family and is one of the herbal medicines used in oriental medicine. As physiologically active efficacies of general ginseng, an effect on the central nervous system, an anticancer effect (Patent Document 1), and the like have been reported. In particular, about 40 types of ginsenosides have been discovered so far, and it has been confirmed that they exerted a wide range of effects on the central nervous system, the endocrine system, the metabolic system, etc., and showed excellent effects in regulating body functions, that is, normalizing physiological functions. These ginsenosides have similar or opposite actions, and it is known that various effects are exerted by a specific component alone or through the interaction of several types of components.

[3] The present inventors studied various raw materials among processed products derived from ginseng, controlled the conditions for processing ginseng to prepare black ginseng having an increased content of ginsenosides present in trace amounts in ginseng, and confirmed that the bioavailability and absorption rate in the body of ginsenosides contained in a black ginseng extract were significantly improved compared to that of red ginseng.

[4] [Prior art document]

[5] (Patent Document 1) Korean Unexamined Publication No. 2010-0134463

Detailed Description of the Invention

Technical Problem

[6] An object of the present application is to provide a composition for increasing the bioavailability and promoting the absorption of ginsenosides in a black ginseng extract.

Technical solution

[7] According to an aspect of the present application, there is provided a method for preparing a black ginseng extract.

[8] Another aspect of the present application provides a composition for increasing the bioavailability and promoting the absorption of ginsenosides in a black ginseng extract.

[9] Hereinafter, the present application will be described in detail.

[10] One embodiment of the present application provides a method for preparing a black ginseng extract enriched with ginsenosides Rk1 and Rg5, the method comprising: a step for steaming ginseng to prepare black ginseng; a step for extracting the prepared black ginseng with a solvent; and a step for maturing the obtained black ginseng extract.

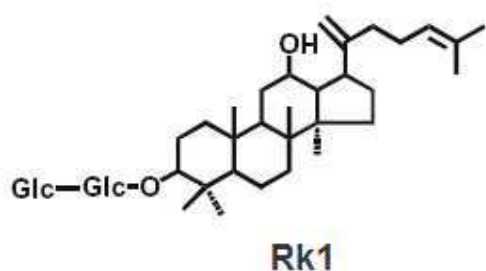
[11] The black ginseng extract is derived from black ginseng obtained by steaming ginseng multiple times.

[12] The ginseng may be Korean ginseng (*Panax ginseng*), Canadian ginseng (*P. quinquefolius*), Chinese Ginseng (*P. notoginseng*), Bamboo ginseng (*P. japonicus*), Dwarf ginseng (*P. trifolium*), Himalayan ginseng (*P. pseudoginseng*), Vietnamese ginseng (*P. vietnamensis*), American ginseng (*Panax quinquefolium*), or the like. Ginseng is generally divided into white ginseng and red ginseng according to processing methods. White ginseng refers to ginseng obtained by drying unprocessed ginseng gathered right out of the field, that is, fresh ginseng, as it is. Red ginseng is ginseng obtained by steaming, drying, and processing fresh ginseng. The preparation process of red ginseng involves several chemical changes, such as saponin modification and

amino acid changes. Ginsenoside components that do not exist in ginseng are generated by the heat applied during the red ginseng preparation process. The unique active components in red ginseng show cancer-preventive effect, cancer cell growth-inhibiting effect, blood pressure-lowering effect, brain nerve cell-protective effect, and learning ability-improving effect.

[13] Black ginseng of the present application may be obtained by steaming nine times any one selected from the group consisting of ginseng leaves, young shoots, stems, stem shells, roots, root shells, seeds, fruits, immature fruits, mature fruits, flesh, pericarp, flowers, androecium, gynoecium, calyxes, stamens, petals, calyx pieces, carpels, and combinations thereof. The androecium represents the entire stamens in a flower, and the gynoecium represents the entire pistils in a flower. The carpel is a component that makes the pistil of a flower and represents a deformed form of a leaf, which is generally called a floral leaf. The ginseng may be, but is not limited to, ginseng roots. Other parts of ginseng steamed nine times may be mixed.

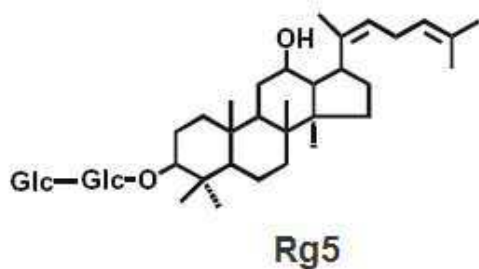
[14] The ginsenoside Rk1 is represented by the following formula:



[16] (wherein Glc represents a glycosyl residue.)

[17] The ginsenoside Rg5 is represented by the following formula:

[18]



[19] (wherein Glc represents a glycosyl residue.)

[20] The steaming may be performed 3 to 12 times at 70°C to 120°C.

5 [21] The steaming may be performed at 75°C to 115°C, 80°C to 110°C, 85°C to 105°C, 87°C to 103°C, or 90°C to 100°C. When performing steaming under the above temperature condition, the content of the active ingredient ginsenosides Rk1 and Rg5 increases, and
10 substances harmful to health are not generated so that the quality can be optimized.

[22] The steaming may be performed 3 to 11 times, 4 to 10 times, 5 to 9 times, 6 to 9 times, 7 to 9 times, 8 times, or 9 times. When performing steaming under the
15 above condition of the number of steaming, the content of the active ingredient ginsenosides Rk1 and Rg5 increases, and substances harmful to health are not generated so that the quality can be optimized. As long as the bioavailability of the black ginseng extract
20 obtained by applying the steaming conditions of the present application increases and the absorption rate is improved, the number of steaming can be variously applied.

[23] The steaming time may be 1.5 hours to 6 hours, 2
25 hours or more, 2 hours to 6 hours, 2 hours to 5.5 hours, 2 hours to 5 hours, 2 hours to 4.5 hours, 2 hours to 4 hours, 2 hours to 3.5 hours, or 2 hours to 3 hours per steaming. When performing steaming under the above time condition, the content of the active ingredient
30 ginsenosides Rk1 and Rg5 increases, and substances harmful to health are not generated so that the quality can be optimized.

[24] The method for preparing the black ginseng extract may further include a step for drying the steamed ginseng each time completing steaming. Drying may be performed at 25°C to 60°C, 27°C to 58°C, or 30°C to 55°C. In addition, drying may be performed for 10 hours to 30 hours, 12 hours to 28 hours, 12 hours to 26 hours, or 12 hours to 24 hours.

[25] As used herein, the term "extract" refers to a material extracted by any method from a raw material, and is meant to include, without limitation, all of an extract thus extracted, a concentrate obtained therefrom, a dried product and powders of the concentrate.

[26] The extract may be obtained by extraction from a raw material or a dried product thereof, and the raw material of the extract may be a raw material grown or a commercially available raw material, without limitation.

[27] When the extract is obtained by extracting the raw material, conventionally known general extraction methods, such as solvent extraction, ultrasonic extraction, filtration and reflux extraction, may be used. The extract may be prepared by using solvent extraction or reflux extraction. The extraction process may be repeated several times, after which the extract may be further subjected to steps such as concentration or freeze-drying. For example, high concentration extract powders may be prepared by concentrating the obtained extract under reduced pressure to obtain a concentrate, freeze-drying the concentrate, and using a grinder. The extract also includes a fraction obtained by further fractionating the extract.

[28] The extract may be obtained by using water, an organic solvent, or a mixture thereof as an extraction solvent. The organic solvent may be any one selected from the group consisting of an alcohol, a lower alcohol having 1 to 4 carbon atoms, hexane (n-hexane), ether, glycerol, propylene glycol,

butylene glycol, ethyl acetate, methyl acetate, dichloromethane, chloroform, ethyl acetate, benzene, and a mixture thereof.

[29] When a mixture of water and an organic solvent is used as an extraction solvent, the mixture of water and an organic solvent may be a mixture of water and a lower alcohol having 1 to 4 carbon atoms, and may be a mixture of water and ethanol. In this case, the solvent may be 20% (v/v) to 90% (v/v) aqueous ethanol solution, 25%(v/v) to 85%(v/v) aqueous ethanol solution, 30%(v/v) to 80%(v/v) aqueous ethanol solution, 20%(v/v) to 40%(v/v) aqueous ethanol solution, 30%(v/v) to 60%(v/v) aqueous ethanol solution, 35%(v/v) to 75%(v/v) aqueous ethanol solution, 40%(v/v) to 70%(v/v) aqueous ethanol solution, 45%(v/v) to 65%(v/v) aqueous ethanol solution, or 50%(v/v) to 80%(v/v) aqueous ethanol solution. When preparing the black ginseng extract, the extraction solvent may be added 4 times to 10 times, 5 times to 9 times, or 6 times to 8 times the raw material for extraction, black ginseng. The content of the active ingredient ginsenosides Rk1 and Rg5 increases during extraction under the above aqueous ethanol solution condition.

[30] When preparing the black ginseng extract, extraction may be performed for 2 hours to 12 hours, 3 hours to 11 hours, 4 hours to 10 hours, 4 hours to 9 hours, or 4 hours to 8 hours. The content of the active ingredient ginsenosides Rk1 and Rg5 increases during extraction under the above time condition.

[31] The black ginseng extract may be prepared by the following process. The black ginseng obtained by completing the final steaming and drying may be firstly extracted with 50% (v/v) to 80% (v/v) aqueous ethanol solution, the residue generated from the first extraction may be secondly extracted with the aqueous ethanol solution of the same concentration, the residue generated from the secondary extraction may be tertiarily extracted with 30% (v/v) to 60% (v/v)

aqueous ethanol solution, and the residue generated from the tertiary extraction may be quaternarily extracted with 20% (v/v) to 40% (v/v) aqueous ethanol solution. The black ginseng extract may be each of the
5 extracts obtained in each round and may be a mixture of the extracts obtained from the first to fourth extractions. The solvent used for each extraction round may have various concentrations. That is, to increase the content of the active ingredient ginsenosides Rk1
10 and Rg5, the extraction solvent may be used in various combinations.

[32] The black ginseng extract may be 55 Brix% to 85 Brix%, 57 Brix% to 83 Brix%, 60 Brix% to 80 Brix%, 62 Brix% to 78 Brix%, or 65 Brix% to 75 Brix%. When the
15 black ginseng extract is in the above Brix% concentration range, the quality, such as the content of active ingredient ginsenosides Rk1 and Rg5, is optimized, and the viscosity of the black ginseng extract is not too high, so the desired formulation can
20 be prepared.

[33] The method for preparing the black ginseng extract may further include a step for maturing the black ginseng extract after the extraction step.

[34] The step for maturing the black ginseng extract
25 may be performed at 80°C or higher, 82°C to 95°C, 84°C to 93°C, 86°C to 91°C, or 88°C to 90°C. The content of ginsenosides Rk1 and Rg5 increases during maturing under the above temperature condition.

[35] The step for maturing the black ginseng extract
30 may be performed for 3 hours or more, 3 hours to 48 hours, 3 hours to 44 hours, 3 hours to 40 hours, 3 hours to 36 hours, 3 hours to 32 hours, 3 hours to 28 hours, or 3 hours to 24 hours. The content of ginsenosides Rk1 and Rg5 increases during maturing
35 under the above time condition.

[36] The total content of ginsenosides Rk1 and Rg5 contained in the black ginseng extract may be 20 parts by weight to 90 parts by weight, 25 parts by weight to

85 parts by weight, 30 parts by weight to 80 parts by weight, 35 parts by weight to 75 parts by weight, 40 parts by weight to 70 parts by weight, 45 parts by weight to 65 parts by weight, or 50 parts by weight to 60 parts by weight, based on 100 parts by weight of the total content of ginsenosides Rb1, Rb2, Rc, Rd, Re, Rg1, Rg3(s), Rk1, Rg5, and Rh1(s). When the total content of ginsenosides Rk1 and Rg5 is within the above range, the effect of increasing the bioavailability of the black ginseng extract is excellent.

[37] In the method for preparing the black ginseng extract, pressure is not applied during the steaming. Pressure is not applied separately during the steaming, so harmful substances such as benzopyrene are not generated. Thus, the black ginseng extract of the present application has excellent quality in terms of safety.

[38] The black ginseng is prepared by steaming ginseng. A black ginseng extract having a high content of ginsenosides Rk1 and Rg5 can be obtained through extraction of the prepared black ginseng and maturing. For example, black ginseng was prepared by steaming 3 to 12 times at 70°C to 120°C, with the condition of 2 hours or more per steaming. To this black ginseng, 4 to 10 times the weight of the black ginseng of water, a lower alcohol having 1 to 4 carbon atoms, or a mixed solvent thereof was added, and the black ginseng was subjected to the extraction for 2 to 12 hours to obtain a black ginseng extract. The black ginseng extract was concentrated, and the black ginseng concentrate was matured at 80°C or higher for 3 hours or longer. As a result, the total content of ginsenosides Rk1 and Rg5, which are known to be not contained or contained in trace amounts in red ginseng, was 20 parts by weight to 90 parts by weight, based on 100 parts by weight of the total content of ginsenosides Rb1, Rb2, Rc, Rd, Re, Rg1, Rg3(s), Rk1, Rg5, and Rh1(s), and was significantly higher than that in the red ginseng extract.

[39] Another embodiment of the present application provides a composition for increasing the bioavailability and promoting the absorption of ginsenosides in a black ginseng extract, the composition comprising the black ginseng extract containing ginsenosides Rk1 and Rg5, wherein the total content of ginsenosides Rk1 and Rg5 is 20 parts by weight to 90 parts by weight, based on 100 parts by weight of the total content of ginsenosides Rb1, Rb2, Rc, Rd, Re, Rg1, Rg3(s), Rk1, Rg5, and Rh1(s).

[40] In the composition for increasing the bioavailability and promoting the absorption of ginsenosides in the black ginseng extract of the present application, the total content of ginsenosides Rk1 and Rg5 may be 25 parts by weight to 85 parts by weight, 30 parts by weight to 80 parts by weight, 35 parts by weight to 75 parts by weight, 40 parts by weight to 70 parts by weight, 45 parts by weight to 65 parts by weight, or 50 parts by weight to 60 parts by weight, based on 100 parts by weight of the total content of ginsenosides Rb1, Rb2, Rc, Rd, Re, Rg1, Rg3(s), Rk1, Rg5, and Rh1(s). When the total content of ginsenosides Rk1 and Rg5 is within the above range, the effects of increasing the bioavailability and promoting the absorption of ginsenosides in the black ginseng extract are excellent.

[41] In the composition for increasing the bioavailability and promoting the absorption of ginsenosides of the present application, the total content of ginsenosides Rk1 and Rg5 contained in the black ginseng extract may be 9 mg/g or more, 9 mg/g to 30 mg/g, 9 mg/g to 28 mg/g, 9 mg/g to 26 mg/g, 9 mg/g to 24 mg/g, 9 mg/g to 22 mg/g, 9.1 mg/g to 20 mg/g, 9.1 mg/g to 18 mg/g, 9.2 mg/g to 16 mg/g, 9.2 mg/g to 14 mg/g, or 9.2 mg/g to 12 mg/g. When the total content of ginsenosides Rk1 and Rg5 is within the above range, the effects of increasing the bioavailability and promoting

the absorption of ginsenosides in the black ginseng extract are excellent.

[42] The term "bioavailability" used concerning the ginsenosides of the black ginseng extract in the present application refers to the ratio of the amount of ginsenosides that are absorbed and reach the systemic circulation in an unchanged form when the black ginseng extract is administered.

[43] In the present specification, the term "absorption rate" may be used interchangeably with the same meaning as bioavailability.

[44] In the present application, the bioavailability may be expressed as the area under the plasma level-time curve (AUC) of ginsenosides measured when the black ginseng extract was taken, or may also be expressed by comparing the AUC value when the black ginseng extract was taken with the AUC value of ginsenosides measured when the same amount of the red ginseng extract is taken.

[45] In the composition for increasing the bioavailability and promoting the absorption of ginsenosides of the present application, when 9 g of the black ginseng extract is administered, the sum of the AUC values of ginsenosides Rb1, Rb2, Rc, Rd, Rg3(s), Rk1, Rg5, CK, Rh2(s), PPD(s), Re, Rg1, Rh1(s), and PPT(s) may be 500 to 1200 $\mu\text{g}\cdot\text{hr}/\text{ml}$.

[46] Specifically, in the composition for increasing the bioavailability and promoting the absorption of ginsenosides of the present application, when 9 g of the black ginseng extract is administered, the sum of the AUC values of ginsenosides Rb1, Rb2, Rc, Rd, Rg3(s), Rk1, Rg5, CK, Rh2(s), PPD(s), Re, Rg1, Rh1(s), and PPT(s) may be 550 to 1150 $\mu\text{g}\cdot\text{hr}/\text{ml}$, 600 to 1100 $\mu\text{g}\cdot\text{hr}/\text{ml}$, 650 to 1050 $\mu\text{g}\cdot\text{hr}/\text{ml}$, 700 to 1000 $\mu\text{g}\cdot\text{hr}/\text{ml}$, or 750 to 950 $\mu\text{g}\cdot\text{hr}/\text{ml}$.

[47] In addition, in the composition for increasing the bioavailability and promoting the absorption of ginsenosides of the present application, when 9 g of

the black ginseng extract is administered, the AUC value of ginsenoside Rk1 may be 20 to 40 $\mu\text{g}\cdot\text{hr}/\text{ml}$, more specifically 25 to 40 $\mu\text{g}\cdot\text{hr}/\text{ml}$, 25 to 38 $\mu\text{g}\cdot\text{hr}/\text{ml}$, 25 to 35 $\mu\text{g}\cdot\text{hr}/\text{ml}$, or 30 to 35 $\mu\text{g}\cdot\text{hr}/\text{ml}$.

5 [48] In addition, in the composition for increasing the bioavailability and promoting the absorption of ginsenosides of the present application, when 9 g of the black ginseng extract is administered, the AUC value of ginsenoside Rg3 may be 40 to 80 $\mu\text{g}\cdot\text{hr}/\text{ml}$, more
10 specifically 45 to 75 $\mu\text{g}\cdot\text{hr}/\text{ml}$, 50 to 70 $\mu\text{g}\cdot\text{hr}/\text{ml}$, or 55 to 65 $\mu\text{g}\cdot\text{hr}/\text{ml}$.

[49] In addition, in the composition for increasing the bioavailability and promoting the absorption of ginsenosides of the present application, when 9 g of
15 the black ginseng extract is administered, the AUC value of ginsenoside Rh2 may be 250 to 400 $\mu\text{g}\cdot\text{hr}/\text{ml}$, more specifically 270 to 380 $\mu\text{g}\cdot\text{hr}/\text{ml}$, 290 to 360 $\mu\text{g}\cdot\text{hr}/\text{ml}$, 300 to 350 $\mu\text{g}\cdot\text{hr}/\text{ml}$, 310 to 350 $\mu\text{g}\cdot\text{hr}/\text{ml}$, or 320 to 340 $\mu\text{g}\cdot\text{hr}/\text{ml}$.

20 [50] The term "Tmax value" herein refers to the time at which the blood concentration reaches the maximum after administration of the black ginseng extract or red ginseng extract, which is the time when the absorption of the extract reaches the maximum and is the moment
25 when the absorption rate and the excretion rate of the extract are the same. It is an indicator of the absorption rate when comparing the absorption of extracts.

[51] In the composition for increasing the
30 bioavailability and promoting the absorption of ginsenosides of the present application, the Tmax value of ginsenosides Rb1, Rb2, Rc, Rd, Rg3(s), Rk1, Rg5, CK, Rh2(s), PPD(s), Re, Rg1, Rh1(s), and PPT(s) may be 5 to 10 hours. Specifically, the Tmax value of ginsenosides
35 in the black ginseng extract may be 5.5 to 9.5 hours, 6.0 to 9.0 hours, 6.5 to 9.0 hours, 6.7 to 8.8 hours, 6.9 to 8.7 hours, or 7.0 to 8.5 hours.

[52] In the composition for increasing the bioavailability and promoting the absorption of ginsenosides of the present application, the black ginseng extract may further include acidic polysaccharides and polyphenols.

[53] The acidic polysaccharides may be contained in an amount of 1 mg/g or more, 1 mg/g to 20 mg/g, 1 mg/g to 18 mg/g, 1 mg/g to 16 mg/g, 1 mg/g to 14 mg/g, 1 mg/g to 12 mg/g, 1.5 mg/g to 10 mg/g, 1 mg/g to 8 mg/g, 2 mg/g to 6 mg/g, 1 mg/g to 4 mg/g, or 2.5 mg/g to 4 mg/g. When the acidic polypeptides are contained within the above range, a synergistic effect between the acidic polypeptides and ginsenosides Rk1 and Rg5 contained in the black ginseng increases. Thus, the effects of increasing the bioavailability and promoting the absorption of ginsenosides in the black ginseng extract are excellent.

[54] The polyphenols may be contained in an amount of 15 mg/g or more, 15 mg/g to 40 mg/g, 15 mg/g to 38 mg/g, 15 mg/g to 36 mg/g, 16 mg/g to 34 mg/g, 17 mg/g to 32 mg/g, 18 mg/g to 30 mg/g, 19 mg/g to 28 mg/g, 20 mg/g to 26 mg/g, or 20 mg/g to 24 mg/g. When the polyphenols are contained within the above range, a synergistic effect between the polyphenols and ginsenosides Rk1 and Rg5 contained in the black ginseng increases. Thus, the effects of increasing the bioavailability and promoting the absorption of ginsenosides in the black ginseng extract are excellent.

[55] The composition for increasing the bioavailability and promoting the absorption of ginsenosides in the black ginseng extract of the present application may be a food or pharmaceutical composition.

[56] As used herein, the term "administration" means introducing a predetermined substance to a subject in any suitable way. The composition of the present application can be administered through any general route that can reach an in vivo target. The route of administration of the composition of the present

application is not particularly limited but may be oral or parenteral. The administration of the present application may be performed 1 to 4 times, 2 to 3 times, or 2 times a day. In addition, the administration of the present application may be performed for a period of 4 weeks or more, 8 weeks or more, 4 weeks to 12 weeks, or 8 weeks to 12 weeks.

[57] The dosage of the black ginseng extract containing ginsenosides Rk1 and Rg5 contained in the composition for increasing the bioavailability and promoting the absorption of ginsenosides in the black ginseng extract depends on the patient's condition and weight, the degree of the disease, drug form, and route and period of the administration and may be appropriately selected depending on the circumstances. For example, the black ginseng extract containing ginsenosides Rk1 and Rg5 may be administered at a dose of 0.0001 to 1000 mg/kg, 0.001 to 700 mg/kg, 0.01 to 500 mg/kg, 0.1 to 100 mg/kg, or 0.1 to 100 mg/kg, 0.1 to 10 mg/kg, 0.1 to 8 mg/kg, 0.1 to 6 mg/kg, 0.1 to 5 mg/kg, 0.1 to 4 mg/kg, 0.3 to 3.5 mg/kg per day. The administration may be performed once or several times per day in a divided manner. The black ginseng extract containing ginsenosides Rk1 and Rg5 of the present application is a composition for increasing the bioavailability and promoting the absorption, and when the composition is administered in an amount equivalent to the dosage of an extract containing other ginsenosides in general, it may have excellent bioavailability of ginsenosides and may have excellent efficacy of a composition containing other ginsenosides in general. In addition, even when the composition is administered in an amount smaller than the dosage of an extract containing other ginsenosides in general, it may have equivalent, similar, or excellent bioavailability of ginsenosides and may have equivalent, similar, or excellent efficacy of a composition containing other ginsenosides in general. The dosage of the black ginseng extract containing

ginsenosides Rk1 and Rg5 of the present application may be increased or decreased according to the route of administration, the degree of the disease, sex, weight, age, or the like. Accordingly, the above dosage does
5 not limit the scope of the present application in any way.

[58] The food composition of the present application may be provided in the form of a powder, a granule, a tablet, a capsule, syrup, or a beverage. The food
10 composition may be used with other food or food additives, in addition to the black ginseng extract containing ginsenosides Rk1 and Rg5 of the present application, which is the active ingredient. The mixing amount of the active ingredient may be determined
15 appropriately depending on the purpose of use, for example, prevention, health, or therapeutic treatment.

[59] The black ginseng extract containing ginsenosides Rk1 and Rg5 may be contained in the food composition in an amount of 0.001 wt% to 60 wt%, for example, 0.01 wt%
20 to 50 wt%, 0.1 wt% to 45 wt%, 1 wt% to 40 wt%, or 1 wt% to 20 wt%. When the content of the black ginseng extract in the food composition is less than 0.001 wt%, the effects of the black ginseng extract may not be sufficiently exhibited. When it exceeds 60 wt%, the
25 effect of the black ginseng extract may be relatively low relative to the introduced concentration, but there is no problem in terms of safety, and thus the black ginseng extract can be used in an amount greater than the above range.

[60] There is no particular limitation on the type of the food of the present application. Examples of the food of the present application include meat, sausages, bread, chocolate, candies, snacks, confectioneries, pizza, ramen, other noodles, gums, dairy products
35 including ice cream, various soups, beverages, teas, drinks, alcoholic beverages, and vitamin complexes.

[61] The pharmaceutical composition of the present application may further include an appropriate carrier,

an excipient, or a diluent, commonly used for preparing the pharmaceutical composition.

[62] Examples of the carrier, the excipient, or the diluent that can be used for the pharmaceutical composition of the present application include lactose, dextrose, sucrose, sorbitol, mannitol, xylitol, erythritol, maltitol, starch, acacia rubber, alginate, gelatin, calcium phosphate, calcium silicate, cellulose, methylcellulose, microcrystalline cellulose, polyvinylpyrrolidone, water, methyl hydroxybenzoate, propyl hydroxybenzoate, talc, magnesium stearate, or mineral oil.

[63] The pharmaceutical composition of the present invention may be formulated and used in the form of oral formulations, such as powders, granules, tablets, capsules, suspensions, emulsions, syrups, aerosols, or the like, external applications, suppositories, and sterilized injection solutions, respectively, according to conventional methods. For example, the pharmaceutical composition of the present application may be provided in the form of an aerosol, powders, gels, an ointment, or a drop for easy application to the mucous membrane. The mucous membrane may be, but not limited to, a nasal mucosa, an oral mucosa, an airway mucosa, or an eye mucosa.

[64] For preparation into formulations, a diluent or an excipient, such as a commonly used filler, a bulking agent, a binder, a wetting agent, a disintegrating agent, a surfactant, or the like may be used. Solid formulations for oral administration include tablets, pills, powders, granules, capsules, etc. These solid formulations may be prepared by mixing the compound with at least one excipient, for example, starch, calcium carbonate, sucrose, lactose, gelatin, etc.

[65] Furthermore, in addition to simple excipients, lubricants, such as magnesium stearate and talc are also used. Liquid formulations for oral administration include a suspension, a liquid for internal use, an

emulsion, syrup, and the like. In addition to water and liquid paraffin, which are commonly used simple diluents, various excipients, for example, a wetting agent, a sweetener, a flavoring agent, a preserving agent, or the like may be added.

[66] Formulations for parenteral administration include a sterilized aqueous solution, a non-aqueous solvent, a suspension, an emulsion, a lyophilized formulation, and a suppository formulation. As the non-aqueous solvent or the suspension, propylene glycol, polyethylene glycol, a plant oil such as olive oil, an injectable ester such as ethylolate, or the like may be used. As a base for suppositories, witepsol, macrogol, tween 61, cacao butter, laurin butter, glycerogelatin, or the like may be used.

[67] Solid formulations for oral administration include tablets, pills, powders, granules, capsules, etc. These solid formulations are prepared by mixing the pharmaceutical composition of the present application with at least one excipient, for example, starch, calcium carbonate, sucrose, lactose, gelatin, etc. Furthermore, in addition to simple excipients, lubricants, such as magnesium stearate and talc may also be used.

[68] Liquid formulations for oral administration include a suspension, a liquid for internal use, an emulsion, syrup, and the like. In addition to water and liquid paraffin, which are commonly used simple diluents, various excipients, for example, a wetting agent, a sweetener, a flavoring agent, a preserving agent, or the like may be added.

[69] Formulations for skin administration may be dusting powders, emulsions, suspensions, oils, sprays, ointments, cream pastes, gels, foams, or solutions. The pharmaceutical formulation of the present application may be an anhydrous ointment, and may contain paraffin that is suitable for local application and is in a liquid state at body temperature, particularly, low-

viscosity paraffin, or may contain the natural fats or partially synthesized fats, for example, coconut fatty acid triglyceride, hydrogenated oil, for example, hydrogenated peanut oil or castor oil, partial fatty acid ester of glycerol, for example, glycerol monostearate and distearate, silicone, for example, polymethylsiloxane, such as hexamethyldisiloxane or octamethyltrisiloxane. For example, the pharmaceutical formulation may contain a fatty alcohol, which is associated with an aqueous cream and serves to increase the moisture absorption capacity, and sterols, wool wax, other emulsifying agents and/or other additives.

[70] The dosage of the black ginseng extract containing ginsenosides Rk1 and Rg5 contained in the pharmaceutical composition of the present application is as described above.

[71] The pharmaceutical composition of the present application may be administered to mammals such as rats, mice, livestock, humans, and the like through various routes. Administration may be performed through, for example, oral, rectal, intravenous, intramuscular, subcutaneous, endobronchial inhalation, intrauterine dural, or intracerebroventricular injection.

[72] The black ginseng extract containing ginsenosides Rk1 and Rg5 of the present application may be administered to a subject in need thereof in an effective amount.

[73] In the present application, the subject in need thereof means a subject in need of the bioavailability increase and absorption promotion of ginsenosides in the black ginseng extract.

[74] The subject herein may be an animal, including a human or an animal other than a human.

[75] In the composition for increasing the bioavailability and promoting the absorption of ginsenosides of the present application, the black ginseng extract may be prepared by the method for preparing a black ginseng extract enriched with

ginsenosides Rk1 and Rg5, the method comprising: a step for steaming ginseng to prepare black ginseng; a step for extracting the prepared black ginseng with a solvent; and a step for maturing the obtained black ginseng extract.

[76] In the composition for increasing the bioavailability and promoting the absorption of ginsenosides of the present application, the steaming may be performed 3 to 12 times at 70°C to 120°C.

[77] The steaming may be performed at 75°C to 115°C, 80°C to 110°C, 85°C to 105°C, 87°C to 103°C, or 90°C to 100°C. When performing steaming under the above temperature condition, the content of the active ingredient ginsenosides Rk1 and Rg5 increases, and substances harmful to health are not generated so that the quality can be optimized.

[78] The steaming may be performed 3 to 11 times, 4 to 10 times, 5 to 9 times, 6 to 9 times, 7 to 9 times, 8 times, or 9 times. When performing steaming under the above condition of the number of steaming, the content of the active ingredient ginsenosides Rk1 and Rg5 increases, and substances harmful to health are not generated so that the quality can be optimized.

[79] The steaming time may be 1.5 hours to 6 hours, 2 hours or more, 2 hours to 6 hours, 2 hours to 5.5 hours, 2 hours to 5 hours, 2 hours to 4.5 hours, 2 hours to 4 hours, 2 hours to 3.5 hours, or 2 to 3 hours per steaming. When performing steaming under the above time condition, the content of the active ingredient ginsenosides Rk1 and Rg5 increases, and substances harmful to health are not generated so that the quality can be optimized.

[80] In the composition for increasing the bioavailability and promoting the absorption of ginsenosides of the present application, the step for maturing the black ginseng extract may be performed at 80°C or higher, 82°C to 95°C, 84°C to 93°C, 86°C to 91°C, or 88°C to 90°C. The content of ginsenosides Rk1

and Rg5 increases during maturing under the above temperature condition.

[81] The step for maturing the black ginseng extract may be performed for 3 hours or more, 3 hours to 48 hours, 3 hours to 44 hours, 3 hours to 40 hours, 3 hours to 36 hours, 3 hours to 32 hours, 3 hours to 28 hours, or 3 hours to 24 hours. The content of ginsenosides Rk1 and Rg5 increases during maturing under the above time condition.

[82] The contents described herein concerning the method for preparing the black ginseng extract, which is one embodiment of the present application, may be applied to the composition for increasing the bioavailability and promoting the absorption of ginsenosides in the black ginseng extract. The contents common between them will not be described redundantly to avoid undue complexity of the specification. For example, the contents of the step for steaming ginseng to prepare black ginseng; the step for extracting the prepared black ginseng with a solvent; and the step for maturing the obtained black ginseng extract can be applied to the composition for increasing the bioavailability and promoting the absorption of ginsenosides.

[83] As another aspect of the present application, the present application provides a method for increasing the bioavailability and promoting the absorption of ginsenosides in a black ginseng extract, the method comprising a step for administering to a subject a composition comprising a black ginseng extract containing ginsenosides Rk1 and Rg5, wherein the total content of ginsenosides Rk1 and Rg5 is 20 parts by weight to 90 parts by weight, based on 100 parts by weight of the total content of ginsenosides Rb1, Rb2, Rc, Rd, Re, Rg1, Rg3(s), Rk1, Rg5, and Rh1(s).

[84] In the method for increasing the bioavailability and promoting the absorption of ginsenosides of the present application, when 9 g of the black ginseng

extract is administered, the AUC (Area under the plasma level-time curve) value of ginsenosides Rb1, Rb2, Rc, Rd, Rg3(s), Rk1, Rg5, CK, Rh2(s), PPD(s), Re, Rg1, Rh1(s), and PPT(s) may be 500 to 1200 $\mu\text{g}\cdot\text{hr}/\text{ml}$.

5 [85] In the method for increasing the bioavailability and promoting the absorption of ginsenosides of the present application, the T_{max} of ginsenosides in the black ginseng extract may be 5 hours to 10 hours.

10 [86] In the method for increasing the bioavailability and promoting the absorption of ginsenosides of the present application, the black ginseng extract may further include acidic polysaccharides and polyphenols.

15 [87] In the method for increasing the bioavailability and promoting the absorption of ginsenosides of the present application, the composition containing the black ginseng extract may be a food composition or a pharmaceutical composition.

20 [88] In the method for increasing the bioavailability and promoting the absorption of ginsenosides of the present application, the black ginseng extract may be prepared by the method for preparing a black ginseng extract enriched with ginsenosides Rk1 and Rg5, the method comprising: a step for steaming ginseng to prepare black ginseng; a step for extracting the prepared black ginseng with a solvent; and a step for maturing the obtained black ginseng extract.

25 [89] In the method for increasing the bioavailability and promoting the absorption of ginsenosides of the present application, the steaming may be performed 3 to 30 12 times at 70°C to 120°C.

[90] In the method for increasing the bioavailability and promoting the absorption of ginsenosides of the present application, the steaming may be performed under the condition of 2 hours or more per steaming.

35 [91] In the method for increasing the bioavailability and promoting the absorption of ginsenosides of the present application, the step for maturing the black ginseng extract may be performed at 80°C or higher.

[92] In the method for increasing the bioavailability and promoting the absorption of ginsenosides of the present application, the step for maturing the black ginseng extract may be performed for 3 hours or more.

5 **Effects of the Invention**

[93] The black ginseng extract of the present application has the effects of increasing bioavailability and promoting the absorption of ginsenosides and thus, can be usefully used as an
10 active ingredient.

[94] However, effects of the present application are not limited to the above-mentioned effects and other effects not mentioned will be clearly understood from the following description by a person skilled in the
15 art.

Brief Description of the Drawings

[95] Figures 1a to 1c show changes in ginsenosides according to the steaming time during the preparation of the black ginseng.

20 [96] Figures 2a to 2c show changes in ginsenosides according to the maturing temperature and the maturing time of the black ginseng concentrate.

[97] Figure 3 shows a clinical trial design plan for measuring the bioavailability of ginsenosides in black
25 ginseng concentrate.

Best Mode for Carrying Out the Invention

[98] Hereinafter, the present invention will be described in detail through Preparation Examples and Experimental examples.

30 [99] However, the following Preparation Examples and Experimental examples merely illustrate the present invention, and the contents of the present application are not limited by the following Examples and Experimental examples.

35 **[100]Preparation Example 1. Preparation of black ginseng**

[101]1-1. Preparation of red ginseng (one steaming-drying black ginseng)

[102] Four-year-old fresh ginseng roots were placed into a screw washer (Samgak fmc, South Korea) and washed once for 3 minutes to remove soil or foreign substances. The washed fresh ginseng roots were placed in a steamer and first steamed at 98°C for 2 hours, excluding the preheating time. The steamer was cooled to a temperature of 55°C. Then, the steamed fresh ginseng roots were taken out of the steamer. The internal temperature of a hot air dryer was maintained at 55°C, and then, the steamed fresh ginseng roots were added and dried for about 18 hours. The dried red ginseng was moved to a sun-drying place (a drying facility under natural light) and dried for over a month. Through the above process, 930 kg of red ginseng (one steaming-drying) was prepared.

[103] 1-2. Preparation of nine times steaming-nine times drying black ginseng

[104] 930 kg of red ginseng prepared in Preparation Example 1-1 above was steamed under the same steaming and drying conditions as in Preparation Example 1-1. The above-described steaming and drying processes were repeatedly performed and were referred to as two times to nine times steaming-drying depending on the number of repetitions. As the steaming and drying were repeated, the color gradually became closer to black. Through the above process, 853.8 kg of nine times steaming-nine times drying black ginseng was prepared. When preparing the black ginseng extract of Preparation Example 2 or the black ginseng concentrate of Preparation Example 3, nine times steaming-nine times drying black ginseng was used as a raw material.

[105] Preparation Example 2. Preparation of black ginseng extract

[106] Each of 284.6 kg of the red ginseng prepared in Preparation Example 1-1 and 284.6 kg of the black ginseng prepared in Preparation Example 1-2 was taken and pulverized. Then, 70% (v/v) aqueous ethanol solution corresponding to 6 times the weight of the

pulverized product was added, and the first extraction was performed for 6 hours at 82°C. The extraction residue generated from the first extraction was subjected to the second extraction under the same conditions as in the first extraction. 50% (v/v) aqueous ethanol solution corresponding to 6 times the weight of the extraction residue generated from the second extraction was added, and the third extraction was performed for 6 hours at 85°C. 30% (v/v) aqueous ethanol solution corresponding to 6 times the weight of the extraction residue generated from the third extraction was added, and the fourth extraction was performed for 6 hours at 90°C. Purified water corresponding to 6 times the weight of the extraction residue generated from the fourth extraction was added, and the fifth extraction was performed for 6 hours at 95°C.

[107]Preparation Example 3. Preparation of black ginseng concentrate

[108]The first to fourth red ginseng extracts and the first to fourth black ginseng extracts obtained in Preparation Example 2 each were filtered to separate the extracts from the extraction residues. For each raw material, only the separated extract was placed in a concentrator and concentrated at 55°C in a vacuum concentrator for 4 hours. 231 kg of 70 Brix% red ginseng concentrate was obtained, and 212 kg of 70 Brix% black ginseng concentrate was obtained. The obtained red ginseng concentrate and black ginseng concentrate were used as samples for the following component analysis and experiments on the bioavailability increase and absorption rate.

[109]Experimental Example 1. Confirmation of changes in ginsenosides content in black ginseng concentrate according to steaming time

[110]Nine times steaming-drying was carried out in the same manner as in the steaming conditions of Preparation Example 1-1 except that the steaming time

was changed to 1 hour, 2 hours, and 3 hours. The prepared red ginseng was extracted and concentrated according to Preparation Examples 2 and 3. The ginsenosides content was measured in the same manner as in Experimental Example 3 below.

[111]When the steaming time was set to 1 hour, it was confirmed that ginsenosides Rk1 and Rg5 did not exist even after nine times steaming-drying as shown in Figure 1a. Meanwhile, when the steaming time was set to 2 hours, the content of ginsenosides Rk1 and Rg5 was significantly increased compared to the black ginseng concentrate prepared with the steaming time of 1 hour (Figure 1b). In addition, when the steaming time was set to 3 hours, the content of ginsenosides Rk1 and Rg5 was increased compared to the case where the steaming time was set to 2 hours (Figure 1c).

[112]Experimental Example 2. Confirmation of changes in ginsenosides content in black ginseng concentrate according to maturing temperature or maturing time

[113]The black ginseng concentrate obtained in Preparation Example 3 was placed in a 2 ml vial and matured in a water bath for 8 hours at 70°C, 80°C, and 90°C, respectively, and the changes in ginsenosides content over time were measured. The ginsenosides content was measured in the same manner as in Experimental Example 3.

[114]As a result, when maturing the black ginseng concentrate at 70°C, the ginsenosides content did not increase even after 8 hours of maturing (Figure 2a). Meanwhile, when maturing the black ginseng concentrate at 70°C, the content of ginsenosides Rk1 and Rg5 increased over time. Even at 90°C, the content of ginsenosides Rk1 and Rg5 increased over time as in the case of maturing at 80°C.

[115]In addition, as can be seen from Figures 2b to 2c, the content of ginsenosides Rk1 and Rg5 was changed according to the maturing time. The content of ginsenosides Rk1 and Rg5 increased in the black ginseng

concentrate matured under the condition of 80°C or higher for 3 hours or more.

[116]Experimental Example 3. Analysis of ginsenoside components in black ginseng concentrate

5 [117]The analysis of ginsenoside components present in the red ginseng concentrate or the black ginseng concentrate obtained in Preparation Example 3 was performed using HPLC. As a sample, a solution obtained by diluting the black ginseng concentrate obtained in
10 Preparation Example 3 in methanol at a ratio of 1/30, followed by filtration through a 0.45 µm filter, was used. HPLC 1260 (DAD) (Agilent, USA) was used. VENUSIL XBP C18 column (4.6MM×250MM, 5.0 µm) was used, and as mobile phases, LC-grade water was used as solvent A and
15 acetonitrile as solvent B. The column temperature was maintained at 35°C. The gradient conditions were as follows: 0-3.8 min, a flow rate of 1 ml/min, hold at 30% B; 3.81-4.5 min, a flow rate of 0.5 ml/min, hold at 30% B; 4.51-6 min, a flow rate of 1.2 ml/min, 30% B
20 increased to 42% B; 7.5-13 min, a flow rate of 0.5 ml/min, hold at 42% B; until 18 min, a flow rate of 0.5 ml/min, increased to 47.4% B; 18.1-25 min, a flow rate of 1 ml/min, increased to 55% B; 30-32 min, a flow rate of 1 ml/min, increased to 60% B; 42-50 min, a flow rate
25 of 1 ml/min, 60% B increased to 90% B; and 50.1-53 min, a flow rate of 1 ml/min, hold at 30% B. The results of the component analysis are shown below (unit: mg/g).

[118][Table 1]

	Ginsenoside content									
	Rb1	Rb2	Rc	Rd	Re	Rg1	Rg3 (S)	Rk1	Rg5	Rh1 (S)
Red ginseng	4.91	2.21	3.23	1.75	3.74	1.29	0.42	0.12	0.46	0.43
Black ginseng	0.83	0.00	0.00	0.00	1.34	0.00	4.12	4.75	4.54	0.94

[119]As a result of analyzing ginsenosides in the black ginseng concentrate, it was confirmed that 0.832 mg/g of Rb1, 1.157 mg/g of Rf, 1.008 mg/g of Rg2(S), 0.265

30

mg/g of Rg2(R), 0.941 mg/g of Rh1(S), 0.416 mg/g of Rh1(R), 0.274mg/g of Rg6, 0.777 mg/g of F4, 0.862 mg/g of Rk3, 1.714 mg/g of Rh4, 4.122 mg/g of Rg3(S), 1.184 mg/g of Rg3(R), 4.747 mg/g of Rk1, and 4.539 mg/g of Rg5 existed.

[120]When comparing the ginsenosides content contained in the black ginseng concentrate and the red ginseng concentrate, Rk1 and Rg5 increased about 40 times and about 10 times, respectively, compared to those in the red ginseng concentrate.

[121]Experimental Example 4. Analysis of acidic polysaccharide components in black ginseng concentrate

[122]The analysis of acidic polysaccharide components present in the red ginseng concentrate or the black ginseng concentrate obtained in Preparation Example 3 was performed through the carbazole-sulfuric acid colorimetric method. A sample obtained by diluting 300 mg of each concentrate obtained in Preparation Example 3 above in 10 ml of distilled water was used. The diluted solution was heated in boiling water at 90°C for 3 hours, cooled, and centrifuged (3000 rpm, 10 minutes). 1 ml of the supernatant was taken, and 4 ml of ethanol was added to form a white precipitate. To obtain the white precipitate, the supernatant was removed after centrifugation (3000 rpm, 10 minutes), 4 ml of distilled water was added to dissolve the white precipitate, and 1 ml of 1:4 mixture of n-butanol and CHCl₃ was added, stirred, and then centrifuged again (3000 rpm, 10 minutes). 4 ml of water extract, which is a supernatant herein, was taken, and sonication was performed.

[123]20 µl of the sonication-completed solution, 80 µl of distilled water, 50 µl of 0.1% carbazole ethanol reagent (prepared with 0.125 g of carbazole / 100 ml of anhydrous ethanol), and 600 µl of sulfuric acid, were added to a 2 ml tube and stirred. Then, 200 µl each was placed in a 96-well plate. The absorbance was measured

at 530 nm, and the content was calculated using a calibration curve.

[124]For standard products, galacturonic acid was dissolved in distilled water to prepare concentrations of 1000, 500, 250, 125 mg/L. 20 µl of the standard solution, 80 µl of distilled water, 50 µl of 0.1% carbazole ethanol reagent (prepared with 0.125 g of carbazole / 100 ml of anhydrous ethanol), and 600 µl of sulfuric acid were added to a 2 ml tube and stirred. Then, 200 µl each was placed in a 96-well plate. The absorbance was measured at 530 nm to make a calibration curve, and the concentration was measured. The acidic polysaccharides content is shown below (unit: mg/g).

[125][Table 2]

	Acidic polysaccharides
Red ginseng	0.37
Black ginseng	2.63

[126]As shown in Table 2, the black ginseng concentrate contained a large amount of acidic polysaccharides compared to the red ginseng concentrate.

[127]Experimental Example 5. Analysis of polyphenol components in black ginseng concentrate

[128]The polyphenols content present in the red ginseng concentrate and the black ginseng concentrate obtained in Preparation Example 3 was measured using a Microplate Reader (Powerwave XS, BioTek, USA). 2 g of sodium carbonate (Sigma 223484, CAS No. 497-19-8) is taken in a 100 mL constant volume flask. Distilled water was added to adjust the total volume to 100 mL to prepare a 2% sodium carbonate reagent. Folin-Ciocalteu's phenol reagent (Sigma F9252-1L) and distilled water were mixed at a ratio of 1:1 to prepare 50% Folin-Ciocalteu's phenol reagent, which was wrapped with aluminum foil to prevent light from being transmitted.

[129]As for the test solutions, the red ginseng concentrate and the black ginseng concentrate obtained

in Preparation Example 3 each were diluted with distilled water at a ratio of 1:1. 0.1 mL of each solution was taken and mixed with 0.1 mL of 50% Folin-Ciocalteu's phenol reagent and 2 mL of 2% sodium carbonate. Then, the mixture was allowed to stand in a dark place for 30 minutes, and the absorbance was measured at 750 nm. The standard solution was prepared by taking 0.4 g of gallic acid (Sigma G7384, CAS No. 149-91-7) in a 100 mL constant volume flask, adding distilled water to adjust the total volume to 100 mL, and diluting the solution to concentrations of 31.25 ppm, 62.5 ppm, 125 ppm, 250 ppm, and 500 ppm. The standard solution was mixed with the reagents in the same manner as the test solutions. Then, the mixture was allowed to stand in a dark place for 30 minutes, and the absorbance was measured at 750 nm.

[130]After absorbance measurement, a calibration curve was prepared with the absorbance of the standard solution as the abscissa axis and the concentration of the standard solution as the ordinate axis. The total polyphenol content of the red ginseng concentrate and the black ginseng concentrate obtained in Preparation Example 3 was calculated using Equation 1 below.

[131][Equation 1]
[132]Total polyphenol content (mg/mL) = (A × B × C) / D
[133]* A: Total amount of test solution (mL), B: Dilution factor, C: Total polyphenol concentration in the test solution (mg/mL), D: Collected sample amount (mL)

[134]The polyphenols content is shown below (unit: mg/g).

[135][Table 3]

	Polyphenols
Red ginseng	10.4
Black ginseng	20.8

[136]As shown in Table 3, the black ginseng concentrate contained a large amount of polyphenols compared to the red ginseng concentrate.

[137]**Summary of Experimental Examples 3 to 5**

5 [138]The black ginseng concentrate prepared in Preparation Example 3 had ginsenosides Rk1 and Rg5, acidic polysaccharides, and polyphenols content higher than that of the red ginseng concentrate prepared in Preparation Example 3. Accordingly, the black ginseng
10 concentrate of Preparation Example 3 was named as a standardized black ginseng concentrate. The above standardized black ginseng concentrate was used for measuring the bioavailability of ginsenosides.

15 **[139]Experimental Example 6. Measurement of bioavailability of ginsenosides in black ginseng concentrate**

[140]In Experimental Example 6, after single oral administration of the black ginseng concentrate and the red ginseng concentrate to healthy male volunteers, the
20 pharmacokinetic (bioavailability) characteristics of ginsenosides were compared and evaluated.

[141]The clinical trial design plan was conducted in a randomized, open, two-way crossover trial form (see Figure 3). Subjects judged suitable for the clinical
25 trial were selected by conducting screening tests, such as inquiry, physical examinations, and clinical laboratory tests within three weeks (-21d to -1d) from the first scheduled health functional food administration date (1d) for volunteers only. Selected
30 subjects are randomized to one of two sequence groups, admitted to the clinical trial center on the afternoon of -1d, and asked to be fasted except for drinking water after dinner. On the morning of the health functional food administration day (1d), the black
35 ginseng concentrate or the red ginseng concentrate was orally administered according to the assigned sequence group, followed by the clinical trial according to a set schedule. Subjects were discharged on the morning

of 2d. A drug-free period is at least 14 days after the first administration. On the afternoon of 14d, the day before the second period, subjects were hospitalized again, maintained fasting after dinner, and received
5 the black ginseng concentrate or the red ginseng concentrate on the morning of 15d. After that, the clinical trial was conducted according to the schedule and subjects were discharged on the morning of 16d.

[142]The rationale for setting the dosage of the black
10 ginseng is as follows. Ginsenosides have been approved by the Korean Ministry of Food and Drug Safety for their functionalities of improving immunity, relieving fatigue, improving blood circulation through inhibition of platelet aggregation, improving memory, and helping
15 antioxidant effect. To be recognized for these five functional contents, the daily intake of the sum of ginsenosides Rb1, Rg1, and Rg3, which are indicators of ginsenosides, should be 3 mg - 80 mg. In the clinical trial, the sum of Rb1, Rg1, and Rg3, which are
20 indicators of ginsenosides, is less than 80 mg in 9 g of the black ginseng concentrate (T) and 9 g of the red ginseng concentrate (R), respectively. So, the corresponding dose (9 g) was set as a single dosage in the clinical trial.

[143]Blood sampling time points for pharmacokinetic (bioavailability) evaluation were set to be before dosing and 0, 0.5, 1, 1.5, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 14, 24h after dosing on 1d/15d. The method for measuring the sample is as follows. Regarding the
30 concentrations of the main components of ginsenosides (Rb1, S-Rg3, S-Rh2, S-PPD, Rg1, S-Rh1, Rg5, Rk1, S-PPT, Rd, Rb2, Rc, and CK), plasma separated from the collected blood was analyzed using LC-MS/MS for the maximum plasma concentration (Cmax) and the area under
35 the blood concentration-time curve until the last measurable blood sampling time (AUClast) of each ginsenoside.

[144]6-1. Assessment of bioavailability degree of fourteen ginsenosides in black ginseng

[145]After making two test subjects intake the red ginseng concentrate and the black ginseng concentrate at 2-week intervals, the absorption rate of fourteen ginsenosides (Rb1, Rb2, Rc, Rd, Rg3(s), Rk1, Rg5, CK, Rh2(s), PPD(s), Re, Rg1, Rh1(s), and PPT(s)) was analyzed. As a result of analyzing the absorption rate, as shown in Table 4 below, the absorption rate (based on the AUC) of the black ginseng concentrate was: 1.8 times for the sum of 14 ginsenosides; 15.7 times for Rg3; and 11.7 times for Rh2, compared to the red ginseng concentrate, and each increased. In particular, in the red ginseng concentrate-ingested group, Rk1 absorption was 0, whereas, in the black ginseng concentrate-ingested group, 32 $\mu\text{g}\cdot\text{hr}/\text{ml}$ of the uptake rate for Rk1 (based on the AUC) was measured. The total absorption rate of all ginsenosides was 456 $\mu\text{g}\cdot\text{hr}/\text{ml}$ in the red ginseng group and 770 $\mu\text{g}\cdot\text{hr}/\text{ml}$ in the black ginseng group, increasing by 1.7 times. In addition, in terms of the absorption speed, the time to reach the maximum total ginsenosides content in the red ginseng concentrate was 11 hours after administration (T_{max} 11 hr), whereas the time to reach the maximum total ginsenosides content in the black ginseng concentrate was 8.5 hours after administration (T_{max} 8.5 hr). So, the absorption speed was also excellent in the black ginseng concentrate.

[146][Table 4]

Compo nent	Rb 1	Rb 2	Rc	Rd	Re	Rg 1	Rg 3	Rk 1	Rg 5	Rh 2	PP D	CK	Rh 1	PP T	AU C	T_{max}
Red ginse ng	87	35	34	13	ND	ND	4	ND	-	28	17	23 0	ND	8	45 6	11
Black ginse ng	25	12	8	7	ND	ND	60	32	-	33 2	39	24 6	7	4	77 0	8.5
Multi	-	-3	-	-			15	32		11	2.	1.	7	-	1.	

plyin	3.		4.	1.			.7			.7	3	1		2.	7	
g	4		6	9										1		
facto																
r																

[147]Preparation Example 4. Preparation of foods

[148]4-1. Preparation of Wheat Flour Foods

[149]0.5 to 5.0 parts by weight of the black ginseng extract of the present invention was added to wheat flour, and this mixture was used to prepare bread, cakes, cookies, crackers, and noodles.

[150]4-2. Preparation of Soups and Gravies

[151]0.2 to 5.0 parts by weight of the black ginseng extract of the present invention was added to soups and gravies to prepare meat-processed products for health improvement, noodle-style soups, and gravies.

[152]4-3. Preparation of Ground Beef

[153]10 parts by weight of the black ginseng extract of the present invention was added to ground beef to prepare ground beef for health improvement.

[154]4-4. Preparation of Dairy Products

[155]5 to 10 parts by weight of the black ginseng extract of the present invention was added to milk, and various dairy products such as butter and ice cream were prepared using the milk.

[156]4-5. Preparation of Dry Cereal

[157]Brown rice, barley, glutinous rice, and adlay were pregelatinized by a conventional method, dried, roasted, and prepared into powders by a pulverizer to have a particle size of 60 mesh.

[158]Black beans, black sesame, and perilla seeds were also steamed and dried by a conventional method, roasted, and prepared into powders by a pulverizer to have a particle size of 60 mesh.

[159]The black ginseng extract of the present invention was concentrated under reduced pressure, sprayed, and dried by a hot air dryer. The resulting dry product was prepared into powders by a pulverizer to have a particle size of 60 mesh.

[160]The thus-prepared grains, seeds and nuts, and the black ginseng extract of the present invention were mixed in the following ratio to prepare dry cereal:

5 [161]grains (brown rice (30 parts by weight), adlay (15 parts by weight), and barley (20 parts by weight)), seeds and nuts (perilla seeds (7 parts by weight), black beans (8 parts by weight), black sesame (7 parts by weight), the black ginseng extract of the present invention (3 parts by weight), Ganoderma lucidum (0.5
10 part by weight), and Rehmannia glutinosa (0.5 part by weight)).

[162]4-6. Preparation of Health Drinks

[163]5 g of the black ginseng extract of the present invention was homogeneously mixed with minor
15 ingredients, such as high fructose corn syrup (0.5%), oligosaccharide (2%), sugar (2%), salt (0.5%), and water (75%). The mixture was sterilized instantly and packaged in small containers, such as glass bottles, pet bottles, etc., to prepare health drinks.

20 **[164]4-7. Preparation of Vegetable Juice**

[165]5 g of the black ginseng extract of the present invention was added to 1,000 ml of tomato or carrot juice to prepare vegetable juice.

[166]4-8. Preparation of Fruit Juice

25 [167]1 g of the black ginseng extract of the present invention was added to 1,000 ml of apple or grape juice to prepare fruit juice.

[168]Preparation Example 5. Preparation of Pharmaceutical Compositions

30 **[169]5-1. Preparation of Powders**

[170]The black ginseng extract of the present invention
2 g

[171]Lactose 1 g

[172]The above ingredients were mixed and filled in an
35 airtight pouch to prepare powders.

[173]5-2. Preparation of Tablets

[174]The black ginseng extract of the present invention
100 mg

[175]Corn starch 100 mg

[176]Lactose 100 mg

[177]Magnesium stearate 2 mg

[178]The above noted ingredients were mixed and
5 tabletted according to a conventional tablet
preparation method to provide tablets.

[179]**5-3. Preparation of Capsules**

[180]The black ginseng extract of the present invention
100 mg

10 [181]Corn starch 100 mg

[182]Lactose 100 mg

[183]Magnesium stearate 2 mg

[184]The above ingredients were mixed and filled in a
gelatin capsule according to a conventional method for
15 preparing capsules to prepare capsules.

[185]**5-4. Preparation of pills**

[186]The black ginseng extract of the present invention
1 g

[187]Lactose 1.5 g

20 [188]Glyserine 1 g

[189]Xylitol 0.5 g

[190]The above ingredients were mixed and prepared into
a pill according to a conventional method in such a
manner that one pill has a weight of 4 g.

25 [191]**5-5. Preparation of Granules**

[192]The black ginseng extract of the present invention
150 mg

[193]Soybean extract 50 mg

[194]Glucose 200 mg

30 [195]Starch 600 mg

[196]The above ingredients were mixed and 100 mg of 30%
ethanol was added thereto, followed by drying at 60°C.
After formation of granules, the granules were filled
into packaging.

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CLAIMS

[Claim 1]

A composition for increasing the bioavailability and promoting the absorption of ginsenosides in a black ginseng extract, the composition comprising the black ginseng extract containing ginsenosides Rk1 and Rg5, wherein the total content of ginsenosides Rk1 and Rg5 is 20 parts by weight to 90 parts by weight, based on 100 parts by weight of the total content of ginsenosides Rb1, Rb2, Rc, Rd, Re, Rg1, Rg3(s), Rk1, Rg5, and Rh1(s).

[Claim 2]

The composition for increasing the bioavailability and promoting the absorption of ginsenosides in a black ginseng extract of claim 1, wherein when 9 g of the black ginseng extract is administered, the sum of the AUC (Area under the plasma level-time curve) values of ginsenosides Rb1, Rb2, Rc, Rd, Rg3(s), Rk1, Rg5, CK, Rh2(s), PPD(s), Re, Rg1, Rh1(s), and PPT(s) is 500 to 1200 $\mu\text{g}\cdot\text{hr}/\text{ml}$.

[Claim 3]

The composition for increasing the bioavailability and promoting the absorption of ginsenosides in a black ginseng extract of claim 2, wherein when 9 g of the black ginseng extract is administered, the AUC (Area under the plasma level-time curve) value of ginsenoside Rk1 is 20 to 40 $\mu\text{g}\cdot\text{hr}/\text{ml}$.

[Claim 4]

The composition for increasing the bioavailability and promoting the absorption of ginsenosides in a black ginseng extract of claim 2, wherein when 9 g of the black ginseng extract is administered, the AUC (Area under the plasma level-time curve) value of ginsenoside Rg3 is 40 to 80 $\mu\text{g}\cdot\text{hr}/\text{ml}$.

[Claim 5]

The composition for increasing the bioavailability and promoting the absorption of ginsenosides in a black ginseng extract of claim 2, wherein when 9 g of the

black ginseng extract is administered, the AUC (Area under the plasma level-time curve) value of ginsenoside Rh2 is 250 to 400 $\mu\text{g}\cdot\text{hr}/\text{ml}$.

[Claim 6]

5 The composition for increasing the bioavailability and promoting the absorption of ginsenosides of claim 1, wherein the Tmax value of ginsenosides Rb1, Rb2, Rc, Rd, Rg3(s), Rk1, Rg5, CK, Rh2(s), PPD(s), Re, Rg1, Rh1(s), and PPT(s) in the black ginseng extract is 5 to 10
10 hours.

[Claim 7]

The composition for increasing the bioavailability and promoting the absorption of ginsenosides in a black ginseng extract of claim 1, wherein the black ginseng
15 extract further comprises acidic polysaccharides and polyphenols.

[Claim 8]

The composition for increasing the bioavailability and promoting the absorption of ginsenosides in a black
20 ginseng extract of claim 1, wherein the composition is a food or pharmaceutical composition.

[Claim 9]

The composition for increasing the bioavailability and promoting the absorption of ginsenosides in a black
25 ginseng extract of claim 1, wherein the black ginseng extract is prepared by a method for preparing a black ginseng extract enriched with ginsenosides Rk1 and Rg5, the method comprising: a step for steaming ginseng to prepare black ginseng; a step for extracting the
30 prepared black ginseng with a solvent; and a step for maturing the obtained black ginseng extract.

[Claim 10]

The composition for increasing the bioavailability and promoting the absorption of ginsenosides in a black
35 ginseng extract of claim 9, wherein the steaming is performed at 70°C to 120°C for 3 to 12 times.

[Claim 11]

The composition for increasing the bioavailability and promoting the absorption of ginsenosides in a black ginseng extract of claim 9, wherein the steaming is performed under the condition of 2 hours or more per
5 steaming.

[Claim 12]

The composition for increasing the bioavailability and promoting the absorption of ginsenosides in a black ginseng extract of claim 9, wherein the step for
10 maturing the black ginseng extract is performed at 80°C or higher.

[Claim 13]

The composition for increasing the bioavailability and promoting the absorption of ginsenosides in a black ginseng extract of claim 9, wherein the step for
15 maturing the black ginseng extract is performed for 3 hours or more.