

5 Title: COMPOSITIONS AND METHODS FOR TREATING AND
PREVENTING A CORONAVIRUS INFECTION

10 FIELD AND BACKGROUND OF THE INVENTION

The present invention, in some embodiments thereof, relates to compositions and methods for treating and preventing a Coronavirus infection.

Human coronavirus (HCoV) infection causes respiratory diseases with mild to severe outcomes. In the last 15 years, the emergence of three zoonotic, highly pathogenic
15 HCoVs: SARS-CoV, MERS-CoV and SARS-Cov2 has been witnessed. In November 2002, a viral respiratory disease appeared in southern China with mortality rate of ~9.6%. The etiologic agent was identified as SARS-CoV, a zoonotic originated in horseshoe bats (Fung and Liu 2019). MERS-CoV was first identified and described in November 2012 from a case of pneumonia in Saudi Arabia. Both MERS-CoV and SARS-CoV are
20 members of the Coronaviridae, closely related to two known bat coronaviruses (BtCoV) (van Boheemen et al. 2012). The corona virus is an enveloped virus containing a 30-kb single-stranded, positive-sense RNA genome. In December 2019, a new infectious respiratory disease emerged in Wuhan, Hubei province, China (Huang et al. 2020; Wang et al. 2020; Zhu et al. 2020) and the disease, termed coronavirus disease 19 (COVID-19)
25 rapidly spread worldwide. A novel coronavirus, SARS-coronavirus 2 (SARS-CoV-2), which is closely related to SARS-CoV, was detected in patients and is the etiologic agent of the COVID-19 new lung disease.

To date there is no effective vaccine or treatment against COVID-19. The death toll is increasing and the number of severely ill patients reaches new picks everyday world-
30 wide.

There is an unmet and urgent need for a new therapeutic and preventive treatment against COVID-19.

SUMMARY OF THE INVENTION

According to an aspect of the invention there is provided a method of preventing or treating Coronavirus infection in a subject in need thereof, the method comprising

5 administering to the subject an effective amount of a plant species or genus thereof-derived component selected from the group consisting of a plant part, extract thereof, fraction thereof, active ingredient thereof, synthetic analog thereof, mimetic thereof or combination thereof, wherein the component is capable of ameliorating symptoms of Coronavirus infection and wherein the plant species is selected from the group consisting

10 of *Nigella sativa*, *Thymus capitatus*, *Thymus vulgaris*, *Origanum syriacum*, *Thymbra spicata*, *Satujera thymbra*, *Sesamum indicum* and *Rhus coriaria* *Gynostemma petaphyllum*, *Boswellia sacra* and *Panax ginseng*, or Korean Ginseng and American Ginseng, preventing or treating Coronavirus in the subject.

According to an aspect of the invention there is provided a vaccine against a

15 Coronavirus infection comprising an effective amount of a plant species or genus thereof-derived component selected from the group consisting of a plant part, extract thereof, fraction thereof, active ingredient thereof, synthetic analog thereof, mimetic thereof or combination thereof, wherein the component is capable of ameliorating symptoms of Coronavirus infection and wherein the plant species is selected from the group consisting

20 of *Nigella sativa*, *Thymus capitatus*, *Thymus vulgaris*, *Origanum syriacum*, *Thymbra spicata*, *Satujera thymbra*, *Sesamum indicum*, and *Rhus coriaria*, *Gynostemma petaphyllum*, *Boswellia sacra* and *Panax ginseng*, or Korean Ginseng and American Ginseng.

According to an aspect of the invention there is provided a pharmaceutical composition comprising an effective amount of a plant species or genus thereof-derived component selected from the group consisting of a plant part, extract thereof, fraction thereof, active ingredient thereof, synthetic analog thereof, mimetic thereof or combination thereof, wherein the component is capable of ameliorating symptoms of Coronavirus

25 infection and wherein the plant species is selected from the group consisting of *Nigella sativa*, *Thymus capitatus*, *Thymus vulgaris*, *Origanum syriacum*, *Thymbra spicata*, *Satujera thymbra*, *Sesamum indicum*, and *Rhus coriaria* *Gynostemma petaphyllum*, *Boswellia sacra* and *Panax ginseng* or Korean Ginseng and American Ginseng.

for use in preventing or treating a Coronavirus infection.

According to an aspect of the invention there is provided a composition of matter comprising at least 2 of a plant species or genus thereof-derived components selected from the group consisting of a plant part, extract thereof, fraction thereof, active
 5 ingredient thereof, synthetic analog thereof, mimetic thereof or combination thereof, wherein the component is capable of ameliorating symptoms of Coronavirus infection and wherein the plant species is selected from the group consisting of *Nigella sativa*, *Thymus capitatus*, *Thymus vulgaris*, *Origanum syriacum*, *Thymbra spicata*, *Satujera thymbra*, *Sesamum indicum*, and *Rhus coriaria*, *Gynostemma petaphyllum*, *Boswellia sacra* and
 10 *Panax ginseng*, or Korean Ginseng and American Ginseng.

According to a further aspect of the present invention there is provided a composition including bromelain or products derived therefrom. The bromelain may be derived from pineapple extracts.

15 According to further aspects of the present invention pineapple extracts comprising bromelain will be included in the composition.

According to an aspect of the invention there is provided a food supplement comprising a combination of at least 2 of a plant species or genus thereof-derived
 20 component selected from the group consisting of a plant part, extract thereof, fraction thereof, active ingredient thereof, synthetic analog thereof, mimetic thereof or combination thereof, wherein the component is capable of ameliorating symptoms of Coronavirus infection and wherein the plant species is selected from the group consisting of *Nigella sativa*, *Thymus capitatus*, *Thymus vulgaris*, *Origanum syriacum*, *Thymbra*
 25 *spicata*, *Satujera thymbra*, *Sesamum indicum*, and *Rhus coriaria*, *Gynostemma petaphyllum*, *Boswellia sacra* and *Panax ginseng*, or Korean Ginseng and American Ginseng.

According to an aspect of the invention there is provided a food supplement, *composition or extracts further including "Beduin Tea"* comprising
 30 Rose Leaves *Micromeria fruticosa*, *Salvia*, *cymbopogon* (Cital), *Aloysia*, *verbena officinalis*, *origanum majorana*, *menthe*

According to another aspect of the invention there is provided a food supplement, *composition or extracts further including "Beduin Tea"* comprising

Thyme,sage, cardamom,cinamon,Habuk, Marmaya, black tea.

Further details of components of Thyme Vulgaris are included in APPENDIX1.

According to some embodiments of the invention, the Coronavirus is SAR-CoV-2,
5 Middle East respiratory syndrome Coronavirus (MERS-CoV) or severe acute respiratory
syndrome Coronavirus (SARS-CoV).

According to some embodiments of the invention, the Coronavirus is SAR-CoV-2.

According to some embodiments of the invention, the symptoms are selected from
the group consisting of fever, chills, coughing, shortness of breath, difficulty in breathing,
10 muscle aches, body aches, vomiting and diarrhea.

According to some embodiments of the invention, the component comprises at least
2 components.

According to some embodiments of the invention, the component comprises at least
3 components.

15 According to some embodiments of the invention, the component comprises at least
4 components.

According to some embodiments of the invention, the component comprises at least
5 components.

20 According to some embodiments of the invention, the component comprises 5-10
components.

According to some embodiments of the invention, the component comprises
thymoquinone or analog thereof.

According to some embodiments of the invention, the component comprises
thymol or analog thereof.

25 According to some embodiments of the invention, the component comprises
carvacrol or analog thereof.

Unless otherwise defined, all technical and/or scientific terms used herein have the
same meaning as commonly understood by one of ordinary skill in the art to which the
invention pertains. Although methods and materials similar or equivalent to those
30 described herein can be used in the practice or testing of embodiments of the invention,
exemplary methods and/or materials are described below. In case of conflict, the patent
specification, including definitions, will control. In addition, the materials, methods, and
examples are illustrative only and are not intended to be necessarily limiting.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING(S)

Some embodiments of the invention are herein described, by way of example only, with reference to the accompanying drawings. With specific reference now to the drawings
5 in detail, it is stressed that the particulars shown are by way of example and for purposes of illustrative discussion of embodiments of the invention. In this regard, the description taken with the drawings makes apparent to those skilled in the art how embodiments of the invention may be practiced.

In the drawings:

- 10 FIGs. 1A-C shows embodiments in plant extraction methods as taken from berkem(dot)com. Figure 1A - scheme describing the general principle of plant extraction; Figure 1B - scheme describing the main separation process according to some embodiments; Figure 1C - scheme describing parameters that may influence the process.
- FIG.2 depicting SDS-page of the SARS-CoV-2 S1 subunit protein digestion assay with the
15 tested extracts following an incubation time of 2h at 37°C.
- FIG.3 depicting SDS-page of the SARS-CoV-2 S2 subunit protein digestion assay with the tested extracts following an incubation time of 2h at 37°C.
- FIG.4 depicting SDS-page of the SARS-CoV-2 Nucleocapsid digestion assay with the tested extracts following an incubation time of 2h at 37°C.
- 20 FIG.5 depicting a graphic representation of the densitometry test of the SARS-CoV-2 Nucleocapsid protein digestion assay with the tested extracts following an incubation time of 2h at 37°C.
- FIG.6 depicting SDS-page of the SARS-CoV-2 Nucleocapsid digestion assay with the tested extracts following an over-night incubation time at 37°C.
- 25 FIG.7 depicting SDS-page of the recombinant COVID-19 Envelope protein digestion assay with the tested extracts following an incubation time of 6h at 37°C.
- FIG.8 depicting SDS-page of the recombinant COVID-19 surface glycoprotein digestion assay with the tested extracts following an incubation time of 6h at 37°C.
- FIG.9 depicting a graphic representation of the densitometry test of the SARS-CoV-2
30 Nucleocapsid digestion assay with the tested extracts following an over-night incubation time at 37°C.

FIG.10 depicting a graphic representation of the densitometry test of the recombinant COVID-19 Envelope protein digestion assay with the tested extracts following an incubation time of 6h at 37°C.

FIG.11 depicting a graphic representation of the densitometry test of the recombinant
5 COVID-19 surface glycoprotein digestion assay with the tested extracts following an incubation time of 6h at 37°C.

FIG.12 depicting SDS-page of the SARS-CoV-2 S1 subunit protein digestion assay with the tested extracts following an incubation time of 6h at 37°C.

FIG.13 depicting SDS-page of the SARS-CoV-2 S2 subunit protein digestion assay with
10 the tested extracts following an incubation time of 6h at 37°C.

FIG.14 depicting SDS-page of the SARS-CoV-2 Nucleocapsid digestion assay with the tested extracts following an incubation time of 6h at 37°C.

FIG.15 depicting a graphic representation of the densitometry test of the SARS-CoV-2 S1 subunit protein digestion assay with the tested extracts following an incubation time of 6h
15 at 37°C.

FIG.16 depicting a graphic representation of the densitometry test of the SARS-CoV-2 S2 subunit protein digestion assay with the tested extracts following an incubation time of 6h at 37°C.

FIG.17 depicting a graphic representation of the densitometry test of the SARS-CoV-2
20 Nucleocapsid digestion assay with the tested extracts following an incubation time of 6h at 37°C.

DESCRIPTION OF SPECIFIC EMBODIMENTS OF THE INVENTION

The present invention, in some embodiments thereof, relates to compositions and
25 methods for treating and preventing a Coronavirus infection.

Before explaining at least one embodiment of the invention in detail, it is to be understood that the invention is not necessarily limited in its application to the details set forth in the following description or exemplified by the Examples. The invention is capable of other embodiments or of being practiced or carried out in various ways.

30 Coronavirus disease (COVID-19) is an infectious disease caused by the newly discovered coronavirus, SARS-CoV-2. Most people infected with the COVID-19 virus will experience mild to moderate respiratory illness and recover without requiring special treatment. Older people, and those with underlying medical problems like cardiovascular

disease, diabetes, chronic respiratory disease, and cancer are more likely to develop serious illness and even die. At this time, there are no specific vaccines or treatments for COVID-19.

Thus, according to an aspect of the invention there is provided a method of preventing or treating Coronavirus infection in a subject in need thereof, the method comprising administering to the subject an effective amount of a plant species or genus thereof-derived component selected from the group consisting of a plant part, extract thereof, fraction thereof, active ingredient thereof, synthetic analog thereof, mimetic thereof or combination thereof, wherein the component is capable of ameliorating symptoms of Coronavirus infection and wherein the plant species is selected from the group consisting of *Nigella sativa*, *Thymus capitatus*, *Thymus vulgaris*, *Origanum syriacum*, *Thymbra spicata*, *Satujera thymbra*, *Sesamum indicum*, and *Rhus coriaria* *Gynostemma petaphyllum*, *Boswellia sacra* and *Panax ginseng* or Korean Ginseng and American Ginseng or any plant containing tryptophan preventing or treating Coronavirus in the subject.

According to an alternative or an additional aspect of the invention there is provided a vaccine against a Coronavirus infection comprising an effective amount of a plant species or genus thereof-derived component selected from the group consisting of a plant part, extract thereof, fraction thereof, active ingredient thereof, synthetic analog thereof, mimetic thereof or combination thereof, wherein the component is capable of ameliorating symptoms of Coronavirus infection and wherein the plant species is selected from the group consisting of *Nigella sativa*, *Thymus capitatus*, *Thymus vulgaris*, *Origanum syriacum*, *Thymbra spicata*, *Satujera thymbra*, *Sesamum indicum*, and *Rhus coriaria* or *Gynostemma petaphyllum*, *Boswellia sacra* and *Panax ginseng* Korean Ginseng and American Ginseng. or any plant containing tryptophan

According to an alternative or an additional aspect of the invention there is provided a pharmaceutical composition comprising an effective amount of a plant species or genus thereof-derived component selected from the group consisting of a plant part, extract thereof, fraction thereof, active ingredient thereof, synthetic analog thereof, mimetic thereof or combination thereof, wherein the component is capable of ameliorating symptoms of Coronavirus infection and wherein the plant

species is selected from the group consisting of *Nigella sativa*, *Thymus capitatus*, *Thymus vulgaris*, *Origanum syriacum*, *Thymbra spicata*, *Satujera thymbra*, *Sesamum indicum*, and *Rhus coriaria* *Gynostemma petaphyllum*, *Boswellia sacra* and *Panax ginseng* or Korean Ginseng and American Ginseng. or any plant containing tryptophan for use in preventing or treating a Coronavirus infection.

According to an alternative or an additional aspect of the invention there is provided a composition of matter comprising at least 2 of a plant species or genus thereof-derived components selected from the group consisting of a plant part, extract thereof, fraction thereof, active ingredient thereof, synthetic analog thereof, mimetic thereof or combination thereof, wherein the component is capable of ameliorating symptoms of Coronavirus infection and wherein the plant species is selected from the group consisting of *Nigella sativa*, *Thymus capitatus*, *Thymus vulgaris*, *Origanum syriacum*, *Thymbra spicata*, *Satujera thymbra*, *Sesamum indicum*, and *Rhus coriaria* or *Gynostemma petaphyllum*, *Boswellia sacra* and *Panax ginseng* Korean Ginseng and American Ginseng. or any plant containing tryptophan

Hydrolysable tannins compose the highest percentage in the Sumac fruits, followed by flavonoids. This emphasizes the antioxidant potential of the fruit. Following
 5 hydrolysable tannins, comprising almost 20% of the fruit's mass, are other unidentified compounds. Subsequently there are anthocyanins, isoflavonoids, terpenoids and diterpenes. The chemical properties of sumac fruit is conducted on ripe fruits and have found a 2.6% protein content, 7.4% fat content, 14.6% fiber content, 1.8% ash. Also, a calorimetric calculation showed that 100g of sumac fruit contains 147.8 kcal.

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Chemical Composition of Panax ginseng (Ginseng)

Characterization and identification of chemical compounds of Ginseng using a variety of methods identified a large variety of compounds in *Panax ginseng* and classified them as generally being:

- 15
- Saponin Glycosides (e.g., ginsenosides)
 - Phytosterols (e.g. stigmasterol, beta-sterol)

- Sesquiterpenes (e.g. beta-alamene and beta-selinine)
- Flavenoids (e.g. Kaempferol)
- Polyacetylenes (e.g. panaxynol, ginsenoyne A)
- Alkaloids (e.g. fumarine, girinimbin)
- 5 • Polysaccharides
- Phenolic compounds (e.g. elemicin, dauricin, maltol).

According to specific embodiments, the saponin compounds in Ginseng and the polysaccharide compounds are the compounds that constitute its phytochemical activity. The most abundant saponin compound in ginseng root was found to be ginsenoside.

10 Polysaccharides from ginseng have been identified as NGP, WGP, 1-KGP, 4-KGP, WGPE and EGP, with WGP and WGPE being the most abundant, depending on the species of ginseng plant material used for extraction.

Most ginseng saponins belong to a family of steroids with a four trans-ring rigid steroid skeleton. They are also referred to as ginsenosides, triterpenoid saponins or

15 dammarane derivatives. More than 200 saponins have been isolated from ginseng plants. In addition to ginseng root, saponins have been identified in ginseng leaves and stems, flower buds, fruits, berries, and seeds. Because steaming or heating changes the saponin profile of ginseng products, ginseng saponins have also been identified in the processed root, leaf, flower-bud and berry.

20 Ginseng saponins are divided into several groups. Two major groups are the protopanaxadiol (PPD)-type saponins with sugar moieties attached to the C-3 and/or C-20 and the protopanaxatriol (PPT) group with sugar moieties at C-6 and/or at C-20. Other groups include the ocotillol-type with a five-membered epoxy ring at C-20, the oleanane-type with a nonsteroidal structure, and the dammarane type with a modified C-20 side

25 chain. As techniques are developed for chemical purification and structural identification, novel ginseng saponins continue to be discovered.

The table below shows ginsenoside compounds recovered from ginseng extracts prepared by different extraction procedures:

30 **GINSENOSES**

Material	Solvent system ^a (volume ratio)	Detection ^b	Obtained compound	Isolation efficiency ^c
<i>P. notoginseng</i> , root	Hex- <i>n</i> -BuOH-H ₂ O (3 : 4 : 7)	TLC	Ginsenosides Rb1, Re, Rg1 and notoginsenoside R1	157, 13, 56, and 17 mg of Rb1, Re, Rg1 and R1 from 283 mg MeOH extract of five tablets
<i>P. ginseng</i> , root	CH ₂ Cl ₂ -MeOH-NH ₄ OAc-iPrOH (6 : 2 : 4 : 3)	ELSD	Ginsenosides Rf, Rd, Re, and Rb1	10.7, 11.0, 13.4 and 13.9 mg of Rf, Rd, Re and Rb1 from 480 mg enriched fraction by macroporous resin
<i>P. notoginseng</i> , root	CHCl ₃ -MeOH-2-BuOH-H ₂ O (5 : 6 : 1 : 4) EtOAc- <i>n</i> -BuOH-H ₂ O (1 : 1 : 2)	ELSD	Ginsenosides Rg1, Rd, Re, Rb1 and notoginsenoside R1	Not provided
Red <i>P. ginseng</i> , steamed root	CH ₂ Cl ₂ -MeOH-H ₂ O-iPrOH (6 : 6 : 4 : 1)	ELSD	Ginsenosides Rg3, Rk1, Rg5 and F4	32.2, 26.6, 28.6 and 8.1 mg of Rg3, Rk1, Rg5 and F4 from 350 mg enriched fraction by RP-C ₁₈ column
<i>P. ginseng</i> , root	EtOAc-iPrOH-0.1% formic acid H ₂ O (3 : 1 : 5)	UV	Ginsenoside Ro	61 mg Ro from 100 mg enriched sample by normal-phase MPLC

^aAbbreviations: Hex: *n*-hexane; BuOH: butanol; CH₂Cl₂: methylene chloride; MeOH: methanol; NH₄OAc: ammonium acetate; iPrOH: isopropanol; CHCl₃: chloroform; EtOAc: ethyl acetate.

^bAbbreviations: TLC: thin layer chromatography; ELSD: evaporative light scattering detection; UV: ultraviolet.

^cAbbreviations: RP: reversed-phase; MPLC: medium-pressure liquid chromatography.

The table below shows the chemical formulae of 123 dammarane-type saponins isolated from various parts of *Panax* plants. They are placed in the order of the structure type.

5 **Dammarane – type saponin ginsenosides**

No.	Name	Formula	Plant Material
1	Floralginsenoside M	C ₅₃ H ₉₀ O ₂₂	Flower buds of <i>P. ginseng</i>
2	Floralginsenoside N	C ₅₃ H ₉₀ O ₂₂	Flower buds of <i>P. ginseng</i>
3	Floralquinquenoside E	C ₅₃ H ₉₀ O ₂₂	Flower buds of <i>P. quinquefolius</i>
4	Ginsenoside Rh5	C ₃₇ H ₆₄ O ₉	Roots and rhizomes of <i>P. vietnamensis</i>
5	Notoginsenoside FP1	C ₄₇ H ₈₀ O ₁₈	Fruit pedicels of <i>P. notoginseng</i>
6	Notoginsenoside M	C ₄₈ H ₈₂ O ₁₉	Roots of <i>P. notoginseng</i>
7	Notoginsenoside N	C ₄₈ H ₈₂ O ₁₉	Roots of <i>P. notoginseng</i>
8	Notoginsenoside Rw1	C ₄₆ H ₇₈ O ₁₇	Rhizomes of <i>P. notoginseng</i>
9	Notoginsenoside T3	C ₃₈ H ₆₆ O ₉	Acid hydrolysate roots of <i>P. notoginseng</i>
10	Notoginsenoside U	C ₄₂ H ₇₂ O ₁₄	Roots of <i>P. notoginseng</i>
11	Quinquenoside L17	C ₄₇ H ₈₀ O ₁₈	Leaves and stems of <i>P. quinquefolius</i>
12	Yesanchinoside D	C ₄₄ H ₇₄ O ₁₅	Underground part of <i>P.</i>

No.	Name	Formula	Plant Material
			<i>japonicus</i>
13	Yesanchinoside E	C ₅₄ H ₉₂ O ₂₃	Underground part of <i>P. japonicus</i>
14	Yesanchinoside F	C ₅₆ H ₉₄ O ₂₄	Underground part of <i>P. japonicus</i>
15	20(<i>S</i>)-acetylated Rg2	C ₄₄ H ₇₄ O ₁₄	Roots of <i>P. quinquefolius</i>
16	20(<i>R</i>)-acetylated Rg2	C ₄₄ H ₇₄ O ₁₄	Roots of <i>P. quinquefolius</i>
17	Malonylginsenoside Ra3	C ₆₂ H ₁₀₂ O ₃₀	Fresh roots of <i>P. ginseng</i>
18	Malonylnotoginsenoside R4	C ₆₂ H ₁₀₂ O ₃₀	Roots of <i>P. ginseng</i>
19	Notoginsenoside FP2	C ₅₈ H ₉₈ O ₂₆	Fruit pedicels of <i>P. notoginseng</i>
20	Notoginsenoside FT1	C ₄₇ H ₈₀ O ₁₇	Acid hydrolysate roots of <i>P. notoginseng</i>
21	Notoginsenoside L	C ₅₃ H ₉₀ O ₂₂	Roots of <i>P. notoginseng</i>
22	Notoginsenoside O	C ₅₂ H ₈₈ O ₂₁	Flower buds of <i>P. notoginseng</i>
23	Notoginsenoside P	C ₅₂ H ₈₈ O ₂₁	Flower buds of <i>P. notoginseng</i>
24	Notoginsenoside Q	C ₆₃ H ₁₀₆ O ₃₀	Flower buds of <i>P. notoginseng</i>
25	Notoginsenoside S	C ₆₃ H ₁₀₆ O ₃₀	Flower buds of <i>P. notoginseng</i>
26	Notoginsenoside T	C ₆₄ H ₁₀₈ O ₃₁	Flower buds of <i>P. notoginseng</i>
27	Quinquenoside L10	C ₄₇ H ₈₀ O ₁₇	Leaves and stems of <i>P. quinquefolius</i>
28	Quinquenoside L14	C ₄₇ H ₈₀ O ₁₇	Leaves and stems of <i>P.</i>

No.	Name	Formula	Plant Material
			<i>quinquefolius</i>
29	Yesanchinoside J	C ₆₁ H ₁₀₂ O ₂₈	Underground part of <i>P. japonicus</i>
30	Floralginsenoside A	C ₄₂ H ₇₂ O ₁₆	Flower buds of <i>P. ginseng</i>
31	Floralginsenoside C	C ₄₁ H ₇₀ O ₁₅	Flower buds of <i>P. ginseng</i>
32	Floralginsenoside H	C ₅₀ H ₈₄ O ₂₁	Flower buds of <i>P. ginseng</i>
33	Floralginsenoside J	C ₄₈ H ₈₂ O ₂₀	Flower buds of <i>P. ginseng</i>
34	Floralginsenoside Ka	C ₃₆ H ₆₂ O ₁₁	Flower buds of <i>P. ginseng</i>
35	Floralginsenoside Tc	C ₅₃ H ₉₀ O ₂₄	Flower buds of <i>P. ginseng</i>
36	Floralquinquenoside B	C ₄₂ H ₇₂ O ₁₅	Flower buds of <i>P. quinquefolius</i>
37	Floralquinquenoside D	C ₄₂ H ₇₂ O ₁₅	Flower buds of <i>P. quinquefolius</i>
38	Floranotoginsenoside B	C ₅₃ H ₉₀ O ₂₄	Flowers of <i>P. notoginseng</i>
39	Floranotoginsenoside C	C ₅₃ H ₉₀ O ₂₄	Flowers of <i>P. notoginseng</i>
40	Ginsenoside I	C ₄₈ H ₈₂ O ₂₀	Flower buds of <i>P. ginseng</i>
41	Ginsenoside II	C ₄₈ H ₈₂ O ₂₀	Flower buds of <i>P. ginseng</i>
42	Ginsenoside SL1	C ₃₆ H ₆₂ O ₁₁	Steamed leaves of <i>P. ginseng</i>
43	Floralginsenoside B	C ₄₂ H ₇₂ O ₁₆	Flower buds of <i>P. ginseng</i>
44	Floralginsenoside D	C ₄₁ H ₇₀ O ₁₅	Flower buds of <i>P. ginseng</i>
45	Floralginsenoside E	C ₄₂ H ₇₂ O ₁₅	Flower buds of <i>P. ginseng</i>
46	Floralginsenoside F	C ₄₂ H ₇₂ O ₁₅	Flower buds of <i>P. ginseng</i>
47	Floralginsenoside G	C ₅₀ H ₈₄ O ₂₁	Flower buds of <i>P. ginseng</i>
48	Floralginsenoside I	C ₄₈ H ₈₂ O ₂₀	Flower buds of <i>P. ginseng</i>
49	Floralginsenoside K	C ₄₈ H ₈₂ O ₂₁	Flower buds of <i>P. ginseng</i>

No.	Name	Formula	Plant Material
50	Floralginsenoside O	C ₅₃ H ₉₀ O ₂₄	Flower buds of <i>P. ginseng</i>
51	Floralginsenoside P	C ₅₃ H ₉₀ O ₂₃	Flower buds of <i>P. ginseng</i>
52	Floralquinquenoside A	C ₃₆ H ₆₂ O ₁₁	Flower buds of <i>P. quinquefolius</i>
53	Floralquinquenoside C	C ₄₂ H ₇₂ O ₁₅	Flower buds of <i>P. quinquefolius</i>
54	Ginsenoside Rh6	C ₃₆ H ₆₂ O ₁₁	Leaves of <i>P. ginseng</i>
55	Floralginsenoside La	C ₄₈ H ₈₂ O ₁₉	Flower buds of <i>P. ginseng</i>
56	Floralginsenoside Lb	C ₄₈ H ₈₂ O ₁₉	Flower buds of <i>P. ginseng</i>
57	Floranotoginsenoside D	C ₅₃ H ₉₀ O ₂₃	Flowers of <i>P. notoginseng</i>
58	Ginsenoside Rg7	C ₃₆ H ₆₀ O ₉	Leaves of <i>P. ginseng</i>
59	Notopanaxoside A	C ₃₆ H ₆₂ O ₁₀	Roots of <i>P. notoginseng</i>
60	Notoginsenoside FT3	C ₄₇ H ₈₀ O ₁₈	Acid hydrolysate roots of <i>P. notoginseng</i>
61	Floranotoginsenoside A	C ₅₃ H ₉₀ O ₂₃	Flowers of <i>P. notoginseng</i>
62	Ginsenoside ST2	C ₃₆ H ₆₂ O ₁₀	Steamed leaves of <i>P. ginseng</i>
63	Notoginsenoside Rw2	C ₄₁ H ₇₀ O ₁₄	Rhizomes of <i>P. notoginseng</i>
64	Notoginsenoside ST5	C ₄₇ H ₈₀ O ₁₈	Steamed roots of <i>P. notoginseng</i>
65	Yesanchinoside H	C ₅₃ H ₉₀ O ₂₃	Underground part of <i>P. japonicus</i>
66	Ginsenoside Ki	C ₃₆ H ₆₂ O ₁₀	Leaves of <i>P. ginseng</i>
67	Ginsenoside Km	C ₃₆ H ₆₂ O ₁₀	Leaves of <i>P. ginseng</i>
68	Quinquenoside L2	C ₄₈ H ₈₂ O ₁₉	Leaves and stems of <i>P. quinquefolius</i>
69	Dammar-25(26)-ene-3,6,12,20,22,24-	C ₃₀ H ₅₂ O ₆	Leaves of <i>P. ginseng</i>

No.	Name	Formula	Plant Material
	hexanol		
70	Floralginsenoside Kb	C ₄₅ H ₇₆ O ₁₉	Flower buds of <i>P. ginseng</i>
71	Floralginsenoside Kc	C ₄₅ H ₇₆ O ₂₀	Flower buds of <i>P. ginseng</i>
72	Floralginsenoside Ta	C ₃₆ H ₆₀ O ₁₀	Flower buds of <i>P. ginseng</i>
73	Vina-ginsenoside R25	C ₄₂ H ₇₀ O ₁₅	Roots and rhizomes of <i>P. vietnamensis</i>
74	Floralginsenoside Tb	C ₃₅ H ₆₂ O ₁₁	Flower buds of <i>P. ginseng</i>
75	Quinquenoside L9	C ₄₂ H ₇₄ O ₁₅	Leaves and stems of <i>P. quinquefolius</i>
76	Quinquenoside L16	C ₅₄ H ₉₄ O ₂₅	Leaves and stems of <i>P. quinquefolius</i>
77	25-OCH ₃ -PPD	C ₃₁ H ₅₆ O ₄	Leaves of <i>P. notoginseng</i>
78	25-OH-PPD	C ₃₀ H ₅₄ O ₄	Fruits of <i>P. ginseng</i>
79	25-OH-PPT	C ₃₀ H ₅₄ O ₅	Fruits of <i>P. ginseng</i>
80	Notoginsenoside FT2	C ₄₇ H ₈₂ O ₁₈	Acid hydrolysate roots of <i>P. notoginseng</i>
81	Notoginsenoside T4	C ₃₆ H ₆₂ O ₁₁	Acid hydrolysate roots of <i>P. notoginseng</i>
82	Quinquenoside L1	C ₄₈ H ₈₀ O ₁₈	Leaves and stems of <i>P. quinquefolius</i>
83	Quinquefoloside La	C ₅₄ H ₉₂ O ₂₃	Leaves of <i>P. quinquefolius</i>
84	Quinquefoloside Lc	C ₅₄ H ₉₂ O ₂₃	Leaves of <i>P. quinquefolius</i>
85	Dammar-(<i>E</i>)-20(22)-ene-3,12,25-triol	C ₃₀ H ₅₂ O ₃	Acid hydrolysate roots of <i>P. ginseng</i>
86	Notoginsenoside ST1	C ₃₆ H ₆₂ O ₁₀	Steamed roots of <i>P. notoginseng</i>

No.	Name	Formula	Plant Material
87	Ginsenoside Rg6	C ₄₂ H ₇₀ O ₁₂	Stem-leaves of <i>P. ginseng</i>
88	Ginsenoside Rs4	C ₄₂ H ₇₀ O ₁₂	Steamed roots of <i>P. notoginseng</i>
89	Ginsenoside Rs6	C ₄₂ H ₇₀ O ₁₂	Steamed roots of <i>P. notoginseng</i>
90	Isoginsenoside Rh3	C ₃₆ H ₆₀ O ₇	Fruits of <i>P. ginseng</i>
91	Ginsenoside Rh5	C ₃₆ H ₆₀ O ₉	Leaves of <i>P. ginseng</i>
92	Ginsenoside SL2	C ₄₂ H ₇₀ O ₁₄	Steamed leaves of <i>P. ginseng</i>
93	Ginsenoside ST1	C ₃₆ H ₆₀ O ₁₀	Steamed leaves of <i>P. ginseng</i>
94	Notoginsenoside ST2	C ₄₃ H ₇₄ O ₁₅	Steamed roots of <i>P. notoginseng</i>
95	Notoginsenoside ST3	C ₄₃ H ₇₄ O ₁₅	Steamed roots of <i>P. notoginseng</i>
96	Ginsenoside Rg8	C ₄₂ H ₇₀ O ₁₂	Roots of <i>P. quinquefolius</i>
97	Notoginsenoside T1	C ₃₆ H ₆₀ O ₁₀	Acid hydrolysate roots of <i>P. notoginseng</i>
98	Notoginsenoside T2	C ₃₆ H ₆₂ O ₁₀	Acid hydrolysate roots of <i>P. notoginseng</i>
99	Ginsenoside Rg1-12,23-epoxy	C ₄₂ H ₇₀ O ₁₄	Leaves of <i>P. ginseng</i>
100	Ginsenoside Rh9	C ₃₆ H ₆₀ O ₉	Leaves of <i>P. ginseng</i>
101	Quinquefoloside-Lb	C ₅₃ H ₈₈ O ₂₂	Leaves of <i>P. quinquefolius</i>
102	Ginsenoside Rk1	C ₄₂ H ₇₀ O ₁₂	Processed roots of <i>P. ginseng</i>
103	Ginsenoside Rk2	C ₃₆ H ₆₀ O ₇	Processed roots of <i>P. ginseng</i>
104	Ginsenoside Rk3	C ₃₆ H ₆₀ O ₈	Processed roots of <i>P. ginseng</i>

No.	Name	Formula	Plant Material
105	Ginsenoside Rs5	C ₃₈ H ₆₂ O ₉	Steamed roots of <i>P. notoginseng</i>
106	Ginsenoside Rs7	C ₃₈ H ₆₂ O ₉	Steamed roots of <i>P. notoginseng</i>
107	Notoginsenoside T5	C ₄₁ H ₆₈ O ₁₂	Acid hydrolysate roots of <i>P. notoginseng</i>
108	Ginsenoside Rz1	C ₄₂ H ₇₀ O ₁₂	Steamed roots of <i>P. notoginseng</i>
109	Ginsenoside SL3	C ₄₂ H ₇₀ O ₁₄	Steamed leaves of <i>P. ginseng</i>
110	Ginsenoside Rh8	C ₃₆ H ₆₀ O ₉	Leaves of <i>P. ginseng</i>
111	Ginsenoside Rh7	C ₃₆ H ₆₀ O ₉	Leaves of <i>P. ginseng</i>
112	Yesanchinoside G	C ₅₃ H ₈₈ O ₂₃	Underground part of <i>P. japonicus</i>
113	Yesanchinoside I	C ₅₉ H ₁₀₀ O ₂₆	Underground part of <i>P. japonicus</i>
114	Hexanordammaran	C ₂₄ H ₄₀ O ₄	Leaves of <i>P. ginseng</i>
115	Notoginsenoside R10	C ₃₀ H ₅₀ O ₉	Steamed leaves of <i>P. ginseng</i>
116	Yesanchinoside A	C ₄₄ H ₇₄ O ₁₆	Underground part of <i>P. japonicus</i>
117	Yesanchinoside B	C ₄₈ H ₈₂ O ₂₀	Underground part of <i>P. japonicus</i>
118	Yesanchinoside C	C ₄₇ H ₈₀ O ₁₉	Underground part of <i>P. japonicus</i>
119	Panaxadione	C ₃₀ H ₄₈ O ₅	Seeds of <i>P. ginseng</i>
120	Polyacetyleneginsenoside Ro	C ₆₅ H ₁₀₀ O ₂₁	Roots of <i>P. ginseng</i>
121	Isodehydroprotopanaxatriol	C ₃₀ H ₅₀ O ₃	Acid hydrolysate roots of <i>P. ginseng</i>

No.	Name	Formula	Plant Material	
122	20,25-epoxy-dammaran-2-en-6,12-diol	C ₃₀ H ₅₀ O ₃	Acid hydrolysate roots of <i>P. ginseng</i>	
123	3-methyl-28-nordammaran-2-en-6,12-diol	C ₃₀ H ₅₀ O ₃	Acid hydrolysate roots of <i>P. ginseng</i>	

Analysis of ginseng root (Japanese ginseng) has indicated (per 100 grams root) 0.17g (0.17%) total fat, 50mg sodium, 8.82g (8.82%) total carbohydrates comprising 2.3 g dietary fiber and 3.85g sugars and 0.71g (0.71%) protein content. Calorimetric calculation
 5 showed that 100g of ginseng root contains 37 kcal.

According to a specific embodiment, the active ingredient or combination thereof includes a ginsenoside, e.g. a protopanaxadiol (PPD)-type saponin with sugar moieties attached to the C-3 and/or C-20, a protopanaxatriol (PPT) saponin with sugar moieties at C-6 and/or at C-20, an ocotillol-type saponin with a five-membered epoxy ring at C-20,
 10 an oleanane-type saponin with a nonsteroidal structure, and a dammarane type saponin. Some specific ginsenosides include, but are not limited to notoginsenosides, yesanchinosides, panaxodione, floralginsenosides and ginsenosides Rg1, Rd, Re, Rb1, R1, Rg3, Rk1, Rf, Rg5, F4, Ro.

According to a specific embodiment, the active ingredient or combination thereof
 15 includes a volatile compound, e.g., terpene hydrocarbons, monoterpene and sesquiterpene hydrocarbons, specifically β -alamene and β -selenine.

According to a specific embodiment, the active ingredient or combination thereof includes a phytosterol, e.g., stigmasterol, beta-sterol.

According to a specific embodiment, the active ingredient or combination thereof
 20 includes a polyacetylene, e.g., panaxynol, ginsenoynes A.

According to a specific embodiment, the active ingredient or combination thereof includes a flavenoid, e.g., Kaempferol.

According to a specific embodiment, the active ingredient or combination thereof includes an alkaloid, e.g., fumarine, girinimbin.

25 According to a specific embodiment, the active ingredient or combination thereof includes a polysaccharide, e.g., WGP, KGP-1, KGP-4, WGPE, NGP, EGP.

According to a specific embodiment, the active ingredient or combination thereof includes a phenolic compound, e.g., elemicin, dauricin, maltol.

According to a specific embodiment, the active ingredient or combination thereof includes a mineral, e.g., potassium, calcium, magnesium, phosphorus, aluminum, iron,
5 sodium, boron, zinc, cadmium, selenium.

According to a specific embodiment, the active ingredient or combination thereof includes a vitamin, e.g., vitamin D, vitamin A and vitamin C.

According to a specific embodiment, a methanol or ethanol extract is performed, e.g., ethanol concentration is 80%; extraction time is 24 h; extraction temperature is 80-90
10 °C; particle size 1.0mm; and solvent to ginseng ratio of 20:1 ml/g. Other extraction procedures include, but are not limited to, those described in Dong et al. 2017 Phytother Res Aug; 19(8): 684-688, which is hereby incorporated by reference in its entirety.

According to another embodiment, the plant part is leaf.

Also contemplated herein are plants of the genus *Panax*.

15 Examples include, but are not limited to:

Ginseng Species	Common name and geographical designation
<i>P. ginseng</i>	Korean ginseng
<i>P. quinquefolius</i>	American ginseng
<i>P. notoginseng</i>	Chinese ginseng
<i>P. japonicas</i>	Japanese ginseng
<i>P. omeiensis</i>	Omei ginseng
<i>P. pseudoginseng</i>	Himalayan ginseng
<i>P. assamicus</i>	N/A
<i>P. shangianus</i>	N/A
<i>P. sinensis</i>	N/A
<i>P. stipuleanatus</i>	Pingpien ginseng
<i>P. trifolius</i>	Dwarf ginseng
<i>P. variabilis</i>	N/A
<i>P. vietnamensis</i>	Vietnamese ginseng

<i>P. wangianus</i>	Narrow-leaved
<i>P. bipinnatifidus</i>	Feather-leaf bamboo ginseng
<i>P. sokpayensis</i>	N/A
<i>P. zingiberensis</i>	Ginger ginseng

Korean ginseng cultivars suitable for use with the present invention include, but are not limited to: Chunpoong, Yunpoong, Gopoong, Sunpoong, Gumpoong, Cheongsun, Sunhyang, Sunun, Sunone, K-1, G-1 and Kowon. Chinese ginseng cultivars suitable for use with the present invention include, but are not limited to Jilin Huangguo Reshen, Jishen 01, Fuxing 01, Fuxing 02, Kangmei 01, Xinkaihe 01, Xinkaihe 02, Zhongnong Huangfengshen and Zhongda Linxiashen.

Chemical Composition of Boswellia species (Frankincense, Olibanum)

Olibanum, also known as frankincense, is a natural oleo-gum-resin that exudes from tappings in the bark of *Boswellia* trees. There are approximately 23 species of trees in the genus *Boswellia*, which grow mainly in Arabia, on the eastern coast of Africa and in India. Characterization and identification of chemical compounds of Olibanum using a variety of methods identified a large variety of compounds in the gum resin of *Boswellia* tree species and classified them as generally being:

- Alcohol-soluble resins (e.g. diterpenes, triterpenes)
- Highly aromatic essential oils (e.g. mono- and sesquiterpenes)
- Water soluble gums

According to specific embodiments, Olibanum comprises 65-85% alcohol-soluble resins, about 5-9% highly aromatic essential oils and the remainder water soluble gums.

In India, the main commercial sources of *Boswellia serrata* are Andhra Pradesh, Gujarat, Madhya Pradesh, Jharkhand and Chhattisgarh. Regionally, it is also known by different names. The botanical origin and vernacular names of *Boswellia serrata* are given in below Table 1. *Salai*, an oleo gum-resin, is a plant exudate of genus *Boswellia* (Family: Burseraceae). It is tapped from the incision made on the trunk of the tree, which is then stored in specially made bamboo basket. The semi-solid gum-resin is allowed to remain in the basket for about a month during which its fluid content locally known as 'ras' keeps flowing out. The residue, semi-solid to solid part, is the gum-resin which hardens slowly

into amorphous, tear-shaped products with an aromatic scent. Then, it is broken into small pieces by wooden mallet or chopper and during this process all impurities including bark pieces etc. are removed manually. The gum-resin is then graded according to its flavour, colour, shape and size. Generally four grades i.e. Superfine, Grade I, Grade II and Grade

5 III are available in the market. The fresh gum obtained from the tree is hot with pleasant flavour and slightly bitter in taste. It had been the 'frankincense' of ancient Egyptians, Greeks and Romans who used it as prized incense, fumigant as well as a multipurpose aromatic. It is generally used in making incense powder and sticks.

TABLE 1
BOTANICAL ORIGIN AND VERNACULAR NAMES OF *BOSWELLIA*
10 *SERRATA*

Botanical origin	Vernacular names
Division: Spermatophyta	English: Indian Olibanum or Indian frankincense
Sub-division: Angiospermae	Hindi: Kundur, Salai
Tribe: Burseraceae	Bengali: Kundur, Salai
Sub-tribe: Residae s. lat.	Gujarati: Dhup, Guggul
Order: Rosales	Kannada: Chitta, Gugguladhu
Class: Anacardiales	Malayalam: Parangi, Saambraani
Family: Burseraceae	Tamil: Parangi, Saambraani
Genus: Boswellia	Telugu: Phirangi, Saambraani
Species: serrata	Sanskrit: Ashvamutri, Kundara, Shallaki.

The oleo gum-resins contain 30-60% resin, 5-10% essential oils, which are soluble

15 in the organic solvents, and the rest is made up of polysaccharides (~ 65% arabinose, galactose, xylose) which are soluble in water. The resins have a fragrant aroma because of the presence of essential oils and this accounts for their commercial importance.

According to specific embodiments, the common components of Olibanum belonging to the terpene and sesquiterpene families, or their terpenoid derivatives include,

20 but are not limited to α - and β -pinene, α -limonene, myrcene, linalool, α -cubebene, γ -cadinene, β -bourbonene, and α -phellandrene dimer compounds in Olibanum are the compounds that constitute its phytochemical activity. Several oxygenated isoprenoid derivatives have also been identified, such as carbonyl derivatives (e.g., carvone, fenchone) and alcohol-containing terpene and sesquiterpene derivatives (e.g., transpinocarveol, cis-verbenol, and cembrenol), as well as ester-containing compounds (e.g., α -terpinyl acetate

25 and bornyl acetate).

Diverse investigators have reported that limonene is the most abundant volatile in Olibanum, while others have identified octanol acetate, α -pinene and α -thujene as most abundant depending on the species of *Boswellia* resin used for extraction.

More than 300 essential oils have been isolated from *Boswellia* ssp.

- 5 The table below shows the essential oils recovered from Olibanum extracts prepared by different extraction procedures, from diverse *Boswellia* ssp.:

Number	Compound
1	5,5-Dimethyl-1-vinylbicyclo-[2.1.1]-hexane
2	Anethol
3	Benzyl tiglate
4	<i>trans</i> - α -Bergamotene
5	Bornyl acetate
6	β -Bourbonene
7	Cadinene
8	γ -Cadinene
9	Camphene
10	Camphor
11	<i>m</i> -Camphorene
12	<i>p</i> -Camphorene
13	Carene-3
14	(<i>E</i>)- β -Caryophyllene
15	Cembrene A
16	Cembrenol
17	1,8 Cineol
18	Citronellol
19	α -Copaene

Number	Compound
20	β -Copaene
21	<i>p</i> -Cymene
22	<i>m</i> -Cymene
23	Elemol
24	Elemicine
25	<i>epi</i> -Cubenol
26	Estragol
27	Eudesmol
28	10- <i>epi</i> - γ -Eudesmol
29	Fenchone
30	Geraniol
31	Germacrene D
32	Humulene epoxide
33	Isoincensole
34	Isomenthone
35	Kessane
36	Limonene
37	Linalool
38	Linalyl acetate
39	Menthone
40	Methylchavicol
41	Methylisoeugenol
42	Methyleugenol
43	γ -Muurolene
44	Myrcene

Number	Compound
45	Neocembrene A
46	Nerolidol
47	<i>cis</i> - β -ocimene
48	(<i>Z</i>)-Ocimene
49	(<i>E</i>)- β -Ocimene
50	Perillene
51	α -Phellandrene
52	β -Phellandrene
53	α -Pinene
54	β -Pinene
55	<i>trans</i> -Pinocarveol
56	Sabinene
57	<i>cis</i> -Sabinol
58	Terpinin-4-ol
59	Terpinen-4-ol
60	Terpinolene
61	α -Terpineol
62	α -Terpinene
63	α -Terpinene
64	γ -Terpinene
65	Terpinyl acetate
66	Terpinyl isobutyrate
67	Tetrahydrolinalool
68	α -Thujene
69	α -Thujone

Number	Compound
70	β -Thujone
71	Tricyclene
72	Undecenol
73	<i>trans</i> -Verbenol
74	β -Ylangene
75	Zingiberene
76	Abieta-8,12-diene
77	α -Amorphene
78	<i>alloaromadendrene</i>
79	Benzyl benzoate
80	Beyerene
81	Bisabolene
82	Isopentyl-2-methylbutanoate
83	<i>cis</i> -Calamenene
84	α -Cadinene
85	τ -Cadinol
86	2-Carene
87	Campholenealdehyde
88	Caryophyllene oxide
89	<i>cis</i> -Carveol
90	(+) <i>trans</i> -Carveol
91	Carvone
92	α -Cedrene
93	Cedrol
94	Cembra-1,3,7,11-tetraene

Number	Compound
95	Cembra-3,7,11,15-tetraene
96	Cembrene
97	Cembrene C
98	Citronellyl acetate
99	α -Cubebene
100	β -Cubebene
101	<i>o</i> -Cymene
102	Chrysanthenone
103	1,4-Cyclohexadiene
104	<i>p</i> -Cymen-8-ol
105	Decanol
106	Decyl acetate
107	2,6-Dimethoxytoluene
108	3,5-Dimethoxytoluene
109	Duva-3,9,13-trien-1,5 α -diol
110	Duva-4,8,13-trien-1 α ,3 α -diol
111	Duva-3,9,13-trien-1,5 α -diol-1-acetate
112	Duva-3,9,13-triene-1 α -ol-5,8-oxide-1-acetate
113	β -Elemene
114	Farnesyl acetate
115	Geranyl acetate
116	α -Gurjunene
117	Hedycariol
118	1,3,6-Trimethylencycloheptane
119	1-Hexanol

Number	Compound
120	Hexyl acetate
121	Hexyl hexanoate
122	α -Humulene
123	Incensole
124	Incensole acetate
125	Isodurene
126	Isocembrene
127	Isophyllocladene (kaur-15-ene)
128	Kaurene
129	Ledol
130	Maaliane
131	<i>p</i> -Mentha-1,5-dien-8-ol
132	<i>o</i> -Methyl anisole
133	α -Muurolene
134	α -Muurolol
135	Myrtenal
136	Naphthalene
137	Naphthalene 1,2,3,4,4a,7-hexahydro-1,6-dimethyl-4-(1-methylethyl)
138	Neryl acetate
139	<i>cis</i> -Nerolidol
140	(<i>S</i>)- <i>trans</i> -Nerolidol
141	(<i>E</i>)-Nerolidol
142	1-Octanol
143	<i>n</i> -Octanol
144	Octanol acetate

Number	Compound
145	Octyl acetate
146	Octyl formate
147	<i>allo</i> -Ocimene
148	Phenanthrene-7-ethenyl-9,10,10a-dodeca-hydro-1-1-4a-7-tetramethyl
149	α -Phellandrene epoxide
150	Phyllocladene
151	α -Pinene-epoxide
152	1- β -Pinene
153	2- β -Pinene
154	Isopinocampheol
155	Piperitone
156	Pyrimidine
157	Sabinyol acetate
158	Sandaracopimara-8(14)-15-diene
159	Sclarene
160	α -Selinene
161	β -Selinene
162	δ -Selinene
163	<i>trans</i> -Terpine
164	4-Terpineol
165	Terpinolene
166	Isoterpinolene
167	2,4(10)-Thujadiene
168	Thujopsene

Number	Compound
169	Thunbergol
170	Isomyl-valerate
171	Verticilla-4(20),7,11-triene
172	Verbenone
173	<i>cis</i> -Verbenol
174	Verticiol
175	Viridiflorol
176	Benzene, 1methoxy-2-methyl
177	<i>endo</i> -Borneol
178	γ -Campholene aldehyde
179	α -Campholene aldehyde
180	Cara-2,4-diene
181	Carvacrol
182	Carvotanacetone
183	<i>trans</i> -Dihydrocarvone
184	Cumin alcohol
185	<i>m</i> -Cymene-8-ol
186	<i>p</i> -Cymene-9-ol
187	<i>p</i> -Cymenene
188	Dodecanol
189	Eucalyptol
190	Eucarvone
191	Isopropyl benzaldehyde
192	Isopropyl benzalcohol
193	<i>cis</i> -1,2-Limonene epoxide

Number	Compound
194	8,9-Limonene epoxide II
195	8,9-Limonene-epoxide I
196	<i>trans</i> -1,2-Limonene epoxide
197	<i>cis</i> -Linalool oxide
198	<i>trans</i> -Linalool oxide
199	<i>p</i> -Mentha-1,5-diene-7-ol
200	<i>p</i> -Mentha-1,8-diene-4-ol
201	<i>cis-p</i> -Menth-2-en-1-ol
202	<i>cis-p</i> -Mentha-1(7),8-diene-2-ol
203	<i>cis-p</i> -Mentha-2,8-diene-1-ol
204	<i>trans-p</i> -Menth-2-en-1-ol
205	<i>trans-p</i> -Mentha-1(7),8-diene-2-ol
206	<i>trans-p</i> -Mentha-2,8-diene-1-ol
207	2,4(8)- <i>p</i> -Menthadiene
208	<i>p</i> -Mentha-6,8-dien-2-one
209	<i>p</i> -Methylanisole
210	Myrtenol
211	Nerol
212	<i>trans</i> -Ocimene
213	(<i>E</i>)- β -Ocimene epoxide
214	α -Phellandrene-dimer
215	α -Phellandrene-8-ol
216	α -Pinene oxide
217	Pinocamphone
218	Pinocarvone

Number	Compound
219	Piperitenone
220	Isopiperitenone
221	<i>trans</i> -Piperitol
222	α -Terpineol
223	Sabina ketone
224	<i>cis</i> -Sabinene hydrate
225	<i>trans</i> -Sabinene hydrate
226	<i>trans</i> -Sabinol
227	2,5-Dimethylstyrene
228	<i>cis</i> -1,2-Epoxy-terpin-4-ol
229	Thuj-3-en-10-al
230	Thujanol
231	Thunbergene
232	Thymol
233	Umbellulone
234	Verticellol
235	5,5-Dimethyl-1-vinylbicyclo-[2.1.1]-hexane
236	<i>p</i> -Anisaldehyde
237	Aromadendrene
238	Benzyl tigilate
239	<i>p</i> -Camphorene
240	Isocaryophyllene
241	Cumaldehyde
242	Cyclosativene
243	γ -Eudesmol

Number	Compound
244	Guaioxide
245	5-Guaiene-11-ol
246	Isogermacrene D
247	4-Methylene-1-(1-methylethyl)-bicyclo[3.1.0]hex-2-ene
248	2-Methyl-5-(1-methylethyl)-1,3-cyclohexadiene monoepoxide
249	<i>n</i> -Pentadecan
250	Perilla alcohol
251	Perillol
252	Thujol
253	<i>m</i> -Thymol
254	α -Ylangene
255	γ -Campholene aldehyde
256	<i>n</i> -Decanoic acid
257	β -Eudesmene
258	β -Cyclogeranylacetate
259	<i>n</i> -Hexanoic acid
260	Hexylcaprylate
261	Incensyl acetate
262	Incensole oxide
263	Incensole oxide acetate
264	Lauric acid
265	<i>p</i> -Methylacetophenone
266	<i>p</i> -Methyleugenol
267	β -Myrcene
268	<i>n</i> -Nonanoic acid

Number	Compound
269	<i>n</i> -Octanoic acid
270	3,4-Dimethoxystyrene
271	α -Cadinol
272	1,Hydroxy-1,7-dimethyl-4-isopropyl-2,7-cyclodecadiene
273	1,5,5,8-Tetramethyl-12-oxabicyclo-[9.1.0]-dodeca-3,7-diene
274	1-Methyl-4-(1-methylethenyl)-1,2-cyclohexanediol
275	<i>trans-p</i> -Mentha-2,8-dienol
276	1,2,3,4,6,8a-hexahydro-1-isopropyl-4,7-dimethyl-naphthalene
277	2-Isopropenyl-4a,8-dimethyl-1,2,3,4,4a,5,6,8a-ctahydronaphthalene
278	3,5-Dimethoxytoluene
279	(<i>Z</i>)- α -Hydroxymanool
280	Hydroxy-manool
281	Methyl linoleate
282	1-Acetyl-4-isopropenylcyclopentene
283	2,4-Dimethylacetophenone
284	α -Amyrenone
285	β -Amyrenone
286	10-Hydroxy-4-cadinen-3-one
287	2-Hydroxy-1,4-cineole
288	Cryptone
289	Eucarvone
290	Isopropylidencyclohexane
291	1,2,4-Trihydroxy- <i>p</i> -menthane
292	Δ^4 - <i>p</i> -Menthen-2-one

Number	Compound
293	5-Hydroxy- <i>p</i> -menth-6-en-2-one
294	Myrtenoic acid
295	Nopinone
296	3,6,6,-Trimethyl-norpinan-2-one
297	<i>o</i> -Methylacetophenone
298	Perillaaldehyde
299	Phellandra
300	Pinocamphone/isopinocamphone
301	Thujone
302	24-Noroleana-3,12-diene
303	24-Noroleana-3,9(11),12-triene
304	24-Norursa-3,12-diene
305	24-Norursa-3,9(11),12-triene
306	24-Norursa-3,12-dien-11-one
307	α -Amyrine
308	<i>epi</i> - α -Amyrine
309	β -Amyrine
310	Lupeol
311	Terpinenyl acetate
312	1,5-Isopropyl-2-methylbicyclo[3.1.0]hex-3-en-2-ol
313	α -Campholenal
314	(3 <i>E</i> ,5 <i>E</i>)-2,6-Dimethyl-1,3,5,7-octatetraene
315	(<i>E</i>)-2,3-Epoxyarene
316	3,4-Dimethylstyrene
317	1-(2,4-Dimethylphenyl)ethanol

Number	Compound
318	4-Methylbenzoic acid
319	<i>p</i> -Menth-1(7)-en-2-one
320	Caryophyllene
321	Methylcycloundecanecarboxylate
322	Nonanoic acid
323	Hexadecanoic acid
324	1,4-Cineol
325	Sabinene hydrate
326	Methyl- <i>trans</i> -2- <i>cis</i> -4-decadienoate
327	2-Hydroxy-5-methoxy-acetophenone
328	(<i>E</i>)- β -Farnesene
329	2-Dodecenoic acid methyl ester
330	Calacorene
331	<i>n</i> -Dodecanoic acid
332	α -Guaïol
333	Caryophylla-3(15),7(14)-dien-6-ol
334	Cadalene
335	Eudesma-4(15),7-dien-1 β -ol
336	<i>n</i> -Heptadecane
337	<i>n</i> -Tetradecanoic acid
338	<i>n</i> -Octadecane
339	Galaxolide
340	Manool

Although many *Boswellia* species produce Olibanum, the major sources of commercial Olibanum are *B. serrata* (India), *B. sacra* (Oman), and *B. carteri* (Somalia).

The table below shows the major components of Olibanum derived from diverse *Boswellia* species, according to their percentage representation:

<i>Boswellia</i> specie	Source of resin	Predominant compound(s)	Percentage (%)	
<i>B. serrata</i>	Commercial (Hamburg, Germany)	Myrcene	38	
<i>B. serrata</i>	NA	α -Thujene	22.7–47.4	
<i>B. serrata</i>	NA	α -Thujene	29.3	
<i>B. serrata</i>	NA	α -Thujene	61.36	
<i>B. carteri</i>	Purchased from the local market of herbs and spices in Egypt	Duva-3,9,13-triene-1a-ol-5,8-oxide-1-acetate	21.4	
<i>B. sacra</i>	Botanically certified oleogum resin	<i>E</i> - β -Ocimene	32.3	
<i>B. carteri/sacra</i>	NM	Octanol acetate	45.2	
<i>B. carteri</i>	Authentic sample from Ethiopia certified for its authenticity from the Agricultural Department of the Ethiopian government	Octyl acetate	39.3	
<i>B. rivae</i>	NA	Limonene	28.0	
<i>B. rivae</i>	Authentic sample from Ethiopia	α -Pinene	16.7	
<i>B. rivae</i>	NA	α -Pinene	13.3	
<i>B. rivae</i>	NA	Octanol	17.8	
<i>B. neglecta</i>	NA	α -Pinene	16.7	
<i>B. neglecta</i>	Authentic sample from Ethiopia	α -Pinene	21.3	
<i>B. papyrifera</i>	NA	Octyl acetate	63.5	
<i>B. papyrifera</i>	NA	Octyl acetate	56.0	

<i>Boswellia</i> specie	Source of resin	Predominant compound(s)	Percentage (%)	
<i>B. pirottae</i>	NA	<i>Trans</i> -Verbenol	15.5	
<i>B. pirottae</i>	NA	Terpinen-4-ol	14.6	
<i>B. frereana</i>	Commercial (Hamburg, Germany)	α -Pinene	38.0	

One exemplary analysis of Olibanum has indicated the following components

- Acid resin (6%), soluble in alcohol and having the formula $C_{20}H_{32}O_4$
- gum (similar to gum arabic) 30–36%
- 5 • 3-acetyl-beta-boswellic acid (*Boswellia sacra*)
- alpha-boswellic acid (*Boswellia sacra*)
- incensole acetate, $C_{21}H_{34}O_3$
- phellandrene

Another analysis of *B. serrata* resin revealed that the resinous part of *Boswellia*
 10 *serrata* contains monoterpenes (α -thujene); diterpenes (macrocyclic diterpenoids such as incensole, incensole oxide, iso-incensole oxide, a diterpene alcohol [serratol]); triterpenes (such as α - and β -amyrins); pentacyclic triterpenic acids (boswellic acids); tetracyclic triterpenic acids (tirucall-8,24-dien-21-oic acids). The structures of four major pentacyclic triterpenic acids (boswellic acids) as also some of their characteristic features of four
 15 pentacyclic triterpene acids (Boswellic acid) are given in the following table:

Properties	8-Boswellic acid	Acetyl-8-Boswellic acid	11-keto-8-Boswellic acid	Acetyl-11-keto-8-Boswellic acid
Molecular formula	C ₃₀ H ₄₈ O ₈	C ₃₂ H ₄₈ O ₈	C ₃₀ H ₄₆ O ₈	C ₃₂ H ₄₆ O ₈
Molecular weight	458.7	498.74	470.69	512.73
Chemical name	3 α -Hydroxy-urs-12-en-23-oic acid	3 α -Acetoxy-urs-12-en-23-oic acid	3 α -Hydroxy-urs-12-en-11-keto-23-oic acid	3 α -Acetoxy-urs-12-en-11-keto-23-oic acid
Melting point	226-228°	252-255°	195-197°	271-274°
Specific rotation	+106.8°	+138°	+78.3°	+88.5°
UV-MeOH	Maxima at 208 nm	Maxima at 208 nm	Maxima at 250 nm	Maxima at 250 nm
NMR (in CDCl ₃ , δ ppm)	5.15, CH=C; 4.08, CH-OH; 2.3-1.1, Methylenes and methines, 23 protons; 1.1-0.7 Methyls, 21 protons	5.31, CH=C; 5.2, CH-OAc; 2.1, COCH ₃ , 1.9-1.25, Methylenes and methines, 23 protons; 1.2-0.7, Methyls, 21 protons	5.55, CH=C; 4.08, CH-OH; 2.6-1.4, Methylenes and methines, 21 protons; 1.25-0.75, Methyls, 21 protons	5.55, CH=C; 5.2, CH-OAc; 2.6-1.4, Methylenes and methines, 21 protons; 1.25-0.75, Methyls, 21 protons
FTIR (in KBr, cm ⁻¹)	3300 (OH), 1699.5 (COOH)	1732 (OAc), 1701 (COOH)	1660 (OH), 1693 (COOH)	1740 (Ac), 1701 (COOH), 1647 (u, β -unsaturated carbonyl)
GC-MS	394 (M-68[44 due to -CO ₂ and 18 due to -H ₂ O]); Other fragments: 203, 189, 175, 161.	394 (M-104[44 due to -CO ₂ and 80 due to -HOAc]); 218 (base peak)	408 (M-68[44 due to -CO ₂ and 18 due to -H ₂ O]); 232 (base peak); Other fragments: 217, 175, 161, 135	408 (M-68[44 due to -CO ₂ and 18 due to -HOAc]); 232 (base peak); Other fragments: 217, 175, 161, 135

The Olibanum gum component contains polysaccharides and polymeric components. The proteoglycans in Olibanum comprise mainly D-galactose units in the main chain and glucuronic acid, uronic acids, 4-O-methyl-glucuronic acid and arabinose in the side chains.

According to a specific embodiment, the active ingredient or combination thereof includes an alcohol soluble acid resin, a water soluble gum, an alpha-boswellic acid, an incensole acetate and a phellandrene.

According to a specific embodiment, the active ingredient or combination thereof includes a volatile compound, e.g. α -Thujene, Duva-3,9,13-triene-1 α -ol-5,8-oxide-1-acetate, *E*- β -Ocimene, Octanol acetate, Octyl acetate, Limonene, α -Pinene, Octanol, *Trans*-Verbenol and Terpinen-4-ol.

According to a specific embodiment, the active ingredient or combination thereof includes a mineral, e.g., potassium, calcium, magnesium, phosphorus, aluminum, iron, sodium, boron, zinc, cadmium, selenium.

According to a specific embodiment, a water or alcohol extract is performed.

In some embodiments, the Olibanum is prepared by water extract. An exemplary water extract is described herein:

Preparation of olibanum extract by water. At first, Olibanum is carefully powdered. The powder (25 g) is mixed with 200 ml of deionized water and stirred with 800 rpm overnight at room temperature. This mixture is centrifuged at 1,500 rpm for 10

min and the supernatant collected. Thereafter, the supernatant is again centrifuged at 2,500 rpm for 10 min and successively at 10,000 rpm for 20 min, and then filtered. The filtrates can be stored at -20 C and then freeze-dried -58 C and 0.5 Torr for 24 h to yield 4.02 gr of water soluble extract. At the next step, the resulted powder is dissolved in 100ml methanol and stirred for 12 hr. at room temperature, then allowed to settle. The precipitate phase is collected and dried in an oven. Again the powder is dissolved in deionized water, centrifuged repeatedly and refiltered. The filtrates can be stored and then freeze-dried.

In some embodiments, the Olibanum is prepared by alcohol extract. An exemplary alcohol extract is described herein:

Preparation of olibanum extract by alcohol: In this method, 100 gr of Olibanum powder with 400 ml of methanol is mixed. This mixture is then stirred at 650 rpm for 24 hours. The resulting mixture is made up of two phases, the upper phase is alcoholic and yellow, and contains substances that are soluble in alcohol. The material is then dried in an oven at 50 C. The bottom phase has a sedimentary and white state, which is set to in the oven until dry. The resulting powder in the water is well dissolved and the obtained solution is centrifuged at 1,500 rpm for 10 min and the supernatant collected. Thereafter, the supernatant is again centrifuged at 2,500 rpm for 10 min and successively at 10,000 rpm for 20 min, and then filtered. The filtrates can be stored at -20 C and then freeze-dried.

Other extraction procedures include, but are not limited to, those described in Mertens et al, et al. 2009, Flavor and Fragrance, 24:279-300 and Hamm et al, Phytochemistry 2005, 66:1499-1514, which are hereby incorporated by reference in their entirety.

Also contemplated herein are Olibarum and other compositions from trees of the genus *Boswellia*.

Examples include, but are not limited to:

<u>Some Boswellia Species</u>
<i>B. socotrana</i>
<i>B. elongata</i>
<i>B. ameero</i>
<i>B. carteri</i>

<i>B. neglecta</i>
<i>B. sacra</i>
<i>B. thurifera</i>
<i>B. frereana</i>
<i>B. dioscorides</i>
<i>B. rivaie</i>
<i>B. papyrifera</i>
<i>B. serrata</i>

Chemical Composition of *Gynostemma pentaphyllum* (Jiaogulan)

Gynostemma pentaphyllum is a perennial herb from the Cucurbitaceae family, with 5-lobed leaves and a gourd-like, inedible fruit which grows in forests, thickets or roadside on mountain slopes in many areas of Northeast and Southeast Asia, including China, Taiwan, S Korea, Japan, Thailand, Vietnam and Laos. *G. pentaphyllum* also grows in Bangladesh, Bhutan, India, Indonesia, Malaysia, Myanmar, Nepal, New Guinea and Sri Lanka. Jiaogulan is prized for its reputation as a “longevity plant”. Characterization and identification of chemical compounds of *Gynostemma pentaphyllum* using a variety of methods identified a large variety of compounds in *Gynostemma pentaphyllum* (Thun.) Makino and classified them as generally being:

- Saponin Glycosides (e.g., gypenosides)
- Phenolic compounds
- Flavenoids (e.g. Kaempferol, quercetin, rutin, ombuin, isorahmnetin)
- Polysaccharides
- Sterols (e.g. ergostane, cholestane, stigmastane)
- Trace elements (e.g. Cu, Fe, Zn, Mn, Co, Ni, Se, Mo and Sr)
- Carotenoids
- Volatiles (e.g. malonic acid, benzyl-O-beta-D-glucopyranoside, lutein, vomifoliol, palmitic acid, linoleic acid)

According to specific embodiments, the saponin compounds in Jiaogulan and the polysaccharide compounds are the compounds that constitute its phytochemical activity. The most abundant saponin compound in Jiaogulan was found to be gypenoside.

Most Jiaogulan saponins belong to a family of triterpenoid saponins. They are also referred to as gypenosides, and dammarane derivatives. More than 150 saponins have been isolated from *G. pentaphyllum* plants. Saponins have been identified in Jiaogulan leaves and stems, flower buds, fruits, berries, and seeds.

- 5 The table below shows the phytochemical properties of 5 different *Gynostemma pentaphyllum* samples from different sources:

SAMPLE	SOLVENT	TPC (mg GAE/g)	TSC (mg GE/g)	TFC (mg RE/g)	RUTIN CONTENT (ug/g)	QUERCITIN CONTENT (ug/g)	R+Q (umol QE/g)
GP1	50% acetone	44.3	38.02	21.44	3049.5	4906.5	21.2
	50% ethanol	37.5	41.39	26.40	7948.2	7431.8	37.6
	100% ethanol	33.6	87.28	26.87	11235.4	7279.1	42.5
GP2	50% acetone	14.9	90.17	10.6	2527.3	117.5	4.5
	50% ethanol	12.9	114.48	14.27	3588.1	136.2	6.3
	100% ethanol	6.9	132.57	13.84	2131.9	166.2	4.0
GP3	50% acetone	12.3	47.62	10.52	8614.9	358.9	15.3
	50% ethanol	10.6	59.13	9.51	9954.0	411.0	17.7
	100% ethanol	6.7	64.57	8.05	7193.0	549.4	13.6
GP4	50% acetone	43.2	77.64	63.48	1409.2	241.3	3.1
	50% ethanol	30.4	82.12	54.04	680.2	150.8	1.6

	100% ethanol	17.7	104.1	36.47	579.4	151.3	1.4
GP5	50% acetone	13.1	23.61	14.55	nd	nd	
	50% ethanol	10.2	60.7	16.53	nd	nd	
	100% ethanol	8.9	123.97	22.11	nd	nd	

GP1-5 represent *G. pentaphyllum* samples from different sources. Data are per gram of dry botanical basis and are expressed as mean (SD). Different letters represent significant differences ($P < 0.05$). nd stands for not detectable. TPC, TSC, and TFC stand for total phenolic content, total saponin content, and total flavonoid content by spectrometric methods, respectively. GAE, GE, RE, and QE stand for gallic acid equivalents, gypenoside equivalents, rutin equivalents, and quercetin equivalents. Rutin and quercetin contents were flavonoid profile obtained by HPLC. R + Q stands for total amount of rutin and quercetin.

Ethanol extraction: 12g sample in 250 ml 100% ethanol, 5 hours in Soxhlet apparatus.

50% acetone extraction and 75% ethanol extraction: 2 g sample in 20 ml solvent at ambient temperature and filtration through 45 micron filter.

Water content of the *Jiaogulan* samples ranged from 3.79 to 7.57 g/100 g sample. Dietary fiber content ranged from 0.6 g/g to 0.24 g/g sample. Selenium content ranged from 1.7 mg/kg to 0.94 mg/kg.

5 According to a specific embodiment, the active ingredient or combination thereof includes a gypenoside. Some specific ginsenosides include, but are not limited to CP-1-6.

According to a specific embodiment, the active ingredient or combination thereof includes a volatile compound, e.g., malonic acid, benzyl-O-beta-D-glucopyranoside, lutein, vomifoliol, palmitic acid, linoleic acid.

10 According to a specific embodiment, the active ingredient or combination thereof includes a phytosterol, e.g., stigmasterol, ergostane.

According to a specific embodiment, the active ingredient or combination thereof includes a flavonoid, e.g., Kaempferol, quercetin, rutin.

According to a specific embodiment, the active ingredient or combination thereof includes a phenolic compound.

According to a specific embodiment, the active ingredient or combination thereof includes a mineral, e.g., potassium, calcium, magnesium, phosphorus, aluminum, iron,
5 sodium, boron, zinc, cadmium, selenium.

According to a specific embodiment, the active ingredient or combination thereof includes a vitamin, e.g., vitamin D, vitamin A and vitamin C.

According to a specific embodiment, a methanol or ethanol extract is performed, e.g., ethanol concentration is 100 or 75%; 5 hours in Soxhlet apparatus, or 50% acetone
10 extraction and 75% ethanol extraction: 2 g sample in 20 ml solvent at ambient temperature and filtration through 45 micron filter. Other extraction procedures include, but are not limited to, those described in Yantao et al. 2016 Chi Med 11:43, which is hereby incorporated by reference in its entirety.

According to another embodiment, the plant part is leaf.

15 Also contemplated herein are plants of the genus *Gynostemma*.

Origanum Syriacum

According to a specific embodiment, the plants of this species include flavones, monoterpenoids and monoterpenes. Over 60 different compounds have been identified, with the primary ones being carvacrol and thymol ranging to over 80%, while lesser
20 abundant compounds include p-cymene, γ -terpinene, caryophyllene, spathulenol, germacrene-D, β -fenchyl alcohol and δ -terpineol.

The table below shows a profile of the organic compounds identified in *Origanum* extract through fractional distillation:

Profile of the organic compounds found in the fractions analyzed.

25

Compound	Boiling Point °C	Code	% de Relative Area				Unoil	Ooil
			F1	F2	F3	F4		
α -thujene	150–152	MH1	5.03	0.389	ND		ND	1.74
α -pinene	156	MH2	3.01	ND	ND	ND	ND	1.07
β -myrcene	166–168	MH3	11.62	6.93	1.08	ND	ND	5.50
Phellandrene	172	MH4	1.32	1.00	ND	ND	ND	0.72
α -terpinene	174	MH5	8.91	8.32	2.90	ND	ND	5.57

o-cymene	174	MH6	47.96	53.97	38.14	1.31	0.973	39.13
Limonene	175	MH7	2.29	2.71	1.25	ND	ND	1.58
1,8-cineole	177	MO1	1.51	1.77	2.74	ND	ND	1.53
γ -terpinene	181–183	MH8	15.59	24.43	40.57	1.40	0.94	22.34
Thymol	232	MO2	ND	ND	ND	5.08	3.77	
	1.71							
Carvacrol	237–238	MO3	ND	ND	4.58	60.03	64.31	12.60
Trans-caryophyllene	268	SeH1	ND	ND	2.97	18.96	13.78	3.47
α -humulene	276	SeH2	ND	ND	0.34	6.16	8.36	1.56
Monoterpene hydrocarbons (MH)			95.73	97.75	83.94	2.71	1.91	77.65
Monoterpene oxygenated (MO)			1.51	1.77	7.32	65.11	68.08	15.84
Sesquiterpene hydrocarbons (SeH)			ND	ND	3.31	25.12	22.14	5.03
Total identified components			97.24	99.52	94.57	92.94	92.13	98.52

Oregano essential oil (Ooil) was obtained through the steam entrainment method and the oil fractions through a fractional distillation system. The first fraction started to distill at a temperature of 82 °C and the last fraction distilling at 140 °C, finally undistilled oil (Unoil) was obtained. At the end of the process, five fractions named Fraction 1 (F1), Fraction 2 (F2), Fraction 3 (F3), Fraction 4 (F4), and undistilled oil (Unoil) were obtained.

When Origanum extract was analyzed on HPLC, a variety of phenolic compounds were identified:

Phenolic compounds determined by the HPLC method in *O. vulgare* ssp. *vulgare* extract.

Compounds	[M – H] [–] , <i>m/z</i>	Retention Time (t _R), min	UV Detection	MS Detection	Concentration (mg/g)
Gentisic acid	153	3.69 ± 0.04	NO	YES	<0.02
Chlorogenic	353	6.43 ± 0.05	YES	YES	2.10 ± 0.14

Compounds	[M – H] [–] , <i>m/z</i>	Retention Time (t _R), min	UV Detection	MS Detection	Concentration (mg/g)
acid					
<i>p</i> -Coumaric acid	163	9.48 ± 0.08	NO	YES	<0.02
Hyperoside	463	18.60 ± 0.12	YES	YES	1.05 ± 0.03
Isoquercitrin	463	20.29 ± 0.10	YES	YES	0.71 ± 0.19
Rutin	609	20.76 ± 0.15	YES	YES	0.64 ± 0.15
Rosmarinic acid	360	21.80 ± 0.10	YES	YES	12.83 ± 2.19
Quercitrin	447	23.64 ± 0.13	YES	YES	0.50 ± 0.08
Quercetin	301	27.55 ± 0.15	NO	YES	<0.02
Luteolin	285	29.64 ± 0.19	YES	YES	0.10 ± 0.04

Values are the mean ± SD (n = 3).

Total polyphenol content and antioxidant activity of *O. vulgare* ssp. *vulgare* extract.

Sample	TPC (mg GAE/g)	Flavonoid (mg RE/g)	Caffeic Acids (mg CAE/g)	CUPRAC (μM TE/g)	FRAP (μM TE/g)	SO Scavenging (μM TE/g)
<i>O. vulgare</i>	94.69 ± 4.03	38.46 ± 3.54	29.92 ± 1.08	1284 ± 66	794.40 ± 25.80	44.00 ± 0.56

Each value is the mean ± SD of three independent measurements. TPC, total polyphenols content; SO, superoxide; GAE, gallic acid equivalents; RE, rutin equivalents; CAE, caffeic acid equivalents; TE, Trolox equivalents.

5

According to a specific embodiment, the active ingredient or combination thereof includes an organic compound component of *Origanum* extract.

According to a specific embodiment, the active ingredient or combination thereof is selected from the group consisting of α -thujene, α -pinene, β -myrcene, Phellandrene, α -terpinene, o-cymene, Limonene, 1,8-cineole, γ -terpinene, Thymol, Carvacrol, Trans-caryophyllene and α -humulene.

5 According to a specific embodiment, the active ingredient or combination thereof includes a monoterpene hydrocarbon, an oxygenated monoterpene and a sesquiterpene hydrocarbon.

According to a specific embodiment, the active ingredient or combination thereof includes a phenolic compound, e.g., gentisic acid, chlorogenic acid, *p*-coumaric acid,
10 hyperoside, isocitric acid, rutin, rosmarinic acid, quercetin, quercetin and luteolin.

According to a specific embodiment, the active ingredient or combination thereof includes a mineral, e.g., potassium, calcium, magnesium, phosphorus, aluminum, iron, sodium, boron, zinc, cadmium, selenium.

According to embodiments of the present invention the active ingredients of the
15 present of the invention may be synthetic analogues.

According to an aspect of the invention there is provided a food supplement, *composition or extracts further including "Beduin Tea" comprising*
Rose Leaves Micromeria fruticosa, Salvia, cymbopogon (Citra), Aloysia, verben
officinalis, origanum majorana, mentha

20 According to another aspect of the invention there is provided a food supplement, *composition or extracts further including "Beduin Tea" comprising*
Thyme, sage, cardamom, cinnamon, Habuk, Marmaya, black tea.

25

30 The term "plant" as used herein encompasses whole plants, a grafted plant, ancestors and progeny of the plants and plant parts, including seeds, flowers, bark, shoots, stems, roots (including tubers), fruit, rootstock, scion, and plant cells, tissues and organs.

According to a specific embodiment, the plant part is a seed.

According to a specific embodiment, the plant part is a fruit.

According to a specific embodiment, the plant part is a leaf.

According to a specific embodiment, the plant part is a stem.

According to a specific embodiment, the plant part is a flower.

5 The plant part can be a solid part or a non-solid part such as oil or aqueous portions of the plant.

 The plant may be in any form including suspension cultures, embryos, meristematic regions, callus tissue, leaves, gametophytes, sporophytes, pollen, and microspores.

 The term plant refers to a wild plant or a cultivated variety thereof.

10 As used herein the term "plant species" refers to a sub-group of one or more plants within the genus. These plants will share similar characteristics with each other. There may be a single plant within a species, or there may be many hundreds of plants. The term intends to include subspecies, such as grown or can be found in different geographical location, e.g., Lebanese Sumac and Syrian Sumac.

15 As used herein "plant genus" refers to a taxonomic rank below family and above species.

 It will be appreciated that the relevant species and genera and listed below and each option or combination thereof represents a different embodiment of the invention.

 The term "extraction" refers to a separation process which relies on the separation
20 of one or more analytes from the components of a sample other than the one or more analytes. Extractions are processes that typically use two immiscible phases to separate one or more solutes from one phase into the other. The distribution of a solute between two phases is an equilibrium condition described by partition theory. For example, boiling tea leaves in water extracts the tannins, theobromine, and caffeine out of the leaves and into
25 the water. More typical extractions performed typically but not only in a laboratory are settings of organic compounds out of an aqueous phase and into an organic phase. Common extractants are arranged from ethyl acetate to water (ethyl acetate<acetone<ethanol<methanol<acetone: water (7:3)<ethanol:water (8:2)<methanol:water (8:2)<water) in increasing order of polarity according to the
30 Hildebrand solubility parameter. Procedures for plant extraction are provided in Figures 1A-C.

 The term "extract" as used herein refers to the result of such process of separation that can take the form of a solution formulation or other chemical form depending on the

extraction process. In particular, the term extract can relate to a substance made by extracting a part of a sample (e.g. a raw material), such as by using a solvent such as ethanol or water. In various instances an extract relates to a solvent that is enriched in one or more solute. In particular, a "plant extract" in the sense of the present disclosure
5 typically comprises a concentrated preparation of a plant material obtained by isolating or purifying desired active constituents with one or more extraction processes.

The choice of the solvent depends on the desired component to be obtained. For example, to extract polar components in an extraction process suggested solvents include, but are not limited to, water, ethanol methanol or butanol while for non polar compounds
10 diethyl ether, hexane or chloroform depending on the use of the extract. For midpolar one may choose Ethyl acetate but other solvents can be used as well.

The general procedure of solid/liquid extraction can be scaled in five different ways:

Maceration: the contact stage is maintained at room temperature.

15 Decoction or reflux: the contact stage is maintained at the boiling point of the solvent.

Digestion: the contact stage is maintained at a temperature in between those of the previous two cases.

20 Infusion: the boiling solvent is poured over the solid, then left to cool for a set time.

Leaching or percolation: the solvent passes through the biomass.

It is also possible to combine these methods with each other or with other processes such as distillation, steam distillation, rectification, etc.

25 According to another embodiment, the use of various solvents, either successively or in combination is contemplated and the ordinary skilled of organic chemistry will know which to choose according to the active ingredient as described below.

Extraction may be further assisted by other means such as ultrafiltration, reverse osmosis, high pressure (supercritical CO₂), microwaves, ultrasound, etc.

30 In some embodiments, the plant part is contacted with a polar solvent (e.g. ethanol) or nonpolar solvent (e.g., hexane or pentane) for several minutes, e.g., 15 minutes or more, about 30 minutes or more, about 1 hour or more, about 2 hours or more, or about 5 hours or more.

Temperature can also be controlled during the contacting.

According to specific embodiments, the plant part is contacted with the solvent (e.g. ethanol) while being constantly mixed e.g. on a shaker.

It will be appreciated that the extraction process can also be solvent-free.

For example, solvent-free microwave extraction (SFME) has been proposed as a
5 green method for the extraction of essential oil from aromatic herbs that are extensively
used in the food industry. This technique is a combination of microwave heating and dry
distillation performed at atmospheric pressure without any added solvent or water. The
isolation and concentration of volatile compounds is performed in a single stage. In some
embodiments, SFME and/or hydro-distillation (HD), are used for the extraction of essential
10 oil from the plants of the invention.

In some embodiments, the process of the present invention comprises isolating a
liquid extract (i.e. filtered extract) from the mixture (i.e. crude extract) comprising the
liquid extract and solids. Suitable means for isolating the liquid extract (i.e. filtered
extract) include those known in the art of organic synthesis and include, but are not limited
15 to, gravity filtration, suction and/or vacuum filtration, centrifuging, setting and decanting,
and the like. In some embodiments, the isolating comprises filtering a liquid extract
through a porous membrane, syringe, sponge, zeolite, paper, or the like having a pore size
of about 1-5 μm , about 0.5-5 μm , about 0.1-5 μm , about 1-2 μm , about 0.5-2 μm , about
0.1-2 μm , about 0.5-1 μm , about 0.1-1 μm , about 0.25-0.45 μm , or about 0.1-0.5 μm (e.g.
20 about 2 μm , about 1 μm , about 0.45 μm , or about 0.25 μm).

According specific embodiments, the present invention contemplates drying (i.e.
removal of the polar/non-polar solvent) and/or freezing the filtered extract following
generation thereof.

The method for drying the filtered extract (i.e. removing the polar solvent) is not
25 particularly limited, and can include solvent evaporation at a reduced pressure (e.g., sub-
atmospheric pressure) and/or an elevated temperature (e.g., above about 25 °C). In some
embodiments, it can be difficult to completely remove a solvent from a liquid extract by
standard solvent removal procedures such as evaporation. In some embodiments,
processes such as co-evaporation, lyophilization, and the like can be used to completely
30 remove the polar solvent from a liquid fraction to form a dry powder, dry pellet, dry
granulate, paste, and the like. According to a specific embodiment the polar solvent is
evaporated with a vacuum evaporator.

The selection of the extraction process much depends on the component to be isolated.

It will be appreciated that following generation of the extract, specific embodiments of the present invention further contemplate additional purification steps so as to further isolate/purify active agents from the extract, for example, by fractionating the filtered extract.

As used herein "a fraction" refers to a portion of the extract that contains only certain chemical ingredients of the extract but not all.

Fractionating can be performed by processes such as, but not limited to: column chromatography, preparative high performance liquid chromatography ("HPLC"), reduced pressure distillation, and combinations thereof.

According to a specific embodiment, fractionating is performed by HPLC.

In some embodiments, fractionating comprises re-suspending the filtered extract in a polar solvent (such as methanol, as discussed above), applying the polar extract to a separation column, and isolating the extract having the anti-Coronavirus activity by column chromatography (preparative HPLC).

An eluting solvent is applied to the separation column with the polar extract to elute fractions from the polar extract. Suitable eluting solvents for use include, but are not limited to, methanol, ethanol, propanol, acetone, acetic acid, methylethyl ketone, acetonitrile, butyronitrile, carbon dioxide, ethyl acetate, tetrahydrofuran, di-isopropylether, ammonia, triethylamine, N,N-dimethylformamide, N,N-dimethylacetamide, and the like, and combinations thereof.

According to an alternative or an additional embodiment, liquid chromatography comprises high performance liquid chromatography (HPLC).

According to an alternative or an additional embodiment, liquid chromatography is performed on a reverse stationary phase.

The fractions may be characterized by analytical methods such as, but not limited to, spectroscopic methods such as, but not limited to, ultraviolet-visible spectroscopy ("UV-Vis"), infrared spectroscopy ("IR"), and the like; mass-spectrometry ("MS") methods such as, but not limited to, time-of-flight MS; quadrupole MS; electrospray MS, Fourier-transform MS, Matrix-Assisted Laser Desorption/Ionization ("MALDI"), and the like; chromatographic methods such as, but not limited to, gas-chromatography ("GC"), liquid chromatograph ("LC"), high-performance liquid chromatography ("HPLC"), and the like;

and combinations thereof (e.g., GC/MS, LC/MS, HPLC/UV-Vis, and the like), and other analytical methods known to persons of ordinary skill in the art.

The component (active ingredients, extract and/or fractions) obtained may be tested for reducing Crononavirus infection or symptoms thereof. Exemplary methods for testing
5 the effect are further described herein below as well as in the Examples section which follows.

The active ingredients, extract and/or fraction described herein may be immediately used or stored until further used.

According to specific embodiments, the active ingredients, extract and/or fractions
10 is kept frozen, e.g. in a freezer, until further use (e.g. at about -20 °C to -90 °C, at about -70 °C to -90 °C, e.g. at -80 °C), for any required length of time.

According to other specific embodiments, the active ingredients, extract and/or fractions is immediately used (e.g. within a few minutes e.g., up to 30 minutes).

The active ingredients, extract and/or fractions may be used separately.
15 Alternatively, different active ingredients, extract and/or fractions (e.g. from different plants or from separate extraction procedures) may be pooled together. Likewise, different active ingredients, extract and/or fractions (from the same extract, from different extracts, from different plants and/or from separate extraction procedures) may be pooled together.

Using the present teachings, the present inventor was able to identify not only
20 plants and extracts that can be used to effectively combat Coronavirus, but also active ingredients thereof.

“Active ingredient” refers to a defined chemical composition which is responsible for the anti (preventive or therapeutic) effect against Coronavirus.

The active ingredient can be purified from a plant or chemically synthesized
25 (artificial, man-made).

Also contemplated herein are analogs and derivatives of the active ingredients as long as the anti (preventive or therapeutic) effect against Coronavirus is maintained (see e.g., Examples section which follows), which are also referred to as mimetics.

Following are some non-limiting examples for extraction of active ingredients from
30 selected plants of the present invention.

Extraction from leaves of *T. capitatus* - The Aerial parts of *T. capitatus* (leaves) samples are collected. Leaves separated from branches are dehydrated at room temperature for 7 days and slightly blended into fine powders for extractions.

Essential oil (EO) extraction - hydro-distillation is used to extract EO from the plant, e.g., dried aerial parts of *T. capitatus*. In brief, the extraction is conducted for several hours for example, 3 h, by mixing 100 g of plants in 500 mL of distilled water. The extract is dried and concentrated using sodium sulphate and rotatory evaporator under
5 reduced pressure. The EO yield is established by quantity of the obtained oil in mL for 100 g of dried plant. Finally, the pure EO is stored at -4°C until further analyzed.

Essential oil analysis - The chemical composition of EO is examined by GC and GC-MS. GC analysis is conducted using gas chromatograph. The proportion of the constituents is determined by the integration of peak areas. In addition, mass spectrometry
10 (MS) can be used to analyze the EO typically under the same conditions as described above for gas chromatography. The identification of the different compounds is defined by comparison of their retention indexes (determined relatively to the retention times of a series of n-alkanes) with those of standards of the Wiley library search routines¹², based on fit and purity of mass spectra. Such conditions are used for determining the active
15 ingredients as described below.

Extraction from *Satujera Thymbra*:

Air dried aerial parts from *S. thymbra* were collected in Lebanon at random during April 2009. For 3 h the plant material was submitted to steam distillation using a cleverger-type apparatus to produce the essential oil with a yield of 0.84% (w/w). Oil is
20 dried using anhydrous magnesium sulfate and stored at 4°C . *S. thymbra* oil was analyzed by GC/MS.

Extraction from *Rhus coriaria* (Sumac)

In order to isolate, determine and identify the compounds from the *Rhus coriaria* fruits, different extracts are taken from the fruit or leaves of the Sumac plant.
25 Some are isolated from aqueous extracts, others from alcoholic extracts and some from lipid extracts. Hydrolysable tannins compose the highest percentage in the Sumac fruits, followed by flavonoids. This emphasizes the antioxidant potential of the fruit. Following hydrolysable tannins, comprising almost 20% of the fruit's mass, are other unidentified compounds. Subsequently there are anthocyanins, isoflavonoids, terpenoids and
30 diterpenes. The chemical properties analysis of sumac fruit is conducted on ripe fruits and have found a 2.6% protein content, 7.4% fat content, 14.6% fiber content, 1.8% ash. Also, a calorimetric calculation showed that 100g of sumac fruit contains 147.8 kcal.

Extraction of thymoquinone from *Nigella sativa*

Various methods can be used including microwave-assisted extraction system having temperature controlling function as well as other extraction methods, Soxhlet and conventional solid/liquid extraction.

5 **Nigella Sativa**

<u>24-ETHYL-LOPHENOL</u>	Seed Oil		
<u>24-METHYL-LOPHENOL</u>	Seed Oil		
<u>24-METHYLENE-CYCLOARTANOL</u>	Seed Oil		
<u>5-DEHYDRO-AVENASTEROL</u>	Seed Oil		
<u>7-DEHYDRO-AVENASTEROL</u>	Seed Oil		
<u>ALANINE</u>	Seed	8,000	10,255
<u>ALPHA-SPINASTEROL</u>	Seed Oil		
	Seed		
<u>ARABIC-ACID</u>	Seed		
<u>ARACHIDIC-ACID</u>	Seed Oil		1,900
<u>ARACHIDONIC-ACID</u>	Seed Oil		24,900
<u>ARGININE</u>	Seed	41,500	53,050
<u>ASCORBIC-ACID</u>	Leaf		2,577
<u>ASH</u>	Seed	38,000	53,000
<u>ASPARAGINE</u>	Seed		0
<u>ASPARTIC-ACID</u>	Seed	10,670	13,650
<u>ASTRAGALIN</u>	Seed		200
<u>BETA-AMYRIN</u>	Seed Oil		
	Seed Oil		
<u>BETA-SITOSTEROL</u>	Seed		3,218
<u>BUTYROSPERMOL</u>	Seed Oil		
<u>CALCIUM</u>	Seed		10,600
<u>CAMPESTANOL</u>	Seed Oil		
<u>CAMPESTEROL</u>	Seed Oil		
	Seed		
<u>CARBOHYDRATES</u>	Seed		339,600
<u>CARVONE</u>	Seed		
	Essent. Oil		
	Seed	2,250	9,600
<u>CHOLESTEROL</u>	Seed Oil		
	Seed		
<u>CITROSTADIENOL</u>	Seed Oil		
<u>CYCLOARTENOL</u>	Seed Oil		
<u>CYCLOEUCALENOL</u>	Seed Oil		

<u>CYMENE</u>	Seed		
<u>CYSTINE</u>	Seed		
<u>D-LIMONENE</u>	Seed		
<u>DAMASCENINE</u>	Plant		
<u>DEHYDROASCORBIC-ACID</u>	Leaf		295
<u>DITHYMOQUINONE</u>	Seed Oil		
<u>EICOSADIENOIC-ACID</u>	Seed Oil		25,000
	Seed	8,979	10,525
<u>EO</u>	Seed Oil		4,500
	Seed	4,000	16,000
<u>FAT</u>	Seed	354,900	416,000
<u>FIBER</u>	Seed		55,000
<u>FIXED-OIL</u>	Seed		380,000
<u>GLUCOSE</u>	Seed		
<u>GLUTAMIC-ACID</u>	Seed	28,085	35,900
<u>GLYCINE</u>	Seed	8,840	20,700
<u>GRAMISTEROL</u>	Seed Oil		
<u>hederagenin</u>	Seed		10,000
<u>INDOLE-3-ACETIC-ACID</u>	Tissue Culture		14
<u>IRON</u>	Seed		140
<u>ISOLEUCINE</u>	Seed	8,570	10,960
<u>KAEMPFEROL-3-O-BETA-GLUCOPYRANOSYL-(1.2)-O-BETA-GALACTOPYRANOSYL-(1.2)-BETA-GLUCOPYRANOSIDE</u>	Seed		100
<u>LEUCINE</u>	Seed	23,130	29,595
<u>LINOLEIC-ACID</u>	Seed Oil	487,600	576,300
	Seed	128,124	233,459
<u>LINOLENIC-ACID</u>	Seed Oil	5,700	7,000
	Seed	2,484	2,912
<u>LIPASE</u>	Seed		
<u>LOPHENOL</u>	Seed Oil		
<u>LYSINE</u>	Seed	16,200	20,700
<u>MELANTHIGENIN</u>	Seed		
<u>MELANTHIN</u>	Plant		15,000
	Seed		15,000
<u>METHIONINE</u>	Seed	13,100	16,750
<u>MYRISTIC-ACID</u>	Seed Oil	1,900	18,000
	Seed	567	1,082
<u>NIGELLICINE</u>	Seed		
<u>NIGELLIDINE</u>	Seed		

<u>NIGELLIMINE</u>	Seed		0.13
<u>NIGELLIMINE-N-OXIDE</u>	Seed		0.2
<u>NIGELLIN</u>	Seed		
<u>NIGELLINE</u>	Seed Essent. Oil		
<u>NIGELLONE</u>	Seed Essent. Oil		
	Plant		
	Seed		
<u>OBTUSIFOLIOL</u>	Seed Oil		
<u>OLEIC-ACID</u>	Seed Oil	244,600	262,400
	Seed	89,911	184,912
<u>PALMITIC-ACID</u>	Seed Oil	120,000	171,200
	Seed	22,464	50,523
<u>PALMITOLEIC-ACID</u>	Seed Oil		2,000
<u>PHENYLALANINE</u>	Seed	16,850	21,560
<u>PHYTOSTEROLS</u>	Seed		5,100
<u>POTASSIUM</u>	Seed		5,820
<u>PROLINE</u>	Seed	11,350	14,520
<u>PROTEIN</u>	Seed	210,000	271,900
<u>QUERCETIN-3'-GLUCOSIDE</u>	Seed		440
<u>QUERCETIN-3-O-(6-FERULOYL-BETA-GLUCOPYRANOSYL)-(1.2)-BETA-GALACTOPYRANOSYL-(1.2)-BETA-GLUCOPYRANOSIDE</u>	Seed		240
<u>QUERCETIN-3-O-BETA-GLUCOPYRANOSYL-(1.2)-O-BETA-GALACTOPYRANOSYL-(1.2)-BETA-GLUCOPYRANOSIDE</u>	Seed		1,380
<u>RESIN</u>	Seed		
<u>RUTIN</u>	Seed		200
<u>SERINE</u>	Seed	4,210	5,385
<u>SODIUM</u>	Seed		980
<u>STEARIC-ACID</u>	Seed Oil	18,100	60,400
	Seed	8,722	10,192
<u>STIGMAST-7-EN-3-BETA-OL</u>	Seed Oil		
<u>STIGMASTANOL</u>	Seed Oil		
<u>STIGMASTEROL</u>	Seed Oil		
	Seed		
<u>TANNIN</u>	Seed		
<u>TARAXEROL</u>	Seed Oil		
<u>TELFAIRIC-ACID</u>	Seed Oil		
<u>THREONINE</u>	Seed	2,615	3,345
<u>THYMOHYDROQUINONE</u>	Seed		
<u>THYMOL</u>	Seed Oil		

<u>THYMOQUINONE</u>	Seed Essent. Oil		
	Seed Oil		
<u>TIRUCALLOL</u>	Seed		
	Seed Oil		
<u>TRYPTOPHAN</u>	Seed		
<u>TYROSINE</u>	Seed	12,925	16,530
<u>VALINE</u>	Seed	6,500	8,325

According to a specific embodiment, active ingredients (e.g., which can be obtained by supercritical carbon dioxide extraction method) include but are not limited to:

Compound	RI _{exp}	RI _{lit}	SFE 1	SFE 2	HD SFE	Identification
<i>n</i> -Nonane ^a	905	900	0.12	—	—	RI, MS
Tricyclene	926	926	tr	—	—	RI, MS
Camphene	953	953	—	—	1.64	RI, MS
β -Pinene	958	959	—	—	0.40	RI, MS
2,4,(10)-Thujadiene	967	960	4.74	0.19	—	RI, MS
Sabinene	978	977	1.05	—	—	RI, MS
β -Myrcene	990	991	0.31	—	—	RI, MS
1,8-Cineole	1013	1010	—	—	0.98	RI, MS
α -Terpinene	1025	1026	2.34	—	—	RI, MS
Limonene	1034	1034	0.18	0.38	1.03	RI, MS
γ -Terpinene	1054	1056	27.46	13.20	12.87	RI, MS
<i>cis</i> -Sabinene hydrate	1063	1068	—	0.38	Tr	RI, MS
<i>allo</i> -Ocimenol ^a	1079	1071	—	0.11	—	RI, MS
Linalool	1087	1080	0.25	0.19	—	RI, MS
Terpinolene	1091	1088	—	—	Tr	RI, MS
<i>trans</i> -Sabinene hydrate	1099	1097	0.37	—	—	RI, MS
Terpinen-1-ol ^a	1124	1120	—	—	0.11	RI, MS

Compound	RI _{exp}	RI _{lit}	SFE 1	SFE 2	HD SFE	Identification
1,5,8-p-Menthatriene ^a	1130	1135	0.43	0.38	—	RI, MS
Borneol	1152	1152	—	—	1.02	RI, MS
Pinocarvone	1167	1165	2.96	3.00	—	RI, MS
<i>trans</i> -Dihydrocarvone	1208	1202	—	0.19	—	RI, MS
Dihydrocarvone ^a	1215	1214	0.37	2.06	—	RI, MS
Ocimenone (E) ^a	1249	1239	1.54	1.50	—	RI, MS
Thymoquinone	1250	1250	35.05	33.12	38.41	RI, MS, NMR
Thymol	1283	1288	7.43	5.30	16.95	RI, MS, NMR
Carvacrol	1299	1299	1.98	1.73	0.81	RI, MS
2-Undecanone	1312	1315	—	—	13.72	RI, MS
<i>n</i> -Octyl isobutyrate ^a	1323	1326	—	—	0.12	RI, MS
α -Longipinene	1330	1334	0.26	—	—	RI, MS
Citronellyl acetate ^a	1339	1336	—	—	0.50	RI, MS
Thymohydroquinone methyl ether ^a	1353	1351	—	—	Tr	RI, MS
Cyclosativene	1367	1366	—	—	1.43	RI, MS
α -Longicyclene	1381	1380	0.43	5.25	—	RI, MS
α -Copaene	1385	1383	1.54	2.00	0.41	RI, MS
α -Longifolene	1391	1387	—	—	0.51	RI, MS
(<i>Z</i>)-Caryophyllene ^a	1395	1395	0.23	—	—	RI, MS
β -Caryophyllene	1420	1417	2.89	5.07	4.80	RI, MS
Thymohydroquinone dimethylether ^a	1429	1425	0.43	—	—	RI, MS
Aromadendrene ^a	1437	1438	—	—	1.04	RI, MS

Compound	RI _{exp}	RI _{lit}	SFE 1	SFE 2	HD SFE	Identification
Thymohydroquinone	1515	1509	1.17	1.12	2.31	RI,MS,NMR
Davanone ^a	1587	1586	0.31	—	—	RI, MS
8-Heptadecene ^a	1683	1680	1.23	1.13	0.86	RI, MS
Dihydrofarnesyl acetate ^a	1841	1840	2.28	4.69	—	RI, MS
Pimaradiene ^a	1934	1935	1.23	2.25	—	RI, MS
Palmitic acid	1947	1946	0.18	—	—	RI, MS
Pimara-8(14),15-diene	1968	1966	0.92	—	—	RI, MS
Octadecanoic acid	2145	2157	0.26	12.31	—	RI, MS
Total identified			99.94	95.55	99.92	
Grouped compounds:						
Quinones			44.08	39.54	57.67	
Monoterpene hydrocarbons			36.51	14.15	15.94	
Oxygenated monoterpenes			7.47	9.16	17.14	
Sesquiterpene hydrocarbons			5.35	12.32	8.19	
Oxygenated sesquiterpenes			2.59	4.69	—	
Diterpenes			2.15	2.25	—	
Alkane			0.12	—	—	
Alkenes			1.23	1.13	0.86	
Fatty acids			0.44	12.31	—	
Fatty acid esters			—	—	0.12	

Additional plants that are contemplated herein are of the genus *Nigella*.

Nigella is a genus of 18 species of annual plants in the family Ranunculaceae, native to Southern Europe, North Africa, South Asia, Southwest Asia and Middle East.

- 5 Common names applied to members of this genus are *nigella*, devil-in-a-bush or love-in-a-mist.

- Nigella arvensis*
Nigella carpatha
Nigella damascena
Nigella degenii
5 *Nigella deserti*
Nigella doerfleri
Nigella elata
Nigella fumariifolia
Nigella hispanica
10 *Nigella latisecta*
Nigella nigellastrum
Nigella orientalis
Nigella oxypetala
Nigella papillosa
15 *Nigella sativa*
Nigella segetalis
Nigella stricta
Nigella unguicularis

According to a specific embodiment the active ingredient is thymoquinone.

- 20 Additional plants containing thymoquinone include, but are not limited to:

Monarda fistulos (of the genus *Monarda*);

Satureja montana (of the genus *Satureja*);

Additional families containing thymoquinone include, but are not limited to:

Asteraceae - examples include, but are not limited to the subfamilies:

- Barnadesioideae Bremer & Jansen
- Carduoideae Sweet
25 - Cichorioideae Chevallier
- Corymbioideae Panero & Funk
- Famatinanthoideae S.E. Freire, Ariza & Panero
- Gochnatioideae Panero & Funk
- Gymnarrhenioideae Panero & Funk

- Hecastocleidoideae Panero & Funk
- Mutisioideae Lindley
- Pertyoideae Panero & Funk
- Stifftioideae Panero
- 5 • Wunderlichioideae Panero & Funk

Cupressaceae

-
- Cunninghamioideae
 - Taiwanoideae
 - Athrotaxidoideae
 - Sequoioideae
 - 10 • Taxodioideae
 - Callitroideae
 - Cupressoideae
 - *Incertae sedis*

Lamiaceae

- 15 Ranunculacea
- Hydrastidoideae
- Glaucidoideae
- Coptoideae
- Thalictrioideae
- 20 • Ranunculoideae

List of plants that contain Carvacrol include, but are not limited to:

Monarda didyma

Nigella sativa

Origanum compactum

- 25 *Origanum dictamnus*

Origanum microphyllum

Origanum onites

Origanum scabrum

Origanum syriacum

*Origanum vulgare**Plectranthus amboinicus**Thymus glandulosus**Lavandula multifida*5 *Origanum minutiflorum**Satureja thymbra***Active ingredients found in Thymus Capitatus**

No	RI	Compound	%
1	935	α -Thujene	0.54
2	940	α -Pinene	0.38
3	991	Myrcene	0.87
4	1019	α -terpinene	1.11
5	1025	p-Cymene	6.25
6	1063	γ-Terpinene	6.75
7	1089	α -terpinolene	0.26
8	1101	Linalool	1.51
9	1179	Terpinen-4-ol	1.40
10	1185	4-Carvomenthenol	0.94
11	1260	Geraniol	0.25
12	1309	Carvacrol	65.38
13	1310	Thymol	1.35
14	1358	Eugenol	0.21
15	1408	Carvacryl Acetate	0.45
16	1427	β-Caryophyllene	4.94

No	RI	Compound	%
17	1461	α -Humulene	0.10
18	1487	allo-aromadendrene	0.18
19	1685	α -Bisabolol	0.35
20	1774	α -Bisabolol oxide A	0.11
21	1815	Hexadecanal	0.14
22	1870	1-Hexadecanol	0.46
23	1879	1-Hexadecanol	0.13
24	1894	Rimuene	0.28
25	1957	Hexadecanoic acid	0.68
		Total identified	95.02
		Unknown	4.98

Additional plants contemplated herein are of the genus *Thymus*.

The genus *Thymus* (/ˈtʌməs/ TY-məs; thymes) contains about 350 species of aromatic perennial herbaceous plants and subshrubs to 40 cm tall in the family Lamiaceae, native to temperate regions in Europe, North Africa and Asia.

Stems tend to be narrow or even wiry; leaves are evergreen in most species, arranged in opposite pairs, oval, entire, and small, 4–20 mm long, and usually aromatic. Thyme flowers are in dense terminal heads with an uneven calyx, with the upper lip three-lobed, and are yellow, white, or purple.

Several members of the genus are cultivated as culinary herbs or ornamentals, when they are also called thyme after its best-known species, *Thymus vulgaris* or common thyme.

About 350 species, including:

Thymus adamovicii

Thymus altaicus

- Thymus amurensis*
Thymus boissieri
Thymus bracteosus
Thymus broussonetii
5 *Thymus caespititius*
Thymus camphoratus
Thymus capitatus
Thymus capitellatus
Thymus camphoratus
10 *Thymus carnosus*
Thymus cephalotus
Thymus cherlerioides
Thymus ciliatus
Thymus cilicicus
15 *Thymus cimicinus*
Thymus citriodorus (*Thymus* × *citriodorus*) syn. *T. fragrantissimus*, *T. serpyllum*
citratus, *T. serpyllum citriodorum*.^[7] – citrus thyme
Thymus comosus
Thymus comptus
20 *Thymus curtus*
Thymus decussatus
Thymus disjunctus
Thymus doerfleri
Thymus glabrescens
25 *Thymus herba-barona*
Thymus hirsutus
Thymus hyemalis
Thymus inaequalis
Thymus integer
30 *Thymus lanuginosus*, syn. *T. serpyllum* – woolly thyme
Thymus leucospermus
Thymus leucotrichus
Thymus longicaulis

- Thymus longiflorus*
Thymus mandschuricus
Thymus marschallianus
Thymus mastichina
5 *Thymus membranaceus*
Thymus mongolicus
Thymus moroderi
Thymus nervulosus
Thymus nummularis
10 *Thymus odoratissimus*
Thymus pallasianus
Thymus pallidus
Thymus pannonicus
Thymus praecox – creeping thyme
15 *Thymus proximus*
Thymus pseudolanuginosus, syn. *T. serpyllum* – woolly thyme
Thymus pulegioides – lemon thyme ^[8]
Thymus quinquecostatus
Thymus richardii
20 *Thymus satureioides*
Thymus serpyllum
Thymus sibthorpii
Thymus striatus
Thymus thracicus – lavender thyme
25 *Thymus villosus*
Thymus vulgaris – common thyme
Thymus zygis

List of plants that contain thymol include, but are not limited to:

- Euphrasia rostkoviana*
30 *Lagoecia cuminoides*
Monarda didyma
Monarda fistulosa
Mosla chinensis, Xiang Ru

*Origanum compactum**Origanum dictamnus**Origanum onites**Origanum vulgare*5 *Satureja thymbra**Thymus glandulosus**Thymus hyemalis**Thymus vulgaris**Thymus zygis*10 *Trachyspermum ammi*Active ingredients in *Thymus vulgaris*:

Chemical	Plant part	Low ppm	High ppm
<u>1-OCTEN-3-OL</u>	Shoot		150
	Shoot		65
	Shoot		80
<u>2,5-DIETHYL-TETRAHYDROFURAN</u>	Shoot		0
	Shoot		6
	Shoot		6
<u>3-OCTANOL</u>	Shoot		110
	Shoot		12
	Shoot		30
<u>ALPHA-GUAIENE</u>	Shoot		0.1
	Shoot		6
	Shoot		0
<u>ALPHA-HUMULENE</u>	Shoot		45
	Shoot		20
	Shoot		55
<u>ALPHA-PHELLANDRENE</u>	Shoot		0

	Shoot		40
	Shoot		12
<u>ALPHA-PINENE</u>	Shoot		0
	Shoot		265
	Shoot		325
<u>ALPHA-TERPINENE</u>	Shoot		840
	Shoot		990
	Shoot		990
<u>ALPHA-TERPINEOL</u>	Shoot		55
	Shoot		55
	Shoot		25
<u>ALPHA-THUJENE</u>	Shoot		320
	Shoot		0
	Shoot		0
<u>BETA-CARYOPHYLLENE</u>	Shoot		175
	Shoot		185
	Shoot		200
<u>BETA-GUAIENE</u>	Shoot		0.1
	Shoot		0
	Shoot		3
<u>BETA-PHELLANDRENE</u>	Shoot		80
	Shoot		60
<u>BETA-PHELLLANDRENE</u>	Shoot		70
<u>BETA-PINENE</u>	Shoot		30
	Shoot		30
	Shoot		560

<u>BORNEOL</u>	Shoot		55
	Shoot		30
	Shoot		15
<u>CAMPHENE</u>	Shoot		30
	Shoot		25
	Shoot		40
<u>CAMPHOR</u>	Shoot		0
	Shoot		0.1
	Shoot		0
<u>CARVACROL</u>	Shoot		1,285
	Shoot		24,850
	Shoot		23,765
<u>CARVONE</u>	Shoot		15
	Shoot		20
	Shoot		0.1
<u>CARYOPHYLLENE-OXIDE</u>	Shoot		75
	Shoot		55
	Shoot		45
<u>CIS-CARVEOL</u>	Shoot		0
	Shoot		0
	Shoot		3
<u>CIS-SABINENE-HYDRATE</u>	Shoot		20
	Shoot		0
	Shoot		55
<u>CITRONELLOL</u>	Shoot		12
	Shoot		0.1

	Shoot		0
<u>CITRONELLOL-BUTYRATE</u>	Shoot		0
<u>CITRONELLYL-BUTYRATE</u>	Shoot		0
	Shoot		15
<u>DIHYDROCARVONE</u>	Shoot		0
	Shoot		0
	Shoot		12
<u>EHTYL-CINNAMATE</u>	Shoot		0
<u>EO</u>	Shoot		31,000
	Shoot		31,000
	Shoot		31,000
<u>ETHYL-CINNAMATE</u>	Shoot		0
	Shoot		30
<u>GAMMA-TERPINENE</u>	Shoot		2,700
	Shoot		1,015
	Shoot		240
<u>GERANIOL</u>	Shoot		0
	Shoot		0
	Shoot		65
<u>GERANYL-ACETATE</u>	Shoot		0
	Shoot		0
	Shoot		15
<u>GERANYL-BUTYRATE</u>	Shoot		0
	Shoot		20
	Shoot		0
<u>GERANYL-HEXANOATE</u>	Shoot		0

	Shoot	0
	Shoot	6
<u>GERANYL-PROPIONATE</u>	Shoot	0
	Shoot	0
	Shoot	70
<u>GERMACRENE-D</u>	Shoot	0
	Shoot	0
	Shoot	50
<u>LIMONENE</u>	Shoot	110
	Shoot	55
	Shoot	90
<u>LINALOL</u>	Shoot	35
	Shoot	55
	Shoot	25
<u>METHYL-2-METHYL-BUTYRATE</u>	Shoot	6
	Shoot	12
	Shoot	9
<u>MYRCENE</u>	Shoot	750
	Shoot	565
	Shoot	0.1
<u>P-CYMENE</u>	Shoot	4,445
	Shoot	1,880
	Shoot	3,135
<u>TERPINEN-1-OL</u>	Shoot	6
	Shoot	15
	Shoot	0

<u>TERPINEN-4-OL</u>	Shoot		435
	Shoot		315
	Shoot		335
<u>TERPINOLENE</u>	Shoot		0
	Shoot		0.1
	Shoot		45
<u>THYMOL</u>	Shoot		18,560
	Shoot		385
	Shoot		280
<u>TRANS-BERGAMOTENE</u>	Shoot		9
	Shoot		9
<u>TRANS-BERGAMOTTENE</u>	Shoot		9
<u>TRANS-SABINENE-HYDRATE</u>	Shoot		25
	Shoot		120
	Shoot		0
<u>TRICYCLEN</u>	Shoot		0
	Shoot		0
	Shoot		3

Active ingredients on the EO of *Thymus vulgaris* according to some embodiments of the invention, include, but are not limited to:

No.	RT (min)	Area % of total	Constituents*
1	5.39	1.06	alpha-Thujene
2	5.63	1.07	alpha-Pinene
3	6.89	0.37	beta-Pinene

4	6.97	1.53	beta-Myrcene
5	7.53	0.33	alpha-Phellandrene
6	7.77	3.76	Carene< δ -2->
7	8.04	0.29	D-Limonene
8	8.26	0.21	beta-Phellandrene
9	8.46	8.41	para-Cymene
10	8.96	30.90	gamma-Terpinene
11	9.48	0.47	Terpineol
12	12.55	0.46	Terpinen-4-ol
13	16.17	47.59	Thymol
14	17.32	2.68	Caryophyllene
15	19.03	0.78	Cyclohexene, 1-methyl-4-(5-methyl-1-methylene-4-hexenyl)
Total		99.91%	

Active ingredients of *Satureja Thymbra*:

Air dried aerial parts from *S. thymbra* were collected in Lebanon at random during April 2009. For 3 h the plant material was submitted to steam distillation using a clevenger-type apparatus to produce the essential oil with a yield of 0.84% (w/w). Oil was dried using anhydrous magnesium sulfate and stored at 4°C. *S. thymbra* oil are analyzed by GC/MS. Nineteen compounds representing 98.8% of the oil sample are identified. The major components of *Satureja thymbra* L. oil are γ -terpinene (34.06%), carvacrol (23.07%) and thymol (18.82%). Also abundant are p -cymene (7.58%), caryophyllene (3.96%), α -terpinene (3.53%) and myrcene (1.70%).

Also contemplated herein are plants of the genus *Satureja*.

Satureja is a genus of aromatic plants of the family Lamiaceae, related to rosemary and thyme. It is native to North Africa, southern and southeastern Europe, the Middle East, and Central Asia. A few New World species were formerly included

in *Satureja*, but they have all been moved to other genera. Several species are cultivated as culinary herbs called savory, and they have become established in the wild in a few places.

Examples include, but are not limited to:

- Satureja adamovicii* Šilic - Balkans
- 5 *Satureja aintabensis* P.H.Davis - Turkey
- Satureja amani* P.H.Davis - Turkey
- Satureja atropatana* Bunge - Iran
- Satureja avromanica* Maroofi - Iran
- Satureja bachtiarica* Bunge - Iran
- 10 *Satureja boissieri* Hausskn. ex Boiss. - Turkey, Iran
- Satureja bzybica* Woronow - Caucasus
- Satureja* × *caroli-pau* G.López - Spain (*S. innota* × *S. montana*)
- Satureja cilicica* P.H.Davis - Turkey
- Satureja coerulea* Janka - Bulgaria, Romania, Turkey
- 15 *Satureja cuneifolia* Ten - Spain, Italy, Greece, Albania, Yugoslavia, Iraq
- Satureja* × *delpozoi* Sánchez-Gómez, J.F.Jiménez & R.Morales - Spain (*S. cuneifolia* × *S. intricata* var. *gracilis*)
- Satureja edmondii* Briq. - Iran
- Satureja* × *expectata* G.López - Spain (*S. intricata* var. *gracilis* × *S. montana*)
- 20 *Satureja fukarekii* Šilic - Yugoslavia
- Satureja hellenica* Halácsy - Greece
- Satureja hortensis* L.
- Satureja horvatii* Šilic - Greece, Yugoslavia
- Satureja icarica* P.H.Davis - Greek Islands
- 25 *Satureja innota* (Pau) Font Quer - Spain
- Satureja intermedia* C.A.Mey. - Iran, Caucasus
- Satureja intricata* Lange - Spain
- Satureja isophylla* Rech.f. - Iran
- Satureja kallarica* Jamzad - Iran
- 30 *Satureja kermanshahensis* Jamzad - Iran
- Satureja khuzistanica* Jamzad - Iran
- Satureja kitaibelii* Wierzb. ex Heuff. - Bulgaria, Romania, Yugoslavia
- Satureja laxiflora* K.Koch - Iran, Iraq, Turkey, Caucasus

- Satureja linearifolia* (Brullo & Furnari) Greuter - Cyrenaica region of Libya
- Satureja macrantha* C.A.Mey. - Iran, Iraq, Turkey, Caucasus
- Satureja metastasiantha* Rech.f. - Iraq
- Satureja montana* L. – winter savory - southern Europe, Turkey, Syria
- 5 *Satureja mutica* Fisch. & C.A.Mey. - Caucasus, Iran, Turkmenistan
- Satureja nabateorum* Danin & Hedge - Jordan
- Satureja* × *orjenii* Šilic - Yugoslavia (*S. horvatii* × *S. montana*)
- Satureja pallaryi* J.Thiébaud - Syria
- Satureja parnassica* Heldr. & Sart. ex Boiss. - Greece, Turkey
- 10 *Satureja pilosa* Velen. - Italy, Greece, Bulgaria
- Satureja rumelica*" Velen. - Bulgaria
- Satureja sahendica* Bornm. - Iran
- Satureja salzmannii* (Kuntze) P.W.Ball - Morocco, Spain
- Satureja spicigera* (K.Koch) Boiss. - Turkey, Iran, Caucasus
- 15 *Satureja spinosa* L. - Turkey, Greek Islands including Crete
- Satureja subspicata* Bartl. ex Vis. - Austria, Yugoslavia, Albania, Bulgaria, Italy
- Satureja taurica* Velen. - Crimea
- Satureja thymbra* L. - Libya, southeastern Europe from Sardinia to Turkey; Cyprus, Lebanon, Palestine
- 20 *Satureja thymbrifolia* Hedge & Feinbrun - Israel, Saudi Arabia
- Satureja visianii* Šilic. - Yugoslavia
- Satureja wiedemanniana* (Ave-Lall.) Velen. – Turkey

Active ingredients of *Thymbra spicata*:

Compounds	%	RI ¹	RT ²
α -pinene	0.56	1028	3.64
α -phellandrene	0.64	1033	3.71
camphene	0.06	1073	4.36
β -pinene	0.10	1113	5.16
δ -3-carene	0.05	1155	6.10
β -myrcene	1.04	1170	6.51
α -terpinene	1.48	1184	6.90
dl-limonene	0.17	1202	7.43
β -phellandrene	0.12	1212	7.69
γ -terpinene	10.73	1252	8.86
p-cymene	12.18	1276	9.69
α -terpinolene	0.05	1286	10.04
oct-1-en-3-ol	0.11	1454	16.17
trans sabinene hydrate	0.05	1465	16.59
cis sabinene hydrate	0.03	1547	19.73
linalool	0.03	1551	19.91
trans caryophyllene	1.28	1589	21.39
4-terpineol	0.53	1598	21.79
isoborneol	0.21	1694	25.36
d-carvone	0.02	1728	26.55
anethole	0.04	1826	30.05
caryophyllene oxide	0.65	1968	34.87
spathulenol	0.15	2125	39.56
thymol	2.77	2218	41.80
carvacrol	66.86	2239	42.61
naphthalene ³	0.08	2281	44.26

¹ RT – retention time; ² RI – retention index; ³ naphthalene, 1,2,3,4,4a, 5,6,7-octahydro-4a-methyl

Also contemplated herein are plants of the genus *Thymbra*.

Thymbra, common name Mediterranean thyme, is a genus of plants in the family Lamiaceae. As currently categorized, the genus has seven species and one
5 subspecies. It is native to the Mediterranean region of southern Europe, North Africa, and the Middle East.

Examples include, but are not limited to:

- Thymbra calostachya* (Rech.f.) Rech.f. - Crete
- Thymbra capitata* (L.) Cav. - widespread from Morocco + Portugal to Turkey + Palestine
- 10 *Thymbra sintenisii* Bornm. & Azn. - Iraq, Turkey
- Thymbra spicata* L. - Greece, Turkey, Syria, Lebanon, Palestine, Israel, Iraq, Iran
- Thymbra thymbrifolia* (Hedge & Feinbrun) Bräuchler, comb. nov. - Israel, Palestine, Judean Desert, Khirbet el Mird
- Thymbra nabateorum* (Danin & Hedge) Bräuchler, comb. nov. - W of Jordan and the
15 adjacent N of Saudi Arabia
- Thymbra linearifolia* (Brullo & Furnari) Bräuchler, comb. nov. - Libya

Chemical Composition of *Rhus coriaria* (Sumac)

Characterization and identification of chemical compounds of Sumac using HPLC-MS method identified 191 compounds in *Rhus coriaria* and classified them as generally
20 being:

- 78 hydrolysable tannins (e.g., gallotannins, e.g., penta, hexa, hepta, octa, nona and decagalloyl-glucoside)
- 59 flavonoids (e.g., Quercetin, Myrecetin 3-rhamnoside and Quercetin 3-glucoside)
- 9 anthocyanins (e.g., Delphinidin-3-glucoside, Cyanidin 3-(2"-galloyl)galactoside,
25 Cyanidin-3-glucoside, 7-methyl-cyanidin-3-(2"-galloyl)galactoside, 7-methyl-cyanidin-3-galactoside)
- 2 isoflavonoids
- 2 terpenoids
- 1 diterpene
- 30 • 38 other unidentified compounds.

According to specific embodiments, the phenolic compounds in Sumac are the compounds that constitute its phytochemical activity along with anthocyanins. The most abundant phenolic compound in sumac fruits was found to be Gallic acid.

Hydrolysable tannins compose the highest percentage in the Sumac fruits, followed by flavonoids. This emphasizes the antioxidant potential of the fruit, a plant part contemplated herein as a specific embodiment. Following hydrolysable tannins, comprising almost 20% of the fruit's mass, are other unidentified compounds. Subsequently there are anthocyanins, isoflavonoids, terpenoids and diterpenes. The chemical properties of sumac fruit is conducted on ripe fruits and have found a 2.6% protein content, 7.4% fat content, 14.6% fiber content, 1.8% ash. Also, a calorimetric calculation showed that 100g of sumac fruit contains 147.8 kcal.

Other active ingredients or any combinations thereof include, but are not limited to, methyl gallate, gathisflavone, sumaflavone, hinfikflavone, photocatechuic acid, penta-galloylglucose, hinokiflavone, β -caryophyllene, Delphinidin-3-glucoside, Cyanidin 3-(2''-galloyl)galactoside, Cyanidin-3-glucoside, 7-methyl-cyanidin-3-(2''-galloyl)galactoside, 7-methyl-cyanidin-3-galactoside, quercetin-3-glucoside, kampferol, myricetin, butein, D-limonine.

According to a specific embodiment, the active ingredient or combination thereof includes a volatile compound, e.g., terpene hydrocarbons, monoterpene and sesquiterpene hydrocarbons, specifically β -caryophyllene and α -pinene, Coriarianaphthyl ether, Coriarioic acid and Coriariaethracenyl ester.

According to a specific embodiment, the active ingredient or combination thereof includes a fatty acid, e.g., oleic acid, linoleic acid, palmitic acid, β -caryophyllene, cembrene stearic acid, Myristic acid, α -linolenic acid.

According to a specific embodiment, the active ingredient or combination thereof includes a mineral, e.g., potassium, calcium, magnesium, phosphorus, aluminum, iron, sodium, boron, zinc, cadmium, selenium.

According to a specific embodiment, the active ingredient or combination thereof includes a vitamin, e.g., thiamin B₁, riboflavin B₂, pyridoxine B₆, cyanocobalamin B₁₂, nicotinamide, biotin and ascorbic acid.

According to a specific embodiment, a methanol or ethanol extract is performed, e.g., ethanol concentration is 80%; extraction time is 1 h; extraction temperature is 40 °C; particle size 1.0mm; and solvent to sumac ratios 15:1 ml/g. Other extraction procedures

include, but are not limited to, those described in Sakhr and Khatib Heliyon. 2020 Jan; 6(1): e03207, which is hereby incorporated by reference in its entirety.

According to another embodiment, the plant part is leaf.

Also contemplated herein are plants of the genus *Rhus*.

5 Examples include, but are not limited to:

Asia and southern Europe

Rhus chinensis Mill. – Chinese sumac

Rhus coriaria – Tanner's sumac

Rhus delavayi Franchet

10 **Australia, Pacific**

Rhus taitensis Guill. (Northeast Australia, Malesia, Micronesia, French Polynesia)

Rhus sandwicensis A.Gray – *neneleau* (Hawaii)

North America

Rhus aromatica – fragrant sumac

15 *Rhus copallinum* – winged or shining sumac

Rhus glabra – smooth sumac

Rhus integrifolia – lemonade sumac

Rhus kearneyi – Kearney sumac

Rhus lanceolata – prairie sumac

20 †*Rhus malloryi* Wolfe & Wehr – Ypresian, Washington

Rhus michauxii – Michaux's sumac

Rhus microphylla – desert sumac, littleleaf sumac

Rhus ovata – sugar sumac

†*Rhus republicensis* Flynn, DeVore, & Pigg-Ypresian, Washington

25 †*Rhus rooseae* Manchester – Middle Eocene, Oregon

Rhus trilobata Nutt. – skunkbush sumac

Rhus typhina – staghorn sumac

Rhus virens Lindh. ex A.Gray – evergreen sumac

Origanum Syriacum

30 According to a specific embodiment, the plants of this species include flavones, monoterpenoids and monoterpenes. Over 60 different compounds have been identified, with the primary ones being carvacrol and thymol ranging to over 80%, while lesser

abundant compounds include p-cymene, γ -terpinene, caryophyllene, spathulenol, germacrene-D, β -fenchyl alcohol and δ -terpineol.

Also contemplated herein are plants of the genus *Origanum*.

Origanum is a genus of herbaceous perennials and subshrubs in the family Lamiaceae, native to Europe, North Africa, and much of temperate Asia, where they are found in open or mountainous habitats. A few species also naturalized in scattered locations in North America and other regions.

The plants have strongly aromatic leaves and abundant tubular flowers with long-lasting coloured bracts. The genus includes the important group of culinary herbs: marjoram (*Origanum majorana*) and oregano (*Origanum vulgare*).

Examples include, but are not limited to:

- Origanum acutidens* (Hand.-Mazz.) Ietsw. - Turkey, Iraq
- Origanum* $\times$ *adanense* Baser & H.Duman - Turkey (*O. bargyli* $\times$ *O. laevigatum*)
- Origanum* $\times$ *adonidis* Mouterde - Lebanon (*O. libanoticum* $\times$ *O. syriacum* subsp. *bevanii*)
- 15 *Origanum akhdarens* Ietsw. & Boulos - Cyrenaica region of eastern Libya
- Origanum amanum* Post - Hatay region of Turkey
- Origanum* $\times$ *barbarae* Bornm. - Lebanon (*O. ehrenbergii* $\times$ *O. syriacum* subsp. *bevanii*)
- Origanum bargyli* Mouterde - Turkey, Syria
- Origanum bilgeri* P.H.Davis - Antalya region of Turkey
- 20 *Origanum boissieri* Ietsw. - Turkey
- Origanum calcaratum* Juss. - Greece
- Origanum compactum* Benth. - Spain, Morocco
- Origanum cordifolium* (Montbret & Aucher ex Benth.) Vogel - Cyprus
- Origanum cyrenaicum* Bég. & Vacc. - Cyrenaica region of eastern Libya
- 25 *Origanum dayi* Post - Israel
- Origanum dictamnus* L. – hop marjoram, Cretan dittany, dittany of Crete - endemic to Crete
- Origanum* $\times$ *dolichosiphon* P.H.Davis - Seyhan region of Turkey (*O. amanum* $\times$ *O. laevigatum*)
- 30 *Origanum ehrenbergii* Boiss. - Lebanon
- Origanum elongatum* (Bonnet) Emb. & Maire - Morocco
- Origanum floribundum* Munby - Algeria
- Origanum* $\times$ *haradjanii* Rech.f - Turkey (*O. laevigatum* $\times$ *O. syriacum* subsp. *bevanii*)

- Origanum haussknechtii* Boiss. - Turkey
- Origanum husnucan-baseri* H.Duman, Aytac & A.Duran - Turkey
- Origanum hypericifolium* O.Schwarz & P.H.Davis - Turkey
- Origanum × intercedens* Rech.f. - Greece, Turkey (*O. onites* × *O. vulgare* subsp. *hirtum*)
- 5 *Origanum × intermedium* P.H.Davis - Denizli region of Turkey (*O. onites* × *O. sipyleum*)
- Origanum isthmicum* Danin - Sinai
- Origanum jordanicum* Danin & Kunne - Jordan
- Origanum laevigatum* Boiss. - Turkey, Syria, Cyprus
- Origanum leptocladum* Boiss. - Turkey
- 10 *Origanum libanoticum* Boiss. - Lebanon
- Origanum majorana* L. – (sweet) marjoram - Turkey, Cyprus; naturalized in scattered locations in Europe, North Africa, North + South America
- Origanum × lirim* Heldr. ex Halácsy - Greece (*O. scabrum* × *O. vulgare* subsp. *hirtum*)
- Origanum × majoricum* Cambess. – hardy sweet marjoram - Spain including Balearic
- 15 Islands (*O. majorana* × *O. vulgare* subsp. *virens*)
- Origanum microphyllum* (Benth.) Vogel - Crete
- Origanum × minoanum* P.H.Davis - Crete (*O. microphyllum* × *O. vulgare* subsp. *hirtum*)
- Origanum minutiflorum* O.Schwarz & P.H.Davis - Turkey
- Origanum munzurensense* Kit Tan & Sorger - Turkey
- 20 *Origanum × nebrodensense* Tineo ex Lojac - Sicily (*O. majorana* × *O. vulgare* subsp. *viridulum*)
- Origanum onites* L. - Greece, Turkey, Sicily
- Origanum × pabotii* Mousterde - Syria (*O. bargyli* × *O. syriacum* subsp. *bevanii*)
- Origanum pampaninii* (Brullo & Furnari) Ietsw - Cyrenaica region of eastern Libya
- 25 *Origanum petraeum* Danin - Jordan
- Origanum punonense* Danin - Jordan
- Origanum ramonense* Danin - Israel
- Origanum rotundifolium* Boiss. - Turkey, Caucasus
- Origanum saccatum* P.H.Davis - Turkey
- 30 *Origanum scabrum* Boiss. & Heldr. in P.E.Boissier - Greece
- Origanum sipyleum* L. -Turkey, Greek Islands
- Origanum solymicum* P.H.Davis - Antalya region of Turkey
- Origanum symes* Carlström - Islands of the Aegean Sea

Origanum syriacum L. - Turkey, Cyprus, Syria, Lebanon, Jordan, Palestine, Israel, Sinai, Saudi Arabia

Origanum vetteri Briq. & Barbey - Crete

Origanum vogelii Greuter & Burdet - Turkey

- 5 *Origanum vulgare* L. - oregano - Europe, North Africa, temperate Asia (Iran, Siberia, Central Asia, China, etc.); naturalized in parts of North America, New Zealand, Venezuela

Sesame

Sesame seeds contain the lignans, sesamol, sesamin, pinorensin and lariciresinol. Insoluble 11S globulin and soluble 2S albumin, conventionally termed α -globulin and β -globulin, are the two major storage proteins and constitute 80–90% of total seed proteins in sesame. Comparison of amino acid composition indicated that they are substantially less hydrophobic than the known oleosins, and thus should not be aggregated multimers of oleosins. The results of immuno-recognition to sesame proteins reveals that these three polypeptides are unique proteins gathered in oil bodies, accompanying oleosins and triacylglycerols, during the active assembly of the organelles in maturing seeds. The phospholipid, oleic and linoleic acids, chlorophyll and sesamol, sesamin and γ -tocopherol are found. 10 compounds [2-furfurylthiol, 2-phenylethylthiol, 2-methoxyphenol, 4-hydroxy-2, 5-dimethyl-3[2H]-furanone, 2-pentylpyridine, 2-ethyl-3,5-dimethylpyrazine, acetylpyrazine, [E,E]-2,4-decadienal, 2-acetyl-1-pyrroline and 4-vinyl-2-methoxy-phenol] are quantified. On the basis of high OAVs in oil, especially 2-acetyl-1-pyrroline [roasty], 2-furfurylthiol [coffee-like], 2-phenylethylthiol [rubbery] and 4-hydroxy-2,5-dimethyl-3[2H]-furanone [caramel-like] are elucidated as important contributors to the overall roasty, sulphury odour of the crushed sesame material. The structures of novel sesaminol glucosides isolated from sesame seed are determined to be sesaminol 2'-O- β -d-glucopyranoside, sesaminol 2'-O- β -d-glucopyranosyl [1 $\rightarrow$ 2]-O- β -d-glucopyranoside and sesaminol 2'-O- β -d-glucopyranosyl [1 $\rightarrow$ 2]-O-[β -d-glucopyranosyl [1 $\rightarrow$ 6]]-[β -d-glucopyranoside. Also minor sesame lignans such as -(7S,8'R,8R)-acuminatolide piperitol and pinorensin (as mentioned).

Also contemplated herein are plants of the genus *Sesamum*.

- 30 Examples include, but are not limited to:

Sesamum abbreviatum Merxm.

Sesamum alatum Thonn.

- Sesamum angolense* Welw.
Sesamum biapiculatum De Wild.
Sesamum calycinum Welw.
Sesamum capense Burm. f.
5 *Sesamum digitaloides* Welw. ex Schinz
Sesamum gracile Endl.
Sesamum hopkinsii Suess.
Sesamum indicum L.
Sesamum lamiifolium Engl.
10 *Sesamum latifolium* J.B. Gillett
Sesamum lepidotum Schinz
Sesamum macranthum Oliv.
Sesamum marlothii Engl.
Sesamum mombazense De Wild. & T.Durand
15 *Sesamum parviflorum* Seidenst.
Sesamum pedalioides Welw. ex Hiern
Sesamum radiatum Schumach. & Thonn.
Sesamum rigidum Peyr.
Sesamum rostratum Hochst.
20 *Sesamum sabulosum* A.Chev.
Sesamum schinzianum Asch.
Sesamum somalense Chiov.
Sesamum thonneri De Wild. & T. Durand
Sesamum triphyllum Welw. ex Asch.
25 Plants that contain Lignan according to some embodiments of the invention include
a wide variety of plant foods, including seeds (flax, pumpkin, sunflower, poppy, sesame),

whole grains (rye, oats, barley), bran (wheat, oat, rye), beans, fruit (particularly berries), and vegetables (Broccoli and curly kale are rich sources of lignans. Other vegetables such as white and red cabbage, Brussels sprouts, cauliflower, carrots, green and red sweet peppers are also good sources).

5 Additional plants that contain Sesamin include but are limited to *Eleutherococcus senticosus*.

Thus, any combination of the above plants is contemplated including 2, 3, 4, 5, 6, 7 of the plants. According to another embodiment, a combination of extracts or fractions including 2, 3, 4, 5, 6, 7 of the different plants.

10 Examples include, but are not limited, *Nigella sativa*, *Thymus vulgaris*, *Origanum syriacum*, *Thymbra spicata*, *Satujera thymbra*, *Sesamum indicum* and *Rhus coriaria*.

Nigella sativa, *Thymus capitatus*, *Origanum syriacum*, *Thymbra spicata*, *Satujera thymbra*, *Sesamum indicum* and *Rhus coriaria*.

15 *Nigella sativa*, *Thymus capitatus*, *Thymus vulgaris*, *Thymbra spicata*, *Satujera thymbra*, *Sesamum indicum* and *Rhus coriaria*.

Nigella sativa, *Thymus capitatus*, *Thymus vulgaris*, *Origanum syriacum*, *Satujera thymbra*, *Sesamum indicum* and *Rhus coriaria*.

20 *Nigella sativa*, *Thymus capitatus*, *Thymus vulgaris*, *Origanum syriacum*, *Thymbra spicata*, *Sesamum indicum* and *Rhus coriaria*.

Nigella sativa, *Thymus capitatus*, *Thymus vulgaris*, *Origanum syriacum*, *Thymbra spicata*, *Satujera thymbra*, and *Rhus coriaria*.

Nigella sativa, *Thymus capitatus*, *Thymus vulgaris*, *Origanum syriacum*, *Thymbra spicata*, *Satujera thymbra*, *Sesamum indicum*.

25 *Nigella sativa*, *Origanum syriacum*, *Thymbra spicata*, *Satujera thymbra*, *Sesamum indicum* and *Rhus coriaria*.

Nigella sativa, *Thymus capitatus*, *Thymus vulgaris*, *Satujera thymbra*, *Sesamum indicum* and *Rhus coriaria*.

30 *Nigella sativa*, *Thymus capitatus*, *Thymus vulgaris*, *Origanum syriacum*, *Sesamum indicum* and *Rhus coriaria*.

Nigella sativa, *Thymus capitatus*, *Thymus vulgaris*, *Origanum syriacum*, *Thymbra spicata*, and *Rhus coriaria*.

Nigella sativa, *Thymus capitatus*, *Thymus vulgaris*, *Origanum syriacum*, *Thymbra spicata*, *Satujera thymbra*.

Nigella sativa, *Thymus capitatus*.

Nigella sativa, *Thymus vulgaris*.

5 *Nigella sativa*, *Origanum syriacum*.

Nigella sativa, *Thymbra spicata*.

Nigella sativa, *Satujera thymbra*.

Nigella sativa, *Sesamum indicum*.

Nigella sativa, *Rhus coriaria*.

10 Also contemplated are various combinations without *Nigella sativa*.

According to another embodiment, a combination of active ingredients e.g., thymoquinone, carvacrol, thymol; thymoquinone, carvacrol; thymoquinone, thymol; carvacrol, thymol.

Nigella sativa, *Thymus capitatus*, *Thymus vulgaris*.

15 *Nigella sativa*, *Thymus vulgaris*, *Origanum syriacum*.

Nigella sativa, *Origanum syriacum*, *Thymbra spicata*.

Nigella sativa, *Thymbra spicata*, *Satujera thymbra*.

Nigella sativa, *Satujera thymbra*, *Sesamum indicum* *Rhus coriaria*.

20 According to some embodiments the plants and active ingredients thereof are listed in the Table below.

Origanum Syriacum	Carvacrol thymol
Thymus Capitatus	Carvacrol p-cymene γ-terpinene β-caryophyllene
Thymus	Thymol

Vulgaris	
Thymbra Spicata	Carvacrol γ-terpinene p-cymene
Satureja Thymbra	γ-terpinene p-cymene carvacrol thymol
Sumac	Tannin
Sesame	Lignans Seasamolin Seasamin Pinoresinol Lariciresinol
Nigella sativa	Thymoquinone

Other embodiments, which comprise any of the *Nigella sativa*, *Thymus capitatus*, *Thymus vulgaris*, *Origanum syriacum*, *Thymbra spicata*, *Satureja thymbra*, *Sesamum indicum* and *Rhus coriaria* plants or genera thereof in combinations of 2, 3, 4, 5, 6, 7 and 8 plants are contemplated herein.

- 5 Yet further embodiments of the present invention will include bromelain or products derived therefrom. The bromelain may be derived from pineapple extracts. In some embodiments of the present invention pineapple extracts comprising bromelain will be included in the composition.

Yet further embodiments of the present invention will include extracts of plants containing
 10 tryptophan .

The plant part, extract thereof, fraction thereof, active ingredient thereof, synthetic analog thereof, mimetic thereof or combination thereof can be used in the treatment of Coronavirus infections.

As used herein, “Coronavirus” refers to enveloped positive-stranded RNA viruses
5 that belong to the family *Coronaviridae* and the order *Nidovirales*.

Examples of Corona viruses which are contemplated herein include, but are not limited to, 229E, NL63, OC43, and HKU1 with the first two classified as antigenic group 1 and the latter two belonging to group 2, typically leading to an upper respiratory tract infection manifested by common cold symptoms.

10 However, Coronaviruses, which are zoonotic in origin, can evolve into a strain that can infect human beings leading to fatal illness. Thus particular examples of Coronaviruses contemplated herein are SARS-CoV, Middle East respiratory syndrome Coronavirus (MERS-CoV), and the recently identified SARS-CoV-2 [causing 2019-nCoV (also referred to as “COVID-19”)].

15 It would be appreciated that any Coronavirus strain is contemplated herein even though SARS-CoV-2 is emphasized in a detailed manner.

According to specific embodiments, the Corona virus is SARS-CoV-2.

The term “treating” refers to inhibiting, preventing or arresting the development of a pathology (disease, disorder or condition) and/or causing the reduction, remission, or
20 regression of a pathology. Those of skill in the art will understand that various methodologies and assays can be used to assess the development of a pathology, and similarly, various methodologies and assays may be used to assess the reduction, remission or regression of a pathology.

As used herein, the term “preventing” refers to keeping a disease, disorder or
25 condition from occurring in a subject who may be at risk for the disease, but has not yet been diagnosed as having the disease.

As used herein, the term “subject” includes mammals, preferably human beings, male or female, at any age or gender, who suffer from the pathology. Preferably, this term encompasses individuals who are at risk to develop the pathology (e.g., above 65 of age,
30 exposed to the virus).

The composition of matter comprising the component(s) (a plant species or genus thereof-derived component selected from the group consisting of a plant part, extract thereof, fraction thereof, active ingredient thereof, synthetic analog thereof, mimetic

thereof or combination thereof, wherein said component is capable of ameliorating symptoms of Coronavirus infection) of the present invention can be administered to the subject *per se*, or in a pharmaceutical composition where it is mixed with suitable carriers or excipients.

5 As used herein a "pharmaceutical composition" refers to a preparation of one or more of the active ingredients described herein with other chemical components such as physiologically suitable carriers and excipients. The purpose of a pharmaceutical composition is to facilitate administration of a compound to an organism.

 Herein the term "active ingredient" refers to the composition of matter comprising
10 the components accountable for the biological effect.

 Hereinafter, the phrases "physiologically acceptable carrier" and "pharmaceutically acceptable carrier" which may be interchangeably used refer to a carrier or a diluent that does not cause significant irritation to an organism and does not abrogate the biological activity and properties of the administered compound. An adjuvant is included under
15 these phrases.

 Herein the term "excipient" refers to an inert substance added to a pharmaceutical composition to further facilitate administration of an active ingredient. Examples, without limitation, of excipients include calcium carbonate, calcium phosphate, various sugars and types of starch, cellulose derivatives, gelatin, vegetable oils and polyethylene glycols.

20 Techniques for formulation and administration of drugs may be found in "Remington's Pharmaceutical Sciences," Mack Publishing Co., Easton, PA, latest edition, which is incorporated herein by reference.

 Suitable routes of administration may, for example, include oral, rectal, transmucosal, especially transnasal, intestinal or parenteral delivery, including
25 intramuscular, subcutaneous and intramedullary injections as well as intrathecal, direct intraventricular, intracardiac, e.g., into the right or left ventricular cavity, into the common coronary artery, intravenous, intraperitoneal, intranasal, or intrapulmonary or intraocular injections.

 In various exemplary embodiments of the invention, the composition is provided as
30 a pharmaceutical or dietary supplement dosage form suitable for oral administration. Dosage forms suitable for oral administration include tablets, soft capsules, hard capsules, pills, granules, powders, emulsions, suspensions, sprays, syrups and pellets. In various other embodiments of the invention, the composition is provided as a pharmaceutical

dosage form suitable for parenteral administration such as liquid formulations for administration as drops or by injection, or as solid or semisolid dosage forms for suppositories.

Conventional approaches for drug delivery to the central nervous system (CNS) include: neurosurgical strategies (e.g., intracerebral injection or intracerebroventricular infusion); molecular manipulation of the agent (e.g., production of a chimeric fusion protein that comprises a transport polypeptide that has an affinity for an endothelial cell surface molecule in combination with an agent that is itself incapable of crossing the BBB) in an attempt to exploit one of the endogenous transport pathways of the BBB; pharmacological strategies designed to increase the lipid solubility of an agent (e.g., conjugation of water-soluble agents to lipid or cholesterol carriers); and the transitory disruption of the integrity of the BBB by hyperosmotic disruption (resulting from the infusion of a mannitol solution into the carotid artery or the use of a biologically active agent such as an angiotensin polypeptide). However, each of these strategies has limitations, such as the inherent risks associated with an invasive surgical procedure, a size limitation imposed by a limitation inherent in the endogenous transport systems, potentially undesirable biological side effects associated with the systemic administration of a chimeric molecule comprised of a carrier motif that could be active outside of the CNS, and the possible risk of brain damage within regions of the brain where the BBB is disrupted, which renders it a suboptimal delivery method.

Alternately, one may administer the pharmaceutical composition in a local rather than systemic manner, for example, via injection of the pharmaceutical composition directly into a tissue region of a patient.

Pharmaceutical compositions of some embodiments of the invention may be manufactured by processes well known in the art, e.g., by means of conventional mixing, dissolving, granulating, dragee-making, levigating, emulsifying, encapsulating, entrapping or lyophilizing processes.

Pharmaceutical compositions for use in accordance with some embodiments of the invention thus may be formulated in conventional manner using one or more physiologically acceptable carriers comprising excipients and auxiliaries, which facilitate processing of the active ingredients into preparations which, can be used pharmaceutically. Proper formulation is dependent upon the route of administration chosen.

For injection, the active ingredients of the pharmaceutical composition may be formulated in aqueous solutions, preferably in physiologically compatible buffers such as Hank's solution, Ringer's solution, or physiological salt buffer. For transmucosal administration, penetrants appropriate to the barrier to be permeated are used in the
5 formulation. Such penetrants are generally known in the art.

For oral administration, the pharmaceutical composition can be formulated readily by combining the active compounds with pharmaceutically acceptable carriers well known in the art. Such carriers enable the pharmaceutical composition to be formulated as tablets, pills, dragees, capsules, liquids, gels, syrups, slurries, suspensions, and the like, for
10 oral ingestion by a patient. Pharmacological preparations for oral use can be made using a solid excipient, optionally grinding the resulting mixture, and processing the mixture of granules, after adding suitable auxiliaries if desired, to obtain tablets or dragee cores. Suitable excipients are, in particular, fillers such as sugars, including lactose, sucrose, mannitol, or sorbitol; cellulose preparations such as, for example, maize starch, wheat
15 starch, rice starch, potato starch, gelatin, gum tragacanth, methyl cellulose, hydroxypropylmethyl-cellulose, sodium carbomethylcellulose; and/or physiologically acceptable polymers such as polyvinylpyrrolidone (PVP). If desired, disintegrating agents may be added, such as cross-linked polyvinyl pyrrolidone, agar, or alginic acid or a salt thereof such as sodium alginate.

20 Dragee cores are provided with suitable coatings. For this purpose, concentrated sugar solutions may be used which may optionally contain gum arabic, talc, polyvinyl pyrrolidone, carbopol gel, polyethylene glycol, titanium dioxide, lacquer solutions and suitable organic solvents or solvent mixtures. Dyestuffs or pigments may be added to the tablets or dragee coatings for identification or to characterize different combinations of
25 active compound doses.

Pharmaceutical compositions which can be used orally, include push-fit capsules made of gelatin as well as soft, sealed capsules made of gelatin and a plasticizer, such as glycerol or sorbitol. The push-fit capsules may contain the active ingredients in admixture with filler such as lactose, binders such as starches, lubricants such as talc or magnesium
30 stearate and, optionally, stabilizers. In soft capsules, the active ingredients may be dissolved or suspended in suitable liquids, such as fatty oils, liquid paraffin, or liquid polyethylene glycols. In addition, stabilizers may be added. All formulations for oral administration should be in dosages suitable for the chosen route of administration.

For buccal administration, the compositions may take the form of tablets or lozenges formulated in conventional manner.

For administration by nasal inhalation, the active ingredients for use according to some embodiments of the invention are conveniently delivered in the form of an aerosol spray presentation from a pressurized pack or a nebulizer with the use of a suitable
5 propellant, e.g., dichlorodifluoromethane, trichlorofluoromethane, dichloro-tetrafluoroethane or carbon dioxide. In the case of a pressurized aerosol, the dosage unit may be determined by providing a valve to deliver a metered amount. Capsules and cartridges of, e.g., gelatin for use in a dispenser may be formulated containing a powder
10 mix of the compound and a suitable powder base such as lactose or starch.

The pharmaceutical composition described herein may be formulated for parenteral administration, e.g., by bolus injection or continuous infusion. Formulations for injection may be presented in unit dosage form, e.g., in ampoules or in multidose containers with optionally, an added preservative. The compositions may be suspensions, solutions or
15 emulsions in oily or aqueous vehicles, and may contain formulatory agents such as suspending, stabilizing and/or dispersing agents.

Pharmaceutical compositions for parenteral administration include aqueous solutions of the active preparation in water-soluble form. Additionally, suspensions of the active ingredients may be prepared as appropriate oily or water based injection
20 suspensions. Suitable lipophilic solvents or vehicles include fatty oils such as sesame oil, or synthetic fatty acids esters such as ethyl oleate, triglycerides or liposomes. Aqueous injection suspensions may contain substances, which increase the viscosity of the suspension, such as sodium carboxymethyl cellulose, sorbitol or dextran. Optionally, the suspension may also contain suitable stabilizers or agents which increase the solubility of
25 the active ingredients to allow for the preparation of highly concentrated solutions.

Alternatively, the active ingredient may be in powder form for constitution with a suitable vehicle, e.g., sterile, pyrogen-free water based solution, before use.

The pharmaceutical composition of some embodiments of the invention may also be formulated in rectal compositions such as suppositories or retention enemas, using, e.g.,
30 conventional suppository bases such as cocoa butter or other glycerides.

Pharmaceutical compositions suitable for use in context of some embodiments of the invention include compositions wherein the active ingredients are contained in an amount effective to achieve the intended purpose. More specifically, a therapeutically

effective amount means an amount of active ingredients (composition of matter comprising the components accountable for the biological effect) effective to prevent, alleviate or ameliorate symptoms of a disorder (e.g., Coronaviral infection) or prolong the survival of the subject being treated.

5 Determination of a therapeutically effective amount is well within the capability of those skilled in the art, especially in light of the detailed disclosure provided herein.

For example, any in vivo or in vitro method of evaluating Coronavirus viral load may be employed.

For any preparation used in the methods of the invention, the therapeutically
10 effective amount or dose can be estimated initially from in vitro and cell culture assays. For example, a dose can be formulated in animal models to achieve a desired concentration or titer. Such information can be used to more accurately determine useful doses in humans.

Toxicity and therapeutic efficacy of the active ingredients described herein can be
15 determined by standard pharmaceutical procedures in vitro, in cell cultures or experimental animals. The data obtained from these in vitro and cell culture assays and animal studies can be used in formulating a range of dosage for use in human. The dosage may vary depending upon the dosage form employed and the route of administration utilized. The exact formulation, route of administration and dosage can be chosen by the
20 individual physician in view of the patient's condition. (See e.g., Fingl, et al., 1975, in "The Pharmacological Basis of Therapeutics", Ch. 1 p.1).

Dosage amount and interval may be adjusted individually to provide the active ingredient at a sufficient amount to induce or suppress the biological effect (minimal effective concentration, MEC). The MEC will vary for each preparation, but can be
25 estimated from in vitro data. Dosages necessary to achieve the MEC will depend on individual characteristics and route of administration. Detection assays can be used to determine plasma concentrations.

Depending on the severity and responsiveness of the condition to be treated, dosing can be of a single or a plurality of administrations, with course of treatment lasting from
30 several days to several weeks or until cure is effected or diminution of the disease state is achieved.

The amount of a composition to be administered will, of course, be dependent on the subject being treated, the severity of the affliction, the manner of administration, the judgment of the prescribing physician, etc.

Compositions of some embodiments of the invention may, if desired, be presented
5 in a pack or dispenser device, such as an FDA approved kit, which may contain one or more unit dosage forms containing the active ingredient. The pack may, for example, comprise metal or plastic foil, such as a blister pack. The pack or dispenser device may be accompanied by instructions for administration. The pack or dispenser may also be accommodated by a notice associated with the container in a form prescribed by a
10 governmental agency regulating the manufacture, use or sale of pharmaceuticals, which notice is reflective of approval by the agency of the form of the compositions or human or veterinary administration. Such notice, for example, may be of labeling approved by the U.S. Food and Drug Administration for prescription drugs or of an approved product insert. Compositions comprising a preparation of the invention formulated in a compatible
15 pharmaceutical carrier may also be prepared, placed in an appropriate container, and labeled for treatment of an indicated condition, as is further detailed above.

In another embodiment, the invention provides a nutritional or dietary compositions in the form of foods or beverages, which comprise the component(s) described herein. These foods or beverages comprise various exemplary embodiments of
20 the inventive compositions. These foods or beverages can be prepared or provided as cereals, baby foods, healthy foods, or food for specified health uses such as solid food like chocolate or nutritional bars, semisolid food like cream or jam, or gel; and also as beverages. Specific and non-limiting examples of such food or beverage items include refreshing beverages, lactic acid bacteria beverages, drops, candies, chewing gum,
25 chocolate, gummy candy, yoghurts, ice creams, puddings, soft adzuki bean jellies, jellies, cookies and the like.

The present teachings further envisage treating with other anti-viral drugs or anti-inflammatory drugs or anti-coagulants as separate treatments or in a co-formulation.

Without being limited to COVID19 but for the sake of example, according to a
30 specific embodiment, the antiviral drug is selected from the group consisting of remdesivir, an interferon, ribavirin, adefovir, tenofovir, acyclovir, brivudin, cidofovir, fomivirsen, foscarnet, ganciclovir, penciclovir, amantadine, rimantadine and zanamivir.

Also contemplated are plasma treatments from infected persons who survived and/or anti-HIV drugs such as lopinavir and ritonavir, as well as chloroquine.

Specific examples for drugs that are routinely used for the treatment of COVID-19 include, but are not limited to, Lopinavir /Ritonavir, Nucleoside analogues, Neuraminidase inhibitors, Remdesivir, polypeptide (EK1), abidol, RNA synthesis inhibitors (such as TDF, 3TC), anti-inflammatory drugs (such as hormones and other molecules), Chinese traditional medicine, such ShuFengJieDu Capsules and Lianhuaqingwen Capsule, could be the drug treatment options for 2019-nCoV.

As used herein the term "about" refers to $\pm 10\%$

10 The terms "comprises", "comprising", "includes", "including", "having" and their conjugates mean "including but not limited to".

The term "consisting of" means "including and limited to".

The term "consisting essentially of" means that the composition, method or structure may include additional ingredients, steps and/or parts, but only if the additional ingredients, steps and/or parts do not materially alter the basic and novel characteristics of the claimed composition, method or structure.

As used herein, the singular form "a", "an" and "the" include plural references unless the context clearly dictates otherwise. For example, the term "a compound" or "at least one compound" may include a plurality of compounds, including mixtures thereof.

20 Throughout this application, various embodiments of this invention may be presented in a range format. It should be understood that the description in range format is merely for convenience and brevity and should not be construed as an inflexible limitation on the scope of the invention. Accordingly, the description of a range should be considered to have specifically disclosed all the possible subranges as well as individual numerical values within that range. For example, description of a range such as from 1 to 6 should be considered to have specifically disclosed subranges such as from 1 to 3, from 1 to 4, from 1 to 5, from 2 to 4, from 2 to 6, from 3 to 6 etc., as well as individual numbers within that range, for example, 1, 2, 3, 4, 5, and 6. This applies regardless of the breadth of the range.

30 Whenever a numerical range is indicated herein, it is meant to include any cited numeral (fractional or integral) within the indicated range. The phrases "ranging/ranges between" a first indicate number and a second indicate number and "ranging/ranges from" a first indicate number "to" a second indicate number are used herein interchangeably and

are meant to include the first and second indicated numbers and all the fractional and integral numerals therebetween.

As used herein the term "method" refers to manners, means, techniques and procedures for accomplishing a given task including, but not limited to, those manners, means, techniques and procedures either known to, or readily developed from known
5 manners, means, techniques and procedures by practitioners of the chemical, pharmacological, biological, biochemical and medical arts.

As used herein, the term "treating" includes abrogating, substantially inhibiting, slowing or reversing the progression of a condition, substantially ameliorating clinical or
10 aesthetical symptoms of a condition or substantially preventing the appearance of clinical or aesthetical symptoms of a condition.

It is appreciated that certain features of the invention, which are, for clarity, described in the context of separate embodiments, may also be provided in combination in a single embodiment. Conversely, various features of the invention, which are, for brevity,
15 described in the context of a single embodiment, may also be provided separately or in any suitable subcombination or as suitable in any other described embodiment of the invention. Certain features described in the context of various embodiments are not to be considered essential features of those embodiments, unless the embodiment is inoperative without those elements.

20 Various embodiments and aspects of the present invention as delineated hereinabove and as claimed in the claims section below find experimental support in the following examples.

EXAMPLES

25 Reference is now made to the following examples, which together with the above descriptions illustrate some embodiments of the invention in a non-limiting fashion.

Generally, the nomenclature used herein and the laboratory procedures utilized in the present invention include molecular, biochemical, microbiological and recombinant DNA techniques. Such techniques are thoroughly explained in the literature. See, for
30 example, "Molecular Cloning: A laboratory Manual" Sambrook et al., (1989); "Current Protocols in Molecular Biology" Volumes I-III Ausubel, R. M., ed. (1994); Ausubel et al., "Current Protocols in Molecular Biology", John Wiley and Sons, Baltimore, Maryland (1989); Perbal, "A Practical Guide to Molecular Cloning", John Wiley & Sons, New York

(1988); Watson et al., "Recombinant DNA", Scientific American Books, New York; Birren et al. (eds) "Genome Analysis: A Laboratory Manual Series", Vols. 1-4, Cold Spring Harbor Laboratory Press, New York (1998); methodologies as set forth in U.S. Pat. Nos. 4,666,828; 4,683,202; 4,801,531; 5,192,659 and 5,272,057; "Cell Biology: A Laboratory Handbook", Volumes I-III Cellis, J. E., ed. (1994); "Culture of Animal Cells - A Manual of Basic Technique" by Freshney, Wiley-Liss, N. Y. (1994), Third Edition; "Current Protocols in Immunology" Volumes I-III Coligan J. E., ed. (1994); Stites et al. (eds), "Basic and Clinical Immunology" (8th Edition), Appleton & Lange, Norwalk, CT (1994); Mishell and Shiigi (eds), "Selected Methods in Cellular Immunology", W. H. Freeman and Co., New York (1980); available immunoassays are extensively described in the patent and scientific literature, see, for example, U.S. Pat. Nos. 3,791,932; 3,839,153; 3,850,752; 3,850,578; 3,853,987; 3,867,517; 3,879,262; 3,901,654; 3,935,074; 3,984,533; 3,996,345; 4,034,074; 4,098,876; 4,879,219; 5,011,771 and 5,281,521; "Oligonucleotide Synthesis" Gait, M. J., ed. (1984); "Nucleic Acid Hybridization" Hames, B. D., and Higgins S. J., eds. (1985); "Transcription and Translation" Hames, B. D., and Higgins S. J., eds. (1984); "Animal Cell Culture" Freshney, R. I., ed. (1986); "Immobilized Cells and Enzymes" IRL Press, (1986); "A Practical Guide to Molecular Cloning" Perbal, B., (1984) and "Methods in Enzymology" Vol. 1-317, Academic Press; "PCR Protocols: A Guide To Methods And Applications", Academic Press, San Diego, CA (1990); Marshak et al., "Strategies for Protein Purification and Characterization - A Laboratory Course Manual" CSHL Press (1996); all of which are incorporated by reference as if fully set forth herein. Other general references are provided throughout this document. The procedures therein are believed to be well known in the art and are provided for the convenience of the reader. All the information contained therein is incorporated herein by reference.

COVID-19 is caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). The cell membrane ACE-2 receptor is an attachment and entry site for SARS-CoV-2. The ACE-2 receptor is a type I transmembrane metallopeptidase with homology to ACE, an enzyme long-known to be a key player in the Renin-Angiotensin system (RAS) and a target for the treatment of hypertension. There is evidence that SARS-CoV-2 utilizes ACE-2 as a cellular entry receptor. Zhou et al. showed that SARS-CoV-2 could use ACE-2 from humans, Chinese horseshoe bats, civet cats, and pigs to gain entry into ACE-2-expressing HeLa cells (See Zhou, P., Yang, XL., Wang, XG. et al. A pneumonia outbreak associated with a new coronavirus of probable bat

origin. Nature 579, 270–273 (2020)). The spike (S) protein of SARS-CoV-2, which plays a key role in the receptor recognition and cell membrane fusion process, is composed of two subunits, S1 (120 kDa) and S2 (80 kDa). The S1 subunit contains a receptor-binding domain that recognizes and binds to the host receptor angiotensin-converting enzyme 2 (ACE-2). The S2 subunit mediates viral cell membrane fusion by forming a six-helical bundle via the two-heptad repeat domain (see Huang, Y., Yang, C., Xu, Xf. et al. Structural and functional properties of SARS-CoV-2 spike protein: potential antivirus drug development for COVID-19. Acta Pharmacol Sin 41, 1141–1149 (2020)). Interfering, attenuating, impairing the function of the S1 and S2 subunits will eventually lead to an attenuated, impaired and less infective virus

EXAMPLE 1

In vitro assay for amelioration of a Coronavirus infection

Option A

Virus growth and handling

Vero E6 cells (American Type Culture Collection, Manassas, VA) are propagated in 75 cm² cell culture flasks in growth medium consisting of medium 199 (Sigma, St Louis, MO) supplemented with 10% fetal calf serum (FCS; Biological Industries, Kibbutz Beit Haemek, Israel). SARS-CoV-2 isolate is propagated in Vero E6 cells. Briefly, 2 mL of stock is added to a confluent monolayer of Vero E6 cells and incubated at 37°C in 5% CO₂ for 1 h; 13 mL of medium 199 supplemented with 5% FCS is then added. The cultures are incubated at 37°C in 5 % CO₂, and the supernatant is harvested after 48 h; in >75% of cultures, inhibition of CPE (3+) in each well is observed with an inverted microscope. The supernatant is clarified at 2,500 rpm and then divided into aliquots, placed in cryovials, and stored at –80°C until use.

Plaque Reduction Assay

Trypsinized Vero E6 cells are resuspended in growth medium and preincubated with interferons (serial fivefold dilution) in quadruplicate wells in 24-well plates. The next day, the medium is aspirated, and 100 µL of virus is added to each well at a titer of 100 PFU/well. After incubation for 1 h, the virus inoculum is aspirated, and a carboxymethylcellulose overlay containing maintenance medium and the appropriate interferon concentration is added. After 4 days' incubation, the plates are fixed and stained

as described previously. The number of plaques is then counted visually, and the concentration of plant species, genus-derived part, extract, fraction, active ingredient, synthetic analog, mimetic thereof or combination thereof that inhibits 50% of plaques in each well (IC_{50}) is determined. Results were plotted in Microsoft Excel, and a polynomial of order three is used to approximate the data and extrapolate IC_{50} and IC_{95} values.

Option B

Materials: Vero E6 cells, SARS-CoV-2 (German isolate)

Experiments involving the virus will all be carried out in an appropriate facility.

Preparation: IZI receives the substances plus information of suitable test concentrations.

Plaque Reduction Assay

The cells are incubated with the plant species, genus-derived part, extract, fraction, active ingredient, synthetic analog, mimetic thereof or combination thereof for 30 min at 37°C, in a 96-well plates format SARS-CoV2 is then added to the cells, the inoculum is removed after 1 hour and the cultures are overlaid using methylcellulose-based material - two days later, virus foci are stained with a SARS-CoV2 antibody, yielding FFUs (focus forming units) - FFUs are determined and plotted against concentrations of the plant species, genus-derived part, extract, fraction, active ingredient, synthetic analog, mimetic thereof or combination thereof.

VIRAL PROTEIN DIGESTION ASSAYS

The materials used in all the following viral protein digestion assays are disclosed in table 1.

Table 1

	Company	cat #
Recombinant SARS-CoV-2 S1 Subunit	RayBiotech	230-30161
Recombinant SARS-CoV-2 S2 Subunit	RayBiotech	230-30163
Recombinant SARS-CoV-2 Nucleocapsid	RayBiotech	230-30164
Recombinant COVID-19 Envelope protein	MyBiosource	M858309649
Recombinant Struface glycoprotein	BioWorld	NCP0027P
Proteinase K	Sigma	P4850
Instant Blue	Expedeon	ISB1L
DMSO	SIGMA	D2650
Criterion™ TGX Stain-Free Precast Midi Gels 4-15%, 18 wells, 30ul	BIORAD	5671084
10X Tris/Glycine/SDS	BIORAD	161-0772
4X Laemmli Sample Buffer	BIORAD	1610747
B-Mercaptoethanol 14.2M	SIGMA	M9148
Precision protein standard	BIORAD	161-0373

Each of the tested plant based treatment was numbered as disclosed in table 2

Treatment No.	Name
1	Oregano Oil
2	Thyme Oil
3	Nigella Sativa
4	Sumac Oil
5	Sesame Oil
6	Olibanum Oil

Table 2

5 The tested combinations complexes were classified as disclosed in table 3

Complex A	Oils 1+2+3
Complex B	Oils 1+2+3+4
Complex C	Oils 1+2+3+4+5
Complex D	Oils 1+2+3+4+5+6

10 **Table 3**

Oils mixtures were prepared by mixing equal amounts of each oil. The mix was then diluted 1:2 with DMSO, to acquire a solution of 50% DMSO, 50% Oil mix and the final reaction concentration was 5% oil mix, 5% DMSO.

15 For each assay reaction, 1 μ g protein per reaction was incubated with 3 μ l of the oil mixture at final reaction volume of 30 μ l. The reaction was incubated for over-night or 2 or 6 hours at 37°C.

Following incubation, the reaction was stopped by adding 10 μ l/reaction of sample buffer 4X and incubation 10 minutes at 72°C. Samples were then run in 4-15% TGX Criterion Gel (BIORAD) for 50 minutes at 200 Volt. Following run, the gel was incubated for 1 hour with Instant Blue reagent (Expedeon) and further washed with water until distinct bands were observed.

20 Densitometry was performed, pictures were analyzed with ImageJ software.

EXAMPLE 2

25 **Viral protein digestion experiment #1**

The protein digestion assay was conducted as disclosed in table 4. SARS-CoV-2 S1 subunit, SARS-CoV-2 S2 subunit and SARS-CoV-2 Nucleocapsid protein were incubated with different plant oils or combinations for 2h at 37°C and subsequently run on SDS-page.

stained with "instant blue" for the presence of proteins in the gel. The untreated control appeared at the expected molecular weight and the effect of different treatments were compared to this control (see figures 2-4). Significant disappearance of the protein was observed following treatment with the protease proteinase K.

5

Table 4

Lane No.	Sample	Treatment		µg/lane	Expected MW (kDa)
1	SARS-CoV-2 S1 Subunit	Non treated	W/O incubation	0.5 µg	120 kDa
2		Non treated	incubation 2 h at 37°C		
3		Proteinase K			
4		1			
5		2			
6		3			
7		1+2			
8		1+3			
9		2+3			
10		1+2+3			
11	SARS-CoV-2 S2 Subunit	Non treated	W/O incubation		80 kDa
12		Non treated	incubation 2 h at 37°C		
13		Proteinase K			
14		1			
15		2			
16		3			
17		1+2			
18		1+3			
19		2+3			
20		1+2+3			
21	SARS-CoV-2 Nucleocapsid	Non treated	W/O incubation		55 kDa
22		Non treated	incubation 2 h at 37°C		
23		Proteinase K			
24		1			
25		2			
26		3			
27		1+2			
28		1+3			
29		2+3			
30		1+2+3			

protein underwent little to no digestion with either of the tested treatments as compared to the protein K treatment (see figure 5).

EXAMPLE 3

5 Viral protein digestion experiment #2

The protein digestion assay was conducted as disclosed in table 5. SARS-CoV-2 Nucleocapsid protein, recombinant COVID-19 envelope protein and recombinant COVID-19 surface glycoprotein were incubated with different plant oils or combinations for over-night/6h at 37°C and subsequently run on SDS-page, stained with "instant blue" for the
10 presence of proteins in the gel. The untreated control appeared at the expected molecular weight and the effect of different treatments were compared to this control (see figures 6-8). Significant disappearance of the protein was observed following treatment with the protease proteinase K.

Table 5

No	Protein	Treatment	Incubation	µg/lane	Expected MW (kDa)
1	SARS-CoV-2 Nucleocapsid	Complex B	over night - 37°	1µg	55kDa
2		Complex C			
3		Complex D			
4		Non treated			
5		Soya Oil			
6		Canola Oil			
7		Non treated	W/O incubation		
8	Recombinant COVID-19 Envelope protein	Soya Oil	6 hours- 37°	1µg	27kDa
9		Canola Oil			
10		Complex A			
11		Complex B			
12		Complex C			
13		Complex D			
14		Proteinase K			
15	Recombinant Surface glycoprotein	Non treated	6 hours- 37°	5µg	134kDa
16		Non treated			
17		Soya Oil			
18		Canola Oil			
19		Complex A			
20		Complex B			
21		Complex C			
22		Complex D			
23		Proteinase K			
24		Non treated			
25		Non treated	W/O incubation		

15

Densitometry of the Nucleocapsid protein, envelope protein and surface glycol protein assays disclose that the abovementioned proteins underwent little to no digestion with

either of the tested treatments as compared to the protein K treatment (see figures 9-11 respectively).

EXAMPLE 4

Viral protein digestion experiment #3

- 5 The protein digestion assay was conducted as disclosed in table 6. SARS-CoV-2 S1 subunit, SARS-CoV-2 S2 subunit, SARS-CoV-2 Nucleocapsid protein and a negative control with no protein, were incubated with different plant oils or combinations for 6h at 37°C and subsequently run on SDS-page, stained with "instant blue" for the presence of proteins in the gel. The untreated control appeared at the expected molecular weight and
- 10 the effect of different treatments were compared to this control (see figures 12-14). Significant disappearance of the protein was observed following treatment with the protease proteinase K.

Table 6

No.#	Protein	Treatment	Incubation	µg/lane	Expected MW (kDa)
1	SARS-CoV-2 S1 Subunit	Non treated - control	W/O incubation	1 µg	120 kDa
2		Positive control - Proteinase K	6 hours - 37°C		
3		Complex B			
4		Complex C			
5		Complex D			
6		Negative control - DMSO			
7		Non treated - control			
8	SARS-CoV-2 S2 Subunit	Non treated - control	W/O incubation	1 µg	80 kDa
9		Positive control - Proteinase K	6 hours - 37°C		
10		Complex B			
11		Complex C			
12		Complex D			
13		Negative control - DMSO			
14		Non treated - control			
15	SARS-CoV-2 Nucleocapsid	Non treated - control	W/O incubation	1 µg	55 kDa
16		Positive control - Proteinase K	6 hours - 37°C		
17		Complex B			
18		Complex C			
19		Complex D			
20		Negative control - DMSO			
21		Non treated - control			
22	No protein	Complex B	6 hours - 37°C		
23		Complex C			
24		Complex D			

Densitometry of the SARS-CoV-2 S1 subunit, SARS-CoV-2 S2 subunit, SARS-CoV-2 and the Nucleocapsid protein assays disclose that although the Nucleocapsid protein underwent little to no digestion with either of the tested treatments as compared to the protein K treatment the two SARS-CoV-2 subunits S1 and S2 underwent a substantial digestion (see figures 15-17 respectively).

To conclude, the viral protein digestion assay demonstrates that there is a significant digestion of the S1 and S2 subunits without destroying the Nucleocapsid protein, envelope protein and surface glycoprotein.

Recombinant SARS-Cov-2 S1 subunit

Following incubation of the protein with a mix prepared from equal volumes from items 1+2+3+4 (complex B), a 26% reduction in the protein signal was observed.

Recombinant SARS-Cov-2 S2 subunit protein

Following incubation of the protein with a mix prepared from equal volumes from items 1+2+3+4 (complex B), a 19% reduction in the protein signal was observed.

Following incubation of the protein with a mix prepared from equal volumes from items 1+2+3+4+5 (complex C), a 27% reduction in the protein signal was observed.

Following incubation of the protein with a mix prepared from equal volumes from items 1+2+3+4+5+6 (complex D), a 47% reduction in the protein signal was observed.

These significant digestion rates of both S1 and S2 subunits of the spike protein are likely to result in the subsequent attenuation of the Coronavirus cell attachment and internalization mechanism. It is clear that attenuating the virus cell attachment and internalization mechanism, disease levels and viral load can be reduced in an infected subject, or prevent an uninfected subject from getting infected.

Trial 1

Patient A: Received 1 + 2 + 3 - and reported in less than 24 hours relief of his sore throat

Patient B: Received 1 + 2 + 3 reported cough relief within about 40 hours

Trial 2

Patient C: Add the pregnancy results of the pregnant woman

Case Report

A 34 years old pregnant woman diagnosed with gestational diabetes and treated with glutamin was administered daily with 5 ml sesame oil 100 % w/v (commencing on September 23, 2020 for 4 days and then co-administered with 5 ml sesame oil 100 % w/v (Naissance) and

5 ml 100 % w/v Nigella sativa oil (Better Flex). During oil treatment glucamin was not administered.

Blood glucose levels (mg/dL) were determined at the indicated hours.

Results are shown below.

6 AM	11 AM	15 PM	21 PM	Date
172	154	122	97	10/9/2020
125	109	126	103	11/9/2020
101	88	106	95	12/9/2020
113	84	125	80	13/9/2020
94	90	134	125	14/9/2020
158	159	98	83	15/9/2020
148	ND	154	88	16/9/2020
99	124	90	77	17/9/2020
94	84	89	84	18/9/2020
ND	ND	109	74	21/9/2020
151	86	73	81	23/9/2020
166	154	89	85	24/9/2020
112	134	99	80	25/9/2020
126	112	94	90	26/9/2020
ND	ND	70	83	27/9/2020
91	136	74	80	28/9/2020
130	83	113	85	29/9/2020
116	92	104	82	30/9/2020
101	96	96	95	1/10/2020
ND	ND	151	78	2/10/2020

5 ND=Not determined

Trial 3 10/03/21

- 10 Tests were carried out on a canine subject before and after oral dosage of the composition of the present invention.

Bag Number: 178075 Sticker Number: 2114353

5

The referring physician: Dr. Ofer Israeli

Owner details: Simba

Animal details: Simba, dog, female, about 16 and a half years old.

History / Physical examination / Other findings:

10 Type of test: Blood count and biochemistry

lab results (Appendix 1)

15 The treatment reduced blood glucose from 123 mg/dL to 64 mg/dL measured after treatment on the same day.

20

Although the invention has been described in conjunction with specific embodiments thereof, it is evident that many alternatives, modifications and variations will be apparent to those skilled in the art. Accordingly, it is intended to embrace all such alternatives, modifications and variations that fall within the spirit and broad scope of the
25 appended claims.

It is the intent of the applicant(s) that all publications, patents and patent applications referred to in this specification are to be incorporated in their entirety by reference into the specification, as if each individual publication, patent or patent application was specifically and individually noted when referenced that it is to be
30 incorporated herein by reference. In addition, citation or identification of any reference in this application shall not be construed as an admission that such reference is available as prior art to the present invention. To the extent that section headings are used, they should

not be construed as necessarily limiting. In addition, any priority document(s) of this application is/are hereby incorporated herein by reference in its/their entirety.