PLANT BASED HONEY COMPOSITION

Claim of Priority

[0001] This application is entitled to the benefit of and claims priority to U.S. App. No 63/219,000 filed July 7, 2021 entitled PLANT BASED HONEY COMPOSITION, the entirety of which is hereby incorporated by reference.

Field of the Invention

[0002] The present invention is generally in the field of non-bee made honey formulations.

Background

[0003] The population of honeybees in the U.S. has decreased by about 45% in 2021, a decrease which has been deemed "unsustainable," and which places the various ecosystems dependent upon honeybees for pollination at risk. Honeybees are also currently the only method of production available for producing honey. Further, use of honeybees commercially for honey production poses a threat to native and wild bee populations – essential pollinators of many flowering plants and trees. There remains a need in the art for a replacement for natural honeys to reduce the dependency and burden placed upon bees as a result of honey production.

Summary

[0004] There is a lack of available honey alternatives which closely approximate the taste, aroma, mouthfeel, texture, appearance, color, and overall flavor of natural honey. It would be desirable to provide a plant based alternative to natural honey, which can have different flavors and fragrances, to mimic the variations that occur naturally, and provide plant based honey compositions having known and quantitated amounts of polyphenols and organic acids associated with specific health benefits, and flavor profiles. It would also be desirable to have a honey alternative product which does not contain any allergens, bee parts, pollens, other organic proteins which could serve as potential allergens to consumers of honey, or spores of botulin toxin which render honey unsuitable for consumption by infants.

[0005] Production of non-bee made honey products has been attempted by the inventors by utilizing a blend of sugars and organic acids which are naturally found in honey. However, the results included unsatisfactory products which failed to closely approximate bee-made clover honey in a manner which would be acceptable to a consumer. Bee-made honeys may contain a variety of compounds such as polyphenols, acids, vitamins, minerals, amino acids, enzymes, ash, among other compounds, which account for less than about 1% of the honey by mass, but which are critical to the flavor, texture, appearance, mouthfeel, and other properties of honey for which

consumers purchase honey. Of these ingredients, the polyphenols and organic acids alone number in the hundreds of possible ingredients, and there is little to no guidance provided as to selection of the polyphenols and organic acids which may be used to closely approximate bee-made honey. Further, the identity of the polyphenols and organic acids naturally found widely varies among the different types of honeys. Similarly, there are tens of thousands of possible combinations of these ingredients, and many different possible concentrations for each ingredient, and choosing particular polyphenols and organic acids sufficient to produce a non-bee made honey formulation which closely approximates bee-made honey remains a challenge. As such, disclosed herein are non-bee made honey formulations with unique combinations and concentrations of sugars, polyphenols, organic acids, and plant extracts which produce a non-bee made honey formulation closely approximating that of natural clover honey.

[0005a] In an aspect of the present disclosure, there is provided a non-bee made honey formulation comprising:

a. fructose in an amount from about 20% to about 55% w/w;
b. glucose in an amount from about 20% to about 40% w/w;
c. one or organic acids in an amount from about 0.001% to about 5% w/w;
d. one or more polyphenols in an amount from 0.001% to about 5% w/w, wherein the total polyphenols are present in a concentration of at least 0.4 mM;
e. water; and
f. sea buckthorn extract.

[0006] Examples disclosed herein provide a non-bee made honey formulation comprising: fructose in an amount from about 20% to about 55% w/w; glucose in an amount from about 20% to about 40% w/w; one or organic acids in an amount from about 0.001% to about 5% w/w; water; and one of the following: one or more polyphenols in an amount from 0.001 % to about 5% w/w, wherein the total polyphenols in the formulation are present in a concentration of at least 0.4 mM; or protein in an amount between 0.00 g up to about 0.17 g per 100 g of the formulation. In some examples, the formulation comprises protein in an amount less than 0.17% w/w. In some examples, the formulation is substantially devoid of protein. In some examples, the one or more polyphenols are present in a concentration at least 3x that of bee made honey. In some examples, the total polyphenols are present in a concentration of at least 0.4 mM. In some examples, the total polyphenols are present in a concentration from about 0.4 mM to about 2.0 mM. In some examples, the total polyphenols are present in a concentration from about 1.4 mM to about 1.6 mM. In some examples, the total polyphenols are present in a

concentration of at least 0.4 mM catechin equivalent (CE). In some examples, the total polyphenols are present in a concentration from about 0.4 mM catechin equivalent (CE) to about 2.0 mM catechin equivalent (CE). In some examples, the total polyphenols are present in a concentration from about 1.4 mM catechin equivalent (CE) to about 1.6 mM catechin equivalent (CE).The non-bee made honey formulation of any of the preceding claims, further comprising one or more proanthocyanidins. In some examples, the formulation comprises the one or more proanthocyanidins in an amount from 0.0001% to about 0.1% w/w. In some examples, the formulation comprises the one or more proanthocyanidins in an amount from about 5 mg to about 20 mg per 30 mL of the formulation. In some examples, the formulation comprises the one or more proanthocyanidins in an amount from 0.0001% to about 0.001% w/w. In some

examples, the one or more polyphenols comprise kaempferol, quercetin, and isorhamnetin. The non-bee made honey formulation of any of the preceding claims, further comprising sea buckthorn extract. The non-bee made honey formulation of any of the preceding claims, further comprising sea buckthorn extract in an amount of from 0.01% to about 1% w/w of the formulation. The non-bee made honey formulation of any of the preceding claims, further comprising sea buckthorn extract in an amount from 0.05% to about 0.5% w/w. The non-bee made honey formulation of any of the preceding claims, further comprising sea buckthorn extract in an amount of about 0.1% w/w. In some examples, the one or more polyphenols quercetin in an amount greater that 0.038% w/w. In some examples, the formulation comprises quercetin in an amount from about 0.04% to about 0.1% w/w. In some examples, the formulation comprises quercetin in an amount of about 0.05% w/w. In some examples, the one or organic acids comprise gluconic acid in an amount from about 0.001 % to about 0.5 % w/w. In some examples, the one or organic acids comprise gluconic acid in an amount from about 0.05 % to about 0.5 % w/w. In some examples, the one or organic acids comprise gluconic acid in an amount of about 0.1% w/w. In some examples, the one or organic acids comprise succinic acid in an amount from about 0.001 % to about 0.5 % w/w. In some examples, the one or organic acids comprise succinic acid in an amount from about 0.05 % to about 0.5 % w/w. In some examples, the one or organic acids comprise succinic acid in an amount of about 0.01% w/w. In some examples, the one or organic acids comprise chlorogenic acid in an amount from about 0.001 % to about 0.01% w/w. In some examples, the one or organic acids comprise chlorogenic acid in an amount of about 0.004 % w/w. In some examples, the one or organic acids comprise gallic acid in an amount from about 0.001% to about 0.01% w/w. In some examples, the one or organic acids comprise gallic acid in an amount of about 0.005% w/w. In some examples, the formulation contains 50 milli-equivalents acid per 1000 g or less. In some examples, the one or more polyphenols comprise quercetin in an amount from about 0.005% to about 0.05% w/w. In some examples, the one or more polyphenols comprise quercetin in an amount of about 0.01% w/w. In some examples, the one or more polyphenols comprise chrysin in an amount from about 0.001% to about 0.01% w/w. In some examples, the formulation the one or more polyphenols comprise apigenin in an amount from about 0.001% to about 0.5% w/w.In some examples, the formulation the one or more polyphenols comprise apigenin in an amount of about 0.003% w/w. In some examples, one or more polyphenols comprise quercetin, galangin, hesperetin, chrysin, pinocembrin, naringenin, pinobanksin, luteolin, apigenin, genistein, catechin, epicatechin, isorhamnetic, myricetin, rutin, kaempferol, and derivatives. In

some examples, the formulation is substantially similar to bee made honey. In some examples, the formulation comprises a mouthfeel substantially similar to bee made honey. In some examples, the formulation comprises a taste substantially similar to bee made honey. In some examples, the formulation comprises an aroma substantially similar to bee made honey. In some examples, the formulation comprises a viscosity substantially similar to bee made honey. In some examples, the formulation comprises an appearance substantially similar to bee made honey. In some examples, the formulation comprises wherein the formulation is an artificial clover honey formulation. In some examples, the formulation comprises an overall comparison score of less than 3.6 when evaluated against natural clover honey. In some examples, the formulation comprises a mouthfeel comparison score of less than 1.9 when evaluated against natural clover honey. In some examples, the formulation comprises a taste score of less than 3.1 when evaluated against natural clover honey. In some examples, the formulation comprises an aroma score of less than 3.3 when evaluated against natural clover honey. In some examples, the formulation comprises a viscosity score of less than 1.7 when evaluated against natural clover honey. In some examples, the formulation comprises an appearance score of less than 4.3 when evaluated against natural clover honey. In some examples, the formulation comprises a likability score of at least 4.97 when evaluated against natural clover honey. In some examples, the natural clover honey which the formulation is evaluated against is bee-made clover honey produced in the United States consisting of clover honey as the sole ingredient. In some examples, the natural clover honey which the formulation is evaluated against is Signature Select clover honey. The non-bee made honey formulation of any of the preceding claims wherein the formulation comprises comparison scores comprising: an overall comparison score of less than 3.6 when evaluated against natural clover honey; a mouthfeel comparison score of less than 1.9 when evaluated against natural clover honey; a taste score of less than 3.1 when evaluated against natural clover honey; an aroma score of less than 3.3 when evaluated against natural clover honey; a viscosity score of less than 1.7 when evaluated against natural clover honey; an appearance score of less than 4.3 when evaluated against natural clover honey; and a likability score of at least 4.97 when evaluated against natural clover honey. In some examples,, the percentage of fructose in the non-bee made honey composition is between about 20 and about 55% w/w. In some examples,, the percentage of fructose in the non-bee made honey composition is between about 25 and 55 % w/w. In some examples, the percentage of fructose in the non-bee made honey composition is between about 30 and 55 % w/w. In some examples, the percentage of fructose in the non-bee made honey composition is between about 25 and 55 % w/w. In some

examples, the percentage of fructose in the non-bee made honey composition is between about 35 and 45 % w/w. In some examples, the percentage of fructose in the non-bee made honey composition is between about 35 and 55 % w/w. In some examples, the percentage of fructose in non-bee made honey composition is about 39%. In some examples, the percentage of glucose in the final composition is between about 20 and about 40% w/w. In some examples, the percentage of glucose in the non-bee made honey composition is between about 25 and about 40% w/w. In some examples, the percentage of glucose in the non-bee made honey composition is between about 30 and about 40% w/w. In some examples, the percentage of glucose in the non-bee made honey composition is between about 30 and about 45% w/w. In some examples, the percentage of glucose in the non-bee made honey composition is about 28%. In some examples, there is no detectable protein by AOAC 2011.04 crude protein analysis. In some examples, there is less than 0.17% w/w protein by AOAC 2011.04 crude protein analysis. In some examples, there is no pollen detectable by AOAC 2011.04 crude protein analysis. In some examples, there 0.17% w/w pollen detectable by AOAC 2011.04 crude protein analysis. In some examples, there are no pollen lipids detectable. In some examples, there are no allergens detectable by AOAC 2011.04 crude protein analysis. In some examples, there are no glycoproteins detectable by AOAC 2011.04 crude protein analysis. In some examples, there are glycoproteins in an amount less than 0.17% w/w. In some examples, the formulation comprises a pH from about ranges from about 3.0 to about 6.0. In some examples, the formulation comprises a pH of about 3.72. In some examples, the formulation comprises an antioxidant capacity of about 15 nmol/uL to about 45 nmol/uL. In some examples, the formulation comprises an antioxidant capacity of about 18 nmol/uL to about 35 nmol/uL. In some examples, the formulation comprises an antioxidant capacity of about 18 nmol/uL. In some examples, the formulation comprises an antioxidant capacity of about 30 nmol/uL. In some examples, the water in the formulation comprises about 10% to about 40% w/w. In some examples, the water in the formulation comprises about 25% to about 35% w/w. In some examples, the water in the formulation comprises about 32% w/w. In some examples, the water in the formulation comprises about 10% to about 20% w/w. In some examples, the water in the formulation comprises about 15% w/w, wherein the formulation is a low moisture formulation. In some examples, the formulation comprises a water activity of about 0.45 to about 0.6. In some examples, the formulation comprises a water activity of about 0.5. In some examples, the formulation comprises a viscosity of about 14,000 cP to about 17,000 cP. In some examples, the formulation comprises a viscosity of about 16,000 cP. In some examples, the formulation

comprises protein in an amount less than 0.16% w/w. In some examples, the formulation comprises protein in an amount less than 0.15% w/w. In some examples, the formulation comprises protein in an amount less than 0.14% w/w. In some examples, the formulation comprises protein in an amount less than 0.13% w/w. In some examples, the formulation comprises protein in an amount less than 0.12% w/w. In some examples, the formulation comprises protein in an amount less than 0.11% w/w. In some examples, the formulation comprises protein in an amount less than 0.1% w/w. In some examples, the formulation comprises protein in an amount less than 0.9% w/w. In some examples, the formulation comprises protein in an amount less than 0.8% w/w. In some examples, the formulation comprises protein in an amount less than 0.7% w/w. In some examples, the formulation comprises protein in an amount less than 0.6% w/w. In some examples, the formulation comprises protein in an amount less than 0.5% w/w. In some examples, the formulation comprises protein in an amount less than 0.4% w/w. In some examples, the formulation comprises protein in an amount less than 0.3% w/w. In some examples, the formulation comprises protein in an amount less than 0.2% w/w. In some examples, the formulation comprises protein in an amount less than 0.1 % w/w. In some examples, the one or more polyphenols are present in an amount of about 0.1 % w/w. In some examples, the one or more polyphenols are present in an amount of about 0.2 % w/w. In some examples, the one or more polyphenols are present in an amount of about 0.3 % w/w. In some examples, the one or more polyphenols are present in an amount of about 0.4 % w/w. In some examples, the one or more polyphenols are present in an amount of about 0.5 % w/w. In some examples, the one or more polyphenols are present in an amount of about 0.6 % w/w. In some examples, the one or more polyphenols are present in an amount of about 0.7 % w/w. In some examples, the one or more polyphenols are present in an amount of about 0.8 % w/w. In some examples, the one or more polyphenols are present in an amount of about 0.9 % w/w. In some examples, the one or more polyphenols are present in an amount of about 1 % w/w. In some examples, the one or more polyphenols are present in an amount of about 1.1 % w/w. In some examples, the one or more polyphenols are present in an amount of about 1.2 % w/w. In some examples, the one or more polyphenols are present in an amount of about 1.3 % w/w. In some examples, the one or more polyphenols are present in an amount of about 1.4 % w/w. In some examples, the one or more polyphenols are present in an amount of about 1.5 % w/w. In some examples, the one or more polyphenols are present in an amount of about 1.6 % w/w. In some examples, the one or more polyphenols are present in an amount of about 1.7 % w/w. In some examples, the one or more polyphenols

are present in an amount of about 1.8 % w/w. In some examples, the one or more polyphenols are present in an amount of about 1.9 % w/w. In some examples, the one or more polyphenols are present in an amount of about 2 % w/w. In some examples, the one or more polyphenols are present in an amount of about 2.1 % w/w. In some examples, the one or more polyphenols are present in an amount of about 2.2 % w/w. In some examples, the one or more polyphenols are present in an amount of about 2.3 % w/w. In some examples, the one or more polyphenols are present in an amount of about 2.4 % w/w. In some examples, the one or more polyphenols are present in an amount of about 2.5 % w/w. In some examples, the one or more polyphenols are present in an amount of about 2.6 % w/w. In some examples, the one or more polyphenols are present in an amount of about 2.7 % w/w. In some examples, the one or more polyphenols are present in an amount of about 2.8 % w/w. In some examples, the one or more polyphenols are present in an amount of about 2.9 % w/w. In some examples, the one or more polyphenols are present in an amount of about 3 % w/w. In some examples, the one or more polyphenols are present in an amount of about 3.2 % w/w. In some examples, the one or more polyphenols are present in an amount of about 3.4 % w/w. In some examples, the one or more polyphenols are present in an amount of about 3.6 % w/w. In some examples, the one or more polyphenols are present in an amount of about 3.8 % w/w. In some examples, the one or more polyphenols are present in an amount of about 4 % w/w.

[0007] Examples disclosed herein provide a method of producing a non-bee made honey formulation, comprising: (a) mixing glucose and fructose in water under elevated temperature to form a first solution; (b) mixing one or organic acids, and one or more polyphenols in water under elevated temperature to form a second solution; (c) mixing the first solution and the second solution to form a third solution; and (d) dehumidifying the solution at elevated temperature while mixing to reduce the water content of the solution.

Brief Description of Drawings

[0008] FIG. 1 shows results of a sensory panel comparing the various sensory properties of the non-bee made honey formulations disclosed herein.

[0009] FIG. 2 shows results of a sensory panel comparing the likeability of the non-bee made honey formulations disclosed herein.

[0010] FIG. 3 shows results of a catechin equivalent assay quantifying the total phenolic content of the non-bee made honey formulations disclosed herein.

What is claimed is:

1. A non-bee made honey formulation comprising:
    a. fructose in an amount from about 20% to about 55% w/w;
    b. glucose in an amount from about 20% to about 40% w/w;
    c. one or organic acids in an amount from about 0.001% to about 5% w/w;
    d. one or more polyphenols in an amount from 0.001% to about 5% w/w, wherein the total polyphenols are present in a concentration of at least 0.4 mM;
    e. water; and
    f. sea buckthorn extract.
2. The non-bee made honey formulation of claim 1, wherein the formulation comprises protein in an amount less than 0.17% w/w.
3. The non-bee made honey formulation of claim 1, wherein the one or more polyphenols are present in a concentration at least 3x that of bee made honey.
4. The non-bee made honey formulation of any of the preceding claims, wherein the total polyphenols are present in a concentration of at least 1.4 mM catechin equivalent (CE).
5. The non-bee made honey formulation of claim 1, further comprising one or more proanthocyanidins.
6. The non-bee made honey formulation of claim 5, wherein the formulation comprises one or more proanthocyanidins in an amount from 0.0001% to about 0.1% w/w.
7. The non-bee made honey formulation of claim 1, wherein the one or more polyphenols comprise kaempferol, quercetin, and isorhamnetin.
8. The non-bee made honey formulation of claim 1, further comprising sea buckthorn extract in an amount of from 0.01% to about 1% w/w of the formulation.
9. The non-bee made honey formulation of claim 9, further comprising sea buckthorn extract in an amount from 0.05% to about 0.5% w/w.
10. The non-bee made honey formulation of claim 1, wherein one of the one or more organic acids comprise gluconic acid in an amount from about 0.001 % to about 0.5 % w/w.
11. The non-bee made honey formulation of claim 10, wherein one of the one or more organic acids comprise gluconic acid in an amount from about 0.05 % to about 0.5 % w/w.
12. The non-bee made honey formulation of claim 1, wherein the formulation is substantially similar to bee made honey.
13. The non-bee made honey formulation of claim 12, wherein the formulation comprises a mouthfeel substantially similar to bee made honey.

14. The non-bee made honey formulation of claim 12, wherein the formulation comprises a taste substantially similar to bee made honey.
15. The non-bee made honey formulation of claim 12, wherein the formulation comprises an aroma substantially similar to bee made honey.
16. The non-bee made honey formulation of claim 12, wherein the formulation comprises a viscosity substantially similar to bee made honey.
17. The non-bee made honey formulation of claim 12, wherein the formulation comprises an appearance substantially similar to bee made honey.
18. The non-bee made honey formulation of claim 1, wherein the formulation comprises a pH from about 3.0 to about 6.0.
19. The non-bee made honey formulation of claim 1, wherein the formulation comprises an antioxidant capacity of about 15 nmol/uL to about 45 nmol/uL.
20. The non-bee made honey formulation of claim 1, wherein the formulation comprises a water activity of less than 0.7.
21. The non-bee made honey formulation of claim 1, wherein the formulation comprises a plant extract in an amount between about 0.001% to about 3% w/w.