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(54) **Title:** AN AROMATIZED TEA MATERIAL

(57) **Abstract:** According the present invention there is provided an aromatized tea material comprising: a.at least 78% by weight hot water insoluble tea solids on dry weight basis, and; b.at least 0.1 ppm of the aromatized tea material on dry weight basis one or more of the aroma compounds selected from the group consisting of t-2-hexenal, linalool, cis-3 hexenol, methyl salicylate, and hexanal.



AN AROMATIZED TEA MATERIAL

TECHNICAL FIELD

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The present invention relates to an aromatized tea material, process of preparation thereof and tea compositions comprising aromatized tea materials.

BACKGROUND

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It is known to add aroma compounds back onto the tea material to prepare aromatized tea material for enhancing aroma and organoleptic properties of the end-cup beverage.

15 EP0530880 (Unilever, 1992) discloses a process of preparation of tea aroma wherein teal leaf material is contacted with water vapour under distillation conditions and emanating mixture of aroma volatiles is condensed by contacting with cold tea solids comprising material. There is no disclosure about hot water insoluble solids content in the cold tea solids comprising material.

20

US2005/0084566 A1 (Bavan) discloses a method of the production of hot water soluble instant tea comprising the steps of: (a) forming an extract by treating black tea leaves with hard warm water, (b) stripping the extract of its aroma volatiles by passing the tea extract through a flash evaporator under partial vacuum, (c) separating at least
25 12% by weight as insoluble solids from the extract by subjecting the extract to repeated clarification and polishing to obtain clarified concentrate (d) separating 6-10% soluble solids from the clarified concentrate, (e) adjusting pH of the concentrate to neutral by adding an edible acid, (f) adding aroma volatiles obtained in step (b) to the concentrate, and (g) obtaining a substantially moisture free tea powder capable of
30 being reconstituted in hot water to produce instant tea that is substantially free of haze and cloudiness. In this process, the aroma is added back to the concentrate which is free of insolubles, and the method relates to production of hot water soluble instant tea, which is known to be substantially free of hot water insoluble tea solids.

US2007/0160737 A1 (Unilever) discloses a method of manufacturing a green tea product with enhanced aroma comprising the steps of providing an aroma composition comprising t-2-hexenal and linalool in a weight ratio of at least 0.7:1 and
5 combining the aroma composition with the tea product. The tea product is said to be a leaf tea product or a ready-to-drink tea. There is no disclosure about the hot water insoluble solids content in the green tea product.

GB1490370 (Gasser and Watercutter, published in 1977) discloses a process for
10 preparing a tea extract which comprises confining an aqueous tea slurry at temperature of at least 90 °C in a first zone for a period of at least 2 minutes while confining a body of aqueous extraction liquid at a temperature of at least 90 °C in a second zone and in contact with a liquid permeable barrier separating said first and second zones to permit diffusion of tea solubles from the aqueous tea slurry into the
15 aqueous extraction liquid, the volume of slurry being 0.5 to 2.5 times the volume of the aqueous extraction liquid and extraction liquid from the respective first and second zones and combining at least a part of tea solubles diffused into the extraction liquid with tea solubles remaining in the aqueous slurry. The process and the apparatus are directed to provide attainment of a tea solubles extract having flavour and aroma
20 characteristics quite like those of freshly brewed tea. There is no disclosure about the hot water insoluble solids content in the tea product.

WO2007/039018 A1 (Unilever) discloses a leaf tea product comprising less than 10% by weight aroma concentrate and by implication at least 90% by weight leaf tea. The
25 leaf tea could be green tea, oolong tea, or black tea and has water content in the range 1 to 10% by weight. However, there is no disclosure of a tea product comprising specific amount of hot water insoluble tea solids.

However, aromatized tea materials of the art deliver relatively low aroma and result
30 into an end-cup beverage having relatively less acceptable organoleptic properties. Furthermore, known aromatized tea materials retain aroma for a relatively short time and therefore have relatively short shelf life.

One of the objects of the present invention is to overcome or ameliorate at least one of the disadvantages of the prior art, or to provide a useful alternative.

- 5 One of the objects of the present invention is to provide an aromatized tea material that delivers relatively high aroma.

Another object of the present invention is to provide an aromatized tea material that results into end-cup beverage having relatively better organoleptic properties.

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Yet another object of the present invention is to provide an aromatized tea material that retains aroma for relatively long time and has relatively longer shelf life.

- Present inventors have surprisingly found that adding one or more of selective aroma
15 compounds to a tea material having high amount of hot water insoluble solids provides an aromatized tea material having relatively high aroma.

SUMMARY OF THE INVENTTION

- 20 According to a first aspect of the present invention there is provided an aromatized tea material comprising:

- a. at least 78% by weight hot water insoluble tea solids on dry weight basis, and;
- b. at least 0.1 ppm of the aromatized tea material on dry weight basis
25 one or more of the aroma compounds selected from the group consisting of t-2-hexenal, linalool, cis-3 hexenol, methyl salicylate, and hexanal.

- According to a second aspect of the present invention there is provided a process for
30 preparing an aromatized tea material of the first aspect comprising the step of contacting

- a. 1 part of a tea material comprising at least 78% by weight hot water insoluble tea solids with
- b. at least 0.1 ppm of the tea material on dry weight basis one or more of the aroma compounds selected from the group consisting of t-2-hexenal, linalool, cis-3 hexenol, methyl salicylate, and hexanal.
- 5

According to a third aspect of the present invention there is provided a tea product comprising 1-99% by weight the aromatized tea material of the first aspect.

10 DETAILED DESCRIPTION OF THE INVENTION

The term "tea material" as used herein refers to any material obtained from the plant *Camellia sinensis* or derived therefrom after processing such a plant material.

15 The term "total tea solids" as used herein means total solids in the tea material or in the aromatized tea material excluding moisture and aroma compounds, if any. The mass of total tea solids may be conveniently determined by exposing the tea material to a temperature of 100 °C or higher for a sufficient amount of time to remove water/moisture and aroma compounds if any, and by measuring the mass of the
20 residue to obtain the mass of total tea solids. Such measurements may be conveniently carried out using infrared moisture balance. Aroma compounds, if any present in the tea material or the aroma compounds in the aromatized tea material are thus excluded from the total tea solids.

25 The term "hot water soluble tea solids" as used herein means the part of tea solids that is soluble in water at a temperature of 100 °C.

The term "hot water insoluble tea solids" as used herein means the part of tea solids that is insoluble in water at a temperature of 100 °C.

30

The term "spent tea material" as used herein means the tea material that has been subjected to a prior step of extraction with water or aqueous mixture comprising water.

The step of extraction is preferably carried out by contacting the tea material with water and separating the extract of soluble solids to obtain the residual or spent tea material. The extraction may be cold extraction (temperature of 20 °C to 40 °C) or hot extraction (temperature from 40 °C to 100°C).

5

The aromatized tea material

The term "aromatized tea material" as used herein refers to the tea material to which one or more exogenous aroma compounds are added. The exogenous aroma
10 compounds themselves may be derived from a different or similar tea material. The aroma compounds include at least 0.1 ppm of the aromatized tea material on dry weight basis one or more of the aroma compounds selected from the group consisting of t-2-hexenal, linalool, cis-3 hexenol, methyl salicylate, and hexanal.

15 Total tea solids

The aromatized tea material preferably comprises 60-99.9 % total tea solids by weight of the aromatized tea material on wet basis. Accordingly, the aromatized tea material preferably comprises 0.1-40% water on wet basis. The total tea solids are preferably
20 greater than 70% by weight, more preferably greater than 80% by weight, most preferably greater than 90% by weight of the aromatized tea material on wet basis. It is particularly preferred that the aromatized tea material comprises greater than 95% by weight total tea solids on wet basis.

25 Hot water insoluble tea solids

The aromatized tea material comprises at least 78% by weight hot water insoluble tea solids on dry weight basis. The amount of hot water insoluble solids is preferably greater than 80% by weight, more preferably greater than 85% by weight and most
30 preferable greater than 88% by weight of the aromatized tea material on dry weight basis. The aromatized tea material may comprise preferably up to 99.9%, more

preferably up to 99% and most preferably up to 98% by weight the hot water insoluble solids on dry weight basis.

Hot water soluble tea solids

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The aromatized tea material comprises preferably less than 22% by weight, more preferably less than 20% by weight and most preferable less than 15% by weight hot water soluble tea solids on dry weight basis. It is particularly preferred that the amount of hot water soluble solids is less than 12% by weight of the aromatized tea material
10 on dry weight basis. The aromatize tea material may comprise preferably greater than 0.1%, more preferably greater than 1% and most preferably greater than 2% by weight the hot water soluble tea solids on dry weight basis.

Ratio of hot water insoluble tea solids to hot water soluble tea solids

15

In the aroamtized tea material, the ratio of the hot water insoluble tea solids to the hot water soluble tea solids on dry weight basis is preferably greater than 3.5, more preferably greater than 6, most preferably greater than 7. It is particularly preferred that the ratio of the hot water insoluble solids to the hot water soluble solids is greater
20 than 10. The ratio of hot water insoluble tea solids to hot water soluble solids is preferably less than 999, more preferably less than 99, and most preferably less than 50.

Total polyphenols

25

The aromatized tea material comprises preferably less than 12% by weight total polyphenols, more preferably less than 10% by weight total polyphenols and most preferably less than 5% by weight total polyphenols on dry weight basis. The aromatized tea material may comprise preferably greater than 0.1%, more preferably
30 greater than 1% by weight total polyphenols on dry weight basis

Any suitable method for measurement of total polyphenols known in the art may be used. One preferred method is the 4-dimethyl amino cinnamaldehyde indicator test, which provides a measure of the total polyphenols.

- 5 Preferably the aromatized tea material is characterized in that the absorbance at a wavelength of 640 nm of a 100 μ L sample taken from a solution prepared by adding 50 mg of said aromatized tea material to 1 mL of 4-dimethyl amino cinnamaldehyde indicator and diluted with 10 mL of methanol, measured within a span of 15 minutes from said addition is less than 0.05, wherein said indicator is prepared by adding 100
- 10 mg of dimethyl amino cinnamaldehyde to 100 mL methanol and 3 mL of 0.1 N hydrochloric acid. Said absorbance is more preferably less than 0.04, most preferably less than 0.03. Said absorbance may be preferably greater than 0.0001.

Aroma compounds

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The aromatized tea material comprises at least 0.1 ppm of the aromatized tea material on dry weight basis one or more of the aroma compounds selected from the group consisting of t-2-hexenal, linalool, cis-3 hexenol, methyl salicylate, and hexanal.

- 20 t-2 hexenal is preferably greater than 10 ppm, more preferably greater than 100 most preferably greater than 200 ppm of the aromatized tea material on dry weight basis. T2-hexenal is preferably less than about 1000 ppm, more preferably less than about 800 ppm and most preferably less than 500 ppm of the aromatized tea material on dry weight basis.

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Linalool is preferably greater than 10 ppm, more preferably greater than 100 most preferably greater than 200 ppm of the aromatized tea material on dry weight basis. Linalool is preferably less than about 1000 ppm, more preferably less than about 800 ppm and most preferably less than 500 ppm of the aromatized tea material on dry

- 30 weight basis.

Cis-3 hexenol is preferably greater than 10 ppm, more preferably greater than 100 most preferably greater than 200 ppm of the aromatized tea material on dry weight basis. Cis-3 hexenol is preferably less than about 1000 ppm, more preferably less than about 800 ppm and most preferably less than 500 ppm of the aromatized tea material on dry weight basis.

Methyl salicylate is preferably greater than 10 ppm, more preferably greater than 100 most preferably greater than 200 ppm of the aromatized tea material on dry weight basis. Methyl salicylate is preferably less than about 1000 ppm, more preferably less than about 800 ppm and most preferably less than 500 ppm of the aromatized tea material on dry weight basis.

Hexanal is preferably greater than 10 ppm, more preferably greater than 100 most preferably greater than 200 ppm of the aromatized tea material on dry weight basis. Hexanal is preferably less than about 1000 ppm, more preferably less than about 800 ppm and most preferably less than 500 ppm of the aromatized tea material on dry weight basis.

Aroma compounds may be of synthetic or natural origin. It is preferred that the aroma compounds are derived or recovered from a different tea material. Various processes of recovering aroma compounds are known in the art and aroma compounds derived or recovered from a tea material during processing are further preferred. Some examples of processes of recovering aroma compounds are described in patent applications WO2007/039018 A1, WO/2009/077189 A1, WO2009/083418 A1, WO2009/083420 A1 and aroma compounds recovered using the process of any of these documents, which are incorporated herein by reference, are particularly preferred.

Tea material

30

As described earlier, total tea solids means the tea solids excluding the mass of water/moisture and aroma compounds, if any. Therefore, on dry weight basis, the

composition of the total tea solids in the aromatized tea material is identical to the composition of the total tea solids in the tea material.

Total tea solids

5

The tea material preferably comprises 60-99.9 % total tea solids by weight of the aromatized tea material on wet basis. Accordingly, the tea material preferably comprises 0.1-40% water on wet basis. The total tea solids are preferably greater than 70% by weight, more preferably greater than 80% by weight, most preferably
10 greater than 90% by weight of the tea material on wet basis. It is particularly preferred that the tea material comprises greater than 95% by weight total tea solids on wet basis.

Hot water insoluble tea solids

15

The tea material comprises at least 78% by weight hot water insoluble tea solids on dry weight basis. The amount of hot water insoluble solids in the tea material is preferably greater than 80% by weight, more preferably greater than 85% by weight and most preferable less than 88% by weight of the tea material on dry weight basis.

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Hot water soluble tea solids

The tea material comprises preferably less than 22% by weight, more preferably less than 20% by weight and most preferable less than 15% by weight hot water soluble
25 tea solids on dry weight basis. It is particularly preferred that the amount of hot water soluble solids is less than 12% by weight of the tea material on dry weight basis.

Ratio of hot water insoluble tea solids to hot water soluble tea solids

30 In the tea material, the ratio of the hot water insoluble tea solids to the hot water soluble tea solids on dry weight basis is preferably greater than 3.5, more preferably greater than 6, most preferably greater than 7. It is particularly preferred that the ratio

of the hot water insoluble solids to the hot water soluble solids in the tea material is greater than 10.

Total polyphenols

5

The tea material comprises preferably less than 12% by weight total polyphenols, more preferably less than 10% by weight total polyphenols and most preferably less than 5% by weight total polyphenols on dry weight basis.

10 Preferred tea materials

The tea material is preferably selected from:

- a. a spent tea material, or;
- b. tea fannings, or;
- 15 c. fibrous tea material, or a mixture thereof.

It is particularly preferred that the tea material is a spent tea material.

Spent tea material

20

The spent tea material can be obtained from any starting tea material. Accordingly, the spent tea material may be spent green tea, spent black tea, spent oolong tea, or a mixture thereof. The spent tea material is preferably a spent green tea.

- 25 Although spent tea materials of any average particle size may be used, particle size of the spent tea material is preferably in a range of average particle sizes ranging from 0.1 mm (dust) to orthodox (10 mm). Spent tea materials may be obtained after a single step of extraction or after multistep extraction. Spent tea materials that have gone through multiple extraction steps are particularly preferred. Preferably the spent
- 30 tea materials are dried after extraction.

One of the characteristics of the spent tea materials is that the spent tea material has a relatively high water carrying capacity as compared to that of the corresponding starting tea material from which the spent tea material is obtained

- 5 The water carrying capacity of the materials can be measured according to the protocol given below: 25 mL water is added to a container comprising 500 mg of material. After 1 hour, the material is filtered using muslin cloth, or any other suitable filtering material. Wet material is weighed. The amount of water carried is determined by subtracting 500 mg from the weight of the wet material, and expressed as g/ g of
10 the material.

The water carrying capacity of the spent green tea is preferably greater than 9 g water per g material. The water carrying capacity of the spent green tea is more preferably in the range of 10 to 20, more preferably in the range of 11 to 14 g water / g material.

- 15 In contrast, unspent green tea (green tea which has not been subjected to extraction) has relatively lower water carrying capacity.

- The water carrying capacity of the spent black tea material is preferably greater than 23 g water per g material. The water carrying capacity of the spent black tea is more
20 preferably in the range of 23 to 30, more preferably in the range of 24 to 27 g water / g material. In contrast, unspent black tea (black tea which has not been subjected to extraction) has relatively lower water carrying capacity.

Tea fannings

25

The term "tea fannings" as traditionally used in the industry refers to the grade of tea material that is obtained by blowing air from a fan on a falling tea mass to separate flaky, lighter and more fibrous tea material. The tea fannings are secondary grade tea material typically having relatively high amount of the hot water insoluble tea solids.

30

Fibrous tea material

The term "Fibrous tea material" as used herein refers to a tea material rich in stem or stalk of the tea plant. The fibrous tea material preferably has relatively low content of leaf material. The fibrous tea material comprises preferably at least 20%, more preferably at least 30%, and most preferably at least 50% by weight material derived from the stem or stalk of the tea plant. The fibrous tea material may preferably comprise up to 100% by weight derived from the stem or stalk of the tea plant. The fibrous tea material typically have relatively high amount of the hot water insoluble tea solids.

10

Process of preparation of the aromatized tea material

The process for preparing an aromatized tea material comprises the step of contacting

- 15 a. 1 part of a tea material comprising at least 78% by weight hot water insoluble tea solids with
- b. at least 0.1 ppm of the tea material on dry weight basis one or more of the aroma compounds selected from the group consisting of t-2-hexenal, linalool, cis-3 hexenol, methyl salicylate, and hexanal.

20

The ppm of t-2-hexenal, linalool, cis-3 hexenol, methyl salicylate, and hexanal, added per part of the tea material on the dry weight basis during the process is identical to the ppm of the respective aroma compound in the aromatized tea material obtained at

25 the end of the process on the dry weight basis.

t-2 hexenal is preferably greater than 10 ppm, more preferably greater than 100 most preferably greater than 200 ppm of the tea material on dry weight basis. t2-hexenal is preferably less than about 1000 ppm, more preferably less than about 800 ppm and

30 most preferably less than 500 ppm of the tea material on dry weight basis.

Linalool is preferably greater than 10 ppm, more preferably greater than 100 most preferably greater than 200 ppm of the tea material on dry weight basis. Linalool is preferably less than about 1000 ppm, more preferably less than about 800 ppm and most preferably less than 500 ppm of the tea material on dry weight basis.

5

Cis-3 hexenol is preferably greater than 10 ppm, more preferably greater than 100 most preferably greater than 200 ppm of the tea material on dry weight basis. Cis-3 hexenol is preferably less than about 1000 ppm, more preferably less than about 800 ppm and most preferably less than 500 ppm of the tea material on dry weight basis.

10

Methyl salicylate is preferably greater than 10 ppm, more preferably greater than 100 most preferably greater than 200 ppm of the tea material on dry weight basis. Methyl salicylate is preferably less than about 1000 ppm, more preferably less than about 800 ppm and most preferably less than 500 ppm of the tea material on dry weight

15 basis.

Hexanal is preferably greater than 10 ppm, more preferably greater than 100 most preferably greater than 200 ppm of the tea material on dry weight basis. Hexanal is preferably less than about 1000 ppm, more preferably less than about 800 ppm and

20 most preferably less than 500 ppm of the tea material on dry weight basis.

The aroma compounds may be used as such or may be part of an aqueous phase or may be a part of an oil phase. The aroma compounds are preferably comprised in form of an aqueous extract.

25

The aroma compounds as such or an aqueous extract or oil phase comprising the aroma compounds is added to the tea material. The addition is preferably by spraying the aroma compounds or oil/aqueous extract comprising aroma compounds on the tea material. Preferably the step of addition is accompanied or followed by step of

30 mixing of the tea material with aroma compounds to obtain uniformly aromatized tea material.

It is particularly preferred that an aqueous extract comprising one or more aroma compounds at greater than 100 ppm, more preferably greater than 200 ppm is contacted with the tea material. When the aroma compounds are in form of an aqueous solution or an aqueous extract, the process may comprise a further step of
5 drying to reduce the moisture content of the aromatized tea material to less than 10% by weight. It is preferred that the drying is continued till the moisture content is less than 5% by weight of the aromatized tea material. However, present inventors have found that such a drying step has an adverse impact due to loss of aroma compounds and if thermal drying is used, there is a further problem due to change in organoleptic
10 properties if the drying step involves exposure to temperatures in excess of 70 °C. Accordingly, the mass of aqueous solution of aroma compounds per kg of the starting tea material is preferably less than 500 mg, more preferably less than 250 mg, most preferably less than 100 mg. It is particularly preferred that the mass of aqueous solution of aroma compounds per kg of the starting tea material is less than 50 mg.

15

The ratio of total water to the dry weight of the tea material during the process is preferably less than 6, more preferably less than 5, and most preferably less than 4. If the process is carried out with relatively high ratio of total water to the dry weight of the tea material, for example under slurry conditions, the resulting aromatized material
20 would need to be subjected to a further step of drying for a relatively long period of time to reduce the water content to less than 10% by weight of the aromatized tea material on wet basis – leading to loss of aroma compounds.

The tea material comprises preferably less than 30% by weight, more preferably less
25 than 20% by weight and most preferably less than 10% by weight water on wet basis. It is particularly preferred that the tea material and comprises less than 5% by weight water on wet basis. The tea material is preferably dried to a water content less than 5% by weight on wet basis before adding aroma compounds.

30 The aromatized tea material obtained at the end of the step (b), if it is subjected to drying, is preferably exposed to temperature less than 70 °C, more preferably less

than 60 °C, most preferably less than 50 °C. It is particularly preferred that the aromatized tea material is not subjected to a further step of drying.

Tea product comprising the aromatized tea material

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Preferably the tea product comprises 0.1-99% by weight, more preferably 0.1-30% by weight, most preferably 1-10% by weight aromatized tea material.

The tea product preferably further comprises 1-99% by weight black tea, green tea,
10 oolong tea or white tea. It is particularly preferred that the tea product comprises 1-99% by weight green tea.

Green tea is a preferred vehicle for the aromatized tea material as the delivery of exogenous aroma compounds, in particular t-2- hexenal, when added on to green tea
15 in conventional processing is relatively very low. Present inventors have found that the addition of the aromatized tea material according to the present invention to green tea significantly improves delivery of aroma compounds, in particular that of t-2-hexenal.

Without wishing to be limited by any theory, it is believed that the higher catechin
20 contents of green tea as compared to black tea cause poor delivery of aroma compounds, in particular for aldehyde aroma compounds such as t-2-hexenal.

The tea product is preferably prepared by blending the aromatized tea material with any other tea material; preferably an unaromatized tea material, to obtain a tea
25 product. Tea products comprising 1-10% by weight of the aromatized tea materials are particularly preferred as such products offer the benefit of reduction in processing and transportation costs of the aromatized materials and provide flexibility of operation as the relatively small amounts of the aromatized tea materials prepared at the processing site can be transported to various locations.

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EXAMPLES

The invention will now be demonstrated with examples. The examples are for the purpose of illustration only and do not limit the scope of the invention in any manner

Following tea materials were loaded with aroma compounds.

5

GT: Green tea ML (Medium Leaf grade) obtained from Kenya

GTBMF: Green tea (Broken Mixed Fanning grade) obtained from Kenya

BT: Black tea ML (Medium Leaf) grade obtained from Kenya

BTBMF: Black tea (Broken Mixed Fanning grade) obtained from Kenya

10

Aromatized tea materials according to the present invention were prepared from following starting tea materials by adding aroma compounds

15 GT4 : 1 g of GTML is extracted with 10 g of water at 90 °C, followed by filtration and separation of solids. The solids are subjected to three further steps of extraction with 10 g of water at 90 °C to reduce hot water soluble contents. Spent tea material after the fourth extraction is dried to a moisture content of about 3%.

GTBMF4: Obtained from GTBMF by following same procedure as that of GT4.

20

BT4: Obtained from BT by following same procedure as that of GT4.

BTBMF4: Obtained from BTBMF by following same procedure as that of GT4.

25 GT1, GT2, GT3 etc were prepared by following procedure as that of GT4 except that the suffix indicates number of aqueous extraction steps.

Mixture of synthetic aroma compounds

30 The aroma compounds (5 compounds) were added to propylene glycol (each aroma compound being 3000 ppm of propylene glycol). The mixture of aroma compounds in propylene glycol (40 µL) was then added to 200 mg of each of the tea material to

prepare the aromatized tea materials. The effective loading of each of the aroma compounds was 0.6 ppm of the tea material.

The aroma compounds were:

- 5 aldehydes: t-2-hexenal (T2H) and hexanal (Hex)
 alcohols: Linalool (L) and cis-3 hexenol (C3H)
 ester: methyl salicylate (MetS)

Table 1: Tea materials aromatized with the mixture of synthetic aroma compounds

10

Aromatized Tea Material	Tea Material		
	HWI*	HWS**	HWI/HWS
GT (control)	75	25	3
GT4	96	4	24
GTBMF	86	14	6.1
GTBMF4	97	3	32.3
BT (control)	75	25	3
BT4	96	4	24
BTBMF	80	20	4
BTBMF4	96.5	3.5	19.3

HWI*: % hot water insoluble tea solids on dry weight basis

HWS**: % hot water soluble tea solids on dry weight basis

HWI/HWS: mass ratio of hot water insoluble teas solids to hot water soluble tea solids

15

Method for evaluating aroma delivery

200 mg of the aromatized tea material was added to 12 mL of hot water (95 °C) in a Dewar flask and the flask was capped immediately. After capping the flask was
 20 shaken for 30 seconds and total brew time of 4 minutes was allowed. The contents of the flask were filtered through a muslin cloth to obtain test liquor. The test liquor (3

mL) was taken in a GC vial (Perkin Elmer 22 mL volume), crimped and headspace vapours were analyzed using a gas chromatograph.

Headspace conditions were as follows: Oven temperature: 75 °C, Needle
5 temperature: 100 °C, Transfer temp: 110 °C, Thermostat time: 30 min, Pressurising time: 3 min, Injection time: 1.5 min, Withdrawal time: 0.5min.

GC details used were: Column: CP-Wax 52 CB 30 m x 250 mm (0.15 µm), Oven
ramp: 35 °C, 2 min hold, 10°C /min to 230 °C, 5 min hold, Injector temperature: 230 °C
10 , Detector temperature: 250°C, Carrier gas: He (13.6 psi)

As a control, aroma compounds that would have been present in 30 mg of aromatized tea material were added to 3 mL water. The delivery of each compound from aroma compounds added to water was taken as 100%. The aroma delivery of various
15 compounds from aromatized tea materials was then reported as % with respect to the delivery from water as a control vehicle. The results are tabulated below

Table 2: Aroma delivery (%) from the aromatized tea materials aromatized with the mixture of synthetic aroma compounds

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Aroma compound	GT	GT4	GTBMF	GTBMF4	BT	BT4	BTBMF	BTBMF4
T2H	5	16	7	29	7	25	7	37
Hex	7	13	7	28	7	15	9	20
L	17	25	24	46	24	40	24	50
C3H	27	42	35	68	34	63	36	61
MetS	6	12	8	17	8	18	9	25

From the results, it is clear that the aromatized tea materials according to the present invention provide significantly higher delivery of various aroma compounds in the

beverage form as compared to the aromatized tea materials prepared by adding aroma compounds directly to either green or black tea.

Individual synthetic aroma compounds

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Similar experiments were conducted except that only individual aroma compounds (instead of mixtures of aroma compounds) were added onto green tea (GT) and spent green tea (GT4) at a level 0.6 ppm of the tea material.

The aroma delivery results are given below:

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Table 3: Aroma delivery (%) from aromatized tea materials starting from GT and GT4 loaded with individual aroma compounds

Aroma compound	Amount of aroma compound (ppm tea material on dry weight basis)	GT (% delivery)	GT4 (% delivery)
T2H	0.6	1	7
Hex	0.6	2	5
L	0.6	22	28
C3H	0.6	18	41
MetS	0.6	10	15

20 From the results, it is clear that the aromatized tea materials according to the present invention provide significantly higher delivery of various aroma compounds in the

beverage form as compared to the prior art tea materials prepared by adding aroma compounds directly to green tea.

Furthermore, the above table indicates the minimum amounts of aroma compound as ppm of tea material that is required to deliver aroma compounds.

5

Mixture of aroma compounds of natural origin

An aqueous solution comprising aroma compounds was obtained during processing of black tea. The aqueous solution of aroma compounds included a large number of
10 aroma compounds. Specifically the aqueous solution was characterized in terms of T2H, C3H and L and found to comprise: 6000 ppm T2H, 2360 ppm C3H, and and 440 ppm L.

Aromatized tea material was prepared by adding the above aqueous solution/extract
15 (18 mg per g tea material) to various starting tea materials. Effective loading of the aroma compounds on the the aromatized tea materials was:

T2H – 104 ppm of tea material, L: 8 ppm of tea material, C3H: 42 ppm of tea material.

The results of % delivery of aroma compounds are tabulated below.

20 Table 4: Aroma delivery (%) from the aromatized tea materials aromatized with the mixture of aroma compounds of natural origin.

Aroma compound	GT	GT4	BT	BT4
T2H	0.5	5	1	6
linalool	20	25	15	25
C3H	16	40	10	38

25 **Tea products**

The aromatized tea materials were prepared by adding mixture of aroma compounds recovered during processing of tea as described above to GT, GT1, GTBMF and GT4. The aromatized tea materials were then blended with unaromatized green tea at various proportions as tabulated below. The blends were also evaluated by an expert 5 perfumer by tasting an end-cup prepared by adding 1 g of the tea product to 100 mL of water at 90 °C and brewing from 2 minutes. The results are tabulated below:

Table 5: Aroma delivery (%) and organoleptic properties of tea products obtained by blending of aromatized tea material with unaromatized green tea

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Tea Product			Aroma delivery			Organoleptic properties
Unaromatized green tea (wt%)	Aromatized tea material (wt%)	Type of Aromatized Tea Material	T2H (%) delivery)	C3H (%) delivery)	L (%) delivery)	
99.5	0.5	GT4	5	28	12	++
99	1	GT4	10	42	12	++
95	5	GT4	17	53	27	++
90	10	GT4	14	51	35	++
95	5	GT1	10	50	25	+
95	5	GTBMF	7	35	24	+
95	5	GT (Control)	2	20	20	-

++ Very good aroma and taste

+ Good aroma and taste

- no significant aroma – taste acceptable

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From the above results, it is clear that the tea products according to the present invention provide relatively high aroma delivery and provide acceptable organoleptic properties, in particular the aroma of the end-cup

20 Absorbance of aromatized tea material using 4DACA test

Reagent preparation

4-DimethylAmino CinnamIdehyde (4DACA) (100 mg) was mixed in methanol (100 mL) in a beaker and cooled in an ice bath. Concentrated HCl (3 mL) was added dropwise to the contents of the cooled beaker. The reagent color turned to orange.

Sample Preparation

The above reagent (1 mL) was added to tea leaf (whole leaf / spent, 50 mg) in a test tube and shaken. The reaction mixture changes color to greenish-blue. After 2 minutes, 100 μ L of the reacted sample was diluted with 10 mL of methanol. The absorbance (at a wavelength of 640 nm) of the diluted sample was measured within a time-span of 15 minutes. Measured absorbance values for various green tea materials are given below:

Table 6: 4DACA Absorbance of aromatized green tea materials

Sample	Hot water soluble solids on dry weight basis	Hot water insoluble solids on dry weight basis	Absorbance (after reaction – 640 nm)
Aromatized spent GT4	4	96	0.002
Aromatized spent GT1 (one step extraction)	12	88	0.011
GTBMF	14	86	0.047
GT (Control)	25	75	0.066

From the results, it is clear that the aromatized tea materials are characterized by 4DACA absorbance values which are less than 0.05.

Claims

1. An aromatized tea material comprising:
 - a. at least 78% by weight hot water insoluble tea solids on dry weight basis, and;
 - b. at least 0.1 ppm of the aromatized tea material on dry weight basis one or more of the aroma compounds selected from the group consisting of t-2-hexenal, linalool, cis-3 hexenol, methyl salicylate, and hexanal.
2. The aromatized tea material as claimed in claim 1 comprising 60-99.9 % total tea solids by weight of the aromatized tea material on wet basis.
3. An aromatized tea material as claimed in claim 1 or claim 2 comprising less than 12% by weight total polyphenols on dry weight basis.
4. An aromatized tea material as claimed in any one of the preceding claims characterized in that absorbance at wavelength of 640 nm of a 100 μ L sample taken from a solution prepared by adding 50 mg of said aromatized tea material to 1 mL of 4-DimethylAmino Cinnamaldehyde indicator and diluted with 10 mL of methanol, measured within a span of 15 minutes from said addition is less than 0.05, wherein said indicator is prepared by adding 100 mg of dimethyl amino cinnamaldehyde to 100 mL methanol and 3 mL of 0.1 N hydrochloric acid.
5. A process for preparing an aromatized tea material as claimed in claim 1 comprising the step of contacting
 - a. 1 part of a tea material comprising at least 78% by weight hot water insoluble tea solids with
 - b. at least 0.1 ppm of the tea material on dry weight basis one or more of the aroma compounds selected from the group consisting of t-2-hexenal, linalool, cis-3 hexenol, methyl salicylate, and hexanal.

6. A process as claimed in claim 5 wherein the ratio of total water to the dry weight of the tea material during the process is less than 6.
7. A process as claimed in claim 5 or claim 6 wherein said tea material is selected from:
 - a. a spent tea material, or;
 - b. tea fannings, or;
 - c. fibrous tea material, or a mixture thereof.
8. A process as claimed in claim 7 wherein said tea material is a spent tea material
9. A tea product comprising 1-99% by weight the aromatized tea material as claimed in claim 1.
10. A tea product as claimed in claim 9 comprising 1-99% by weight black tea, green tea, oolong tea or white tea.

INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2010/068195

A. CLASSIFICATION OF SUBJECT MATTER
INV. A23F3/16 A23F3/40
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A23F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, FSTA, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2007/039018 A1 (UNILEVER PLC [GB]; UNILEVER NV [NL]; LEVER HINDUSTAN LTD [IN]; BAGARIA) 12 April 2007 (2007-04-12) cited in the application claims 25, 26 page 13, lines 3-8, 9 example 1 page 6, lines 17, 19, 30, 31 -----	1-10
A	US 2007/160737 A1 (COLLIVER STEVEN P [GB] ET AL) 12 July 2007 (2007-07-12) claims 1, 13 paragraph [0085]; example 2 ----- -/--	1-10

☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

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"P" document published prior to the international filing date but later than the priority date claimed

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INTERNATIONAL SEARCH REPORT

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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Information on patent family members

International application No

PCT/EP2010/068195

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