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KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

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**Declarations under Rule 4.17:**

- as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))
- as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))
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(54) Title: PROCESS FOR MAKING AN INFUSIBLE TEA COMPOSITION

(57) Abstract: A process for making an infusible *Camellia sinensis* plant material composition comprising at least 500 µg/g of anthocyanins on a dry weight basis, the process involving the steps of: a) obtaining a source of *Camellia sinensis* plant material comprising at least 500 µg/g of anthocyanins on a dry weight basis, b) adding a source of acidity to the plant material to make an acidified blend, thereby producing the infusible purple *Camellia sinensis* plant material composition, and wherein the source of acidity is added in such a type and quantity such that when 1g of the plant material composition is added to 100g of water at 90°C and steeped for 2 minutes, it produces an infusion with a pH of less than 3.5 and which has a colour on the L\*a\*b\* scale wherein L\* is from 55 to 70, a\* is from 30 to 45 and b\* is from 5 to 28.



## PROCESS FOR MAKING AN INFUSIBLE TEA COMPOSITION

### Field of the invention

- 5 The invention relates to a process for making an infusible purple *Camellia sinensis* plant material composition, an infusible composition obtainable by the process and an infusion obtainable by adding water to the infusible composition.

### Background of the invention

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*Camellia sinensis*, commonly known as “tea” is widely used to prepare infusible compositions for the preparation of a beverage. The natural plant may have leaves varying in colour from white, yellow, and various shades of green.

- 15 However, varieties exist which have particularly high levels of anthocyanins. Such varieties have such a high level of anthocyanins that the leaves are often no longer green but are darker or even red, purple or brown in colouration.

Infusible particulate products based on such purple leaf tea are commercially available.

20

Anthocyanins are antioxidant flavonoids that have known health benefits. An infusible composition that is naturally high in anthocyanins would therefore be highly desirable. Anthocyanins are also known to provide a red, purple or pinkish colouration in an acidic environment.

25

However when such “purple” tea is processed to form an infusible substance in known methods, such as traditional green and black tea processing, to produce an infusible substance, any purple or pink colour is surprisingly absent from the resulting infusion.

- 30 It would therefore be desirable to provide an infusible substance that was naturally high in anthocyanins and also provided an infusion which appeared pink or purple, to reinforce to a consumer that the infusion was high in anthocyanins and to improve the enjoyment of the consuming process.

### Summary of the invention

In a first aspect the invention relates to a process for making an infusible *Camellia*  
5 *sinensis* plant material composition comprising at least 500 µg/g of anthocyanins on a  
dry weight basis, the process involving the steps of:

- a) obtaining a source of *Camellia sinensis* plant material comprising at least  
500 µg/g of anthocyanins on a dry weight basis,
- 10 b) adding a source of acidity to the plant material,

to produce the infusible purple *Camellia sinensis* plant material composition, and wherein  
the source of acidity is added in such a type and quantity such that when 1g of the plant  
material composition is added to 100g of water at 90°C and steeped for 2 minutes, it  
15 produces an infusion with a pH of less than 3.5 and which has a colour on the L\*a\*b\*  
scale wherein L\* is from 55 to 70, a\* is from 30 to 45 and b\* is from 5 to 28.

It has been found that this particular process provides an infusible composition that can  
form an infusion in water which has an attractive pink colour without needing to add  
20 anything further. The presence of the pink colour is indicative of the presence of a high  
level of anthocyanins, which have known health benefits. In particular, the infusion has  
a colour on the L\*a\*b\* scale wherein L\* is from 55 to 70, a\* is from 30 to 45 and b\* is  
from 5 to 28.

25 In a second aspect, the invention relates to an infusible *Camellia sinensis* plant material  
composition obtainable by a process as described herein.

In a third aspect, the invention relates to a beverage obtainable by the process of infusing  
a composition as described herein in water. Preferably the water is at a temperature of  
30 from 60°C to 100°C.

### Detailed description of the invention

- 3 -

Conventional tea plant material contains approximately from 200 to 400 µg/g of anthocyanins on a dry weight basis. However, the variants considered here, as well as the infusible compositions derived therefrom, have a greater concentration of anthocyanins. In particular the tea plant material and the infusible material comprises at  
5 least 500 µg/g of anthocyanins on a dry weight basis, preferably at least 1000 µg/g.

Thus the naturally present anthocyanins are largely or completely retained in the composition during processing.

10 It is hypothesised that a wide variety of sources of acidity will provide an infusion which has a pleasant pink colouration. However, preferably the source of acidity is citric acid. A convenient and natural form for the citric acid is lemon juice. It is also preferred that the source of acidity does not include ascorbic acid.

15 The source of acidity is preferably an aqueous acid solution. In a preferred process the aqueous acid solution is blended with the leaf, e.g. macerated to create a pulp, (which may have been withered, steamed and/or cut) to create the acidified blend, also known as a dhool.

20 As such the process typically involves a drying step to reduce the water content of the acidified blend to provide the infusible composition in particulate flowable form. For example, the drying step may involve drying in any conventional drying apparatus such as an oven or fluid bed dryer.

25 A process according to any one of the preceding claims, wherein the source of *Camellia sinensis* plant material comprises leaf material that is untreated, withered, chopped and/or steamed prior to adding the source of acidity.

The invention will now be illustrated by reference to the following non-limiting  
30 examples.

### Examples

- 4 -

10 different lab scale processes were carried out on purple *Camelia sinensis* leaf (a mix of 3 purple leaf clonal varieties). Also tested was a commercially available purple tea composition.

- 5 1) Sample 1 - 150g fresh purple leaf tea (PLT) (withered for 48 hours) was flash frozen in liquid nitrogen and dried/lyophilised. Purple patches of colour on leaf retained on freezing. Brewed tea gave a pale beige/brown infusion. Acidification of infusion with citric acid caused a change in infusion colour to pink/purple.
- 10 2) Sample 2 - 150g of fresh PLT (withered for 48 hours) was placed in a muslin bag and dried in the oven at 80°C for 6 hours. Leaves turn olive green and brown on drying. Brewed tea gave a yellow green cup similar to green tea. Acidification of the infusion with citric acid caused a very minor change in colour to a pale pinkish brown. The pH of the infusion was measured as 5.5.
- 15 3) Sample 3 - 150g fresh PLT (withered for 48 hours) was blended with 200 mL of reverse osmosis water to form a pulp. The pulp was placed into silver foil trays and dried in the oven at 80°C. Leaf pulp was an olive green colour. Dried dhoor was pale brown. Brewed tea gave a chocolate brown infusion. Citric acid addition to the infusion
- 20 resulted in no obvious colour changes. The pH of the infusion was measured as 5.14.
- 4) Sample 4 - 150g fresh PLT (withered for 48 hours) was blended to a pulp with 200 mL of citric acid (15g in 200mL / 0.39 mol/L similar to concentration of lemon juice. pH not measured). The pulp was placed into silver foil trays and dried in the oven at 80°C.
- 25 Leaf pulp was a dark purple brown colour. On drying the purple colour became more intense and brighter. The fully dry milled material was however a dark purple/pink colour. Brewed tea gave a dark purple pink infusion. This colour remained stable over a weekend. The pH of the infusion was measured as 3.06. Further acidification did not change the colour significantly.
- 30 5) Sample 5 - 150g fresh PLT (withered for 48 hours) was blended to a pulp with 200 mL of ascorbic acid (15g in 200mL / 0.426 mol/L. pH not measured). The pulp was placed into silver foil trays and dried in the oven at 80°C. Leaf pulp was a dark purple

brown colour. The fully dry milled material was however dark green/brown. Brewed tea gave a cloudy yellow green infusion, slightly darker than no.2. It was surprising that it was not pink like the citric acid sample. The pH of the infusion was measured as 3.7. Reducing the pH further by adding citric acid to the infusion resulted in no noticeable colour change.

6) Sample 6 – 150g fresh PLT shoots (withered for 48 hours) was laid out on the lab bench as whole shoots to dry for 7 days. Once dry, leaf was crushed gently to form small pieces of leaf approximately 0.5cm<sup>2</sup> in size and large stalks removed. Dried leaf was light to dark green in colour with no obvious purpleness. The infusion colour was pale yellow/brown. Acidification of the infusion with citric acid resulted in a change to a pinkish colour.

7) Sample 7 – 150g fresh PLT shoots was chopped up finely with a double handled roll blade to particle sizes of approximately 0.5 -1 cm<sup>2</sup>. Chopped leaf was placed into the drying oven at 80°C until there was no change in weight. The infusion of the leaf gave a yellow green colour. Acidification of the infusion resulted in no colour change.

8) Sample 8 – 150g fresh PLT shoots was chopped up finely with a double handled roll blade to particle sizes of approximately 0.5 -1 cm<sup>2</sup>. Chopped leaf was frozen in liquid nitrogen and freeze dried. The infusion was pale yellow brown, similar to sample 1. When acidified with citric acid the infusion turned pale pink.

9) Sample 9 – 150g fresh PLT shoots was steamed in a sieve over a kettle for 60 seconds. The leaf was then chopped to approximate particle sizes of 0.5-1cm<sup>2</sup> and oven dried at 80°C. The infusion was pale yellow brown, similar to samples 1 and 8. When acidified with citric acid the infusion turned pink.

10) Sample 10 – 150g fresh PLT shoots was steamed in a sieve over a kettle for 60 seconds. The leaf was then chopped to approximate particle sizes of 0.5-1cm<sup>2</sup> and bench dried on tissue paper at room temperature for 7 days. The infusion was pale yellow brown, similar to samples 1, 8 and 9. When acidified with citric acid the infusion turned pink.

11) Sample 11 – Commercially available purple infusible tea.

5 Table 1 Summary of processing conditions for samples 1 to 11.

Sample no.	Step 1	Step 2	Step 3	Step 4
1	Whole leaf	Freeze dried	Chopped	
2	Whole leaf	Oven dried @ 80C	Chopped	-
3	Whole leaf	150g + 200ml dH <sub>2</sub> O	Blended to pulp/dhool	Oven dried @ 80C
4	Whole leaf	150g + 200ml Citric acid solution (15g (0.39mol/L))	Blended to pulp/dhool	Oven dried @ 80C
5	Whole leaf	150g + 200ml Ascorbic acid solution (15g (0.426mol/L))	Blended to pulp/dhool	Oven dried @ 80C
6	Whole leaf	Bench dried	Chopped	-
7	Whole leaf	Chopped	Oven dried @ 80C	-
8	Whole leaf	Chopped	Freeze dried	-
9	Whole leaf	Steamed 60 seconds	Chopped	Oven dried @ 80C
10	Whole leaf	Steamed 60 seconds	Chopped	Bench dried
11	commercial sample	-	-	-

10 Beverages were made by infusing the produced tea in hot water. The colour of the resulting infusion was measured using the Lab system and the results are shown below in Table 2.

Table 2: L\*a\*b\* values of infusions generated from the compositions made from samples 1 to 11.

Sample no.	L*	a*	b*	Colour
1	74.67	11.61	18.4	Pale yellow/brown
2	74.03	10.01	38.75	yellow
3	52.57	25.27	49.28	Yellow/brown
4	60.46	35.84	23.82	Pink
5	70.35	14.38	42.53	Yellow
6	72.84	10.78	32.7	Pale yellow/brown
7	74.44	11.23	44.4	Pale Yellow/green
8	78.09	8.29	22.28	Pale yellow/brown
9	80.67	6.11	15.01	Pale yellow/brown
10	80.07	7.14	16.84	Pale yellow/brown
11	74.89	8.43	20.72	Pale yellow/brown

5

Of all the samples, only sample 4 gave an attractive pink colour upon infusion with hot water. This indicates that the citric acid protects the anthocyanins from degradation during oven drying. This may be because it protects the anthocyanins when the leaf has not been steamed to deactivate the oxidative enzymes.

10

To the infusions generated was added an amount of citric acid and the colour of the resulting beverage was measured again. The results are shown below in table 3.

15 Table 3: L\*a\*b\* values of infusions generated from the compositions made from samples 1 to 11 after further adding citric acid to the infusion.

Sample no.	L*	a*	b*	Colour
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- 8 -

<b>1</b>	59.94	41.71	13.18	Pink
<b>2</b>	69.02	24.44	32.83	Pale pink/brown
<b>3</b>	53.64	26.5	49.59	Yellow/brown
<b>4</b>	58.97	40.12	23.17	Pink
<b>5</b>	68.78	20.18	40.03	Yellow
<b>6</b>	64.39	34.37	26.74	Pink
<b>7</b>	73.21	15.79	39.48	yellow
<b>8</b>	66.81	34.65	19.32	Pink
<b>9</b>	69.2	30.83	11.03	Pink
<b>10</b>	67.26	34.94	12.59	Pink
<b>11</b>	60.57	38.44	13.47	Pink

As can be seen, the majority of the samples provide a pink infusion when citric acid is added. However, the process that involved the addition of ascorbic acid (sample 5) did not turn pink. Also most processes which involved oven drying the leaf at 80°C (samples 2, 3, 7) did not turn pink unless they were stabilised with citric acid or steamed beforehand.

This may be due to the anthocyanins being destabilised.

**Claims**

- 1 A process for making an infusible *Camellia sinensis* plant material composition  
5 comprising at least 500 µg/g of anthocyanins on a dry weight basis, the process  
involving the steps of:
- a) obtaining a source of *Camellia sinensis* plant material comprising at least  
500 µg/g of anthocyanins on a dry weight basis,
- 10 b) adding a source of acidity to the plant material to make an acidified blend,  
thereby producing the infusible purple *Camellia sinensis* plant material  
composition, and wherein the source of acidity is added in such a type and quantity  
such that when 1g of the plant material composition is added to 100g of water at  
15 90°C and steeped for 2 minutes, it produces an infusion with a pH of less than 3.5  
and which has a colour on the L\*a\*b\* scale wherein L\* is from 55 to 70, a\* is from  
30 to 45 and b\* is from 5 to 28.
- 2 A process according to claim 1, wherein the source of acidity is citric acid.  
20
- 3 A process according to claim 2, wherein the citric acid is provided by lemon juice.
- 4 A process according to any one of the preceding claims, wherein the source of  
acidity does not include ascorbic acid.  
25
- 5 A process according to any one of the preceding claims, wherein an aqueous acid  
solution is the source of acidity.
- 6 A process according to any one of the preceding claims, wherein the *Camellia*  
30 *sinensis* plant material comprises at least 1000 µg/g of anthocyanins on a dry  
weight basis and the resulting infusible composition also comprises at least 1000  
µg/g of anthocyanins on a dry weight basis.

- 10 -

- 7 A process according to any one of the preceding claims, wherein the source of *Camellia sinensis* plant material comprises leaf material that is untreated, withered, chopped and/or steamed prior to adding the source of acidity.
- 5 8 A process according to claim 6 and 7, wherein the acid solution is blended with leaf *Camellia sinensis* to produce a dhool.
- 9 A process according to any one of the preceding claims, which involves a drying step to reduce the water content of the acidified blend.
- 10 10 A process according to claim 9, wherein the drying step provides the infusible composition in particulate flowable form.
- 11 An infusible *Camellia sinensis* plant material composition obtainable by a process  
15 according to any one of the preceding claims.
- 12 An infusion obtainable by the process of infusing a composition according to claim 11 in water.
- 20 13 An infusion according to claim 12, wherein the water is at a temperature of from 60°C to 100°C.

INTERNATIONAL SEARCH REPORT

International application No  
PCT/EP2017/057440

A. CLASSIFICATION OF SUBJECT MATTER  
INV. A23F3/14  
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 practicable, search terms used)  
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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Further documents are listed in the continuation of Box C.

See patent family annex.

\* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier application or patent but published on or after the international filing date
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- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
- "&" document member of the same patent family

Date of the actual completion of the international search  24 May 2017	Date of mailing of the international search report  07/06/2017
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Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer  Piret-Viprey, E
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International application No  
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Information on patent family members

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