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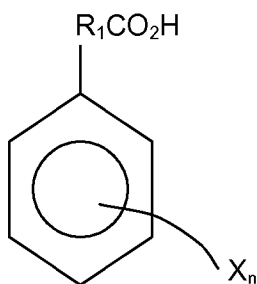
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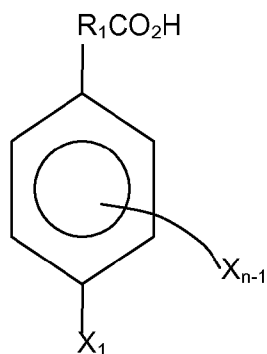
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(54) Title: FLAVAN-3-OL CONTAINING FOODSTUFFS



(I)

(57) Abstract: The use of a compound for the reduction or elimination of bitterness caused by flavan-3-ols is provided. Compositions having greater than 0.01 wt % flavan-3-ols and that comprise an effective amount of the compound are also provided. The compound conforms to the general formula (I) wherein R<sub>1</sub> represents C<sub>2</sub> - C<sub>3</sub> saturated or unsaturated divalent hydrocarbon radical, n is an integer from 0 to 3, and each X is independently selected from C<sub>1</sub> - C<sub>3</sub> alkyloxy and OH; and wherein if n is 0 then R<sub>1</sub> is C<sub>3</sub> saturated divalent hydrocarbon radical or C<sub>2</sub> - C<sub>3</sub> unsaturated divalent hydrocarbon radical; and wherein if n is greater than 0 then the compound has formula (II).



(II)

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### Flavan-3-ol Containing Foodstuffs

#### **Technical field of the invention**

The present invention is directed to compounds and compositions for the reduction or  
5 elimination of bitterness caused by flavan-3-ols.

#### **Background to the invention**

Excluding water, tea is the most popular beverage consumed by man. Tea is very  
refreshing, can be served either hot or cold, and has been made commercially available  
10 for many years. Lipton®, for example, is the world's leading brand of tea, made  
available in over 110 countries by Unilever.

Today, modern scientists are exploring the exciting potential of tea, which has a  
unique combination of natural antioxidants known as flavonoids that can include  
15 flavan-3-ols, flavonols and flavonol glucosides. Taken regularly, tea can help improve  
vascular function, combat fatigue, reduce cholesterol levels and increase feelings of  
vitality.

Studies have found that the flavan-3-ols, such as catechins, found in tea have many  
20 health benefits and epigallocatechin gallate, epicatechin, epicatechin gallate, and  
epigallocatechin have been shown to positively impact physiological activities, and  
their use as antiallergic agents and cerebral function activators has been proposed.

In view of the many positive contributions associated with flavan-3-ols, it is desirable  
25 to formulate consumable compositions, such as beverages and food, with elevated  
levels of flavan-3-ols. Unfortunately, increased amounts of flavan-3-ols can lead to end  
use products that can have poor organoleptic properties, in particular bitter taste.

US 2003/0096050 discloses a food composition containing catechins (i.e. flavan-3-ols)  
30 and gallic acid wherein the gallic acid is alleged to have a certain bitterness mitigating  
effect. There is therefore a need for consumable compositions with elevated levels of  
flavan-3-ols with improved bitterness reduction.

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## Definitions

### Flavan-3-ols

As used herein the term "flavan-3-ols" is used as a generic term for catechins, theaflavins, thearubigins, and mixtures thereof.

5

### Catechins

As used herein the term "catechins" is used as a generic term for catechin, galocatechin, catechin gallate, galocatechin gallate, epicatechin, epigallocatechin, epicatechin gallate, epigallocatechin gallate, and mixtures thereof.

10

### Theaflavins

As used herein the term "theaflavins" is used as a generic term for theaflavin, isotheaflavin, neotheaflavin, theaflavin-3-gallate, theaflavin-3'-gallate, theaflavin-3,3'-digallate, epitheaflavic acid, epitheaflavic acid-3'-gallate, theaflavic acid, theaflavic acid-3'-gallate and mixtures thereof. The structures of these compounds are well-known (see, for example, structures xi-xx in Chapter 17 of "Tea – Cultivation to consumption", K.C. Willson and M.N. Clifford (Eds), 1992, Chapman & Hall, London, pp.555-601). The term theaflavins includes salt forms of these compounds. The preferred theaflavins are theaflavin, theaflavin-3-gallate, theaflavin-3'-gallate, theaflavin-3,3'-digallate and mixtures thereof, as these theaflavins are most abundant in natural sources, such as black tea.

15

20

### Beverage

As used herein the term "beverage" refers to a substantially aqueous drinkable composition suitable for human consumption. Preferably the beverage comprises at least 85% water by weight of the beverage, more preferably at least 90% and most preferably from 95 to 99.9%.

25

### Tea solids

As used herein, the term "tea solids" refers to dry material extractable from the leaves of the plant *Camellia sinensis* var. *sinensis* and/or *Camellia sinensis* var. *assamica*. The material may have been subjected to a so-called "fermentation" step wherein it is oxidised by certain endogenous enzymes that are released during the early stages of

30

"black tea" manufacture. This oxidation may even be supplemented by the action of exogenous enzymes such as oxidases, laccases and peroxidases. Alternatively the material may have been partially fermented ("oolong" tea) or substantially unfermented ("green tea").

5

#### Tea-based beverage

As used herein, the term "tea-based beverage" refers to a beverage comprising at least 0.01% by weight tea solids. Preferably the tea-based beverage comprises from 0.04 to 3% by weight tea solids, more preferably from 0.06 to 2%, most preferably from 0.1 to 1%.

10

#### Elevated levels of flavan-3-ols

As used herein, the term "elevated levels of flavan-3-ols" refers to compositions comprising at least 0.01 wt% flavan-3-ols.

15

#### Effective amount

As used herein, the term "effective amount" refers to at least 0.01 wt% of the compound or compounds for the reduction or elimination of bitterness caused by flavan-3-ols.

20

#### Comprising

The term "comprising" is meant not to be limiting to any subsequently stated elements but rather to encompass non-specified elements of major or minor functional importance. In other words the listed steps, elements or options need not be exhaustive. Whenever the words "including" or "having" are used, these terms are meant to be equivalent to "comprising" as defined above.

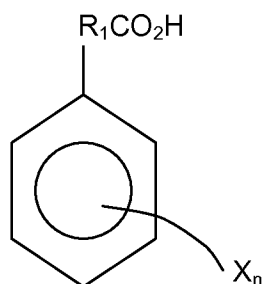
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#### **Brief description of the invention**

We have now found that bitterness in consumable compositions with elevated levels of flavan-3-ols may be eliminated through the use of particular compounds. Accordingly, in a first aspect, the present invention provides the use of a compound of formula (I):

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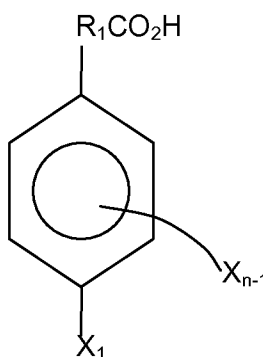
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(I)

for the reduction or elimination of bitterness caused by flavan-3-ols, wherein  $R_1$  represents  $C_2 - C_3$  saturated or unsaturated divalent hydrocarbon radical,  $n$  is an integer from 0 to 3, and

5 each  $X$  is independently selected from  $C_1 - C_3$  alkyloxy and  $OH$ ;  
and wherein if  $n$  is 0 then  $R_1$  is  $C_3$  saturated divalent hydrocarbon radical or  $C_2 - C_3$  unsaturated divalent hydrocarbon radical;  
and wherein if  $n$  is greater than 0 then the compound has formula (II)



(II).

10

We have conducted extensive research into the physiological origin of bitterness from flavan-3-ols. The human tongue perceives bitterness via a family of about 25 related receptors, each of which detects a different set of bitter tasting molecules. Without

15 wishing to be bound by theory, we believe that the bitter taste of flavan-3-ols is caused by the activation of a specific receptor, TAS2R39, by flavan-3-ols. Furthermore, we have found that compounds of formula (I) specifically bind to receptor TAS2R39 and antagonise its activation. Hence compounds according to the invention block or reduce the activation of receptor TAS2R39 by flavan-3-ols and the bitter taste of the

- 5 -

flavan-3-ols is alleviated. More specifically, compounds according to formula (I) are more effective at blocking TAS2R39 than gallic acid.

5 In a second aspect, the present invention provides a composition comprising greater than 0.01 wt % flavan-3-ols and an effective amount of at least one compound of formula (I). An advantage of this aspect of the present invention is that such a composition will allow consumers to reach the required intake of flavan-3-ols with fewer servings of, for example, a high-flavan-3-ol tea without the aversive effects of enhanced bitterness that this would normally introduce.

10

In a third aspect, the present invention provides a method of manufacturing the composition, the method comprising the steps of: providing a first substance comprising flavan-3-ols and a second substance comprising the at least one compound of formula (I), combining the two substances, and recovering the composition.

15

In a final aspect, the present invention provides a method for the reduction or elimination of bitterness caused by flavan-3-ols comprising consuming a first substance and a second substance, simultaneously or sequentially, wherein the first substance comprises flavan-3-ols and the second substance comprises an effective amount of at least one compound of formula (I).

20

### **Detailed description of the invention**

The present invention is directed to consumable compositions that contain high levels of flavan-3-ols in which the bitter taste of the flavan-3-ols is reduced.

25

The present invention provides for the use of a compound of formula (I) that is more effective at blocking flavan-3-ol bitterness. The compound is particularly effective at blocking the bitter taste of catechins and hence a preferred use is for blocking bitterness caused by catechins. Especially effective, and thus preferred compounds, are those wherein each X of formula (I) is independently selected from methoxy and OH. Alternatively preferred compounds are those wherein if n of formula (I) is 0 then R<sub>1</sub> is C<sub>2</sub> unsaturated divalent hydrocarbon radical or C<sub>3</sub> saturated divalent hydrocarbon radical. Particularly preferred compounds are:

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- Cinnamic acid,  
4-Phenylbutanoic acid,  
3-(3,4,5-trimethoxyphenyl)propanoic acid,  
3,4,5-trimethoxycinnamic acid,  
5 3-(4-methoxyphenyl)propanoic acid,  
4-methoxycinnamic acid,  
2,4-dimethoxycinnamic acid,  
3-(3,4-dimethoxyphenyl)propanoic acid,  
3,4-dimethoxycinnamic acid,  
10 4-hydroxycinnamic acid,  
3-(3,4-dihydroxyphenyl)propanoic acid,  
3,4-dihydroxycinnamic acid,  
3-(3-methoxy-4-hydroxyphenyl)propanoic acid,  
3-methoxy-4-hydroxycinnamic acid,  
15 4-hydroxy-3,5-dimethoxycinnamic acid,  
and mixtures thereof.

Yet more preferred compounds are:

- 4-Phenylbutanoic acid,  
20 3-(3,4,5-trimethoxyphenyl)propanoic acid,  
3,4,5-trimethoxycinnamic acid,  
3-(4-methoxyphenyl)propanoic acid,  
4-methoxycinnamic acid,  
2,4-dimethoxycinnamic acid,  
25 3-(3,4-dimethoxyphenyl)propanoic acid,  
3,4-dimethoxycinnamic acid,  
3-(3,4-dihydroxyphenyl)propanoic acid,  
3-(3-methoxy-4-hydroxyphenyl)propanoic acid,  
and mixtures thereof.

30

The present invention also provides for a composition comprising greater than 0.01 wt% flavan-3-ols, preferably greater than 0.02 wt% flavan-3-ols, more preferably greater than 0.05 wt% flavan-3-ols and an effective amount of at least one compound



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of formula (I). Preferably, the flavan-3-ols are one or more catechins. The amount of the compound is typically at least 0.05 wt%, more preferably at least 0.075 wt%, most preferably at least 0.1 wt%. The amount of the compound is typically at most 1.5 wt%, more preferably at most 0.75 wt%, most preferably at most 0.25 wt%. The preferred  
5 form of the composition is a food, more preferably a beverage, most preferably a tea-based beverage. Preferably the compound is one or more of: Cinnamic acid, 4-Phenylbutanoic acid, 3-(3,4,5-trimethoxyphenyl)propanoic acid, 3,4,5-trimethoxycinnamic acid, 3-(4-methoxyphenyl)propanoic acid, 4-methoxycinnamic acid, 2,4-dimethoxycinnamic acid, 3-(3,4-dimethoxyphenyl)propanoic acid, 3,4-  
10 dimethoxycinnamic acid, 4-hydroxycinnamic acid, 3-(3,4-dihydroxyphenyl)propanoic acid, 3,4-dihydroxycinnamic acid, 3-(3-methoxy-4-hydroxyphenyl)propanoic acid, 3-methoxy-4-hydroxycinnamic acid, and 4-hydroxy-3,5-dimethoxycinnamic acid. More preferably the compound is one or more of: 4-Phenylbutanoic acid, 3-(3,4,5-trimethoxyphenyl)propanoic acid, 3,4,5-trimethoxycinnamic acid, 3-(4-  
15 methoxyphenyl)propanoic acid, 4-methoxycinnamic acid, 2,4-dimethoxycinnamic acid, 3-(3,4-dimethoxyphenyl)propanoic acid, 3,4-dimethoxycinnamic acid, 3-(3,4-dihydroxyphenyl)propanoic acid, and 3-(3-methoxy-4-hydroxyphenyl)propanoic acid.

The present invention further provides a method of manufacturing the composition,  
20 the method comprising the steps of: providing a first substance comprising flavan-3-ols and a second substance comprising the at least one compound of formula (I), combining the two substances, and recovering the composition. Preferably, the first substance comprises catechins.

25 The present invention finally provides a method for the reduction or elimination of bitterness caused by flavan-3-ols comprising consuming a first substance and a second substance wherein the first substance comprises flavan-3-ols and the second substance comprises an effective amount of at least one compound of formula (I). Preferably, the first substance comprises catechins. Preferably the first and second substances are  
30 consumed simultaneously as part of the same meal, more preferably the first and second substances are consumed simultaneously in the same composition. Alternatively the first and second substances are consumed sequentially, most

preferably when consumed sequentially, the first substance is consumed after the second substance.

### Example 1

#### 5 Evaluation of TSA2R39 inhibitors

Activation of the bitter receptor TAS2R39 causes the release of calcium from the endoplasmic reticulum of those cells containing the receptor. Therefore, changes in calcium levels within cells expressing TAS2R39 serves as a proxy marker for the activity of the receptor. An assay was used to assess the stimulation of TAS2R39 by the flavan-  
10 3-ol epicatechin gallate (ECG) and to assess the inhibition of this stimulation of TAS2R39 through the use of various compounds as follows:

HEK293 cells expressing the human bitter receptor TAS2R39 and a G-protein that allows coupling to a calcium readout system were maintained in Dulbecco's Modified  
15 Eagle's Medium (DMEM) containing DMEM and 10% tetracycline-free fetal bovine serum (Cambrex) supplemented with blasticidin (5 µg/ml) geneticin (400 µg/ml) and hygromycin (100 µg/ml). Cells were grown and maintained at 37°C / 5% CO<sub>2</sub>.

Cells were cultured in a 75 cm<sup>2</sup> flask, harvested by trypsinisation and resuspended in  
20 DMEM medium. 100 µl of cells per well were added to a poly-L-lysine coated µClear 96-well plate, and incubated overnight. Expression of the TAS2R39 gene was then induced by the addition of 100 µl DMEM medium containing 0.5 µg/ml doxycyclin. After another 24-30 hrs the medium was removed and the cells were loaded for 1 hour with  
25 50 µl Tyrodes buffer (140 mM NaCl, 5 mM KCl, 10 mM glucose, 1 mM CaCl<sub>2</sub> · 2 H<sub>2</sub>O, 1 mM MgCl<sub>2</sub> · 6 H<sub>2</sub>O, 20 mM HEPES pH 7.4 (Sigma P8761)) containing 2.5 µM of the fluorescent marker of calcium, Fluo-4-AM, followed by a 1-hr incubation at 37°C. The cells were then washed with Tyrodes buffer and finally taken up in 100 µl Tyrodes buffer.

30 Test solutions containing 0.5mM ECG and 10mM of the test compounds, dissolved in Tyrodes buffer, were prepared and 100 µl of each test solution was added to the wells of the 96-well plate containing the cells. A comparative solution containing only

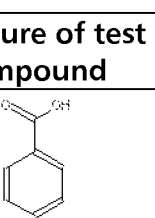
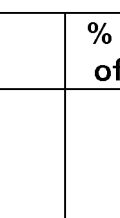
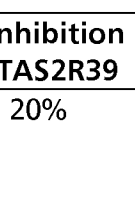
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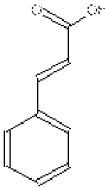
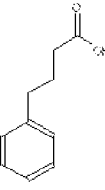
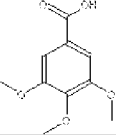
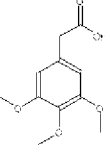
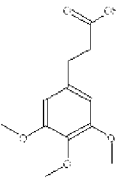
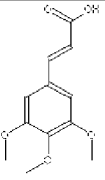
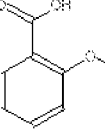
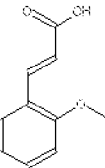
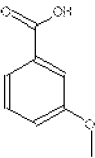
0.5mM ECG dissolved in Tyrodes buffer was also prepared and 100  $\mu$ l was added to a well of the 96-well plate containing the cells.

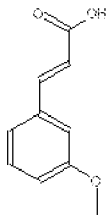
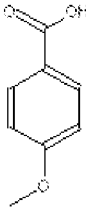
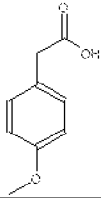
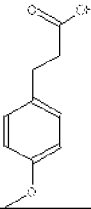
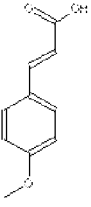
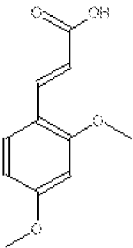
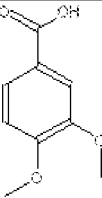
Intracellular calcium levels were monitored using a Flexstation II 384. The 96-well plate  
 5 was loaded onto the Flexstation II 384 and fluorescence measurements were carried out at 37°C at an excitation wavelength of 485nm and an emission wavelength of 520nm. Activity of TAS2R39 was measured as the change in fluorescence ( $\Delta F$ ) which was calculated by subtracting the maximum fluorescence after the addition of the test or comparative solution from the baseline fluorescence measured before addition of  
 10 the test or comparative solution.

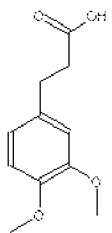
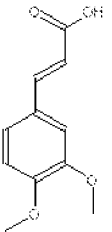
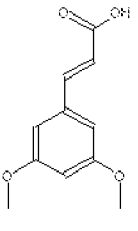
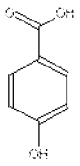
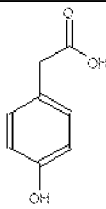
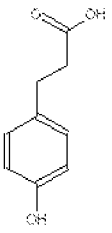
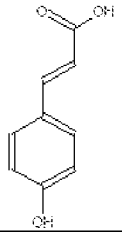
Inhibition of TAS2R39 activity was measured as the percentage reduction of  $\Delta F$  in the presence of ECG alone, compared to  $\Delta F$  in the presence of ECG plus a test compound. The test compounds, their structures and the percentage inhibition of TAS2R39 activity  
 15 is given in the following table. 3,4,5-trihydroxybenzoic acid (gallic acid) was included in the selection of the test compounds.

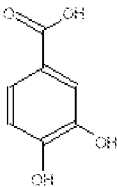
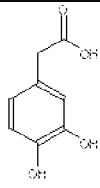
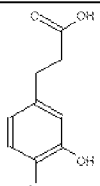
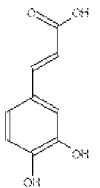
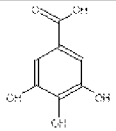
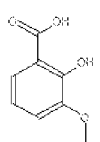
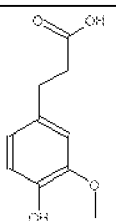
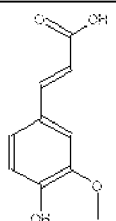
Table 1 – Inhibition of TAS2R39 activity

Test compound	Structure of test compound	% inhibition of TAS2R39
Benzoic acid		20%
Phenylacetic acid		5%
3-phenylpropanoic acid		15%

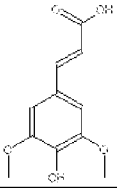
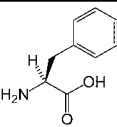
3-phenyl propenoic acid (Cinnamic acid)		40%
4-phenylbutanoic acid		40%
3,4,5-trimethoxybenzoic acid		20%
3,4,5-trimethoxyphenylacetic acid		25%
3-(3,4,5-trimethoxyphenyl)propanoic acid		35%
3,4,5-trimethoxycinnamic acid		70%
2-methoxybenzoic acid		10%
2-methoxycinnamic acid		0%
3-methoxybenzoic acid		5%

3-methoxycinnamic acid		0%
4-methoxybenzoic acid		15%
4-methoxyphenylacetic acid		15%
3-(4-methoxyphenyl)propanoic acid		40%
4-methoxycinnamic acid		30%
2,4-dimethoxycinnamic acid		40%
3,4-dimethoxybenzoic acid		10%

3-(3,4-dimethoxyphenyl)propanoic acid		35%
3,4-dimethoxycinnamic acid		45%
3,5-dimethoxycinnamic acid		20%
4-hydroxybenzoic acid		25%
4-hydroxyphenylacetic acid		20%
3-(4-hydroxyphenyl)propanoic acid		25%
4-hydroxycinnamic acid		40%

3,4-dihydroxybenzoic acid		15%
3,4-dihydroxyphenylacetic acid		15%
3-(3,4-dihydroxyphenyl)propanoic acid		30%
3,4-dihydroxycinnamic acid		30%
3,4,5-trihydroxybenzoic acid (gallic acid)		25%
2-hydroxy-3-methoxybenzoic acid		25%
3-(3-methoxy-4-hydroxyphenyl)propanoic acid		35%
3-methoxy-4-hydroxycinnamic acid		65%

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4-hydroxy-3,5-dimethoxycinnamic acid		65%
Phenylalanine		0%

It can clearly be seen that although the test compounds share similar basic moieties, their ability to inhibit the bitter receptor TAS2R39 is varied. Only those compounds according to formula (I) are better than gallic acid. In particular, the results above

5 according to formula (I) are better than gallic acid. In particular, the results above demonstrate that compounds according to formula I, such as Cinnamic acid, 4-Phenylbutanoic acid, 3-(3,4,5-trimethoxyphenyl)propanoic acid, 3,4,5-trimethoxycinnamic acid, 3-(4-methoxyphenyl)propanoic acid, 4-methoxycinnamic acid, 2,4-dimethoxycinnamic acid, 3-(3,4-dimethoxyphenyl)propanoic acid, 3,4-

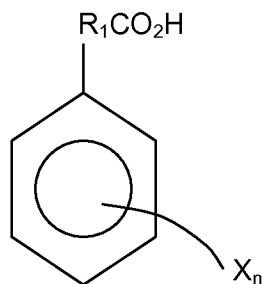
10 dimethoxycinnamic acid, 4-hydroxycinnamic acid, 3-(3,4-dihydroxyphenyl)propanoic acid, 3,4-dihydroxycinnamic acid, 3-(3-methoxy-4-hydroxyphenyl)propanoic acid, 3-methoxy-4-hydroxycinnamic acid and 4-hydroxy-3,5-dimethoxycinnamic acid, are more effective inhibitors of TAS2R39 than gallic acid.



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## Claims

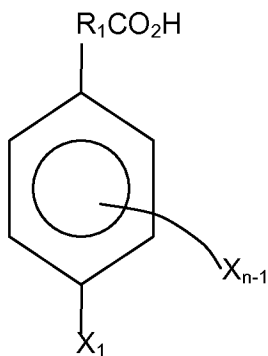
1. Use of a compound of formula (I):



5

(I)

- for the reduction or elimination of bitterness caused by flavan-3-ols, wherein  
 10  $R_1$  represents  $C_2 - C_3$  saturated or unsaturated divalent hydrocarbon radical,  
 $n$  is an integer from 0 to 3, and  
 each  $X$  is independently selected from  $C_1 - C_3$  alkyloxy and OH;  
 and wherein if  $n$  is 0 then  $R_1$  is  $C_3$  saturated divalent hydrocarbon radical or  $C_2 -$   
 $C_3$  unsaturated divalent hydrocarbon radical;  
 15 and wherein if  $n$  is greater than 0 then the compound has formula (II)



(II).

2. Use according to claim 1 wherein the bitterness is caused by catechins.

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3. Use according to claim 1 or claim 2 wherein each X is independently selected from methoxy and OH.
4. Use according to claim 1 or claim 2 wherein if n is 0 then R<sub>1</sub> is C<sub>2</sub> unsaturated divalent hydrocarbon radical or C<sub>3</sub> saturated divalent hydrocarbon radical.
5. Use according to any of the preceding claims wherein the compound is one or more of:
- Cinnamic acid,  
4-Phenylbutanoic acid,  
3-(3,4,5-trimethoxyphenyl)propanoic acid,  
3,4,5-trimethoxycinnamic acid,  
3-(4-methoxyphenyl)propanoic acid,  
4-methoxycinnamic acid,  
2,4-dimethoxycinnamic acid,  
3-(3,4-dimethoxyphenyl)propanoic acid,  
3,4-dimethoxycinnamic acid,  
4-hydroxycinnamic acid,  
3-(3,4-dihydroxyphenyl)propanoic acid,  
3,4-dihydroxycinnamic acid,  
3-(3-methoxy-4-hydroxyphenyl)propanoic acid,  
3-methoxy-4-hydroxycinnamic acid, and  
4-hydroxy-3,5-dimethoxycinnamic acid.
6. Use according to any of the preceding claims wherein the compound is one or more of:
- 4-Phenylbutanoic acid,  
3-(3,4,5-trimethoxyphenyl)propanoic acid,  
3,4,5-trimethoxycinnamic acid,  
3-(4-methoxyphenyl)propanoic acid,  
4-methoxycinnamic acid,  
2,4-dimethoxycinnamic acid,  
3-(3,4-dimethoxyphenyl)propanoic acid,

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3,4-dimethoxycinnamic acid,  
3-(3,4-dihydroxyphenyl)propanoic acid, and  
3-(3-methoxy-4-hydroxyphenyl)propanoic acid.

- 5 7. A composition comprising greater than 0.01 wt % flavan-3-ols and an effective amount of at least one compound of formula (I).
8. A composition according to claim 7 wherein the at least one compound is one or more of:
- 10 Cinnamic acid,  
4-Phenylbutanoic acid,  
3-(3,4,5-trimethoxyphenyl)propanoic acid,  
3,4,5-trimethoxycinnamic acid,  
3-(4-methoxyphenyl)propanoic acid,
- 15 4-methoxycinnamic acid,  
2,4-dimethoxycinnamic acid,  
3-(3,4-dimethoxyphenyl)propanoic acid,  
3,4-dimethoxycinnamic acid,  
4-hydroxycinnamic acid,
- 20 3-(3,4-dihydroxyphenyl)propanoic acid,  
3,4-dihydroxycinnamic acid,  
3-(3-methoxy-4-hydroxyphenyl)propanoic acid,  
3-methoxy-4-hydroxycinnamic acid, and  
4-hydroxy-3,5-dimethoxycinnamic acid.
- 25 9. A composition according to claim 7 or claim 8 wherein the at least one compound is one or more of:
- 30 4-Phenylbutanoic acid,  
3-(3,4,5-trimethoxyphenyl)propanoic acid,  
3,4,5-trimethoxycinnamic acid,  
3-(4-methoxyphenyl)propanoic acid,  
4-methoxycinnamic acid,  
2,4-dimethoxycinnamic acid,

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3-(3,4-dimethoxyphenyl)propanoic acid,  
3,4-dimethoxycinnamic acid,  
3-(3,4-dihydroxyphenyl)propanoic acid, and  
3-(3-methoxy-4-hydroxyphenyl)propanoic acid.

5

10. A composition according to any of claims 7 to 9 comprising at least 0.05 wt % flavan-3-ols.

10 11. A composition according to any of claims 7 to 10 wherein the flavan-3-ols are one or more catechins.

12. A composition according to any one of claims 7 to 11 wherein the amount of the at least one compound of formula (I) is from 0.05 to 1.5 wt%.

15

13. A composition according to any one of claims 7 to 12 wherein the composition is a beverage, preferably a tea-based beverage.

14. A method of manufacturing a composition according to any one of claims 7 to 13, the method comprising the steps of: providing a first substance comprising flavan-3-ols and a second substance comprising the at least one compound of formula (I), combining the two substances, and recovering the composition.

20

15. A method according to claim 14 wherein the first substance comprises one or more catechins.

25

16. A method for the reduction or elimination of bitterness caused by flavan-3-ols comprising consuming a first substance and a second substance, simultaneously or sequentially, wherein the first substance comprises flavan-3-ols and the second substance comprises an effective amount of at least one compound of formula (I).

30

17. A method according to claim 16 wherein the first substance comprises one or more catechins.

## INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2009/059940

A. CLASSIFICATION OF SUBJECT MATTER  
 INV. A23L1/226 A23F3/00

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)  
 A23L 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, WPI Data, FSTA, BIOSIS, EMBASE

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A	US 5 336 513 A (RIEMER JED A [US]) 9 August 1994 (1994-08-09) column 1, line 63 - column 2, line 11 column 2, line 62 - column 3, line 7 column 3, line 13 - line 22 -----	1-5,7-8, 10-17 6,9
X A	US 2007/059421 A1 (CATANI STEVEN J [US] ET AL) 15 March 2007 (2007-03-15) paragraph [0009] paragraph [0026] - paragraph [0027] example 1; table 1 claims 8,33,41 -----	1-5,7-8, 10-17 6,9
X	WO 99/21432 A (UNILEVER PLC [GB]; UNILEVER NV [NL]) 6 May 1999 (1999-05-06) page 4, line 6 - page 5, line 26 page 6, line 8 - line 19 example 4 -----	7-8, 10-15
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Further documents are listed in the continuation of Box C.

See patent family annex.

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- \*Z\* document member of the same patent family

Date of the actual completion of the international search

7 October 2009

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## INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2009/059940

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/EP2009/059940

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