

GREEN SICHUAN PEPPER FLAVOURING OIL COMPOSITION

5 The present invention is in the field of ready-to-use
flavouring oil compositions comprising Green Sichuan Pepper
oil extract.

The use of different peppers as seasoning and condiment, on
10 its own or in spice blends, extracts or in the form of
flavouring oils, is well known in many Asian countries and a
common spice used in the Asian cuisine. The use of such pepper
condiments is also on the increase in the Western world with
the growing popularity of snacks, ethnic foods, ready-to-cook
15 meals and Asian cuisine type cooking.

Different types of pepper plants and pepper spices are known
and are commonly used in different parts of the world,
depending on where they are cultivated and traditionally part
20 of the local cuisine, and depending on the historic trade and
adapted use of some of those pepper products in other parts of
the world.

Sichuan pepper, originally grown and consumed in the Sichuan
25 province of China, is known in Chinese as "hua jiao",
literally meaning 'flower pepper'. In the commerce, the
generic term of Sichuan pepper refers to all pepper spices
harvested from plants of that province and belonging to the
Zanthoxylum genus. In particular, one of the examples of
30 Sichuan pepper is 'Tengjiao pepper' which derives from
Zanthoxylum schinifolium which primarily grows along the
Jinsha River in the province of Sichuan in China. Related

spices to Green pepper are used in the cuisines of Tibet, Bhutan, Nepal, Thailand and Indonesia.

Sichuan pepper has a unique aroma and flavor that is not hot
5 or pungent like black, white or chili pepper. Instead, it has
a slight lemony overtone and creates a tingly numbness in the
mouth (caused by hydroxy-alpha-sanshool) that sets the stage
for hot spices. According to Harold McGee in On Food and
Cooking, second edition, p429 they are not simply pungent;
10 "they produce a strange, tingling, buzzing, numbing sensation
that is something like the effect of carbonated drinks or of a
mild electrical current (touching the terminals of a nine-volt
battery to the tongue). Sanshools appear to act on several
different kinds of nerve endings at once, induce sensitivity
15 to touch and cold in nerves that are ordinarily non-sensitive,
and so perhaps cause a kind of general neurological
confusion."

Sichuan pepper is also available as an oil, marketed in China
20 as either "Sichuan pepper oil", "Bunge Prickly Ash Oil" or
"Hwajiaow oil". In this form it is best used in stir-fry noodle
dishes without hot spices. In many traditional noodle and
vegetable recipes Sichuan pepper oil is added after the
cooking step. This is due to the fact that the typical and
25 intense aroma and flavor of the Sichuan pepper is heat labile
and rapidly lost upon cooking or frying for several minutes,
if added to a food product before the cooking step.

It is the object of the present invention to improve the state
30 of the art and to provide a new Sichuan pepper flavouring oil
product which overcomes at least some of the inconveniences
described above. The object of the present invention is
further to provide a new Sichuan pepper flavouring oil which

has an improved flavour and aroma stability of the typical Sichuan Green pepper flavour. In particular, the object of the present invention is to provide such a new Sichuan pepper flavouring oil with an improved flavour and aroma stability of the Sichuan Green pepper flavour when heated, cooked or when fried together with a food product for several minutes.

The object of the present invention is achieved by the subject matter of the independent claims. The dependent claims further develop the idea of the present invention.

Accordingly, the present invention provides in a first aspect a ready-to-use flavouring oil composition comprising: 5 - 40 wt% Green Sichuan Pepper oil extract, 0.2 - 5 wt% Oleoresin, and 20 - 90 wt% of a vegetable oil.

The "wt%" relates to weight per-cent of the total ready-to-use flavouring oil composition. This applies through-out the entire present application.

In a second aspect, the invention pertains to a use of a vegetable oil in combination with a Green Sichuan pepper oil extract and an Oleoresin in a flavouring oil composition for improving the stability of the Green Sichuan pepper aroma and flavor in said flavouring oil composition.

A third aspect of the present invention relates to a food product comprising the flavouring oil composition of the present invention.

A still further aspect of the invention is a method for improving the Green Sichuan Pepper flavor and aroma of a food product when cooked, comprising the steps of applying to said

food product a flavouring oil composition according to the present invention, and cooking or frying said food product for at least 1 or 2 min, preferably at least 3 min, and more preferably for at least 5 min.

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It has been surprisingly found by the inventors that the stability of the Green Sichuan Pepper flavor and aroma compounds in a flavouring oil composition upon heating, cooking or frying for several minutes very much depend on the precise nature, composition and amount of the vegetable oil being present in said flavouring oil composition.

Particularly, it has been found that the good, typical Sichuan pepper aroma and flavor compounds are rapidly lost upon heating a Sichuan pepper extract containing oil composition where the major part of the vegetable oil is for example rapeseed oil, olive oil or peanut oil. Thereby, the typical flavor and aroma of the Green Sichuan pepper oil was already substantially lost after only about 1 minute of a heating step. Furthermore, upon a longer cooking time for example 10 minutes, very strong off-flavors probably due to oxidation of some of the aroma and flavor compounds became apparent to the tasting panel. The tested samples were considered by the tasting panel as not being acceptable anymore after a 10 minute heating time. It is worthwhile noting here, that traditionally Green Sichuan pepper oil is prepared in the province of Sichuan primarily with rapeseed oil and in the Western world pepper/spice oils are usually prepared with olive oil.

The inventors have further found that the use of soy bean oil and corn oil as the major oil component in a flavouring oil composition containing Green Sichuan pepper oil extract has a very positive effect on the heat stability of the pepper aroma

and flavor compounds. Thereby it has been observed by the tasting panel, that the pepper aroma/flavor was still very strong and very acceptable after 5 minutes of heating of those respective flavouring oil samples. Even after 10 minutes of heating, the respective oil samples had still an acceptable level of Green pepper aroma and flavor. It was thereby observed that the use of corn oil particularly well conserved the green pepper aroma and flavor after the boiling step. The experimental set-up and the detailed results are demonstrated in the Examples section below.

Furthermore, the inventors observed that the use of palm oil and sunflower oil significantly increased the heat stability of the Green Sichuan pepper flavor and aroma compounds when compared to for example olive oil or peanut oil. Nevertheless, the effect on heat stability was somewhat less good than the ones observed for soy bean oil and corn oil. Details of the results are shown in the Examples section below.

The inventors also observed that the amount of the selected oil is critical for the stability of the Green Sichuan pepper flavoring oil composition. As specified and shown below in Examples 3 and 4, the oil samples with 60 wt% and 79 wt% soy bean oil (in wt% of the total flavouring oil composition) had a significant better stability of the flavor and aroma compounds in question, than when used at lower concentrations of e.g. 40 wt%, 30 wt% or even lower.

Hence, by selecting the appropriate vegetable oil in the appropriate concentration, a ready-to-use flavouring oil composition comprising Green Sichuan Pepper oil extract and an oleoresin can be produced, which has a significant stability of its Green pepper aroma and flavor compounds when used cold

or upon heating, cooking or frying together with a food product. Therefore, such a flavouring oil composition as of the present invention can be applied or added to a food product such as for example a vegetable or noodle dish before heating, cooking or frying said food product, and where it still maintains the full flavor and aroma profile of the Green Sichuan pepper even after the food product has been heated. This allows to provide a more consumer friendly and convenient flavouring oil product to consumers for a use for example at a consumer's home. It also allows the food industry to flavor pre-prepared food products with Green Sichuan Pepper oil extract in such a way, that a consumer just needs to heat, cook or fry a pre-prepared dish comprising the flavouring oil of the present invention at home and can still fully enjoy the specific flavor of Green Sichuan pepper without the need of flavoring the food product, once it has been cooked, by him- or her-self.

Detailed Description of the invention

The present invention pertains to a ready-to-use flavouring oil composition comprising: 5 - 40 wt% Green Sichuan Pepper oil extract, 0.2 - 5 wt% Oleoresin, and 20 - 90 wt% vegetable oil, wherein the vegetable oil comprises soy bean oil, palm oil, corn oil or sunflower oil.

It has been found by the inventors that the use of soy bean oil, palm oil, corn oil and sunflower oil is particularly well suited in a flavouring oil composition comprising Green Sichuan Pepper oil extract and an Oleoresin for preserving the typical Green Sichuan pepper oil aroma and flavor when used cold or upon heating, cooking or frying said flavouring oil composition.

"Green Sichuan Pepper" as of the present invention relates to the Sichuan pepper originally grown and consumed in the Sichuan province of China and also known in Chinese as "hua jiao". It also refers to all pepper spices harvested from plants belonging to the Zanthoxylum genus.

"Green Sichuan Pepper oil extract" refers to an extract made from Green Sichuan Pepper. Such an extract can be made for example by a combination of water and oil extraction as e.g. disclosed in CN102757860, by oil extraction sautéing as e.g. disclosed in CN102754803, by low-polarity organic solvent extraction as e.g. disclosed in CN101870918, by a combination of water and organic solvent extraction as e.g. disclosed in CN101530497, or by supercritical carbon dioxide extraction process as e.g. disclosed in CN1568786.

"Oleoresin" refers to an oil soluble natural mixture of oil and resin extracted from a spice plant material. Oleoresin is the concentrated liquid form of a spice, obtained from the spice by extraction with a non-aqueous solvent followed by removal of the solvent and super critical fluid extraction. The oleoresin has the same flavor and aroma property as the spice it is obtained from.

"Vegetable oil" as of the present invention is a triglyceride extracted from a plant material.

In a preferred embodiment, the flavouring oil composition comprises soy bean oil and/or corn oil in an amount of 50 - 90 wt% of the flavouring oil composition. Preferably, the soy bean oil and/or corn oil composition are present in an amount of 60 - 90 wt% of the flavouring oil composition.

The inventors have found that the presence of soy bean oil and/or corn oil is particularly advantageous for stabilizing the Sichuan pepper flavor and aroma in the flavouring oil composition when kept and used cold, at room temperature or upon heating, cooking or frying. Thereby, the best results were achieved where soy bean oil and corn oil were present in the flavouring oil composition in an amount of above 60 wt% of the total composition.

10 The flavouring oil composition of the present invention comprises Green Sichuan Pepper oil extract which is an extract from plant material of the genus *Zanthoxylum*. Preferably, the plant material is from *Zanthoxylum schinifolium* (*Z. schinifolium*), *Zanthoxylum simulans* (*Z. simulans*) and/or
15 *Zanthoxylum bungeanum* (*Z. bungeanum*). The plant material is preferably the husk or hull (pericarp) around the seeds of the above mentioned plants and it may be used whole or as a finely ground powder for the extraction purpose. Alternatively, also the leaves of the above mentioned plants may be used in the
20 extraction.

Preferably, the Green Sichuan Pepper oil extract is an extract of the plant material obtained by liquid extraction with using a liquid solvent comprising soy bean oil and/or corn oil.

25 Extraction processes with using a liquid solvent is well known in the art. The advantage of using soy bean oil and/or corn oil in the extraction method of the Green Sichuan Pepper oil extract to be used in the present invention is that the pepper aroma and flavor compounds are dissolved from the beginning of
30 the manufacturing process of the flavouring oil in either soy bean oil and/or corn oil. Those two oils have been disclosed in the present application as being particularly suitable for stabilizing these aromas and flavor compounds and make them

more resistant to heat treatments. A further advantage is that the Green Sichuan Pepper oil extract used in the flavouring oil composition comprises preferably already a substantial high level of soy bean oil and/or corn oil, which allows to assure or even increase the total concentration of these oils in the ready-to-use flavouring oil composition as a whole. This should allow to achieve maximal stability of those pepper aromas and flavors as can be provided with the selected oils.

Therefore, in a preferred embodiment, the total concentration of soy bean oil and/or corn oil of the ready-to-use flavouring oil composition as a whole, including the composition of the Green Sichuan Pepper oil extract and the vegetable oil components, is above 60 wt%, more preferably above 80 wt% and even more preferably above ca. 90 wt% of the flavouring oil composition.

In a preferred embodiment, the Oleoresin is selected from the group consisting of pepper (which includes Green Sichuan pepper, black pepper, white pepper and further other pepper varieties), paprika, cardamom, celery, cassia, garlic and chili oleoresin. Those oleoresins are particularly well suited to be combined with the Green Sichuan Pepper oil extract as they enhance and well complement the typical Sichuan pepper aroma and flavor of the entire composition. Preferably, those oleoresins comprise sanshool, particularly hydroxyl-alpha-sanshool, and/or capsaicin. Both flavoring compounds are known for providing the typical tingling sensation of Green Sichuan pepper and the pungency of the pepper aromas.

Preferably, the oleoresin is added to the Green Sichuan Pepper oil extract and is not considered as being already part naturally of the pepper oil extract. This allows to enrich the

overall flavor and aroma profile of the flavouring oil composition by combining e.g. the Green Sichuan pepper oil extract with an oleoresin extracted from a different pepper plant variety or differently produced from a same or similar Green Sichuan pepper plant variety, or produced even from a different spice plant altogether.

A preferred flavouring oil composition of the present invention comprises 10 - 30 wt% Green Sichuan Pepper oil extract, 0.5 - 3.0 wt% of Oleoresin, and vegetable oil with 60 - 85 wt% of the flavouring oil composition being soy bean oil and/or corn oil.

An even more preferred flavouring oil composition of the present invention comprises 15 - 25 wt% Green Sichuan Pepper oil extract, 0.5 - 2.0 wt% of Oleoresin, and vegetable oil with 60 - 80 wt% of the flavouring oil composition being soy bean oil and/or corn oil.

Preferably, the ready-to-use flavouring oil composition of present invention is transparent. Transparency of the flavouring oil composition can be achieved by either selecting purified oils for its composition and/or for example filtering the final oil composition. Transparent oils have a much better consumer acceptance than non-transparent oils as they better transmit an image of purity and cleanness of an oil composition to consumers.

A further aspect of the present invention is the use of a vegetable oil in combination with a Green Sichuan pepper oil extract and an Oleoresin in a flavouring oil composition for improving the stability of the pepper aroma and flavor upon heating of the flavouring oil composition. This particularly

applies where the heating of the flavouring oil composition is to a temperature of above 100°C. The use of the present invention also pertains to where the heating of the flavouring oil composition is cooking or frying for at least 1 min,

5 preferably at least 3 min, more preferably for at least 5 min.

A still further aspect of the present invention is a food product comprising the flavouring oil composition of the present invention. Such a food product can be a sauce for
10 seasoning or a salad dressing to be used cold. Such a food product can also be a noodle or vegetable dish, to be prepared by cooking or frying. Further food products comprising the flavouring oil of the present invention can be meat dishes with for example pork or chicken meat, dishes comprising fish
15 meat, pizzas, and hot pots.

The present invention pertains also to a method for improving the Green Sichuan Pepper flavor and aroma of a food product when cooked, comprising the steps of applying to said food
20 product a flavouring oil composition according to the present invention, and cooking or frying said food product for at least 1 min, preferably at least 3 min, and more preferably for at least 5 min.

25 Those skilled in the art will understand that they can freely combine all features of the present invention disclosed herein. In particular, features described for the flavouring oil composition of the present invention may be combined with the method and use of the present invention, and vice versa.

30 Further, features described for different embodiments of the present invention may be combined.

Further advantages and features of the present invention are apparent from the examples as described below.

Example 1:

Preparation of ready-to-use flavouring oil composition samples.

- 5 Samples A to F of flavouring oil compositions were prepared. Thereby, the ingredients as listed in Table I were weighed and then added into a bowl, where they were fully mixed with a whisk. No specific sequence of adding and mixing of the different ingredients was required. The flavouring oil
- 10 compositions were then stored at room temperature.

Table I: Flavouring oil composition samples A to F

Samples :	A	B	C	D	E	F
Green Pepper Oil extract from Jiaowang ^{*)}	20 g	20 g	20 g	20 g	20 g	20 g
Haoji Pepper Oleoresin from Hanchenghongda ^{*)}	1 g	1 g	1 g	1 g	1 g	1 g
Soy bean oil	79 g					
Olive oil		79 g				
Palm olein			79 g			
Corn oil				79 g		
Peanut oil					79 g	
Sunflower oil						79 g
Total	100 g	100 g	100 g	100 g	100 g	100 g

^{*)} Sourced from Haoji Food Co. Ltd., SiChuan, China.

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Example 2:

- 20 Assessment as to stability of the flavouring oil composition upon heating.

The flavouring oil composition samples A to F were transferred into a cooker and heated on a heating plate at a temperature above 100°C for 5 min and 10 min each. After heating, the oil samples were then poured into a white bowl prepared for

5 assessing the appearance and color of the boiled oil.

The results showed that sample D (with corn oil) had still its original appearance and color, which did not change after the heating step, even after 10 min of heating. It was considered

10 to be the best sample of the evaluated oils.

Sample A (with soy bean oil) and sample C (with palm oil) were considered second best as they only slightly changed the appearance after the heating and became a little bit darker. Sample F (with sunflower oil) was considered good as well as

15 it became slightly lighter after the heating.

Sample B (with olive oil) and sample E (with peanut oil) became turbid and dark after the heating step. They are clearly not preferred samples.

20 Thereafter, the aroma and flavor profile of the heated oil compositions was assessed by sensory evaluation with a panel of 4 Chinese people familiar with the typical aroma and flavor profile of Green Sichuan Pepper. For this sensory evaluation, cucumbers were washed and cut into strips of approximately 5

25 cm length; 60 g of those cucumber strips were then mixed with using chopsticks in a bowl with 3 g of the heated oil samples; and thereafter tasted by the panel in order to assess flavor and aroma release. The presence of the typical Green Sichuan Pepper aroma and flavor was then monitored by the panel on a

30 scale from 1 to 5: where 1 is unacceptable bad flavor or no flavor, and where 5 is the preferred, very strong and authentic Green Sichuan Pepper aroma/flavor. The results are shown in Table II.

Table II: Aroma release of the boiled flavouring oil compositions:

Samples:	A	B	C	D	E	F
After 5 min heating	4	1	3	5	1	4
After 10 min heating	3	1	3	5	1	2

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The results indicate that the samples A and D with soy bean and corn oil, respectively, provide the best oil as carrier for the stability of the typical Green Sichuan pepper aroma in a flavoring oil composition. The samples B and E with olive oil and peanut oil, respectively, were clearly the least preferred oils as carriers of the Sichuan pepper aroma.

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It can be concluded that the composition with corn oil, soy bean oil, palm olein and sunflower oil base can preserve the green pepper oil aroma and flavor even after a long time heat treatment. Thereby, the composition with corn oil can best maintain and preserve a strong green pepper oil aroma and flavor even after a heat treatment (cooking) for 10 min. The other three oils, i.e. soy bean oil, palm olein and sunflower oil, can well maintain a strong green pepper oil aroma and flavor after a heat treatment (cooking) for 5 min.

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Example 3:

Assessment of the amount of soy bean oil necessary to preserve the Green Sichuan pepper aroma in a ready-to-use flavouring composition.

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Samples G to M were prepared in the same way as Samples A to F in Example 1, but comprising the amounts of the ingredients as specified in Table III.

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Table III: Flavouring oil composition samples G to M

Sampes :	G	H	I	K	L	M
Sunflower oil	79 g	59 g	49 g	39 g	19 g	-
Green Sichuan Pepper Oil Extract	20 g	20 g	20 g	20 g	20 g	20 g
Haoji Pepper Oleoresin	1 g	1 g	1 g	1 g	1 g	1 g
Soybean oil	-	20 g	30 g	40 g	60 g	79 g
Total	100 g	100 g	100 g	100 g	100 g	100 g

Example 4:

- 5 Assessment as to stability of the flavouring oil composition upon heating of samples G to M.
- Preservation and the release of the typical Green Sichuan pepper aroma from the heated flavouring oil composition was assessed in the same way as described above in Example 2, but
- 10 only for the 5 min heating step. The presence of the typical Green Sichuan Pepper aroma and flavor was monitored by the panel on a scale from 1 to 5: where 1 is unacceptable bad flavor or no flavor, and where 5 is the preferred, very strong and authentic Green Sichuan Pepper aroma/flavor. The results
- 15 are summarized in Table IV.

Table IV: Aroma release of the boiled flavouring oil compositions:

Samples :	G	H	I	K	L	M
After 5 min heating	4	4	3	3	5	5

- 20 It can be concluded that the higher the concentration of soy bean oil is present in the flavouring oil composition, the better the maintenance and preservation of the typical Green Sichuan Pepper aroma is observed. Particularly good results

are achieved, if the amount of soy bean oil is at least 60 wt% of the entire composition, or higher.

Claims

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1. Ready-to-use flavouring oil composition comprising:
5.0 - 40 wt% Green Sichuan Pepper oil extract,
0.2 - 5 wt% Oleoresin,
20 - 90 wt% vegetable oil.

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2. The flavouring oil composition of claim 1, wherein the vegetable oil comprises soy bean oil, palm oil, corn oil or sunflower oil.

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3. The flavouring oil composition of claim 1 or 2, wherein the vegetable oil comprises soy bean oil and/or corn oil in an amount of 50 - 90 wt% of the flavouring oil composition.

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4. The flavouring oil composition of one of the claims 1 to 3, wherein the Green Sichuan Pepper oil extract is an extract from plant material of the genus *Zanthoxylum*; preferably from the plant *Zanthoxylum schinifolium*, *Zanthoxylum simulans* and/or *Zanthoxylum bungeanum*.

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5. The flavouring oil composition of one of the claims 1 to 4, wherein the Green Sichuan Pepper oil extract is a solvent extract obtained with a solvent comprising soy bean oil and/or corn oil.

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6. The flavouring oil composition of one of the claims 1 to 5, wherein the Oleoresin is selected from the group

consisting of Green Sichuan pepper, black pepper, white pepper, paprika, cardamom, celery, cassia, garlic and chili pepper oleoresin.

- 5 7. The flavouring oil composition of one of the claims 1 to 6, wherein the Oleoresin comprises sanshool and/or capsaicin.
- 10 8. The flavouring oil composition of one of the claims 1 to 7, wherein the Oleoresin is added to the Green Sichuan Pepper oil extract.
- 15 9. The flavouring oil composition of one of the claims 1 to 8, wherein the composition comprises 10 - 30 wt% Green Sichuan Pepper oil extract, 0.5 - 3.0 wt% of Oleoresin, and vegetable oil with 60 - 85 wt% of the flavouring oil composition being soy bean oil and/or corn oil.
- 20 10. The flavouring oil composition of one of the claims 1 to 9, wherein the flavouring oil composition is transparent.
- 25 11. Use of a vegetable oil in combination with a Green Sichuan pepper oil extract and an Oleoresin in a flavouring oil composition for improving the stability of the Green Sichuan pepper aroma and flavor in the oil composition.

12. The use according to claim 11, wherein the flavouring oil composition is heated to a temperature of above 100°C.
- 5 13. The use according to claim 11 or 12, wherein the flavouring oil composition is cooked or fried for at least 1 min, preferably at least 3 min, more preferably for at least 5 min.
- 10 14. Food product comprising the flavouring oil composition of one of the claims 1 to 10.
- 15 15. Method for improving the Green Sichuan Pepper flavor and aroma of a food product when cooked, comprising the steps of applying to said food product a flavouring oil composition according to one of the claims 1 to 10, and cooking or frying said food product for at least 1 min, preferably at least 3 min, and more preferably for at least 5 min.

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