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(54) **Title:** PLANT EXTRACT HIGHLY CONCENTRATED IN SAFRANAL, PRODUCTION METHOD AND USES THEREOF

(54) **Titre :** EXTRAIT DE PLANTE TRES CONCENTRE EN SAFRANAL, PROCEDE D'OBTENTION ET UTILISATIONS

(57) **Abstract:** The invention relates to a plant extract comprising a concentration, measured by the HPLC method, of at least 0.2 wt. % of safranal in relation to the total weight of the dry material. The invention also relates to a method for producing such an extract, to the compositions including same and to the use thereof.

(57) **Abrégé :** L'objet de l'invention est un extrait végétal comprenant une concentration mesurée par méthode HPLC d'au moins 0,2% de safranal en poids par rapport au poids total de la matière sèche. L'invention a également pour objet un procédé d'obtention d'un tel extrait, les compositions l'incluant et son utilisation.

PLANT EXTRACT HIGHLY CONCENTRATED IN SAFRANAL, PRODUCTION METHOD AND USES THEREOF

This invention relates to a new extract obtained from a plant-based raw material containing safranal, in particular saffron, the said extract having a higher safranal concentration than plant extracts currently known.

The invention also concerns a specific procedure which enables such an extract to be obtained, as well as compositions including this extract, and its uses.

Safranal can be extracted from several plants, such as *Crocus sativus*, *Centaurea sibthorpii, Centaurea consanguinea, Centaurea amanicola, Erodium cicutarium, Chinese green tea, Calycopteris floribunda, Crocus heuffelianus, Sambucus nigra, Gardenia jasminoides, Citrus limon, Cuminum cyminum L.*, and *Achillea distans* but is mostly extracted from *Crocus sativus,* which is also known as saffron.

Saffron is a traditional spice which is typically cultivated in Iran. It has several uses, such as the treatment of mood disorders, premenstrual syndrome, erectile dysfunction, or for skincare, as is notably presented in *Javadi B & al. "A survey on saffron in major islamic traditional medicine books" Iranian journal of basic medical sciences 2013; 16(1): 1-11*. Several clinical studies seeking to demonstrate the effectiveness of saffron have been conducted over past years, particularly in regard to its use for treating depression and anxiety, as is the case in: *Akhondzadeh S & al. "Comparison of Crocus sativus L. and imipramine in the treatment of mild to moderate depression: a pilot double-blind randomized trial" [ISRCTN45683816]. BMC Complement Altern Med 2004; **4**: 12*, or, more recently, in: *Hausenblas HA & al. "Saffron (Crocus sativus L.) and major depressive disorder: a meta-analysis of randomized clinical trials". Journal of integrative medicine 2013; **11**(6): 377-83.*

Saffron (*Crocus sativus*) is composed of several molecules, including safranal, a volatile molecule which creates the spice's fragrance and which is recognized for its effectiveness in the aforementioned applications. The extracts used in prior art are mostly standardized at 2% safranal using UV spectrometry, in accordance with the standard ISO 3632-2:2010 (*Spices - Saffron (Crocus sativus L.) – Part 2: Test methods. ISO International standard; 2010: 1-42*). This

standard describes a comprehensive analysis protocol, which consists of dissolving the saffron extract in water, stirring it, filtering it, and then taking a spectrophotometric reading at 330 nm. Nevertheless, this method can be criticized as the absence of the use of any solvents and/or specific reagents results in the quantification of molecules other than safranal, and so the reading does not reflect the actual safranal concentration of the extract.

Effectively, the analysis by HPLC (High Performance Liquid Chromatography) of the safranal in extracts, which was used in prior art, reveals actual concentrations between 30 and 1000 times lower than those obtained by analysis using UV spectrometry, in accordance with standard ISO 3632-2, and with significant variability in the correlation of the two methods, as demonstrated by the results presented in Table 1 below:

Saffron extract	Safranal ISO 3632-2:2010 method	Safranal HPLC method
Saffron dry extract – Natac	2.71	0.0650
Saffron ES stigma – Plantex	2.12	0.0040
Saffr'Activ® – Green Plant Extract	2.32	0.0380
Affron® – Pharmactive	2.90	0.0190

Table 1: comparison of the results obtained with two safranal measurement methods applied to several saffron extracts from prior art (results given as percentages in weight relative to the total weight of the dry matter of the extract).

In reality, the plant extracts containing safranal, particularly the saffron extracts, which can be obtained using the procedures of prior art, have very small doses of safranal.

The measurement method is therefore important, as it leads to results which differ from those obtained using the prior measurement method via spectrometry which was systematically used to measure the safranal concentration of a product. This prior method, referenced as ISO3632-2:2010, overestimates the safranal concentration, as demonstrated in this application, as well as in the 2017 publication by Garcia-Rodriguez et al., "*Comparative evaluation of an ISO 3632 method and an HPLC-DAD method for safranal quantity determination in saffron*". In this publication, the study was carried out using 390 saffron

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samples. The overestimation may be between 20 and 50 times. Hence, an extract with an indicated concentration of X% safranal using the reference measurement method ISO3632-2:2010, contains, in reality, much less safranal.

Advantageously, this invention may provide a saffron extract with a higher dose of safranal than current extracts.

In particular, the disclosure concerns a plant extract obtained from saffron, with a concentration measured, using the HPLC method, of a minimum of 0.2% safranal in weight relative to the total weight of the dry matter of the extract.

In a first aspect, there is provided a plant extract obtained from a plant-based raw material containing safranal, selected from amongst *Crocus sativus*, *Centaurea sibthorpii, Centaurea consanguinea, Centaurea amanicola, Erodium cicutarium, Chinese green tea, Calycopteris floribunda, Crocus heuffelianus, Sambucus nigra, Gardenia jasminoides, Citrus limon, Cuminum cyminum L.,* and *Achillea distans.,* wherein the extract comprises a safranal concentration, measured using HPLC method, of at least 0.2% in weight relative to the total dry weight of extract, wherein the plant extract is impregnated onto a support selected from amongst maltodextrin, sugars, silica, and acacia gum, and wherein the plant extract is obtained by a procedure comprising a thermal treatment step which lasts for at least 2 hours at a temperature between 30°C and 95°C.

This extract can notably be obtained via a procedure including a thermal treatment step, particularly a specific procedure which includes the implementation of the following steps:

- Possible drying of the raw material,
- Grinding of the dried raw material,
- Aqueous or hydroalcoholic extraction, or extraction using an organic solvent,
- Impregnation of the extract obtained onto a support,
- Thermal treatment of the extract.

This economical procedure, which is simple to implement, enables a saffron extract to be obtained with a concentration, measured using the HPLC method, of a minimum of 0.2% safranal in weight relative to the total weight of the dry matter of the extract.

Advantageously, such an extract contains an actual safranal concentration which is greater than that of the extracts currently known and hence offers greater effectiveness, especially

for use in combating depression, anxiety, mood disorders, erectile dysfunctions and premenstrual disorders. The disclosure therefore also concerns saffron extract for these uses, in addition to cosmetic, food, nutritional and medicinal compositions containing saffron extract.

Other characteristics and benefits will emerge from the detailed description of the invention which will follow, with respect to the appended figures which present:

- Figure 1: chromatogram of the extract according to the invention from example 1, obtained via the UHPLC method,
- Figure 2: chromatogram of the extract according to the invention from example 2, obtained via the UHPLC method.

- Figure 3A: chromatogram of an extract from prior art according to example 3A (obtained without thermal treatment) obtained via the UHPLC method,
- Figure 3B: chromatogram of an extract from prior art according to example 3B (obtained without thermal treatment) obtained via the UHPLC method,

Therefore, the invention concerns a plant extract obtained from a plant (or plant-based raw material) containing safranal, with a concentration, measured using the HPLC method, of a minimum of 0.2% safranal in weight relative to the total weight of the dry matter.

The expressions "plant extract obtained from a plant containing safranal" or "plant extract obtained from a plant-based raw material containing safranal" are understood to refer to at least one molecule or a set of several molecules from either an entire plant or part of a plant containing safranal. This may be from a specific selection of native molecules present in the plant or molecules obtained by any type of transformation of the said native molecules. The raw material used to obtain the extract can consist of either all or part of a plant containing safranal. If the plant containing the safranal is saffron, the plant extract according to the invention can in particular be obtained from saffron stigmas and/or petals and/or bulbs.

The extract according to the invention is not the raw material in itself. It is not considered to be a plant, part of a plant, a dried plant, a dried part of a plant, a plant sample or a dried plant sample. It is not an essential oil either.

The terms "plant containing safranal" or "raw material containing safranal" (the terms plant and plant-based raw material can be used equivalently within the meaning of the invention) are understood to refer to any plant containing safranal, in particular, *Crocus sativus*, *Centaurea sibthorpii, Centaurea consanguinea, Centaurea amanicola, Erodium cicutarium, Chinese green tea, Calycopteris floribunda, Crocus heuffelianus, Sambucus nigra, Gardenia jasminoides, Citrus limon, Cuminum cyminum L.,* and *Achillea distans*. Preferentially, the plant containing safranal from which the extract according to the invention is obtained is *Crocus sativus* (saffron).

The extract according to the invention includes at least safranal, and the safranal is present at a concentration of at least 0.2% in terms of dry matter weight, measured using the HPLC method (High Performance Liquid Chromatography). The measurement method is of the utmost importance given that with another measurement method, namely with UV

spectrometry (standard ISO 3632-2), the result obtained does not correspond to the actual safranal concentration given this method's lack of specificity.

The HPLC method for the analysis of molecules is a method known to skilled persons. It enables the precise identification and quantification of individual molecules.

Preferentially, the analysis method used for measuring the molecules contained in the extract according to the invention, in particular safranal, is a UHPLC method (Ultra High Performance Liquid Chromatography). This method also enables greater resolution and separation of compounds, as well as the detection of several compounds in the same chromatogram from a single sample.

According to a particularly suitable mode of implementation, the HPLC or UHPLC analysis method includes a prior preparation step for the sample, including the following steps:

- Introduction of the saffron extract to be measured into a hydroalcoholic solution,
- Magnetic stirring for at least 1 hour,
- Ultrasonic bath for at least 5 minutes,
- Filtration through a membrane, then injection.

The analysis method, after the preparation of the sample, traditionally then includes an elution step, then a detection step.

Elution is preferentially performed using a binary gradient. For example, the first solvent can be an organic solvent and an acid. Preferentially, formic acid in acetonitrile should be used. For example, the second solvent can be an acidified aqueous solvent. Preferentially, formic acid in water should be used.

In addition to the safranal, the extract according to the invention can include other molecules, notably crocins and/or flavonoids, derived from kaempferol and/or derived from picrocrocin, particularly in the case of saffron extracts.

In the case whereby crocins are present, they should preferentially represent at least 1% of the dry matter weight of the extract, measured using the HPLC method.

In the case whereby flavonoids derived from kaempferol are present, they should preferentially represent at least 500 ppm of the dry matter weight of the extract, measured using the HPLC method.

In the case whereby picrocrocins are present, they should preferentially represent at least 0.5% of the dry matter weight of the extract, measured using the HPLC method.

Preferentially, the extract according to the invention is impregnated onto a support. The terms "support" or "bulking agent" within the meaning of the invention are understood to refer to any plant-, mineral-, or chemical-based food substance used as an ingredient or food additive which enables the impregnation and dilution of the extract of the invention.

The support may be selected from among the following components: maltodextrin, sugar, silica, and acacia gum, preference being given to maltodextrin.

When the extract is impregnated onto a support, the percentages of molecules present in the extract are expressed in terms of the dry matter weight of the extract, including the support.

The extract according to the invention can be obtained by any means enabling at least 0.2% safranal to be obtained in terms of the dry matter weight of the extract. Preferentially, the extract according to the invention is obtained via a procedure including a thermal treatment step. This step can be implemented on the raw material at the beginning, during, or at the end of the procedure for obtaining the extract.

Thermal treatment, within the meaning of the invention, is understood to refer to heating up to a temperature to above ambient temperature. Preferentially, the thermal treatment step consists of a thermal treatment carried out for at least 2 hours, preferentially for at least 24 hours, at a temperature between 30°C and 95°C, preferentially at a temperature between 30°C and 60°C.

Thermal treatment may be carried out using any known means, notably in a chamber, in an oven, by cooking, pasteurizing or debacterialization. Preferentially, the thermal treatment is to be carried out in a chamber.

According to a particularly suitable mode of implementation, the plant extract according to the invention is obtained via a procedure including the implementation of the following steps, completed using saffron as a raw material:

- Possible drying,
- Grinding, preferentially between 50 and 500 µm,
- Aqueous or hydroalcoholic extraction, or extraction using an organic solvent,
- Impregnation of the extract obtained onto a support,
- Thermal treatment.

The aqueous or hydroalcoholic extraction steps, or extraction using an organic solvent and impregnation of the extract obtained onto a support, constitute the known extraction procedure, named Tech'Care Extraction®.

The thermal treatment step can be carried out at any moment during this procedure, preferentially at the end of the procedure, on the raw material saffron, and completes the Tech'Care Extraction® procedure.

According to a particularly suitable mode of implementation, the thermal treatment step in the implementation of this procedure is a thermal treatment step in a chamber for at least 2 hours, even more preferentially for at least 24 hours at a temperature between 30°C and 95°C, even more preferentially at a temperature between 30°C and 60°C.

Grinding can be carried out by any suitable known means, particularly by a granulating mill, a pin mill or a hammer miller, with preference given to a pin mill.

The extraction step can be carried out by any suitable known means.

In the case of aqueous extraction, the ground substance is introduced into water at a ratio of 50 g/L.

In the case of hydroalcoholic extraction, the solvent can be ethanol, with preference given to ethanol at 60% v/v. The ground substance is introduced into the hydroalcoholic solution at a ratio of 50 g/L.

In the case of extraction using an organic solvent, the solvent can be methanol or ethyl acetate, with preference given to methanol at 30% v/v. The ground substance is introduced into the organic solvent at a ratio of 100 g/L.

After extraction, the procedure can also include an acidification step. This step consists of adding acid into the aqueous or hydroalcoholic solvent. It enables the pH of the extraction solution to be reduced to between 3 and 5. It can be carried out in the following conditions: adding citric acid or hydrochloric acid into the hydroalcoholic solvent to adjust the pH to 4.

The step of impregnation onto a support consists of adding a bulking agent into the extraction solution. The support or bulking agent can be selected from among the following components: maltodextrin, sugar, silica, and acacia gum, but maltodextrin is preferred.

After this impregnation step, the procedure can also include an emulsion step and/or an encapsulation step for the obtained extract. This step consists of high-speed stirring of the extraction solution containing the bulking agent and, possibly, the auxiliary substance. It can

be carried out using auxiliary substances such as acacia gum, cyclodextrins, or fatty substances.

The extract according to the invention can be used alone or integrated into a cosmetic, food, nutritional or medicinal composition, at a ratio of 0.1 to 100% in terms of the dry matter weight of the composition. Preferentially, the extract according to the invention is present in the composition in a quantity which enables it to be administered to humans or animals at a minimum of 0.07 mg of extract according to the invention per kg of body weight per day, even more preferentially between 1.4 and 4.2 mg of extract according to the invention per kg of body weight per day.

The invention therefore concerns such a composition, preferentially a composition which is presented in the form of a capsule, tablet, soft capsule, stick, sachet, prepared dish, oil, lotion, cream or emulsion.

The compositions including an extract according to the invention may contain other suitable known components, such as excipients, which are selected depending on the form and intended use of the composition, or other active substances or active molecules.

The extract according to the invention and compositions including it may be used for several applications, particularly for preventing or treating depression and anxiety, or for preventing or treating mood disorders (pathological mood disorders), erectile dysfunctions, or premenstrual disorders.

The invention also concerns the extract for its use:

- in the prevention or treatment of depression in humans or animals,
- in the prevention or treatment of anxiety in humans or animals,
- in the prevention or treatment of mood disorders in humans,
- in the prevention or treatment of erectile dysfunction in humans (males),
- in the prevention or treatment of premenstrual disorders in humans (females).

Advantageously, due to the high quantity of safranal it contains, which is greater than that of all existing extracts, the extract according to this invention offers great effectiveness for these applications. Furthermore, it is important to use an extract rather than a raw material in itself (an entire plant or part of a plant, dried or not), as the extracts according to the invention enable the bioavailability of active molecules to be increased as the latter are no longer locked in the plant matrix of the flower, and are more easily available to the organism. The presence

of the support in the extract also allows for improved homogeneity of molecules which are of interest for the finished product.

The invention is currently illustrated with examples of extracts and procedures according to the invention (examples 1 and 2), comparative examples of extracts from prior art (examples 3A and 3B) and compositions.

For all examples, the measurement method for molecules in the extract, and particularly for safranal, is a UHPLC method, with the following characteristics:

1. Sample preparation

Sample extraction using a hydroalcoholic solution. Magnetic stirring for at least 1 hour, then ultrasonic bath for at least 5 minutes. Filtration through a membrane, then injection.

2. HPLC elution

Binary gradient:

Solvent A (formic acid in MeCN)

Solvent B (formic acid in water)

3. Detection

Crocins	440 nm
Picrocrocin derivatives	250 nm
Flavonoids	350 nm
Safranal	310 nm

4. Standards

Trans-crocin-4-gentiobiose-gentobiose

Trans-crocin 3-gentiobiose-glucose

beta-cyclocitral

Kaempferol glucoside

Safranal

<u>Example 1: Extract according to the invention</u>

A first extract example is an extract obtained via the implementation of the procedure, consisting of the implementation of the following steps:

- use of Crocus sativus stigmas,
- grinding using a pin mill, to 250 µm,
- hydroalcoholic extraction using ethanol 60% v/v, at a ratio of 50 g of saffron per liter of hydroalcoholic solution,

- impregnation on maltodextrin, introduced into the hydroalcoholic solution,
- thermal treatment in a chamber for 48 hours at 40°C.

The obtained extract is measured for several molecules using the UHPLC method described in the foreword of the section pertaining to the examples.

The chromatogram obtained is presented in Figure 1.

The extract is characterized by:

- a safranal concentration of 0.238%,
- a crocin concentration of 3.96%,
- a picrocrocin derivative concentration of 1.08%, and
- a flavonoid concentration of 0.25%.

Example 2: Extract according to the invention

A second extract example is an extract obtained via the implementation of the procedure, consisting of the implementation of the following steps:

- use of Crocus Sativus stigmas,
- grinding using a pin mill, to 250 µm,
- acidified aqueous extraction using hydrochloric acid at pH 4,
- impregnation on acacia gum, introduced into the aqueous solution,
- thermal treatment in a chamber for 72 hours at 40°C.

The obtained extract is measured for several molecules using the UHPLC method described in the foreword of the section pertaining to the examples.

The chromatogram obtained is presented in Figure 2.

The extract is characterized by:

- a safranal concentration of 0.73%,
- a crocin concentration of 1.0%,
- a picrocrocin derivative concentration of 2.93%, and
- a flavonoid concentration of 0.57%.

Example 3: Extract according to the invention

A third example of extract is an extract obtained via the implementation of the procedure, consisting of the implementation of the following steps:

- use of Crocus Sativus stigmas,

- grinding using a pin mill, to 250 µm,
- first thermal treatment in a chamber for 2 to 6 hours at 105°C
- second thermal treatment in a chamber for 2 to 6 hours at 140°C
- hydroalcoholic extraction using ethanol 60% v/v, at a ratio of 50 g of saffron per liter of hydroalcoholic solution,
- impregnation on maltodextrin, introduced into the hydroalcoholic solution,
- freeze-drying of the liquid extract

The extract is characterized by:

- a safranal concentration of 0.39%,
- a crocin concentration of 2.31%,
- a picrocrocin derivative concentration of 1.37%, and
- a flavonoid concentration of 0.24%.

Example 3A: Extract obtained by atomization (exclusive of the invention)

A first extract counterexample is an extract obtained via the implementation of the procedure, consisting of the implementation of the following steps:

- use of Crocus sativus stigmas,
- grinding using a pin mill, to 250 µm,
- hydroalcoholic extraction using ethanol 60% v/v, at a ratio of 50 g of saffron per liter of hydroalcoholic solution,
- impregnation on maltodextrin, introduced into the hydroalcoholic solution,
- spray-drying of the liquid extract.

The chromatogram obtained is presented in Figure 3A.

The obtained extract is characterized by:

- a safranal concentration of 0.028%,
- a crocin concentration of 4.98%,
- a picrocrocin derivative concentration of 1.26%, and
- a flavonoid concentration of 0.24%

Example 3B: Extract obtained by freeze-drying (exclusive of the invention)

A second extract counterexample is an extract obtained via the implementation of the procedure, consisting of the implementation of the following steps:

- use of Crocus sativus stigmas,
- grinding using a pin mill, to 250 µm,
- hydroalcoholic extraction using ethanol 60% v/v, at a ratio of 50 g of saffron per liter of hydroalcoholic solution,
- impregnation on maltodextrin, introduced into the hydroalcoholic solution,
- freeze-drying of the liquid extract.

The chromatogram obtained is presented in Figure 3B.

The extract is characterized by:

- a safranal concentration of 0.038%,
- a crocin concentration of 4.40%,
- a picrocrocin derivative concentration of 1.15%, and
- a flavonoid concentration of 0.22%.

Example 4: Example of nutritional composition for human use

Example 4 is a 150 mg capsule composed of:

- The extract according to the invention from example 1:15 mg
- Maltodextrin: 135 mg

The composition is obtained by mixing the components in the traditional conditions known to the skilled person, the mixture then being transferred into a capsule, also according to the traditional conditions.

The advised dosage is 2 capsules per day.

Example 5: Example of medication for human use

Example 5 is a 1500 mg tablet composed of:

- The extract according to the invention from example 2: 20 mg,
- Sorbitol: 1430 mg,
- Magnesium stearate: 27 mg,
- Brilliant blue FCF lacquer E133: 20 mg,
- Acesulfame K (E950): 1.5 mg,
- Sodium saccharin (E954): 1.5 mg.

The composition is obtained by mixing the components in the traditional conditions known to the skilled person, the mixture then being compressed, also according to the traditional conditions.

The advised dosage is 1 tablet per day.

Example 6: Example of nutritional composition for animal use

Example 6 is a 300 mg tablet composed of:

- The saffron extract from example 1: 6 mg,
- Microcrystalline cellulose: 135 mg,
- Magnesium stearate: 10 mg.

The composition is obtained by mixing the components in the traditional conditions known to the skilled person, the mixture then being compressed, also according to the traditional conditions.

The advised dosage is 1 tablet per day.

Example 7: Cosmetic composition for topical application in the form of a day cream

This composition is presented in the form of a cream to be applied to skin.

It is composed of:

- The extract according to the invention from example 1: 10 mg,
- Preservative: 0.5%,
- Perfumes: 0.6%,
- Fatty phase + aqueous phase: 97.4%.

The fatty phase is composed of an emulsifier and triglycerides. The aqueous phase is composed of water combined with pyrrolidone carboxylic acid.

The composition is obtained by adding the saffron extract from example 1, while stirring, with the preservatives and perfumes to the aqueous phase, over a period of 10 minutes. The aqueous phase is then itself added while stirring to the fatty phase and is mixed for 30 minutes.

It is to be understood that, if any prior art publication is referred to herein, such reference does not constitute an admission that the publication forms a part of the common general knowledge in the art, in Australia or any other country.

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In the claims which follow and in the preceding description of the invention, except where the context requires otherwise due to express language or necessary implication, the word "comprise" or variations such as "comprises" or "comprising" is used in an inclusive sense, i.e. to specify the presence of the stated features but not to preclude the presence or addition of further features in various embodiments of the invention.

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CLAIMS

1. Plant extract obtained from a plant-based raw material containing safranal, selected from amongst *Crocus sativus*, *Centaurea sibthorpii, Centaurea consanguinea, Centaurea amanicola, Erodium cicutarium, Chinese green tea, Calycopteris floribunda, Crocus heuffelianus, Sambucus nigra, Gardenia jasminoides, Citrus limon, Cuminum cyminum L.,* and *Achillea distans.,*

wherein the extract comprises a safranal concentration, measured using HPLC method, of at least 0.2% in weight relative to the total dry weight of extract,

wherein the plant extract is impregnated onto a support selected from amongst maltodextrin, sugars, silica, and acacia gum, and

wherein the plant extract is obtained by a procedure comprising a thermal treatment step which lasts for at least 2 hours at a temperature between 30°C and 95°C.

2. Plant extract according to the previous claim, comprising crocins and/or flavonoids derived from kaempferol and/or picrocrocin.

3. Plant extract according to any one of the previous claims, wherein the plant extract is obtained from *Crocus sativus* stigmas and/or petals and/or bulbs.

4. Plant extract according to any one of the previous claims, wherein the thermal treatment temperature is between 30°C and 60°C.

5. Plant extract according to any one of the previous claims, wherein the thermal treatment is carried out for a period of at least 24 hours.

6. Plant extract according to any one of the previous claims, wherein the thermal treatment is carried out in a chamber, oven, by cooking, pasteurization or debacterialization.

7. Plant extract according to any one of the previous claims, wherein the thermal treatment step is implemented on the raw material at the beginning, during, or at the end of the procedure.

8. Procedure for obtaining a plant extract according to any one of the previous claims, comprising implementation of the following steps:

- Grinding of a plant-based raw material containing safranal,
- Aqueous or hydroalcoholic extraction, or extraction using an organic solvent,

- Impregnation of the extract obtained onto a support,
- Thermal treatment in a chamber for at least 2 hours at a temperature between 30°C and 95°C.

9. Procedure according to Claim 8, wherein the plant-based raw material containing safranal is dried prior to grinding.

10. Procedure according to Claim 8 or 9, further comprising an acidification step after the extraction step.

11. Procedure according to any one of Claims 8 to 10, wherein drying is carried out over at least 24 hours, at a temperature between 30°C and 60°C.

12. Procedure according to any one of Claims 8 to 11, further comprising an emulsion step and/or an encapsulation step for the obtained extract.

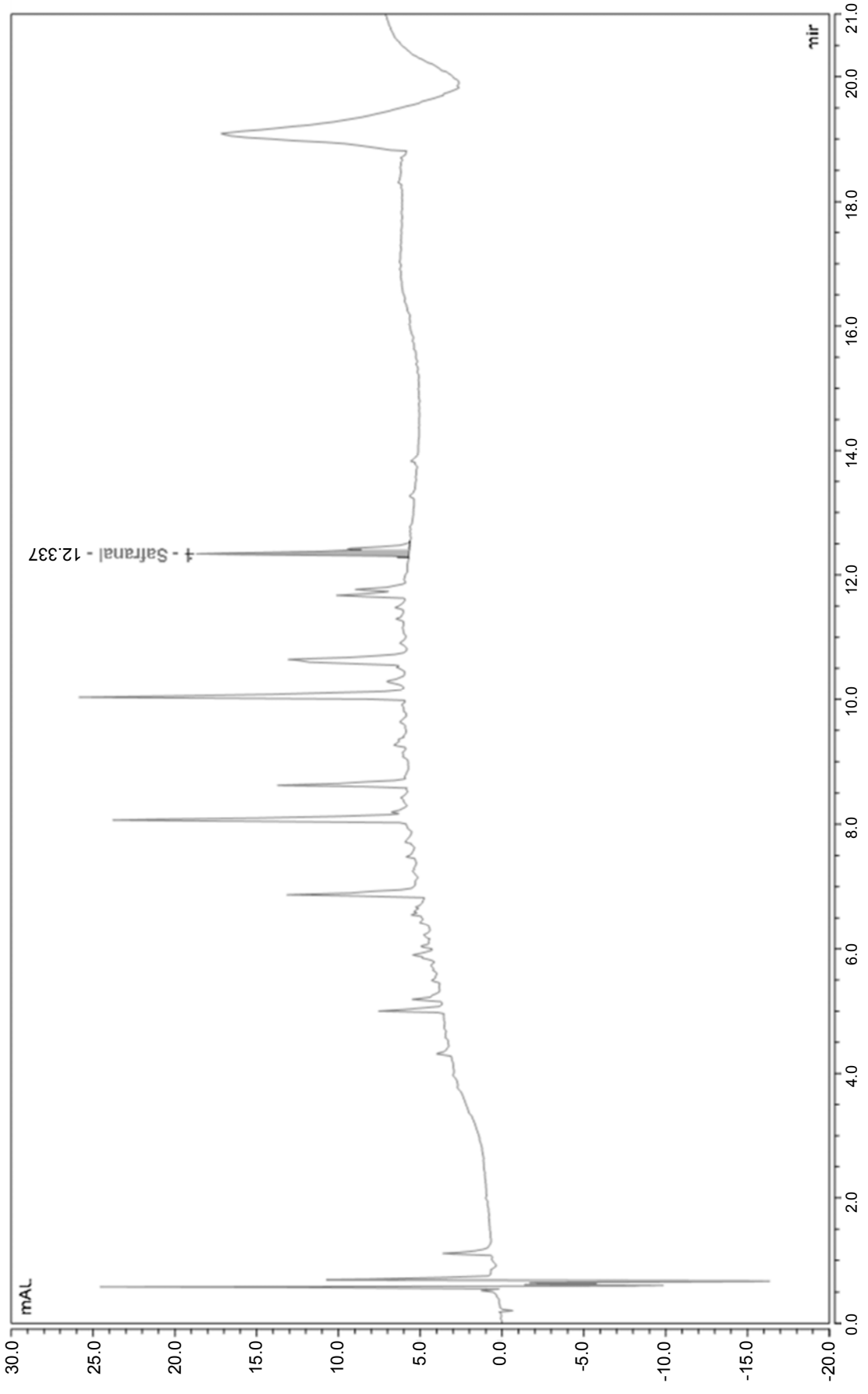
13. Cosmetic, food, nutritional or medicinal composition including between 0.1 and 100% in terms of dry matter weight of a plant extract according to any one of Claims 1 to 7, or obtained according to the procedure of any one of claims 8 to 12.

14. Composition according to Claim 13, wherein the composition is presented in the form of capsules, tablets, soft capsules, sticks, sachets, prepared dishes, oil, lotion, cream or emulsion.

15. A method of preventing or treating depression or anxiety, in humans or in animals, comprising administration of the plant extract according to any one of Claims 1 to 7, or obtained according to the procedure of any one of claims 8 to 12.

16. A method of preventing or treating mood disorders, erectile dysfunctions or premenstrual disorders in humans comprising administration of the plant extract according to any one of Claims 1 to 7, or obtained according to the procedure of any one of claims 8 to 12.

17. Use of the plant extract according to any one of Claims 1 to 7, or obtained according to the procedure of any one of claims 8 to 12, in the manufacture of a medicament for preventing or treating depression or anxiety or mood disorders, erectile dysfunctions or premenstrual disorders.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18.0
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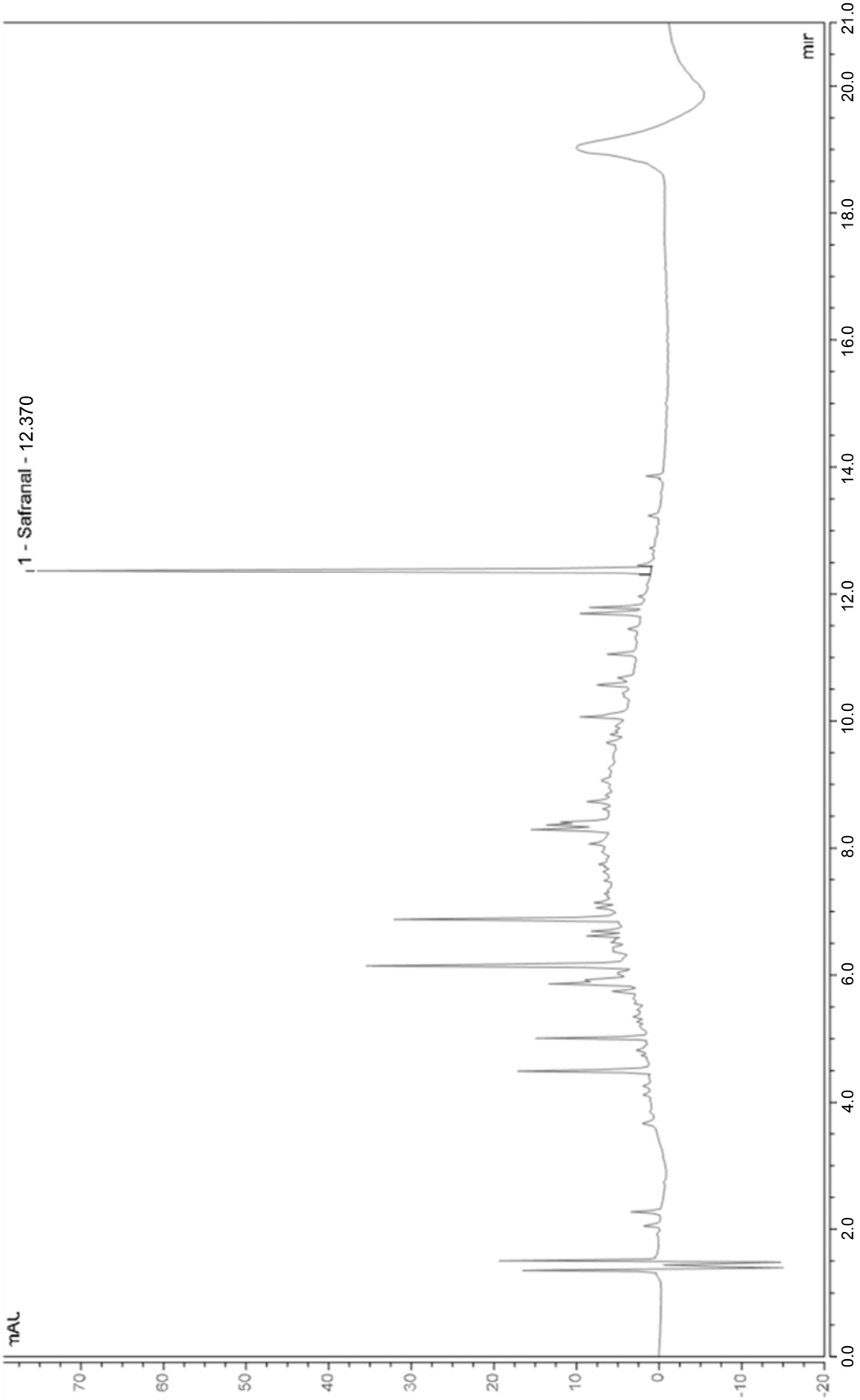
21.0

Figure 1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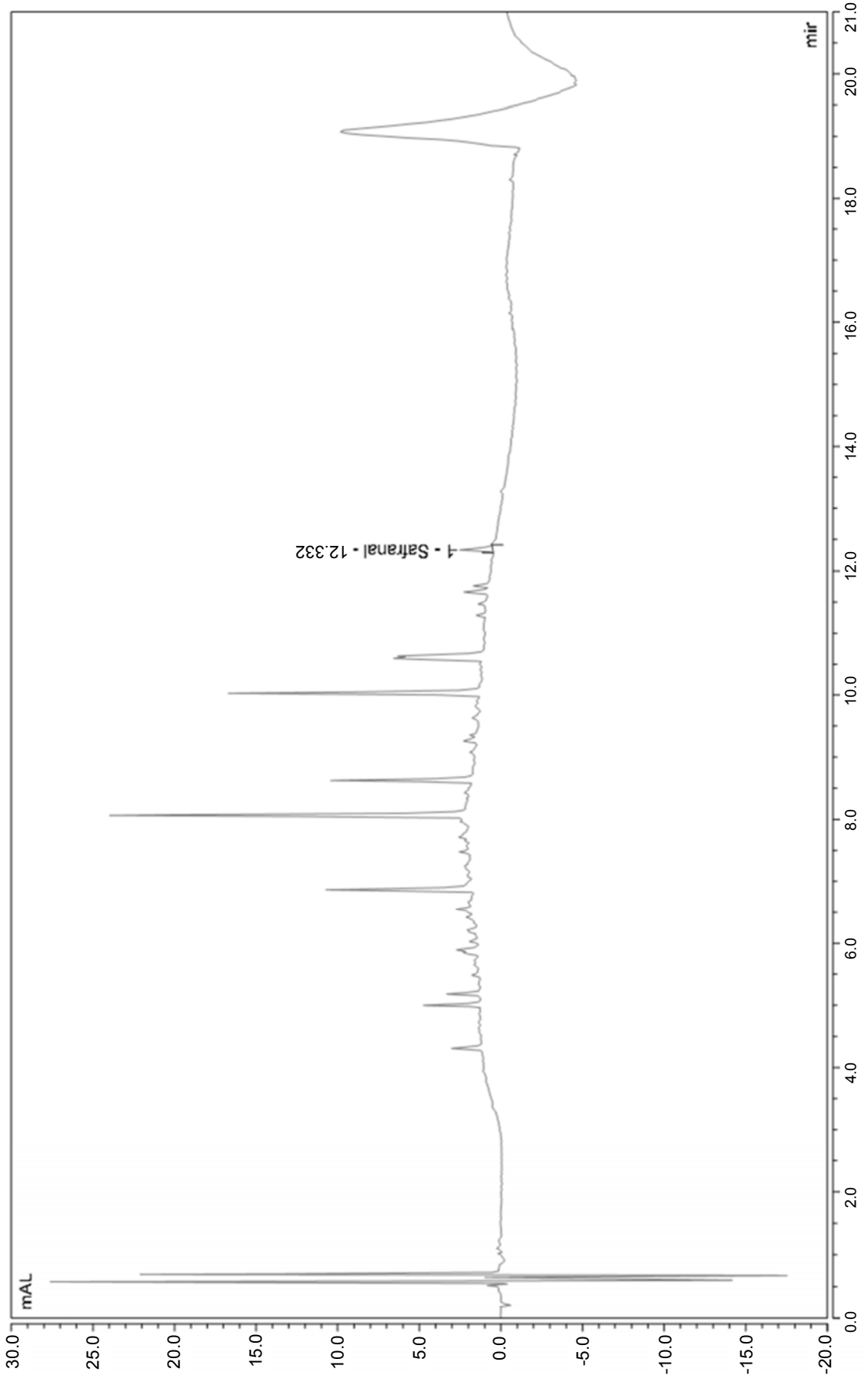
21.0

Figure 2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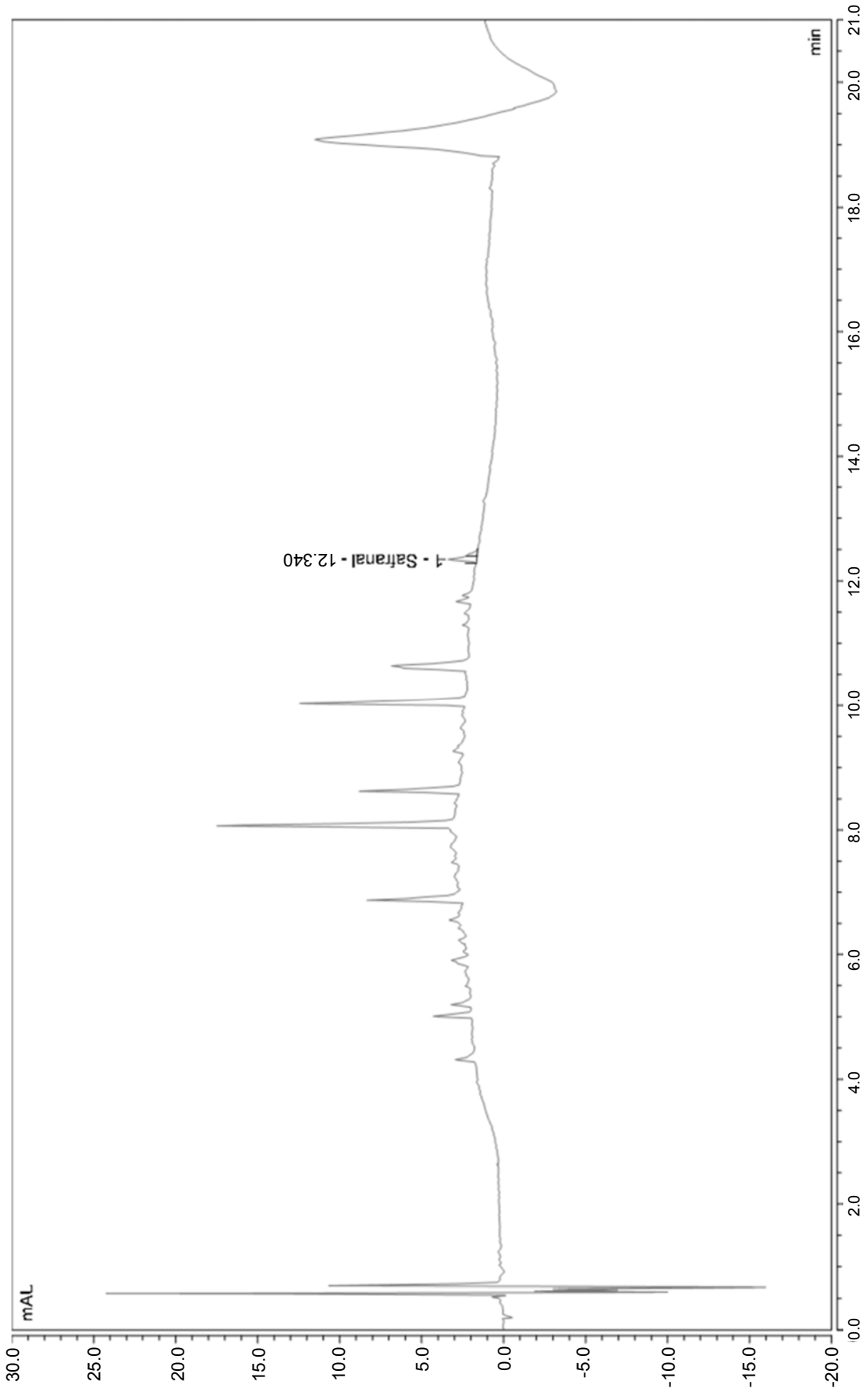
21.0

Figure 3A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6.0
8.0
10.0
12.0
14.0
16.0
18.0
20.0
21.0

Figure 3B