Description

Natural extract comprising xanthohumol, and method for the production thereof and products produced therefrom

Technical field

The present invention relates to a method for producing a roasted extract from cereals, cereal malt or coffee comprising xanthohumol (XN) and a hop extract comprising xanthohumol as well as its use for the production of beverages and/or food products.

Background art

Hop is used as raw material for the production of beer. Hop provides the bitter impression of beer but also an elongated shelf life due to its antibacterial effect.

The most important compounds contained in hop are, besides the bitter acids (e.g. a-acids), essential oils, tannins and polyphenols.

Xanthohumol, a prenylflavonoid (polyphenol) of hop which occurs in the lupulin glands of the hop cones has a plurality of positive effects. Beside the antiviral and the anti-oestrogenic and anti-inflammatory effect, a cancer-chemo preventive activity of XN is also discussed which activity is currently under investigation in animal experiments. The content of xanthohumol in hops varies depending on the hop variety between 0.1 and 1 %. The hop varieties having a high content of xanthohumol usually comprise a high portion of bitter substances.

Hop products may be divided in raw hops, hop pellets and hop extracts. Since xanthohumol occurs only in the lupulin glands of the hop cone, hop pellets exhibit a high content of XN corresponding to the accumulation of a-acids. Hop extracts may be obtained by extraction with CO_2 and/or ethanol. Whereas CO_2 extract hardly comprises any xanthohumol XN is extracted almost completely during the ethanol extraction. Recently, XN enriched products are produced by a combination of both extraction methods. Depending on the production method XN contents of between 8 and 99 % are achieved. The production of hop extracts enriched with XN and drinks comprising XN is described e.g. in the patents DE 19939350, DE 10256031, DE 10240065 and EP 1431385.

In the brewing process xanthohumol is relatively instable and is mainly precipitated via the trub, the yeast, by filtration and stabilisation due to its limited solubility. Besides, xanthohumol is isomerised to iso-xanthohumol which also has a positive effect, however, to quite a lower extent compared to xanthohumol. With the conventional method less then 0.2 mg/l XN are reached in the final beer in most of the cases. In some stout or porter type dark beers XN contents of up to 1.2 mg/l XN were found (Walker et al., Brauwelt 2003). With a special brewing method which applies late hopping and a fast cooling of the beer wort it is possible to increase the XN content in non-filtered pale beers to 1-10 mg/l (DE 102 56 166).

It is an advantage of the present invention that the isomerisation of xanthohumol to iso-xanthohumol is supressed to a large extent due to the improvement of the brewing method. Therefore, it is possible to increase dosage amounts of XN without allowing the beers to become unpleasantly bitter, for instance. Further, the addition of stabilisers is possible which would normally lead to a relevant decrease in the XN content.

A method for producing the roasted extract comprising XN from roasted products of cereals, cereal malt, coffee or cacao and a hop extract comprising XN is an object of the present invention. The hop extract comprising XN is characterised by a particularly high content of xanthohumol. It is in the range from 10 mg to 2 g/kg, preferably in the range of 200 mg to 850 mg/kg. Due to the use of this roasted extract beers with a significant increased content of XN compared to the prior art can be obtained in accordance with the German purity law, for instance.

Herein, "roasted extract comprising XN" denotes an extract which is obtainable from a roasted extract from roasted products of cereals, cereal malt, coffee or cacao and from the hop extract comprising XN. "Roasted extract" denotes a cold or hot extract from coarsely ground or non-ground roasted malt or cereals and includes a hot or cold extract from coffee or cacao; "cereal malt" denotes a cereal that was artificially or controllably allowed to germinate, and "hop extract comprising XN" denotes an extract from hops which was obtained with the aid of a solvent and exhibits an increased content of XN. "Basic materials" is a collective term for plain or combined substances which may be of natural or synthetic origin. They are used as parent material for the further production of food products. In the present invention basic materials denote e.g. essences which may be enriched with XN as well as e.g. a basic material for coke according to an embodiment of the present invention.

For producing roasted extract comprising XN a hot aqueous extract of the ground roasted products e.g. of barley, wheat, rye as well as the corresponding malts, coffee beans or cacao beans is prepared. A hop extract comprising XN is added thereto at the beginning of the heating period. The extraction of xanthohumol in the extractions of the roasted products leads to a XN content which is by far higher than the solubility limit of XN in typical aqueous solutions.

This amounts to 1.3 mg/l of XN at a water temperature of 23 °C and to 1.1 mg/l of XN at a water temperature of 8 °C.

Soluble roasted substances which adsorb or bind XN and therefore, apparently keep it in solution, are probably responsible for the high yields of xanthohumol in the extracts. The extracts may be fermented, concentrated or clarified without noteworthy losses of XN. According to one embodiment of the present invention a xanthohumol content of approximately 1320 mg/kg was obtained in the extract after concentration of the XN comprising roasted malt wort.

The XN comprising roasted malt wort may be used in the food industry such as in the brewing and beverage industry as well as in the foodstuff industry. Thus, the application of the XN comprising roasted malt wort may lead to an enrichment of xanthohumol in spirits, herbal spirits, herbal liquor wine, beer, mixed drinks comprising beer, or bitters, and also of non-alcoholic drinks or drinks with reduced alcohol content such as malt beverages, coffee, coffee substitute, cacao, ice tea or soft drinks as well as of basic materials for the production of such products in a simple, safe and economic way. A particular advantage is that a roasted malt beer enriched with XN and prepared according to this method may be added to a conventionally produced beer at any time of the beer production in accordance with the purity law, i.e., without the use of emulsifying agents or other chemical additives.

An enrichment of food products with xanthohumol, such as bakery products, backing kits, parfaits, dairy products (e.g. yoghurt, curd cheese and mixed drinks comprising milk) desserts, ice cream, meat products, sauces and herbal candies as well as enrichment of pharmaceutical products with xanthohumol, such as cough syrup, is also possible.

The method for preparing an aqueous extract comprising XN from roasted products of cereals, cereal malt, coffee or cacao comprises the following process steps:

a) addition of a hop product comprising XN to an extract which is mainly or completely produced from roasted or colour malts, respectively, or roasted barley; wherein the added hop product has a content of XN which is, related to the mass used for its production, at least 5 times that of the hops used for its production; and wherein after the addition of the hop product comprising xanthohumol to the aqueous roasted extract the dissolving or even an intensive dissolving of XN is reached, despite the original low solubility in aqueous solutions;

b) dissolving of XN by pre-dissolving of the XN comprising hop product in ethanol;

c) dissolving of XN by agitating, mixing, shaking, supersonic treatment, ultraturax treatment or other mechanical forces;

d) dissolving of XN by heating of the roasted extract;

e) dissolving of XN by application of an alternating current;

f) wherein the amount of the addition of the hop product comprising XN is at least 50 mg XN per litre.

As will be understood from the following examples, it is not necessary that all of the previously mentioned process steps are realised when implementing the process. The process steps b) to h) are optional.

In the following, examples of methods according to the present invention and beverages produced thereby are given.

Example 1

Preparation of beer wort from a mixture of special malt comprising 1.9 kg of roasted barley malt (Carafa™, type 2, Fa. Weyermann, Bamberg) and 0.1 kg of Pilsen type malt. After mashing according to the congress method and mash separation 25 g/l of a hop extract enriched with XN were added (XanthoExtrakt, Simon H. Steiner Hopfen GmbH, XN 2.0 %) during boiling of the roasted malt wort with the kettle-up wort concentration of 11 %w/w (weight/weight percent) and a wort colour of 1650 EBC (European Brewing Convention). After separation of hot trub and a separation with diatomaceous earth the roasted malt wort comprising XN was concentrated in vacuo (200 mbar, ca. 55 °C) to an extract content of approximately 50 %w/w. The syrup like extract ("density 1.25" kg/l) had a colour of approximately 7500 EBC and a content of xanthohumol of approximately 1320 mg/kg.

Example 2

Preparing of beer wort from a special mixture comprising 0.05 kg of Pilsen type malt and 0.95 kg of roasted barley malt (Carafa™, Weyermann). After mashing according to the congress method and mash separation the wort was boiled for 2 hours. At the start of boiling 5000 mg/l of XN were added to the wort. For this, a hop extract comprising XN with 80 % of diatomaceous earth and 20 % of hop extract (XanthoExtrakt, Hopsteiner, XN 1.7 %) was used. Beside XN, this extract also comprises α-acids and hard resins which have an influence on the flavour. The cast wort having a concentration of 11.7 %w/w was fermented within 2 days by bottom fermenting brewer's yeast and was centrifuged after 5 days of

storage. The resulting roasted malt beer (RMB) had a colour of 1850 EBC and an XN content of 390 mg/l.

Example 3

Method for preparing a roasted malt extract comprising XN according to example 1, however, the wort was fermented with brewer's yeast, centrifuged and filtered with diatomaceous earth prior to concentration. The roasted malt beer thus prepared and having an original extract of 12 % and a colour of approximately 1700 EBC, had an XN content of 246 mg/l.

Example 4

Method for preparing a roasted malt beer comprising XN according to example 3, however, the RMB was concentrated after the filtration in vacuo (200 mbar, ca. 55 °C) to an extract content of approximately 48 %. The density of the syrup like roasted malt beer comprising XN was approximately 1.2 kg/l, the colour was 6900 EBC, and the XN content was 846 mg/kg.

Example 5

Method for preparing a roasted malt extract comprising XN according to example 1, however, an amount of approximately 100 mg XN per litre of wort (11 %w/w roasted malt extract) was dosed. Further treatment according to examples 3 and 4 gave a roasted malt beer with an extract content of 47 %w/w, a density of 1.2 kg/l, a colour of 7200 EBC and a XN content of 341 mg/l.

Example 6

Preparation of a coffee extract from 40 g of ground roasted coffee and 1 litre of hot water. After separation of the coffee grounds 100 mg of a hop extract comprising XN (XN content 80 %) were added to the hot coffee extract. The hop extract was intensively mixed at temperatures of above 60 °C and it was further dissolved at 8 °C for 24 hours. After filtration of the coffee beverage comprising XN using a fluted filter the coffee beverage had an XN content of more than 12 mg/l.

Example 7

Method for preparing a coffee beverage comprising XN according to example 6, however, the filtered coffee beverage was dried in a freeze drier to a water content of less than 10 %. The soluble coffee beverage comprising XN had an XN content of 1042 mg/kg.

Example 8

Approximately 1.8 g of the soluble coffee beverage comprising XN according to example 7 were mixed with 150 ml of hot water. The XN content of the mixed coffee beverage was approximately 10 mg/l.

Example 9

To a non-filtered pale lager beer (XN content 0.1 mg/l) 2 g/l of the roasted malt beer comprising XN according to example 4 were added. Compared to the control beer a colour increase by 15 EBC and an enrichment of XN by 1.8 mg/l were detected in the bright beer.

Example 10

To a non-filtered pale lager beer (XN content 0.1 mg/l) 20 g/l of the roasted malt beer comprising XN according to example 4 were added. The filtered beer had a colour of 120 EBC and a XN content of 13 mg/l.

Example 11

To a filtered pale lager beer (XN content 0.05 mg/l) 20 g/l of the roasted malt beer comprising XN according to example 4 were added. The mixed filtered beer had a colour of 125 EBC and an XN content of 15 mg/l.

Example 12

To a typical basic material for coke consisting of two components, coke essence, caramel colour and caffeine on the one hand, and phosphoric acid on the other hand, 880 g of a roasted malt beer comprising XN according to example 1 (concentration 1320 mg XN/kg) were added to 3.05 kg basic coke material and homogenised. After mixing of the enriched basic material with processed water (3:1000), carbon dioxide (6.2 g/l) and sugar (110 g/l) a xanthohumol content of 1.1 mg/l was determined in the ready-to-drink beverage.

Example 13

To one kilogram of probiotic yogurt 2.29 g of roasted malt extract comprising XN according to example 1 is added and homogenised. In the pasteurised product a xanthohumol content of 0.3 mg/100 g was detectable.

Example 14

To a pharmaceutical product, here 1 litre of cough syrup, a roasted malt extract comprising XN (7.6 g) according to example 1 was added. The resulting product comprised approximately 1.0 mg XN/100 ml.

Claims

1. A concentrated roasted extract comprising xanthohumol (XN) (hereinafter referred to as "the extract"), the extract obtainable from a mixture of a roasted extract from roasted products of cereals, cereal malt, coffee or cacao, and a hop extract comprising XN, wherein the extract contains more than 10 mg/kg of XN.

2. The extract according to claim 1, characterised in that the roasted extract includes a cold or hot extract of coarsely ground or non-ground roasted malt, cereals, coffee or cacao.

3. The extract according to claim 1 or 2, characterised in that the extract has an XN content in the range of 11 mg/kg to 2 g/kg.

4. The extract according to claim 3, characterised in that the extract has an XN content in the range of 50 mg/kg to 1320 mg/kg.

5. The extract according to claim 4, characterised in that the extract has an XN content in the range of 200 mg/kg to 850 mg/kg.

6. A pharmaceutical composition, characterised in that it comprises the extract according to any one of claims 1 to 5.

7. A pharmaceutical composition according to claim 6, characterised in that the pharmaceutical composition is a cough syrup.

8. A food product, characterised in that it comprises the extract according to any one of claims 1 to 5.

9. A food product according to claim 8, characterised in that the food product includes alcoholic, alcohol reduced and non-alcoholic beverages.

10. A food product according to claim 9, characterised in that the alcoholic or alcohol reduced beverages include spirits, herbal spirits, herbal liqueurs, bitters, wine, beer, or mixed beverages comprising beer.

11. A food product according to claim 9, characterised in that the non-alcoholic beverages include soft drinks, coffee beverages, coffee substitutes, malt beverages, ice tea or basic materials for producing the same.

12. A food product according to claim 8, wherein the food product comprises bakery products, parfaits, dairy products, sweets, sauces and meat products.

13. A food product according to any one of claims 8 to 12, wherein the XN content is more than 10 mg/l.

14. A food product according to claim 13, wherein the XN content is from 11 mg/l to 400 mg/l.

15. A food product according to claim 14, wherein the XN content is from 15 mg/l to 246 mg/l.

16. A method for producing a concentrated roasted extract comprising xanthohumol (XN) (hereinafter referred to as "the extract"), wherein a hop extract comprising XN is mixed with a cold or hot extract from a coarsely ground or non-ground roasted malt, cereals, coffee or cacao and wherein the mixture is concentrated thereafter to contain more than 10 mg/kg of XN.

17. A method according to claim 16, wherein the hop extract comprising XN has an XN content in the range from 0.5 to 99% w/w.

18. A method according to claim 16, wherein the extract is concentrated to dry matter of 40 - 50% w/w.

19. A method according to claim 18, wherein the extract is concentrated to dry matter of 47 - 48% w/w.

20. A method according to claim 16, wherein the concentrating is performed by evaporating, freeze drying or at reduced pressure.

21. A method according to any one of claims 16 to 20, wherein the extract is fermented by yeast and clarified.

22. A method according to claim 21, wherein the clarifying is effected by centrifuging or filtrating.

23. A method according to claim 16, wherein the hop extract is pre-dissolved in ethanol for dissolving of the XN.

24. A method according to claim 23, wherein the XN is dissolved by agitating, mixing, shaking, super sonic treatment and/or treatment with dispersing means.

25. A method according to claim 23 or 24, characterised in that the dissolving of xanthohumol further includes heating and/or the application of an alternating current.

26. A method for producing an aqueous extract comprising xanthohumol (XN) from roasted products of cereals, cereal malt, coffee or cacao, said method comprising the following steps:

a) obtaining or preparing an aqueous extract from the roasted product;

b) adding a hop product comprising XN to the aqueous extract, wherein the hop product has an XN content which, related to its mass used for its production, is at least five times that of the hop used for its production;

c) achieving substantial dissolving of the XN.

27. A method according to claim 26, wherein dissolving of the XN is promoted by pre-dissolving of the hop product comprising XN in ethanol.

28. A method according to claim 26, wherein dissolving of the XN is promoted by agitating, mixing, shaking, supersonic treatment, Ultraturax treatment or any other mechanical forces.

29. A method according to claim 26, wherein dissolving of the XN is promoted by heating of the aqueous extract.

30. A method according to claim 26, wherein dissolving of the XN is promoted by applying an alternating current.

31. A method according to claim 26, wherein the amount of addition of the hop product comprising XN is at least 50 mg of XN per litre.

32. A method according to claim 26, further characterised in that the extract enriched with XN is concentrated to a dry matter of approximately 50 %.

33. A method according to claim 26, further characterised in that

a) the resulting extract is fermented by yeast, centrifuged or filtered;

b) the resulting extract is concentrated to an extract content of about 50 %.

34. A method according to any one of claims 26 to 33, further characterised in that a commercially available roasted malt extract and a commercially available roasted malt beer is used for dissolving the hop extract enriched with XN.

35. A method according to any one of claims 26 to 33, further characterised in that an extract from commercially available roasted coffee and from commercially available instant coffee is used for dissolving the hop extract enriched with XN.

36. An extract comprising more than 10 mg/kg of xanthohumol (XN), which is produced according to any one of claims 26 to 35.

37. An extract comprising more than 50 mg/kg of xanthohumol (XN) which is produced according to any one of claims 26 to 35.

38. An extract comprising more than 200 mg/kg of xanthohumol (XN) which is produced according to any one of claims 26 to 35.

39. Use of an extract according to any one of claims 36 to 38 in the production of a beverage.

40. Use according to claim 39 wherein the beverage is beer, a mixed beverage comprising beer, wine, coffee beverage, coffee substitute or other non-alcoholic beverage, or a precursor of any of these products.

41. Use of an extract according to any one of claims 36 to 38 in the production of a food product.

42. Use according to claim 41 wherein the food product is a bakery product, parfait, dessert, ice cream, meat product, sauce, or a precursor of any of these products.

43. An extract as claimed in any one of claims 1 to 5, or 36 to 38, substantially as herein described with reference to the examples.

44. A pharmaceutical composition as claimed in claim 6 or 7, substantially as herein described with reference to the examples.

45. A food product as claimed in any one of claims 8 to 15, substantially as herein described with reference to the examples.

46. A method for producing a roasted extract as claimed in any one of claims 16 to 25, substantially as herein described with reference to the examples.

47. A method for producing an aqueous extract as claimed in any one of claims 26 to 35, substantially as herein described with reference to the examples.

48. Use of an extract as claimed in any one of claims 39 to 42, substantially as herein described with reference to the examples.