

Description

Title of Invention

5 METHOD FOR AUGMENTING COMPONENT PROVIDING SMOKING FLAVOR
FOR TOBACCO PRODUCT, TOBACCO RAW MATERIAL, CIGARETTE, AND
CIGAR

Technical Field

10 The present invention relates to a method for
augmenting a component providing smoking flavor for a
tobacco product, a tobacco raw material, a cigarette, and a
cigar.

15 Background Art

A fragrance is added to a tobacco product to improve a
smoking flavor. An improvement in the fragrance is
required owing to smoker demands concerning improved
smoking flavor, a change in taste, reduction tendency of a
20 mainstream smoke tar amount (subtle in flavor) of the whole
cigarette, or a reduction in manufacturing cost or the like,
and various trials are performed.

Raw materials mainly used for such tobacco product
fragrances are natural sugars and plant extracts. Methods
25 for adding required substances to original extracts, or
processing the extract, to modify the extract is known as
an example of improvements in these extracts.

However, the modifying method for adding the required substance to the plant extract or processing the plant extract causes an extreme change in the content component of the original extract, which possibly inhibits the feature of the original extract. Particularly, the effect of the plant extract may change with time.

On the other hand, methods described in the following Patent Literatures are known as common methods for modifying fragrances.

In Jpn. Pat. Appln. KOKAI Publication No. 2010-207116, heat-treating a tea steam distillation liquid at a temperature of 100°C or less to extract a first extract, adding ascorbic acid to a tea steam distillation residue to obtain a second extract, and mixing the first and second extracts and thereafter heat-treating the mixture at 80 to 85°C for 30 seconds to make an extract having good fragrance are described.

Jpn. Pat. Appln. KOKAI Publication No. 2009-219488 discloses a method for heating a mixed liquid of a coffee extraction component, sugars, and water at 130 to 180°C for 10 minutes or more to produce an anaminocarbonyl reaction, thereby augmenting a fragrance component. Herein, the fragrance component is a furanic compound other than furfural.

Production of an extract according the following method is described in Jpn. Pat. Appln. KOKAI Publication No. 2002-272408. First, a non-heated squeezed liquid of an

edible plant is heat-treated at 70 to 135°C under a non-pressure for 2 to 15 minutes. Then, the heat-treated squeezed liquid is heat-treated at 105 to 135°C under a pressure of 1.2 to 3.2 MPA for 2 to 8 minutes to produce an aggregate. Then, an extract having an augmented sweet and delicious taste and having very low odor is produced by removing the aggregate.

Jpn. Pat. Appln. KOKAI Publication No. 2-245169 discloses a method for mixing an animal extract with a plant extract and heating the mixture at 80 to 100°C for 15 minutes or more to produce a bouillon having excellent quality such as flavor.

Summary of Invention

Technical Problem

However, the above four Patent Literatures cannot be applied to the flavor for the tobacco product accompanied by burning to improve the flavor directly tasted.

It is an object of the present invention to provide a method for augmenting a component providing smoking flavor for a tobacco product. The method can efficiently augment a component providing smoking flavor (or component group) from at least one raw material for flavor selected from the group consisting of natural sugars, the original form of a plant, and a liquid extract distilled or condensed from the original form of a plant, without causing an extreme change in the component.

It is an object of the present invention to provide a tobacco raw material which contains the raw material for flavor containing the component providing smoking flavor augmented by the method and has a fragrance and flavor (savor) augmented without changing the original fragrance and flavor (savor) of the raw material for flavor in burning during smoking.

Another object of the present invention is to provide a cigarette and a cigar which contain the tobacco raw material containing the raw material for flavor containing the component providing smoking flavor augmented by the method, and have a fragrance and flavor (savor) augmented without changing the original fragrance and flavor (savor) of the raw material for flavor in burning during smoking.

Solution to Problem

A first aspect of the present invention provides a method for augmenting a component providing smoking flavor for a tobacco product, the method including the steps of: preparing at least one raw material for flavor selected from the group consisting of natural sugars, the original form of a plant, and a liquid extract distilled or condensed from the original form of a plant; accommodating the raw material in an oven at a volume ratio of 50 to 80% by volume relative to a volume amount of the oven; heating the raw material in the oven to 80 to 100°C at a temperature increase rate of 1.0 to 2.0°C/minute while

stirring the raw material; and cooling the contents in the oven after processing to a desired temperature at a temperature decrease rate of 0.40 to 0.85°C/minute.

5 A second aspect of the present invention provides a tobacco raw material containing the raw material for flavor containing the component providing smoking flavor augmented by the method according to the first aspect.

10 A third aspect of the present invention provides a cigarette containing the tobacco raw material containing the raw material for flavor containing the component providing smoking flavor augmented by the method according to the first aspect.

15 A fourth aspect of the present invention provides a cigar containing the tobacco raw material containing the raw material for flavor containing the component providing smoking flavor augmented by the method according to the first aspect.

Brief Description of Drawings

20 FIG. 1 is a schematic perspective view showing a cigarette with a filter according to a third embodiment.

FIG. 2 is a schematic sectional view showing a cigar according to a fourth embodiment.

25 FIG. 3 shows the increase rates of 2,5-dioxyfructosazine and 2,6-dioxyfructosazine in a carob extract treated in Example 6.

FIG. 4 shows the amounts of DDMP and 5-HMF in honey after and before augmenting treatment by Example 11 in

GC/MS measurement.

FIG. 5 shows the amounts of DDMP and 5-HMF in honey after and before augmenting treatment by Example 14 in GC/MS measurement.

5 FIG. 6 shows the increase rates of DDMP and 5-HMF in honeys augmented in Example 11 and Example 14.

FIG. 7 shows the amounts of DDMP and 5-HMF in honey after and before augmenting treatment by Example 16 in GC/MS measurement.

10 FIG. 8 shows the amounts of 3-hydroxy- β -damascone and 4-vinyl guaiacol in a mate extract after and before augmenting treatment by Example 22 in GC/MS measurement.

FIG. 9 shows the increase rates of 3-hydroxy- β -damascone and 4-vinyl guaiacol in a mate extract subjected to augmenting treatment in Example 22.

15

Description of Embodiments

Hereinafter, a method for augmenting a flavor component for tobacco, a tobacco raw material, a cigarette, and a cigar according to embodiments of the present invention will be described in detail.

20

<First Embodiment>

A method for augmenting a component providing smoking flavor for a tobacco product according to a first embodiment includes the steps of: preparing at least one raw material for flavor selected from the group consisting of natural sugars, the original form of a plant, and a

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liquid extract distilled or condensed from the original form of a plant (first step); accommodating the raw material in an oven at a volume ratio of 50 to 80% by volume relative to a volume amount of the oven (second step); heating the raw material in the oven to 80 to 100°C at a temperature increase rate of 1.0 to 2.0°C/minute while stirring the raw material (third step); and cooling the contents in the oven after processing to a desired temperature at a temperature decrease rate of 0.40 to 0.85°C/minute (fourth step).

Herein, the phrase "component providing smoking flavor" means a component (or component group) which contributes to fragrance and flavor (savor) in burning during smoking.

The first embodiment performs the first step to the fourth step, and particularly specifies the heating temperature of the third step and the temperature decrease rate during the cooling of the fourth step. Therefore, the method for augmenting a component providing smoking flavor for a tobacco product can be provided. The method can dominantly augment at least one component providing smoking flavor (a component useful as a smoking flavor in smoking) selected from the group consisting of natural sugars, the original form of a plant, and a liquid extract distilled or condensed from the original form of a plant which are raw materials for flavor.

The tobacco raw material contains the raw material for

flavor having the augmented component providing smoking flavor. The tobacco raw material is heated in burning during smoking, and thereby the component providing smoking flavor in the raw material for flavor is thermally

5 decomposed to a volatile component, or evaporated and vaporized. For this reason, a complex rose tea fragrance and flavor (savor) are exhibited.

The first embodiment can provide a method for augmenting a component providing smoking flavor for a tobacco product in a simple step without adding another
10 substance in addition to the raw material for flavor.

Examples of the natural sugars in the raw material for flavor used in the first step include polysaccharides such as honey and starch.

15 Examples of the original form of a plant in the raw material for flavor used in the first step include mate and green tea.

Examples of the liquid extract in the raw material for flavor used in the first step include seed-based extracts
20 such as a carob extract, a coffee extract, a cocoa extract, a fenugreek extract, and a malt extract; and leaf-based extracts such as a tea extract, a camomile extract, and a rosemary extract.

The raw material for flavor used in the first step may
25 be a mixture of two or more selected from the group consisting of the natural sugars, the original form of a plant, and the liquid extract.

When the volume ratio of the raw material for flavor relative to the volume amount of the oven is set to be less than 50% by volume in the second step, the volume amount of the raw material for flavor treated in the oven is

5 decreased, which may decrease a processing efficiency for augmenting the component providing smoking flavor. On the other hand, when the volume ratio of the raw material for flavor relative to the volume amount of the oven is more than 80% by volume, it is difficult to efficiently augment
10 the component providing smoking flavor in the raw material for flavor in stirring and heat treating.

The raw material for flavor is preferably stirred by using, for example, a stirring blade in the third step. The rotating speed of the stirring blade is preferably set
15 to 15 to 100 rpm.

The component providing smoking flavor in the raw material for flavor can be efficiently augmented by heating the raw material for flavor to 80°C to 100°C at the temperature increase rate of 1.0 to 2.0°C/minute in the
20 third step. When the heating temperature is less than 80°C, it is difficult to sufficiently augment the component providing smoking flavor in the raw material for flavor. On the other hand, when the heating temperature is more than 100°C, the component providing smoking flavor in the
25 raw material for flavor is possibly deteriorated.

The above heating temperature is preferably held for 240 minutes or less in the third step. Thus, the component

providing smoking flavor in the raw material for flavor can be further augmented by specifying the holding time. The lower limit of the holding time is preferably set to 30 minutes.

5 The component providing smoking flavor in the raw material for flavor can be more efficiently augmented by specifying the temperature decrease rate during cooling to 0.40 to 0.85°C/minute in the fourth step. When the temperature decrease rate during cooling falls outside the
10 above range, it is difficult to sufficiently augment the component providing smoking flavor in the raw material for flavor.

 Although an attainment cooling temperature according to "cooling to a desired temperature" is different
15 according to the kinds of the raw material for flavor, usually, the attainment cooling temperature is preferably set to 40 to 60°C.

 The internal pressure of the oven in the second step to the fourth step may be atmospheric pressure or a
20 pressurization state higher than atmospheric pressure. Particularly, the inside of the oven is pressurized, and thereby a void ratio based on the amount of the raw material for flavor injected into the oven can be reduced, and temperature maintenance and a sealed state in the oven
25 can be attained. The pressure is preferably set to 0.105 to 0.11 MPa.

<Second Embodiment>

A tobacco raw material according to a second embodiment contains the raw material for flavor containing the component providing smoking flavor augmented by the method according to the first embodiment.

5 Examples of the tobacco raw material include tobacco lamina, cut tobacco, reconstitution tobacco, puffed tobacco, tobacco medium-bone, cut tobacco medium-bone, a filter of a cigarette, paste for wound paper, pipe tobacco, and cigar raw material (filler, binder, wrapper) leaf tobacco.

10 The content of the raw material for flavor in the tobacco raw material is suitably selected according to the kinds of the tobacco raw material.

 According to the second embodiment described above, the augmented component providing smoking flavor in the raw material for flavor is thermally decomposed, or evaporated and vaporized without changing the original fragrance and flavor (savor) of the raw material for flavor in burning during smoking, and thereby the tobacco raw material having the augmented fragrance and flavor (savor) can be provided.

20 <Third Embodiment>

 A cigarette according to a third embodiment contains the tobacco raw material containing the raw material for flavor containing the component providing smoking flavor augmented by the method of the first embodiment.

25 A specific cigarette (for example, a cigarette with a filter) will be described in detail with reference to FIG. 1.

The cigarette with a filter contains a tobacco rod 1, and a filter 2 having a circumference equivalent to, or thinner than that of the tobacco rod 1. The tobacco rod 1 and the filter 2 are butted to each other at one end. The whole outer periphery of the filter 2 and the outer periphery portion of the tobacco rod 1 near the butted portion are encapsulated with tipping paper 3 to integrate the tobacco rod 1 with the filter 2. The tobacco rod 1 is formed by cylindrically encapsulating cut tobacco 4 with wound paper 5. The filter 2 is formed of a filter material (not shown) formed by bundling or folding up acetate fibers or pulp nonwoven fabrics, for example, and plug paper (forming paper) 6 obtained by cylindrically winding the filter material.

In the cigarette with a filter, the cut tobacco 4 of the tobacco rod 1 contains the raw material for flavor containing the component providing smoking flavor augmented by the method of the first embodiment, or the filter material of the filter 2 contains the raw material for flavor containing the component providing smoking flavor augmented by the method of the first embodiment.

The third embodiment described above contains the filter material (or the cut tobacco 4) containing the raw material for flavor containing the component providing smoking flavor augmented by the method of the first embodiment, and thereby the augmented component providing smoking flavor in the raw material for flavor is thermally

decomposed, or evaporated and vaporized without changing the original fragrance and flavor (savor) of the raw material for flavor contained in the filter material (or the cut tobacco 4) in burning during smoking, and thereby
5 the cigarette having the augmented fragrance and flavor (savor) can be provided.

The cut tobacco to which the raw material for flavor having the augmented component providing smoking flavor is added has high storage resilience. For this reason, the
10 cigarette can be provided, which has excellent temporal stability of tobacco flavor also after storage.

<Fourth Embodiment>

A cigar according to a fourth embodiment contains the tobacco raw material containing the raw material for flavor
15 containing the component providing smoking flavor augmented by the method of the first embodiment.

A specific cigar will be described in detail with reference to FIG. 2.

The cigar contains a cylindrical filler 11, a binder
20 12 with which an outer periphery containing a mouthpiece (right end of FIG. 2) of the filler 11 is encapsulated, a wrapper 13 with which the whole binder is encapsulated, and a ring 14 attached to the outer periphery of the wrapper 13 near the mouthpiece, for example. An end part (left end of
25 FIG. 2) opposite to the mouthpiece is a burning part. All of the filler 11, the binder 12, and the wrapper 13 are made from leaf tobacco.

In the cigar, the filler 11 contains the raw material for flavor containing the component providing smoking flavor augmented by the method of the first embodiment.

5 The fourth embodiment described above contains the filler 11 containing the raw material for flavor containing the component providing smoking flavor augmented by the method of the first embodiment, and thereby there can be provided the cigar having fragrance and flavor (savor) augmented by the thermal decomposition or evaporation and
10 vaporization of the augmented component providing smoking flavor in the raw material for flavor without changing the original fragrance and flavor (savor) of the raw material for flavor contained in the filler 11 in burning during smoking.

15 Hereinafter, Examples of the present invention will be described in detail.

<Example 1: Carob Extract>

An oven (Reokneader KHM-6FT manufactured by Kajiwara Inc.) was prepared, which included a stirring mechanism
20 having a stirring blade and a heating/cooling mechanism having a jacket and had an internal volume of 600 L. A carob extract was prepared, which was condensed to Brix 75 (water amount: 25% by weight) under ordinary pressure after extraction using hydrous alcohol.

25 First, 500 kg of the carob extract was injected into the oven. At this time, the volume ratio of the carob extract to the volume amount of the oven was 60% by volume.

Then, the carob extract was heated to a liquid temperature of 70°C at a temperature increase rate of 1.50°C/minute while the carob extract in the oven was stirred by rotating the stirring blade at the number of rotations of 15 rpm in a state where the internal pressure of the oven was atmospheric pressure (opened). The heating was performed by circulating steam in the jacket and adjusting the steam amount. The internal temperature of the oven was held at 70°C ± 5°C for 60 minutes while stirring by the stirring blade was continued.

Then, while the stirring by the stirring blade was continued, the content in the oven was cooled to 50°C at a temperature decrease rate of 0.42°C/minute after heating and holding. The cooling was performed by circulating water in the jacket and adjusting the water temperature.

<Examples 2 to 10: Carob Extract>

Carob extracts were subjected to the same treatment as that of Example 1 except that the conditions of an internal pressure of an oven, temperature increase rate, heating temperature, holding time during heating, and temperature decrease rate shown in the following Table 1 were set.

The amounts of involatile pyrazines (2,5-dioxyfructosazine [hereinafter, described as 2,5-DFS]) and 2,6-dioxyfructosazine [hereinafter, described as 2,6-DFS]) which were components providing smoking flavor in the carob extracts treated in Examples 1 to 10 were measured by the following method.

<HPLC Measurement of Involatile Pyrazines>

• Device used: high-performance liquid chromatography
Ultimate 3000 (DIONEX)

• Column used: Inertsil ODS-3 (150 mm × 3.0 mm, × 5 μm)

5 • Analysis Conditions:

1) Column Oven; 6.0°C

2) UV; 275 nm

3) Flow Rate; 0.3 mL/min

4) Injection Volume; 20 μL

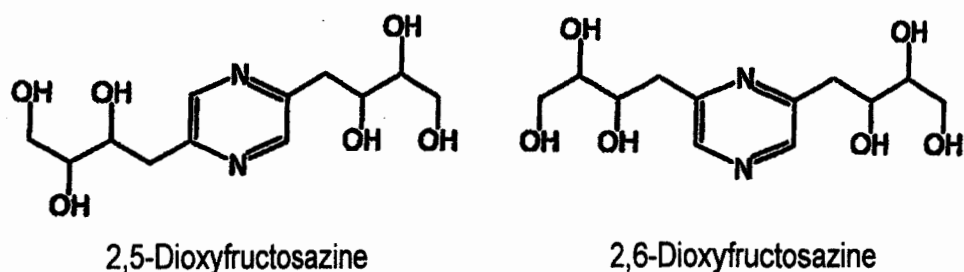
10 The results of measurement of the amounts of the
involatile pyrazines in the carob extracts confirmed that
the amounts of the involatile pyrazines were dominantly
augmented without causing an extreme content component
change of the carob extract in the carob extracts treated
15 in Examples 2 to 6 and 8 in which the temperature increase
rate was set to 1.0 to 2.0°C/minute; the heating
temperature was set to 80°C to 100°C; and the temperature
decrease rate during cooling was set to 0.40 to
0.85°C/minute.

20 In these Examples 2 to 6 and 8, the increase rates of
the involatile pyrazines (2,5-dioxyfructosazine and 2,6-
dioxyfructosazine) in the carob extract treated in Example
4 (the temperature increase rate: 1.5°C/minute, the heating
temperature: 100°C, the holding time during heating: 60
25 minutes, and the temperature decrease rate during cooling:
0.42°C/minute are set) are shown in FIG. 3.

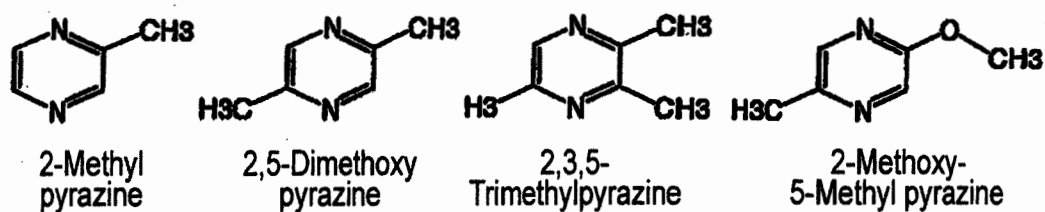
The thermal decomposition examples of the involatile

pyrazines are shown below.

[Chemical Formula 1]



 Thermal decomposition



Furthermore, the carob extracts treated in Examples 1 to 10 were added, and the augmenting effect of flavor (savor) in smoking was evaluated according to the sensory test. The result is shown in the following Table 1. The rank of evaluation is as follows.

AA: an extremely large augmenting effect by treatment

A: an augmenting effect by treatment

B: a minimal augmenting effect by treatment

C no augmenting effect by treatment

	Raw material	Temperature increase rate	Heating temperature	Holding time during heating	Temperature decrease rate	Internal pressure of oven	Evaluation; flavor (savor), augmenting effect
Example 1	Carob	1.5°C/minute	70°C	60 minutes	0.42°C/minute	Atmospheric pressure	C
Example 2			100°C	20 minutes			B
Example 3				30 minutes			A
Example 4				60 minutes			AA
Example 5				120 minutes			A
Example 6				240 minutes			A
Example 7			110°C	60 minutes	0.21°C/minute		C
Example 8					0.84°C/minute		A
Example 9					1.26°C/minute		C
Example 10					0.42°C/minute		C

[Table 1]

As is apparent from Table 1, the carob extracts treated in Examples 2 to 6 and 8 are found to have flavor (savor) augmented as compared with those of the carob extracts treated in Examples 1, 7, 9, and 10.

5 <Example 11: Honey>

A resisting pressure oven (vertical cylinder type jacket type heater FM-14 manufactured by Daiko Kakoki Co., Ltd.) was prepared, which included a stirring mechanism having a stirring blade and a heating/cooling mechanism
10 having a jacket and had an internal volume of 2000 L

First, 1870 kg of honey (Chinese) was injected into the resisting pressure oven by a pump while stirring, and the resisting pressure oven was sealed. At this time, the volume ratio of the honey to the volume amount of the
15 resisting pressure oven was 67% by volume. Then, the honey in the resisting pressure oven was heated to a liquid temperature of 70°C at a temperature increase rate of 1.50°C/minute while the honey was stirred by the stirring blade at the number of rotations of 100 rpm. The heating
20 was performed by circulating steam in the jacket and adjusting the steam amount. The internal temperature of the resisting pressure oven was held at 70°C ± 5°C for 30 minutes while the stirring by the stirring blade was continued. At this time, the internal pressure of the
25 resisting pressure oven was set to 0.10 MPA.

The content in the oven was cooled to 50°C at a temperature decrease rate of 0.42°C/minute after heating

and holding while the stirring by the stirring blade was continued. The cooling was performed by circulating water in the jacket and adjusting the water temperature.

<Examples 12 to 21: Honeys>

5 Honeys were subjected to the same treatment as that of Example 11 except that the conditions of an internal pressure of an oven, temperature increase rate, heating temperature, holding time during heating, and temperature decrease rate shown in the following Table 2 were set.

10 The amounts of 2,3-dihydro-3,5-dihydroxy-6-methyl-4H-pyrane-4-one (DDMP) and 5-hydroxymethyl-2-furfural (5-HMF) which were components providing smoking flavor in the honeys treated in Examples 11 and 14 were measured by the following GC/MS.

15 <GC/MS Measurement>

- Device used: Agilent 5975C
- Column used: DB-WAX (60 m × 0.25 mm × 0.3 μm)
- Analysis Conditions:
 - 1) Inlet Temperature; 250°C
 - 20 2) InletMode; Splitless
 - 3) Column Temperature; 70°C to 220°C
 - 4) Temperature Increase Rate; 2°C/minute
 - 5) Flow Rate Gas; He (1.0 mL/min)
 - 6) Injection Volume; 2 μL

25 • Sample Preparation: 60.0 g of distilled water was added to 90.0 g of a sample, and the solution obtained by stirring and dissolving was distilled and condensed with

150 mL of diethyl ether at 50°C for 6 hours.

The amounts of DDMP and 5-HMF which were components providing smoking flavor in the honeys treated in Examples 12 and 13 and Examples 15 to 21 excluding Examples 11 and 14 were measured by the following GC/MS.

<GC/MS Measurement>

- Device used: Agilent 6890N
- Column used: TC-WAX (60 m × 0.25 mm × 0.3 μm)
- Analysis Conditions:

- 1) Inlet temperature; 250°C
- 2) InletMode; Splitless
- 3) Column temperature; 70°C to 220°C
- 4) Temperature Increase Rate; 3°C/minute
- 5) Flow Rate Gas; He (1.3 mL/min)
- 6) Injection Volume; 2 μL

• Sample Preparation: 60.0 g of distilled water was added into 90.0 g of a sample, and the solution obtained by stirring and dissolving was distilled and condensed with 150 mL of diethyl ether at 50 °C for 6 hours.

The results of measurement of the amounts of DDMP and 5-HMF in the honey confirmed that the honeys treated in Example 12 to 20 in which the temperature increase rate was set to 1.0 to 2.0°C/minute; the heating temperature was set to 80°C to 100°C; and the temperature decrease rate during cooling was set to 0.40 to 0.85°C/minute had the amounts of DDMP and 5-HMF dominantly augmented without causing an extreme content component change.

The results of GC/MS measurement for Examples 11, 14, and 16 will be specifically described below.

• The amounts of DDMP and 5-HMF in the honey after and before augmenting treatment in Example 11 (the temperature increase rate is set to 1.5°C/minute; the heating temperature is set to 70°C; the holding time during heating is set to 30 minutes; and the temperature decrease rate during cooling is set to 0.42°C/minute) in GC/MS measurement are shown in FIG. 4. From the result of FIG. 4, there is no apparent difference between DDMP and 5-HMF, which are fragrance components, before and after augmenting treatment in Example 11, and no remarkable increase in the fragrance component by augmenting treatment is observed.

The amounts of DDMP and 5-HMF in the honeys before and after augmenting treatment in Example 14 (the temperature increase rate is set to 1.5°C/minute; the heating temperature is set to 100°C; the holding time during heating is set to 30 minutes; and the temperature decrease rate during cooling is set to 0.42°C/minute) in GC/MS measurement are shown in FIG. 5. From the result of FIG. 5, DDMP and 5-HMF which are fragrance components before and after augmenting treatment in Example 14 are observed to be notably increased. No change in other fragrance components is seen, and no change in the content component is observed.

• The increase rates of DDMP and 5-HMF in the honeys augmented in Examples 11 and 14 are shown in FIG. 6.

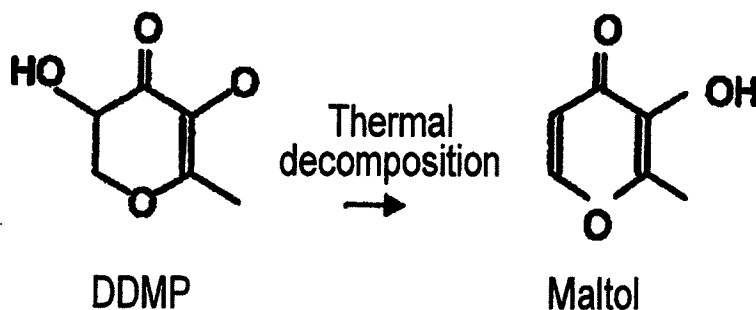
• The amounts of DDMP and 5-HMF in the honeys after

and before augmenting treatment in Example 16 (the temperature increase rate is set to 1.5°C/minute; the heating temperature is set to 100°C; the holding time during heating is set to 60 minutes; and the temperature decrease rate during cooling is set to 0.42°C/minute) in GC/MS measurement are shown in FIG. 7. From the result of FIG. 7, DDMP and 5-HMF which are fragrance components before and after augmenting treatment in Example 16 are observed to be notably increased. No change in other fragrance components is seen, and no change in the content component is observed.

DDMP is generally known to be present in a minute amount also in the honey as a precursor of maltol. Although DDMP itself is odorless, DDMP is thermally decomposed to bring about the same spicy (fret sweet) fragrance and flavor (savor) as those of maltol. Simultaneously, a honey-like fragrance also was confirmed to be augmented by the increase in 5-HMF.

The thermal decomposition example of DDMP will be shown below.

[Chemical Formula 2]



Furthermore, the honeys treated in Examples 11 to 21

were added, and the augmenting effect of flavor (savor) in smoking was evaluated according to the sensory test. The result is shown in the following Table 2. The rank of evaluation is the same as those of Examples 1 to 10.

	Raw material	Temperature increase rate	Heating temperature	Holding time during heating	Temperature decrease rate	Internal pressure of oven	Evaluation; flavor (savor), augmenting effect
Example 11	Honey	1.5℃/minute	70℃	30 minutes	0.42℃/minute	0.10MPa	C
Example 12			80℃	20 minutes			B
Example 13				30 minutes			B
Example 14			100℃			0.10MPa	AA
Example 15				Atmospheric pressure			B
Example 16				0.10MPa			B
Example 17						B	
Example 18						B	
Example 19				240 minutes		Atmospheric pressure	A
Example 20			120℃	30 minutes	0.84℃/minute	0.10MPa	A
Example 21					0.42℃/minute	0.15MPa	C

[Table 2]

As is apparent from Table 2, the honeys treated in Examples 12 to 20 are found to have flavor (savor) augmented compared with those of the honeys treated in Examples 11 and 21.

5 <Example 22: Mate>

An oven (Reokneader KHM-6FT manufactured by Kajiwara Inc.) was prepared, which included a stirring mechanism having a stirring blade and a heating/cooling mechanism having a jacket and had an internal volume of 600 L.

10 First, 25 kg of mate leaves and 375 kg of water were injected into the oven. Then, the mate leaves and the water were stirred in the oven at 40°C for 45 minutes by rotating the stirring blade at the number of rotations of 15 rpm, to distill a mate extract. The distilled liquid
15 was solid-liquid separated by using a circle type vibrating sieve machine (Model: TM-100-1S manufactured by Tokuju Co., Ltd.).

Next, 370 kg of the obtained mate extract was injected into the oven. At this time, the volume ratio of the mate
20 extract relative to the volume amount of the oven was 62% by volume. Then, the mate extract was heated to a liquid temperature of 95°C at a temperature increase rate of 1.50°C/minute while the mate extract was stirred in the oven by rotating the stirring blade at the number of
25 rotations of 30 rpm in a state where the internal pressure of the oven was set to atmospheric pressure (opened). The heating was performed by circulating steam in the jacket

and adjusting the steam amount. The mate extract was condensed to Brix.73 in a state where the internal temperature of the oven was held at $95^{\circ}\text{C} \pm 5^{\circ}\text{C}$ while stirring by the stirring blade was continued. The time was 60 minutes.

Then, while the stirring by the stirring blade was continued, the content in the oven was cooled to 50°C at a temperature decrease rate of $0.84^{\circ}\text{C}/\text{minute}$ after heating and holding. The cooling was performed by circulating water in the jacket and adjusting the water temperature.

<Examples 23 and 24: Mates>

Mate extracts were subjected to the same treatment as that of Example 22 except that the conditions of an internal pressure of an oven, temperature increase rate, heating temperature, holding time during heating, and temperature decrease rate shown in the following Table 3 were set.

The amounts of 3-hydroxy- β -damascone and 4-vinyl guaiacol which were components providing smoking flavor in the mate extracts treated in Examples 22 to 24 were measured by the following GC/MS.

<GC/MS Measurement>

- Device used: Agilent 5975N
- Column used: DB-WAX (60 m $\times$ 0.25 mm $\times$ 0.3 μm)
- Analysis Conditions:
 - 1) Inlet Temperature; 250°C
 - 2) InletMode; Splitless

- 3) Column Temperature; 40°C to 220°C
- 4) Temperature Increase Rate; 2°C/minute
- 5) Flow Rate Gas; He (1.0 mL/min)
- 6) Injection Volume; 2 μ L

5 • Sample Preparation: 60.0 g of distilled water was added into 90.0 g of a sample, and the solution obtained by stirring and dissolving was distilled and condensed with 150 mL of diethyl ether at 50°C for 6 hours.

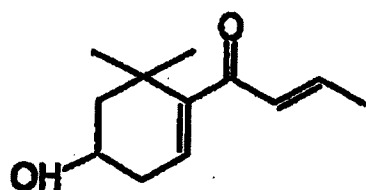
10 The results of measurement of the amounts of 3-hydroxy- β -damascone and 4-vinyl guaiacol in the mate extract confirmed that the mate extracts treated in Examples 22 to 24 in which the temperature increase rate was set to 1.0 to 2.0°C/minute; the heating temperature was set to 80°C to 100°C; and the temperature decrease rate
15 during cooling was set to 0.40 to 0.85°C/minute had the amounts of 3-hydroxy- β -damascone and 4-vinyl guaiacol dominantly augmented without causing an extreme content component change.

20 • The amounts of 3-hydroxy- β -damascone and 4-vinyl guaiacol in the mate extracts after and before augmenting treatment in Example 22 (the temperature increase rate was set to 1.5°C/minute; the heating temperature was set to 95°C; the holding time during heating was set to 60 minutes; and the temperature decrease rate during cooling
25 was set to 0.84°C/minute) in GC/MS measurement are shown in FIG. 8. The increase rates of 3-hydroxy- β -damascone and 4-vinyl guaiacol in the mate extract augmented in Example 22

are shown in FIG. 9.

3-hydroxy- β -damascone is represented by the following constitutional formula, and is known to be present as a component of a tobacco leaf. "Stimulus" and "bitter" can
5 be suppressed by decreasing the amount of such component.

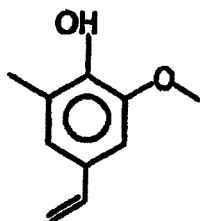
[Chemical Formula 3]



3-Hydroxy- β -Damascone

4-vinyl guaiacol is represented by the following constitutional formula, has sweet spicy fragrance, and
10 applies body to flavor (savor and sweet taste).

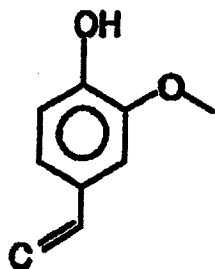
[Chemical Formula 4]



4-Vinyl guaiacol

4-vinyl guaiacol is oxygenized to produce vanillin represented by the following constitutional formula.

15 [Chemical Formula 5]



2,5-Vanillin

Furthermore, the mate extracts treated in Examples 22
and 23 were added, and the augmenting effect of flavor
(savor) in smoking was evaluated according to the sensory
5 test. The result is shown in the following Table 3. The
rank of evaluation is the same as those of Examples 1 to 10.

	Raw material	Temperature increase rate	Heating temperature	Holding time during heating	Temperature decrease rate	Internal pressure of oven	Evaluation; flavor (savor), augmenting effect
Example 22	Mate	1.5°C/minute	95°C	60 minutes	0.84°C/minute	Atmospheric pressure	B
Example 23				120 minutes			A
Example 24				240 minutes			AA

[Table 3]

As is apparent from Table 3, the mate extracts treated in Examples 22 to 23 are found to have augmented flavor (savor).

<Example 25: Sensory Evaluation of Carob Extract>

5 A tobacco leaf (yellow kind) was shredded to a predetermined shredding width, to produce cut tobacco. By weight, 0.5% of the carob extract (no augmenting treatment) prepared in Example 1 to the cut tobacco was added. The cut tobacco to which the carob extract was added was wound
10 in a cigarette shape having a winding length of 63 mm and a winding circumference of 24.9 mm.

<Example 26: Sensory Evaluation of Carob Extract>

 By weight, 0.5% of the carob extract subjected to augmenting treatment in Example 2 was added to the same cut
15 tobacco as that of Example 25. The cut tobacco to which the carob extract was added was wound in a cigarette shape in the same manner as in Example 25.

 The cigarettes obtained in Examples 25 and 26 were stored in a sealed state in a constant-temperature unit at
20 70°C for 7 hours. The cigarettes before and after storage were smoked, and provided for the sensory test.

<Evaluation>

 The sensory tests of fragrance and flavor (savor) for the cigarettes (before storage, after storage: 7 samples,
25 respectively) in smoking were performed by eight trained panelists, and averages thereof were evaluated as follows.

 • Score 8.0 or more: evaluation A (addition effect,

suitably usable)

- Score 7.0 or more and less than 8.0: evaluation B (slight drawback, but usable)

- Score less than 7.0: evaluation C (unsuitable for use)

5

These results are shown in the following table 4.

	Extract		Fragrance	Sweet flavor	Bitter	Stimulus	Smoke volume feeling	Caramelic	Average value
Example 25	Carob (no augmenting treatment) addition of 0.5% by weight	Before storage	7.6	8.4	8.0	8.8	8.4	8.3	8.3
		After storage	7.4	7.9	7.0	7.1	7.8	7.8	7.5
Example 26	Carob (augmenting treatment) addition of 0.5% by weight	Before storage	7.8	8.5	8.3	8.4	8.7	9.1	8.5
		After storage	7.7	8.0	7.7	7.3	8.5	8.6	8.0

[Table 4]

As is apparent from Table 4, the score after storage of the cigarette of Example 25 in which the carob extract without augmenting treatment (Example 1) is added is found to be lower than that before storage (evaluation A → evaluation B).

On the other hand, it is found that the score before storage of the cigarette of Example 26 in which the carob extract subjected to augmenting treatment (Example 2) is added is high and the difference between the scores before and after storage is small (evaluation A → evaluation B). This means that the feature of "caramellic" is augmented from the increase in involatile pyrazine as compared with Example 25 by subjecting the carob extract to an augmenting treatment (before storage: score 8.3 → 9.1), and the score after storage is higher than that of Example 25 (the score on the average value: 7.5 → 8.0), which provides excellent storage resilience.

<Example 27: Sensory Evaluation of Honey>

By weight, 0.5% of the honey (no augmenting treatment) used in Example 11 was added to the same cut tobacco as that of Example 25. The cut tobacco to which the honey was added was wound in a cigarette shape having a winding length of 63 mm and a winding circumference of 24.9 mm.

<Example 28: Sensory Evaluation of Honey>

By weight, 0.5% of the honey subjected to augmenting treatment in Example 14 was added to the same cut tobacco as that of Example 25. The cut tobacco to which the honey

was added was wound in a cigarette shape in the same manner as in Example 25.

5 The cigarettes obtained in Examples 27 and 28 were stored in a sealed state in a constant-temperature unit at 70°C for 7 hours. The cigarettes before and after storage were smoked, and provided for the sensory test.

<Evaluation>

10 The sensory tests of fragrance and flavor (savor) for the cigarettes (before storage, after storage: 7 samples, respectively) in smoking were performed by eight trained panelists, and averages thereof were evaluated as follows.

- Score 8.0 or more: evaluation A (addition effect, suitably usable)

15 • Score 7.0 or more and less than 8.0: evaluation B (slight drawback, but usable)

- Score less than 7.0: evaluation C (unsuitable for use)

These results are shown in the following table 5.

	Extract		Fragrance	Sweet flavor	Bitter	Stimulus	Smoke volume feeling	Flower, Honey- like	Average value
Example 27	Carob (no augmenting treatment) addition of 0.5% by weight	Before storage	8.0	8.6	8.1	8.0	8.1	8.9	8.3
		After storage	7.3	7.7	6.5	6.5	7.3	7.7	7.2
Example 28	Carob (augmenting treatment) addition of 0.5% by weight	Before storage	8.0	9.3	8.2	8.2	8.6	8.8	8.5
		After storage	8.2	9.1	7.4	7.4	8.5	8.7	8.3

[Table 5]

As is apparent from Table 5, the score after storage of the cigarette of Example 27 in which the honey without augmenting treatment (Example 11) is added is found to be lower than that before storage (evaluation A → evaluation B).

On the other hand, it is found that the score before storage of the cigarette of Example 28 in which the honey subjected to augmenting treatment (example 14) is added is high and the difference between the scores before and after storage is small (evaluation A → evaluation A).

Particularly, "sweet flavor" of the cigarette of Example 28 is augmented as compared with that of Example 27 (score: 8.6 → 9.3).

Changes in "sweet flavor" and "flower, honey-like" after storage of the cigarette of Example 28 in which the honey subjected to augmenting treatment is added are less (score: 9.3 → 9.1, score: 8.8 → 8.7).

This means that the reinforcement of the sweet flavor by the thermal decomposition of augmented DDPM in the honey, and the augmenting of honey-like fragrance from augmented 5-MHF provide high evaluation after storage (the score on the average value: 8.5 → 8.3: evaluation A → evaluation A).

<Example 29: Sensory Evaluation of Mate Extract>

By weight, 0.5% of the mate extract (no augmenting treatment) prepared in Example 22 was added to the same cut tobacco as that of Example 25. The cut tobacco to which the mate extract was added was wound in a cigarette shape

having a winding length of 63 mm and a winding circumference of 24.9 mm.

<Example 30: Sensory Evaluation of Mate Extract>

5 By weight, 0.5% of the mate extract subjected to augmenting treatment in Example 24 was added to the same cut tobacco as that of Example 25. The cut tobacco to which the mate extract was added was wound in a cigarette shape in the same manner as in Example 25.

10 The cigarettes obtained in Examples 29 and 30 were stored in a sealed state in a constant-temperature unit at 70°C for 7 hours. The cigarettes before and after storage were smoked, and provided for the sensory test.

<Evaluation>

15 The sensory tests of fragrance and flavor (savor) for the cigarettes in smoking (before storage, after storage: 7 samples, respectively) were performed by eight trained panelists, and averages thereof were evaluated as follows.

• Score 8.0 or more: evaluation A (addition effect, suitably usable)

20 • Score 7.0 or more and less than 8.0: evaluation B (slight drawback, but usable)

• Score less than 7.0: evaluation C (unsuitable for use)

These results are shown in the following Table 6.

	Extract		Fragrance	Sweet flavor	Bitter	Stimulus	Smoke volume feeling	Tobacco flavor (savor)	Average value
Example 29	Mate (no augmenting treatment) addition of 0.5% by weight	Before storage	8.3	8.2	7.2	7.8	7.8	7.6	7.8
		After storage	7.7	8.0	7.0	7.5	7.5	7.4	7.5
Example 30	Mate (augmenting treatment) addition of 0.5% by weight	Before storage	8.0	8.2	8.0	8.3	8.3	8.0	8.1
		After storage	8.5	8.8	8.0	8.0	8.0	8.0	8.2

[Table 6]

As is apparent from Table 6, the scores before and after storage of the cigarette of Example 29 in which the mate extract (Example 22) without augmenting treatment is added are found to be reduced (evaluation B → evaluation B).

5 On the other hand, it is found that the score before storage of the cigarette of Example 30 in which the mate extract subjected to augmenting treatment (Example 24) is added is high, and the difference between the scores before and after storage is small (evaluation A → evaluation A).

10 Particularly, in the cigarette of Example 30 in which the mate extract subjected to augmenting treatment is added, "stimulus" and "bitter" are suppressed (score: 7.8 → 8.3, score: 7.2 → 8.3), and "tobacco flavor" is augmented (score: 7.6 → 8.0).

15 Changes in "stimulus" and "tobacco flavor (savor)" after storage of the cigarette of Example 30 in which the mate extract subjected to augmenting treatment is added are less (score: 8.0 → 8.0, score: 8.6 → 8.4).

20 This means that the suppression effect of "stimulus" and "bitter" by augmented 3-hydroxy- β -damascone and 4-vinyl guaiacol in the mate extract, and the strengthening of "sweet flavor" and "tobacco flavor" provide high evaluation after storage (score on the average value: 8.1 → 8.2: evaluation A → evaluation A).

25 Industrial Applicability

The present invention can provide a method for augmenting a component providing smoking flavor for a

tobacco product. The method can efficiently augment a component providing smoking flavor from at least one raw material for flavor selected from the group consisting of natural sugars, the original form of a plant, and a liquid
5 extract distilled or condensed from the original form of a plant, without causing an extreme change in the component.

The present invention can provide a tobacco raw material which contains the raw material for flavor containing the component providing smoking flavor augmented
10 by the method and has fragrance and flavor (savor) augmented without changing the original fragrance and flavor (savor) of the raw material for flavor in burning during smoking.

The present invention can provide a cigarette and a
15 cigar which contain the tobacco raw material containing the raw material for flavor containing the component providing smoking flavor augmented by the method, and have fragrance and flavor (savor) augmented without changing the original fragrance and flavor (savor) of the raw material for flavor
20 in burning during smoking.

Claims

1. A method for augmenting a component providing smoking flavor for a tobacco product,

5 the method comprising the steps of:

preparing at least one raw material for flavor selected from the group consisting of natural sugars, the original form of a plant, and a liquid extract distilled or condensed from the original form of a plant;

10 accommodating the raw material in an oven at a volume ratio of 50 to 80% by volume relative to a volume amount of the oven;

heating the raw material in the oven at least 30 minutes to 80 to 100°C at a temperature increase rate of
15 1.0 to 2.0°C/minute while stirring the raw material; and

cooling the contents in the oven after processing to a desired temperature which is determined by the selected elements from the group at a temperature decrease rate of 0.40 to 0.85°C/minute.

20

2. The method according to claim 1, wherein the natural sugars are polysaccharides such as honey and starch; the original form of a plant is mate or green tea; and the liquid extract is a seed-based extract such as a
25 carob extract, a coffee extract, a cocoa extract, a fenugreek extract, or a malt extract, or a leaf-based extract such as a tea extract, a camomile extract or a rosemary extract.

30 3. The method according to claim 1, wherein the raw material is held at the temperature of 80 to 100°C for 240 minutes or less in the heating step.

4. The method according to claim 1, wherein the oven is sealed, and an internal pressure of the oven is set to 0.105 to 0.11 MPA.

5 5. A tobacco raw material comprising the raw material for flavor containing the component providing smoking flavor augmented by the method according to any one of claims 1 to 4.

10 6. A cigarette comprising a tobacco raw material containing the raw material for flavor containing the component providing smoking flavor augmented by the method according to any one of claims 1 to 4.

15 7. A cigar comprising a tobacco raw material containing the raw material for flavor containing the component providing smoking flavor augmented by the method according to any one of claims 1 to 4.