AU9210211

(12) PATENT ABRIDGMENT (11) Document No. AU-B-10211/92
(19) AUSTRALIAN PATENT OFFICE (10) Acceptance No. 663301

(54) Title
HAIR NOURISHING AGENT AND PRODUCTION THEREOF

International Patent Classification(s)
(51)[5] **A61K 007/06** **A61K 035/78**

(21) Application No. : **10211/92** (22) Application Date : **14.01.92**

(30) Priority Data

(31) Number	(32) Date	(33) Country
3-316110	**29.11.91**	**JP JAPAN**

(43) Publication Date : **03.06.93**

(44) Publication Date of Accepted Application : **05.10.95**

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(56) Prior Art Documents
US 4180590
US 4028470
US 3395019

(57) Claim

1. A hair nourishing agent when used for nourishing hair, said agent comprising products of fermentation obtained by decomposing a substrate comprising vegetable protein and vegetable lipids using an enzyme or a mixture of enzymes and by filtering the obtained product.

2. A hair nourishing agent according to claim 1, wherein said enzyme is lipase and proteinase.

8. A method for producing a hair nourishing agent for nourishing hair comprising the steps of:

   (i) applying an enzyme or a mixture of enzymes to a substrate comprising vegetable protein and vegetable lipid, the enzyme or mixture of enzymes being capable of decomposing vegetable protein and vegetable lipid in the substrate wherein the decomposition reaction is carried out in the presence of a buffer solution at a pH range of 6 to 11, the reaction temperature is room temperature or 35°C to 45°C and the reaction time is 5 to 10 hours under agitation; and

   (ii) filtering the product obtained from step (i)

663301

AUSTRALIA

Patents Act 1990

COMPLETE SPECIFICATION

For a Standard Patent

ORIGINAL

TO BE COMPLETED BY APPLICANT

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Invention Title: "HAIR NOURISHING AGENT AND PRODUCTION THEREOF"

The following statement is a full description of this invention, including the best method of performing it known to me:-

Field of the Invention

The present invention relates to a hair nourishing agent and the production thereof. More particularly, the invention relates to a hair nourishing agent comprising fermented products obtained by applying, for example, a mixture of lipase and proteinase or rice yeast on a substrate containing vegetable protein such as rice bran and vegetable lipid, and also to the production thereof.

Background of the Invention

The true mechanism of falling-out and growth of hair is yet to be discovered. Chief causes of falling-out of hair, however, are generally believed to be interruption in blood circulation, low metabolism, excessive male hormone, skin inflammation and allergies.

A hair comprises the part protruding out of skin and the part under skin. The hair bulb at the root of a hair comprises tissue called papillar cells. Numerous capillaries surround a hair bulb and papillar cells take in nutrition from blood running in the capillaries, repeating cell divisions and growing the hair.

However, if blood is not sufficiently supplied into the cells, the cell divisional activity slows down, resulting in

blockage to growth of the hair. Accordingly, it is often claimed indispensable for the growth of hair to promote blood circulation in the skin and activate the functions of the cells.

Hair follicle which surrounds a hair possesses enzyme called 5α-reductase, which gets converted into 5α-dihydrotestosteron by combining with male hormone, which is then transported via blood vessels to papillar cells, slowing down the activity of adenylcyclase thereof and leading to slowing down of the cell divisions. As a result, the hair follicle gets gradually atrophied, and the hair becomes downy, leading to generationg of baldness.

As mentioned above as examples, there are a number of views on the mechanism of falling-out and growth of hair, though, none of them are established ones. Presently there are great many types of hair growers distributed on the market, claiming they contain substances which the distributors believe are effective according to their understanding of the mechanism, for instance, for promoting blood circulation in head skin and/or activating papillar cells. However, a hair agent which is truly effective on hair is yet to appear in the market.

Under such circumstances, the inventor of the present invention has continued a long and strenuous research and finally come up with the present invention of a hair nourishing agent which works excellently on hair, comprising fermented products obtained by applying, for example, a

mixture of lipase and proteinase or rice yeast on a substrate containing vegetable protein such as rice bran and vegetable lipid.

Summary of the Invention

In accordance with the present invention there is provided a hair nourishing agent comprising fermented products obtained by applying, an enzyme or mixture of enzymes (for example, a mixture of lipase and proteinase or rice yeast) on a substrate comprising vegetable protein (such as rice bran) and vegetable lipid, the enzyme or mixture of enzymes being capable of decomposing vegetable protein and vegetable lipid in the substrate and by filtering the obtained fermented products.

In another form the invention resides in a method for producing a hair nourishing agent comprising a step of applying an enzyme or mixture of enzymes on a substrate comprising vegetable protein and vegetable lipid the enzyme or mixture of enzymes being capable of decomposing vegetable protein and vegetable lipid in said substrate and by filtering the obtained fermented products.

Said substrate may comprise anything that contains vegetable protein and vegetable lipid. Enzyme for the fermentation must possess the ability to decompose the vegetable protein and the vegetable lipid in the substrate. Such enzyme may be lipase and proteinase. Other types of enzyme such as amylase may be additionally used.

The fermented products go through a filtering process and hair nourishing agents of the present invention are thus obtained. They are harmless to human body and show excellent effects in preventing hair from falling out as well as in growing hair.

Detailed Description of the Invention

The present invention will be more fully described in the following:

A substrate for producing a hair nourishing agent of the present invention may be anything that contains vegetable protein and vegetable lipid. It may be, for example, grain products such as rice bran, sake lees, wheat embryo buds, fusuma bran, whole buckwheat or whole barnyard millet, bean products such as soybeans, bean-curd refuse, soybean milk, adzuki beans, soybean flour or coffee grounds, or others such as yams, taros, tea grounds, honey, sesame, peanuts, lotus seeds, ashitaba, beefsteak plants, wakame seaweed or sea tangles. Rice bran, sake lees, fusuma bran, coffee grounds, wheat embryo buds, sesame, bean-curd refuse, soybeans and adzuki beans are especially preferred as they contain well-ballanced vegetable protein and vegetable lipid.

Enzyme to be used for fermentation of the present invention need be capable of decomposing both vegetable protein and vegetable lipid in said substrate. They may be lipase and proteinase and others such as amylase may also be additionally used. Besides lipase and proteinase, rice yeast which possesses functions of producing a variety of enzyme in a living body may also be utilized.

Lipase to be utilized for the present invention may be spermato lipase used in the acidic range which is contained in a variety of mold, yeast, microorganisms, humors, or enzyme taken from internal organs. More particularly, pancreas lipase, liver lipase, tubercle bacteria lipase, FIB lipase and hima lipase may be used.

Proteinase to be utilized for the present invention is preferred to be acidic at the most suitable pH. In this regard, pepsin, trypsin or chymotrypsin, not possessing any particular active base except amino acid residue of the enzyme itself and not requiring any particular reagent for enzymatic activities, may be utilized. Or most of enzyme or cathepsin found in vegetable enzyme and animal cells such as papain or ficin, which can be activated by a reducing agent such as hydrocyanate, ascorbic acid, cysteine or glutathione, may also be used. More particularly, chymotrypsin, trypsin, pepsin, carboxy peptidase, cathepsin A, cathepsin B, cathepsin C', cathepsin III, cathepsin IV, kidney acylase I, kidney acylase II, leucine amino peptidase, aminotripeptidase, glycilglycine dipectitase, prolitase, prolinase, plasmin, thrompin, papain, ficin, streptococcus proteinase, C1, historyticum proteinase or peptidase can be utilized.

Fermented products can be obtained by applying enzyme on said substrate. Analyses were made upon the fermented products by HPLC and the following results were obtained. Said analyses were made using a detector (LC-9A, Shimadzu Seisakusho, Co., Ltd.) and columns (3 m in length). As an elution layer, acetonitrile solvent was used and the column temperature was kept about 30 ℃ and the flow speed was about 10 ml/min.

The fermented products were found to contain such fatty acids as myristic acid, palmitic acid, stearic acid, arachic acid, behenic acid, lignoceric acid, dodecenic acid, tetradecenic acid, tetradecadienic acid, pentadecenic acid,

hexadecenic acid, oleic acid, linoleic acid, linolenic acid, eicosaenic acid, eicosadienic acid, arachidonic acid, eicosatrienic acid, dococenic acid, and docosahexanic acid. The fermented products were found to also contain such amino acids as leucine, isoleucine, lysine, methionine, cystein, phenylalanine, tyrosine, threonine, tryptophan, valine, histidine, arginine, aspartic acid, alanine, glutamin acid, glycine, proline and celin.

As is clear from the results of the analyses, the fermented products obtained according to the present invention contain a variety of amino acids and fatty acids. Amino acids are believed to function to give nutrition to papillar cells and fatty acids are believed to function to activate and expand capillary blood vessels, to supply hair with moisture to give a shining appearance as well as to inactivate 5α-reductase contained in hair follicle to prevent softening of hair. The components singly or in combination are believed to promote growth of hair as well. It should be noted that the fermented products also contain amino acids which include sulphur and unsatulated fatty acids, both of which are believed to possess excellent effects on the growth of hair.

The products obtained by fermentation by applying rice yeast on the substrate according to the present invention were found to contain in small quantity vitamin A, vitamin B_1, vitamin B_2, vitamin B_6, vitamin B_{12}, vitamin C, vitamin E, copper, iron, calucium, phosphorus, purine, deoxyribonucleic acid, ribonuleic acid, adenine, guanine, uracil, cytosine and

xanthine in addition to the components confirmed in said fermented products obtained using a mixture of lipase and proteinase, since a variety of enzyme besides lipase and proteinase, such as amylase, glutaminase, cellulase and pectinase are produced in the rice yeast, decomposing not only the vegetable protein and vegetable lipid but also other components in the substrate. It is believed that such other components also help promote hair growth by synergism with said amino acids and fatty acids.

For preservation of the hair nourishing agents of the present invention, they may be refrigerated or boiled, however, there is no functional change or degradation of the effects of the hair nourishing agents.

In the following a description of a method for producing the hair nourishing agent of the present invention is given. The method comparises steps of applying enzyme on a substrate containing vegetable protein and vegetable lipid and of filtering the fermented products thus obtained.

The fermentation is performed under aquerous conditions. Lipase and proteinase or rice yeast which produces other enzyme such as amylase is used as enzyme. The lipase and the proteinase may be separately applied or applied together in a form of a mixture. Said mixture can contain other enzyme such as amylase in order to promote decompositional function and to decompose other components in the substrate. It is preferred to apply 0.1 w % of each enzyme in said mixture against the substrate of 100. In case

of rice yeast, as the decompositional function of said yeast is weak compared with that of lipase or proteinase, it is better to add 1 w % of rice yeast against 100 of the substrate.

The fermentation temperature is preferred to be room temperature or 35°C to 45°C, and as a buffer solution, pH 6 to 11 of hydrochloric acid-collidine, primary potassium phosphate-secondary potassium phosphate, hydrochloric acid-sodium Veronal, hydrochloric acid-trisaminomethane, hydrochloric acid-borax, boric acid-sodium carborate, hydrochloric acid-aminomethyl propane diol, ammonium choloride-ammonia, glycine-sodium hydroxide, boric acid-sodium hydroxide, hydrochloric acid-sodium dimethylglycinate, sodium bicarbonate-sodium carbonate, borax-sodium hydroxide, borax-sodium carbonate, hydrochloric acid-sodium carbonate, secondary sodium phosphate-sodium hydroxide or the like can be used. Any combination or combinations of said substances may also be used in the form of a mixture.

The reaction time for the fermentation is preferably 5 to 10 hours under agitation. The completion of the reaction can be known, as for lipase, by giving a predetermined coloring matter as an indicator and checking the amount of the extricated fatty acids which are produced by hydrolysis of ester, or by electrical titration using alkali. When the above is not easily performed, use colorimetry for the alcohol extricated in hydrolysis. As for proteinase, use the ninhydrine colorimetry, which is colorimetry of amino acids

by the bluish matter produced as ninhydrine is heated. When it is not easily performed, use of the formol titration of Sørensen is possible. This method is a utilization of the phenomenon of divergence of the titration curve for α-amino radical or imino radical under the existence of formaldehyde. For sterilization, autoclave sterilization is preferred.

A hair nourishing agent of the present invention is obtained by adding water or alcohol to the fermented products after having filtered said fermented products. The hair nourishing agent thus obtained can be used as it is or can be mixed in hair lotion, hair cream, hair liquid, hair tonic, pomade, shampoo or rinse.

It is possible to mix in the hair nourishing agent of the present invention some components which are often used in the conventional hair growers such as blood facilitator, metabolism promoter, anti-male hormone, anti-inflammatory, anti-allergy, moistener, anti-bacteria, and/or refrigerant. They are, for example, tocopherol acetate, capronium chloride, carbonic acid gas, hinokitiol, pantonyl ethylether benzoinate, glyceride pentadecanate, vitamin H, ethynil estradiol, glythylricinic acid, diphenylhydramin chloride, hyaluronic acid, Minisasanishiki extract, mononitroguaiacol, Togarashi tincture, Shoukyo tincture, hydrocortisone, diphenic hydramin chloride, D-pantothenyl alcohol, salicylic acid, lactic acid, sodium lactate, menthol and the like.

Examples

Example 1:

Rice bran was used as a substrate. Warm water, 1,000 ml, was added to said rice bran, 500 g, and both were mixed well. The mixture was then put in an adequate container such as a glass container or a plastic container, and rice yeast, 5 g, was added to said mixture. Soduim bicarbonate, 3 g, was also added as a buffer to control pH. The container was heated by a heating means to about 45℃ and kept constant at the temperature. The mixture was left for a whole day with occasional agitations. The mixture turned pasty and said pasty liquid in the container was filtered with a cloth to obtain a semitransparent hair nourishing liquid of about 1,000 ml.

Example 2:

Soybean grounds was used as a substrate. Water, 600 ml, was added to said soybean grounds, 200 g. Animal internal organs, 100 g, was prepared and water, 200 ml, was added to said animal internal organs, which was then ground with a glass homogenizer to prepare homogenate. Said homogenate was centrifuged at 1,500 rpm. The supernatant fluid, 100 ml, was then taken and added to the substrate. Sodium carbonate-boric acid was also added at this time as a buffer to adjust pH to 10.0. The mixture was left at about 40℃. The enzume activities were observed by using a kletto photoelectric colorimeter (No. 540 filter) and the end of the

activities was observed after about 8 hours.

Sodium carbonate-boric acid of 0.1 M (pH 10.0), 40 ml, was added as a buffer to the fermented liquid obtained as such. Then chymotripsin was added to be 0.1 M. The whole mixture was left at about 40℃. The confirmation of the completion of the fermentation was made by measuring by the Conway's method the amount of ammonia in the sample liquids of 0.2 ml each taken from said whole mixture. After about 10 hours, generation of ammonia stopped and the fermentation was over. The fermented liquid was then filtered and washed with water. A hair nourishing liquid was thus obtained.

Example 3:

Adzuki grounds was used as a substrate. Water, 500 ml, was added to said adzuki grounds, 200 g, and the mixture was suspended. Separately, lipase obtained from FIB mycelium was floated in distilled water of 100 ml, which was then agitated for about 2 minutes with a Knapp-March Blender and left at room temperature for about 20 minutes. The top liquid obtained after centrifuging the blend at 2,000 rpm for 30 minutes was added to said mixture of adzuki grounds and water. A Britton-Robinson buffer (phosphoric acid, acetic acid, boric acid, caustic soda) was added to adjust pH to 9.0. It was kept shaken for about 8 hours at about 35℃. The fermentation process was observed by titration using 0.05 M alcoholic hydrochloric acid.

Separately, papain on the market was desolved in water

and hydrogen sulfide was sent into the mixture for several hours. Then alcohol was added to said mixture to settle the papain. Water was added to the refined papain (papain 1 g : water 100 ml) and then a Britton-Robinson buffer was also added to adjust pH to 9.0, which was added to said fermentation liquid including said substrate. The whole fermentation liquid was left at about 40℃. The end of the fermentation was confirmed by titration using alcohol of sample liquids of 0.2 ml each taken from said whole fermentation liquid. The fermentation was over after about 12 hours. The fermented liquid was filtered and a hair nourishing liquid was thus obtained.

Example 4:

Bean-curd refuse was used as a substrate. Water, 500 ml, was added to said bean-curd refuse, 100 g, and the mixture was kept at about 50℃. Separately, kidney lipase on the market was dissolved (1 %) in distilled water. Said distilled water containing said kidney lipase (5 ml) was added to said mixture. Phosphoric acid (0.6 M, pH 7.0), 5 ml, was also added as a buffer and the whole mixture was kept for about 10 hours at about 40℃ with occasional agitations. The end of the fermentation was confirmed by observing the stoppage of generation of carbonic acid gas using a Warburg's manometer.

Separately, pepsine on the market (Cudahy, 1/10,000 USP soluble pepsin), 10 g, was dissolved in a 20 % Ethanol solution, 10 ml, which was added to said fermentation liquid.

Hydrochloric acid ammonium was also added to adjust pH to 7.5. This liquid was left for about 20 hours at about 35℃. Then, it was filtered by means of filter cell (5 g). The pH was 7.0 at this time. The filtered liquid was left at about 37℃. The end of fermentation was confirmed by putting sample liquids of 0.5 ml each taken from the filtered liquid from outside of a Conway's apparatus and mixing each sample with the potassium carbonate, 1 ml, which had been placed in said apparatus. The end of the fermentation was known by means of observing the changes in amount of volatilizing ammonia by titration. The end was confirmed after about 10 hours. The liquid thus obtained was filtered in an ordinary manner and a hair nourishin liquid was obtained.

Evaluation of the Effect

The hair nourishing liquids obtained according to Examples 1 to 4 were diluted with ethanol and the blends were applied on men and mice once in the morning and once in the evening everyday. After 30 days of application, both cases showed an outstanding effect of hair growth. Especially in the case of the mice, the hair-growing effect was enormous.

The hair nourishing agent of Claim 1 contains fermented products containing a variety of amino acids and fatty acids. The acids singly or combindedly activate capillary blood vessels and inactivate 5α-reductase which is contained in hair follicle. Compared with conventional types of hair growing agents, the hair nourishing agent of Claim 1 shows more excellent hair-falling-out preventive effect as well as

hair growing effect. The hair nourishing agent of the present invention is not at all harmful to human body since it is a product of fermentation and the substrate comprises vegetable protein and vegetable lipid and harmless enzyme is utilized.

As for the hair nourishing agent of Claim 2, lipase and proteinase used as enzyme decompose the vegetable protein and the vegetable lipid used in the substrate efficiently, providing a high production rate of fermented products per unit weight.

The hair nourishing agent of Claim 3 contains, besides amino acids and fatty acids, vitamin E, copper, purine, nucleid acid, etc. in small quantity and they together with the amino acids and the fatty acids further promote hair growth.

The process of Claim 4 provides a hair nourishing agent of the present invention which activates capillary vessels and inactivates 5α-reductase which is contained in hair follicle. The agent, therefore, works to prevent hair's falling-out and to grow hair more outstandingly than conventional hair growers.

The process of Claim 5 produces a high rate of fermented products per unit weight since lipase and proteinase are used as enzyme, which ferment the vegetable protein and the vegetable lipid in the substrate efficiently.

The process of Claim 6 provides a hair nourishing agent which contains, besides amino acids and fatty acids, vitamin E, copper, purine, nucleid acid, etc. in small quantity and they together with the amino acids and the fatty acids further promote hair growth.

The processes of Claims 7 to 9 provide faster decomposition by means of enzyme, leading to more efficient decomposition, and therefore provides a better production rate of a hair nourishing agent per unit weight.

THE CLAIMS defining the invention are as follows:-

1. A hair nourishing agent when used for nourishing hair, said agent comprising products of fermentation obtained by decomposing a substrate comprising vegetable protein and vegetable lipids using an enzyme or a mixture of enzymes and by filtering the obtained product.

2. A hair nourishing agent according to claim 1, wherein said enzyme is lipase and proteinase.

3. A hair nourishing agent according to claim 2 in which the lipase is spermato lipase.

4. A hair nourishing agent according to claim 2 or claim 3 in which the proteinase is selected from chymotrypsin, trypsin, pepsin, carboxy peptidase, cathepsin A, cathepsin B, cathepsin C', cathepsin III, cathepsin IV, kidney acylase I, kidney acylase II, leucine amino peptidase, aminotripeptidase, glycylglycine, dipeptidase, prolinase, plasmin, thrombin, papain, ficin, streptococcus proteinase C1, hitolyticum proteinase and hitolyticum peptidase.

5. A hair nourishing agent according to claim 1 in which the enzyme is an enzyme produced by rice yeast.

6. A hair nourishing agent according to any one of claims 1 to 5 in which the substrate is selected from rice bran, sake lees, fusuma bran, coffee grounds, wheat embryo buds, sesame seeds, bean curd refuse, soybeans and adzuki beans.

7. A hair nourishing agent according to any one of claims 1 to 6 further comprising a buffer of one or any combination or combinations of the chemicals of pH 6 to 11 selected from the following:

hydrochloric acid-collidine, primary potassium phosphate-secondary potassium phosphate, hydrochloric acid-sodium Veronal, hydrochloric acid-trisaminomethane, hydrochloric acid-borax, boric acid-sodium carbonate, hydrochloric acid-aminomethyl

propane diol, ammonium chloride-ammonia, glycine-sodium hydroxide, boric acid-sodium hydroxide, hydrochloric acid-sodium dimethylglycinate, sodium bicarbonate-sodium carbonate, borax-sodium hydroxide, borax-sodium carbonate, hydrochloric acid-sodium carbonate, secondary potassium phosphate-sodium hydroxide and the like.

8. A method for producing a hair nourishing agent for nourishing hair comprising the steps of:

(i) applying an enzyme or a mixture of enzymes to a substrate comprising vegetable protein and vegetable lipid, the enzyme or mixture of enzymes being capable of decomposing vegetable protein and vegetable lipid in the substrate wherein the decomposition reaction is carried out in the presence of a buffer solution at a pH range of 6 to 11, the reaction temperature is room temperature or 35°C to 45°C and the reaction time is 5 to 10 hours under agitation; and

(ii) filtering the product obtained from step (i)

9. A method for producing hair nourishing agent according to claim 8 wherein said enzyme is a mixture of lipase and proteinase.

10. A method for producing a hair nourishing agent according to claim 8 wherein said enzyme is enzyme produced by rice yeast.

11 A method for producing a hair nourishing agent according to claim 9 in which the lipase is spermato lipase.

12. A method for producing a hair nourishing agent according to claim 9 or claim 10 in which the proteinase is selected from chymotrypsin, trypsin, pepsin, carboxy peptidase, cathepsin A, cathepsin B, cathepsin C', cathepsin III, cathepsin IV, kidney acylase I, kidney acylase II, leucine amino peptidase, aminotripeptidase, glycylglycine, dipeptidase, prolinase, plasmin, thrombin, papain, ficin, streptococcus proteinase C1, hitolyticum proteinase and hitolyticum peptidase.

13. A method of producing a hair nourishing agent according to any one of claims 8 to 12 in which the substrate is selected from rice bran, sake lees, fusuma bran, coffee grounds, wheat embryo buds, sesame seeds, bean curd refuse, soybeans and adzuki beans.

14. A method for producing a hair nourishing agent according to any one of claims 8 to 13 in which the buffer is selected from any one or more of the following:

hydrochloric acid-collidine, primary potassium phosphate-secondary potassium phosphate, hydrochloric acid-sodium Veronal, hydrochloric acid-trisaminomethane, hydrochloric acid-borax, boric acid-sodium carbonate, hydrochloric acid-aminomethyl propane diol, ammonium chloride-ammonia, glycine-sodium hydroxide, boric acid-sodium hydroxide, hydrochloric acid-sodium dimethylglycinate, sodium bicarbonate-sodium carbonate, borax-sodium hydroxide, borax-sodium carbonate, hydrochloric acid-sodium carbonate and secondary potassium phosphate-sodium hydroxide.

15. A method for producing a hair nourishing agent according to anyone of claims 8 to 14 and substantially as herein described.

16. A hair cosmetic in the form of a hair lotion, a hair cream, a hair liquid, a hair tonic, a pomade, a shampoo or a rinse that includes a hair nourishing agent according to claim 1.

DATED this Fourth day of AUGUST 1995

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HAIR NOURISHING AGENT AND PRODUCTION THEREOF

Abstract of the Disclosure

The hair nourishing agent according to the present invention is a product of fermentation by enzyme applied on a substrate comprising vegetable protein and vegetable lipid. The hair nourishing agent obtained by filtering the fermented products is safe to use as only harmless substances compose the agent and shows excellent effects for preventing hair from falling out as well as for growing hair.