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A PROCESS FOR THE PRODUCTION OF A SEASONING SAUCE FROM BREAD

(57) Abstract:
The invention relates to a process for the production of a seasoning sauce similar to the known soy sauce, whereby a fungus-covered, enzyme-containing substrate is first mashed with common salt-containing water, the mash is subjected to a fermentation for a longer period of time, and finally treated by pressing, pasteurizing and filtering, characterized in that
(a) cut bread with a high proportion of wheat gluten is used as the substrate
(b) mashing is carried out with salt water, so that the salt content in the mash amounts to 4 to 12% by weight, preferably to 7 to 8% by weight; and
(c) the fermentation is carried out in several stages at temperatures decreasing from 40 to 45 degree centigrade in the first stage to room temperature in the final stage.

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Process for the Production of a Seasoning Sauce from Bread

The invention relates to a process for the production of a seasoning sauce similar to the known soy sauce.

It is known to produce soy sauce by a fermentation process, whereby soya beans as whole beans or as degreased coarse soya meal, and, if need be, wheat mostly as roasted coarse meal, and salt are used in different proportions, and based on a type of malt, an enzyme-containing, fungus-covered substrate called koji is prepared first, which is subsequently mashed with salt water and subjected to a multi-stage fermentation, in which a combined hydrolytic process takes place with lactic acid and alcoholic fermentation, as well as to a maturation phase. The hyphal fungi of the genus Aspergillus Oryzae or Aspergillus sovae are used as fermentation organisms for the preparation of the koji, and the salt-tolerating lactococci Pediococcus halophilos and the yeast Zygosaccharomyces rouxii are used in the fermentation phase. As opposed to earlier days, when the natural attendant

flora effected the fermentation, modern processes use defined starter cultures. With naturally fermented sauces, no mineral acid is used for accelerating the degradation of the raw vegetable substances; this is accomplished exclusively by means of enzymatic hydrolysis by the fungal enzymes formed during the koji phase. More recent developments use immobilized enzymes or immobilized microorganisms for the fermentation. However, with a reduced fermentation time as well as reduced salt contents during mashing, the quality of the flavor of the sauces so obtained is poorer as compared to the process used heretofore. Following a longer maturation phase (3 to 6 months), the mash is refined by pressing, heating, sludge sedimentation and layer filtration to the stable, ready-to-eat sauce. The traditionally produced soy sauce has a dark color and a salty, roasty-malty flavor that is slightly foreign to western taste.

The problem of the invention was to produce a seasoning sauce similar to the soy sauce which, however, has a lighter color as compared to the known soy sauce, has a high glutamate content, is less roasty and more neutral flavor, and is thus more adapted to western taste, and which has a low salt content. Another problem was to shorten the manufacturing process and to make do with a process time of less than 3 months.

JP-A-52-76488 specifies a process for the production of a seasoning sauce based on protein-containing raw materials such as, for example, soy beans, soya protein, wheat, barley, wheat gluten, corn gluten, fish protein, milk protein etc., and carbohydrate-containing raw materials such as, for example, sorghum, rice bran, wheat bran, potatoes, molasses, starch residues etc., from which a koji is prepared with the use of suitable koji organisms such as, in particular *Aspergillus soyae* and *Aspergillus oryzae*, which koji is fermented in a common salt solution at temperatures between 30° and 55°C.

US-PS 4,115,591 specifies a process for the preparation of a koji, whereby a koji fungus cultivated for 30 to 100 hours in a modified koji substrate at a temperature of 20° to 40°C in the presence of 0.05 to 8% of a salt of an aliphatic carbonic acid with up to 4 carbon atoms. The koji substrate is selected from the group consisting of soya beans, degreased soya beans, gluten, rice, wheat, wheat bran, barley, oat, corn, fish meal and others. The koji so obtained is used for the production of fermented food products such as, for example, soy sauce, miso and sake, for example by fermentation in a 22% salt solution at 30°C for 150 days.

EP-A-417 481 specifies a process for the production of a soy sauce by fermentation based on a koji that was prepared by fermenting a mixture of coarse soya meal and wheat by means of a koji culture, whereupon the koji is hydrolyzed in aqueous suspension for 3 to 8 hours at 45° to 60°C with the enzymes obtained in the course of fermentation with the koji culture, whereafter the mixture, after adding sodium chloride for obtaining a salt content of 15 to 19% by weight, is subjected to 4 to 8 weeks of fermentation.

US-PS 3,912,822 specifies a process for the production of a protein hydrolysate with a high content of glutamic acid, which is obtained by adding a glutaminase together with a proteolytic enzyme to a protein-containing starting material such as, for example, soy beans or wheat gluten.

The growth and respiration coefficient of the fungus *Aspergillus oryzae* are described in Agric. Biol. Chem. 49, 745-750 (1985), whereby the fungus is cultivated on a solid substrate. Bread is used as the solid substrate. The koji so obtained is not fermented further.

Now, surprisingly it has been found that the problems according to the invention can be solved by means of controlling the process in a certain way with the use of raw materials

which are traditionally not used for the soy sauce fermentation, namely with the use of an enzyme-containing, fungus-covered substrate (koji) consisting of cut bread with a high proportion of wheat gluten. According to the invention, such a koji is mashed with salt water with a relatively low salt content, and the fermentation is then carried out in several stages.

The process according to the invention for the production of a seasoning sauce, whereby an enzyme-containing, fungus-covered substrate is mashed with common salt-containing water, the mash is subjected to a fermentation for a longer period of time, and finally treated by pressing, pasteurizing and filtering, is thus characterized in that

(A) cut bread with a high proportion of wheat gluten is used as the substrate;

(B) mashing is carried out with salt water, so that the salt content in the mash amounts to 4 to 12% by weight, preferably to 7 to 8% by weight; and

(C) the fermentation is carried out in several stages for 8 to 12 weeks at temperatures decreasing from 40 to 45°C in the first stage to room temperature in the final stage.

The enzyme-containing, fungus-covered substrate, which is referred to as koji in the trade language and used as the starting material, is produced in the traditional way however, with the use of cut bread with a high proportion of wheat gluten as the protein-containing raw material. In this connection, it is possible to proceed, for example as specified in EP-A1-417 481. It is useful in this connection to use a starter culture, preferably Aspergillus oryzae. A dense mycelium forms on the substrate, and said fungus-covered, enzyme-containing substrate - briefly referred to as koji - is then mashed with common salt-containing water and subjected to a fermentation, whereby a yeast, preferably Zygosaccharomyces rouxii, can be additionally added in the mash fermentation stage.

The koji enzymes are activated by the higher starting temperature in the mash fermentation phase, so that no further addition of enzyme is required for accelerating the process.

A bread produced from 20 to 80% by weight, preferably 30 to 60% by weight wheat gluten (protein content 80%) and 80 to 20% by weight wheat flour and/or other additives such as, for example, oat flakes, leguminous meal, milk protein and/or yeast extract with the use of water and baking raising agents, is preferably used as the starting material, said

bread being subjected to the preparation of the koji and to the fermentation in the form of slices or cubes. The bread is produced by known processes by baking or extrusion. For making the bread durable and for storing it, it can be frozen in the piece or air-dried in the customary way following cutting. Following thawing or rehydrating, it has to be used like fresh bread. The bread texture (moisture, porosity) represents a good substrate for solid fermentation and the starter fungus *Aspergillus oryzae* forms on said gluten-rich substrate a dense mycelium covering the surface of the crumbs. Particularly the protein-degrading enzymes including the glutamases are formed during the koji phase.

According to the invention, mashing is carried out with salt water, whereby a weight ratio of koji to salt water of about 1:1 to 1:1.5 is generally maintained. The salt content of the mash generally comes to 4 to 12, preferably 7 to 8% by weight.

According to a preferred way of executing the process, the process according to the invention is carried out by carrying out the fermentation in a first stage C1 for 4 to 14 days at a temperature of 40 to 45°C, in a second stage C2 for 2 to 4 weeks at a temperature of 28 to 32°C, and in a

third stage C3 for 2 to 6 weeks at a room temperature of 18 to 25°C.

According to a particularly preferred modification of said process, the fermentation stage C1 is started under gradual heating for a time of 3 to 5 days to the fermentation temperature of 40 to 45°C, and fermentation is subsequently carried out at said temperature for 4 to 14 days. The glutaminase activity, which is unstable under heat, is optimally exploited in this way.

While according to the process known from US-PS 3,912,822, a high glutamate content can be obtained only by adding enzymes, an even higher glutamate content is obtained according to the invention without adding enzymes.

The purposeful use of bread for the koji fermentation causes a surprisingly high hydrolytic enzyme activity, in particular a high glutaminase activity, whereby in the further course of the fermentation, the released glutamine is reacted to a high degree to glutamate. According to the invention, this is possible without adding additional enzymes and without using a particularly selected glutaminase-active microorganism.

The rapid protein degradation is reflected by a high amino-nitrogen value (AN) in relation to the total nitrogen (TN), and an AN/TN-ratio of 0.55-0.6 is normally achieved within about 6 days. Preferably sodium glutamate (MSG) is released from the protein, which, as opposed to pyroglutamic acid, has an enhancer effect, and an MSG/TN ratio of 1.3-1.7 is obtained by the process according to the invention. In soy sauce, this value is normally not higher than 1.0, and a value of 0.86 glutamate conforming to 1.08 MSG/TN is specified for the process of US-PS 3,912,822 even though pure wheat gluten is used in the latter, whereas with the substrate of the present invention, only a part consists of wheat gluten.

The matured mash is treated in the usual way by press filtration, heating and, if need be, clarification by diaphragm filtration. For drying, the clear seasoning liquid can be pre-concentrated, then mixed with salt and other carrier substances, and subsequently vacuum dried or spray dried.

Example 1

150 g wheat gluten (protein content 80%) is mixed with the same amount of wheat flour (type 550) and 15 g baking raising agent, and kneaded to a firm dough with an addition of about

225 ml water. Said dough is shaped into a bread and baked light at 220°C.

The bread is cut into cubes and the latter are inoculated with 1% of a spore suspension of *Aspergillus oryzae* (culture obtained from the German Strain Collection for Microorganisms).

The cubes are subsequently fermented on pans for about 70 hours at 30°C, whereby it is necessary to assure a high air humidity and intensive ventilation of the substrate until a dense white mycelium has grown.

The substrate is mashed in a fermentation vessel with 1.5 times the amount of salt water, so that the mash has 7% salt. With occasional mixing, the preparation is first maintained for 3 days at about 30°C, and then for another 12 days at 42°C. The mash liquefies quickly during said period and a sodium glutamate/nitrogen ratio of 1.4 is measured at a nitrogen content of 1.9%.

Subsequently, the mash is inoculated with the yeast *Zygosaccharomyces rouxii* (adapted to salt, obtained from the German Strain Collection for Microorganisms), and the mash is

permitted to ferment for 14 days at 30°C. The alcohol content rises during this phase to 2%; the pH decreases from initially 5.8 to about 5.1.

For maturation, storage for 4 weeks at room temperature is favorable. For treating the mash, the latter is pressed under pressure, pasteurized and diaphragm-filtrated. The clear seasoning fluid has a full and well-balanced flavor.

Example 2

150 g wheat gluten is kneaded with the same amount of pea meal, 15 g baking raising agent and 15 g curds, and with an addition of 220 ml water to form a firm dough. The latter is shaped to a bread and baked light at 220°C. The procedure is continued as specified in example 1.

Claims

1. Process for the production of a seasoning sauce, whereby a fungus-covered, enzyme-containing substrate is first mashed with common salt-containing water, the mash is subjected for a longer period of time to a fermentation, and finally treated by pressing, pasteurizing and filtering, characterized in that

(A) cut bread with a high proportion of wheat gluten is used as the substrate;

(B) mashing is carried out with salt water, so that the salt content in the mash amounts to 4 to 12% by weight, preferably 7 to 8% by weight; and

(C) the fermentation is carried out in several stages at temperatures decreasing from 40 to 45°C in the first stage to room temperature in the final stages, for 8 to 12 weeks.

2. Process according to claim 1, characterized in that a bread produced from 20 to 80% by weight wheat gluten and 80 to 20% by weight wheat flour and/or other additives such as oat flakes, leguminous meal, milk protein and/or yeast extract with the use of water and baking raising agents is used as substrate A, said bread being subjected to the koji preparation and fermentation in the form of slices or cubes.

3. Process according to any one of the preceding claims, characterized in that during the process, one or several micro-organisms from the group *Aspergillus oryzae* and *Zygosaccharomyces rouxii* are added.

4. Process according to claim 3, characterized in that prior to mashing, a starter fungus, preferably *Aspergillus oryzae* is added to the substrate, and growth is permitted until a dense mycelium has formed, and that a yeast, preferably *Zygosaccharomyces rouxii* is added in the mash fermentation stage.

5. Process according to any one of the preceding claims, characterized in that the fermentation is carried out in a first stage C1 for 4 to 14 days at a temperature of 40 to 45°C, preferably for 8 to 12 days, in a second stage C2 for 2 to 4 weeks at a temperature of 28 to 32°C, and in a third stage C3 for 2 to 6 weeks at a room temperature of 18 to 25°C.

6. Modification of the process according to claim 5, characterized in that

(i) the fermentation stage C1 is carried out for 3 to 5 days with gradual heating to the fermentation temperature of 40 to 45°C, and subsequently for 4 to 14 days at said temperature;

(ii) the fermentation stage C2 is carried out for 2 to 4 weeks; and

(iii) the fermentation stage C3 is carried out for 2 to

5 weeks.

Abstract

The invention relates to a process for the production of a seasoning sauce similar to the known soy sauce, whereby a fungus-covered, enzyme-containing substrate is first mashed with common salt-containing water, the mash is subjected to a fermentation for a longer period of time, and finally treated by pressing, pasteurizing and filtering, characterized in that

(A) cut bread with a high proportion of wheat gluten is used as the substrate;

(B) mashing is carried out with salt water, so that the salt content in the mash amounts to 4 to 12% by weight, preferably to 7 to 8% by weight; and

(C) the fermentation is carried out in several stages at temperatures decreasing from 40 to 45°C in the first stage to room temperature in the final stage.