

Re: Singapore Patent Application No. 9500775-3
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"Buckwheat Starch Syrup, method for preparing the same and
foods containing the same"

The claims have been revised to more clearly distinguish the invention over the cited prior art. In this regard all of the claims are now limited to Buckwheat Starch Syrup being prepared by liquefying and saccharifying buckwheat uchiko starch.

All of the cited documents describe the enzymatic liquefying and saccharifying of starch derived from various kinds of materials. As the raw material for starch, potatoes such as white potato, sweet potato and grains such as wheat, rice, corn are exemplified.

However, buckwheat is not mentioned (AN81-94014, Handbuch de Lebensmittelchemie), or only exemplified (US 4,710,386A, US4,656,040A, AN83-786691, AN87-002424. Any documents do not specifically disclose the obtainment of a viscous starch syrup from buckwheat by liquefying and saccharifying buckwheat and filtering and vacuum-concentrating the resultant saccharified starch.

For example, US4,710,386A and US4,656,040A relate to preparation of ready-to-eat cereal by combining saccharified starch with other processed fractions from grains. AN 83-786691 and AN83-002424 relate to preparation of an alcohol drink by fermenting saccharified starch. These

products are different from the starch syrup of the present invention prepared by filtrating and vacuum-concentrating saccharified starch. For these reasons it is submitted that the invention as claimed is novel.

In relation to inventive step, US4,710,386A and US4,656,040A are directed to all grains, and buckwheat is listed as one example. However, it is not predictable whether one can successfully obtain a syrup from any starch material by conventional enzymatic treatment unless one has actually practised the preparation. The reasons are explained below:

First, the difference in protein content among starch materials is given as one reason. In general it is difficult to liquefy and saccharify a starch material with high protein content. In addition, the saccharified solution is difficult to filter because it becomes highly viscous due to swelling of the protein. Thus, when a starch material with high protein content is used, it is predictable that the above problem will occur and prevent one from preparing starch.

Second, the effect of impurities contained in starch materials is given as another reason. Starch materials are natural products containing various impurities. Enzyme reaction is often inhibited by such impurities which may be contained in a natural product since enzyme is extremely high in specificity. Thus, unpredictable components may affect the enzymatic reaction and prevent one from preparing starch.

Buckwheat is a grain which has an extremely high protein content compared with corn, white potato, sweet potato, wheat, etc. (In general, the protein content in buckwheat (all layer flour) is about 11-15%, whereas that in corn is about 8%, and that in potato and sweet potato is about 1-2%). Generally, a starting material for syrup is a starch-containing fraction of a grain. The protein content of potato starch or corn starch commonly used as a material for starch syrup production is 0.1-0.2%. Therefore, they have been preferably used as a material for starch syrup because their protein content is very low and thus the above problem due to high protein content does not occur. In fact, the only material actually used in Examples of US4,710,386A and US4,656,040A is corn.

To the contrary, the protein content of "buckwheat starch" (i.e., "buckwheat uchiko starch") used as a material for the buckwheat starch syrup of the invention is 2-3%. Although this content is lower than that of buckwheat all layer flour, it is still ten times higher than the protein content of potato starch or corn starch (0.1-0.2%) commonly used as materials for starch syrup production. Thus, it is considered that a person skilled in the art would not have motivation to use such "buckwheat uchiko starch" which has a remarkably high protein content compared with conventional starch materials, because the undesirable effect of the protein on enzymatic treatment or filtration is expected.

Under such circumstances, the present inventors have succeeded for the first time in obtaining a buckwheat starch syrup by using the "buckwheat uchiko starch" which anyone have not used. As such, the success in preparing a buckwheat starch syrup by using "buckwheat uchiko starch" which has a high protein content as a material for starch syrup can be said an unexpected effect.

In addition, milling process varies depending on the kind of a grain used. For example, in the milling of buckwheat seeds, operations of crushing and sieving are repeated. During this process, crushing proceeds from the center of the endosperm to the surface layer of seeds in this order. The flour obtained from the first crushing and sieving is "inside layer flour" (also called "kafun" or "uchiko"). The flours obtained successively from the subsequent similar operations are called "medium layer flour" (also called "first flour"), "external layer flour" (also called "second flour") and "surface layer flour" (also called "third flour"). The "uchiko" which is the starting material for preparing a buckwheat starch syrup of the present invention is a flour obtained from the first crushing and sieving. It is composed mainly of "inside layer flour", but it partially contains "medium layer flour". On the other hand, corn starch is obtained by soaking corn kernels in water, separating and removing germs with a germ separator, crushing the remaining fraction to remove fiber, and centrifuging to remove protein. This process is completely different from the process for milling buckwheat seeds described above. The "buckwheat uchiko starch", the starting material of the buckwheat starch syrup of the invention, is obtained from the above-described technique peculiar to the milling of buckwheat, and this technique is not disclosed nor even suggested in any of the documents. Accordingly, it would not be easy to obtain "buckwheat uchiko starch" because conventional techniques to obtain starch cannot be applied.

Furthermore, the syrup of the invention contains rutin which is effective for the prevention of arteriosclerosis and which is not contained in syrup prepared from starting materials other than that used in the invention.

The constitution and effect of the present invention are not disclosed nor suggested in any of the cited documents. Consequently, a person skilled in the art would not arrive at the claimed invention from the documents

For all the foregoing reasons, it is submitted that the invention as claimed is inventive over the cited documents.