

British Patent Specification No. 564,270).

Furthermore, processes for immobilisation by covalent binding are also known. Examples therefor include binding to griess (see P. Monsan, D. Combes and I. Aiemzadeh, *Biotechnol. Bioeng.*, 26, 658/1984; P. Monsan and D. Combes, *Biotechnol. Bioeng.* 26, 347/1984) and to a macroporous poly-(aminomethylstyrene) (Wofatit Y 58) (see J. Mansfeld and A. Schellenberger, *Acta Biotechnol.*, 6, 89/1986).

The inclusion of invertase in polymeric matrices, for example gelatine (see A.I. Krauze, *Zesh. Nauk Ser.*, 188, 39/1981) or calcium alginate (see Y.Y. Linko, L. Weckstrom and P. Linko, *Food Process Eng. Ind.*, 1979, 81) is another process for the production of the immobilised enzyme.

Depending upon the method of immobilisation and the carrier material used, in the case of a number of the known invertase-carrier complexes for the hydrolysis of saccharose, a number of disadvantages arise so that the use of immobilised invertase on a technical scale is only making slow progress.

Such disadvantages can arise with regard to price, mechanical stability as well as operational stability of the invertase-carrier complex, the latter being dependent to a large extent upon ~~the purity and concentration of the substrate and of the reaction temperature.~~ The magnitude of the influence of the pH value on the

operational stability is also dependent upon the substrate concentration.

The catalytic effectiveness of enzymes is also dependent upon the pH value. For invertase, there is a pH optimum of the order of from 4.0 to 5.5 (see W. Hartmeier, *Gordian Int. Z. f. Lebensmittel and Lebensmitteltechnologie*, 78, 320/1976), displacements of the pH optimum arising in the case of the immobilisation depending upon the method of immobilisation used and upon the carrier material.

Therefore, for the adjustment of the pH optimum, in the known processes for the enzymatic hydrolysis of saccharose, stirrer vessels are provided which are, however, disadvantageous for the continuity as well as for the economy of the process with regard to the expenditure of labour and the size of the investment.

Similar disadvantages arise in the case of the pH value adjustment of sugar solutions with ion exchangers which are used in the sugar industry for decalcification and desalination.

The known processes are also said to operate at the pH optimum of the particular immobilised invertase although under the known technical conditions this pH value can only be adjusted and kept constant with difficulty.

It is an object of the present invention to provide a process for the continuous carrying out of the

hydrolysis of saccharose, which process involves only low expenses for apparatus and labour and avoids the use of foreign materials, using immobilised invertase for the production of glucose/fructose/saccharose mixtures of high concentration and purity.

The task forming the basis of the present invention is to provide a generally continuous process which is simple from the point of view of the apparatus used, for the hydrolysis of saccharose with immobilised invertase with which liquid invert sugar or invert sugar syrup can be produced with high concentration and purity.

Thus, according to the present invention, there is provided a process for the hydrolysis of saccharose by means of immobilised invertase in which ~~saccharose solution first flows through a decolorisation column which is filled with a strongly basic decolorising ion exchanger and is subsequently hydrolysed~~, wherein a 50 to 70% saccharose solution flows through the decolorisation column with a specific loading of 0.5 to 2.0 h⁻¹, a pH value of from 4.0 to 7.0 thereby being adjusted, and subsequently hydrolysed.

According to the present invention, there is preferably used a 60 to 70% saccharose solution.

The saccharose solution flows, with a specific loading of 0.5 to 2.0 h⁻¹, through a decolorisation column which is filled with commercially available,

strongly basic decolorising ion exchanger, for example Wofatit EA 60, in order to make the substrate available to the hydrolysis in such a purity that an influencing of the life of the immobilised invertase by non-sugar materials is avoided. The direction of movement can hereby be upward or downward.

From the point of view of an economic utilisation of the capacity of the resin, in the case of the decolorisation of clear or thick juices, there is selected, in known manner, high specific loadings which, depending upon the colour, are from 2 to 6 h⁻¹. Normally, only an insignificant decrease of the pH value thereby occurs, which is brought about by exchanger adsorption in which the anions of the salts of acid compounds present in low concentration are exchanged for chloride ions and is of the order of magnitude of 0.3 pH units (see I. Stamberg and V. Valter, Entfaerbungsharze, pub. Akademie-Verlag, Berlin, 1970).

It is surprising that, in the case of the decolorisation of commercially available saccharose solutions with a specific loading of the decoloration resin of 0.5 to 2.0 h⁻¹, a pH decrease of 0.5 to 2.0 pH units takes place which is sufficient to be able to carry out the hydrolysis in a pH range of from 4.0 to 7.0, corresponding to the optimum of the immobilised invertase, including its upper flank.

Apart from the already mentioned exchanger adsorption, other effects, for example the thermal decomposition of non-sugar materials, also play a part, the result of which is the unexpectedly high decrease of the pH value.

Contrary to the statements of the known technical solutions to the problem, it is doubtful that the hydrolysis of saccharose under technical conditions can only be carried out at the pH optimum of the immobilised invertase with satisfactory conversion rate. Indeed, it is to be assumed or has been found that the hydrolysis takes place in a range which corresponds to the optimum, including its upper flank, of the invertase in question, without substantial decreases of the conversion occurring. It is thereby to be assumed that the operational stability of the immobilised invertase used is comparable over the said pH range with that at the pH optimum.

In order to bring about the greatest possible approximation to the pH optimum of the immobilised invertase, in the process according to the present invention it is preferred to work with a specific loading of the decolorisation of from 0.5 to 1.0 h⁻¹.

Subsequent thereto, the decolorised and pH value-adjusted saccharose solution flows, in known manner, through an inversion column which is filled with immobilised invertase, for example with an invertase-

Wofatit Y 58 complex, a glucose/fructose/saccharose mixture thereby being formed, the invert sugar proportion of which is dependent upon the specific loading of the inversion column and upon the concentration and the temperature of the saccharose solution and can be adjusted according to the requirements of the user.

The direction of movement can hereby be upwards or downwards. It is of value for the simplicity of the process according to the present invention that no additional containers or chemicals are needed for the pH value adjustment and that a generally continuous operation from the introduction of the saccharose solution up to the production of the end product is ensured.

The following Examples are given for the purpose of illustrating the present invention.

As immobilised enzyme, there is used an invertase-Y 58 complex, the operational stability of which in 62% saccharose solution at 70°C., expressed by the half-life time of 131 days and its pH optimum, amounts to 4.5 (see J. Mansfeld and A. Schellenberger, Acta Biotechnol., 6, 97/1986). Independently of the method of immobilisation and of the carrier material, invertase-carrier complexes can be used, the catalytic effectiveness and operational stability of which are comparable over the pH range of from 4.0 to 7.0 with that of the pH value optimum in question.



US006068869A

United States Patent [19]**Bent Ginslov**[11] **Patent Number:** **6,068,869**[45] **Date of Patent:** **May 30, 2000**[54] **METHOD OF PRODUCING A STABILIZED SUGAR CANE JUICE PRODUCT**[75] **Inventor:** **Otto Peter Bent Ginslov**, Waterfall, South Africa[73] **Assignee:** **Jucana Investment CC**, South Africa[21] **Appl. No.:** **09/030,786**[22] **Filed:** **Feb. 25, 1998**[51] **Int. Cl.⁷** **C13K 3/00**[52] **U.S. Cl.** **426/262; 426/49; 426/268; 426/481; 127/46.1; 127/50; 127/51; 127/55; 127/61**[58] **Field of Search** **426/49, 48, 52, 426/262, 268, 541, 544, 590, 478, 481, 489; 127/43, 46.1, 50, 55, 61, 51, 36**[56] **References Cited****U.S. PATENT DOCUMENTS**

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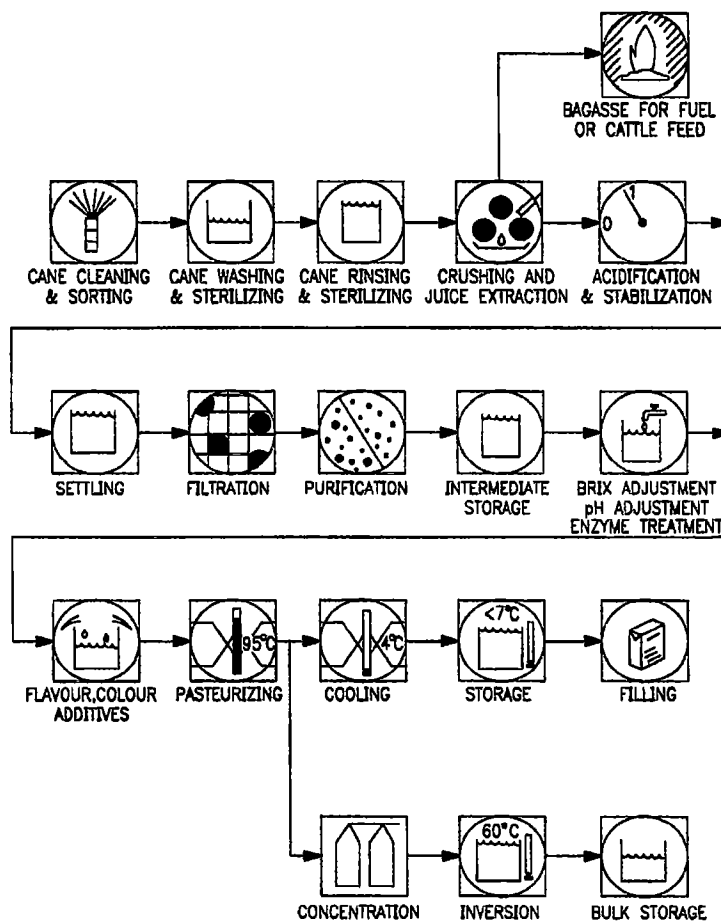
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[57] **ABSTRACT**

A method of providing a stabilized sugar cane juice product for use in soft drinks, that includes providing cleaned sugar cane sticks and extracting cane juice from the sticks. Thereafter, the extracted cane juice is acidified immediately upon extraction by feeding it into a solution comprising ascorbic acid for preventing discoloration of the cane juice and also by feeding it simultaneously into an acidic solution of one of citric acid, malic acid, tartaric acid, phosphoric acid and a mixture thereof, for lowering the pH of the cane juice below a pH of 5. Furthermore, one of a sodium citrate solution, a potassium citrate solution, a sodium phosphate di-basic solution or a mixture thereof, is added to the cane juice for stabilizing it. The cane juice is then coagulated and flocculated to remove unwanted foulants and aromas.

15 Claims, 2 Drawing Sheets

METHOD OF PRODUCING A STABILIZED SUGAR CANE JUICE PRODUCT

BACKGROUND OF THE INVENTION

The present invention relates to a method of producing a stabilized sugar cane juice product.

It is well known in many countries to drink the juice of freshly crushed sugar cane. However, it has not been possible to commercialize the provision of sugar cane juice because of very rapid discolouration of the juice from a pale yellow colour to brown. This is caused by the reaction of amino acids and sugar within the juice, commonly known as the "Maillard" reaction. This non-enzymatic reaction produces the brown pigment, melanoidin, which discolours the cane juice from its original pale yellow colour.

It is an object of this invention to overcome the above problem associated with sugar cane juice and thereby enable the provision of a cloudy or clear stabilised sugar cane juice product in commercially viable volumes and forms.

SUMMARY OF THE INVENTION

According to the invention there is provided a method of producing a stabilised cane juice product, which includes the steps of:

- providing cleaned sugar cane sticks;
- extracting sugar cane juice from said sugar cane sticks;
- adding to the extracted sugar cane juice, a solution comprising ascorbic acid for preventing the discolouration of the cane juice, and one of citric acid, malic acid, tartaric acid, phosphoric acid, and a mixture thereof, for lowering the pH of the cane juice below that of natural untreated cane juice, and one of a sodium citrate solution, a potassium citrate solution, a sodium phosphate di-basic solution, and a mixture thereof, for stabilising the sugar cane juice; and
- coagulating and flocculating the sugar cane juice to remove unwanted foulants and aromas.

The acidifying solution may contain 100 to 400 mg ascorbic acid per liter of solution.

The citric acid, malic acid, tartaric acid, phosphoric acid or a mixture thereof, of the acidifying solution may be sufficient for reducing the pH of the cane juice to below 5.

The sodium citrate solution, potassium citrate solution, sodium phosphate di-basic solution or a mixture thereof, of the acidifying solution, may be a 0.01 to 0.1% (m/m) solution.

The cane juice may be allowed to stand undisturbed for a predetermined period of time immediately after acidification thereof, during which time coagulants and flocculants are added thereto.

The method may include filtering the cane juice after acidification thereof.

The filtration of the cane juice may be effected initially in two stages, with a first stage providing for the separation of particles having a size larger than five microns, from the cane juice, and a second filtration stage providing for the separation of particles having a size larger than one micron, from the cane juice, the cane juice having a cloudy appearance after filtration thereof.

In order to produce a substantially clear sugar cane juice, the method may include filtering the cane juice through a diatomaceous earth filter.

In order to further clarify the sugar cane juice, the method may include further filtering the cane juice in a tubular ultra-filtration system comprising two tubular ultra-filtration

modules forming part of a continuous ultra-filtration process in which a first ultra-filtration module filters out particles in the cane juice having a particle size larger than 45000×10^{-9} m, and in which a second ultra-filtration module filters out particles having a particle size larger than 5000×10^{-9} m.

The filtered cane juice may be stored and the Brix and pH of the cane juice adjusted, if required, the Brix being adjusted to between 10 and 14° Brix and the pH being adjusted to between 1.4 and 4.9, with the pH adjustment being effected by adding one of citric acid solution, malic acid solution, tartaric acid solution, phosphoric acid solution, and a mixture thereof. The method may include a sugar inversion process during the storage thereof, whereby substantially the entire sucrose content of the juice is converted into fructose and glucose by the addition of suitable enzymes into the cane juice.

The enzyme quantity added may be between 50 and 100 mg per liter of juice.

The enzyme added to the cane juice may be an enzyme known as "invertase".

The sugar inversion process may include heating the cane juice to approximately 60° C. immediately after adding the enzyme thereto.

The method may include the addition of one or more of a group comprising fruit juices, flavourings, colouring agents, 0.1 and 1% (m/m) citrus pectin to the cane juice.

The method may include pasteurisation of the cane juice after the storage thereof.

The method may include the addition of suitable preservatives for extending the shelf life of the sugar cane juice product.

The method may include removing water from the sugar cane juice product to form a sugar cane juice concentrate.

The method may include removing water from the sugar cane juice product by an evaporation process.

The method may include carbonating the sugar cane juice product.

The invention extends to a stabilised cane juice product manufactured in accordance with the method defined hereinabove.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Further features of the method of producing a stabilised sugar cane juice product, as defined hereinabove, is described in more detail hereinafter by way of a non-limiting example of the method of the invention, with reference to and as illustrated by way of the accompanying diagrams. In the drawings:

FIG. 1 shows a block diagram of a method of producing a stabilised sugar cane juice product in accordance with the invention, and

FIG. 2 shows a block diagram depicting the sizes of particles which can be separated in an ultrafiltration process.

Referring to the diagrams, the method of producing a stabilised cane juice product in accordance with the invention, includes the first step of providing freshly cut and thrashed sugar cane sticks having all loose leaves removed. These sugar cane sticks can then be transported to the factory where the cane juice product of the invention is to be produced and where the cane sticks are immediately cleaned and all new buds, diseased parts, roots and tops cut off. All waste so collected typically can be used for fuel.

The clean sugar cane sticks are then sterilised by firstly being scrubbed in a water bath containing 0.1 to 1% (m/m) quaternary ammonium compound solution, which is known

to be effective for sterilising purposes. This solution is particularly suitable for destroying harmful bacteria associated with the sugar cane sticks and any soil attached thereto. The cane sticks are thereafter rinsed in a sterilising solution containing between 50 and 200 ppm chlorine, the chlorine solution being of common commercial grade.

After allowing the main part of the sterilising solution to "drip off" from the cane sticks, the cane sticks can be crushed in a roller crusher having a suitable number of crusher rollers that will ensure that at least 90% of the sugar cane juice is extracted from the cane sticks. The sugar cane juice also can be separated by any other method or technique. The Bagasse waste can again be used for fuel.

Immediately upon the extraction of the sugar cane juice, it can be fed into an ascorbic acid solution containing between 100 and 500 mg ascorbic acid per liter, for preventing the discolouration of the cane juice. Simultaneously, an acidic solution of one of citric acid, malic acid, a tartaric acid, phosphoric acid and a mixture thereof, is added in order to reduce the pH of the cane juice to below 5, whereas a basic solution of one of sodium citrate, potassium citrate, sodium phosphate di-basic and a mixture thereof, is also simultaneously added for stabilising the acidic solution. The ascorbic acid has proved to be particularly suitable for preventing discolouration of the extracted sugar cane juice, even after pasteurisation treatment as envisaged hereafter. The basic solution is a 0.01 to 0.1% (m/m) solution.

During the stabilisation of the cane juice as described above, the cane juice must be left undisturbed for approximately one hour, i.e. after the abovementioned solutions have been added thereto. During this period the cane juice is coagulated and flocculated to remove unwanted foulants and aromas. The Applicant believes that a range of polyacrylamide-based cationic coagulants as well as high molecular weight anionic polyelectrolyte flocculants may be used. The dosage of coagulants and flocculants must not exceed 35 mg/l. To further eliminate any residual odours and colours a further treatment of activated carbon may be used. The coagulants, flocculants and activated carbon must be of approved F.D.A. regulations (USA) and D.O.E. regulations (UK) as well as the regulations of the Department of National Health and Population Development (R.S.A.).

The said impurities can then be easily separated in a clarifying process, whereafter the juice is firstly filtered through a five micron filtration bag system which will remove remaining coarse particles from the juice and then a one micron filtration bag system for separating smaller particles. This filtration will result in the provision of a cloudy sugar cane juice that is pale yellow with no visible impurities and no sedimentation. To produce a substantially clear sugar cane juice, the juice is filtered through a diatomaceous earth filter.

In order to further clarify the cane juice, the cane juice is passed through a tubular ultrafiltration system. Referring to FIG. 2 of the drawings, in the Tubular Ultrafiltration system, the cane juice is further filtered in a first ultrafiltration module which filters out particles in the cane juice having a particle size larger than 40000×10^{-9} m and thereafter the cane juice is filtered in a second ultrafiltration module which filters out particles in the cane juice having a particle size larger than 5000×10^{-9} m. In trials performed on ultrafiltration of cane juice, the ultrafiltration equipment comprised a self-contained, food grade pilot plant equipped with two tubular ultrafiltration modules. The ultrafiltration system was operated in a batch wise manner with recirculation of cane juice to be filtered. The feed pressures ranged from 200

kPa to 600 kPa and the feed temperature varied from 25° C. to 60° C. In a test performed on the cane juice after filtration, it was found that very little loss of colour occurred when the filtered cane juice was concentrated from approximately 17° Brix to about 70° Brix. If considered necessary, filtration may be accompanied by de-flavouring.

During intermediate storage of the juice after filtration, the Brix can be adjusted to between 10 and 14° Brix, such adjustment being done by using potable water. A further pH adjustment also can then be effected in order to provide for the pH of the juice to be between 1.4 and 4.9. The addition of one of citric acid, malic acid, tartaric acid, phosphoric acid and a mixture thereof, can be utilised for this purpose.

This intermediate storage stage may be accompanied by the inversion of the sucrose content of the juice into fructose and glucose. This can be done by adding between 50 mg and 100 mg "Invertase" enzymes into each liter of juice and heating the mixture to 60° C. at which temperature the mixture will remain for approximately 6 hours. This will allow the conversion to take place and effectively eliminate all sucrose from the juice. The conversion method also can be carried out in any other way that is effective and viable. If a concentrated form of the stabilised or inverted sugar cane juice is required for transportation and further processing elsewhere, then the Brix of the juice can be adjusted in between 65 and 82° Brix, such adjustment being done by the use of an evaporator for evaporating and concentrating the juice at a temperature below 60° C. at a high vacuum. When the required Brix has been reached, the concentrated syrup is pasteurised between 75° C. and 95° C. and held for not less than 3 minutes before being cooled down to ambient temperature.

After the above adjustment and inversion, a 0.1 to 1% (m/m) citrus pectin (purified food grade) solution is added to the sugar cane juice and, if required, other fruit juice concentrates, flavouring and/or colourings can be added in order to provide a desired type end product. Thereafter, the resulting sugar cane juice, or sugar cane juice concentrate, with or without flavouring agents and other additives, can be pasteurised, typically at between 90 and 95° C. for 15 to 25 seconds, whereafter the juice can be cooled to below 4° C. This can be carried out in a standard plate heat exchanger as is commonly used. In tests performed on filtered cane juice, it was found that during pasteurisation of the cane juice, the cane juice can be heated up to 95° C. for 5 minutes without colour or flavour deterioration of the cane juice.

The pasteurised juice can then be contained in a bulk container at a temperature preferably below 4° C. and final quality control checks can then be carried out. This is followed by filling the sugar cane juice into commercial trade containers in which the sugar cane juice can be finally provided to the public. It is anticipated that without any further preservatives and by keeping the juice refrigerated below 4° C., the juice will have a shelf life of approximately one month, whereas together with suitable preservatives, this can be extended to between 2 and 3 months. The cane juice can also be Ultra-High Temperature (UHT) treated at temperatures above 100° C. for a few seconds in an aseptic UHT system. The shelf life can now be extended to approximately 6 months without refrigeration.

It is believed that one or more of the individual steps associated with the method of producing a stabilised sugar cane juice product, as described above can be varied in various different respects while still incorporating the principles associated with the method of manufacturing a stabilised cane juice product, as hereinabove described and

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defined. For industrial applications, the juice can be concentrated after pasteurisation, or otherwise treated.

The final properties of the sugar cane juice drink also are greatly variable and will be particularly determined by the additives that can be added to the juice in order to provide a juice with desired qualities.

What is claimed is:

1. A method of producing a stabilised cane juice product, which includes the steps of:

providing cleaned sugar cane sticks;

extracting sugar cane juice from said sugar cane sticks;

adding to the extracted sugar cane juice, a solution comprising ascorbic acid for preventing the discoloration of the cane juice, and a member selected from the group consisting of citric acid, malic acid, tartaric acid, phosphoric acid, and a mixture thereof, for lowering the pH of the cane juice, and a member selected from the group consisting of a sodium citrate solution, a potassium citrate solution, a sodium phosphate di-basic solution, and a mixture thereof, for stabilising the sugar cane juice;

coagulating and flocculating the sugar cane juice to remove unwanted foulants and aromas;

filtering the sugar cane juice; and

storing the filtered sugar cane juice.

2. A method as claimed in claim 1, wherein the acidifying solution contains 100 to 400 mg ascorbic acid per liter of solution.

3. A method as claimed in claim 1, wherein the citric acid, malic acid, tartaric acid, phosphoric acid or a mixture thereof, of the acidifying solution is sufficient for reducing the pH of the cane juice to below 5.

4. A method as claimed in claim 1, wherein the sodium citrate solution, potassium citrate solution, sodium phosphate di-basic solution or a mixture thereof, of the acidifying solution, is a 0.01 to 0.1% (m/m) solution.

5. A method as claimed in claim 1, wherein the cane juice is allowed to stand undisturbed for a predetermined period of time immediately after acidification thereof, during which time coagulants and flocculants are added thereto.

6. A method as claimed in claim 1, wherein the filtration of the cane juice is effected initially in two stages, with a first stage providing for the separation of particles having a size

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larger than five microns, from the cane juice, and a second filtration stage providing for the separation of particles having a size larger than one micron, from the cane juice, the cane juice having a cloudy appearance after filtration thereof.

7. A method as claimed in claim 6, further comprising the step of filtering the cane juice through a diatomaceous earth filter.

8. A method as claimed in claim 7, further comprising the step of filtering the cane juice in a tubular ultra-filtration system to produce a substantially clear cane juice product, the ultra-filtration system comprising two tubular ultra-filtration modules forming part of a continuous ultra-filtration process in which a first ultra-filtration module filters out particles in the cane juice having a particle size larger than 45000×10^{-9} m, and in which a second ultra-filtration module filters out particles having a particle size larger than 5000×10^{-9} m.

9. A method as claimed in claim 6, wherein the Brix and pH of the filtered and stored cane juice is adjusted, if required, the Brix being adjusted to between 10 and 14° Brix and the pH being adjusted to between 1.4 and 4.9, with the pH adjustment being effected by adding one of citric acid solution, malic acid solution, tartaric acid solution, phosphoric acid solution, and a mixture thereof.

10. A method as claimed in claim 9, further comprising the step of pasteurizing of the cane juice after the storage thereof.

11. A method as claimed in claim 1, further comprising the step of adding of one or more of a group comprising fruit juices, flavourings, colouring agents, and between 0.1 and 1% (m/m) citrus pectin to the cane juice.

12. A method as claimed in claim 1, further comprising the step of adding preservatives for extending the shelf life of the sugar cane juice product.

13. A method as claimed in claim 1, further comprising the step of removing water from the sugar cane juice to form a sugar cane juice concentrate.

14. A method as claimed in claim 13, further comprising the step of removing water from the sugar cane juice product by an evaporation process.

15. A method as claimed in claim 1, further comprising the step of carbonating the sugar cane juice.

* * * *

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**SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO
DIRECCIÓN DE NUEVAS CREACIONES**

2020
Bogotá, D.C.,

Doctor
GERMAN CASTILLO GRAU
Abogado

ASUNTO	Radicación	06-39073
	Trámite	011
	Evento	378
	Actuación	430
	Oficio	
	Folios	04 1 4 7 6 6

Patente de Invención	☒	Patente de Modelo de Utilidad	
Vía PCT (fase nacional)	☒	Cap. I	☒ Cap. II ☐

No. Sol. Internacional PCT/IB2004/003163
Fecha de Presentación Internal. 29 de septiembre de 2004

Como resultado del examen de fondo, realizado con fundamento en el artículo 45 de la Decisión 486 de la Comisión de la Comunidad Andina, se le comunica:

1. Documentos estudiados

Descripción:	Folios: 4 a 33	como se radicó inicialmente
Reivindicaciones:	Folios: 34 a 40	como se radicó inicialmente
Figuras:	Folios: 42 a 45	como se radicó inicialmente
Prioridad:	29 de septiembre de 2003, US 60/507,947	

2. Objeto de la invención

Título de la invención

Producción de jarabe invertido a partir de guarapo de caña de azúcar usando invertasa inmovilizada (folio 1).

El problema planteado en esta solicitud es lograr un proceso continuo para realizar la conversión a jarabe invertido de un jugo de caña, que prolongue la vida útil de la enzima en un reactor en columna.

Para solucionar este problema técnico se desarrolla un proceso para refinar el jugo de cana de azúcar y posteriormente bioenzimáticamente convertirlo en un jarabe refinado invertido o una solución concentrada de glucosa-fructosa usando un reactor empacado con invertasa inmovilizada.

Clasificación internacional (IPC) en C12P19/02, C13K3/00.

3. De la solicitud de Patente (según el caso)

Reivindicaciones (artículo 30 D 486)

- Los términos "entre aproximadamente", "no mayor que aproximadamente", "cuando menos", "no mayor que aproximadamente" y "no mayor" utilizados en

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las reivindicaciones 2, 11, 13 14, 17, 20, 26, 27, 30 y 31 no proporcionan precisión ni concisión a las características de la invención.

- No hay concisión entre las reivindicaciones 1, 19 y 40, dado que la materia de estas reivindicaciones tienen el mismo alcance, un método para producir un jarabe invertido de jugo crudo de caña, que esta compuesto por los pasos de purificación por medio de un primer proceso de filtración para remover una primera fracción de contaminantes, un segundo proceso de filtración remover una segunda fracción de contaminantes, pasar el producto del segundo proceso de filtración por una columna de intercambio iónico y finalmente poner en contacto el jugo tratado por la resinas de intercambio iónico con la enzima inmovilizada.

Es así que la reivindicación 19 y 40 definen una primera y una segunda filtración, y una primera etapa y una etapa más fina, respectivamente, la cuales pueden ser las mismas etapas definidas en la reivindicación 1, como micro-filtración para una primera filtración ó primera etapa, y como ultrafiltración para una segunda filtración ó etapa más fina.

Así mismo, las reivindicaciones dependientes 2 y 20, 3, 4 y 21, 7 y 22, 8 y 23, 9 y 24, 8,9 y 10, 11, 12 y 25, 13 y 26, 15 y 27, 16 y 29, 17 y 30, presentan el mismo alcance de protección entre cada una de ellas, lo cual muestra también falta de concisión.

Por lo anterior, el capítulo reivindicatorio no cumple con el requisito de claridad y concisión de acuerdo al art. 30 de la Decisión 486.

4. Determinación del Estado de la Técnica

La fecha para determinar el estado de la técnica es el 29 de septiembre de 2003, de acuerdo la fecha de prioridad invocada.

Teniendo en cuenta la anterior fecha indicada, se realiza la búsqueda de las anterioridades de la presente solicitud, encontrándose los siguientes documentos relevantes:

Nº	Documento	Título	Fecha de publicación
D1	GB2198438	PROCESS FOR THE HYDROLYSIS OF SACCHAROSE BY MEANS OF IMMOBILISED INVERTASE	1988-06-15
D2	US6068869	METHOD OF PRODUCING A STABILIZED SUGAR CANE JUICE PRODUCT	2000-05-30

D1 describe un proceso para proveer la hidrólisis de sacarosa por medio de invertasa inmovilizada en una solución de sacarosa, donde el flujo primeramente pasa po un columna de decoloración la cual es llenada con un ion de intercambio para subsecuentemente ser hidrolizado, la hidrólisis es llevada a cabo al pasar a través de una columna de invertasa inmolizada (Resumen).

D2 describe para proveer un producto a base de jugo de caña estabilizado para uso en bebidas suaves. El jugo de caña es acidificado inmediatamente después de la extracción. El método incluye la filtración del jugo de caña después la acidificación inicialmente por dos estados, con el primer estado se provee la separación de partículas que tienen un tamaño mayor de 5 micras, y un segundo estado de filtración para proveer la separación de partículas que tiene un tamaño de partículas mayor de una micra. También puede incluir un sistema de ultrafiltración (Resumen, col 1 líneas 53-59, 65-67). El método puede incluir la inversión del azúcar durante el proceso de almacenamiento, donde la sucrosa contenida en el jugo de caña es convertida en su totalidad en fructosa y glucosa por la adición de enzimas (col 2 líneas 22-26).

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5. Análisis de patentabilidad (según requisito) (artículo 14 D486)

Es importante mencionar que el siguiente análisis de patentabilidad se realizó teniendo en cuenta la objeción del numeral 3 de la presente comunicación.

Nivel Inventivo (artículo 18 D486)

Respecto a la reivindicación 1

La reivindicación 1 dice "Un método para producir un jarabe invertido a partir de jugo crudo de caña de azúcar (guarapo) que comprende los siguientes pasos:

- a) Someter al jugo de caña de azúcar a micro-filtración para remover una primera fracción de contaminantes sólidos del dicho jugo produciendo un jugo de caña micro-filtrado;
- b) Someter al jugo de caña micro-filtrado a ultrafiltración para remover una segunda fracción de contaminantes sólidos del dicho jugo micro-filtrado y una primera fracción de contaminantes solubles de dicho jugo micro-filtrado y así produciendo un jugo de caña ultra-filtrado;
- c) Pasar el jugo de caña de caña ultra-filtrado a través de una columna de intercambio aniónico para remover una segunda fracción de contaminantes solubles de dicho jugo de caña ultrafiltrado, y por consiguiente producir un jugo tratado en una columna de intercambio iónico;
- d) Contactar dicho jugo de caña tratado con resinas de intercambio aniónico con la enzima invertasa inmovilizada para convertir cuando menos el 90% de la sacarosa contenida en dicho jugo tratado en una mezcla de glucosa y fructosa y por consiguiente así dicho jarabe invertido.

Análisis de las diferencias con respecto al estado de la técnica:

Características Esenciales	D1 GB2198438	D2 US6068869
Un método para producir un jarabe invertido a partir de jugo crudo de caña de azúcar	SI (Pág. 3 líneas 26-27, Pág. 4 líneas 1-5)	SI (Col 2 22-26)
Someter al jugo de caña de azúcar a micro-filtración	NO	SI (Col 1 55-59, Col 3 línea 48)
Someter al jugo de caña micro-filtrado a ultrafiltración produciendo un jugo de caña ultra-filtrado;	NO	SI (Col 1 66-67)
Pasar el jugo de caña de caña ultra-filtrado a través de una columna de intercambio aniónico	(Pág. 4 líneas 15-18)	NO
Contactar dicho jugo de caña tratado con resinas de intercambio aniónico con la enzima invertasa inmovilizada para convertir cuando menos el 90% de la sacarosa contenida en dicho jugo tratado en una mezcla de glucosa y fructosa.	(Pág. 6 líneas 24-27, Pág. 7 líneas 1-6)	NO

D1 es el documento del estado de la técnica más cercano porque describe un método de hidrólisis de sacarosa por medio de invertasa inmovilizada que consiste en de-colorear la solución sacarosa para su subsecuente hidrolización.

La solicitud colombiana se diferencia en D1 por el paso de someter el jugo de caña a micro-filtración y ultrafiltración.

El problema técnico objetivo es como remover contaminantes insolubles finos y al menos una fracción significativa de contaminantes solubles.

D2 describe como se soluciona este problema técnico mediante una proceso de clarificación donde el jugo es primeramente filtrado a través de una malla de 5 micras y luego una micro-filtración para separar pequeñas moléculas. Para clarificar aun mas el jugo de caña, este se pasa a través de un sistema de ultrafiltración tubular (Col 3 líneas 44-55).

La reivindicación 1 es obvia porque el técnico medio en el arte enfrentado al problema de remover contaminantes insolubles finos y al menos una fracción significativa de contaminantes solubles, incluiría un proceso de clarificación que consiste en una micro filtración y una ultrafiltración, que revela D2, dentro del método de hidrólisis de sacarosa por medio de invertasa inmovilizada como lo enseña D1, logrando de esta forma el proceso objeto de esta solicitud. Por lo tanto, la reivindicación 1 y sus dependientes no tienen nivel inventivo.

Dado lo anterior, las características técnicas del método para producir un jarabe invertido a partir de jugo crudo de caña de azúcar de esta solicitud, no representa un avance tecnológico sobre el estado de la técnica.

En conclusión, esta reivindicación y sus dependientes se encuentran afectadas en su nivel inventivo ya que se derivan de manera evidente del estado de la técnica y pueden ser obvias para un técnico medio en la materia.

6. Conclusión

Los requisitos de patentabilidad de la presente solicitud se encuentran afectados así:

N°	Documento	Reivindicaciones afectadas	Requisito que afecta
D1	GB2198438	1-18	NIVEL INVENTIVO
D2	US6068869	1-18	NIVEL INVNETIVO

En cumplimiento del artículo 45 de la Decisión 486 de la Comisión de la Comunidad Andina, se le indica que debe dar respuesta dentro del término de 60 días contados a partir de la fecha de notificación de la presente comunicación. En caso de no dar respuesta al presente requerimiento, o si a pesar de la respuesta subsistieran los impedimentos para la concesión, se denegará la patente.

Notifíquese el presente oficio conforme a lo dispuesto en el numeral 5.2, literal e), del capítulo quinto del título primero de la Circular Única N° 10 de 2001.

ALIX CARMENZA CÉSPEDES DE VERGEL
Directora de Nuevas Creaciones (C)

El anterior requerimiento fue notificado por fijación en lista, de fecha 22 NOV 2016

CONCEPTO TÉCNICO N° 3730	EXAMINADOR TÉCNICO Código N° 202090
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