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**Datasheet for the decision  
of 4 August 2017**

**Case Number:** T 1751/13 - 3.3.09

**Application Number:** 05106563.9

**Publication Number:** 1745702

**IPC:** A23F5/24, A23F5/26

**Language of the proceedings:** EN

**Title of invention:**

Enzyme-assisted soluble coffee production

**Patent Proprietor:**

Intercontinental Great Brands LLC

**Opponent:**

NESTEC S.A.

**Headword:**

**Relevant legal provisions:**

EPC Art. 54, 56, 84, 123(2)

**Keyword:**

Auxiliary request 1: Amendments (allowable), clarity (yes), novelty (yes), inventive step (yes)

**Decisions cited:**

G 0003/14, T 1002/92, T 2542/10

**Catchword:**



**Beschwerdekammern**  
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Case Number: T 1751/13 - 3.3.09

**D E C I S I O N**  
**of Technical Board of Appeal 3.3.09**  
**of 4 August 2017**

**Appellant:** Intercontinental Great Brands LLC  
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**Decision under appeal:** Interlocutory decision of the Opposition  
Division of the European Patent Office posted on  
12 June 2013 and maintaining the European Patent  
No. 1745702 in amended form.

**Composition of the Board:**

**Chairman** W. Sieber  
**Members:** N. Perakis  
F. Blumer

## Summary of Facts and Submissions

- I. This decision concerns the appeals filed by the patent proprietor and the opponent against the interlocutory decision of the opposition division that European patent No. 1 745 702 in amended form met the requirements of the EPC.

Since the patent proprietor and the opponent are respectively appellant and respondent in these proceedings, for simplicity the board will continue to refer to them as the patent proprietor and the opponent.

- II. With the notice of opposition the opponent requested that the patent be revoked in its entirety on the grounds of Article 100(a) (lack of novelty and of inventive step), 100(b) and 100(c) EPC.

The documents cited during the opposition proceedings included the following:

D6a: English translation of JP 2004-121138 A;

D7: J.E. Bailey and D.F. Ollis, Biochemical Engineering Fundamentals, 2nd edition, McGraw-Hill Book Company, 1986, pp. 180-195;

D8: US 4 983 408 A;

D10: M.B. Blanc *et al.*, Chromatographic Profile of Carbohydrates in Commercial Soluble Coffees, *J. Agric. Food Chem.*, 1989, 37, pp. 926-930;

- D17: R.M. Smith, Determination of 5-Hydroxymethyl-furfural and Caffeine in Coffee and Chicory Extracts by High Performance Liquid Chromatography, *Food Chemistry*, 1981, 6, pp. 41-45;
- D18: H.G. Maier et al., Möglichkeiten zur Ermittlung der Extraktionsbeute bei löslichem Kaffee, *KTM Kaffeeforschung*, 1978, 28(13), pp. 3-8;
- D24: A.S. Grandison and M.J. Lewis, Separation Processes in the Food and Biotechnology Industries, Woodhead Publishing Limited, 1996, pp. 65-86, 97 and 128-131; and
- D29: D. Kanjahn et al., *Deutsche Lebensmittel-Rundschau*, 1997, 93(2), pp. 44-46.

III. The opposition division's decision was based on a main request (claims as granted) and auxiliary requests 1 and 2, filed during the oral proceedings on 25 April 2013.

The opposition division held that the main request was not allowable since Article 100(c) EPC prejudiced the maintenance of the patent.

Auxiliary request 1 was not allowed because the subject-matter of claim 1 lacked novelty over D10.

Regarding auxiliary request 2, the opposition division held that it met the requirements of the EPC. In particular, the subject-matter of both independent claims 1 and 5 was considered to be novel and inventive. Claims 1 and 5 read as follows:

"1. Coffee beverage composition being devoid of significant contents of oil and insoluble particulates, comprising

(a) at least 15% based on the total weight of soluble coffee solids of total mannose, wherein the free mannose content is less than 50% by weight of the total mannose content, and

(b) less than 150 ppm on a total soluble coffee solids basis of 5-hydroxymethyl furfural (5-HMF)

wherein the composition is a soluble coffee."

"5. Process for producing a soluble coffee extract, comprising the steps:

(i) combining roast and ground coffee with water,

(ii) adding mannanases or mixtures of cellulases and mannanases,

(iii) wet-milling to a mean particle size of 10 to 250  $\mu\text{m}$ ,

(iv) treating the reaction mixture by exposing it to a temperature where the enzyme is active, and

(v) circulating the reaction mixture through a cross-flow semi-permeable membrane separation device where the soluble coffee extract is obtained as permeate and wherein the membrane pore size is less than 0.8  $\mu\text{m}$ ."

IV. The opponent filed its statement setting out the grounds of appeal on 18 October 2013 and requested that the opposition division's decision be set aside and that the patent be revoked in its entirety. It also filed the following documents:

D7a: J.E. Bailey and D.F. Ollis, *Biochemical Engineering Fundamentals*, 2nd edition, McGraw-Hill Book Company, 1986, pp. 158-160;

D31: F.M. Nunes and M.A. Coimbra, *J. Agric. Food Chem.*, 2001, 49, pp. 1773-1782;

D32: US 4 508 745 A;

D33: SCOGS opinion on sodium bisulphite, 2013; and

D34: A. Sachslehner *et al.*, *Journal of Biotechnology*, 2000, 80, pp. 127-134.

V. The patent proprietor filed its statement setting out the grounds of appeal on 22 October 2013 and requested that the opposition division's decision be set aside and that the patent be maintained on the basis of the main request or one of the two auxiliary requests filed therewith. It also filed new technical evidence, Annex A, reproducing the key experiment of D10 to demonstrate that D10 was not novelty-destroying for the subject-matter of claim 1 of any of the requests.

VI. With letter of 7 March 2014, the opponent filed observations on the patent proprietor's appeal.

VII. With letter of 7 May 2014, the patent proprietor filed observations on the opponent's appeal, accompanied by a corrected main request, corrected auxiliary requests 1

and 2 and additional auxiliary requests 3 to 15. The patent proprietor requested that, *inter alia*, D31 and D32 not be admitted into the proceedings.

The corrected auxiliary request 1 is the only relevant request for this decision. It consists of 31 claims with an independent product claim 1 and an independent process claim 5.

Claim 1 is identical to claim 1 of auxiliary request 2 found allowable by the opposition division (see point III above) except in respect of the amount of 5-HMF, which is now required to be less than 250 ppm on a total soluble coffee solids basis (instead of 150 ppm).

Claim 5 is identical to claim 5 of auxiliary request 2 found allowable by the opposition division.

- VIII. With letter of 4 August 2014, the opponent requested that D31 and D32 be admitted into the proceedings and that the patent proprietor's auxiliary requests 3-8 and 12-15 not be admitted into the proceedings.
- IX. On 2 June 2017, the board issued a communication setting out its preliminary opinion on the outstanding issues.
- X. Oral proceedings before the board took place on 4 August 2017. During the oral proceedings the patent proprietor withdrew its main request and the request not to admit D32 into the proceedings. The discussion therefore concerned the patentability of the claims of auxiliary request 1.



XI. The arguments put forward by the patent proprietor in its written submissions and during the oral proceedings which are relevant to the present decision may be summarised as follows:

- The subject-matter of claim 1 of auxiliary request 1 derived from the application as filed. The combination of a 250 ppm level of 5-HMF and a soluble coffee found a basis in the combination of claims 3 and 5 as filed.
- There was no issue of lack of clarity regarding claim 1 of auxiliary request 1 because the terms "soluble coffee" and "total mannose" which were objected to were present in the granted claims on which claim 1 of auxiliary request 1 was based.
- The subject-matter of claim 1 of auxiliary request 1 was novel over the prior art. The late-filed document D31 was not *prima facie* relevant and should not be admitted into the proceedings. D31 disclosed coffee compositions which would not have been considered by the skilled person as coffee beverage compositions. As regards the alleged prior use based on D10, it had not been shown that a commercially available soluble coffee beverage composition had a 5-HMF content of below 250 ppm.
- The subject-matter of claim 1 of auxiliary request 1 involved an inventive step. D10 was the closest prior art. It did not disclose the required amount of 5-HMF. The skilled person seeking to improve the quality of the coffee beverage composition of D10 would not find any motivation in the art to reduce the 5-HMF content while maintaining the total and free mannose content.

Even if D17 were considered the closest prior art, the claimed subject-matter would still involve an inventive step. D17 did not explicitly disclose the required total mannose content of the coffee beverage composition; this could, however, be evaluated to be lower than required. The skilled person seeking to increase the total mannose content of the coffee beverage composition of D17 might have found in D32 the motivation to add the mannan oligomer hydrolysate disclosed therein. However, in view of the process conditions applied in D32 this mannan oligomer should contain 5-HMF in an amount exceeding the claimed level. Therefore if the skilled person had combined D32 with D17, he would have arrived at 5-HMF levels above the upper limit of claim 1. This meant that the combination of D32 with D17 did not lead to the claimed subject-matter. Contrary to the opponent's assertions, no calculation of the amount of 5-HMF could be plausibly based on D18, since the correlation of temperature and 5-HMF in figure 6 did not take into consideration the important factor "time". The 5-HMF level could also not be derived from Annex A, since extrapolating from the 5-HMF value after 60-minute extraction according to Annex A to the 30-second extraction of D32 was mere speculation.

- The subject-matter of claim 5 of auxiliary request 1 involved an inventive step. D6a, which was considered the closest prior art, did not disclose wet-milling to a mean particle size of 10 to 250  $\mu\text{m}$  or use of a cross-flow semi-permeable membrane for separation of the soluble coffee extract from insolubles and enzymes. The skilled person seeking to improve the process of D6a in

terms of process economy without compromising the quality of the soluble coffee extract would not have found any motivation in the prior art to wet-mill the coffee particles or to filter the extract using a cross-flow semi-permeable membrane. Contrary to the opponent's assertions, D8 taught the use of steam explosion in a commercially practical process and not wet milling. Although D7 and D24 disclosed the use of cross-flow semi-permeable membranes in the separation of components in a solution or in colloidal dispersions, they did not disclose their use in the separation of the ingredients present in coffee extracts.

XII. The arguments put forward by the opponent in its written submissions and during the oral proceedings which are relevant to the present decision may be summarised as follows:

- The subject-matter of claim 1 of auxiliary request 1 did not comply with Article 123(2) EPC in respect of the feature "less than 250 ppm on a total soluble coffee solids basis of 5-hydroxymethyl furfural (5-HMF)" and its combination with the feature "wherein the composition is a soluble coffee".
- The terms "soluble coffee" and "total mannose" in claim 1 of auxiliary request 1 lacked clarity.
- The subject-matter of claim 1 of auxiliary request 1 lacked novelty over D31, which was *prima facie* relevant and should be admitted into the proceedings. It disclosed soluble coffee beverage compositions in the broadest sense.

- Furthermore, the subject-matter of claim 1 lack novelty over a public prior use stemming from the commercial products disclosed in D10. Although the 5-HMF content was not indicated in D10, (i) soluble coffee products containing less than 250 ppm 5-HMF were commercially available (D17), and (ii) the 5-HMF content in a powdered soluble coffee decreased to below 250 ppm after 350 days after having been exposed to air on the first day (D29). Therefore, based on the balance of probabilities, i.e. what was more likely than not, powdered soluble coffee compositions which fell within the scope of claim 1 of auxiliary request 1 had existed before the priority date of the patent in suit.
  
- The subject-matter of claim 1 lacked an inventive step on the basis of the obvious combination of D17 (closest prior art) with D32. D17 disclosed a coffee beverage composition with the required 5-HMF level, but its total mannose content was too low. The skilled person seeking to increase the amount of mannose in the coffee composition of D17 would have found in D32 the motivation to add mannose (mannan oligomer hydrolysate) which had been produced with the aim of increasing the soluble coffee solids content. On the basis of the conditions used in D32 for the production of such a mannan and in the light of Annex A and D18 it could be concluded that the 5-HMF content in the mannan of D32 was such that its addition to the coffee beverage composition of D17 would give a final total 5-HMF level falling within the claimed range.
  
- The subject-matter of claim 5 lacked an inventive step in view of the obvious combination of D6a with

D8 and common general knowledge as represented by D7 and D24. D6a was the closest prior art. It did not disclose the wet-milling of the roast and ground coffee beans to a mean particle size of 10 to 250  $\mu\text{m}$  or the filtration of the coffee extract through a cross-flow semi-permeable membrane. Each of these distinguishing features solved a separate and independent problem, namely (i) increasing the solubilisation yield by increasing the contact surface of the coffee particles with the enzyme and (ii) optimising the process economy by separating insolubles and enzymes from the reaction mixture and recycling the latter. Increasing the contact surface by wet-milling the coffee particles to a mean particle size of 10 to 250  $\mu\text{m}$  was disclosed in D8, and filtration with a cross-flow semi-permeable membrane belonged to the general knowledge of the skilled person as represented in D7 and D24.

XIII. The patent proprietor requested that the opposition division's decision be set aside and that the patent be maintained on the basis of auxiliary request 1, or alternatively on the basis of any of auxiliary requests 2 to 15, all requests filed on 7 May 2014. The patent proprietor further requested that documents D21-D23, D25-D28 and D30, which were late-filed before the opposition division, and documents D31, D33, D34 and D7a, which were filed for the first time in appeal, not be admitted into the proceedings.

XIV. The opponent requested that the opposition division's decision be set aside and that the patent be revoked in its entirety. The opponent further requested that at least documents D31 and D32 be admitted into the proceedings and that auxiliary requests 3-8 and 12-15 not be admitted into the proceedings.

## Reasons for the Decision

1. Amendments - Article 123(2) EPC
  - 1.1 According to the opponent, claim 1 of auxiliary request 1 did not comply with Article 123(2) EPC in respect of the feature "less than 250 ppm on a total soluble coffee solids basis of 5-hydroxymethyl furfural (5-HMF)" and its combination with the feature "wherein the composition is a soluble coffee".
  - 1.2 The subject-matter of this claim derives from claim 1 as filed, whereby
    - the amount of 5-HMF of less than 1000 ppm on a total soluble coffee solids basis has been limited to less than 250 ppm; and
    - the coffee beverage composition is required to be a soluble coffee.
  - 1.3 Regarding the first limitation, claim 3 as filed discloses that the level of 5-HMF in the coffee beverage composition according to claim 1 or 2 is more preferably less than 250 ppm by weight of coffee solids. The opponent argued that claim 3 as filed could not support the amendment, as it did not specify the 5-HMF content on the basis of total **soluble** coffee solids, but rather on (total) coffee solids.

The board does not agree. In view of the dependency of claim 3 on claim 1, it is immediately evident to the skilled reader that one and the same basis for the 5-HMF content is intended in the two claims. That this is indeed the basis referred to in claim 1 is apparent

from the application as filed as a whole, e.g. experimental section page 18, lines 18/19, as filed: "Results are expressed on a total soluble coffee solids basis.", or the passage on page 11, lines 7-11, which also discloses 5-HMF levels on a total soluble coffee solids basis. Thus the first limitation is clearly and unambiguously disclosed in the application as filed.

1.4 As regards the limitation of the coffee beverage composition being a soluble coffee, it was not disputed that claim 5 as filed, being dependent on any one of claims 1 to 4, discloses the alternative that the coffee beverage composition is a soluble coffee.

1.5 But in addition, the combination of this limitation with a 5-HMF level of less than 250 ppm is clearly and unambiguously derivable from the application as filed in view of the dependency of claim 5 on claim 3. Thus it is immediately apparent that claim 5 discloses equivalent alternatives for each of which the 5-HMF levels listed in claim 3 apply, in particular the most preferred 5-HMF level of less than 250 ppm. Furthermore, the 5-HMF values measured in example 1 are well below the most preferred level of claim 3 as filed, and the sensorial evaluation is done on soluble coffee (example 11).

1.6 In conclusion, claim 1 of auxiliary request 1 fulfils the requirements of Article 123(2) EPC.

2. Clarity - Article 84 EPC

The opponent objected to the clarity of claim 1 of auxiliary request 1 and argued that the introduction of the feature "wherein the composition is a soluble coffee" in claim 1 rendered this claim unclear because

the term "soluble" was not at all clear in the context of this claim.

This term was, however, present in granted claim 5 and cannot be objected to under Article 84 EPC in view of decision G 3/14.

The same applies to the term "total mannose", the clarity of which had been objected to by the opponent in the context of claim 1 of the main request; the term is also present in claim 1 of auxiliary request 1.

### 3. Novelty - claim 1

The opponent objected to the novelty of the subject-matter of claim 1 of auxiliary request 1 on the basis of D31 and an alleged prior public use.

#### 3.1 Document D31

3.1.1 The patent proprietor objected to the admission of D31 into the proceedings. The opponent had submitted D31 only with its statement setting out the grounds of appeal, i.e. after the nine-month time limit mentioned in Article 99(1) EPC. According to Article 114(2) EPC, late-filed facts or evidence may be disregarded by the board. In the exercise of discretion under Article 114(2) EPC, one criterion for admitting a document is its *prima facie* relevance (see e.g. T 1002/92 and T 2542/10).

3.1.2 D31 relates to a method for the chemical characterisation of the high molecular weight material extracted from roasted Arabica coffee (see title). Thus, it does not relate to the production of coffee beverage compositions *per se*.



The Materials and Methods section of D31 discloses that different coffees were initially roasted and subsequently defatted and ground. For defatting, Soxhlet extraction with petroleum ether was used (page 1774, left-hand column, sections entitled "Coffee Roasting" and "Coffee Grinding and Defatting"). The roast and ground coffee was then treated as disclosed in the section entitled "Preparation of High Molecular Weight Material (HMWM)", namely extracted for 20 minutes at 80°C, filtered through a sintered glass filter, concentrated at 40°C under reduced pressure, and dialysed at 4°C (MW cutoff 12-14 kDa) with eight water renewals. Finally the retentate was freeze-dried giving the HMWM, which was subjected to detailed analysis (see tables 1 and 2 on page 1775).

- 3.1.3 It was not disputed by the patent proprietor that the HMWM had a 5-HMF, free mannose and total mannose content as required by claim 1.

However, the board agrees with the patent proprietor that the freeze-dried HMWM obtained by the process of D31 would not be considered by the skilled person as a soluble coffee beverage composition. The aim of D31 is the extraction of high levels of HMWM from coffee beans and the chemical characterisation of this HMWM, but not the preparation of a soluble coffee beverage composition. The process of D31, in particular the MW cutoff of 12-14 kDa employed for dialysis, removes substantially all of the components which provide the flavour and aroma to a composition which the skilled person would associate with a coffee beverage. Although the term "coffee beverage" is not defined in the patent in suit, this term implies the presence of components which are not present in the HMWM isolated in D31.

3.1.4 Since D31 does not concern a soluble coffee beverage composition, for this reason alone it is not *prima facie* relevant for the novelty of claim 1. Thus the board decided not to admit it into the proceedings, and the novelty objection based on D31 became moot.

3.2 The alleged public prior use

3.2.1 D10 shows in table II an example which relates to a coffee extraction process conducted at 180°C for 120 minutes. The conditions were sufficient to produce an extract of 15.5 wt% of total mannose and 2.54 wt% of free mannose. There is no disclosure of the 5-HMF level of the extract in this example, but the opposition division concluded that, based on the teaching of D18, the example would contain a 5-HMF amount of less than 1000 ppm and probably about 500 ppm.

Novelty over this example from table II was no longer an issue with regard to the subject-matter of claim 1 of auxiliary request 1. Firstly, the 5-HMF content in claim 1 now required is less than 250 ppm, and secondly, the patent proprietor filed experimental data (Annex A to the statement setting out the grounds of appeal) which showed that the extraction conditions used for this example of D10 produced soluble coffee extracts with amounts of 5-HMF far beyond the upper limit of 250 ppm and even 1000 ppm.

3.2.2 Rather, the opponent relied on an alleged public prior use based on a disclosure of D10 which relates to the analysis of commercial products of soluble coffee. In D10, industrial soluble coffees made from arabica and robusta roasted (table I) and 122 samples of commercial products sold as pure soluble coffee (table VII) were analysed for their free and total

carbohydrate contents. Among these soluble coffees, which were without any doubt commercialised before the priority date of the patent in suit, some had a mannose content of at least 15% based on the total weight of soluble coffee solids and a free mannose content of less than 50% by weight of the total mannose content. Thus, one of the samples "arabica-robusta (15:85)" in table I had a total mannose content of 16.30% and a free mannose content of 0.47%. Table VII indicates for 43 (class A) of the 122 samples a range of 10.2 to 19.7% for the total mannose, and a range of 0.13 to 2.62% for the free mannose content.

With respect to the 5-HMF content, not indicated in D10, the opponent pointed out that (i) soluble coffee products containing less than 250 ppm 5-HMF were commercially available (D17, table 1), and (ii) the 5-HMF content in a powdered soluble coffee decreased to below 250 ppm after 350 days after the coffee had been exposed to air on the first day (D29). Therefore, the opponent was of the opinion - based on the balance of probabilities, i.e. what is more likely than not - that powdered soluble coffee compositions which fell within the scope of claim 1 of auxiliary request 1 had existed before the priority date of the patent in suit.

- 3.2.3 When assessing an alleged prior use, one of the essential questions to be examined is what exactly was made available to the public.

As a preliminary remark, the board notes that apparently not all commercial soluble coffees have a high total mannose content as required by claim 1. On the contrary, as evident from table VII of D10 the vast majority of the 122 commercial samples had a total mannose content below 15 wt%. Also, a 5-HMF content

below 250 ppm appears to be rather the exception than the rule (D17, table 1).

The opponent has provided no evidence whatsoever that (i) there was a soluble coffee on the market which had the required combination of low 5-HMF and high total mannose content, or (ii) a commercial product with high mannose content had been stored under conditions long enough so that the 5-HMF content was below 250 ppm.

3.2.4 In view of the above, the board decided that the public prior use had not been substantiated.

3.3 In summary, the subject-matter of claim 1 of auxiliary request 1 is novel over the cited prior art.

4. Claim 1 - inventive step

4.1 The closest prior art

The board agrees with the opponent that D17 could be considered the closest prior-art document. D17 relates to the determination of the level of 5-HMF in commercially available instant coffees (see abstract). Table 1 on page 44 discloses an instant coffee entitled "Freeze dried A" which has a 5-HMF content of 220 ppm. D17 does not disclose the total mannose or free mannose content of the disclosed soluble coffee beverage composition. Taking into account that the amount of free mannose in commercially available instant coffee products was significantly lower than 50% (D10, table VII), the opponent assumed *arguendo* that the instant coffee product "Freeze dried A" shown in table 1 of D17 contained less than 15% total mannose. This constituted the only difference between this

product and the subject-matter of claim 1 of auxiliary request 1.

#### 4.2 The technical problem and its solution

The technical problem in the light of D17 is therefore to provide a soluble coffee beverage composition with an increased amount of bulk coffee material while maintaining a low level of 5-HMF.

The technical evidence of the patent (see in particular the table of paragraph [0066]) shows that the set technical problem has been successfully solved.

#### 4.3 Obviousness

4.3.1 The question which remains to be answered is whether the skilled person starting from the disclosure of D17 and intending to solve the technical problem set out above would find a motivation in the prior art or his common general knowledge to increase the content of total mannose to the claimed level, while maintaining the free mannose content and the 5-HMF level.

4.3.2 D32, referred to by the opponent, discloses a process for preparing mannan oligosaccharide compositions from spent coffee grounds obtained from a commercial percolation process (abstract, column 1, lines 6-12). Mannan oligosaccharide is an equivalent term for mannose as used in claim 1. The mannan oligosaccharide mixture disclosed in Table 5 results from the treatment of the spent coffee grounds at 180°C for 30 seconds and has a free mannose content below 50% by weight of the total mannose. D32 discloses that the mannan oligosaccharide mixture can be added to soluble coffee solids in order to increase the soluble coffee solids

content (column 1, lines 18-21; column 7, lines 38-53; example 4; claims 13 and 14).

- 4.3.3 Thus, according to the opponent, D32 provides the skilled person with the motivation to use the mannan oligosaccharide mixture as a bulk material in order to increase the total mannose content of the soluble coffee beverage composition of D17. In order to arrive at the content required by claim 1 the skilled person would simply have to add the necessary amount of mannan oligosaccharide mixture to the composition of D17.
- 4.3.4 The opponent, however, admitted that the method of D32 for the production of a mannan oligosaccharide mixture inevitably led to the production of high levels of 5-HMF. D32 does indeed disclose that the coffee grounds are treated in a water slurry at a temperature between 160°C and 260°C for about 6 to 60 seconds (column 5, line 49, to column 6, line 6). Especially the higher temperatures are known to lead to high levels of 5-HMF in the product (see Annex A filed by the patent proprietor and D18: page 7, left column, figure 6). Thus, the addition of the mannan oligosaccharide mixture to the freeze-dried coffee of D17 will modify its 5-HMF content. However, D32 does not disclose the 5-HMF level in the mannan oligosaccharide mixture.
- 4.3.5 The opponent relied in particular on the fourth embodiment in table 5 of D32, which discloses the treatment of spent coffee grounds at 180°C for 30 seconds. It tried to calculate the 5-HMF level for that embodiment by using the correlation between the extraction temperature and the amount of 5-HMF produced as disclosed in figure 6 of D18. However, no conclusion can be drawn from this figure as to the amount of 5-HMF produced at the specific conditions of D32, namely

180°C for 30 seconds, since D18 does not deal with the time, another essential parameter in 5-HMF production (see Annex A). Also, the opponent's assumptions based on comparative example 10 of the patent in suit cannot demonstrate that a combination of D17 with D32 would lead to a composition falling within the scope of claim 1. On the contrary, the calculations presented by the opponent in this context at the oral proceedings resulted in a composition falling outside claim 1 of auxiliary request 1.

- 4.4 In summary, it has not been credibly shown that the addition of a mannan oligosaccharide mixture of D32 to the soluble coffee of D17 will keep the 5-HMF amount at a level of less than 250 ppm. Rather, it appears that the opponent's inventive step objection is based on hindsight.

Therefore the board decided that the subject-matter of claim 1 of auxiliary request 1 is based on an inventive step when starting from D17 as the closest prior art.

- 4.5 The same conclusion would be reached if, as suggested by the proprietor, D10 were considered the closest prior art. However, the opponent did not rely on D10 for the assessment of inventive step at the oral proceedings, and so there appears to be no need to further elaborate on this issue.

5. Claim 5 - novelty

As regards the subject-matter of claim 5 (process claim), no novelty objection was raised by the opponent, and the board saw no reason to contest the novelty of the subject-matter of this claim.

6. Claim 5 - inventive step

6.1 The closest prior art

Both parties agreed that D6a was the closest prior-art document for the claimed process. D6a discloses a method for producing soluble coffee which comprises the steps of:

- (1) filling a sealed container allowing to be heated at high temperature with raw coffee beans and water and wet-heat-roasting the beans under pressure at a temperature of higher than 160°C,
- (2) pulverising the roasted coffee beans obtained and allowing enzyme reaction thereof with one or more plant polysaccharidases selected from the group consisting of galactomannanase, mannanase, cellulase and pectinase,
- (3) obtaining a coffee extract from the slurry after the enzyme reaction, and
- (4) drying the coffee extract into a soluble solid (claim 5, paragraph [0012]).



D6a further discloses that:

- the wet-roasted coffee beans are pulverised in step (2) to a particle size suitable for enzyme reaction (page 9, lines 15-20);
- the coffee extract of step (3) is obtained from the slurry after the enzyme reaction by filtration (page 10, lines 23-24); and
- the filter has a pore size of 100 mesh, i.e. 149  $\mu\text{m}$  (examples 1-6).

Thus, the subject-matter of claim 5 differs from the disclosure of D6a in that it requires:

- (i) combining roasted and ground coffee with water,
- (ii) wet-milling the roasted and ground coffee to a mean particle size of 10 to 250  $\mu\text{m}$ , and
- (iii) circulating the reaction mixture through a cross-flow semi-permeable membrane separation device wherein the membrane pore size is less than 0.8  $\mu\text{m}$ .

6.2 The technical problem and its solution

6.2.1 The board agrees with the patent proprietor that the technical problem underlying the process of claim 5 in the light of D6a is the provision of a process improved in terms of process economy without compromising the product quality.

The combination of the features of claim 5 allows for higher yields and lower operational and capital costs in view of the possibility to increase the yield of the soluble coffee solids and for the eventual re-use of enzyme(s). The finished extract is essentially devoid of enzyme, off-flavours, oil or particulates (see patent, paragraphs [0013], [0014], [0036], [0040]-[0042] and [0044]).

The patent in suit contains sufficient technical evidence in the examples to show that the technical problem is solved.

- 6.2.2 The opponent contested that the claimed process would lead to an increased yield of soluble coffee solids by comparing the yield disclosed in example 1 of D6a (sample D in table 2 has a soluble coffee solids yield of 46.2%) with the yields reported in example 8 of the patent.

However, as pointed out by the patent proprietor during the oral proceedings, the solubilisation yields reported in the examples - particular reference was made to the table of paragraph [0106] - concerned only the roast and ground coffee. In order to appreciate the total yield one would also have to take into consideration the solubilisation yield during the initial roasting of the coffee beans, which according to paragraph [0052] was 25%. It is therefore plausible that the total yield obtained by the process of claim 5 is higher than the total yield obtained by the process of D6a.

- 6.2.3 The opponent also objected to the definition of the problem as set out by the patent proprietor. In this context it referred to its submissions before the

opposition division (letter of 25 March 2013, in particular page 25), where two independent problems were identified. In the board's understanding, the first was the improvement of the solubilisation yield, and the second the improvement of the separation of the coffee extract from the slurry after enzyme reaction and the optimisation of the process economy (omitting any element of the solution). The board does not agree. There is an undisputed contribution of both the solubilisation and the separation steps to the overall optimisation and economy of the process which cannot artificially be separated. Therefore, the above-defined problem (point 6.2.1) is indeed the objective problem.

### 6.3 Obviousness

The question which remains to be answered is whether the skilled person starting from the disclosure of D6a and intending to solve the objective technical problem would find in the prior art a motivation to modify the process of D6a in such a manner as to arrive at the process of claim 5.

- 6.3.1 The opponent referred to D8. This document discloses a method for producing coffee extracts, where an aqueous mixture of ground and roast coffee is briefly contacted with steam under pressure and elevated temperatures and then treated with a hydrolytic enzyme or mixture of enzymes (abstract, column 2, lines 64-68; claim 1). The extract is separated from the insoluble residues by centrifugation (column 4, lines 5-6). D8 also discloses:

*"Particle size reduction enhances enzymatic contact. Increasingly smaller particle sizes, even micro-pulverisation to less than 100 microns, gave*

*increasingly greater yields as substrate pre-treatment for enzymatic hydrolysis but insufficient to be commercially practical. More extreme substrate pre-treatment was necessary to provide a larger area for enzymatic contact and studies were conducted using ground roasted coffee which was subjected to steam explosion and enzymatic hydrolysis (Example 2)."*  
(column 4, lines 11-20).

Thus D8 disqualifies micro-pulverisation to less than 100 µm as not being commercially practical and points to a different treatment, namely steam explosion. Thus D8 does not give the skilled person any hint to use wet-milling to reduce the roast and ground coffee to a mean particle size of 10 to 250 µm, let alone to use the cross-flow semi-permeable membrane separation device of claim 5. In fact, it discloses the use of centrifugation for separation purposes (column 4, lines 5-10).

6.3.2 The opponent argued that the use of a semi-permeable membrane was common general knowledge, as evidenced by D7 and D24.

D7 relates to immobilised-enzyme technology (heading chapter 4.3). In this technology the enzyme may be contained in a semi-permeable membrane filtration device (page 187, lines 3-4). This is different from the separation by membrane filtration of enzymes from a reaction mixture such as the soluble coffee extract of claim 5, and therefore D7 is irrelevant.

D24 is an excerpt from a textbook relating to separation processes in the food and biotechnology industries and in the board's view also constitutes common general knowledge for a person skilled in coffee

production. D24, page 65, Figure 3.1, discloses that semi-permeable membranes having a pore size of 0.001 to 0.1  $\mu\text{m}$  (ultrafiltration), i.e. smaller than 0.8  $\mu\text{m}$  which is the upper limit in step (v) of claim 5, are suitable for separating proteins (enzymes) from smaller molecules. Page 66, under section "3.2 Terminology", lines 3-4, discloses that in most cases the feed flows in a direction parallel to the membrane surface and the term cross-flow filtration is used to describe such applications. It can thus be concluded that the use of a cross-flow semi-permeable membrane separation device with a pore size of less than 0.8  $\mu\text{m}$  in the production of soluble coffee extracts belongs to the general technical knowledge of the skilled person.

However, the combination of D6a with the common general knowledge as evidenced by D24 does not lead to the subject-matter of claim 5 since the wet-milling of the roast and ground coffee to a mean particle size of 10 to 250  $\mu\text{m}$  is not part of it. It is in fact the combination of wet-milling and the specific separation technique which is important in the present case. As already pointed out in the decision under appeal, there is no hint in the prior art that the combination of these two measures would actually solve the objective technical problem.

6.4 On the basis of the above, the subject-matter of claim 5 is not obvious in view of the prior art and the common general knowledge. Therefore claim 5 involves an inventive step.

7. The dependent claims

Dependent claims 2 to 4 correspond to preferred embodiments of independent product claim 1, and

dependent claims 6 to 31 correspond to preferred embodiments of independent process claim 5. They are therefore *mutatis mutandis* allowable.

8. Since auxiliary request 1 is allowable, any discussion of the further auxiliary requests becomes redundant.
9. Since the opponent no longer relied on D7a, D21-D23, D25-D28, D30, D33 and D34 at the oral proceedings, the board saw no need to decide on the patent proprietor's request that these documents not be admitted into the proceedings.
10. Amended description

During the oral proceedings the patent proprietor submitted an amended page 3 of the description, bringing it into accordance with the subject-matter of the claims of auxiliary request 1 which had been considered allowable. The opponent did not raise any objections, nor did the board see any reason to raise any objection of its own.

## Order

### For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the opposition division with the order to maintain the patent on the basis of the following documents:
  - claims 1 to 31, filed as first auxiliary request on 7 May 2014;
  - description pages:
    - pages 2 and 4 to 16 as filed during the oral proceedings before the opposition division on 25 April 2013
    - page 3 as filed during the oral proceedings before the board on 4 August 2017.

The Registrar:

The Chairman:



M. Cañueto Carbajo

W. Sieber

Decision electronically authenticated