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**Datasheet for the decision
of 24 March 2023**

Case Number: T 0446/19 - 3.3.08

Application Number: 11745831.5

Publication Number: 2591123

IPC: C12N9/28, C12Q1/40, C12Q1/00

Language of the proceedings: EN

Title of invention:
METHOD FOR IDENTIFYING A PEPSIN RESISTANT ALPHA AMYLASE

Patent Proprietor:
DuPont Nutrition Biosciences ApS

Opponents:
Novozymes A/S
DSM Nutritional Products AG

Headword:
Pepsin resistant alpha amylase in feed/DUPONT NUTRITION
BIOSCIENCES

Relevant legal provisions:
EPC Art. 83, 56
RPBA Art. 12(4)

Keyword:

Admissibility of appeal - opponent 2 - (no)

New lines of attacks - not admitted into the proceedings

Main request - meets the requirements of the EPC (yes)

Decisions cited:

Catchword:



Beschwerdekammern
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Case Number: T 0446/19 - 3.3.08

D E C I S I O N
of Technical Board of Appeal 3.3.08
of 24 March 2023

Appellant: Novozymes A/S
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Decision under appeal: **Interlocutory decision of the Opposition
Division of the European Patent Office posted on
13 December 2018 concerning maintenance of the
European Patent No. 2591123 in amended form**

Composition of the Board:

| | |
|-------------------|---------------|
| Chairwoman | T. Sommerfeld |
| Members: | D. Pilat |
| | A. Bacchin |

Summary of Facts and Submissions

- I. European patent No. 2 591 123 is based on European patent application No. 1 1745 831.5, originally filed as international patent application published as WO 2012/004759. The patent was opposed on the grounds of Article 100(a) in conjunction with Articles 54 and 56 EPC, and of Articles 100(b) and (c) EPC. The opposition division decided that the patent could be maintained in amended form on the basis of auxiliary request 4.
- II. Opponents 1 and 2 each filed a notice of appeal against the decision of the opposition division. Opponent 1 submitted a statement of grounds of appeal, whereas no statement of grounds of appeal was received from opponent 2.
- III. By a communication from the board dated 9 May 2019, opponent 2 was informed that its appeal would be rejected as inadmissible pursuant to Article 108, third sentence, EPC in conjunction with Rule 101(1) EPC.
- IV. The board summoned the parties to oral proceedings and sent a communication pursuant to Article 15(1) RPBA, providing its provisional opinion on some issues.
- V. Oral proceedings took place on 24 March 2023, in the absence of opponent 1 (appellant) and opponent 2 (party as of right), who had both informed the board that they would not be represented at oral proceedings.
- VI. The main request was filed by the patent proprietor (respondent) with the reply to the appeal and re-submitted, with a corrected dependency of claim 15,

with letter dated 10 March 2023. Apart from this dependency correction, the claims of the main request are identical to the claims filed as auxiliary request 4 before the opposition division and found allowable in the appealed decision. Independent claims 1 to 7, 11, 13, 14, 16 and 17 of the **main request** read as follows:

"1. A method for preparing a feed supplement for a monogastric animal comprising admixing a pepsin resistant alpha amylase with at least one physiologically acceptable carrier selected from the group consisting of maltodextrin, limestone (calcium carbonate), cyclodextrin, wheat or a wheat component, sucrose, starch, Na₂SO₄, Talc, PVA, sorbitol, benzoate, sorbate, glycerol, sucrose, propylene glycol, 1,3-propane diol, glucose, parabens, sodium chloride, citrate, acetate, phosphate, calcium, metabisulfite, formate and mixtures thereof; wherein the pepsin resistant amylase has an amino acid sequence:

- i) as set forth in SEQ ID No. 1;
- ii) having at least 85% identity to SEQ ID No. 1;
- iii) which is produced by expression of a nucleotide sequence comprising the sequence of SEQ ID No. 2;
- iv) which is produced by expression of a nucleotide sequence which differs from SEQ ID No. 2 due to the degeneracy of the genetic code; or
- v) which is produced by expression of a nucleotide sequence which has at least 70% identity to SEQ ID No. 2.

2. A feed supplement which is:

- a) a poultry feed supplement comprising a pepsin resistant alpha amylase; or
- b) a feed supplement for monogastric animals comprising a pepsin resistant alpha amylase and at least one

physiologically acceptable carrier selected from the group consisting of maltodextrin, limestone (calcium carbonate), cyclodextrin, wheat or a wheat component, sucrose, starch, Na₂SO₄, Talc, PVA, sorbitol, benzoate, sorbate, glycerol, sucrose, propylene glycol, 1,3-propane diol, glucose, parabens, sodium chloride, citrate, acetate, phosphate, calcium, metabisulfite, formate and mixtures thereof; wherein the pepsin resistant amylase has an amino acid sequence:

...

[i) to v) as in claim 1]

3. A feedstuff for a monogastric animal comprising a pepsin resistant alpha amylase, wherein said feedstuff comprises less than 3000 units of alpha amylase per kilogram feed; wherein the pepsin resistant amylase has an amino acid sequence:

...

[i) to v) as in claim 1]

4. A method for preparing a feed supplement for a monogastric animal comprising admixing a pepsin resistant alpha amylase with at least one physiologically acceptable carrier selected from the group consisting of maltodextrin, limestone (calcium carbonate), cyclodextrin, wheat or a wheat component, sucrose, starch, Na₂SO₄, Talc, PVA, sorbitol, benzoate, sorbate, glycerol, sucrose, propylene glycol, 1,3-propane diol, glucose, parabens, sodium chloride, citrate, acetate, phosphate, calcium, metabisulfite, formate and mixtures thereof; wherein the pepsin resistant alpha amylase on gap alignment with SEQ ID No. 1 comprises any one or more of the following amino acids selected from the group consisting of: K88; I103; H133; Y175; Y290; F292; R442

and H450, wherein the amino acid numbering relates to SEQ ID No. 1.

5. A feed supplement which is:

- a) a poultry feed supplement comprising a pepsin resistant alpha amylase; or
 - b) a feed supplement for monogastric animals comprising a pepsin resistant alpha amylase and at least one physiologically acceptable carrier selected from the group consisting of maltodextrin, limestone (calcium carbonate), cyclodextrin, wheat or a wheat component, sucrose, starch, Na₂SO₄, Talc, PVA, sorbitol, benzoate, sorbate, glycerol, sucrose, propylene glycol, 1,3-propane diol, glucose, parabens, sodium chloride, citrate, acetate, phosphate, calcium, metabisulfite, formate and mixtures thereof;
- wherein the pepsin resistant alpha amylase ... [as in claim 4]

6. A feedstuff for a monogastric animal comprising a pepsin resistant alpha amylase, wherein said feedstuff comprises less than 3000 units of alpha amylase per kilogram feed; wherein the pepsin resistant alpha amylase ... [as in claim 4]

7. A method for preparing a feedstuff for a monogastric animal comprising mixing feed supplement according to any one of claims 2, or 5 with one or more feed materials.

(...)

11. A feedstuff for a monogastric animal prepared by the method of any one of claims 7 to 10 or comprising the feed supplement of any of claims 2, or 5.

(...)

13. A method of increasing weight gain in poultry or swine comprising feeding said poultry or swine a feedstuff comprising a pepsin resistant alpha amylase; wherein the pepsin resistant amylase has an amino acid sequence:

...

[i) to v) as in claim 1]

14. Use of a feed supplement comprising a pepsin resistant alpha amylase for improving monogastric animal performance and/or increasing energy absorption and/or feed efficacy and/or for improving weight gain in a monogastric animal; wherein the pepsin resistant amylase has an amino acid sequence:

...

[i) to v) as in claim 1]

(...)

16. A method of increasing weight gain in poultry or swine comprising feeding said poultry or swine a feedstuff comprising a pepsin resistant alpha amylase; wherein the pepsin resistant alpha amylase ... [as in claim 4]

17. Use of a feed supplement comprising a pepsin resistant alpha amylase for improving monogastric animal performance and/or increasing energy absorption and/or feed efficacy and/or for improving weight gain in a monogastric animal; wherein the pepsin resistant alpha amylase ... [as in claim 4]"

Claims 8 to 10, 12, 15 and 18 are directed to different embodiments of the claims they depend on.

VII. The documents cited in this decision include the following:

D3: Gracia M.I, *et al*, Poultry Science, vol. 82, pages 436 to 442, 2003

D4: WO 03/049550

D8: WO 98/26078

E1: Witness statement of Eduardo Antonio Della Pia

VIII. The arguments of the **appellant**, insofar as relevant to the present decision, may be summarised as follows:

Admittance of the main request

The main request, corresponding to auxiliary request 4 of the decision under appeal, should not have been admitted by the opposition division because it was filed very late, at oral proceedings, and was based on another request which itself was late filed and should not have been admitted either.

Sufficiency of disclosure (Article 83 EPC)

Since the method of identifying a pepsin-resistant alpha-amylase of granted claim 1 was found to be insufficiently disclosed in the decision under appeal, the same conclusion had to apply to the methods using a pepsin-resistant alpha amylase according to granted claims 4 to 18. The patent failed to disclose any means of identifying a "pepsin resistant alpha amylase", or an example of such an alpha amylase. Based on the structural definition set out in claim 1 and the definition given in paragraph [0018] for the expression

"pepsin resistant alpha amylase", the skilled person could only establish by trial and error which of the many alpha-amylases was actually pepsin-resistant. The skilled person could therefore not identify a "pepsin resistance alpha amylases" and implement the claimed method without undue burden. Moreover, of the five alpha amylases tested in example 1 of the patent, at least two, LAT and FRED, had amino acid sequences corresponding to the structural definition of the claims but neither of them was pepsin-resistant according to the definition of the patent in paragraphs [0016] and [0018].

Inventive step (Article 56 EPC)

Document D3 or document D4 represented the closest prior art for the method of claim 1.

The difference between the disclosures of documents D3 and D4 and claim 1 was the use of a specific pepsin resistant alpha amylase (LAT) having the sequence of SEQ ID No. 1 or structurally defined variants thereof. No technical effect could be attributed to this difference. The alpha-amylase was not shown in the patent to resist to strong acidic pH, in the order of 2 to 3, and to proteolytic degradation by pepsin (paragraph [0014]), and to retain increased activity with improved uptake of starch metabolites (paragraph [0015]). Example 1 of the patent could not be considered a valid approximation of the conditions found in the gastrointestinal tract of monogastric animals and so did not demonstrate that the selected pepsin-resistant alpha-amylase achieved the technical effect of improving the performance of a monogastric animal and/or increasing energy intake and/or feed efficiency and/or improving weight gain in a

monogastric animal. On the contrary, document E1 showed that the LAT alpha amylase retained no significant amylase activity when the value of the pH was set to 3.0. Since different amount and type of alpha amylases were compared in Example 2, the increased body weight gain and feed conversion ratio illustrated in Figures 9 and 10 could not confirm this effect either. The technical problem as formulated in the decision under appeal was not solved across the whole scope of claim 1, as it was not plausible that the large number of structurally different pepsin resistant alpha amylases, having almost no structural limitation or being closely related to the benchmark/reference alpha amylase would be capable of "improving monogastric animal performance and/or increasing energy absorption and/or feed efficacy and/or improving weight gain in a monogastric animal". Hence the technical problem had to be reformulated in less ambitious terms as "the provision of an alternative alpha amylase-containing feed supplement for monogastric animals".

Starting from document D3 or D4, and faced with the reformulated objective technical problem, the skilled person would have been motivated to exchange the alpha amylase of document D3 or D4 with other commercially available alpha amylases such as LAT, or would have combined document D3 with document D8, and would have arrived at the subject-matter of claim 1 in an obvious manner. Document D8 related to feed additive compositions containing such amylases and provided an independent motivation to exchange the alpha amylase of document D3.

IX. The arguments of the **respondent**, insofar as relevant to the present decision, may be summarised as follows:

Admittance of the main request

The main request, corresponding to auxiliary request 4 of the decision under appeal, was correctly admitted by the opposition division into the proceedings. The amendments were made in direct response to the fact that, at oral proceedings, the opposition division had deviated from its preliminary opinion.

Admittance of new lines of attack

The new lines of attack against claims 4 to 6 and 16 and 17 under Article 83 EPC and against claims 4 to 6 and 16 and 17 under Article 56 EPC were raised for the first time in the statement of grounds of appeal and should therefore not be admitted into the appeal proceedings. Appellant's objection under Article 56 against item v) of the claims was also raised for the first time in appeal.

Sufficiency of disclosure (Article 83 EPC)

There were no serious doubts substantiated by verifiable facts that a skilled person could carry out the invention. On the contrary, document E1, submitted by the appellant, provided evidence that a skilled person could adapt the pepsin-resistant assay described in the patent, with common general knowledge, so that the claimed invention could be performed. The skilled person could clearly identify pepsin resistant alpha amylases without undue burden. Methods for identifying amino acid sequences and for measuring pepsin resistance were disclosed (patent, paragraphs [0311] to [0320] and [0228]). Finally, the claimed subject-matter did not require the use of a "pepsin resistant" alpha

amylase in accordance with the definition set out in paragraph [0018] of the patent.

Inventive step (Article 56 EPC)

Document D3 represented the closest prior art. It differed from the claimed subject-matter in that a different alpha amylase was used.

Example 2 of the patent showed that the use of the LAT amylase in living poultry (broiler) resulted in statistically significant weight gain compared with the control LTAA amylase and improved feed conversion (Example 2, patent, paragraph [0463] and Figures 9 and 10). The pepsin resistant alpha amylase used in claim 1 was shown to achieve a better performance than the benchmark reference alpha amylase (LAAT) and this was attributed to the pepsin resistance of the enzyme. Appellant's allegation that the claimed invention provided no technical effect was not supported by any comparative data. The objective technical problem had therefore to be seen as to improve the weight gain and the feed conversion ratio (FCR) in monogastric animals. The solution to this problem was to use pepsin resistant alpha amylases or structurally related defined variants thereof in feed.

The objective problem was solved across the entire scope of the claim. There was no evidence to support appellant's doubt that the claimed invention could not solve the technical problem posed.

There was no teaching in document D3 of pepsin resistance nor any motivation to seek to improve weight gain. Document D4 related to the use of an amylase for degrading starch in an animal feed. Document D8 did not

use pepsin resistant alpha amylases in feedstuffs and in fact did not teach that any of the enzymes disclosed therein were pepsin resistant. Hence none of the prior art documents taught the use of pepsin resistant alpha amylases for improving the weight gain and FCR in monogastric animals or feedstuffs for monogastric animals comprising the same. Accordingly, in view of documents D3, D4 and D8, taken alone or in combination, the claimed solution involved an inventive step under Article 56 EPC.

- X. The final requests of the parties, as far as relevant for the present decision, were the following:

Both the appellant and the party as of right requested that the decision of the opposition division be set aside and that the patent be revoked.

The respondent requested that the decision under appeal be set aside and the patent be maintained as upheld by the opposition division but with the corrected claims submitted with letter of 10 March 2023 as main request, or, alternatively on the basis of the claim sets of auxiliary requests 1 to 3, filed as auxiliary requests 11 to 13 with the reply to the grounds of appeal but with the corrected claims submitted with letter of 10 March 2023, or auxiliary request 4, filed with letter of 10 March 2023, or auxiliary requests 5 to 8, filed as auxiliary requests 14 to 17 with the reply to the grounds of appeal, or auxiliary request 9, filed with letter of 10 March 2023. It further requested that the new arguments filed by the appellant with the grounds of appeal regarding insufficiency of disclosure and the breadth of the claims in the context of inventive step not be admitted into the proceedings.

Reasons for the Decision

Admissibility of opponent 2's appeal

1. Opponent 2 filed a notice of appeal but did not submit any statement of grounds of appeal. No written statement setting out the grounds of appeal was received from the appellant within the time limit provided by Article 108, third sentence, EPC in conjunction with Rule 126(2) EPC, nor did its notice of appeal nor any other document filed contain anything that could be regarded as a statement of grounds of appeal according to Article 108 EPC and Rule 99(2) EPC. Further, as no observation was filed in reaction to the board's communication, dated 9 May 2019, on the preliminary finding of inadmissibility of the appeal, the appeal is rejected as inadmissible (Rule 101(1) EPC). Accordingly, opponent 2 is not appellant but party as of right in these appeal proceedings.

Admittance of the main request

2. In its statement of grounds of appeal, the appellant argued that the main request, which was filed as auxiliary request 4 during oral proceedings before the opposition division, should not have been admitted into the proceedings.
 - 2.1 The board understands this as a request to reverse the opposition division's decision on the admittance of this claim request. There is however no legal basis in the EPC for retroactively excluding in appeal proceedings a claim request which has already been admitted in opposition proceedings and which has been decided in substance by the opposition division (see e.g. decision T 858/17, reasons point 2.2 and Case Law

of the Boards of Appeal, 10th edition 2022, in the following "Case Law", V.A.3.4.4). Given that the very aim of the appeal proceedings is the judicial review of the decision under appeal according to Article 12(2) RPBA, such a claim request is automatically part of the appeal proceedings and is to be dealt with by the board in substance.

3. Hence the main request forms part of the appeal proceedings.
4. A corrected version of the main request was filed on 10 March 2023 to clarify a clerical error in the dependency of claim 15 of the main request. No issues as to admittance were raised, so that in the following reference is made to the corrected version.

Admittance of new lines of attack raised under Article 83 EPC and Article 56 EPC (Article 12(4) RPBA)

5. Pursuant to Article 12(4) RPBA 2007, the admission of *inter alia* new lines of attack into the appeal proceedings is at the board's discretion and may be refused if it is concluded that these new lines of attack should have been presented or were not admitted during opposition proceedings.
6. With its statement of grounds of appeal, the appellant submitted new lines of attack against claims 4 to 6, 16 and 17 of the main request in the context of Articles 83 and 56 EPC. It also raised new objections under Article 56 EPC against claim 1, item v).
7. The new lines of attack against claims 4 to 6, 16 and 17 were directed to the feature defining the pepsin resistant amylase by the wording:

"on gap alignment with SEQ ID No. 1 comprises any one or more of the following amino acids selected from the group consisting of K88; /103; H133; Y175; Y290; F292; R442 and H450, wherein the amino acid numbering relates to SEQ ID No. 1"

- 7.1 Under Article 83 EPC, the appellant submitted for the first time that, according to this definition, the pepsin resistant amylase in any one of claims 4 to 6 and 16 and 17 had to have only one amino acid in common with SEQ ID No. 1. The skilled person had therefore to establish, through trial and error, whether the vast range of alpha amylase sequences, which were structurally encompassed, were also pepsin resistant. This constituted an undue burden and thus violated Article 83 EPC.
- 7.2 Under Article 56 EPC, the appellant argued that the vast diversity of amylase sequences covered by this wording would not solve the objective technical problem across the entire scope claimed.
8. The appellant moreover argued that it was even less plausible that an alpha amylase fulfilling the alternative criterion of claim 1, item v, namely one *"which is produced by expression of a nucleotide sequence which has at least 70% identity to SEQ ID No. 2"*, due to the codon degeneracy, would solve the objective technical problem across the entire scope claimed.
9. The board notes that, although these definitions were present in the granted claims (granted claims 7 and 8 referring back to claims 4 to 6), these lines of attack were introduced for the first time during appeal

proceedings and the appellant provided no justification as to why these attacks were not submitted earlier. Since these arguments were neither raised in opposition proceedings nor constituted a further development of an earlier argument, absent any justification, the board decides to exercise its discretion not to admit these new lines of attack into the proceedings (Article 12(4) RPBA 2007).

Main request - Article 83 EPC

10. Article 83 EPC stipulates that the application must disclose the invention in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art.

11. The patent provides a pepsin resistant amylase defined by its structure (amino acid and nucleic acid sequences, paragraph [0228]) including variants thereof with a given sequence homology. It discloses methods for identifying adequate sequences (paragraphs [0311] to [0320]), for identifying and measuring pepsin resistance (paragraphs [0116] to [0141]), and teaches how to select pepsin resistant alpha amylase (paragraph [0016]). In combination with common general knowledge, the patent thus provides sufficient guidance for the identification of pepsin resistant alpha amylase characterised by the structural features according to the claims (Case law, II.C.4.1, fourth paragraph). The experimental data contained in document E1, submitted by the appellant, moreover constitutes evidence that the skilled person would have been able to adapt the method described in the patent, on the basis of his common general knowledge, to identify whether or not a candidate alpha amylase structurally fulfilled the requirements claimed and would have then be able to

select among these alpha amylase variants those with an increased relative pepsin resistance compared to a reference alpha amylase. Thus, in the absence of evidence to the contrary, the board is convinced that the skilled person would have been able, without undue burden, to identify the alpha amylases as defined in claim 1.

12. Moreover, none of the claims requires that a minimum percentage of enzymatic activity be retained. In this context, the board disagrees with the appellant's argument that the "pepsin resistant alpha amylase" used in the claims has to be defined in accordance with paragraph [0018] of the patent. Indeed, the wording and expressions of the claims must generally be interpreted in their broadest technical sense by a skilled reader. A skilled person who comes across the expression "pepsin resistant alpha amylase" in the claims needs not to consult the description for a selected and more specific definition as this term is self-explanatory and requires no interpretation. Since the alpha-amylases of the claims do not need to achieve any particular degree of pepsin resistance, the broadest possible meaningful definition for this feature is adopted, meaning that the alpha-amylase must have at least some increased resistance to pepsin compared to a reference alpha-amylase.

13. The fact that Example 1 disclosed at least two alpha amylases, LAT and FRED, complying with the structural requirements of claim 1(i) and (ii) but which were not pepsin resistant according to the definition in paragraphs [0016] and [0018] of the patent, is not detrimental for sufficiency of disclosure. First, as indicated above, the functional limitation of the claims is not to be restricted to the definition of

paragraphs [0016] and [0018] of the patent. Second, the fact that an amylase fulfils the structural requirements of the claim does not necessarily imply that it also fulfils its functional requirements: otherwise these requirements would be redundant. In any event, the skilled person would be in a position, based on the patent's teachings, to determine if an amylase fulfilling the structural requirements of the claim also fulfilled the functional requirements.

14. Finally, contrary to the appellant's arguments, the board disagrees that the present claims require the use of the specific method of granted claim 1 for selecting and identifying a pepsin-resistant alpha-amylase for use in the claimed methods. The method described in Example 1 would be sufficient to determine whether or not an alpha-amylase shows some degree of pepsin resistance.
15. It is true that the experimental evidence provided in document E1 demonstrates that the pepsin resistance assay described in Example 1 of the patent results in a final incubation pH of 4.8 or 4.3, rather than an incubation pH of 3 as in granted claim 1, but this has no bearing on the claimed subject-matter of the main request, as none of the claims specifies any range of pH values to be applied when evaluating and selecting the pepsin resistant alpha-amylases to be used. Document E1 in fact demonstrates that a skilled person could easily adapt the pepsin resistance assay described in the patent with common knowledge so that an *in vitro* assessment of pepsin resistance could also be performed.
16. Hence, in view of the evidence on file, there are no serious doubts substantiated by verifiable facts that,

based on the teachings in the patent, the skilled person is able to carry out the invention. The subject-matter of the main request complies with the requirements of Article 83 EPC.

Inventive step (Article 56 EPC)

Closest prior art

17. The present invention relates to pepsin resistant alpha amylases and their advantageous use as feed supplements (patent, paragraphs [0001], [0002] and [0013]).
18. In the appealed decision, documents D3 or D4 were selected as closest prior art. This choice is not disputed by the parties and the board sees no reason to disagree either.

Objective technical problem

19. The difference between the disclosure of document D3 and the method of claim 1 is that the latter makes use of a specific pepsin resistant alpha amylase (LAT) having the sequence of SEQ ID No: 1 or structural variants thereof. The same difference exists between claim 1 and document D4. This finding is undisputed.
20. There was however disagreement as to the technical effect of this difference. While the appellant contended that there was no evidence in the patent or elsewhere that this difference achieved a technical effect, the respondent argued that pepsin resistant alpha amylases as claimed achieved a better performance in feed than the reference alpha amylase (LAAT), an effect which was assigned to the pepsin resistance of the enzyme.

21. The board agrees with the respondent and the opposition division as regards the technical effect associated with the distinguishing feature in relation to the closest prior art.

22. It is true that the results obtained in the patent cannot be directly compared to those of document D3, which uses 1-day male Cobb and an alpha-amylase at a concentration of 1720 U/kg diet instead of a day-old chick male broiler (Ross 308) and an alpha amylase at a concentration of 2000 U or 100 U/kg of feed. However, Example 2 of the patent tests the two amylases in the feed having equivalent enzymatic performance, based on laboratory trials, in the same species of male broiler. It constitutes thus the best possible comparison for demonstrating that a technical effect has been achieved. Figure 9 of the patent establishes that a pepsin resistant alpha amylase (LAT) resulted in statistically significant weight gain (2,65%) compared with the control amylase LTAA (2,09%) on animals receiving feed comprising an equivalent in enzymatic performance of alpha amylase compared to animals receiving feed without alpha amylase. Figure 10 of the patent shows an improved feed conversion, where feed conversion is the amount of feed needed to produce 1 kg of animal (the inverse of feed efficacy), on animal receiving feed: LTA (-3,95%), LTAA (-2,20%) compared to animals receiving feed without alpha amylase.

23. Contrary to the appellant's arguments as regards Example 2, the board considers that it is scientifically reasonable and appropriate to compare pepsin resistance of different alpha amylases in a feed by applying the same value of activity in enzymatic units per kg of feed while keeping the other experimental conditions identical. Although the alpha

amylase from *Bacillus amyloliquefaciens* LAAT differs in structure from *Bacillus licheniformis* LAT, their amylase activity in unit/kg of feed under standard experimental conditions was selected to be equivalent and therefore comparable. In the *in vivo* experiment described in Example 2, when the enzyme activity is defined as equivalent for a substrate, the enzymatic performance then only reflects the relative resistance to pepsin of the type of alpha amylase used. Hence, in the absence of evidence to the contrary, the board considers that the statistical significant increase of body weight gain and feed conversion ratio reported in Example 2 can only legitimately be attributed to the LAT itself, i.e. to its pepsin resistance, namely the relative resistance to pepsin of the enzymes LAT and LTAA when used at 100 U/kg feed and 2000 kg/feed (patent, paragraph [0459], Figures 9 and 10). Thus, the board disagrees that the technical effect cannot be assigned to the pepsin resistance of LAT.

24. The board also disagrees with the appellant's arguments that, contrary to the appealed decision (point 13.2), the *in vitro* assay described in Example 1 could not be "a valid approximation of the conditions found in the gastrointestinal tract of monogastric animals", because document E1, which reproduced Example 1 of the patent except that it had a pH of 3.0, demonstrated that the pepsin resistant LAT alpha amylase retained no significant activity under this representative gastric pH conditions.
25. Although it is undisputed that alpha-amylases must withstand harsh pH conditions or pepsin degradation during gastric transit in order to be effective in the ileum, the pH sensitivity reported in the modified experimental *in vitro* set up in document E1 only

demonstrates that LAT alpha amylase retains no significant activity when it is incubated at pH 3 for a certain period of time in the presence of an increasing pepsin concentration relative to samples lacking pepsin while it clearly retains some pepsin resistance in feed for monogastric animal at pH 4.3 to 4.8 (Figures 6 and 7). Since the use of a pH of 3.0 is neither required by the claims nor otherwise indicated as desirable, the board can only conclude that appellant's allegations that the alpha-amylases tested were insufficiently or not pepsin-resistant at all are, without conclusive supporting evidence, not persuasive.

26. As regards the appellant's argument that the LAT alpha amylase is not necessarily the best pepsin-resistant amylase under gastric representative conditions, the board notes that whilst the relative performance of each of the five amylases may vary due to their different resistance to deactivation by denaturation and/or degradation, none of the claims requires the use of the best pepsin-resistant amylase. The board can therefore not be convinced by this argument either, even less so in the absence of conclusive supporting evidence.

27. In view of the above, the board cannot share appellant's view that the technical problem is merely the provision of an alternative alpha amylase-containing feed supplement for monogastric animals, but rather concurs with the respondent and the decision under appeal that the experiment described in Example 2 and the corresponding Figures 9 and 10 shows that pepsin resistant alpha amylases in feed achieved a better performance, which is assigned to the pepsin resistance of the enzyme, than the benchmark reference alpha amylase (LAAT).

28. Accordingly, the objective technical problem is formulated as the provision of a method for preparing an improved feed supplement, with improved weight gain and feed conversion ratio in monogastric animals.

Technical problem not solved across the entire scope

29. The appellant contended that the technical problem as formulated above was not solved across the entire scope of the claim. For the reasons given above, the board agrees to the formulation of the technical problem as stated above, and this implies that said problem is solved over the whole scope of the claims. Otherwise, the technical problem would have to be reformulated to a less ambitious problem.

30. As regards the appellant's arguments based on the percentage sequence identities covered by the claims, the board notes that although the variants defined in the claims may structurally share only a 85% sequence identity to the sequence of LAT, being only slightly higher than the 82% sequence identity obtained when the sequences of LTAA and LTA are aligned, the board cannot agree that these variants, which are also functionally defined as pepsin-resistant in the claims, will fail to improve animal performance and/or increase energy absorption and/or feed efficacy and/or improve weight gain in monogastric animals and thus not solve the objective technical problem across the entire scope of the claim.

- 30.1 Hence, the board is satisfied that the technical problem is solved by the claimed subject-matter.

Obviousness

31. It remains to be assessed whether or not the skilled person, starting from the method described in document D3 or D4 and faced with the technical problem identified above would have arrived at the claimed method in an obvious manner.
32. Starting from document D3 or document D4, the skilled person would not have found any motivation to look for an alpha amylase being pepsin resistant comprising the amino acid sequence of SEQ ID No.1 or variants thereof as defined in item i) to v) of claim 1 so as to improve weight gain and feed conversion ratio in monogastric animals or feedstuffs for monogastric animals comprising the same.
33. Document D8, on the other hand, discloses amylases with improved stability, but in a different context, namely as part of cleaning products (page 10, lines 17 to 28). Use of such amylases in a feed additive composition is mentioned in claim 28 of document D8 but is not the focus of document D8. The skilled person would thus not have derived any suggestion from this document for the use of pepsin-resistant alpha amylases, let alone in the preparation of a feed supplement for monogastric animals.
34. Since none of the documents D3, D4 or D8 provides any pointer on how to solve the technical problem, the skilled person would not have arrived at the subject-matter of claim 1 in an obvious way.
35. For completeness, the board notes that the appellant's arguments concerning obviousness are in the context of the technical problem being formulated as the provision of an alternative feed supplement and not as an

improved feed supplement. Accordingly they are not relevant for the present discussion.

36. The same conclusion applies to independent claims 2 to 6, 13, 14, 16 and 17 referring to one of the pepsin resistant amylase defined in items i) to v) of claim 1 or on gap alignment with SEQ ID No. 1 comprising any one or more of the following amino acids selected from the group consisting of: K88; I103; H133; Y175; Y290; F292; R442 and H450, wherein the amino acid numbering relates to SEQ ID No. 1. It also applies to independent claims 7 and 11, directed to methods for preparing a foodstuff (claim 7) or to foodstuffs (claim 11) making use of the feed supplements of claims 2 or 5.

Thus, the main request complies with Article 56 EPC.

37. An adapted description was already filed at the end of the opposition proceedings. No further adaptation is needed as the corrected main request filed on 10 March 2023 merely reflected a clerical error (see point 3. of the reasons above).

Order

For these reasons it is decided that:

1. The appealed decision is set aside.
2. The case is remitted to the opposition division with the order to maintain the patent on the basis of claims: 1 to 18 of the main request filed with letter of 10 March 2023; sequence listing: 1 to 13 and drawings: sheets 1 to 8 of the patent specification; description: as indicated in the appealed decision.

The Registrar:

The Chairwoman:



L. Malécot-Grob

T. Sommerfeld

Decision electronically authenticated