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**Datasheet for the decision
of 7 November 2007**

Case Number: T 0884/06 - 3.3.08

Application Number: 93200989.7

Publication Number: 0619369

IPC: C12N 9/16

Language of the proceedings: EN

Title of invention:

Phytate hydrolysis and enzyme composition for hydrolyzing phytate

Patentee:

AVEVE N.V.

Opponents:

NOVOZYMES A/S
BASF Aktiengesellschaft

Headword:

Phytate compositions/AVEVE

Relevant legal provisions:

-

Relevant legal provisions (EPC 1973):

EPC Art. 108, 123(2),(3), 54(3), 56, 83
RPBA Art. 10a(2)

Keyword:

"Admissibility of the appeal - (yes)"
"Added subject-matter - (no)"
"Novelty and inventive step - (yes)"
"Sufficiency of disclosure - (yes)"

Decisions cited:

T 0939/92



Case Number: T 0884/06 - 3.3.08

D E C I S I O N
of the Technical Board of Appeal 3.3.08
of 7 November 2007

Appellant:
(Patent Proprietor)

AVEVE N.V.
Eugeen Meeusstraat 6
B-2170 Merksem (BE)

Representative:

van Wezenbeek, L.A.C.M.
Vereenigde
Postbus 87930
NL-2508 DH Den Haag (NL)

Respondents:
(Opponent 01)

NOVOZYMES A/S
Krogshøjvej 36
DK-2880 Bagsvaerd (DK)

Representative:

Thomas, Philip John Duval
Eric Potter Clarkson LLP
Park View House
58 The Ropewalk
Nottingham NG1 5DD (GB)

(Opponent 02)

BASF Aktiengesellschaft
D-67056 Ludwigshafen (DE)

Representative:

Schweiger, Georg
Patentanwälte
Reitstötter, Kinzebach & Partner
Sternwartstrasse 4
D-81679 München (DE)

Decision under appeal:

**Decision of the Opposition Division of the
European Patent Office posted 5 April 2006
revoking European patent No. 0619369 pursuant
to Article 102(1) EPC.**

Composition of the Board:

Chairman: F. Davison-Brunel
Members: P. Julià
T. Karamanli

Summary of Facts and Submissions

I. European patent No. 0 619 369 with the title "Phytate hydrolysis and enzyme composition for hydrolyzing phytate" was granted with 28 claims based on European patent application No. 93 200 989.7. Granted claims 1, 2 and 11 read as follows:

"1. An enzyme composition having a phytate hydrolyzing activity comprising a phytase having a phytate hydrolyzing activity at a pH in the range of from 2.5 to 5.0 and an acid phosphatase having a phytate hydrolyzing activity at a pH of 2.5, in a ratio (a:p) of their activity at pH 2.5 (a) and pH 5 (p) on phytate of from 0.8:1 to below 3:1 having a synergetic action on phytate."

"2. An enzyme composition according to claim 1 wherein the ratio (a:p) of their activity at pH 2.5 (a) and pH 5 (p) on phytate is from 1:1 to 2.5:1."

"11. An enzyme composition according to anyone of the claims 1 to 9 wherein the acid phosphatase is thermally more stable than the phytase."

II. The patent was opposed by two opponents under Article 100(a), (b) and (c) EPC on the grounds of lack of novelty (Article 54 EPC), lack of inventive step (Article 56 EPC), insufficiency of disclosure (Article 83 EPC) and unallowable amendment (Article 123(2) EPC). The opposition division revoked the patent because the main request (claims as granted) was considered not to fulfil the requirements of Article 123(2) EPC. The first and second auxiliary

requests were considered to contravene Article 54(3) EPC and the third auxiliary request did not fulfil the requirements of Articles 83 and 56 EPC. All auxiliary requests had been filed at the oral proceedings before the opposition division.

III. The appellant (patentee) filed a notice of appeal on 2 June 2006 and the statement setting out the grounds of appeal, comprising new experimental data, on 4 August 2006. Reference was made therein to a new main request being filed, which was in fact missing.

IV. With letter dated 24 August 2006, the respondent I (opponent 1) argued that, since the deadline for filing the grounds of appeal expired and there was no claim in the proceedings upon which maintenance of the patent was requested, the appeal was inadmissible.

V. The new main request was filed by the appellant on 28 August 2006. Claim 1 of this main request read as follows:

"1. An enzyme composition having a phytate hydrolyzing activity comprising a phytase having a phytate hydrolyzing activity at a pH in the range of from 2.5 to 5.0 and an acid phosphatase having a phytate hydrolyzing activity at a pH of 2.5, in a ratio (a:p) of their activity at pH 2.5 (a) and pH 5 (p) on phytate of from 1:1 to 2.5:1 having a synergetic action on phytate, with the proviso that the phytase and the acid phosphatase enzymes are not from the strain *Aspergillus niger* ALK0243."

- VI. With letters dated 17 November 2006 and 9 February 2007, respondent I made further submissions both on the admissibility of the appellant's appeal and on substantive issues.
- VII. The board summoned the parties to oral proceedings. In a communication pursuant to Article 11(1) of the Rules of Procedure of the Boards of Appeal (RPBA) sent with the summons to oral proceedings, the board indicated its preliminary, non-binding opinion on the admissibility of the appellant's appeal and on substantive issues.
- VIII. With letter dated 28 September 2007, the respondent I filed further submissions and informed the board that it would not be represented at the oral proceedings.
- IX. The appellant replied to the board's communication with letter dated 8 October 2007 and filed thereby a new document, a new main request, a new first auxiliary request and a new second auxiliary request.
- X. In reply to the appellant's submissions, the respondent I filed further comments with letter dated 30 October 2007.
- XI. The respondent II (opponent 2), who had not participated in the written appeal proceedings before, sent a letter on 8 October 2007 informing the board of its possible intention to attend the oral proceedings. With letter of 31 October 2007, the board was informed however that, although duly summoned, it did not intend to attend oral proceedings.

XII. Oral proceedings took place on 7 November 2007 in the absence of both respondents as announced. During oral proceedings, the appellant withdrew the main request and the second auxiliary request, both filed with letter of 8 October 2007, and filed a new sole request comprising claims 1 to 21 (former first auxiliary request also filed with letter of 8 October 2007).

XIII. Claim 1 of the appellant's sole request read as follows:

"1. An enzyme composition having a phytate hydrolyzing activity comprising a phytase having a phytate hydrolyzing activity at a pH in the range of from 2.5 to 5.0 and an acid phosphatase having a phytate hydrolyzing activity at a pH of 2.5, in a ratio (a:p) of their activity at pH 2.5 (a) and pH 5 (p) on phytate of from 1:1 to 2.5:1 having a synergetic action on phytate, **wherein the acid phosphatase is thermally more stable than the phytase.**"

Claims 2 to 9 were directed to preferred embodiments of claim 1. Whereas claims 10 and 16 were directed to a food, feed or fodder product, or a compound thereof, containing an enzyme composition according to anyone of the claims 1 to 9, claims 11 and 17 were directed to similar products thermally treated. Claims 12 to 14 and 18 to 20 related to processes for hydrolyzing phytate using the enzyme compositions of claims 1 to 9. Claims 15 and 21 were directed to processes for improving feed or fodder digestion in livestock production and reducing phosphorus excretion in livestock manure, comprising feeding the livestock with a feed or fodder containing an enzyme composition of claims 1 to 9.

XIV. The following documents are cited in the present decision:

- D1: WO 94/03072 (International publication date: 17 February 1994, International filing date: 27 July 1993, Priority date: 31 July 1992);
- D2: K. Zyla, World J. Microbiol. and Biotechnol., 1993, Vol. 9, pages 117 to 119;
- D3: K. Zyla and J. Koreleski, J. Sci. Food Agric., 1993, Vol. 61, pages 1 to 6.

XV. The appellant's arguments in writing and during oral proceedings, insofar as relevant to the present decision, may be summarised as follows:

Admissibility of the appeal

Although the statement setting out the grounds of appeal did not contain the literal text of the new main request, it made perfectly clear the contents of this new request which was filed later on in the proceedings. It was clearly stated that the text of the new main request resembled the text of the claims of the first auxiliary request filed during oral proceedings before the opposition division except for a disclaimer. It was further stated in the statement setting out the grounds of appeal that the disclaimer required the phytase and the acid phosphatase enzymes not to be derived from *Aspergillus niger* ALK0243. The appeal was therefore admissible.

Sole request

Article 123(2) EPC

The feature introduced in claim 1 was taken from claim 11 as originally filed and references to this feature were found in the description of the application as filed.

Article 54(3) EPC

Document D1 did not disclose that the acid phosphatase of *Aspergillus niger* ALKO243 was thermally more stable than the phytase. Although Figures 2 and 4 only showed the temperature optima of these enzymes, they allowed to derive some information on their thermal stability. The enzymatic activity shown in these figures was partially dependent on the stability of these enzymes at the temperature used for measuring their activity. Contrary to Figure 2 for the phytase activity, Figure 4 showed a very sharp decline in the activity of acid phosphatase at high temperatures (60°C - 70°C). Whereas at a temperature of 65°C the phytase of *A. niger* ALKO243 retained 50% of its (relative) phytase activity (Figure 2), less than 5% of the (relative) acid phosphatase activity was measured at the same temperature for the acid phosphatase (Figure 4). Thus, it was not possible to assume that the acid phosphatase of *A. niger* ALKO243 was thermally more stable than the phytase of this *Aspergillus* strain.

In fact, the feature introduced into claim 1 was not intrinsic to all acid phosphatases and phytases, including the ones derived from *Aspergillus*. All these enzymes had particular amino acid sequences that

resulted in different properties, including their thermal stability and specific activity, as shown for instance in Table 1 of the patent in suit for the acid phosphatases of *A. ficuum* and of *A. niger*. Thus, the feature introduced into claim 1 was not directly and unambiguously derivable from document D1 and it clearly differentiated the claimed subject-matter from the disclosure of this document.

Article 56 EPC

The closest prior art, document D3, pointed away from the enzyme ratio characterizing the enzyme compositions of claim 1 since it showed that pure phytase was not working properly in degrading plant phytate and that better results were obtained with more impure phytase, i.e. with more acid phosphatase contamination. The skilled person was thus motivated to use higher ratios of acid phosphatase rather than lower ones. The patent in suit further demonstrated the presence of synergetic effects with ratios lower than those disclosed in document D3.

The evidence filed with the statement setting out the grounds of appeal supported the presence of a synergetic effect in the examples of the patent in suit. The additional *in vitro* experimental data demonstrated this effect as well. The respondent's arguments to the contrary failed to consider that, in the absence of phytase, the acid phosphatase had a very low activity during incubation at pH 2.5 and that the activity of the phytase at pH 2.5 was also of relevance. The combination of both enzyme activities resulted in more

than the additive effect compared to the calculated sum of the individual components.

The *in vitro* results were predictive of the *in vivo* situation and it was possible to extrapolate these *in vitro* results to an *in vivo* situation. This was also shown in the additional evidence filed with the statement of grounds of appeal, wherein reference was made to literature showing an *in vivo* trial with an *A. niger* phytase that resulted in a linear response between phytase dosing and digestible phosphorus release for phytase dosages up to 989 total phytase units/Kg feed. The non-linearity of phytase in feed referred to in the decision under appeal was not uniformly demonstrated in the literature. The additional *in vitro* experimental data filed with the statement of grounds of appeal demonstrated the synergetic effect at different dosages of phytase without recalculation to the standardised 500 phytase units/Kg feed.

Thus, an inventive contribution was demonstrated since the enzyme ratio characterizing the enzyme compositions of claim 1 was not obvious and provided an unexpected synergetic effect both *in vitro* and *in vivo*.

Article 83 EPC

The claimed subject-matter was not defined by reference to amounts of phytase and acid phosphatase but by reference to the specific phytate degrading activity of these enzymes. The definition of the invention in terms of units of phytate degrading activity and the ratio of this activity allowed to generalise and to make the

claims independent of other characteristics of the enzymes that were used, including their source. The patent in suit showed a large difference in the activity of *A. ficuum* and *A. niger* acid phosphatases, nevertheless a synergetic effect appeared with both enzymes on the basis of their phytate degrading activity. This synergetic effect was always achieved regardless of the source of the enzymes used.

The examples of the patent in suit also showed that, although large differences existed in the enzymatic breakdown and potential synergetic effects of the claimed enzyme compositions in relation to different individual components of the feed, hydrolysis activity was established in all phytin-containing components tested. Moreover, the component for which the largest synergetic effect was shown, namely soya bean, was used in most, if not in all, of standard animal feeds. Even if the food contained hardly hydrolysable ingredients - or ingredients resulting in a small synergetic effect - the feed as sum of all ingredients acted as a substrate on which synergy was clearly established.

XVI. The respondent I's arguments in writing, insofar as relevant to the present decision, may be summarised as follows:

Admissibility of the appeal

Significant differences were present between the claims as referred to in the appellant's statement of grounds of appeal (but not filed therewith) and the claims that were filed later on in the appeal proceedings. The wording mentioned in the grounds of appeal was not

literally the text of the disclaimer. Moreover, when the grounds of appeal were filed, there was no indication that amendments to any of the other claims were also contemplated. However, the main request as filed later on in the proceedings included amendments not only to claim 1 but to other claims as well. Thus, the main request was not perfectly clear from the statement of grounds of appeal. The only thing that was perfectly clear therefrom was that all of the appellant's requests filed in the first instance proceedings had been abandoned and replaced by a new main request. It was only on the basis of a new main request that maintenance of the patent had been requested. However, this request was not filed within the period specified under Article 108 EPC. When the deadline for filing the statement of grounds of appeal expired, there was no claim in the proceedings upon which maintenance of the patent was requested. Hence, the appeal was inadmissible.

Claim request

Articles 123(2) and 84 EPC and Article 54 EPC

There were no comments on file against the specific subject-matter of the appellant's sole request (former first auxiliary request filed with letter of 8 October 2007) (cf. Section XII *supra*).

Article 56 EPC

Arguments were filed only against the appellant's main request filed on 28 August 2006 (cf. Section V *supra*), however they apply to the appellant's present sole request (cf. Section XII *supra*). Documents D2 or D3

rendered the claimed subject-matter obvious since they disclosed enzyme compositions of acid phosphatase and phytase from *A. niger* and showed the advantageous effect of the former on the phytate hydrolyzing activity of the latter. The claimed ratio of enzyme activities could be arrived at by routine optimization and the use of these enzymes for improving animal feed digestion was obvious to the skilled person.

There was no credible demonstration of a synergetic effect in the patent in suit and the new evidence filed with the appellant's statement of grounds of appeal did not show the presence of this synergetic effect with the claimed combination of enzymes. In this new evidence, an overall increase of the activity units at pH 2.5 of more than three times (414 Ua to 1380 Ua) did not even double the released phosphorous (1,5 and 2,565) clearly demonstrating thereby the absence of any synergetic effect. In any case, the appellant's new evidence could not change the fact that the *in vivo* animal digestibility trial data presented in the patent in suit was not reliable due to the omission of a valid negative control.

Moreover, the claimed subject-matter lacked an inventive step because the technical problem was not solved over the entire breadth of the claims. The extreme breadth of the claims (any phytase and any acid phosphatase) was not justified on the basis of the disclosure of the patent in suit which was exemplified only with very specific enzyme compositions derived from the closely related *A. niger* and *A. ficuum*. In the absence of extensive and convincing evidence of synergism by a plurality of exemplary enzyme

compositions, it was not credible that a synergetic effect was obtained across the entire breadth of the claims. This was even more so since the patent in suit actually failed to show any synergism for the extremely specific enzyme composition tested therein.

Article 83 EPC

Arguments were filed only against the appellant's main request filed on 28 August 2006 (cf. Section V *supra*), however they apply to the appellant's present sole request (cf. Section XII *supra*). The patent in suit was only exemplified with enzymes derived from *A. ficuum* and *A. niger* strains. These strains were taxonomically so close that the former had been reclassified as an *A. niger* strain. The efficiency of these enzymes on phytate degradation was shown in the patent in suit to vary dramatically depending on their source. However, there was no limitation for the acid phosphatase and the phytase in the claims, which thus embraced enzymes derived from any possible source and with different efficiencies, including phytases with low-pH stability and narrow pH-activity range. The efficiency of the phytase and the acid phosphatase was also strongly variable depending on the plant raw material used. The patent in suit acknowledged that with pea phytin no synergetic effect was detected.

The disclosure of the patent in suit was extremely specific and limited and, even if a synergetic effect was shown for the *A. ficuum/A. niger* phytases and acid phosphatases (which was strongly denied), such effect was not expected to be obtained across the broad scope of the claims. Hence, the patent itself raised serious

doubts substantiated by verifiable facts that not all claimed subject-matter solved the technical problem. A skilled person had to undertake a programme of research for every other phytase and every other acid phosphatase to determine which, if any, exhibited a synergetic action on phytate in any particular plant material. This constituted undue burden as established by the case law of the Boards of Appeal (cf. T 939/92, OJ EPO 1996, 309).

- XVII. No arguments were presented in writing by the respondent II, who did also not attend oral proceedings.
- XVIII. The appellant (patentee) requested that the decision under appeal be set aside and the patent be maintained in amended form on the basis of the request comprising claims 1 to 21 filed during oral proceedings before the board on 7 November 2007.
- XIX. The respondent I (opponent 1) requested that the appeal be rejected as inadmissible or, as an auxiliary measure, that it be dismissed.
- XX. With letter dated 31 October 2007, the respondent II (opponent 2) requested a decision to be taken on the case as it stands.

Reasons for the Decision

Admissibility of the appeal

1. The respondent I submitted that the appeal was inadmissible because the appellant's main request had not been filed within the period specified in Article 108 EPC (cf. Sections IV and XVI *supra*).

2. It is clear from the statement of grounds of appeal that the appellant intended to overcome the novelty objection raised in the impugned decision of the opposition division with regard to the first auxiliary request then on file by submitting the same request comprising a disclaimer in claim 1 according to which "*the phytase and acid phosphatase enzymes should not be derived of the strain Aspergillus niger ALK0243*". It was also explicitly stated that "*the text of the claims of this new Main Request resembles the text of the claims of the 1st Auxiliary Request in opposition (i.e. fulfilling the requirements of Article 123(2) EPC), except for the disclaimer*". Although the actual wording of the disclaimer is not exactly the same as the one referred to in the appellant's statement of grounds of appeal (cf. Section V *supra*), the differences between them are not such as to change the meaning and purpose of the disclaimer. The introduction of the disclaimer into other independent claims, even though not explicitly mentioned in the appellant's statement of grounds of appeal and, regardless of its appropriateness in the case in suit, is normal practice for bringing the subject-matter of the whole set of claims in line with the first independent claim.

3. In the statement setting out the grounds of appeal, the appellant also disputed the objections of insufficient disclosure for the term "*synergetic action*" and of lack of inventive step in view of documents D2 and D3 as well as because of the breadth of the claims. The submissions thereto were made with respect to "Auxiliary Request II". However, it is obvious from the reasons of the contested decision that the objections under Articles 83 and 56 EPC were raised with regard to "Auxiliary Request 3" and that the appellant erroneously referred to "Auxiliary Request II". Therefore, the extent to which the decision of the opposition division is challenged, is clear.

4. In view of the whole content of the statement of grounds of appeal, the requirements in accordance with Article 108, third sentence, EPC and Article 10a(2) of the Rules of Procedure of the Boards of Appeal (RPBA) are considered to be fulfilled. The appeal is found admissible.

Appellant's sole request; Claim 1
Articles 123(2),(3) and 84 EPC

5. The objections under Article 123(2) EPC raised by respondent I in appeal proceedings exclusively concerned the presence of the disclaimer in claim 1. The disclaimer was deleted in claim 1. However, claim 1 contains now an additional feature, namely a higher thermostability of the acid phosphatase (cf. Section XIII *supra*). References to this feature are found in the description of the application as originally filed (cf. *inter alia* page 5, lines 11 to 17, page 6, lines 48 to 53, page 7, lines 4 and 5 of the published

application) and claim 11 as originally filed relates to an enzyme composition (according to anyone of claims 1 to 9 as filed), wherein the acid phosphatase is thermally more stable than the phytase. Therefore, the amendment does not contravene Article 123(2) EPC. The introduction of this feature into claim 1 and therefore into the dependent claims, amounts to a restriction of the extent of protection conferred by the European patent and thus does not contravene Article 123(3) EPC. Claim 1 corresponds to granted claim 11 and, therefore, is not open to clarity objections (Article 84 EPC).

6. Thus, the requirements of Articles 123(2),(3) and 84 EPC are considered to be met.

Article 54(3) EPC; claim 1

7. Claim 1 is directed to an enzyme composition wherein the acid phosphatase is thermally more stable than the phytase. It corresponds to granted claim 11. This claim was not objected to during opposition proceedings. On appeal it became claim 1 of the first auxiliary request filed with letter of 8 October 2007. There again it was not argued against by respondent I in its letter of 30 October 2007 although the letter was said to be "*in answer to the Appellant's submissions dated 8 October 2007*". None of the respondents considered it necessary to attend oral proceedings, i.e. to take advantage of this opportunity to argue lack of novelty of the claim which by then had become claim 1 of the sole request on file. Yet, they could fully expect, if only from the appellant's submissions of 8 October 2007, that the request containing such a claim would be defended by

the appellant. Under such circumstances, the board has no hesitation in deciding on the novelty issue as regards claim 1 of this request and claims dependent thereon. In the absence of any evidence or arguments to the contrary, the claimed subject-matter is found to be novel.

Article 56 EPC

8. The closest prior art document D3 discloses an "*acid phosphatase-rich preparation (0.10 PhytU ml; 37.1 AcPU ml)*" and a "*low phosphatase preparation (0.12 PhytU ml; 2.5 AcPU ml)*" from *Aspergillus niger* (cf. page 2, right-hand column, first and third full paragraphs) which correspond, respectively, to preparations C1 (cell homogenate) and W (partially purified phytase) disclosed in document D2. According to the patent in suit (paragraphs [0025] and [0026] of the patent), these preparations have a ratio of **62:1 to 3.5:1** (acid phosphatase/phytase) expressed in phytate hydrolyzing activity. Reference is also made in document D3 to the effects of the particular substrate used on the contribution of acid phosphatase to the total rate conversion of phytate, on the access of phytase to phytate and on the time for obtaining complete conversion (cf. page 4, left-hand column to page 5, right-hand column, first paragraph).

9. The effects of acid phosphatase on the activity of phytase are disclosed in the patent in suit, which refers to two pH values (2.5 and 5.0), to different types of phytases (*A. ficuum* in Example II, *A. niger* in Example VI and combinations thereof in Examples VII and VIII) and to the effect of different substrates on the

efficiency of both phytase and acid phosphatase (cf. Examples IV and V of the patent). The patent in suit differs from the closest prior art by the disclosure of enzyme compositions having the specific ratio (a:p) from **1:1 to 2.5:1** of acid phosphatase and phytase hydrolyzing activities on phytate (pH 2.5 (a) and pH 5.0 (p)), wherein a synergetic effect is shown for this ratio (cf. *infra*). These enzyme mixtures have also a high thermostability due to a higher thermostability of the acid phosphatase compared to the phytase used (cf. paragraphs [0046], [0047], [0068] and [0072] of the patent in suit).

10. Starting from document D3 as the closest prior art, the technical problem to be solved must be seen in the provision of further enzyme compositions having optimal acid phosphatase and phytase hydrolyzing activities on phytate. The claimed enzyme compositions in the ratio disclosed in the patent in suit solve this problem.

11. Document D3 refers to the importance of phytase access to plant phytate and to the advantageous presence of other enzymes (acid phosphatase, cellulase) in phytase preparations for obtaining high yields of phytate hydrolysis. A motivation is thus provided for studying the effect of these other enzymes (in particular, acid phosphatase) on the hydrolysis of plant phytate by phytase. In fact, after determination of an optimal dosage of phytase, document D3 compares the hydrolysis of phytate at three pH values (3.0, 4.5 and 5.5) by both the acid phosphatase-rich (62:1) and the acid phosphatase-low (3.5:1) preparations with identical phytase activity. The acid phosphatase-rich preparation produces higher amounts of phosphorus than the acid

phosphatase-low preparation at all three pH values, the difference being more evident at pH 5.5 (cf. Figure 2). The partially purified phytase preparation (i.e. the acid phosphatase-low preparation) further shows a low level of plant-tissue degrading activities (cf. page 4). In view of these results, there is no motivation to look for enzyme compositions with low amounts of acid phosphatase, let alone lower than those of the acid phosphatase-low preparation (3.5:1) disclosed in this document. Therefore, the ratio referred to in the claims (from 1:1 to 2.5:1) is not derivable in an obvious manner from document D3.

12. The decision of the opposition division that there was no inventive step relied, in particular, on the finding that no synergetic effect was attached to the *in vivo* use of the enzyme compositions in the claimed ratio and therefore, the selection of this ratio was to be regarded as arbitrary. Much was also said in this respect during the written appeal procedure. The board will consider the issue of synergetic effect *in vitro* and *in vivo* in the following paragraphs.

Presence of a "synergetic action on phytate"

13. *In vitro* Example 1 filed with appellant's grounds of appeal shows that at a constant dosage of phytase higher than 500 Up (pH 5.0), namely 690 Up (which liberates 1,5 g/Kg phytin phosphorus and which corresponds to 414 Ua at pH 2.5 according to paragraphs [0016] and [0102] of the patent in suit), a synergetic effect **is achieved** with soybean meal as a substrate. Indeed, the example shows that the addition of 966 Ua of acid phosphatase (which liberates 0,350 g/Kg phytin

phosphorus) so as to have 1380 Ua (966 + 414) and a (a:p) ratio of 2:1 (1380 Ua : 690 Up) liberates a total of 2,565 g/Kg of phytin instead of the additive 1,85 g/Kg (1,5 + 0,35). A similar effect is also shown when using wheat bran as a substrate.

14. In respect of these data, respondent I argued that an overall increase of the activity units at pH 2.5 (Ua) of more than three times (1380 / 414) did not even double the released phosphorous (2,565 / 1,5) thus giving evidence as to **the absence** of any synergetic effect. This reasoning cannot be followed by the board because it does not take into account that, whereas the phytase and acid phosphatase units are calculated using a commercial phytate substrate (cf. paragraphs [0090] to [0093] of the patent in suit), the synergetic effect is actually measured using other substrates, in particular plant raw material containing phytate, such as soybean meal and wheat bran. The overall amount of released phosphorus depends on the particular phytate substrate used (cf. paragraphs [0058] to [0062] and Tables 4 and 5 of the patent in suit). The same (activity) units of phytase and acid phosphatase at pH 2.5 (Ua) measured with a commercial phytate substrate might result in different amounts of released phosphorous when using other substrates such as shown in new Example 1, wherein 414 Ua of phytase release 1,5 g/Kg phytin phosphorous from soybean meal and 966 Ua of acid phosphatase release only 0,350 g/Kg phytin phosphorous from the very same substrate. Therefore, the liberation of a total of 2,565 g/Kg of phytin phosphorous instead of the additive 1,85 g/Kg (1,5 + 0,35) clearly shows the presence of a synergetic effect.

15. It is also noted that in Example III of the patent in suit 500 Up of phytase are used and a synergetic effect is explicitly described (cf. paragraphs [0102] and [103] of the patent in suit). Likewise, Example V refers to the presence of synergy on different feeds using phytase dosages of 350 to 700 Up (cf. paragraph [0111] of the patent in suit). Although no details are provided, no differences are reported for high or low concentrations of phytase enzyme.

16. On the basis of Examples XII to XIV, the opposition division concluded that a "*synergistic action*" *in vivo* was not sufficiently disclosed. The opposition division objected to the absence of a true negative control in view of the statistical differences of normal variations for the results obtained with the animal feeds used for the *in vivo* trials (cf. Tables 12 and 13 of the patent in suit) as well as to the interpretation of these results as showing a synergetic effect (cf. Table 14 of the patent in suit) in view of the non-linearity of phytase activity in animal feed reported in the prior art (cf. points 8.2 to 8.6 of the decision under appeal).

17. The appellant provided further evidence showing that the *in vivo* non-linearity of phytase activity in animal feed was not uniformly demonstrated in the literature, particularly for phytase activities up to - or lower than - 1000 units/Kg feed (cf. Section IX *supra*). Respondent I failed to comment on this evidence in its last submissions (cf. Section X *supra*). Although the absence of a true negative control in the *in vivo* experiments might be regrettable, it does not in itself render these experiments meaningless. The results shown

in Table 14 of the patent in suit might well provide some evidence of a synergetic effect, particularly for the data corresponding to Example XIII which is based on a phytase activity of 400 Up and an acid phosphatase activity of 580 Ua and for which, even though the actual statistical significance might be arguable, a synergetic effect is reported. This result is fully in line with the *in vitro* results for which there is no reason to assume that they are not predictive of an *in vivo* situation under similar conditions. The evidence on file is thus considered to be sufficient to establish the presence of a synergetic action - both *in vitro* and *in vivo* - on phytate for the enzyme compositions and in the conditions disclosed in the patent in suit.

Further indicia of inventive step, the thermostability

18. It is, furthermore, noted that the claimed enzyme compositions have a high thermostability resulting from the combination of a phytase with an acid phosphatase thermally more stable than the phytase. This specific requirement renders the enzyme mixture thermally more stable than the phytase itself, which is a clear advantage in the preparation of animal feed, such as in the feed pelleting process (cf. paragraphs [0046] and [0047] of the patent in suit).

19. The respondent's further objection that the patent in suit is only exemplified with enzyme compositions comprising phytase and acid phosphatase derived from very particular *Aspergillus* strains and therefore, it is not sufficient to support an inventive step over the whole breadth of the claims (cf. Section XVI *supra*), is

considered to be related to those objections raised under Article 83 EPC and, in view of the conclusion arrived at by the board as regards sufficiency of disclosure (cf. *infra*), it is of no further relevance for the assessment of inventive step.

20. In summary, the patent in suit discloses non-obvious enzyme compositions which provide, at the disclosed ratios, unexpected advantages, namely a synergetic effect and a high thermostability. Therefore, the requirements of Article 56 EPC are considered to be met.

Article 83 EPC

21. It is established case law that a patent specification is addressed to a skilled person with common general knowledge in the field (cf. "Case Law of the Boards of Appeal of the European Patent Office", 5th edition 2006, II.A, page 173). Although there is no restriction in the claimed subject-matter as to the source of the acid phosphatase and phytase, there are however other restrictions that would be immediately evident to the person skilled in the art. In particular since the ratio (a:p) of enzyme activities is measured at pH 2.5 (a) and 5.0 (p), it is certainly understood that both enzymes are expected to be active and stable at this pH range. A further requirement relates to the thermostability of the enzymes, which is shown to be of relevance in the processing of these enzyme compositions for industrial applications.
22. The board accepts the appellant's argument that the gist of the invention is based on the specific ratio (a:p) of enzymatic activities regardless of the source

from which the enzymes are derived. There is no evidence on file showing that a synergetic action on phytate cannot be achieved with a similar ratio (a:p) of enzyme activities but for enzymes derived from sources other than the exemplified *Aspergillus* strains. In the absence of this evidence, the respondent's allegations based on the breadth of the claims cannot be equated to serious doubts supported by verifiable facts as required by the case law (cf. "Case Law", *supra*, II.5.1.1, page 178).

23. It is true, as submitted by respondent I, that the presence and relevance of the synergetic action on phytate is strongly dependent on the source of phytate used. Nevertheless, this is already acknowledged in the patent itself, which does not leave the skilled person completely at a loss as to what type of substrate - or, in the alternative, of (acid phosphatase) enzyme - is to be chosen for obtaining a significant synergetic effect (cf. paragraphs [0060] to [0062] of the patent in suit). The patent in suit provides thus adequate experimental instructions for the skilled person to overcome or avoid possible failures.
24. It is also worth noticing that the present situation is quite different from this of decision T 939/92 (*supra*), wherein the technical effect (herbicidal activity) was not part of the definition of the subject-matter for which protection was sought and not all claimed compounds were likely to possess the alleged herbicidal activity. In the case at issue, the technical effect disclosed in the patent in suit, namely a synergetic action on phytate, is explicitly required in the claimed enzyme compositions.

25. For these reasons, the requirements of Article 83 EPC are considered to be fulfilled.

Order

For these reasons it is decided that:

1. The appeal is admissible.
2. The decision under appeal is set aside.
3. The case is remitted to the first instance with the order to maintain the patent in amended form with the following claims and a description to be adapted:

Claims No.: 1 to 21 received during oral proceedings.

The Registrar:

The Chairwoman:

A. Wolinski

F. Davison-Brunel