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**Datasheet for the decision  
of 13 July 2016**

**Case Number:** T 0547/10 - 3.3.04

**Application Number:** 06762978.2

**Publication Number:** 1922409

**IPC:** C12N15/82, C12Q1/68, A01H5/00

**Language of the proceedings:** EN

**Title of invention:**  
Herbicide tolerant cotton plants and methods for identifying same

**Applicant:**  
Bayer CropScience N.V.

**Headword:**  
Transgenic cotton plants/BAYER CROPSCIENCE

**Relevant legal provisions:**  
EPC Art. 53(b), 54, 56, 83, 84, 123(2)  
EPC R. 26(4), 27(b), 115(2)  
RPBA Art. 15(3)

**Keyword:**  
Main request - requirements of the EPC met (yes)

**Decisions cited:**

T 0775/08

**Catchword:**



**Beschwerdekammern**  
**Boards of Appeal**  
**Chambres de recours**

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Case Number: T 0547/10 - 3.3.04

**D E C I S I O N**  
**of Technical Board of Appeal 3.3.04**  
**of 13 July 2016**

**Appellant:** Bayer CropScience NV  
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1831 Diegem (BE)

**Representative:** Almond-Martin, Carol  
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**Decision under appeal:** **Decision of the Examining Division of the European Patent Office posted on 15 October 2009 refusing European patent application No. 06762978.2 pursuant to Article 97(2) EPC.**

**Composition of the Board:**

**Chairwoman** G. Alt  
**Members:** M. Montrone  
M.-B. Tardo-Dino

## Summary of Facts and Submissions

- I. The appeal was lodged by the applicant (hereinafter "the appellant") against the decision of the examining division to refuse European patent application No. 06 762 978.2. The application was filed as an international application and published as WO 2007/017186 (hereinafter "the application as filed") with the title "*Herbicide tolerant cotton plants and methods for identifying same*".
- II. The impugned decision dealt with a single claim request. The examining division decided that the subject-matter of the claims complied with the requirements of Articles 123(2) and 54 EPC. It held, however, that the subject-matter of claims 1 to 8 lacked inventive step starting from either of documents D1 or D2 as closest prior art, which both disclosed transgenic glyphosate tolerant cotton plants. The plants of claim 1 differed from these plants in the so-called elite event, which comprised a modified epsps gene from *Zea mays* that was moreover located at a different genomic position. In the absence of experimental data in the application or from the available documents disclosing an actual improved glyphosate tolerance of the claimed plants *vis-à-vis* the plants of either of documents D1 or D2, the objective technical problem was to be considered as the provision of "*a further, alternative cotton plant containing nucleic acids encoding a mutated EPSPS enzyme and to provide methods for their identification*".

The examining division considered the subject-matter of claim 1 to be obvious because the provision of further transgenic cotton plants without unexpected

advantageous properties was a matter of routine. Even if it was assumed that the claimed plants exhibited an improved glyphosate tolerance *vis-à-vis* those of the closest prior art, this was to be expected by the skilled person due to known variations between transformation events.

- III. With the statement of grounds of appeal, the appellant submitted a new main request and *inter alia* documents D11 and D17 (see section VI below). An auxiliary request and *inter alia* documents D19, D21 and D22 (see section VI below) were subsequently submitted.
- IV. The appellant was informed of the board's preliminary opinion that both claim requests were considered to meet the requirements of Article 56 EPC but did not comply with the requirements of Article 84 EPC.
- V. In reply with its letter dated 8 July 2016, the appellant submitted a new main request and withdrew the previous main and auxiliary requests. It also announced that it would not attend the oral proceedings.

Independent claims 1, 2 and 6 of the new main request read:

"1. A transgenic glyphosate tolerant cotton plant, or cells, parts, seed or progeny thereof, each comprising an elite event in its genome, said elite event comprising a foreign DNA comprising a chimeric gene which comprises the coding sequence of a modified epsps gene from *Zea mays* encoding a glyphosate tolerant EPSPS enzyme, under the control of a plant-expressible promoter of a histone gene, and wherein said elite event comprises

- SEQ ID NO 1, nucleotides 1-732 of SEQ ID No 1 being immediately upstream of and contiguous with said foreign DNA and nucleotides 733-1214 of SEQ ID No 1 being foreign DNA and

- SEQ ID No 2, nucleotides 431-654 of SEQ ID No 2 being immediately downstream of and contiguous with said foreign DNA, and nucleotides 1 to 430 of SEQ ID No 2 being foreign DNA

wherein said elite event is comprised in reference seed deposited at the ATCC under deposit number PTA-6878, the genomic DNA of said cotton plant, or cells, parts, seed or progeny thereof when analyzed in a PCR identification protocol with two primers comprising the nucleotide sequence of SEQ ID No 3 and SEQ ID No 11 respectively, yields a DNA fragment of 334 bp.

2. A method for identifying the presence of an elite event in a transgenic glyphosate resistant cotton plant, or cells, parts, seed or progeny thereof specified in claim 1 ,

said method comprising

amplifying a DNA fragment of between 100 and 500 bp from a nucleic acid present in a biological sample of the plant, cells, parts, seed or progeny thereof, using a polymerase chain reaction with at least two primers, one of said primers recognizing the 5' flanking region of the elite event specified in claim 1,

said 5' flanking region having the nucleotide sequence of SEQ ID No 1 from nucleotide 1 to nucleotide 732 or the 3' flanking region of said elite event, said 3' flanking region having the nucleotide sequence of the complement of SEQ ID No 2 from nucleotide 431 to nucleotide 654,

the other primer of said primers recognizing a sequence within the foreign DNA having the nucleotide sequence of the complement of SEQ ID No 1 from nucleotide 733 to

nucleotide 1214 or the nucleotide sequence of SEQ ID No 2 from nucleotide 1 to nucleotide 430.

6. A kit for identifying the presence of an elite event in a transgenic glyphosate resistant cotton plant, or cells, parts, seed or progeny thereof specified in claim 1 ,  
said kit comprising one primer recognizing the 5' flanking region of the elite event specified in claim 1,  
said 5' flanking region having the nucleotide sequence of SEQ ID No 1 from nucleotide 1 to nucleotide 732 or one primer recognizing the 3' flanking region of said elite event, said 3' flanking region having the nucleotide sequence of the complement of SEQ ID No 2 from nucleotide 431 to nucleotide 654,  
and one primer recognizing a sequence within the foreign DNA, said foreign DNA having the nucleotide sequence of the complement of SEQ ID No. 1 from nucleotide 733 to nucleotide 1214 or the nucleotide sequence of SEQ ID No 2 from nucleotide 1 to nucleotide 430."

VI. The following documents are cited in this decision:

D1: WO 02/34946

D2: WO 2004/072235

D11: US 6566587

D17: Petition for the Determination of Nonregulated Status for Roundup-Ready<sup>TM</sup> Flex Cotton MON 88913, pages 4-7 of 239

D19: WO 2014/170345

D21: Declaration of Dr. R. van Lipzig, dated  
13 June 2016

D22: Declaration of Dr. J. Broadhvest, dated  
10 June 2016

VII. Oral proceedings before the board were held on  
13 July 2016 in the absence of the appellant as announced.  
At the end of the oral proceedings the chairwoman  
announced the board's decision.

VIII. The appellant's arguments as submitted in writing may  
be summarised as follows:

*New main request*

*Inventive step*

Document D2 represented the closest prior art. The  
transgenic cotton plants of claim 1 differed from those  
of document D2 in the nature of the genomic  
transformation event. The technical effect of this  
difference was that the claimed plants were glyphosate  
tolerant to such an extent that "*no visible damage as a  
result of herbicide application is ever observed after  
application regardless of rate or stage of development  
at the time of herbicide application*" (see page 28,  
lines 30 to 31 of the present application).

The objective technical problem was thus the provision  
of transgenic cotton plants with an improved glyphosate  
tolerance, whereby the plants exhibit no visible  
damage, regardless of the rate of glyphosate applied  
and the stage of the plants' development at the time of  
application.



Damage caused by glyphosate application was known to occur in transgenic cotton plants even if they were referred to as tolerant. The skilled person would therefore have derived from document D2 that the cotton plants designated as MON 88913 were to be treated without harm only by the disclosed limited rates of glyphosate during the vegetative growth period. Pointers that possible damage to these plants could be avoided if glyphosate was applied according to a different scheme were not derivable from document D2. Also, no such pointers were disclosed in the other prior art documents cited, in particular document D11, which disclosed the modified epsps gene referred to in claim 1 and that it conferred glyphosate tolerance in transgenic tobacco and maize. However, document D11 did not disclose the potential of the modified epsps gene to confer glyphosate tolerance to such an extent that, regardless of the rate of glyphosate applied and the stage of the plants' development at the time of application, the transgenic plants exhibited no visible damage.

- IX. The appellant requested in writing that the decision under appeal be set aside and that a patent be granted on the basis of the new main request as filed with the letter dated 8 July 2016.

### **Reasons for the Decision**

1. The duly summoned appellant did not attend the oral proceedings, which in accordance with Rule 115(2) EPC and Article 15(3) RPBA took place in its absence.

*New main request*

*Amendments (Article 123(2) EPC)*

2. In the following, the references are to passages and claims in the application as filed.

The subject-matter of claim 1 is derivable from claims 31 and 32 in combination with the disclosure on page 3, line 12, and page 29, lines 9 to 31.

The subject-matter of claim 2 is derivable from claims 1 and 2 in combination with the disclosure on page 5, lines 8 to 10, and page 10, lines 14 to 16, and page 25, lines 27 to 32.

The subject-matter of claims 3 to 5, 7 and 8 is disclosed in claims 3 to 5, 27 and 8 to 10, respectively.

The subject-matter of claim 6 is derivable from claim 7 in combination with page 5, lines 8 to 10, and page 25, lines 27 to 32.

3. Therefore the board is satisfied that the subject-matter of claims 1 to 8 meets the requirements of Article 123(2) EPC.

*Sufficiency of disclosure (Article 83 EPC)*

*Clarity, support (Article 84 EPC)*

4. No objections under Article 83 EPC as to lack of sufficient disclosure in the application as filed in relation to the claimed invention or under

Article 84 EPC as to lack of clarity or support in the description were raised by the examining division in the decision under appeal. The board has no objections regarding the claims of the request on file.

5. Thus, the subject-matter of claims 1 to 8 meets the requirements of Articles 83 and 84 EPC.

*Plant varieties (Article 53(b) EPC)*

6. The subject-matter of claim 1 are cotton plants, where the term "cotton" is used in the art as a synonym for the plant species *Gossypium hirsutum* (see application, page 2, line 17). "Species" is the botanical taxon of the rank falling below the taxon "genus". The population of plants that constitutes a plant species includes within it, *inter alia*, sub-groupings known as plant varieties, as defined in Rule 26(4) EPC.
7. The claimed transgenic cotton plants (including those plant parts that can be used to regenerate whole plants) are defined (see section V above) as containing the DNA of a modified epsps gene from *Zea mays* under the control of a plant-expressible promoter and a closely linked portion of the adjoining cotton chromosome characterising the so-called elite event (hereinafter "the event"). This structural feature provides these plants with an improved glyphosate tolerance compared to cotton plants containing the MON 88913 event (see point 22 below).
8. Thus, the claimed group of plants embraces an indefinite number of individual plants which are all defined by the presence of the event referred to in claim 1. Hence, the plants as claimed are not defined

by the entire constitution of a plant or a set of genetic information, *i.e.* they are not defined "*by the expression of the characteristics that results from a given genotype or combination of genotypes*" (see Rule 26(4) (a) EPC).

9. Since one of the requirements set out in Rule 26(4) EPC for a plant to be considered as a variety is not fulfilled, the board concludes that the plants according to claim 1 do not constitute a plant variety, as defined in Rule 26(4) EPC.
10. Moreover, the technical feasibility of the invention of claim 1 with respect to the improved glyphosate tolerance is not confined to one plant variety or group of plant varieties, but applies to cotton plants with "*multiple genetic backgrounds*" (see page 29, lines 1 to 5 of the application), *i.e.* cotton plants in general (see Rule 27(b) EPC).
11. Accordingly, the board is satisfied that the subject-matter of claim 1 does not constitute a plant variety or varieties and is thus not excepted from patentability pursuant to Article 53(b) EPC.

*Novelty (Article 54 EPC)*

12. The board agrees with the examining division's decision that none of the prior art documents cited are detrimental to the novelty of the subject-matter of claims 1 to 8. Accordingly, the subject-matter of claims 1 to 8 is novel and meets the requirements of Article 54 EPC.

*Inventive step (Article 56 EPC)*

*Introduction to the invention*

13. The invention concerns transgenic cotton plants which are tolerant to the herbicide glyphosate. Glyphosate is a very potent competitive inhibitor for the binding of phosphoenolpyruvate (PEP) - a precursor for the synthesis of aromatic amino acids - to the enzyme 5-enol-pyruvylshikimate-3-phosphate synthase (EPSPS) in the shikimic acid pathway. For the purpose of the invention, the particular tolerance to glyphosate was achieved by the introduction into the plant genome of a modified gene encoding a known variant of EPSPS of *Zea mays* (see page 2, lines 18 to 23 of the application). The enzyme has mutations which substantially prevent glyphosate even at high concentrations from binding to the catalytic site of the enzyme, but not PEP (see document D11, abstract, column 9, last paragraph).
14. The modified epsps gene was introduced into the cotton plant genome by transformation, *i.e.* a process which inserts genes at random chromosomal positions. In the art an independent insertion of foreign DNA into a random genomic locus is termed a transgenic "event". The chromosomal location of such an event is unambiguously identified in the DNA sequences spanning the junctions between the transgenic insert and the cotton plant genome immediately flanking the insert on both sides.
15. The cotton plants of the invention contain in their genome the particular transgenic event referred to in the application as EE-GH3 (see e.g. page 1, line 13). This event is *inter alia* defined in claim 1 by the sequences represented by SEQ ID No: 1, corresponding to

the left junction, and SEQ ID No: 2, corresponding to the right junction.

*Closest prior art*

16. The examining division considered either of documents D1 or D2, to represent the closest prior art; for the appellant it was document D2.
17. Document D1 discloses a transgenic glyphosate tolerant cotton plant containing the so-called "*PV-GHGT07(1445) cotton event*" in its genome. The event comprises a single expression cassette of a natural epsps gene derived from *Agrobacterium sp.* strain CP4 (see page 1, line 7 to 10, page 14, line 28 to page 15, line 10, page 15, line 24).
18. Document D2 discloses a different transgenic glyphosate tolerant cotton plant containing the so-called MON 88913 event (hereinafter the "MON event") in its genome. This event differs from that of document D1 in comprising two expression cassettes of the natural epsps gene from *Agrobacterium sp.* strain CP4 (see abstract, figures 1 and 2, page 2, paragraph [0006], page 16, paragraph [0048], page 17, paragraph [0051]).

Transgenic cotton plants containing the MON event are also known under their brand name Roundup Ready™ Flex Cotton (see document D17, title). Document D2 discloses that these plants have an increased glyphosate tolerance compared to the plants disclosed in document D1 as evidenced by an increased cotton yield. Glyphosate was administered in two different concentrations up to the 14-node stage (see document D2, page 19, paragraphs [0056], [0057] and Table 1 on page 20). No information is disclosed in document D2 in

relation to glyphosate tolerance when glyphosate is applied at later developmental stages of the plants or in relation to agronomic parameters other than yield.

19. Since document D2 aims at the same objective as the subject-matter of claim 1, *i.e.* the improvement of glyphosate tolerance in cotton plants, the board agrees with the appellant that the transgenic cotton plants with the MON event of document D2 represent the closest prior art.

*Technical problem and solution*

20. The event defined in claim 1 differs structurally from the MON event of document D2 in that it comprises a modified epsps gene derived from maize (see page 2, line 20 of the application as filed), whereas the MON event comprises two expression cassettes of a wild-type epsps gene from *Agrobacterium sp.* (see point 17 above). The two events are moreover located at different genomic positions in the transgenic cotton plants.
21. The application as filed discloses that transgenic cotton plants containing the event as defined in claim 1 are glyphosate resistant to an extent that "*No visible damage as a result of herbicide application was ever observed after application regardless of rate or stage of development at the time of application*" (see page 28, lines 30 and 31). From this disclosure, however, it is not derivable whether or not the claimed plants have an improved glyphosate tolerance *vis-à-vis* the plants of the closest prior art. This is also not derivable from the different nature of the epsps genes comprised in the two events of the plants under consideration.

22. However, the appellant submitted document D22, which discloses the application of the glyphosate product "Roundup-Ready™ Ultra" comprising a concentration of 1121 gram of active ingredient/ha (corresponding to 32 oz/A) to leaves of (i) cotton plants according to claim 1, (ii) the plants of the closest prior art containing the MON event and (iii) control plants, under identical growth conditions. The data shows that glyphosate causes no leaf necrosis in plants according to claim 1, while the leaves of the other two plant groups exhibit necrosis (see page 2, sixth paragraph, figures 1 to 3).
  
23. Accordingly, the experimental data disclosed in document D22 allows the glyphosate tolerance of the transgenic cotton plants according to claim 1 to be directly compared with that of the plants constituting the closest prior art and demonstrates an advantageous effect of the event as defined in claim 1 on glyphosate tolerance. In accordance with the established jurisprudence of the boards of appeal this effect can be taken into consideration in determining the technical problem underlying the claimed invention (see Case Law of the Boards of Appeal of the EPO, 8th edition 2016, I.D.4.2).
  
24. In view of the plants disclosed in the closest prior art document D2, the differences of the claimed plants thereto and the properties resulting from these differences, the technical problem to be solved is formulated as the provision of transgenic cotton plants with improved glyphosate tolerance.
  
25. The board is satisfied that this problem is solved by the subject-matter of claim 1 in view of the comparative data disclosed in document D22 (see point



22 above). The submission of these data by the appellant in the present proceedings also overcomes the corresponding objection raised by the examining division in the decision under appeal.

*Obviousness*

26. It remains to be assessed whether or not the skilled person starting from the transgenic cotton plants of document D2 containing the MON event and faced with the technical problem defined in point 24 above would modify the teaching of document D2 either in view of this document alone or in combination with another teaching in the prior art so as to arrive at the claimed cotton plants in an obvious manner.
27. Document D2 discloses that the MON event comprising two expression cassettes of an *Agrobacterium*-derived epsps gene is responsible for the observed glyphosate tolerance in transgenic cotton plants (see point 18 above). However, the document is silent about suggestions in relation to further improving the glyphosate tolerance of the transgenic cotton plants containing the MON event. The document also provides no hints to possible means achieving such an improvement, e.g. by relying on epsps genes derived from different origins in general or on modified epsps genes according to claim 1 in particular.
28. Accordingly, the board concludes that the subject-matter of claim 1 is not obvious in the light of the teaching of document D2 alone.
29. Document D11 reports that two specific point mutations in an epsps gene derived from maize substantially prevent glyphosate from binding to the catalytic site

of the enzyme (see column 9, last paragraph) and that this modified gene confers a "very good" glyphosate tolerance in transgenic tobacco plants at the five-node stage while untransformed control plants are "completely destroyed" (see column 10, lines 31 to 41). However, the document discloses no information relating to the potential of this specific epsps gene in conferring an improved glyphosate tolerance in comparison to other known epsps genes in transgenic plants in general, and in particular not the one disclosed in document D2.

30. In these circumstances, the skilled person had no expectations with regard to an improved glyphosate tolerance mediated by the epsps gene disclosed in document D11 compared to that disclosed in document D2 and therefore no motivation to replace the *Agrobacterium*-derived epsps gene disclosed in document D2 with that disclosed in document D11. Therefore the board concludes that the plants according to claim 1 cannot be considered obvious in the light of the combined teaching of documents D2 and D11 either.
31. The examining division argued in the impugned decision that the improved glyphosate tolerance of cotton plants containing the event as referred to in claim 1 compared to the plants of document D2 was not surprising since "*there is the general expectation of a variation between events. This, in fact, is the reason to look for suitable events among a large number of transformants*".
32. The board cannot agree to this argument since, in the present case, the skilled person had no expectation in relation to an improved glyphosate tolerance mediated by the event as defined in claim 1. Accordingly, he

would not have generated transgenic plants containing the event and would therefore also not have screened for plants with the desired properties. In these circumstances, the question of whether or not variations of glyphosate tolerance between events were known to exist does not arise.

33. Lastly, the board considers that a further indication for the non-obviousness of the claimed subject-matter can be derived from document D21. This document shows that from a total of 475 cotton plants all transformed with the same epsps gene only those containing the event "GHB614" exhibited no damage upon application of glyphosate (see document D21, page 2, point 1, second paragraph, page 4, third paragraph and Table 2). "GHB614" is a synonym for the event as defined in claim 1. Document D19 discloses on page 74, lines 31 and 32 that the event "GHB614" has been deposited as PTA-6878 at the ATCC, which is the identical ATCC deposit number of the seeds comprising the event of the invention (see claim 1 and page 3, lines 20 and 21 of the application as filed).
34. Accordingly, the high glyphosate tolerance of an individual transgenic plant is not due to the presence of the modified epsps gene of document D11 *per se*. However, it is the result of the enzymatic activity of the enzyme encoded by the modified epsps and its location at a particular genomic position resulting from a random, *i.e.* non-predictable integration process. All these factors together contribute to the unexpected high glyphosate tolerance which therefore is an "*element of surprise*" (cf. e.g. decision T 775/08, points 12 to 12.4 of the Reasons).

35. In view of the above considerations, the board arrives at the conclusion that the subject-matter of claim 1 is not obvious for the skilled person having regard to the state of the art. The same applies to the subject-matter of the two other independent claims 2 and 6, which relate to either a method or a kit for the identification of the event of claim 1 in transgenic cotton plants (including the cells, parts, seeds or progeny thereof) and claims 3 to 5 and 7 and 8 dependent thereon. Thus, the new main request meets the requirements of Article 56 EPC.

## Order

### For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the examining division with the order to grant a patent on the basis of the new main request filed with the letter of 8 July 2016 and a description and figures to be adapted thereto.

The Registrar:

The Chairwoman:



P. Cremona

G. Alt

Decision electronically authenticated