

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ALBAUGH, LLC,
Petitioner

v.

BASF SE,
Patent Owner

Case No. PGR2026-00026
Patent No. 12,305,206

DECLARATION OF DAVID A. HUNT, PH.D.

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I. OVERVIEW

1. I have been retained by counsel for Patent Owner BASF SE (“BASF” or “Patent Owner”) in the above-captioned proceedings. I understand that Petitioner Albaugh LLC (“Albaugh” or “Petitioner”) seeks post grant review (PGR) of U.S. Patent 12,305,206 (“the ’206 Patent”). I submit this declaration in support of Patent Owner’s Preliminary Response for the ’206 Patent and in response to the opinions of Dr. Suri S. Iyer provided in Exhibit 1003.

2. Petitioner’s Petition for Post Grant Review of the ’206 Patent challenges claims 1-6 (“the Challenged Claims”). Pet. at 1.

3. As explained in detail below, it is my opinion that U.S. Patent No. 8,445,406 to Long (“Long”), Petitioner’s primary reference, only discloses racemic glufosinate, and thus is missing one limitation as required by the ’206 Patent. Additionally, it is my opinion that that Patent Owner’s test data submitted to the Patent Office is surprising and unexpected. Finally, it is my opinion that Dr. Iyer does not explain how or why one of ordinary skill in the art would have combined the cited references in the Petition.

4. Although this declaration addresses certain disagreements with Dr. Iyer’s conclusions, by not addressing one or more of Dr. Iyer’s statements, I am not conceding or agreeing with Dr. Iyer on those points.

5. Teklicon charges \$860 per hour for my time spent on this matter. My compensation is not tied to my work in this matter, the outcome of this matter, or the content of my opinions.

6. I reviewed the '206 Patent, the prosecution history of the '206 Patent, the Petition, and every exhibit attached to the Petition, including Dr. Iyer's declaration.

II. BACKGROUND AND QUALIFICATIONS

7. My qualifications for forming the opinions in this report are briefly summarized here and explained in more detail in my curriculum vitae, which has been marked as Exhibit 2032.

8. I am currently an instructor at the Guilford Technical Community College, where I teach college level chemistry courses. I also serve as professor and principal investigator at the International Research Institute of North Carolina, where I connect mentors with high-school students/early level college students. I am also currently a consultant in patent disputes. Ex. 2032.

9. I have over five decades of experience in organic chemistry, agrochemical research and development, and the synthesis and development of biologically active compounds, including herbicides, insecticides, and fungicides. *See Ex. 2032.*

10. I earned a B.S. in Chemistry and a M.S. in Organic Chemistry from Marshall University. I then earned a Ph.D. in Organic Chemistry from Duke University. My doctoral work focused on synthetic organic chemistry involving functionalized aryllithium reagents and the preparation of heterocyclic and carbocyclic systems, providing a strong foundation in reaction mechanisms, stereochemistry, and the preparation of complex organic molecules. Ex. 2032.

11. My professional career includes extensive experience in the discovery and development of agricultural compounds. I began my career at Union Carbide Corporate Technical Center, where I was involved in the exploratory synthesis of potential insect control agents. Then I worked at Becton Dickinson Research Center. There, I was involved in the design and synthesis of compounds for use in immunoassays and immunological studies. After that, I worked at PPG Industries where I conducted design and synthesis of novel compounds in the herbicide space. Then I worked at Solvay America, Salsbury Laboratories, where I participated in the development of synthesis routes and scale-ups for intermediates in agrochemicals. I was responsible for a group of research chemists (who were involved in the analytical and process development), technicians, and chemical engineers to define processes. Ex. 2032.

12. From 1989 to 1999, I worked at American Cyanamid Company in the Agricultural Research Division, where I served as Group Leader and then Senior

Group Leader. In these roles, I was involved in the discovery synthesis for insecticides, fungicides, and herbicides. Specifically, I conducted design and exploratory synthesis of fungicides and herbicides that were later developed into novel classes. I also prepared field trial samples. As I progressed at American Cyanamid, I directed a group of chemist teams engaged in the design of insecticides, leading to commercialization of a product known as *Phantom*. Ex. 2032.

13. Then from 2001-2005, I worked for Albany Molecular Research, Inc, where I began by leading a section of 55 chemists to design, evaluate, and reduce to practice novel chemical synthesis routes for compounds in the early drug development phase. Then I led a department of around 100 scientists and technicians in cGMP manufacturing and development projects. Ex. 2032.

14. After my time in industry, I became a professor at the College of New Jersey. There I was one of the faculty members responsible for the organic chemistry curriculum. I developed and conducted lab-based courses in heterocyclic chemistry, medicinal chemistry, and other advanced organic chemistry classes. Ex. 2032. I also conducted research with undergraduate students. During my 19 years at TCNJ, I have worked with more than 50 undergraduate research students. Twenty-six of these students are co-authors on published work.

15. Throughout my career, I regularly attended many conferences, symposia, and lectures, and I served as the co-organizer for the 2nd Pan Pacific

Conference on Pesticide Science in 1999 and was the co-editor of the *Synthesis and Chemistry of Agrochemicals V* monograph in 1997. Ex. 2032.

16. I am named as an inventor of 33 US and international patents in the fields of insecticides, fungicides, and herbicides. I have authored over 41 technical articles and have delivered over 14 presentations at various conferences. I have authored 8 textbook chapters and have edited 6 textbook editions. I have served as an academic and research advisor to over 66 students in organic chemistry. Ex. 2032.

17. Based on my education and experience, I consider myself to be an expert in organic chemistry (including stereochemistry and enantiomers) and in insecticide, fungicide, and herbicide design and development

III. LEGAL STANDARDS

18. I am not an attorney and offer no opinions on the law. I am, however, informed on several legal principles, summarized below, which I have used in reaching my opinions.

A. Anticipation

19. I understand that a patent is invalid if it is established that a single asserted prior art reference discloses each and every element of the claimed invention, either explicitly or inherently, to a person of ordinary skill in the art. There must be no difference between the claimed invention and the disclosure of the

alleged prior-art reference as viewed from the perspective of the person of ordinary skill in the art.

20. Also, I understand that for a reference to be anticipatory, it must describe the claimed subject matter with sufficient clarity to establish that the subject matter existed and that its existence was recognized by persons of ordinary skill in the field of invention.

21. In addition, I am informed and understand that to establish that an element of a claim is “inherent” in the disclosure of an asserted prior art reference, the evidence outside the four corners of the assert prior-art reference must make clear that the missing element is inevitable outcome of the process and/or thing that is explicitly described in the asserted prior-art reference, and that it would be recognized as necessarily present by persons of ordinary skill in the relevant field.

B. Obviousness

22. I understand that a patent is invalid if it is established that the differences between the subject matter of the patent and the prior art are such that the subject matter, as a whole, would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. I also understand that the question of obviousness requires consideration of (a) the scope and content of the prior art; (b) the level of ordinary skill in the art; (c) the differences between the claimed invention and the prior art; and (d) secondary

considerations of non-obviousness. I also understand that the scope and content of the prior art must be viewed through the perspective of a person of ordinary skill in the art at the time of the invention.

23. Because the test for obviousness is what would have been obvious at the time of the invention was made to a person having ordinary skill in the art to which said subject matter pertains, I understand that analyses that rely on hindsight to establish obviousness are improper. I understand that the best way to avoid hindsight reasoning is to demonstrate that a person having ordinary skill in the art would have been motivated to modify the prior art to meet the claimed invention.

24. I understand that in forming an opinion regarding obviousness, one must consider so-called “secondary considerations” or “objective indicia” of non-obviousness, which include for example:

- a. Whether the invention was commercially successful as a result of the merits of the claimed invention (rather than the result of design needs or market-pressure advertising or similar activities);
- b. Whether the invention satisfied a long-felt need;
- c. Whether others have tried and failed to make the invention;
- d. Whether others invented the invention at roughly the same time;
- e. Whether others copied the invention;

- f. Whether there were changes or related technologies or market needs contemporaneous with the invention;
- g. Whether the invention achieved unexpected results;
- h. Whether others in the field praised the invention;
- i. Whether persons having ordinary skill in the art of the invention expressed surprise or disbelief regarding the invention;
- j. Whether others sought or obtained rights to the patent from the patent holder; and
- k. Whether the inventor proceeded contrary to accepted wisdom in the field.

25. I understand that any secondary considerations must have some relationship or nexus to the invention claimed in the patents at issue

C. Claim Construction

26. I understand that claim terms are generally given their ordinary and customary meaning to a person of ordinary skill in the art (“POSITA”) at the time of the invention.

IV. PERSON OF ORDINARY SKILL IN THE ART

27. I understand that the ’206 Patent is to be viewed from the perspective of one of ordinary skill in the art. I understand that the perspective of one of ordinary

skill in the art means the level of skill of an ordinarily skilled person in the art in question at the time of the claimed invention.

28. The relevant date for the '206 Patent is March 2, 2016.

29. I understand that factors such as the education level of those working in the field, the sophistication of the technology, the types of problems encountered in the art, the prior art solutions to those problems, and the speed at which innovations are made inform the relevant level of skill in the art for a POSITA.

30. In my opinion, the POSITA at the time of the invention of the Challenged Patent would have had a (1) bachelor's degree in a pertinent discipline, such as chemistry or biology, or a related field and (2) have three to five years of experience working in the herbicide development space. Alternatively, a POSITA would have (1) a master's degree in a pertinent discipline, such as chemistry or biology, or a related field and (2) have two to five years of experience working in the herbicide development space. My opinion regarding the qualifications of a POSITA is based on my knowledge, skill, training, experience, and review of the materials discussed herein.

31. I am aware that Petitioner has provided its own definition of a POSITA as follows: "For the subject matter of the claims of the challenged patent, a POSITA would be a multidisciplinary team that included a person with an advanced degree in a discipline such as chemistry, organic chemistry, formulation science,

pharmaceutics including molecular pharmaceutics, pesticides and formulation technology, and the like, and five years of practical experience, or the equivalent. Ex.1003, ¶¶29-30. The POSITA would be familiar with prior art methods for synthesizing, purifying, and formulating organic molecules having biological activity, including organic compounds having an asymmetric center and the enantiomers and racemic mixtures of those compounds. *Id.* The POSITA would be familiar with formulations of organic bioactive compounds, such as herbicides, in racemic form and in individual enantiomer form, as well as their properties and applications. *Id.* The POSITA would be part of a research team working to develop biologically active organic molecules, such as herbicides, and attends meetings with team members typical of a team developing herbicides for commercial applications. *Id.* The POSITA would have also had access to other individuals typically involved in developing formulation products, including those involved in upstream and downstream manufacturing, analytical chemistry, packaging, and regulatory affairs. *Id.* The POSITA would have regularly attended lectures, symposia, and conferences on formulations and applications of herbicides, and would have been familiar with the literature in the field and the research and development of other groups working in the field. *Id.*” Pet. at 37–38.

32. I believe Petitioner’s definition is confusing as it requires the POSITA to be both a multidisciplinary team and an individual. Additionally, I believe that the

qualifications and experience set forth in Petitioner's definition is too high, effectively requiring the POSITA to be an expert instead of one of ordinary skill in the art.

33. Based on my qualifications outlined above, I qualify as at least a POSITA under both parties' definitions, as of the effective date for the Challenged Claims and today.

34. Based on Dr. Iyer's qualifications outlined in his declaration and CV, he does not appear to meet either party's definition, as of the effective filing date for the Challenged Claims and today. Both parties' definitions require a POSITA to have experience with herbicide development. I agree that herbicide development experience is necessary to qualify as a person of ordinary skill in the art. I have seen no indication from Dr. Iyer's declaration or CV that he has this required experience with herbicide development to qualify as a POSITA.

V. OVERVIEW OF THE '206 PATENT AND CLAIMS

35. The '206 Patent, which is titled "Methods for Making L-Glufosinate," issued from U.S. Application Ser. No. 18/435,340 filed on February 7, 2024. Ex. 1001, Cover.

36. The '206 Patent relates to a formulation comprising L-glufosinate. The '206 Patent discloses different embodiments of L-glufosinate formulations in

different ratios. Ex. 1001, 13:66-14:48. The claims cover specific embodiments described in the specification. Ex. 1001, 12:14-22.

37. BASF amended the claim language to include the following limitation during prosecution: “greater than about 90% L-glufosinate compared to the sum of the D-glufosinate and the L-glufosinate present in the formulation.” Ex. 2001 at 315. This addition is novel because at the time of the invention, the use of L-glufosinate was prevented due to difficulties in purification and formulations, especially of L-glufosinate at such a high concentration.

38. Also, during the prosecution of the '206 Patent, BASF offered unexpected results as part of its evidence. Ex. 2001 at 313. These results are surprising because one would expect phototoxicity to increase with a larger amount of active ingredient. And as shown in BASF's data, it found the opposite. I provide further analysis on this below.

VI. OPINIONS

A. Long Just Teaches Racemic L-Glufosinate Mixtures

39. Every claim of the '206 Patent requires “greater than about 90% L-glufosinate compared to the sum of the D-glufosinate and the L-glufosinate present in the formulation.” Ex. 1001, claim 1. As discussed below, Long does not teach or suggest this claim requirement.

40. Long is titled “Long Stable Concentrated Herbicidal Compositions,” and teaches a racemic formulation. Ex. 1005, Cover. Long discloses a herbicidal composition, that comprises “a water-soluble herbicidal ingredient (a).” Ex. 1005, 2:33-35. Some examples of the herbicidal ingredient could be glufosinate, and mixtures of different herbicides may also be used. Ex. 1005, 2:35-38.

41. Long’s specification describes that the compounds of formula (I) contain an asymmetric carbon atom. Ex. 1005, 3:10-11. Therefore, it follows that Long discloses stereoisomers of glufosinate because formula (I) contains an asymmetric carbon. By describing formula (I) without wedged and dashed bonds, Long specifies that the formula is racemic, meaning that an equal amount of each isomer (D and L) must be present in the formula resulting in an enantiomeric excess (ee) of zero. Enantiomeric excess is a measure used in stereochemistry to indicate the purity of a chiral substance. It specifies the degree to which a sample contains one enantiomer in greater amounts than its mirror-image counterpart, ranging from 0% (a racemic, 50:50 mixture) to 100% (an enantiomerically pure sample). This would also be the understanding of a person of ordinary skill in the art.

42. Long then goes on to list some examples of the active ingredients that may be included in formula (I). Long lists the L-enantiomer of glufosinate as the active ingredient of the racemic mixture. Ex. 1005, 3:15-23 (“Examples of active ingredients of the formula (I) include glufosinate and/or its ammonium salt such as

in a racemic mixture . . . the L-enantiomer of glufosinate . . .”). Long mentions the L-enantiomer as the active ingredient of the racemic mixture. This formula does not disclose a composition consisting only of L-glufosinate or L-glufosinate in enantiomeric excess. To the contrary, as described above, the formula as drawn requires both isomers to be present. Thus, this formula does not disclose the limitation of the ’206 Patent requiring “greater than about 90% L-glufosinate compared to the sum of the D-glufosinate and the L-glufosinate present in the formulation.”

43. I disagree with Dr. Iyer’s conclusions regarding Long. Specifically, I disagree with his conclusion that a POSITA would understand Long to not be limited to racemic glufosinate. Ex. 1003, ¶ 125. I disagree with his conclusion that L-enantiomer of glufosinate ammonium is “expressly called out.” *Id.* As mentioned above, Long does not “expressly call out” L-glufosinate. Long just identifies L-glufosinate as the active ingredient of the racemic mixture, as the formula “encompass[es] all stereoisomers” of each species described by the formula. Ex. 1005, 3:15-23. Formula (I), and the Long passage quoted by Dr. Iyer, only disclose L-glufosinate as part of the racemic mixture.

44. I further note that Dr. Iyer never explains how or why a person of ordinary skill in the art would interpret the disclosure in Long as disclosing a glufosinate mixture with an enantiomeric excess of the L-isomer. Moreover, Dr. Iyer

never explains how or why a person of ordinary skill in the art would understand Long to disclose a glufosinate formulation wherein the formulation contains “greater than about 90% L-glufosinate compared to the sum of the D-glufosinate and the L-glufosinate present in the formulation.”

45. I agree with BASF’s argument in the prosecution history and the Examiner’s conclusion that Long only discloses racemic glufosinate.

46. In addition to my reasoning above, there are other parts of Long that confirm this understanding. For example, Long describes several examples confirming that Long only ever contemplated and disclosed racemic glufosinate. A person of ordinary skill in the art reading Long would understand these examples, and their use of only racemic glufosinate, as confirmation that Long’s formula (I) (and Long’s overall specification), only discloses racemic glufosinate.

47. More particularly, Long includes some examples of various herbicidal compositions. Ex. 1005, 6:33–34. All the examples only use racemic glufosinate.

	1	2	3	4	5	6	7	8	9
Glufosinate 50%	44.00	44.00	44.00	44.00	44.00	44.00	44.00	44.00	44.00
SEES (sodium fatty ether sulfate) 70%	38.00	38.00	38.00	38.00	38.00	38.00	38.00	38.00	38.00
BREAK THRU S200 ¹	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
THEA (tetrahydrofurfuryl alcohol)	7.00	7.00	7.00						
Propylene glycol monomethyl ether				7.00	7.00	7.00			
Dipropylene Glycol							7.00	7.00	7.00
Iso-propanol	3.00			3.00			3.00		
Iso-Butanol		3.00			3.00			3.00	
1-Butanol			3.00			3.00			3.00
AKZO 6206 Linear	5.00					5.00		5.00	
Hexyl polyglycoside ²									
AKZO 6202 2- ethylhexyl polyglycoside ³		5.00		5.00					5.00
AL 2575 C8-10			5.00		5.00		5.00		
Alkyl polyglycoside ⁴									
Sodium Xylene Sulfonate 40% aqueous	1.75				1.75			1.75	

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Examples 10 to 12

Examples 10 to 12 illustrate the effects of dipropylene glycol with various co-solvents. Example 10 is a composition of the present invention while Examples 11 and 12 are comparative.

INGREDIENT:	10		11		12	
	%	grams	%	grams	%	grams
Glufosinate 50%	44.00	88.00	44.00	88.00	44.00	88.00
SLES 70%	38.00	76.00	38.00	76.00	38.00	76.00
BREAK THRU S200	1.00	2.00	1.00	2.00	1.00	2.00
Dipropylene Glycol	7.00	14.00	7.00	14.00	7.00	14.00
Iso-propanol	3.00	6.00				
Iso-butanol			3.00	6.00		
1-butanol					3.00	6.00
AKZO 6206 Linear Hexyl polyglycoside			5.00	10.00		
AKZO 6202 2-ethylhexyl polyglycoside					5.00	10.00
AL 2575 C8-C10 Alkyl polyglycoside	5.00	10.00				
Sodium Xylene Sulfonate 40%					1.75	3.50
Sodium Toluene Sulfonate 40%			1.75	3.50		
PLANTAPON CMGS ¹	1.75	3.50				
FLUOWET PL80B	0.25	0.50	0.25	0.50	0.25	0.50
TOTAL:	100.00	200.00	100.00	200.00	100.00	200.00
RESULTS:						
Viscosity, cps- Initial Room Temperature	140		NT		NT	
Appearance - Initial Room Temp.	no separation		separation		separation	

Example 13

Comparative

Each composition in the following example contained, in parts by weight:

Glufosinate 50% Concentrate	49	10
BREAK THRU 9905 Antifoam	0.8	
BREAK THRU S200 Silicone Surfactant ²	0.6	
Potassium Hydroxide 50% Solution	0.12	

^{1, 2}Available from Degussa Corporation

Example 14

The following example illustrates the preparation of an herbicidal composition in accordance with the present invention. The ingredients were mixed together in the order listed:

Percent by weight	
INGREDIENT:	
Glufosinate 50%	48.600
AGNIQUE SLES 270 ¹	34.544
AGNIQUE PG 8105 ²	9.850
THFA	5.500
BREAK THRU S200	0.600
BREAK THRU AF 9903	0.800
Potassium Hydroxide 50% Solution	0.100
D&C Red 17	0.006
TOTAL	100.000

These examples further indicate that Long only discloses formulations of racemic glufosinate.

48. Because Long's formulation does not (and cannot) include the claimed ratio of L- and D-glufosinate, Long does not teach or suggest a formulation of "greater than about 90% [*i.e.*, 80% ee] L-glufosinate compared to the sum of the D-glufosinate and the L-glufosinate present in the formulation."

49. Nothing else in Long teaches the required ratios as claimed in the '206 Patent. Thus, one of skill in the art would not understand Long as teaching an enantiomeric excess of L-glufosinate relative to D-glufosinate, much less a specific ratio of L- to D-glufosinate as recited in the claims.

50. Long only teaches the racemic mixture of glufosinate.

B. There is No Motivation to Combine the L-Glufosinate Synthesis References with Long

51. After reviewing the L-Glufosinate Synthesis References, I disagree with Dr. Iyer's opinion that a POSITA would have been motivated to combine Long with the L-Glufosinate Synthesis References. Ex. 1003, ¶ 162. A POSITA would not have been motivated to combine Long with the L-Glufosinate Synthesis References because the inventions are unrelated, having different objectives. As mentioned above, Long is related to formulations that use racemic glufosinate. Ex. 1005, 2:34-36. The L-Glufosinate Synthesis References by contrast relate to different methods of purifying or isolating L-glufosinate. *See* Ex. 1006 (purification from *E. coli*); Ex. 1007 (enantioselective synthesis from L-methionine and L-glutamic acid via L-vinylglycine); Ex. 1011 (selective crystallization); Ex. 1008 (enzymatic cleavage using penicillin-G-acylase); Ex. 1009 (producing glufosinate P from glufosinate P hydrochloride salt); Ex. 1010 (catalytic asymmetric hydrogenation with rhodium catalyst).

52. I disagree with Dr. Iyer's characterization that a "POSITA would have been motivated to prepare and purify the biologically active L-isomer of glufosinate ammonium for use in Long's formulations and would be motivated to look to prior art methods of doing so." Ex. 1003, ¶ 162. Long does nothing more than mention that the L-isomer is the active isomer, and there is no mention of the possibility of

isolating or purifying the active isomer or any suggestion that it would be desirable to use such a purified isomer in Long's formulations. *See generally*, Ex. 1005.

53. As mentioned above, I also disagree with Dr. Iyer's representation that "Long . . . specifically identifies 'the L enantiomer of glufosinate and its ammonium salt' as a biologically active herbicide for use in its formulations." Ex. 1003, ¶ 162. Long does not do so. Long only discloses the L-isomer as the active isomer in a racemic mixture, therefore a POSITA would not be aware or motivated to prepare and purify the L-glufosinate glufosinate for use in Long's formulations.

54. Moreover, Dr. Iyer never explains how or why a person of ordinary skill in the art would combine Long with the specific L-Glufosinate Synthesis References. He does not include any analysis of how a POSITA would combine these references to achieve the specific claimed ratio of L-glufosinate in enantiomeric excess of about greater than 80% as recited in the '206 Patent claims.

55. Modifying Long to incorporate the purification or isolation of L-glufosinate from the L-Glufosinate Synthesis References would not suggest or teach the claimed ratio in the '206 Patent. The L-Glufosinate Synthesis References do not include any reference to a formulation having a particular ratio of L-glufosinate to D-glufosinate, let alone the specific ratio of 90% L-glufosinate compared to the sum of the D-glufosinate and the L-glufosinate (*i.e.*, L-glufosinate in enantiomeric excess of 80%).

56. Even if a POSITA did look to those references, there is no teaching or suggestion to use the L-Glufosinate Synthesis References to achieve the precise range of the claim formulation in the '206 Patent. All the L-Glufosinate Synthesis References relate to obtaining pure L-glufosinate or converting all D-glufosinate to L-glufosinate. None of the references mention or teach the 90% L-glufosinate in the presence of D-glufosinate in the claimed ratio. As mentioned above, Long also does not disclose the claimed element of “greater than about 90% L-glufosinate compared to the sum of the D-glufosinate and the L-glufosinate present in the formulation.” Thus, the L-Glufosinate Synthesis References cannot fill this gap in Long’s teachings.

57. In conclusion, it is my opinion that a POSITA would not look to the L-Glufosinate Synthesis References when attempting to modify Long, and as such, there would have been no motivation to combine Long with the L-Glufosinate Synthesis References.

58. Petitioner identifies Ground 3 as a combination of Long with “one or more of” the L-Glufosinate Synthesis References. I have determined that there would be 63 different combinations consisting of Long and “one or more of” the six L-Glufosinate Synthesis References. I list all 63 below. Neither the Petition nor Dr. Iyer specifically discusses any of these individual combinations.

<u>No.</u>	<u>Combination</u>
1	Long, Schulz
2	Long, Zeiss
3	Long, Grabley
4	Long, Nakanishi
5	Long, Minowa
6	Long, Knorr
7	Long, Schulz, Zeiss
8	Long, Schulz, Grabley
9	Long, Schulz, Nakanishi
10	Long, Schulz, Minowa
11	Long, Schulz, Knorr
12	Long, Zeiss, Grabley
13	Long, Zeiss, Nakanishi
14	Long, Zeiss, Minowa
15	Long, Zeiss, Knorr
16	Long, Grabley, Nakanishi
17	Long, Grabley, Minowa
18	Long, Grabley, Knorr
19	Long, Nakanishi, Minowa
20	Long, Nakanishi, Knorr
21	Long, Minowa, Knorr
22	Long, Schulz, Zeiss, Grabley
23	Long, Schulz, Zeiss, Nakanishi
24	Long, Schulz, Zeiss, Minowa
25	Long, Schulz, Zeiss, Knorr
26	Long, Schulz, Grabley, Nakanishi
27	Long, Schulz, Grabley, Minowa
28	Long, Schulz, Grabley, Knorr
29	Long, Schulz, Nakanishi, Minowa
30	Long, Schulz, Nakanishi, Knorr
31	Long, Schulz, Minowa, Knorr
32	Long, Zeiss, Grabley, Nakanishi
33	Long, Zeiss, Grabley, Minowa
34	Long, Zeiss, Grabley, Knorr
35	Long, Zeiss, Nakanishi, Minowa
36	Long, Zeiss, Nakanishi, Knorr
37	Long, Zeiss, Minowa, Knorr
38	Long, Grabley, Nakanishi, Minowa

39	Long, Grabley, Nakanishi, Knorr
40	Long, Grabley, Minowa, Knorr
41	Long, Nakanishi, Minowa, Knorr
42	Long, Schulz, Zeiss, Grabley, Nakanishi
43	Long, Schulz, Zeiss, Grabley, Minowa
44	Long, Schulz, Zeiss, Grabley, Knorr
45	Long, Schulz, Zeiss, Nakanishi, Minowa
46	Long, Schulz, Zeiss, Nakanishi, Knorr
47	Long, Schulz, Zeiss, Minowa, Knorr
48	Long, Schulz, Grabley, Nakanishi, Minowa
49	Long, Schulz, Grabley, Nakanishi, Knorr
50	Long, Schulz, Grabley, Minowa, Knorr
51	Long, Schulz, Nakanishi, Minowa, Knorr
52	Long, Zeiss, Grabley, Nakanishi, Minowa
53	Long, Zeiss, Grabley, Nakanishi, Knorr
54	Long, Zeiss, Grabley, Minowa, Knorr
55	Long, Zeiss, Nakanishi, Minowa, Knorr
56	Long, Grabley, Nakanishi, Minowa, Knorr
57	Long, Schulz, Zeiss, Grabley, Nakanishi, Minowa
58	Long, Schulz, Zeiss, Grabley, Nakanishi, Knorr
59	Long, Schulz, Zeiss, Grabley, Minowa, Knorr
60	Long, Schulz, Zeiss, Nakanishi, Minowa, Knorr
61	Long, Schulz, Grabley, Nakanishi, Minowa, Knorr
62	Long, Zeiss, Grabley, Nakanishi, Minowa, Knorr
63	Long, Schulz, Zeiss, Grabley, Nakanishi, Minowa, Knorr

C. BASF's Test Data Exhibits Unexpected Results

59. BASF submitted greenhouse trial data showing unexpected results during the prosecution of the '206 Patent. It has been explained to me that unexpected results may overcome an obviousness rejection in the Patent Office. Unexpected results mean that the claimed invention exhibits some superior property or advantage that a POSITA would have found surprising or unexpected.

60. I have reviewed BASF's data submitted to the Patent Office. Based on my experience and the general knowledge of those of ordinary skill in the art, herbicides have effects on both weeds and field crops. The damaging effects on weeds are the intended effects, and the damaging effects on the field crops are unintended (or undesirable). The damaging effect on the field crops is also known as phytotoxicity. It would be expected that by increasing the amount active ingredient in a herbicide that there would be a concomitant increase in the amount of crop phytotoxicity because the concentration of the active ingredient is higher. Thus, I disagree with Dr. Iyer's argument that the data represent an expected result. *See* Ex. 1003, ¶ 168.

61. To avoid damaging crops, some herbicides may be applied prior to the emergence of the crop (pre-emergent). Alternatively, some crops have been bred or genetically engineered to resist the toxic effects of a herbicide. In such cases, herbicides can be applied post-emergence where the herbicide will primarily affect the targeted weeds, but generally not harm the herbicidal resistant crops. Even in these situations, however, herbicidal resistant crops typically incur some (smaller) degree of damage or toxicity as a result of the herbicidal application.

62. In the case of BASF's data, I find the effect of their claimed formulation surprising. BASF's experiments compared the application of different concentrations of racemic glufosinate against the claimed enantiomeric excess

formulation of glufosinate (i.e., wherein the formulation has “greater than about 90% L-glufosinate compared to the sum of the D-glufosinate and the L-glufosinate present in the formulation...”) and further assessed toxicity on the targeted weeds and glufosinate tolerant crops. Ex. 2001 at 313.

63. Thus, I would expect that any increase in the effective amount of L-glufosinate applied to the experimental subjects (targeted weeds and glufosinate resistant crops) would increase the toxicity and phytotoxicity on both the weeds and the field crops. However, BASF’s data surprisingly showed the opposite.

64. For example, I expected there to be, at least, an increase in the amount of phytotoxicity caused by 300 g/ha LGA compared to 300 g/ha GA dosages on the field crops in BASF’s experiment because there would be almost double the amount of L-glufosinate in the LGA mixture as compared to the GA mixture. That is to say, the glufosinate in the racemic GA mixture would contain approximately 50% L-glufosinate, so around 150 g/ha of L-glufosinate. But the test data shows the opposite: 300 LGA, which contains greater than 90% L-glufosinate relative to the total amount of L-glufosinate and D-glufosinate (or greater than about 270 g/ha of L-glufosinate), caused less phytotoxicity compared to racemic GA, which contains 150 g/ha of L-glufosinate. See for example:

[0005] The results of the phytotoxicity experiment are summarized in table 2e below. Surprisingly, all LGA treatments are causing less phytotoxicity than respective GA treatments applied at the same molecular weight. There is some difference in sensitivity to glufosinate between the two soybean varieties but the difference in crop response from LGA as compared to GA is visible in both varieties and at all three application rates 300, 600 and 1200 g/ha. This was not expected.

Table 2e: Ratings of herbicidal activity (phytotoxicity) in an greenhouse experiment against the above mentioned glufosinate tolerant soybeans (GLXMA) after a single post-emergence treatments with racemate glufosinate-ammonium (GA) and L-glufosinate-ammonium (LGA) rated 7 DAA.

Field crop	LGA 300 g/ha	GA 300 g/ha	LGA 600 g/ha	GA 600 g/ha	LGA 1200 g/ha	GA 1200 g/ha
GLXMA (CZ1660)	0	5	10	15	10	40
GLXMA (CZ3519)	5	10	10	35	15	70
average	2.5	7.5	10	25	12.5	55

Ex. 2001 at 213 (annotated). In fact, in all three experimental groups, there was substantially less damage to the crops with the LGA mixture than the GA mixture. *See* Ex. 2001 at 213. This is surprising because in each of these, the amount of L-glufosinate in the LGA mixture is almost double the amount of L-glufosinate in the racemic GA mixture. And as mentioned above, I would have assumed that there would be almost double the damage, or at least some increase in damage, with LGA when compared with GA.

65. Further, I would expect there to be similar damage to crops when similar amounts of L-glufosinate are used. For example, GA 1200 g/ha would have around the same amount of L-glufosinate as LGA 600 g/ha. So, I would expect these two mixtures to exhibit the same level of phytotoxicity of around 40 for the CZ1660 crops and 70 for the CZ3519 crops. But BASF's test data shows a surprising result. Instead of showing similar amounts of damage, LGA 600 g/ha only had a level of 10 for both the CZ1660 and CZ3519 crops. Ex. 2001 at 213. That is a 75% reduction

in damage to the CZ1660 crops and around an 86% reduction to the CZ3519 crops. Thus, the LGA mixture, despite having a similar amount of L-glufosinate, had significantly less damage to crops when compared to a similar amount of L-glufosinate in the racemic GA mixtures.

[0005] The results of the phytotoxicity experiment are summarized in table 2e below. Surprisingly, all LGA treatments are causing less phytotoxicity than respective GA treatments applied at the same molecular weight. There is some difference in sensitivity to glufosinate between the two soybean varieties but the difference in crop response from LGA as compared to GA is visible in both varieties and at all three application rates 300, 600 and 1200 g/ha. This was not expected.

Table 2e: Ratings of herbicidal activity (phytotoxicity) in an greenhouse experiment against the above mentioned glufosinate tolerant soybeans (GLXMA) after a single post-emergence treatments with racemate glufosinate-ammonium (GA) and L-glufosinate-ammonium (LGA) rated 7 DAA.

Field crop	LGA 300 g/ha	GA 300 g/ha	LGA 600 g/ha	GA 600 g/ha	LGA 1200 g/ha	GA 1200 g/ha
GLXMA (CZ1660)	0	5	10	15	10	40
GLXMA (CZ3519)	5	10	10	35	15	70
average	2.5	7.5	10	25	12.5	55

Ex. 2001 at 213.

66. This surprising effect is also seen with LGA 300 and racemic GA 600. Here again, I would have also expected to see similar results in damage as the amount of L-glufosinate in both these mixtures would be similar. However, the test results show significantly less phytotoxicity to the field crops with increased L-glufosinate use. The LGA 300 had a rating of 0 damage with the CZ1660 crops and a rating of 5 damage with the CZ3519 crops. Ex. 2001 at 213. Whereas GA 600 exhibited a rating of 15 damage to CZ1660 crops and a rating of 35 damage to the CZ3519 crops. Ex. 2001 at 213. Thus, the LGA mixture (predominantly L-

glufosinate) had significantly less damage compared to the racemic GA mixture with similar amount of L-glufosinate.

[0005] The results of the phytotoxicity experiment are summarized in table 2e below. Surprisingly, all LGA treatments are causing less phytotoxicity than respective GA treatments applied at the same molecular weight. There is some difference in sensitivity to glufosinate between the two soybean varieties but the difference in crop response from LGA as compared to GA is visible in both varieties and at all three application rates 300, 600 and 1200 g/ha. This was not expected.

Table 2e: Ratings of herbicidal activity (phytotoxicity) in an greenhouse experiment against the above mentioned glufosinate tolerant soybeans (GLXMA) after a single post-emergence treatments with racemate glufosinate-ammonium (GA) and L-glufosinate-ammonium (LGA) rated 7 DAA.

Field crop	LGA 300 g/ha	GA 300 g/ha	LGA 600 g/ha	GA 600 g/ha	LGA 1200 g/ha	GA 1200 g/ha
GLXMA (CZ1660)	0	5	10	15	10	40
GLXMA (CZ3519)	5	10	10	35	15	70
average	2.5	7.5	10	25	12.5	55

Ex. 2001 at 213.

67. I disagree with Dr. Iyer's opinion that "any differences in phytotoxicity in BASF's field tests would have been due to the inherent properties of L-glufosinate ammonium and racemic glufosinate ammonium." Ex. 1003, ¶ 171. As mentioned above, based on the properties of glufosinate, a POSITA would expect greater damage to the crops when using a greater amount of L-glufosinate. This inherent property is seen when comparing the different quantities of GA mixtures. For example, when using GA 300 g/ha on crops, there was a 5 rating of phytotoxicity on CZ1660 crops and a 10 rating of phytotoxicity on CZ3519 crops. Ex. 2001 at 213. And with GA 600 g/ha, there was a 15 rating of phytotoxicity on CZ1660 crops and a 35 rating of phytotoxicity on CZ3519. Ex. 2001 at 213.

[0005] The results of the phytotoxicity experiment are summarized in table 2e below. Surprisingly, all LGA treatments are causing less phytotoxicity than respective GA treatments applied at the same molecular weight. There is some difference in sensitivity to glufosinate between the two soybean varieties but the difference in crop response from LGA as compared to GA is visible in both varieties and at all three application rates 300, 600 and 1200 g/ha. This was not expected.

Table 2e: Ratings of herbicidal activity (phytotoxicity) in an greenhouse experiment against the above mentioned glufosinate tolerant soybeans (GLXMA) after a single post-emergence treatments with racemate glufosinate-ammonium (GA) and L-glufosinate-ammonium (LGA) rated 7 DAA.

Field crop	LGA 300 g/ha	GA 300 g/ha	LGA 600 g/ha	GA 600 g/ha	LGA 1200 g/ha	GA 1200 g/ha
GLXMA (CZ1660)	0	5	10	15	10	40
GLXMA (CZ3519)	5	10	10	35	15	70
average	2.5	7.5	10	25	12.5	55

Ex. 2001 at 213. This data comparing racemic GA shows the inherent property of glufosinate: increased phytotoxicity with increased amounts of racemic GA. Yet, the opposite was found with LGA. As described above, the use of LGA 300 g/ha had a 0 rating of phytotoxicity on CZ1660 crops, compared to the rating of 15 on CZ1660 crops of GA 600 g/ha. Ex. 2001 at 213. As a result, I disagree with Dr. Iyer's contention that these results indicate the inherent properties of LGA and GA.

68. Based on this data, my opinion is that BASF's test data submitted to the Patent Office exhibits surprising and unexpected results for the claimed formulation of L-glufosinate ammonium. I expected phytotoxicity to field crops to be greater with greater amounts of L-glufosinate, and as explained above, BASF's data indicated the opposite.

Dated: May 26, 2026



Dr. David Hunt