UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SYNGENTA CROP PROTECTION AG,
Petitioner

v.

UPL LTD.,
Patent Owner.

Case No. PGR2023-00017
U.S. Patent No. 11,445,727

DECLARATION OF BARRY J JACOBSEN, Ph.D.

I declare that all statements made herein of my knowledge are true, that all statements made herein on information and belief are believed to be true, and that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code.

By: _____ Date: 11/8/2023

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I. Introduction

1. I have been retained by UPL, Ltd. ("UPL") as an independent scientific expert in connection with this proceeding. My declaration responds to the scientific arguments in the petition for Post-Grant Review of U.S. Patent No. 11,445,727 ("the '727 patent") filed by Syngenta Crop Protection AG ("Syngenta") and to the associated declaration of Dr. Phillip Brannen. I understand that my declaration will be accompanied by UPL's response to Syngenta's petition.

II. Background

2. Asian soybean rust is and was a very problematic pest in commercially important legume crops, particularly soybeans, and is considered to be the most important soybean disease in South America. Exhibits 2037 & 2038 (Mitrion® Marketing Materials).

3. There are many known fungicides a person of ordinary skill in the art would know to use for treating diseases like Asian soybean rust. At the present time, control of this disease is primarily accomplished by timely applications of fungicides. Further, the causal fungus has demonstrated resistance (or reduced sensitivity) to Demethylation Inhibitor (DMI), Quinone Outside Inhibitor (QoI), and succinate Dehydrogenase Inhibitor (SDHI) fungicides. Exhibit 2032 (Müller 2021). Traditionally, fungicides with high risk of fungicide resistance like the aforementioned fungicides, would be applied with a multisite inhibitor such as

dithiocarbamate or copper fungicides sequentially, as mixing high risk components is more expensive and contrary to standard recommendations particularly for QoI fungicides. Exhibit 2033 (Brent and Holloway). Exhibit 2021 (Brannen Deposition Transcript) at 12:8-13:7, 14:14-16:3, 16:22-18:7, 21:9-23:8. Specifically, it is generally recommended to sequentially rotate fungicides with different mechanisms of action to reduce the risk of resistance. *Id*.

4. A person of ordinary skill in the art would understand that mixing fungicides together is not like experimenting with paint dyes to achieve a desired color. Fungicides are chemically active compounds, and while combinations can achieve desired properties, a person of ordinary skill in the art would be reluctant to experiment with mixing fungicides together without some data or direction to do so. Exhibit 2021 (Brannen Deposition Transcript) at 33:8-34:5, 35:15-38:11. This is at least because of considerations like physical compatibility of components, phytotoxicity to crops, and safety associated with mixing unknown chemicals together. *Id*. Thus, a person of ordinary skill in the art would be strongly motivated against arbitrarily mixing fungicides together.

III. Summary of Opinions

5. Godoy (Exhibit 1004, Exhibit 1005) does not anticipate any claim of the ’727 patent, because it does not disclose “combinations” or “compositions” containing the claimed fungicides, as required by the claims of the ’727 patent.

Instead, Godoy describes the use of "associated treatments" that appear to have been applied as sequential, unmixed treatments. For example, there is no indication in Godoy that its fungicides were tank mixed, and Godoy states that a component ("Nimbus") was added to azoxystrobin + benzovindiflupyr but not mancozeb. This strongly suggests that Godoy applied mancozeb separately from azoxystrobin + benzovindiflupyr.

6. Godoy's addition of "Nimbus" is also inconsistent with the claims, which require a combination "consisting of" the listed fungicides. That is, the claims do not allow for the addition of any fungicides beyond those claimed. A person of ordinary skill in the art reading Godoy would have been aware that several products were marketed under the tradename "Nimbus," including sulfur and mineral oil fungicides that are *excluded* from the claims of the '727 patent due to the "consisting of" requirement. While a person of ordinary skill in the art could not have known whether Godoy's Nimbus was sulfur fungicide or excluded mineral oil or some other "Nimbus" product, Godoy does not teach excluding additional fungicides beyond those claimed. Godoy's failure to teach the exclusion of additional fungicides beyond those claimed provides an independent reason that Godoy does not anticipate any claim of the '727 patent, as an ambiguous reference cannot anticipate the claims of a patent.

7. Tobler (Exhibit 1006) does not anticipate any claim of the ’727 patent because it does not disclose “combinations” containing the at least three fungicides as required by the claims. Nor would a person of ordinary skill in the art reading Tobler (alone or optionally in view of Godoy) find any claim of the ’727 patent obvious.

8. In my opinion, Syngenta’s arguments are inconsistent with how a person of ordinary skill in the art would understand Tobler. For example, a person of ordinary skill in the art would understand Tobler to be primarily directed to two-component fungicide treatments with no three-component fungicides specifically described. Yet Syngenta has attempted to create specific three-component fungicides by selectively combining multiple lists of component fungicides and treatment types (e.g., mixed vs. sequential). Even just looking at Tobler’s “E1” genus, Tobler teaches over 390,000 options, of which less than 0.01% are claimed by the ’727 patent. There is nothing in Tobler, or Tobler in view of Godoy, that would lead a person of ordinary skill in the art to find the claims obvious and a person of ordinary skill in the art would not have derived any claimed combinations from Tobler, or Tobler in view of Godoy, without using the ’727 claims as a roadmap.

9. De Oliveira (Exhibit 1007) does not render any claim of the ’727 patent obvious alone, or optionally in view of Wiglesworth, Tobler, and Godoy. De

Oliveira is directed to multi-component fungicides and does not disclose or suggest the claimed combinations. Nor does Syngenta explain how a person of ordinary skill in the art would find the claimed combinations obvious from De Oliveira.

10. For example, the De Oliveira disclosure on which Syngenta relies is not specific to three-component fungicides and does not require any of the components claimed in the ’727 patent. Exhibit 1007 (De Oliveira) at pg. 7. Instead, it merely requires a dithiocarbamate fungicide (not mancozeb specifically) with at least one other class of fungicide (not succinate dehydrogenase inhibitors (“SDHI”), ergosterol biosynthesis inhibitors (“EBI”) or quinone outside inhibitors (“QoI”) specifically) and does not even disclose benzovindiflupyr.

11. In my opinion, Syngenta does not provide reasons why a person of ordinary skill in the art would have been motivated to make all the selections necessary to create a specific combination as claimed in the ’727 patent, including not providing a reason to specifically combine mancozeb with an undisclosed benzovindiflupyr instead of using one of the succinate dehydrogenase inhibitors disclosed in De Oliveira, all of which are described as being preferred.

12. In my opinion, Syngenta also does not provide reasons why a person of ordinary skill in the art would have been motivated to combine De Oliveira with Wiglesworth, Tobler, and Godoy, much less reasons why the references would be

combined to reach the claimed combinations. Once again, Syngenta does not show how a person of ordinary skill in the art would have arrived at a specific fungicide combination without using the ’727 claims as a roadmap.

IV. Qualifications

13. Based on more than 52 years of experience in the field, I have extensive knowledge and expertise related to fungicides, including combinations of fungicides, programs to control fungal diseases, and efforts to manage fungicide resistance.

14. I am an Emeritus Professor of Plant Pathology at Montana State University, where I served as the, Associate Director of the Montana Agricultural Experiment Station and Head of the Department of Research Centers (July 1, 2015 to June 30, 2018); as the Interim Head of the Department of Research Centers, (February 1, 2013 to June 30, 2015); as Professor and Integrated Pest Management (“IPM”) Coordinator in the Department of Plant Sciences and Plant Pathology (July 1, 1994 to June 30, 2013); and Dean and Director of the College of Agriculture/Agricultural Experiment Station (July 1, 1992 to July 1, 1994).

15. I served at the Montana Extension Service as the Associate Director of the Montana Agricultural Experiment Station (July 1, 2015 to June 30, 2018) and as

the Assistant Director for Agriculture and Natural Resources (July 1, 1992 to July 1, 1994).

16. I was the IPM Coordinator of the United States Department of Agriculture ("USDA") in Washington, D.C., from April 1, 1995 to November 22, 1996.

17. I was a member of the Extended Faculty of the Cooperative State Research, Education, and Extension Service ("CSREES") at USDA from October 1, 1996 to October 1998.

18. Prior to joining Montana State University, I was a Professor and Head of the Department of Plant Pathology at Auburn University (September 1, 1987 to June 30, 1992); a Professor of Plant Pathology, Extension Project Leader, and Director of the Plant Clinic at the University of Illinois (August 21, 1983 to August 21, 1987); a Visiting Professor at the Institut fur Pflanzenkrankheiten, Friedrich-Wilhelms Universitat, Bonn, West Germany (August 21, 1984 to December 21, 1984); an Associate Professor of Plant Pathology and Extension Project Leader and held an Appointment to the Graduate College of the University of Illinois (August 21, 1978 to August 20, 1983), where I also held the title of Assistant Professor of Plant Pathology (October 1, 1973 to August 21, 1978); an Instructor and Assistant Extension Plant Pathologist at the University of Minnesota (June 1, 1971 to

September 30, 1973); and a Research Assistant at the University of Wisconsin-Madison (June 1, 1969 to May 30, 1971).

19. I have served and continue to serve as a consultant to several grain and potato farms dealing with disease management issues and law firms dealing with mold damage and mycotoxins.

20. I have held several positions at the American Phytopathological Society and at the Environmental Protection Agency/USDA/United States Agency for International Development ("USAID").

21. I have received honors and awards throughout my career, including a Lifetime Achievement Award from the Pacific Division of the American Phytophathological Society (2014), elected Fellow American Phytopathological Society (2004), Distinguished Alumnus University of Minnesota (1997) and University of Wisconsin (2022), and Presidents Award from National Potato Council (2016).

22. I have published 53 book chapters as author or coauthor, 55 peer-reviewed articles, and 316 technical bulletins on topics ranging from plant disease management for several crops and cropping systems, fungicide use guides for field (corn, soybeans, small grains, oil seeds, sugar beets) and vegetable crops, plant disease identification, integrated pest management, aerial application of pesticides,

management of storage molds and mycotoxins. I have also been involved in development and testing of new and registered fungicides for use on aforementioned crops.

23. In my role as extension plant pathologist starting in 1971 through 2013, I regularly provided fungicide recommendations for the aforementioned crops and regularly reviewed the literature relating to use of fungicidal products and fungicide resistance in targeted fungi and attended many professional meetings on fungicides. During this time, I have given thousands of public presentations to growers, commodity meetings, and both international and US professional meetings on use of fungicides, fungicide resistance management and use of fungicides in integrated disease management programs.

24. I am an inventor on several patents, including patents related to *Bacillus mycoides* isolate J ("BmJ"), a biological pesticide that promotes plant resistance to fungal and viral diseases.

25. I have taught courses in Plant Disease Control while at The University of Illinois, Auburn University and Montana State University (33 years). These courses always included several lectures on fungicide history, fungicide classes, fungicide mode of action and fungicide resistance management. These lectures were updated yearly. I have taught Fungal Diseases, and Advanced Plant Pathology. In

addition, I have supervised 11 PhD (Plant Pathology) and 15 Master of Science (Plant Pathology) students.

26. Additional information about my experience and qualifications is provided in my *curriculum vitae*, which is attached as Appendix A.

V. Materials Considered and Compensation

27. In connection with preparing my declaration, I reviewed Syngenta's petition and exhibits, UPL's preliminary response and exhibits, the Board's institution decision, and the materials identified in this declaration.

28. I am being compensated for my time working on this matter at my standard consulting rate. My compensation does not depend on the outcome of this proceeding.

VI. Legal Standards

A. Claim Construction

29. I understand that the claims of a patent must be interpreted from the perspective of a person of ordinary skill in the art in the context of the patent and its prosecution history. I understand that the words and phrases used in the claim generally have their plain and ordinary meaning, as understood in the context of the patent.

B. Anticipation

30. I understand that a single prior art reference anticipates a patent claim if it describes each and every element required by the patent claim.

31. I am informed that if a prior art reference is ambiguous with respect to any claim element, it cannot anticipate a claim.

32. I understand that a prior art publication may not anticipate a claimed combination if the number of categories and components disclosed in that publication is so large that a person of ordinary skill in the art would not immediately envisage the claimed combination.

33. I am also aware that for a publication to anticipate a patent claim, it must enable a person of ordinary skill in the art to make and use the claimed invention without undue experimentation.

C. Obviousness

34. I understand that determining whether a patent claim is obvious requires analysis of four components: (1) the scope and content of the prior art; (2) the differences between the claimed subject matter and the prior art; (3) the level of skill in the art; and (4) objective evidence of non-obviousness.

35. I understand that when assessing the prior art, one should consider whether a person of ordinary skill in the art would have been (a) motivated to

combine the disclosures in the prior art to achieve the claimed invention and (b) would have had a reasonable expectation of success in doing so.

36. I am informed that it is improper to use the patent as a roadmap when combining the disclosures of the prior art references to arrive at the claimed invention as doing so relies on hindsight.

D. Written Description

37. I understand that a patent claim must be supported by an adequate *written description* to support the claim, that is, the claim must be sufficiently described by the disclosure in the earliest filed application. I understand that the basic inquiry for written description is whether the specification describes the claimed subject matter such that a person of ordinary skill in the art would understand that the inventor actually invented what is claimed.

38. I understand that a number of factors are to be considered in evaluating the written description requirement, including: (a) the existing knowledge in the particular field; (b) the extent and content of the prior art; (c) the maturity of the science or technology; and (d) the predictability of the aspect at issue. I have been instructed that a sufficient description of a genus requires the disclosure of either a representative number of species or structural features common to the genus so that one of skill in the art can visualize or recognize the members of the genus.

E. Enablement

39. I understand that a specification must also *enable* the claims, that is, the patent specification must enable a person of ordinary skill in the art to make and use the full scope of the claimed subject matter without undue experimentation.

40. I understand that each claim of a patent must be enabled such that, at the effective filing date of the patent, one of ordinary skill in the art could practice the invention without undue experimentation. I understand that the factors I may consider in determining whether a disclosure would require undue experimentation, known as the "*Wands* factors," include (1) the quantity of experimentation necessary, (2) the amount of direction or guidance presented, (3) the presence or absence of working examples, (4) the nature of the invention, (5) the state of the prior art, (6) the relative skill of those in the art, (7) the predictability or unpredictability of the art, and (8) the breadth of the claims. I further understand that enablement is not precluded where a reasonable amount of routine experimentation is required to practice a claimed invention.

VII. The '727 Patent

A. '727 Patent Specification

41. The '727 patent discloses fungicidal combinations consisting of (1) a dithiocarbamate fungicide, (2) a succinate dehydrogenase inhibitor ("SDHI"), and

at least one of (3) an ergosterol biosynthesis inhibitor ("EBI") and/or (4) a quinone outside inhibitor ("QoI"). Exhibit 1001 ('727 patent) at Abstract.

42. The '727 patent explains that dithiocarbamate fungicides such as mancozeb are multi-site fungicides that, in general, have a broad mode of action spectrum of activity, are well-tolerated by crops, and assist in controlling fungal plant diseases that are not well controlled by fungicides having a single mode of action that increases the likelihood of fungicide resistance. Exhibit 1001 ('727 patent) at 1:50-60.

43. The '727 patent also explains that succinate dehydrogenase inhibitor fungicides bind to the ubiquinone-binding site (Q-site) of the mitochondrial complex II, and thereby inhibit fungal respiration. Exhibit 1001 ('727 patent) at 3:6-8.

44. The '727 patent explains that there was "a need in the art for combinations of succinate dehydrogenase inhibitors with a specific fungicide that helps improve" the spectrum of fungicidal activity. Exhibit 1001 ('727 patent) at 1:65-67. The '727 patent further notes that "[w]ith crop tolerances decreasing, lower use rates being imposed and resistance being increasingly observed, there is a need for a combination of actives that allows for broader disease control spectrum that combines curative and preventive actives and has a lower dosage." Exhibit 1001 ('727 patent) at 1:67-2:4.

45. The ’727 patent discloses that the goals of the invention include providing a fungicidal combination that has enhanced efficacy over individual fungicides, increases crop yield, and reduces fungal disease incidence in the crop to which it is applied. Exhibit 1001 (’727 patent) at 2:7-23.

46. The ’727 patent discloses combinations of a dithiocarbamate fungicide (e.g., mancozeb), a succinate dehydrogenase inhibitor fungicide (e.g., benzovindiflupyr), and at least one other fungicide that is a quinone outside inhibitor or an ergosterol biosynthesis inhibitor. Exhibit 1001 (’727 patent) at 3:11-40.

47. The ’727 patent states that these fungicidal combinations of the invention provided “surprising and unexpected advantages,” including “an enhancement of the efficacy and a surprising reduction in fungal disease incidence.” Exhibit 1001 (’727 patent) at 3:11-21. The ’727 patent additionally states that the “application of these combinations during the flowering stage of the crop delayed the senescence in the crop to which they were applied, which led to better greening in the crop thereby increasing the level of photosynthesis occurring within the plant, thereby leading to a greater yield from the crop to which they were applied.” Exhibit 1001 (’727 patent) at 3:27-32.

48. The ’727 patent lists numerous exemplary fungicidal combinations containing (1) mancozeb, (2) a succinate dehydrogenase inhibitor (such as

benzovindiflupyr or penthiopyrad), and (3) a quinone outside inhibitor fungicide (such as azoxystrobin or picoxystrobin) and/or (4) an ergosterol biosynthesis inhibitor (such as cyproconazole or difenoconazole). Exhibit 1001 ('727 patent) at 6:55-15:24.

49. The '727 patent explains that inventive fungicidal combinations may be tank mixed and sprayed or alternatively be mixed with surfactants then sprayed. Exhibit 1001 ('727 patent) at 16:16-19.

50. The '727 patent then lists examples of fungal diseases in various crops on which the compositions of the invention are effective. Exhibit 1001 ('727 patent) at 17:1-18:67.

51. The patent also states that the compositions of the invention may "typically" be produced by mixing the fungicides with an inert carrier and surfactants and other adjuvants and formulated into "known formulation types," including solid or liquid formulations. Exhibit 1001 ('727 patent) at 16:23-32.

52. The '727 patent provides examples demonstrating the effectiveness of the fungicidal combinations of the invention for controlling Asian soybean rust in soybeans. Exhibit 1001 ('727 patent) at 20:15-21:14. For example, the '727 patent discloses that the combination of mancozeb + prothioconazole + benzovindiflupyr controlled Asian soybean rust by about 95% for two consecutive years, which was a

marked improvement over the combination of prothioconazole + benzovindiflupyr, as shown in Table 1.

A. The ’727 Patent Claims

53. Independent claim 1 of the ’727 patent recites:

> 1. A fungicidal combination consisting of benzovindiflupyr, mancozeb, and at least another fungicide selected from an ergosterol biosynthesis inhibitor fungicide, and a quinone outside inhibitor fungicide,
>
> wherein the ergosterol biosynthesis inhibitor is selected from azaconazole, bitertanol, bromuconazole, cyproconazole, difenoconazole, diniconazole, epoxiconazole, etaconazole, fenbuconazole, fluquinconazole, flusilazole, flutriafol, hexaconazole, imibenconazole, ipconazole, metconazole, myclobutanil, penconazole, propiconazole, simeconazole, tebuconazole, tetraconazole, triadimefon, triadimenol, triticonazole, prothioconazole, imazalil, oxpoconazole, pefurazoate, prochloraz, triflumizole, fenarimol, nuarimol, pyrifenox, pyrisoxazole, triforine, and mixtures thereof, and
>
> wherein the quinone outside inhibitor fungicide is selected from azoxystrobin, coumoxystrobin, enoxastrobin, flufenoxystrobin, picoxystrobin, pyraoxystrobin, mandestrobin, pyraclostrobin, pyrametostrobin, triclopyricarb, kresoxim-methyl, dimoxystrobin, fenaminostrobin, metominostrobin, trifloxystro bin, famoxadone, fluoxastrobin, fenamidone, pyribencarb, and mixtures thereof.

54. Independent claim 2 of the ’727 patent includes the same fungicides recited in claim 1 but requires both an ergosterol biosynthesis inhibitor ***and*** a quinone outside inhibitor.

55. Claims 3 and 4 depend from claim 1 and limits the “at least another” fungicide, which in claim 3 is selected from to “cyproconazole, difenoconazole, epoxiconazole, hexaconazole, hexaconazole, tebuconazole, tetraconazole, prothioconazole, azoxystrobin, picoxystrobin, pyraclostrobin, kresoxim-methyl, trifloxystrobin, or a combination thereof,” and in claim 4 is selected from “prothioconazole and/or azoxystrobin.”

56. Independent claim 5 recites a composition containing at least one agrochemically acceptable excipient and the fungicidal combination of claim 1.

57. Claim 6 depends from claim 5 and specifies that the composition “is formulated into wettable powders, granules, dusts, soluble (liquid) concentrates, suspension concentrates, oil in water emulsion, water in oil emulsion, emulsifiable concentrates, capsule suspensions, a combination of a suspension concentrate (SC) and a capsule suspension (CS), or oil dispersions.”

58. Claim 7 depends from claim 1 and requires that benzovindiflupyr and mancozeb be “admixed in a ratio of 1:80 to 80:1.”

59. Claim 8 depends from claim 5 and requires that each fungicide be present in the range of 0.1 to 99% by weight.

60. Claim 9 recites a "method of foliar application, consisting of applying the combination of claim 1 to the foliage of a plant."

61. Independent claim 10 recites a "method of controlling fungal diseases in plants consisting of, applying to the locus of the plant a combination consisting of" the same fungicides recited in claim 1 (i.e., benzovindiflupyr, mancozeb, and at least one quinone outside inhibitor and/or one ergosterol biosynthesis inhibitor selected from the listed fungicides).

VIII. Priority Date

62. I am informed that the '727 patent is entitled to the filing date of the earliest application to which it claims priority if that application describes the claimed invention and enables a person of ordinary skill in the art to make and use the invention without undue experimentation.

63. In the section titled "Foreign Application Priority Data," the '727 patent lists IN 20163103774 ("Priority Application"), filed on November 4, 2016.

64. The Priority Application is included in Exhibit 1002 at pages 335-386.

65. The Priority Application discloses the claimed combinations, compositions, and methods of treatment, e.g., it discloses:

- Combinations of benzovindiflupyr and mancozeb in combination with ergosterol biosynthesis inhibitors and/or quinone outside inhibitors. Exhibit 1002, 351-353.
- The claimed ergosterol biosynthesis inhibitors and quinone outside inhibitors for use in the disclosed combinations and compositions. Exhibit 1002, 347-348.
- Compositions containing the claimed fungicides. Exhibit 1002, 373-376.
- Fungicide ratios. Exhibit 1002, 375.
- Methods of use. Exhibit 1002, 375-376.

66. Based on this, a person of ordinary skill in the art would have understood the Priority Application to describe all features included in the claims of the ’727 patent.

67. Based on the description in the Priority Application, a person of ordinary skill in the art could readily make and use the claimed inventions.

IX. Level of Ordinary Skill in the Art

68. I am informed that a person of ordinary skill in the art is a hypothetical person of ordinary creativity who has knowledge of all pertinent disclosures in the prior art.

Dr. Brannen provides the following description of the level of skill in the art:

> [A] person of ordinary skill in the art at the time of the alleged invention described in the subject patent would have an advanced degree, preferably a Ph.D. level degree with several years of practical, applied experience in the field of plant pathology. Alternatively, a person possessing an M.S. degree in plant pathology with more years of experience can also be considered as a person of skill in the art. Virtually all degrees in plant pathology are now advanced degrees, as very few undergraduate programs are available. However, as another alternative, a person with a Bachelor of Science degree in plant pathology with 5-10 years of practical, applied experience in the field of plant pathology could also qualify as a person of skill in the art. Further, one skilled in the art would have a good understanding of plant pathology, plant diseases, pathogens associated with plant diseases, experience with disease diagnosis and management on multiple commodities, and a firm understanding of integrated pest management. A person of ordinary skill in the art relevant to the '727 Patent would easily have understood the prior art references referred to herein and would have had the capacity to draw inferences from them.

Exhibit 1003 (Brannen Declaration) at ¶ 72.

69. I generally agree with this definition. However, in my view, a person of ordinary skill in the art would also have been familiar with pesticide label development and/or registration, including safety and compatibility testing, and would have had experience in making pest management recommendations to growers. Dr. Brannen appears to agree that a person of ordinary skill would rely on fungicide product labels, such as the Elatus® product label (EX1009), that provide

the uses for which the product is approved. *See* Exhibit 2021 (Brannen Deposition Transcript) at 24:22-27:15, 31:7-14.

X. Claim Construction

A. "Fungicidal Combination" and "Combination"

70. In the context of the '727 patent, a person of ordinary skill in the art would understand that the terms "fungicidal combination" and "combination" refer to a mixture of fungicides.

71. For example, the '727 patent states that the inventive "combinations" may be "sold as a pre-mix composition or a kit of parts such that individual actives may be mixed before spraying," and explains that "the kit of parts may contain succinate dehydrogenase inhibitor fungicide and the dithiocarbamate fungicide pre-mixed and the third active may be admixed with an adjuvant such that the two components may be tank mixed before spraying." Exhibit 1001 ('727 patent) at 19:54-60.

72. The '727 patent also uses the term "mixed" to describe fungicidal combinations: "It was thus found that the incorporation of mancozeb greatly increased efficacy and disease control of the succinate dehydrogenase inhibitor fungicide treatments when ***mixed with*** ergosterol biosynthesis inhibitors or quinone outside inhibitors. It was thus concluded that the addition of mancozeb enhanced the

efficacy of ***the combination*** and surp[ri]singly gave a synergistic effect." Exhibit 1001 ('727 patent) at 21:15-20.

73. This is consistent with the plain and ordinary meaning of the word "combination" in plant pathology and in the field of pesticide use generally. For example, those in the field refer to products containing two or more active ingredients mixed together as "combination" products. By contrast, products that contain two pesticides that are packaged separately (and thus not sold as mixtures) are referred to as "co-packs." Exhibit 2036 at 18-3 (EPA Label Review Manual); Exhibit 1008 (Wiglesworth) at S2.11 (referring to a benzovindiflupyr "co-pack" with azoxystrobin and difenoconazole).

74. It is also consistent with the plain and ordinary meaning of the word "combination" in everyday usage. For example, Merriam Webster's Collegiate Dictionary defines combination as "a result or product of combining" (Exhibit 2027) and Collins Dictionary defines combination as "the act of combining or state of being combined… a union of separate parts" (Exhibit 2028).

75. I note that in his deposition, Dr. Brannen referred to a passage from the '727 patent that refers to "sequential" application. Exhibit 2021 (Brannen Deposition Transcript) at 183:9-185:11. The passage reads:

> The composition of the present invention maybe applied simultaneously as a tank mix or a formulation or may be applied sequentially. The application may be made to the soil before emergence of the plants, either pre-planting or post-planting. The application may be made as a foliar spray at different timings during crop development, with either one or two applications early or late post-emergence.

Exhibit 1001 ('727 patent) at 19:61-67.

76. In my opinion, this paragraph would not have led a person of ordinary skill in the art to interpret the claimed "combination" as including sequential applications of individual fungicides. First, the passage does not use the word "combination" or indicate any intent on the part of the inventors to change the plain meaning of the word "combination." Second, in the context of the paragraph above, "sequential" appears to refer to repeated applications of the inventive compositions, e.g., applying the composition "as a foliar spray at different timings during crop development, with either one or two applications early or late post-emergence." Exhibit 1001 ('727 patent) at 19:61-67.

77. Thus, a person of ordinary skill in the art would have read the word "combination" in the context of the '727 patent to have its plain and ordinary meaning, i.e., "a mixture."

B. "Composition"

78. In the context of the '727 patent, a person of ordinary skill in the art would understand that the term "composition" has its plain and ordinary meaning, i.e., a mixture.

79. The terms "combination" and "composition" may generally be used interchangeably, as reflected in their plain and ordinary meaning (i.e., they both refer to mixtures). However, the '727 patent uses the terms differently using the term "combination" when describing the fungicidal mixtures of the invention and the term "composition" when an agrochemically acceptable excipient is included in the fungicidal mixture. For example, the patent explains that the "combinations of the present invention may be formulated in the form of a composition" comprising fungicides and "at least one agrochemically acceptable excipient." Exhibit 1001 ('727 patent) at 15:26-48; *see also* Exhibit 1001 ('727 patent) at claim 1 (reciting a "fungicidal combination"), claim 5 (reciting a "composition" that includes at least one agrochemically acceptable excipient and a fungicidal combination). The patent also explains that "the compositions of the present invention may typically be produce[d] by mixing the actives in the composition with an inert carrier and adding surfactants and other adjuvants and carriers as needed and formulated into solid, or liquid formulations...." Exhibit 1001 ('727 patent) at 16:23-25.

80. I note that the ’727 patent states that the inventive “composition” may be applied “sequentially,” e.g., by applying the composition “to the soil before emergence of the plants, either pre-planting or post-planting” and/or “as a foliar spray at different timings during crop development, with either one or two applications early or late post-emergence.” Exhibit 1001 (’727 patent) at 19:61-67. In my opinion, this passage does not indicate that the inventors were re-defining the word “composition” to include fungicides that are never mixed. Rather, it is describing that the composition containing the fungicidal combination may be applied at various stages in the crop cycle.

81. The use of the term “composition” in the ’727 patent contrasts with the explicit definition in Tobler, which specifically defines “composition” to include “mixtures or combinations” and “a combined use of the single active ingredients when applied in a sequential manner, i.e.[,] one after the other with [*sic*, within] a reasonably short period [of time], such as a few hours or days.” Exhibit 1006 (Tobler) 27:55-63. I am informed that when a patent specifically defines a claim term, that express definition should generally apply. Here, however, in the ’727 patent, the inventors did not define the term “composition” to include the application of separate (non-mixed) fungicides.

C. "Consisting of"

82. I am informed that in patent law, the claim term "consisting of" is interpreted to mean that the claimed invention contains only what is expressly set forth in the claim. By contrast, I am informed that the word "comprising" is generally understood in patent law to permit additional components to be added to the claim.

83. Here, the claims consistently use the term "consisting of" in connection with the claimed fungicidal combinations. Therefore, a person of ordinary skill in the art would understand that the claims exclude fungicides that are not specifically recited in the claims.

XI. Godoy Does Not Anticipate Any Claim of the '727 Patent (Ground 1)

84. Syngenta argues that Godoy anticipates claims 1, 3-5, 7, 9, and 10 of the '727 patent. Petition at 19-23.

85. Claims 1, 3-5, 7, 9, and 10 all require a fungicidal "combination" or "composition" containing benzovindiflupyr, mancozeb, and at least one of a QoI inhibitor or an ergosterol biosynthesis inhibitor. Godoy does not disclose such a "combination" or "compositions."

86. Claims 1, 3-5, 7, 9, and 10 also require a combination that contains only the fungicides listed in the claims (and no other fungicides), as indicated by the

"consisting of" type language of the claims. Even if Godoy is read as disclosing a "combination" or "composition" of the claimed fungicides, it does not disclose any combination "consisting of" only the claimed fungicides.

87. Additionally, I am aware that there is a dispute over whether Syngenta established that Godoy qualifies as prior art.

A. Public Availability of Godoy

88. I understand that for Godoy to be considered prior art to the claims of the '727 patent, Syngenta needs to show that it was publicly available prior to November 4, 2016, when the patent's provisional application was filed. *See* Section VI.B., above. I recognize that Syngenta has submitted a declaration from Dr. Hall-Ellis asserting the Embrapa website provides "a ***publication date*** of September 1, 2016" for Godoy. Exhibit 1019 (Hall-Ellis Declaration) at ¶47. I disagree with this statement. Based on my experience, the Hall-Ellis declaration does not show Godoy to have been publicly available prior to November 4, 2016.

89. The Embrapa website attached to Dr. Hall-Ellis's declaration has no "***publication date*** of September 1, 2016" shown. Exhibit 1019 (Hall-Ellis Declaration) at 134-135 (Attachment 1b). While I see "[y]ear of publication: 2016," there is no associated month or day. Exhibit 1019 (Hall-Ellis Declaration) at 134-135 (Attachment 1b). At most, Attachment 1b provides the publication *year* was

"2016," not "September 1, 2016." Exhibit 1019 (Hall-Ellis Declaration) at 134-135 (Attachment 1b).

90. Even if Godoy had been uploaded to the Embrapa website in 2016, this does not mean that Godoy was indexed or otherwise searchable prior to November 4, 2016. In my experience from teaching, publishing, and conducting research in plant pathology, I have seen it takes considerable time for a publication to be indexed and searchable. Based on this, it cannot be assumed that Godoy was indexed and searchable as of the date listed on its face. And, in my experience, once a publication is indexed, it is generally assigned a digital object identifier ("DOI"). I did not see any DOI for Godoy provided in the materials submitted with Syngenta's petition. Without this indicium of being indexed, it cannot be assumed that Godoy was searchable as of the date listed on its face or by November 4, 2016.

B. Godoy Does Not Disclose a "Combination" or "Composition" of Azoxystrobin, Benzovindiflupyr, and Mancozeb

91. Syngenta argues that Godoy discloses "the use of a combination of azoxystrobin, benzovindiflupyr, and mancozeb." Petition at 19. Syngenta includes Table 3 of Godoy as support for its argument, as shown below.

Table 3. Active ingredients (a.i.), commercial product (C.P.) and dose of fungicides evaluated in associated treatments to control diseases in soybean crops, 2015/16 harvest.

	Active ingredient (a.i.)	Dose g a.i. ha^{-1}	Commercial product (C.P.)	Dose l-kg C.P. ha^{-1}
1	control	-	Control	-
2	picoxystrobin + cyproconazole[1]	60+24	Aproach®Prima	0.3
3	picoxystrobin + cyproconazole[1] and copper oxychloride	60+24 and 294	Aproach®Prima and Difere®	0.3 and 0.5
4	picoxystrobin + cyproconazole[1] and chlorothalonil	60+24 and 1080	Aproach®Prima and Previnil®	0.3 and 1.5
5	picoxystrobin + cyproconazole[1] and copper oxychloride	60+24 and 280	Aproach®Prima and PNR[2]	0.3 and 0.4
6	picoxystrobin + cyproconazole[1] and mancozeb	60+24 and 1500	Aproach®Prima and Unizeb Gold®	0.3 and 2.0
7	picoxystrobin + cyproconazole[1] and copper sulfate	60+24 and 113,85	Aproach®Prima and PNR[2]	0.3 and 0.75
8	picoxystrobin + cyproconazole[1] and propineb	60+24 and 1400	Aproach®Prima and PNR[2]	0.3 and 2.0
9	picoxystrobin + cyproconazole[1] and fluazinam	60+24 and 500	Aproach®Prima and Frowncide®/Zignal®	0.3 and 1.0
10	picoxystrobin + cyproconazole[1] and chlorothalonil	60+24 and 1000	Aproach®Prima and Bravonil 500®	0.3 and 2.0
11	picoxystrobin + cyproconazole[1] and chlorothalonil	60+24 and 1000	Aproach®Prima and PNR[2]	0.3 and 2.0
12	picoxystrobin + cyproconazole[1] and mancozeb	60+24 and 2000	Aproach®Prima and PNR[2]	0.3 and 2.5
13	azoxystrobin + benzovindiflupyr[1]	60+30	Elatus®	0.2
14	azoxystrobin + benzovindiflupyr[1] and copper oxychloride	60+30 and 294	Elatus® and Difere®	0.2 and 0.5
15	azoxystrobin + benzovindiflupyr[1] and chlorothalonil	60+30 and 1080	Elatus® and Previnil®	0.2 and 1.5
16	azoxystrobin + benzovindiflupyr[1] and copper oxychloride	60+30 and 280	Elatus® and PNR[2]	0.2 and 0.4
17	azoxystrobin + benzovindiflupyr[1] and mancozeb	60+30 and 1500	Elatus® and Unizeb Gold®	0.2 and 2.0
18	azoxystrobin + benzovindiflupyr[1] and copper sulfate	60+30 and 113,85	Elatus® and PNR[2]	0.2 and 0.75
19	azoxystrobin + benzovindiflupir[1] and propineb	60+30 and 1400	Elatus® and PNR[2]	0.2 and 2.0
20	azoxystrobin + benzovindiflupyr[1] and fluazinam	60+30 and 500	Elatus® and Frowncide®/Zignal®	0.2 and 1.0
21	azoxystrobin + benzovindiflupyr[1] and chlorothalonil	60+30 and 1000	Elatus® and Bravonil 500®	0.2 and 2.0
22	azoxystrobin + benzovindiflupyr[1] and chlorothalonil	60+30 and 1000	Elatus® and PNR[2]	0.2 and 2.0
23	azoxystrobin + benzovindiflupyr[1] and mancozeb	60+30 and 2000	Elatus® and PNR[2]	0.2 and 2.5

[1] Added Nimbus 0,6 L ha-1; [2] PNR – Product not registered for the soybean crop, RET III.

92. Exhibit 1005 (Godoy translation) at 4 (Table 3) (yellow highlighting and red boxes added by Syngenta in the Petition at 20; blue highlighting added in this declaration).

93. A person of ordinary skill in the art reading Table 3 of Godoy would not understand rows 17 and 23 to teach azoxystrobin + benzovindiflupyr + mancozeb as a combination.

94. In the caption of Table 3, Godoy states "associated treatments" of fungicides were evaluated (see blue highlighting above).

95. Godoy also specifically refers to "applications associated with" azoxystrobin + benzovindiflupyr, e.g., "associations" with mancozeb. Exhibit 1005 (Godoy translation) at 5. Exemplary statements regarding "associations" and "associated" treatments with these fungicides are copied below.

For applications associated with the fungicide azoxystrobin + benzovindiflupyr 60 + 30 g a.i. ha^{-1}, only associations with mancozeb 2000 and 1500 g a.i. ha^{-1} (T23 – 15 %; T17 - 15.2 %), copper oxychloride 294 g a.i. ha^{-1} (T14 – 15.2 %), chlorothalonil 1080 g a.i. ha^{-1} (T15 – 15.6 %) and copper oxychloride 280 g a.i. ha^{-1} (T16 – 16.4 %) differed statistically from the isolated application.

For applications associated with fungicide azoxystrobin + benzovindiflupyr 60 + 30 g a.i. ha^{-1}, the highest productivities were observed for treatments with associations of mancozeb 1500 g a.i. ha^{-1} and 2000 g a.i. ha^{-1} (T17 – 3377 kg ha^{-1}; T23 – 3270 kg ha^{-1}, respectively), although the productivity of the association with mancozeb 2000 g a.i. ha^{-1} was statistically similar to azoxystrobin + benzovindiflupyr 60 + 30 g a.i. isolated ha^{-1} (T13 – 3186 kg ha^{-1}).

For the fungicide Elatus®, which alone presented 77 % of control, the gains in control in the associations were lower than those observed for the fungicide Aproach®Prima, with a maximum control of 81 % observed for the associations with mancozeb 2000 g a.i. ha^{-1} and 1500 g a.i. ha^{-1} and copper oxychloride 294 g a.i. ha^{-1}. Similarly, the productivity increments were not significant for the associations, with the exception of mancozeb 1500 g a.i. ha^{-1}.

96. Exhibit 1005 (Godoy translation) at 5 (highlighted excerpts).

97. As discussed further below, "associated" treatments is not the same as a "combination" treatment and Godoy does not refer to the fungicides azoxystrobin + benzovindiflupyr and mancozeb as a "combination" or "composition." *See* Exhibit 1005.

98. Not only does Godoy not state that azoxystrobin + benzovindiflupyr and mancozeb were tank mixed or otherwise combined to make a fungicidal combination, Godoy states that "Nimbus" was added to azoxystrobin + benzovindiflupyr (which was Syngenta's commercial Elatus product), but not to mancozeb, as shown below. Obviously, if all three fungicides had been mixed, the "Nimbus" would likewise have been mixed with all three fungicides, including

mancozeb. That Godoy only reports the "Nimbus" to have been mixed with Elatus (azoxystrobin + benzovindiflupyr) further indicates that its "associated" treatments were kept separate rather than combined.

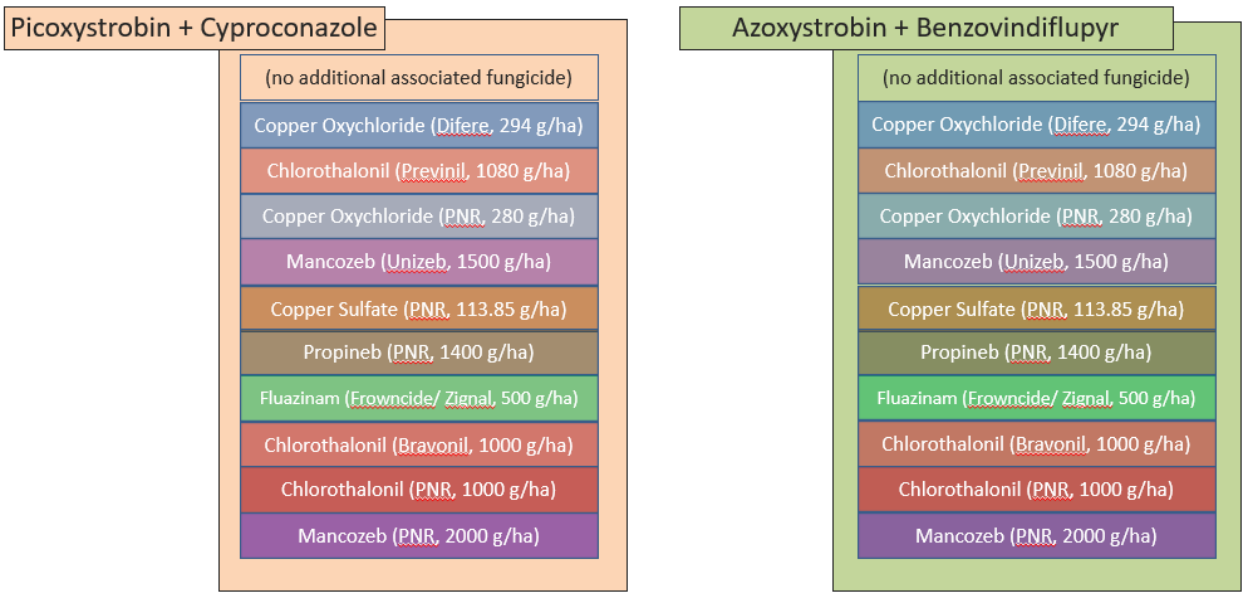
17	azoxystrobin + benzovindiflupyr[1] and mancozeb	60+30 and 1500	Elatus® and Unizeb Gold®
18	azoxystrobin + benzovindiflupyr[1] and copper sulfate	60+30 and 113,85	Elatus® and PNR[2]
19	azoxystrobin + benzovindiflupir[1] and propineb	60+30 and 1400	Elatus® and PNR[2]
20	azoxystrobin + benzovindiflupyr[1] and fluazinam	60+30 and 500	Elatus® and Frowncide®/Zignal®
21	azoxystrobin + benzovindiflupyr[1] and chlorothalonil	60+30 and 1000	Elatus® and Bravonil 500®
22	azoxystrobin + benzovindiflupyr[1] and chlorothalonil	60+30 and 1000	Elatus® and PNR[2]
23	azoxystrobin + benzovindiflupyr[1] and mancozeb	60+30 and 2000	Elatus® and PNR[2]

[1] Added Nimbus 0,6 L ha-1; [2] PNR – Product not registered for the soybean crop, RET III.

99. A person of ordinary skill in the art reading Godoy also would not have understood the context of Godoy to teach or suggest the claimed "combination." For the purpose of the testing being evaluated in Godoy, there was no reason why the fungicides azoxystrobin + benzovindiflupyr and mancozeb would need to be applied as a combination as opposed to sequentially and Godoy provides no such reason.

100. To the contrary, a person of ordinary skill in the art with fungicide plot testing experience reading Godoy would have understood that the fungicide products would have more easily been applied sequentially, e.g., Elatus® (azoxystrobin + benzovindiflupyr) could be applied before or after mancozeb. That is, a person of ordinary skill in the art would have understood that unmixed sequential applications were the most efficient—and most likely—test format.

101. Specifically, applying the different products sequentially would have been understood by a person of ordinary skill in the art to be efficient, and the likely treatment method for this reason, given the various treatments evaluated in Godoy, which involved either (1) Approach®Prima (picoxystrobin + cyproconazole) or (2) Elatus® (azoxystrobin + benzovindiflupyr) as stand-alone treatments or in association with an additional product, e.g., Difere® (copper oxychloride), PreVinil® (chlorothalonil), Unizeb Gold® (mancozeb), Frowncide®/Zignal® (fluazam), Bravonil 500® (chlorothalonil), or an unregistered product (noted as "PNR" or "Product not registered" in Godoy), as schematically depicted below:



Schematic 1. Depiction of the associated treatments of Godoy.

102. A person of ordinary skill in the art would have understood the "associated treatments" of Table 3 of Godoy to be applied as illustrated above in

Schematic 1. Exhibit 1005 (Godoy translation) at 4 (Table 3). That is, a person of ordinary skill in the art would understand Godoy teaches that either (i) Picoxystrobin + Cyproconazole (rows 2-12) are to be applied together as a combination or (ii) Azoxystrobin + Benzovindiflupyr (rows 12-23) are to be applied together as a combination. But then one of the associated treatment options shown in the sub-schematic color-coded list would be applied sequentially at a different time.

103. These 22 different experimental conditions (11 each for picoxystrobin + cyproconazole and azoxystrobin + benzovindiflupyr) would require only 12 preparations and applications (picoxystrobin + cyproconazole alone, azoxystrobin + benzovindiflupyr alone, and 10 different associated treatments). By contrast, if all three components were pre-mixed prior to applications, this would require 22 different preparations and applications (i.e., one for each set of "associated" treatments."

104. Applying the treatments in the more efficient sequential process is also consistent with how "associated" treatments had otherwise been described in the art.

105. This is shown, for example, in Exhibit 2002 (de Souza).

106. First, de Souza describes the "association of protective and systemic fungicides." Exhibit 2002 (de Souza) at Abstract. In it, there are two fungicides that are applied separately, where a first protective fungicide is applied in the morning

and then, in the afternoon, a second systemic fungicide is applied separately. (Exhibit 2002 (de Souza) at 3-4). The fact that one fungicide is applied in the morning and the "associate[ed]" fungicide is applied in the afternoon would make it impossible for the separate fungicides to be mixed together as a combination.

107. A person of ordinary skill in the art would further understand the "association of protective and systemic fungicides" taught in de Souza are applied separately as the reference explains "[m]ixtures of triazoles and strobilurins are commonly used in soybean crops to manage[] Asian rust; thus, the addition of a protective fungicide alone would result in more efficient control of leaf spot." Exhibit 2002 (de Souza) at 4. Unlike the systemic triazoles and strobilurins, the protective fungicide is not described as being used in a mixture.

108. De Souza's application of protective fungicide "alone" in the morning followed by a sequential "associate[ed]" treatment later in the day is consistent with Godoy treatments 17 and 23, that is, applying a treatment using mixtures of azoxystrobin + benzovindiflupyr (Elatus) and Nimbus first, followed by "associated" mancozeb at a later time.

109. Using "associated" to describe sequential treatments as opposed to mixed combinations is also reflected in Reis 2009 (Exhibits 2040 & 2041).

110. Reis teaches the "impact of glyphosate associated with insecticide and fungicide." (Exhibits 2040 & 2041 (Reis 2009) at 1). In this article, the author teaches that the soil in which crops are to be planted is "chemically desiccated with glyphosate." Separately as an "associated" treatment, the crop "seeds" are then "treated with" insecticide and fungicide (carbendazim + thiram). Exhibits 2040 & 2041 (Reis 2009) at 3.

111. Reis's uses of "associated" in the context of "glyphosate associated with insecticide and fungicide" to refer to separate, unmixed treatments reinforces my opinion that a person of ordinary skill in the art would have understood Godoy's "associated" treatments to describe using sequentially applying azoxystrobin + benzovindiflupyr (Elatus) and Nimbus first, followed by mancozeb at a later time.

112. While it is my opinion that a person of ordinary skill in the art would understand Godoy's "associated" treatments to be unmixed treatments applied sequentially, it is true that the term "associated treatments" is not explicitly defined in Godoy. To the extent a person of ordinary skill in the art would not understand it to refer to sequential treatments, the undefined term would be ambiguous.

113. In this regard, I am informed that a prior art publication that is ambiguous cannot anticipate a claim. Thus, in my opinion, if Godoy's associated

treatments were not understood to refer to sequential treatments, Godoy would still not anticipate any claim of the '727 patent.

114. For these reasons, I conclude that Godoy does not anticipate the fungicidal combinations or compositions of claims 1, 3-5, 7, 9, and 10.

C. Godoy Does Not Disclose a Fungicidal Combination "Consisting of" Mancozeb, Azoxystrobin, and Benzovindiflupyr

115. Syngenta's Petition does not appear to argue that Godoy discloses a fungicidal combination "consisting of" the claimed fungicides, i.e., a combination containing the listed fungicides without any other fungicide(s). *See* Petition at 19-23. In my opinion, a person of ordinary skill in the art reading Godoy also would not understand Godoy to teach or suggest fungicidal combinations "consisting of" the claimed fungicides.

116. Godoy discloses adding "Nimbus" to every azoxystrobin + benzovindiflupyr (Elatus) example, including rows 17 and 23.

17	azoxystrobin + benzovindiflupyr[1] and mancozeb	60+30 and 1500	Elatus® and Unizeb Gold®
18	azoxystrobin + benzovindiflupyr[1] and copper sulfate	60+30 and 113,85	Elatus® and PNR[2]
19	azoxystrobin + benzovindiflupir[1] and propineb	60+30 and 1400	Elatus® and PNR[2]
20	azoxystrobin + benzovindiflupyr[1] and fluazinam	60+30 and 500	Elatus® and Frowncide®/Zignal®
21	azoxystrobin + benzovindiflupyr[1] and chlorothalonil	60+30 and 1000	Elatus® and Bravonil 500®
22	azoxystrobin + benzovindiflupyr[1] and chlorothalonil	60+30 and 1000	Elatus® and PNR[2]
23	azoxystrobin + benzovindiflupyr[1] and mancozeb	60+30 and 2000	Elatus® and PNR[2]

[1] Added Nimbus 0,6 L ha-1; [2] PNR – Product not registered for the soybean crop, RET III.

Exhibit 1005 (Godoy translation) at 4 (Table 3).

117. Godoy does not disclose the contents of "Nimbus."

118. Syngenta's Petition also does not address the meaning or contents of "Nimbus."

119. A person of ordinary skill in the art reading Godoy would have understood that there were multiple products marketed as "Nimbus," including sulfur and mineral oil products. Both are fungicides and both would be excluded by the "consisting of" language in the '727 claims.

120. For instance, the use of "Nimbus" to refer to sulfur fungicide is reflected in the Australian Pesticides and Veterinary Medicines Authority Nimbus label (Exhibit 2003) and registration information (Exhibit 2004), which describes it as a "WG Fungicide/Miticide." Likewise, the Safety Data Sheet for Nimbus for the Spain Ministry of Agriculture, Fisheries and Food refers to the Nimbus "recommended use" as a "fungicide." Exhibit 2005, 1; Exhibit 2006 (translation of Exhibit 2005), Exhibit 2007 (registration page for the Nimbus product of Exhibit 2005); Exhibit 2008 (translation of Exhibit 2007). And likewise, the Data Sheet IQV Agro Portugal categorizes Nimbus as a fungicide. Exhibit 2009, 1; Exhibit 2010 (translation of Exhibit 2009), 2.

121. Consistent with the crops and disease studied in Godoy, a person of ordinary skill in the art would have understood that sulfur fungicides had been used

as fungicides for soybean rust. However, I understand because of the "consisting of" limitation, sulfur fungicides are excluded from the claims of the '727 patent.

122. Dr. Brannen argues that Godoy's "Nimbus is a mineral oil used to improve spreadability of sprayed droplets applied to leaves of plants in the treatment of soybean rust," citing Moura (Exhibit 1017) and Della Vechia (Exhibit 1018). Exhibit 1003 (Brannen Declaration) at page 41 (footnote 3). The publications cited by Dr. Brannen do not, however, purport to identify what "Nimbus" is in the context of Godoy.

123. Dr. Brannen's assumption is inconsistent with the product label for Elatus®, which recommends *against* the use of mineral oil:

> For best performance, the addition of a spreading/penetrating type adjuvant such as organo-silicon blends with either non-ionic surfactants (NIS) or vegetable based crop oil concentrate (COC); or vegetable based COC (***not mineral***); or NIS with at least 90% concentration is recommended unless otherwise stated in the specific crop section.

Exhibit 1009 (Elatus label), 17.

124. In fact, the Elatus label *repeatedly* recommends against the combined use of mineral oil ("not mineral")[1] in the crop sections of the label. Exhibit 1009 (Elatus label) at 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 31, 33.

125. That said, if a person of ordinary skill in the art had assumed that Godoy's "Nimbus" was mineral oil, then "Nimbus" as used in Godoy would be a fungicide excluded by the "consisting of" claims of the '727 patent. *See* Exhibit 2022 (Wojdyla 2005); Exhibit 2039 (Vawdrey 2004); Exhibit 2059 (Picton 2003) (noting that mineral oil "is effective in low concentrations" and has "proven effective in controlling powdery mildew on grapes" as well as roses and hops; and reduced mildew infection in black currants and while pine blister rust on Ribes). Yet it appears he was aware that mineral oils can, at least in some instances, have fungicidal activity. Exhibit 2021 (Brannen Deposition Transcript) at 46:17-49:14.

126. Indeed, Tobler identifies "paraffin oil" as a fungicide, and paraffin oil is a mineral oil. Exhibit 1006 (Tobler) at 23:51-24:25 ("a fungicide selected from the group consisting of . . . paraffin oil (628)"); Exhibit 2022 (Wojdyla 2015) at 856

[1] In this context, a mineral crop oil concentrate has the same meaning as "mineral oil."

(referring to Sunspray 850 SL as a mineral oil containing 85% paraffinic oil); Exhibit 2023 (EPA website) ("Mineral oil – includes paraffin oil from 063503").

127. I note additionally that there are 213 active registrations for mineral oil in EPA's registration database. *See* Exhibit 2023 (Chemical Name: Mineral oil - includes paraffin oil from 063503). While I did not check all these products, I note that labels for many of them indicate fungicidal activity. Exhibit 2045 (Reg. No. 019713, Drexel 415 Oil 98) at 3 (targeting pests including greasy spot and sooty mold on citrus); Exhibit 2042 (Reg. No. 002935-00546, PN All Season Spray Oil) at 6-7 (targeting pests including powdery mildew and rust); Exhibit 2043 (Reg. No. 034704-00805, BioCover MLT) at 7, 10, 11 (targeting pests including powdery mildew); Exhibit 2044 (Reg. No. 034704-00849, Glacial® Spray Fluid) at 6, 7, 11 (targeting pests including powdery mildew).

128. Regarding the level at which mineral oil is a fungicide, Wojdyla (Exhibit 2022) reported in 2015 that mineral oils had fungicidal activity at concentrations as low as 0.25%:

Table 2
Effectiveness of oils in the control of *Sphaerotheca pannosa* var. *rosae* on rose cv. Madelon. – (2-times at 7-day intervals) Beginning of experiment and initial infection level: 2002.07.25 = 5.0.

Treatments	Conc., %	Mean degree of shoots infection after days from beginning of experiment	
		1	10
Control	-	5.0 l	5.00 m
Triforine	0.03	1.10 g-i	1.60 g
Plant oils used as a food (Cooking oil)			
Canola Oil (Rape Oil)	0.25	1.65 k	2.30 kl
Canola Oil (Rape Oil)	0.5	1.25 h-j	2.15 jk
Canola Oil (Rape Oil)	1.0	0.34 de	1.40 f
Canola Oil (Rape Oil)	2.0	0.00 a	0.45 b
Sunflower Oil	0.25	1.50 jk	2.15 jk
Sunflower Oil	0.5	1.10 g-i	2.00 ij
Sunflower Oil	1.0	0.20 c	1.15 d
Sunflower Oil	2.0	0.00 a	0.80 c
Mineral oils			
Atpolan 80 EC	0.25	1.05 gh	1.85 hi
Atpolan 80 EC	0.5	0.55 f	1.20 de
Atpolan 80 EC	1.0	0.00 a	0.70 c
Atpolan 80 EC	2.0	0.00 a	0.00 a
Sunspray 850 EC	0.25	1.30 ij	2.40 l
Sunspray 850 EC	0.5	0.59 f	2.00 ij
Sunspray 850 EC	1.0	0.24 cd	1.45 fg
Sunspray 850 EC	2.0	0.11 b	1.10 d

Note: Means in columns, followed by the same letter, do not differ with 5% of significance (Duncan's multiple range test)
Disease index: 0 – no symptoms, 1 – up to 1% of shoot area covered with mycelium, 2 – 1.1 up to 5%, 3 – 5.1 up to 10%, 4 – 10.1 up to 20%, 5 – over 20% of shoot area covered with mycelium.

Exhibit 2022 (Wojdyla 2015) at Table 2.

129. This is consistent with the application rate of "Nimbus" in Godoy, where "a minimum application volume" of 120 L ha-1 was used," and Nimbus was added at 0.6 L ha-1, e.g., at 0.5%:

$$0.6 \text{ L ha}^{-1} \div 120 \text{ L ha-1} \times 100\% = 0.5\%$$

Exhibit 1005 (Godoy) at 3, 4.

130. While 120 L ha^{-1} was the "minimum" application volume in Godoy, even if that volume were doubled, the concentration of Nimbus would still have been 0.25%, which Wojdyla reported was sufficient for fungicidal activity. Exhibit 2022 (Wojdyla 2015).

131. As a result, even if a person of ordinary skill in the art would have assumed that "Nimbus" in Godoy was a mineral oil (as Dr. Brannen suggests), Godoy still would not anticipate any claim, as it includes an additional fungicide that is not recited in the claims.

132. For this additional reason that Godoy does not disclose any fungicidal combination "consisting of" only the recited fungicides, it is my opinion that Godoy does not anticipate any claim of the '727 patent.

XII. Tobler Does Not Anticipate Any Claim of the '727 Patent (Ground 2A)

133. Syngenta argues that Tobler anticipates claims 1 and 3-10 of the '727 patent. Petition at 27-50. I disagree, as Syngenta's arguments are inconsistent with how a person of ordinary skill in the art would understand Tobler.

134. Syngenta argues that Tobler discloses benzovindiflupyr (which Tobler identifies as "compound A-1.1") "in combination with at least one compound selected from the group consisting of (B1) a strobilurin fungicide, (B2) an azole fungicide, etc." and "provides disclosure[s] of numerous fungicidal combinations which fall within the claims of the '727 patent." Petition at 28.

135. Syngenta then constructs a road map to build certain of the claimed fungicidal combinations from within Tobler based on "embodiment E1." Petition at 28-29. No such combinations are expressly disclosed in Tobler as its embodiment

E1 recites a list of compounds + TX1, where TX1 stands for benzovindiflupyr (compound A-1.1) plus a compound selected from Group P. Petition at 30-31; Exhibit 1006 (Tobler) at 28:10-11.

136. At the outset, I note that Tobler is a very difficult reference to decipher. It is primarily directed to two-component embodiments, with tacked on three (or more) component genera (E1 and E2) based on a laundry list of potential components. For instance, Tobler only provides biological data for 2-component combinations, and even reported routinely achieving 100% control, suggesting to a person of ordinary skill in the art there is no need for additional components to provide additional efficacy. Tobler does not identify any specific three (or more) component combinations. A person of ordinary skill in the art would have only understood Tobler to teach these broad genera and not any specific three (or more) component combinations. Thus, in my opinion, a person of ordinary skill in the art reading Tobler would not have found it to disclose combinations containing benzovindiflupyr, mancozeb, and an ergosterol biosynthesis inhibitor and/or quinone outside inhibitor.

137. Indeed, it appears that Dr. Brannen had considerable difficulty at his deposition understanding Tobler's embodiment E1, even after submitting a declaration discussing that embodiment. Exhibit 2021 (Brannen Deposition

Transcript) at 92:2-24, 102:2-12. For example, Dr. Brannen could not identify any composition within embodiment E1 without referring to the claim charts attached to his declaration that were prepared in collaboration with Syngenta's attorneys. Exhibit 2021 (Brannen Deposition Transcript) at 94:20-96:6.

138. In my opinion, without referring to the claim charts attached to Dr. Brannen's declaration, a person of ordinary skill in the art similarly would not recognize Tobler to disclose any purported combination containing benzovindiflupyr, mancozeb, and an ergosterol biosynthesis inhibitor and/or quinone outside inhibitor, nor would a person of ordinary skill in the art find such a purported combination obvious.

A. A Person of Ordinary Skill in the Art Would Not Have Read Tobler as Teaching the Claimed Fungicidal Combinations

139. I understand that for Tobler to anticipate any claim of the '727 patent, (1) Tobler must disclose the same invention as arranged as in the claims and (2) that a person of ordinary skill in the art must have been able to immediately envisage the claimed fungicidal combinations based on Tobler's disclosures.

140. In my opinion, (1) Tobler does not disclose the same invention as arranged in the claims of the '727 patent and (2) a person of ordinary skill in the art would not have immediately envisaged any of the claimed fungicidal combinations based on Tobler.

141. Tobler describes six chemical formulas for compound A (where R_1 may be difluoromethyl or trifluoromethyl and X may be a chloro, fluoro, or bromo substituent). Exhibit 1006 (Tobler) at Abstract. Tobler refers to compositions that contain one of the six "A" compounds as well as one or more compounds selected from B1 (strobilurin fungicides, 10 options), B2 (azole fungicides, 35 options), B3 (morpholine fungicides, 8 options), B4 (anilopyrimidine fungicides, 3 options), B5 (which is a list of 166 compounds), B6 (plant bioregulators, 5 options), or B7 (insecticides, 6 options plus a genus of compounds), B8 (3 options), or B9 (which includes 3 chemical structures, each with various options). Exhibit 1006 (Tobler) at 1:42-7:65.

142. Tobler then describes two nonpreferred embodiments E1 and E2. Syngenta relies on Tobler's description of embodiment E1, without providing any reason why a person of ordinary skill in the art would select E1 over E2. E1 is reproduced below, with bracketed numbers added in bold (e.g., [**1**], [**10**]) to count the members of this group.

> Further examples for compositions according to the present invention which comprise three active ingredients are defined as embodiments E1 and E2:
>
> Embodiment E1:
>
> The term "TX1" means: "the compound A-1.1+a compound selected from the group P"

[**1**] Dimoxystrobin+TX1, fluoxastrobin+TX1, kresoxim-methyl+TX1, metominostrobin+TX1, orysastrobin+TX1, picoxystrobin+TX1, pyraclostrobin+TX1, trifloxystrobin+TX1, a compound of formula B-1.1+TX1,

[**10**] azaconazole+TX1, bromuconazole+TX1, cyproconazole+TX1, difenoconazole+TX1, diniconazole+TX1, diniconazole-M+TX1, epoxiconazole+TX1, fenbuconazole+TX1, fluquinconazole+TX1, flusilazole+TX1, [**20**] flutriafol+TX1, hexaconazole+TX1, imazalil+TX1, imibenconazole+TX1, ipconazole+TX1, metconazole+TX1, myclobutanil+TX1, oxpoconazole+TX1, pefurazoate+TX1, penconazole+TX1, [**30**] prochloraz+TX1, propiconazole+TX1, prothioconazole+TX1, simeconazole+TX1, tebuconazole+TX1, tetraconazole+TX1, triadimefon+TX1, triadimenol+TX1, triflumizole+TX1, triticonazole+TX1, [**40**] diclobutrazol+TX1, etaconazole+TX1, furconazole+TX1, furconazole-cis+TX1, quinconazole+TX1, aldimorph+TX1, dodemorph+TX1, fenpropimorph+TX1, tridemorph+TX1, fenpropidin+TX1, [**50**] spiroxamine+TX1, piperalin+TX1, a compound of formula B-3.1+TX1, cyprodinil+TX1, mepanipyrim+TX1, pyrimethanil+TX1, benalaxyl+TX1, benalaxyl-M+TX1, benomyl+TX1, bitertanol+TX1, [**60**] boscalid+TX1, captan+TX1, carboxin+TX1, carpropamid+TX1, chlorothalonil+TX1, copper+TX1, cyazofamid+TX1, cymoxanil+TX1, diethofencarb+TX1, dithianon+TX1, [**70**] famoxadone+TX1, fenamidone+TX1, fenhexamide+TX1, fenoxycarb+TX1, fenpiclonil+TX1, fluazinam+TX1, fludioxonil+TX1, flutolanil+TX1, folpet+TX1, guazatine+TX1, [**80**] hymexazole+TX1, iprodione+TX1, lufenuron+TX1, mancozeb+TX1, metalaxyl+TX1, mefenoxam+TX1, metrafenone+TX1, nuarimol+TX1, paclobutrazol+TX1, pencycuron+TX1, [**90**] penthiopyrad+TX1, procymidone+TX1,

> proquinazid+TX1, pyroquilon+TX1, quinoxyfen+TX1, silthiofam+TX1, sulfur+TX1, thiabendazole+TX1, thiram+TX1, triazoxide+TX1, [**100**] tricyclazole+TX1, a compound of formula B-5.1+TX1, a compound of formula B-5.2+TX1, a compound of formula B-5.3+TX1, a compound of formula B-5.4+TX1, a compound of formula B-5.5+TX1, a compound of formula B-5.6+TX1, a compound of formula B-5.7+TX1, a compound of formula B-5.8+TX1, a compound of formula B-5.9+TX1, [**110**] a compound of formula B-5.10+TX1, a compound of formula B-5.12+TX1, acibenzolar-S-methyl+TX1, chlormequat chloride+TX1, ethephon+TX1, mepiquat chloride+TX1, trinexapc-ethyl+TX1, abamectin+TX1, emamectin benzoate+TX1, tefluthrin+TX1, [**120**] thiamethoxam+TX1 and glyphosate+TX1.

Exhibit 1006 (Tobler) at 28:9-57.

143. By my count, E1 provides 121 options for the set of compounds to be used in connection with TX1.

144. I understand Syngenta then relies on a nested definition provided in Tobler that explains "'TX1' means: 'the compound A-1.1+a compound selected from the group P." Exhibit 1006 (Tobler) at 28:10-11.

145. First, a person of ordinary skill in the art would have to search Tobler to find compound A-1.1 is defined to mean (9-dichloromethylidene-benzonorbornene-5-yl)amide. Nowhere does Tobler use the name benzovindiflupyr. Exhibit 1006 (Tobler) at 13:9-11.

146. Second, a person of ordinary skill in the art would then have to navigate to where Tobler defines "group P." Tobler's group P is a laundry list that includes more than 250 compounds, as listed below, with bracketed numbers added in bold (e.g., [**1**], [**10**]). The numbers in parentheses (e.g., (47), (226)) refer to entries for the preceding compound in Exhibit 2030 (Pesticide Manual) as explained in Tobler. Exhibit 1006 (Tobler) at. 21:23-31.

> A strobilurin fungicide selected from [1] azoxystrobin (47), dimoxystrobin (226) [sic, 266], fluoxastrobin (382), kresoxim-methyl (485), metominostrobin (551), orysastrobin, picoxystrobin (647), pyraclostrobin (690), trifloxystrobin (832), [**10**] a compound of formula B-1.1 [structure omitted]
>
> an azole fungicide selected from azaconazole (40), bromuconazole (96), cyproconazole (207), difenoconazole (247), diniconazole (267), diniconazole-M (267), epoxiconazole (298), fenbuconazole (329), fluquinconazole (385), [**20**] flusilazole (393), flutriafol (397), hexaconazole (435), imazalil (449), imibenconazole (457), ipconazole (468), metconazole (525), myclobutanil (564), oxpoconazole (607), pefurazoate (618), [**30**] penconazole (619), prochloraz (659), propiconazole (675), prothioconazole (685), simeconazole (731), tebuconazole (761), tetraconazole (778), triadimefon (814), triadimenol (815), triflumizole (834), [**40**] triticonazole (842), diclobutrazol (1068), etaconazole (1129), furconazole (1198), furconazole-cis (1199) and quinconazole (1378);
>
> a morpholine fungicide selected from aldimorph, dodemorph (288), fenpropimorph (344), tridemorph (830), [**50**] fenpropidin (343), spiroxamine (740), piperalin (648) and a compound of formula B-3.1 [structure omitted]

an anilino-pyrimidine fungicide selected from cyprodinil (208), mepanipyrim (508) and pyrimethanil (705);

a fungicide selected from the group consisting of

anilazine (878), arsenates, benalaxyl (56), [**60**] benalaxyl-M, benodanil (896), benomyl (62), benthiavalicarb, benthiavalicarb-isopropyl (68), biphenyl (81), bitertanol (84), blasticidin-S (85), bordeaux mixture (87), boscalid (88), bupirimate (98), [**70**] cadmium chloride, captafol (113), captan (114), carbendazim (116), carbon disulfide (945), carboxin (120), carpropamid (122), cedar leaf oil, chinomethionat (126), chlorine, [**80**] chloroneb (139), chlorothalonil (142), chlozolinate (149), cinnamaldehyde, copper, copper ammoniumcarbonate, copper hydroxide (169), copper octanoate (170), copper oleate, [**90**] copper sulphate (87), cyazofamid (185), cycloheximide (1022), cymoxanil (200), dichlofluanid (230), dichlone (1052), dichloropropene (233), diclocymet (237), diclomezine (239), dicloran (240), [**100**] diethofencarb (245), diflumetorim (253), dimethirimol (1082), dimethomorph (263), dinocap (270), dithianon (279), dodine (289), edifenphos (290), ethaboxam (304), ethirimol (1133), [**110**] etridiazole (321), famoxadone (322), fenamidone (325), fenaminosulf (1144), fenamiphos (326), fenarimol (327), fenfuram (333), fenhexamid (334), fenoxanil (338), fenpiclonil (341), [**120**] fentin acetate (347), fentin chloride, fentin hydroxide (347), ferbam (350), ferimzone (351), fluazinam (363), fludioxonil (368), flusulfamide (394), flutolanil (396), folpet (400), [**130**] formaldehyde (404), fosetyl-aluminium (407), fthalide [sic, phthalide] (643), fuberidazole (419) [sic, (409)], furalaxyl (410), furametpyr (411), flyodin (1205), fuazatine [sic, guazatine] (422), hexachlorobenzene (434), hymexazole, [**140**] iminoctadine (459), iodocarb (3-Iodo-2-propynyl butyl carbamate), iprobenfos (IBP) (469), iprodione (470), iprovalicarb (471), isoprothiolane (474), kasugamycin (483), mancozeb (496), maneb (497), manganous dimethyldithiocarbamate, mefenoxam (Metalaxyl-M) (517), [**150**] mepronil (510), mercuric

chloride (511), mercury, metalaxyl (516), methasulfocarb (528), metiram (546), metrafenone, nabam (566), neem oil (hydrophobic extract), nuarimol (587), [**160**] octhilinone (590), ofurace (592), oxadixyl (601), oxine copper (605), oxolinic acid (606), oxycarboxin (608), oxytetracycline (611), paclobutrazole (612), paraffin oil (628), paraformaldehyde, [**170**] pencycuron (620), pentachloronitrobenzene (716), pentachlorophenol (623), penthiopyrad, perfurazoate, phosphoric acid, polyoxin (654), polyoxin D zinc salt (654), potassium bicarbonate, probenazole (658), [**180**] procymidone (660), propamocarb (668), propineb (676), proquinazid (682), prothiocarb (1361), pyrazophos (693), pyrifenox (703), pyroquilon (710), quinoxyfen (715), quintozene (PCNB) (716), [**190**] silthiofam (729), sodium bicarbonate, sodium diacetate, sodium propionate, streptomycin (744), sulphur (754), TCMTB, tecloftalam, tecnazene (TCNB) (767), thiabendazole (790), [**200**] thifluzamide (796), thiophanate (1435), thiophanate-methyl (802), thiram (804), tolclofos-methyl (808), tolylfluanid (810), triazoxide (821), trichoderma harzianum (825), tricyclazole (828), triforine (838), [**210**] triphenyltin hydroxide (347), validamycin (846), vinclozolin (849), zineb (855), ziram (856), zoxamide (857), 1,1-bis(4-chlorophenyl)-2-ethoxyethanol (IUPAC-Name) (910), 2,4-dichlorophenyl benzenesulfonate (IUPAC-/Chemical Abstracts-Name) (1059), 2-fluoro-N-methyl-N-1-naphthylacetamide (IUPAC-Name) (1295), 4-chlorophenyl phenyl sulfone (IUPAC-Name) (981),

[**220**] a compound of formula B-5.1, a compound of formula B-5.2, a compound of formula B-5.3, a compound of formula B-5.4, a compound of formula B-5.5, a compound of formula B-5.6, a compound of formula B-5.7, compound B-5.8, compound B-5.9, [**230**] compound B-5.10, compound B-5.11, compound B-5.12, compound B-5.13, compound B-5.14, compound B-5.15, compound B-5.16, compound B-5.17 and compound B-5.18;

> a plant-bioregulator selected from the group consisting of acibenzolar-S-methyl (6), [**240**] chlormequat chloride (137), ethephon (307), mepiquat chloride (509) and trinexapc-ethyl [sic, trinexapac-ethyl] (841);
>
> an insecticide selected from the group consisting of abamectin (1), clothianidin (165), emamectin benzoate (291), imidacloprid (458), tefluthrin (769), thiamethoxam (792), and [**250**] glyphosate (419), [**251**] a compound of formula V [structure omitted], [**252**] fomesafen, and [**253** & **254**] (B9) a racemic compound of formula VIa (syn) [structure omitted] wherein Ra7 is trifluoromethyl or difluoromethyl; [**255** & **256**] a racemic mixture of formula VIb (anti) [structure omitted] which is an epimeric mixture of racemic compounds of formulae F-10 (syn) and F-11 (anti), wherein the ratio from racemic compounds of formula F-10 (syn) to racemic compounds of formula F-11 (anti) is from 1000:1 to 1:1000 and wherein Ra7 is trifluoromethyl or difluoromethyl.

Exhibit 1006 (Tobler) at 22:61-25:67.

147. By my count, group P provides 256 options for the set of compounds to be used in connection with compound A-1.1.

148. Tobler also used a definition of "composition" not to refer to a specific type of combination of components but to a genus of possible mixed combinations (e.g., tank-mix) and sequential applications where "[t]he order of applying the components (A) and (B) is not essential for working the present invention."

> Throughout this document the expression "composition" stands for [**1**] the various mixtures or combinations of components (A) and (B), for example in a single "***ready-mix***" form, in a combined spray mixture composed from separate formulations of the single active ingredient

> components, such as a "tank-mix", and [**2**] in a combined use of the single active ingredients when applied in a ***sequential manner***, i.e. one after the other with a reasonably short period, such as a few hours or days. The order of applying the components (A) and (B) is not essential for working the present invention.

Exhibit 1006 (Tobler) at 27:55-64.[2] Based on Tobler's statement that the "order of applying the components (A) and (B) is not essential," for a two component "composition" (A) + (B), Tobler is allowing for three different "compositions":

1. a combination of (A) + (B),
2. application of (A) followed by "sequential" application of (B), and
3. application of (B) followed by "sequential" application of (A).

149. Applying Tobler's definition of "composition" where "the order of applying… is not essential" to three components, a person of ordinary skill in the art would understand it to cover 13 different three-component "compositions":

1. A+B+C
2. A+B followed by C
3. A+C followed by B
4. B+C followed by A
5. A followed by B+C

[2] All ***bold italic*** emphasis is added, unless otherwise stated.

6. B followed by A+C

7. C followed by A+B

8. Sequential applications of each of A, B, then C

9. Sequential applications of each of A, C, then B

10. Sequential applications of each of B, C, then A

11. Sequential applications of each of B, A, then C

12. Sequential applications of each of C, A, then B

13. Sequential applications of each of C, B, then A

See Exhibit 2016 (3-component permutations). Especially where Tobler teaches that "the order of applying… is not essential," a person of ordinary skill in the art would not understand Tobler to be teaching mixed combinations for any possible three component combination. To the contrary, as I discuss further below, Tobler's "composition" can only be understood as a generic genus not specific to any type of mixed combination or sequential application as mixed combinations are not even feasible for all possible components.

150. For multiple reasons, in my opinion, a person of ordinary skill in the art would not have read Tobler as disclosing a combination of (1) benzovindiflupyr, (2) mancozeb, and at least one of (3) the ergosterol biosynthesis inhibitors and/or quinone outside inhibitors recited in the claims of the '727 patent, as I explain below.

1. Tobler's Enormous E1 Genus Neither Discloses the Claimed Fungicidal Combinations as Arranged in the Claim Nor Permits a Person of Ordinary Skill in the Art to Immediately Envisage Such Combinations

151. In my opinion, a person of ordinary skill would not understand Tobler's E1 genus to disclose any specific three-component mixed combinations.

152. Tobler's embodiment E1 comprises (1) (compound A-1.1) plus (2) one of the 120+ compounds recited in the description of embodiment E1 (Exhibit 1006 (Tobler) at 28:12-57) plus (3) one of the 250+ members of Group P (Exhibit 1006 (Tobler) at 22:61-25:67) applied in one of thirteen permutations of sequential or in combination. This corresponds to more than 30,000 permutations of just compounds within embodiment E1 (120 E1 x 250 group P = 30,000). Since "[t]he order of applying… is not essential for working" according to Tobler, the three compounds may be applied as a combination and/or sequentially (see Exhibit 1006 (Tobler) at 28:6-8), resulting in more than 390,000 Tobler "compositions" (120+ E1 × 250+ group P × 13 options for sequential or simultaneous treatment). It would not have been possible for a person of ordinary skill in the art to have immediately envisaged all such possibilities.

153. In addition, Tobler states its embodiment E1 "comprise[s] three active ingredients. Exhibit 1006 (Tobler) at 28:6-9. As noted above, I understand that in patent law, "comprises" signals that additional components may be added (as

opposed to "consisting of," which does not permit additional components) (described above in § XII.C). Therefore, a person of ordinary skill in the art would have understood that additional fungicides could be added to Tobler's embodiment E1. This is consistent with Tobler repeatedly referring to the use of "***at least one***" compound (B). *E.g.,* Exhibit 1006 (Tobler), Abstract, 37:33-37, 33:44-48.

154. Tobler's embodiment E1 thus includes far more than 390,000 permutations, and Tobler provides no guidance about excluding fungicides of Group P that are not recited in the claims of the '727 patent, e.g., morpholine fungicides, anilino-pyrimidine fungicides, and numerous compounds in Tobler's catch-all list of additional fungicides (e.g., anilzazine, arsenates, benalaxyl, etc.).

155. In my opinion, this does not disclose the invention as arranged in the claims and a person of ordinary skill in the art would not have immediately envisaged all permutations of Tobler's embodiment E1, much less zeroed in on the claimed fungicidal ***combinations***.

2. Even Narrowing Embodiment E1 to Require Mancozeb, Tobler Still Fails to Teach the Claimed Fungicidal Combinations

156. Even if a person of ordinary skill in the art zeroed in on Tobler's disclosure of benzovindiflupyr and mancozeb (recited as one of 120+ options within embodiment E1), a person of ordinary skill in the art would not have immediately

envisaged a "combination" consisting of benzovindiflupyr, mancozeb, and one or more of the ergosterol biosynthesis inhibitors and/or quinone outside inhibitors as claimed. Instead, this genus still encompasses at least 3,250 potential but undifferentiated three-component combinations (250+ group P × 13 options for sequential or simultaneous treatment) and the potential for adding additional fungicides. Given the size of this genus, a person of ordinary skill in the art would understand it as exactly that—a broad genus—and not have understood it to teach or suggest any specific combination consisting of benzovindiflupyr, mancozeb and each of the 250+ members of group P.

157. Further, rather than understanding Tobler to teach that any possible three-component "composition" could be a mixed combination consisting of benzovindiflupyr, mancozeb, and each of the 250+ members of group P, a person of ordinary skill in the art would have understood that some group P compounds should not be used in mixed together with benzovindiflupyr and/or mancozeb. This is another reason why a person of ordinary skill in the art would read Tobler as teaching no more than undefined generic "compositions" with group P compounds rather than any particular type (mixed or sequential) of combination of specific components.

158. The compatibility of certain components as mixed combustions is reflected in the "Pesticide Manual," cited in Tobler as providing information related

to certain pesticides included in its broad disclosure. Exhibit 1006 (Tobler) at 21:23-28 (citing Exhibit 2030 (Pesticide Manual)).

159. From the Exhibit 2030 (Pesticide Manual) at a person of ordinary skill in the art would have understood that a number of Group P members are incompatible with mancozeb. These include at least:

- Bordeaux mixture (87), which is listed as incompatible with carbamates (e.g., dithiocarbamates such as mancozeb). Exhibit 2030 (Pesticide Manual) at 102-103.
- Dithianon (279), which is listed as incompatible with sulfur-containing compounds (e.g., mancozeb). Exhibit 2030 (Pesticide Manual) at 345.
- Ethephon (307), which is listed as incompatible with zinc- or manganese-containing fungicides (e.g., mancozeb). Exhibit 2030 (Pesticide Manual) at 377-78.

160. A person of ordinary skill in the art would have also been aware that mancozeb should not be "combined" with chlorine, as it reduces and/or destroys the fungicidal activity of mancozeb. Indeed, chlorine has been used to remove mancozeb residues from food products. *See, e.g.*, Exhibit 2046 (Singh 2013) at 116 ("Mancozeb residues were decreased by 56-99% with chlorine."). Indeed, mixtures of mancozeb and chlorine result in rapid degradation of the ethylene thiourea residue, which greatly reduces or destroys the fungicidal activity of mancozeb. Exhibit 2025 (Hwang 2002); Exhibit 2026 (Cengiz and Certel 2014).

161. As described in Tobler, "mercury" is associated with CAS No. 7487-94-7 (mercury (II) chloride, $HgCl_2$); CAS No. 21908-53-2 (mercury (II) oxide, HgO); CAS No. 7546-30-7 (mercurous chloride, Hg_2Cl_2). Exhibit 1006 (Tobler) at 21:53-54. As such, "mercury" refers to three distinct compounds, none of which would have been deemed suitable for combining with benzovindiflupyr and mancozeb, at least because EPA banned the use of mercury compounds as fungicides in the United States and cancelled all related registrations in 1995. Exhibit 2055 (EPA Mercury Ban) at 27 ("Mercury compounds have historically been used in agriculture as fungicides, mildewcides and pesticides. In early 1995, all mercury compound-containing U.S. pesticide registrations were discontinued.").

162. Group P also includes non-selective contact herbicides and other compounds that are phytotoxic to plants, and these would also have not been considered suitable for combining with benzovindiflupyr and mancozeb in view of Tobler's goal of "controlling diseases on useful plants" (presumably without killing the plants) (Exhibit 1006 (Tobler) at abstract):

- Paraffin oils (628),[3] some of which are phytotoxic to plants. Exhibit 2030 (Pesticide Manual) at 761.

- Pentachlorophenyl (623), which is a non-selective contact herbicide. Exhibit 2030 (Pesticide Manual) at 755.

- Glyphosate is a non-selective herbicide (plant killer) and should only be used with genetically modified plants (GMO plants). Exhibit 2030 (Pesticide Manual) at 513-16.

- Fomesafen (401), which is an herbicide. Exhibit 2030 (Pesticide Manual) at 492-93.

163. A person of ordinary skill in the art would have also recognized that members of group P that are fumigants (i.e., compounds applied as a gas) would not be combinable with benzovindiflupyr or mancozeb, including:

- Dichloropropene (233), which is listed as a soil fumigant nematicide that must be applied before crops are planted. Exhibit 2030 (Pesticide Manual) at 286.

- Formaldehyde (404), which is a fumigant used to sterilize soil, glasshouses (when crops are not present), and mushroom houses, and it is "extremely phytotoxic." Exhibit 2030 (Pesticide Manual) at 496. In my experience, formaldehyde is also used in potato storage facilities.

- Hexachlorobenzene (434), which is listed as a fumigant seed treatment. Exhibit 2030 (Pesticide Manual) at 532-33.

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[3] A person of ordinary skill in the art would understand paraffin oils to be synonymous with mineral oil. Exhibit 2030 (Pesticide Manual) at 761 (Entry 628 for petroleum oils: "**Other names** mineral oils…; paraffin oils.").

164. A person of ordinary skill in the art would have considered other group P members as potentially appropriate for use in sequential treatments, but not in a mixed combination with benzovindiflupyr and mancozeb, including at least:

- Trinexapac-ethyl (841), a plant growth regulator and retardant, for which the Pesticide Manual states: "Compatibility of little importance because of late timing of application." Exhibit 2030 (Pesticide Manual) at 1020.

165. Additionally, *Trichoderma harzianum* (825) was reported to be incompatible with at least mancozeb in certain studies. Exhibit 2024 (McLean 2001) at 87 ("*Trichoderma* colonisation was lowest in the combination seed treatment plus mancozeb foliar spray (TPBM) and the single mancozeb treatment. This can be explained on the basis of the strong inhibition of Trichoderma spore germination exhibited by mancozeb and thiram.").

166. Several additional members of group P are listed as incompatible with oils or adjuvants, and a person of ordinary skill in the art would need to carefully evaluate whether such compounds would be compatible with the selected formulations of benzovindiflupyr and/or mancozeb:

- Captan (114) is incompatible with alkaline materials, oil sprays, TEPP, and emulsifiable concentrate formulations of parathion. Exhibit 2030 (Pesticide Manual) at 134.
- Chinomethionat (126): incompatible with mineral oils, as "phytotoxicity may result." Exhibit 2030 (Pesticide Manual) at 149.

- Sulphur (754): "For reasons of phytotoxicity, mixing with oils should be avoided." Exhibit 2030 (Pesticide Manual) at 917.

- Chlorothalonil (142), copper octanoate (170), dinocap (270), dodine (289), fentin hydroxide (347): incompatible with oils. Exhibit 2030 (Pesticide Manual) at 169, 204, 335, 356, 426.

- Triforine (838): should not be mixed with adjuvants. Exhibit 2030 (Pesticide Manual) at 1016.

167. Several members of group P are listed as soil and/or seed treatments (see below). A person of ordinary skill in the art would have understood that seed treatment alone is insufficient as a fungicide during plant growth, and as such, a person of ordinary skill in the art would have understood that permutations of embodiment E1 involving seed treatments would require sequential applications of fungicides. Compounds in Group P that the Pesticide Manual teaches are seed treatments include:

- Fenfuram (333): seed treatment. Exhibit 2030 (Pesticide Manual) at 407.

- Fenpiclonil (341): applied to seeds or soil. Exhibit 2030 (Pesticide Manual) at 417.

- Flusulfamide (394): soil treatment. Exhibit 2030 (Pesticide Manual) at 484.

- Fuberidazole (409): seed treatment. Exhibit 2030 (Pesticide Manual) at 503.

- Silthiofam (729): seed treatment. Exhibit 2030 (Pesticide Manual) at 890.

- Triazoxide (821): seed treatment. Exhibit 2030 (Pesticide Manual) at 995.
- Pentachloronitrobenzene (716): seed treatment. Exhibit 2030 (Pesticide Manual) at 874.

168. Given the numerous issues and incompatibilities associated with members of group P, a person of ordinary skill in the art would not have read Tobler as teaching that all members of group P can be "combined" with benzovindiflupyr and mancozeb.

169. Thus, because Tobler provides a laundry list of possible multi-component fungicides, none of which are expressly taught as arranged in the claims, and many of the taught components are not compatible together as a combination, in my opinion Tobler does not teach any of the claimed fungicidal combinations.

170. I provide additional comments in this regard with respect to claim 2 below.

XIII. Tobler Optionally in View of Godoy Would Not Have Rendered the Claims of the '727 Patent Obvious (Ground 2B)

171. Syngenta argues that claims 1-10 of the '727 patent would have been obvious over the combination of Tobler and Godoy. Petition at 27. I disagree.

172. Syngenta argues that Godoy "provides further motivation for the combination" which seems to refer to the "combination" purportedly disclosed by

Tobler). Petition at 33. Syngenta argues that Godoy discloses that there are "only a few 'main modes' of action used to control disease in soybean crops," including demethylation inhibitors, quinone oxidase inhibitors, and succinate dehydrogenase inhibitors," and suggests that multisite fungicides such as mancozeb "may be an option for both the control of rust and as an anti-resistance strategy." Petition at 33. I disagree.

173. Syngenta argues that Godoy also provides "a reasonable expectation of success" because, according to Syngenta, Godoy "provides a working example which falls within claim 1 of the '727 patent." Petition at 33-34. I disagree.

174. Syngenta next argues that Tobler "provides data of various synergistic effects of benzovindiflupyr with an azole fungicide (cyproconazole) or a strobilurin fungicide (cyproconazole)" (citing Exhibit 1003 (Brannen Declaration) at ¶¶146-153) and that a person of ordinary skill in the art "would be highly motivated to combine benzovindiflupyr with an azole fungicide (cyproconazole) or a strobilurin fungicide (cyproconazole [*sic*]) based on this data." Petition at 34. I disagree.

175. For the same reasons addressed for Ground 2A (Section XII.), it is my opinion the '727 patent is not obvious. In particular, a person of ordinary skill in the art would need to navigate though all possible species (whether 390,000, 30,000, or 3,250) to find a claimed combination of three components, at the exclusion of others.

This is especially so given Tobler provides the listed fungicides can be applied in 13 permutations of sequential or combination, and many fungicides listed are incompatible in combination.

176. As explained above, I understand Dr. Brannen testified that mixing components was more expensive and contrary to standard recommendations to sequentially rotate fungicides with different mechanisms of action to reduce the risk of resistance. Exhibit 2021 (Brannen Deposition Transcript) at 12:8-13:7, 14:14-16:3, 16:22-18:7, 21:9-23:8. I agree from my professional experience that this was generally the case.

177. Further, I understand Dr. Brannen described in his deposition testimony the reluctance with which a person of ordinary skill in the art would have about experimenting with mixing untaught combinations. Exhibit 2021 (Brannen Deposition Transcript) at 33:8-34:5, 35:15-38:11. I agree. As a matter of physical compatibility of components, phytotoxicity to the plants, and safety involved with mixing unknown chemicals, a person of ordinary skill in the art would be strongly motivated against mixing ingredients if the compatibility was unknown.

A. Godoy Would Not Have Motivated a Person of Ordinary Skill in the Art to Select the Claimed Combinations from Tobler

178. A person of ordinary skill in the art reading Tobler and Godoy together would not have been motivated to make the claimed fungicidal combinations.

179. As I previously explained, Godoy does not disclose any "combination" containing the claimed fungicides, much less one "consisting of" only those fungicides. As a result, Godoy would not have motivated a person of ordinary skill in the art to select such combinations when reading Tobler.

180. Moreover, a person of ordinary skill in the art would not have understood much, if anything, based on Godoy. In my view, Godoy is a non-peer-reviewed report that lacks many of the details that one would need to include for a reputable, peer-reviewed publication. For example, Godoy lacks a substantive description of how its associated treatments were applied, how disease severity ratings were done and how data was analyzed. And given the addition of "Nimbus," it is not even clear what was applied.

181. In addition, Godoy's analysis lacks rigor. For example, when evaluating the control of soybean rust by the various associated treatments, Godoy does not indicate whether the results from individual sites were statistically significant, so it is not possible to tell whether the percent control are meaningfully different. Exhibit 1005 (Godoy) at 6 (Table 5).

182. Moreover, Godoy's control data do not suggest any added control of Asian soybean rust when a multisite fungicide was used in association with azoxystrobin + benzovindiflupyr. First, Godoy does not provide data from an

appropriate control, i.e., water plus Nimbus. Next, the percent control for azoxystrobin + benzovindiflupyr was 77%, while the percent control for that product used in association with a multisite ranged from 79% to 81%, and these numbers do not appear to have been significantly different. Exhibit 1005 (Godoy) at 6 (Table 5); *id.,* 6 ("For the fungicide Elatus®, which alone presented 77 % of control, the gains in control in the associations were lower than those observed for the fungicide Aproach®Prima, with a maximum control of 81 % observed for the associations with mancozeb 2000 g a.i. ha^{-1} and 1500 g a.i. ha^{-1} and copper oxychloride 294 g a.i. ha^{-1}. Similarly, the productivity increments were not significant for the associations, with the exception of mancozeb 1500 g a.i. ha^{-1}.").

183. When reporting the severity results, Godoy indicates that other multisite fungicides had about the same impact when associated with treatments of azoxystrobin + benzovindiflupyr. Exhibit 1005 (Godoy translation) at 6 (Table 5). In particular, severity in associated treatments with mancozeb was no better than copper oxychloride (at 280 or 294 g/ha) or chlorothalonil (at 1080 g/ha). Exhibit 1005 (Godoy) at 6 (Table 5).

184. Thus, a person of ordinary skill in the art would not have been motivated to combine Tobler and Godoy together and further would not have found the claimed fungicidal combinations obvious.

B. Claim 2

185. Claim 2 of the ’727 patent requires a combination consisting of four fungicides, specifically: (1) benzovindiflupyr, (2) mancozeb, (3) an ergosterol biosynthesis fungicide, and (4) a quinone outside inhibitor fungicide.

186. Syngenta argues that “Tobler also discloses three component (B)s can be used giving a 4-way mixture,” citing a general statement in Tobler that “it may be advantageous in the agricultural practice to combine two or three components (B) with component (A),” e.g., “a compound of formula (I), azoxystrobin and cyproconazole.” Petition at 34-35 (citing Exhibit 1006 (Tobler) at 27:65-28:5).

187. Syngenta further argues that a “person of ordinary skill in the art would include different modes of action, such as ‘an ergosterol biosynthesis inhibitor fungicide and a quinone outside inhibitor fungicide” to broaden “the spectrum of phytopathogenic disease control.” Petition at 35.

188. Syngenta additionally argues that because Tobler discloses “various ergosterol biosynthesis inhibitor fungicides (*e.g.,* cyproconazole, prothioconazole); quinone outside inhibitor fungicides (*e.g.*, azoxystrobin, picoxystrobin); and mancozeb as acceptable (B) components,” so “it would be obvious to use a combination of these three (B) components with benzovindiflupyr.” Petition at 35.

189. I disagree with Syngenta's conclusory assertions. There is nothing in Tobler that would have guided a person of ordinary skill in the art to select a four-way fungicidal combination of claim 2.

190. Tobler's group (B) is enormous. *See* Exhibit 1006 (Tobler) 1:61-7:64. Even if one focuses on Tobler's "preferred" or "especially suitable" (B) components, the list still includes over 250 options. Exhibit 1006 (Tobler) 7:65-12:19 ((B) components in "preferred" compositions), 22:60-27:64 (Group P and Group Q listing "especially suitable" (B) components).

191. As I discuss above, a person of ordinary skill in the art would not have read Tobler as disclosing the claimed fungicides as arranged in the claim (i.e., as combinations) and would not been able to immediately envisage the claimed combinations within Tobler's enormous genus.

192. Tobler does not provide any disclosures that would have guided a person of ordinary skill in the art to select mancozeb from among its broad disclosures. For example, Tobler does not have any examples that include mancozeb and thus does not provide any data involving combinations with mancozeb. Mancozeb is simply listed as one of 120+ options in Group P. Tobler also fails to provide any information regarding which fungicides may be "combined," e.g., which

mixtures would be physically compatible, not exhibit undesirable phytotoxicity, and retain fungicidal efficacy when mixed.

193. There are also numerous incompatibilities among the various members of Tobler's B compounds, and even the narrower set of group P compounds. For example:

- Combinations of triazole fungicides with copper results in Fenton (Haber-Weiss) reactions resulting in formation of complexes resulting in two or more triazolic ligands which have pronounced inhibitory effects on aromatase activity. These relatively unpredictable triazolic ligards present significant barriers to address safe regulatory residue issues. Exhibit 2056 (Dytrtova 2020).
- Pyrimethanil is not compatible with chlorine. Exhibit 2047 (Kanetis 2008).
- Copper hydroxide mixed with either cyproconazole or pyraclostrobin results in poor control of coffee leaf rust compared the cyproconazole or pyracclostrobin applied alone. Exhibit 2048 (da Costa 2019).
- Several compounds in Tobler exhibit reduce or inhibit the activity of *Trichoderma harzianum*, including metrafenone (Exhibit 2049 (Lukovic 2020)); thiram, carboxin and propiconazole (Exhibit 2050 (Tomer 2018)); mancozeb, tebuconazole and thiram (Exhibit 2024 (McLean 2001)); propiconazole, hexaconazole, and tebuconazole (Exhibit 2051 (Kiran and Jyothi 2018)).
- *Trichoderma harzianum* is sensitive relative to mycelial growth in culture or spore production to pyraclostrobin + boscalid (a succinate dehydrogenase inhibitor fungicide), cyprodininal + fludioxanil, fenhexamid, pyrimethanil, and thiram depending on time of culture and rate tested (Exhibit 2052 (Khirallah 2016)); and sensitive to carbendazim + mancozeb, benomyl, and hexaconazole (Exhibit 2053 Manandar 2020)).

- The Intermountain Tree Fruit Production Guide (Exhibit 2054) indicates that thiophanate -methyl (Topsin) is not compatible with fixed copper fungicides and oil is not compatible with captan or sulfur.

194. These are but a few examples of the combinations in the Tobler patent that are not compatible, thus showing the listing Group B (and subset Group P) describes mixing components without foresight. A person of ordinary skill in the art would have been aware of at least some of these incompatibilities and would not have read Tobler as describing all its enormous optional compositions as suitable for use in combination.

C. Dependent Claims

195. While it is my opinion that Syngenta failed to show a person of ordinary skill in the art reading Tobler or Tobler with Godoy would find any of the dependent claims are obvious, it is also my opinion that a person of ordinary skill in the art reading Tobler alone or with Godoy would not find any of the dependent claims obvious.

196. For example, Claim 6 requires that the composition of claim 5 be "formulated into wettable powders, granules, dusts, soluble (liquid) concentrates, suspension concentrates, oil in water emulsion, water in oil emulsion, emulsifiable concentrates, capsule suspensions, a combination of a suspension concentrate (SC)

and a capsule suspension (CS), or oil dispersions." Exhibit 1001 ('727 patent) at claim 6.

197. Claim 5 recites a "composition consisting of: at least one agrochemically acceptable excipient; and a fungicidal combination" containing the same fungicides recited in claim 1. Exhibit 1001 ('727 patent) at claim 5. I understand that the requirements of claim 5 are also part of claim 6.

198. Based on Tobler and Tobler in view of Godoy, a person of ordinary skill in the art would not have been motivated to co-formulate benzovindiflupyr, mancozeb, and an ergosterol biosynthesis inhibitor and/or a quinone outside inhibitor as one of the formulation types specified in claim 6.

199. Tobler provides no such motivation to prepare such a combination. The formulations in Tobler include only two components, not three. Exhibit 1006 (Tobler) at 39:25-40:67. And, as noted above, rather than guiding toward mixed formulations—much less the formulations according to claim 6—Tobler teaches that "[t]he order of applying the components (A) and (B) is not essential for working the present invention." Exhibit 1006 (Tobler) at 27:55-64.

200. Godoy also lacks motivation guiding toward mixed formulations, much less the formulations according to claim 6. To the contrary, as I discussed in Section XI.B, Godoy teaches associated treatments where Nimbus is only added on one

component and where a person of ordinary skill would have understood that sequential applications are most efficient for its experimental objectives.

201. In my opinion, the '727 patent's claimed co-formulation of benzovindiflupyr, mancozeb, and an ergosterol biosynthesis inhibitor and/or a quinone outside inhibitor would not have been obvious from Tobler optionally in view of Godoy.

XIV. De Oliveira Would Not Have Rendered Obvious Any Claim of the '727 Patent Alone or in Combination with Wiglesworth, Tobler, and Godoy (Ground 3)

202. Syngenta argues that De Oliveira would have rendered the claims of the '727 patent obvious, either alone or in combination with Wiglesworth, Tobler, and Godoy. Petition at 50.

203. Syngenta notes that De Oliveira discloses treatments with dithiocarbamate fungicides such as mancozeb in combination with "at least another fungicide selected from a demethylation inhibitor, quinone outside inhibitor, succinate dehydrogenase inhibitor, quinone inside inhibitor, or combinations thereof." Petition at 51.

204. Syngenta argues that De Oliveira discloses combinations of mancozeb, azoxystrobin, and cyproconazole; mancozeb, pyraclostrobin, and epoxiconazole; mancozeb, cyproconazole, and picoxystrobin; and mancozeb, picoxystrobin, and

tebuconazole and that De Oliveira states that "incorporation of mancozeb increased the [Asian soybean] rust control of the conventional strobilurin + conazole fungicide treatment standard." Petition at 52.

205. Syngenta acknowledges that De Oliveira does not disclose benzovindiflupyr but argues that adding benzovindiflupyr "would have been obvious based on the general disclosure of De Oliveira as evidenced by the fact that benzovindiflupyr is an SDHI." Petition at 52-53. I disagree, as I explain below.

A. De Oliveira Would Not Have Motivated a Person of Ordinary Skill in the Art to Add Benzovindiflupyr to Any of Its Combinations

206. In my opinion, Syngenta has not shown that a person of ordinary skill in the art would have been motivated from De Oliveira to prepare a fungicidal combination consisting of benzovindiflupyr, mancozeb, and one or more of the claimed quinone outside inhibitors and ergosterol biosynthesis inhibitors.

207. As a preliminary matter, De Oliveira discloses a list of sixteen preferred succinate dehydrogenase inhibitor fungicides:

> Preferably, the succinate dehydrogenase inhibitor is selected from the group consisting of benodanil, flutolanil, mepronil, fluopyram, fenfuram, carboxin, oxycarboxin, thifluzamide, bixafen, fluxapyroxad, furametpyr, isopyrazam, penflufen, penthiopyrad, sedaxane and boscalid.

Exhibit 1007 (De Oliveira) at 15-16. This list of preferred SDHIs *excludes* benzovindiflupyr, which is nowhere disclosed in De Oliveira.

208. The exclusion of benzovindiflupyr from De Oliveira is significant since benzovindiflupyr was commercialized by 2012 (when it was first sold in Paraguay) and was the subject of a patent filed in 2006. Exhibit 1011 (Pesticide Manual) at 93; *See* Exhibit 1011 (Pesticide Manual) at 12-13 ("First sold in Paraguay in 2012;" citing US 7,732,469 (Exhibit 2029). De Oliveira does not explain the reason for selecting other SDHIs as preferred and provides no basis for rejecting this preference. Without understanding this reason, a person of ordinary skill in the art would not be motivated to combine references to supplement De Oliveira.

209. Next, while Syngenta points to a section of De Oliveira disclosing a method of treating a plant with a dithiocarbamate fungicide and "at least another fungicide selected from a [1] demethylation inhibitor, [2] quinone outside inhibitor, [3] succinate dehydrogenase inhibitor, [4] quinone inside inhibitor or [5] combinations thereof," (Exhibit 1007 (De Oliveira) at 7), this disclosure does not render the '727 patent obvious.

210. First, this section merely teaches multi-component fungicides, that can be as limited as a two-component dithiocarbamate and just one of the other listed fungicide class, or as large as five-component fungicides set. There is nothing

requiring a 3-component succinate dehydrogenase inhibitor, dithocarbamate, and ergosterol biosynthesis inhibitor or quinone outside inhibitor. Neither Syngenta nor Dr. Brannen explain why a person of ordinary skill in the art would select a three-component combination, much less a dithiocarbamate, succinate dehydrogenase inhibitor, and a demethylation inhibitor or quinone outside inhibitor.

211. Second, this section does not require mancozeb, and in fact, provides over two dozen possible dithiocarbamates. Exhibit 1007 (De Oliveira) at pg. 8. Syngenta nor Dr. Brannen explain why a person of ordinary skill in the art would use mancozeb over the 24 other options.

212. Third, like Tobler, De Oliveira provides the "additional components can be applied concurrently, prior or subsequently to the dithiocarbamate fungicide." Exhibit 1007 (De Oliveira) at p.7; 15; 22 ("the application of the dithiocarbamate fungicide may be prior, subsequent or concurrent to the application of the systemic fungicide."). Neither Syngenta nor Dr. Brannen explain why a person of ordinary skill in the art would be motivated to apply the fungicide components as a combination.

213. Fourth, this section does not even require quinone outside inhibitors or demethylation inhibitors (a genus containing the subgenus of ergosterol biosynthesis

inhibitors). Moreover, De Oliveira teaches 18 of these fungicides from these classes that are unclaimed by the ’727 patent. Exhibit 1007 (De Oliveira) at pg. 10-11.

214. Syngenta argues “De Oliveira disclose[s] use of a ‘quinone outside inhibitor[s],’… [and teaches] Demethylation inhibitors (DMIs) work by inhibiting the biosynthesis of ergosterol,” (Petition at 51) and this is a reason to use these fungicide classes. I disagree. At best, Syngenta points to sections of De Oliveira describing these fungicide classes at a high level. Syngenta nor Dr. Brannen explain why a person of ordinary skill in the art would be motivated to select the claimed fungicides over the other listed unclaimed classes.

215. Fifth, while this section does not require succinate dehydrogenase inhibitors, it also does not disclose benzovindiflupyr as a preferred embodiment. Further, De Oliveira does not disclose benzovindiflupyr. Exhibit 1007 (De Oliveira) at pg. 15.

216. Syngenta asserts that a person of ordinary skill in the art would have found obvious “the addition of benzovindiflupyr” as the succinate dehydrogenase inhibitor because benzovindiflupyr “is an SDHI.” Petition at 52-53. I disagree.

217. No embodiment discloses using benzovindiflupyr. In fact, it disclosed sixteen preferred succinate dehydrogenase inhibitors that are not benzovindiflupyr. Exhibit 1007 (De Oliveira) at 16.

218. A person of ordinary skill in the art at the time De Oliveira was published would have known and been familiar with benzovindiflupyr, as it was known since it was launched in Paraguay in 2012. Exhibit 1011 (Pesticide Manual) at 93.

219. Neither Syngenta nor Dr. Brannen explain why a person of ordinary skill in the art would have selected a succinate dehydrogenase inhibitor not identified in De Oliveira (benzovindiflupyr) to use in De Oliveira's combinations, or even why a person of ordinary skill in the art would have considered benzovindiflupyr a suitable replacement for De Oliveira's preferred succinate dehydrogenase inhibitors. Petition at 52-53; Exhibit 1003 (Brannen Declaration) at ¶198.

220. Neither Syngenta nor Dr. Brannen explain how De Oliveira selected the 16 preferred succinate dehydrogenase inhibitors, and indeed, De Oliveira provides no guidance for why those 16 succinate dehydrogenase inhibitors are preferred. Without understanding the basis for De Oliveira preferring certain succinate dehydrogenase inhibitors, a person of ordinary skill in the art would have no basis or motivation to contradict those preferences.

221. And sixth, this section is not limited to "consisting of" the disclosed fungicides. Indeed, De Oliveira teaches 62 fungicides from the listed classes that are

not claimed by the ’727 patent. Exhibit 1007 (De Oliveira) at pg. 10-11, 14, 15. Syngenta nor Dr. Brannen even address this absence in De Oliveira.

222. Further, it is also unclear from Syngenta’s arguments about “the addition of benzovindiflupyr….” being obvious as to whether they are arguing benzovindiflupyr would be added in addition to the disclosed and preferred succinate dehydrogenase inhibitors. If so, that addition would be outside of the claimed “consisting of” limitation due to the use of two SDHIs. In fact, Syngenta provides no reason to exclude another SDHI already preferred by De Oliveira in favor of benzovindiflupyr.

223. Thus, in my opinion, a person of ordinary skill in the art would not have been motivated from De Oliveira to prepare a fungicidal combination consisting of benzovindiflupyr, mancozeb, and one or more of the claimed quinone outside inhibitors and ergosterol biosynthesis inhibitors.

B. De Oliveira in View of Wiglesworth, Tobler, and Godoy Would Not Have Rendered any Fungicidal Combination of the ’727 Patent Obvious

224. Syngenta argues that Wiglesworth, Tobler, and Godoy combined “further support the obviousness of claim 1,” as summarized below. Petition at 53. I disagree.

225. Syngenta relies on Wiglesworth's disclosure that benzovindiflupyr is a succinate dehydrogenase inhibitor fungicide registered by Syngenta in 2015 that is "extremely efficacious on soybean rust" and "combinable with azoxystrobin." Petition at 53. Syngenta argues that a person of ordinary skill in the art "would have combined benzovindiflupyr with any of the fungicidal combinations disclosed in De Oliveira as A(2), B(2), C(2) or D(2)," and in particular A(2), "since Wiglesworth discloses combining benzovindiflupyr with azoxystrobin." Petition at 53. I disagree.

226. First, Wiglesworth reads like an advertisement. While it is submitted as an abstract, it is not peer reviewed, it is submitted on behalf of Syngenta, and it does not establish that it relied on standard established scientific methods. Because of this, a person of ordinary skill in the art would not be inclined to rely on Wiglesworth at all for motivation to modify other formulations.

227. Second, Syngenta has not established that Wiglesworth would have motivated a person of ordinary skill in the art to use benzovindiflupyr over one of De Oliveira's preferred embodiments. Wiglesworth provides no specific evidence regarding benzovindiflupyr's activity, nor any basis for selecting benzovindiflupyr over the other effective succinate dehydrogenase inhibitors.

228. Third, if anything, a person of ordinary skill in the art would take away from Wiglesworth that benzovindiflupyr alone (not in combination) is highly

effective in treating soybean rust. Indeed, Wiglesworth teaches using benzovindiflupyr alone for soybean rust and in combinations for other crops (e.g., peanuts, cucurbits) and different diseases (e.g., early leafspots, peanut rust, powdery mildew). Given Wiglesworth touts benzovindiflupyr for use alone as "extremely efficacious on soybean rust," a person of ordinary skill in the art would see no benefit in using it over preferred succinate dehydrogenase inhibitors taught by De Oliveira.

229. Syngenta argues that Tobler discloses that benzovindiflupyr (compound A1.1) "is highly effective at controlling *Phakopsora pachyrhizi* (Asian soybean rust)" and claims a purportedly synergistic composition comprising benzovindiflupyr and an azole fungicides." Petition at 53.

230. I disagree. Tobler describes a leaf disc test the inventors conducted to compare compounds A-1.1, A-1.2, and A-1.3 for effectiveness of controlling soybean rust. Exhibit 1006 (Tobler) at 41:20, Table B1. Compound A-1.1, which I understand is benzovindiflupyr, underperformed compounds A-1.2 and A-1.3 at dosage of 250 g.ai./hi. If anything, a person of ordinary skill in the art would instead be inclined to use the SDHIs A-1.2 or A-1.3.

231. As explained above, I understand Dr. Brannen testified that mixing components was more expensive and contrary to standard recommendations to sequentially rotate fungicides with different mechanisms of action to reduce the risk

of resistance. Exhibit 2021 (Brannen Deposition Transcript) at 12:8-13:7, 14:14-16:3, 16:22-18:7, 21:9-23:8. I agree from my professional experience that this was generally the case.

232. Further, I understand Dr. Brannen described in his deposition testimony the reluctance with which a person of ordinary skill in the art would have about experimenting with mixing untaught combinations. Exhibit 2021 (Brannen Deposition Transcript) at 33:8-34:5, 35:15-38:11. I agree. As a matter of physical compatibility of components, phytotoxicity to the plants, and safety involved with mixing unknown chemicals, a person of ordinary skill in the art would be strongly motivated against mixing ingredients if the compatibility was unknown.

233. This is particularly true for Tobler, where, as I discuss above in section XII.A.2, Tobler disclosed numerous components that are incompatible as a mixture.

234. Syngenta argues that Godoy "provides additional motivation as there are a limited number 'main modes' of action for controlling disease in soybeans, and further illustrates that such combinations are effective thereby establishing a reasonable expectation of success." Petition at 53.

235. I disagree. As discussed above in section XI.B, a person of ordinary skill in the art would not understand Godoy to disclose the claimed 3-components applied in combination. Thus, for the same reasons a person of ordinary skill in the

art would not mix combinations not taught by Tobler, a person of ordinary skill in the art would not pick and choose components from other articles, like Godoy.

236. In fact, Syngenta has not shown that any of these publications provide any comparative data showing that benzovindiflupyr would provide any advantage over—or even be interchangeable with—De Oliveira's preferred succinate dehydrogenase inhibitors. Exhibit 1008 (Wiglesworth) at S2.11-12. Benzovindiflupyr was known since at least 2012, when it was first sold in Paraguay. See Exhibit 1011 (Pesticide Manual) at 12-13 ("First sold in Paraguay in 2012;" citing US 7,732,469 (Exhibit 2029)). And yet De Oliveira teaches that other succinate dehydrogenase inhibitors are preferred to control Asian soybean rust. Exhibit 1007 (De Oliveira) at 16.

237. Further, none of these publications indicates that benzovindiflupyr could be "combined" with mancozeb, as required by the claims of the '727 patent. For example, neither Wiglesworth nor Tobler provide any information on benzovindiflupyr's compatibility or incompatibility with mancozeb, and Godoy discloses "associated" treatments, not combinations. Exhibit 1008 (Wiglesworth) at S2.11-12; Exhibit 1006 (Tobler); Exhibit 1005 (Godoy). A person of ordinary skill in the art would thus not have known specifically whether benzovindiflupyr could be "combined" with mancozeb or whether such a combination would be physically

incompatible, exhibit undesirable phytotoxicity, or provide less control than applying the fungicides separately.

238. Thus, in my opinion, none of these publications (alone or in combination) would have motivated a person of ordinary skill in the art to add benzovindiflupyr to De Oliveira's exemplary combinations (i.e., A(2)-D(2)). This leads me to conclude that De Oliveira in combination with Wiglesworth, Tobler, and Godoy would not have rendered any claim of the '727 patent obvious.

XV. Objective Indicia

239. I am informed that certain "objective" factors can support the non-obviousness of a claimed invention, including evidence of unexpected results and a need in the industry to solve the problem addressed by the invention (called long-felt unmet need), among other factors. I address these below.

A. Unexpected Results

240. As shown by Syngenta's data underlying the Prates declaration (which I discuss further below), the claimed combinations and compositions have enabled increased disease control for Asian soybean rust, which translates [redacted].[4]

[4] For instance, while an increase may seem modest numerically, a person of ordinary skill in the art would understand that when scaled up to a commercial setting, a small

Exhibit 2037 & 2038 (Mitrion® Marketing Materials) at 16-18 (claimed combination exhibiting increased control). This superior performance would have been particularly important to but unexpected by a person of ordinary skill in the art.

1. The Colby Calculation

241. I understand that Syngenta relies heavily on Dr. Caio Prates and his use of the Colby calculation to argue synergy does not exist in the claimed combinations. Petition at 72-73. I disagree that the absence of "synergy" according to the Colby calculation would lead a person of ordinary skill in the art to conclude there was actually an absence of synergy. That is, a combination can still be considered synergistically effective where it performs better than its components but short of the prediction by Colby.

242. First, as a preliminary matter, while the Colby calculation is certainly a way to consider synergy, there is no universally adopted standard for calculating

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percentage increase in control can translate to an increase in crop yield. A person of ordinary skill in the art would appreciate that crop yield is ultimately what is most important. Exhibit 2021 (Brannen Deposition Transcript) at 135:5-14. This is because yield is what translates to increased revenue from the crop.

synergy. In fact, Colby himself acknowledges "[o]bviously, there are practical limitations in using mathematical formulas in predicting the responses for herbicide combinations. The methods described here are approximations, but they represent an improvement over no attempt to predict responses." Exhibit 2012 (Colby) at 5.

243. For reasons including these, in my experience, Colby is not commonly utilized in the art in practice. I understand that even Syngenta's declarant Dr. Brannen has not used Colby calculations often in his career. Exhibit 2021 (Brannen Deposition Transcript) at 129:5-22. Indeed, I understand Dr. Brannen has never even used the Colby calculation to predict expected effect of combinations of fungicides. Exhibit 2021 (Brannen Deposition Transcript) at 136:12-21. Likewise, in 52 years, while I have been aware of the Colby calculation, I have not applied to my research.

244. Second, the Colby calculation assumes independent modes of action. Exhibit 2057 (Stoller 2012), 2 (Colby was "derived under the assumption that effect of the mixture can be described by one minus the probability of not responding to any of the compounds. In other words, the fungicides do not interact"); Exhibit 2058 (Kosman 1996) at 10. For combinations of multisite inhibitors, like mancozeb, component fungicides will not have fully independent modes of action relative to the other components. For example, mancozeb can act on the same target as a succinate dehydrogenase inhibitor, ergosterol biosynthesis inhibitor, or a quinone

outside inhibitor. In addition, while precise modes of action for SDHI and QoI fungicides are different, they and mancozeb all inhibit fungal respiration, and thus have similar modes of action. Exhibit 1011, 19; Exhibit 2060 (FRAC Code List), 6-7. In such cases, the Colby calculation will overestimate the threshold for synergy, and thus, synergistic combinations may not be recognized by the Colby calculation. As discussed below, where the modes of action overlap, synergy would be reflected in a lower Colby ratio, such as 0.9.[5]

2. Syngenta's Studies

245. I understand Syngenta conducted its own studies described in Syngenta's field books (excerpts provided as Exhibits 1031, 1032, and 1033) that Dr. Prates relied on in part in the Prates Declaration (Exhibit 1020). I understand Dr. Prates only relied on Exhibit 1031, not Exhibits 1032 and 1033. Exhibit 2035 (Emails from Syngenta counsel). I further understand Syngenta uses those studies to allege that there is no synergy exhibited in claimed combinations. Exhibit 1003 (Brannen Dec.) at ¶258.

[5] In my opinion, the ratio as low as 0.8 may still reflect synergy for combinations having overlapping modes of action. Below I have used the more conservative 0.9 threshold.

246. I disagree. To the contrary, Syngenta's testing *does* demonstrate synergy for the claimed subject matter in fungus control, defoliation, and yield.

247. Before assessing Syngenta's analysis, I note that across the board for [redacted] as shown below:

[redacted]

Table A. Comparison of average improvement in *disease severity, yield, and foliage* retention. *See* Exhibit 1031 at 2-5, 6-10; Exhibit 1032 at 1-3; Exhibit 1033 at 1-2, 9-10; Appendix B at 1-2, 5-9, 12-13, 16-20, 23-24, 27-31, 34-35, 39-43, 46-47, 50, 52-53, 56, 58-59, 62, 64-65, 68, 71-72, 75, 77-78, 81, 83-84, 87, 89-90, 91.

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[6] Exhibit 1031 at 2-5, 6-10; Exhibit 1032 at 1-3.

[7] Exhibit 1033 at 1, 9.

[8] Exhibit 1033 at 2, 10.

248. [redacted] is an important result that would have been considered surprising and unexpected by a person of ordinary skill in the art. In addition, I also considered the Colby calculation for Syngenta's studies.

249. First, as a preliminary matter, as discussed above in section XV.A.2, a person of ordinary skill in the art would not have limited their consideration of synergy to the Colby calculation. In practice, a person of ordinary skill in the art would have been concerned with improvements in yield, even if modest. The theoretical nature of Colby provides an additional way to evaluate synergy, but it does not detract from a person of ordinary skill in the art considering synergy based on enhanced efficacy over individual components.

250. Second, as discussed above in section XV.A.2, Colby assumes that the components have non-overlapping mechanisms of action. Exhibit 2057 (Stoller 2012), 2. This assumption does not apply to the tested mixtures with mancozeb, which is a multi-site fungicide with overlapping modes of action with benzovindiflupyr and other claimed EBI and QoI fungicides. Where, as here, the components have overlapping mechanisms of action, a person of ordinary skill in the art would expect Colby to over-estimate the threshold for synergy. Exhibit 2058 (Kosman 1996) at 10.

251. Similarly, for components with distinct modes of action, the Colby ratio measures *Observed % Control* / *Colby Expected % Control* where values over 1.0 indicate synergy and values under 1.0 indicate no synergy. Exhibit 2057 (Stoller 2012), 2. Since this assumption does not apply for the combinations tested by Syngenta, which have claimed combinations would involve overlapping modes of action, Colby ratios less than 1 would still be indicative of synergy. Exhibit 2058 (Kosman 1996) at 10. In the absence of a standard Colby threshold for synergy with overlapping modes of action, it is reasonable to assume a 10% deviation such that a Colby ratio of 0.9 would correspond to synergy for combinations with overlapping modes of action.

252. With this background in mind, given Syngenta's reliance on the Colby calculation, I nevertheless assessed Syngenta's data with the Colby calculation, of which all results and steps are provided in Appendix B and explained below.

a. Yield Data

253. Ultimately, crop yield is most important to persons of ordinary skill in the art, as that is what affects a farmer's revenue. Exhibit 2021 (Brannen Deposition Transcript) at 135:5-14. Thus, yield data is informative about how a person of ordinary skill in the art would consider synergy.

254. Looking at Colby ratios for yield data, [redacted] These Colby ratios for Syngenta's yield data are shown below:

[redacted]

Table B. Colby Ratios for *Yield* for A-Combinations. *See* Exhibit 1033 at 1; Appendix B at 1-11.

[9] For illustration, I color code charts depicting Colby ratios with green highlights to represent a value greater than 0.9, yellow highlights to represent values between 0.8 and 0.9, and red highlights to represent values below 0.8

Table C. Colby Ratios for *Yield* for B-Combinations. *See* Exhibit 1033 at 9; Appendix B at 12-22.

255. I view the shown above as strong evidence of synergy, especially given that yield is what is most important to a person of ordinary skill of the art.

b. Defoliation Data

256. Defoliation, or inversely foliage retention, is also a useful measurement to evaluate synergy of fungicides. Taking Syngenta's defoliation data, I calculated Colby ratios for the foliage retention from Syngenta's tests and observed as illustrated below:

[redacted]

Table D. Colby Ratios for *Defoliation* for A-Combinations. *See* Exhibit 1033 at 2; Appendix B at 23-33.

[redacted]

Table E. Colby Ratios for *Defoliation* for B-Combinations. *See* Exhibit 1033 at 10; Appendix B at 34-44.

257. Looking at these Colby ratios, [redacted] I view these Colby ratios shown above as evidence of synergy.

c. Disease Severity Data Reported in Prates Declaration (Exhibit 1020)

258. Given inconsistencies in how Dr. Prates relied on disease severity data (explained further below), it is my opinion that it is more informative to look at Colby ratios week by week to account for differences in disease onset and inconsistent ranges of data. A further reason to look at week by week is because of variability resulting from time of disease onset and fungicidal sensitivity of the rust population in the specific study Area. Accordingly, the charts below show week by week data starting with the first day of treatment where there is meaningful disease (i.e., raw disease severity data is greater than 5/100 in control). The Colby ratios for week by week are shown below:

[redacted]

Table F. Colby Ratios for *Week By Week Disease Severity* for A-Combinations. *See* Exhibit 1031 at 2-5; Appendix B at 46-70.

[redacted]

Table G. Colby Ratios for *Week By Week Disease Severity* for B-Combinations. *See* Exhibit 1031 at 7-10 and Exhibit 1032 at 1-3; Appendix B at 71-95.

259. As shown above, week by week Colby ratios for every combination [redacted] Indeed, Colby ratios for all combinations [redacted] I view these Colby ratios shown above as evidence of synergy. Notably, [redacted]

260. [redacted] However, a person of ordinary skill in the art would consider data where disease severity was late onset, [redacted] would not be an appropriate test for synergy. In addition to the limited time to study the effect of the fungicide, a person of ordinary skill in the art would understand the economic threshold would be variable relative to disease severity and crop maturity. [redacted]

261. I disagree with Dr. Prates's presentation of Colby calculations regarding synergy.

262. First, I note that even though Dr. Prates explained in his deposition that he gathered data at 7-day intervals for 56 days (Exhibit 2018 (Prates Deposition Transcript) at 43:7-15), the disease severity data Syngenta has provided shows Dr.

Prates [redacted]

263. I understand from counsel that Syngenta later provided additional data that Dr. Prates collected but did not rely on for:

[redacted]

264. These inconsistencies are problematic for relying on averages for multiple reasons.

265. Dr. Prates selectively excluded data that he collected where [redacted] Syngenta later provided disease severity data Dr. Prates collected [redacted] explaining that Dr. Prates did not rely on it.[10] But

[10] Exhibit 2035 (Email correspondence) at 1, 7.

Schematic 2. Week by week Colby Ratio for Area 6 B-Combinations Exhibit 1031, 9 and 1032 at 3; Appendix B at 83-88.

266. Because Dr. Prates inconsistently especially where he selectively excluded certain disease severity data that he collected, it is inappropriate to rely on averages across testing Areas.

267. Additionally, the fact that means that it is inappropriate to rely on averages for considering synergy.

268. I also note that when reconstructing the data Dr. Prates provided, it is apparent the data reported in Tables 3 and 5 of Exhibit 1020, reproduced below (with highlights added), are incorrect and/or internally inconsistent.

Table 3

#	Active Ingredient	Rate g a.i /ha	Isolated A.I. % Control for Expected Action Calculation	Expected Action (by Colby)	Rust (%Control Observed)	Difference Between Observed and Expected
A4	Benzovindiflupyr + Prothioconazole + Mancozeb	30 + 70 + 900	**36** **64** **48**	**89**	**74**	**-15**
A9	Benzovindiflupyr + Prothioconazole + Mancozeb	33.8 + 67.5 + 900	**36** **64** **48**	**89**	**75**	**-14**
A10	Benzovindiflupyr + Prothioconazole + Mancozeb	30 + 70 + 900	**36** **64** **48**	**89**	**74**	**-15**
A8	Benzovindiflupyr + Prothioconazole + Mancozeb	200 + 150 + 1500	**55** **71** **55**	**94**	**79**	**-15**

Table 6

#	Active Ingredient	Rate g a.i /ha	Isolated A.I. % Control for Expected Action Calculation	Expected Action (by Colby)	Rust (%Control Observed)	Difference Between Observed and Expected
B7	Benzovindiflupyr + Azoxystrobin + Mancozeb	30 + 60 + 1125	**55** **52** **61**	**92**	**69**	**-23**
B8	Benzovindiflupyr + Cyproconazole + Difenoconazole + Mancozeb	30 + 45 + 75 + 1125	**55** **55** **53** **61**	**96**	**69**	**-27**
B9	Benzovindiflupyr + Prothioconazole + Mancozeb	33.8 + 67.5 + 1125	**55** **67** **61**	**94**	**76**	**-18**
B10	Benzovindiflupyr + Prothioconazole + Mancozeb	30 + 70 + 1125	**55** **67** **61**	**94**	**76**	**-18**

Exhibit 1020 (Prates Declaration) at 5 (Table 3) (Highlighting added in yellow).

269. It appears that Dr. Prates rounded values at each step and used two different methods of calculating the average expected Colby values, which both resulted in higher than appropriate expected Colby values. The data highlighted in Table 3 first averaged the raw disease severity data from each area, then used the Colby calculation. The data highlighted in Table 6 shows the Colby calculation for each area's disease severity, then reported the average of those values.

270. The correct calculation using Dr. Prates's disease severity data would be to conduct the expected Colby calculation for each area, without rounding at intermediate steps, then averaging those values. Below I report the correct data, with corrections highlighted in green:

[redacted]

Table H. Expected Colby Values for Disease Severity for A-Combinations. *See* Exhibit 1031 at 7-10 and Exhibit 1032 at 1-3; Appendix B at 70.

Table I. Expected Colby Values for Disease Severity for B-Combinations. *See* Exhibit 1031 at 7-10 and Exhibit 1032 at 1-3; Appendix B at 95.

271. As I explain above, using averages here is inappropriate. Nevertheless, I note that when using these corrected values,

[redacted]

Table J. Average Colby Ratios for Disease Severity for A and B Combinations. *See* Exhibit 1031 at 7-10 and Exhibit 1032 at 1-3; Appendix B at 70, 95.

272. Taking all of this data as a whole, Syngenta's data shows strong synergistic effects for the claimed combinations.

B. Long-Felt Unmet Need

273. As explained in the scientific literature, Asian soybean rust is and was a very problematic pest in commercially important crops such as soybeans, particularly in Brazil. Exhibits 2037 & 2038. Exhibit 1006 (Tobler), 1:21-39; Exhibit 1007 (De Oliveira), pg. 1 ("Soybean rust caused by *Phakopsora pachyrhizi* is the most damaging disease affecting the yield of leguminous plants causing widespread damage to crops and depleting yield from 10 to 90% if not treated in time."), pg. 2 ("[T]here is need for a method of treatment that demonstrates improved yields along with preventive and/or curative capabilities in the treatment of Soybean Rust.").

274. As Syngenta explains in its promotional materials for a product named Mitrion®, Brazil is the largest exporter of soybeans in the world, and diseases such as Asian soybean rust reduce soybean production by 15-20% annually. Exhibits 2037 & 2038.

275. The combination of benzovindiflupyr, prothioconazole, and mancozeb has, at least in part, met the need for a more effective way to control Asian soybean rust. In fact, in addition to what is shown in Syngenta's data above, Syngenta markets this combination in Brazil for control of Asian soybean rust. Exhibits 2037 & 2038 (Mitrion® Marketing Materials); Exhibit 2018 (Prates Deposition Transcript) at 64:15-66:11.

276. Specifically, Syngenta developed Mitrion® to address the need for greater control of Asian soybean rust and other soybean crop pathogens. Exhibits 2037 & 2038 (Mitrion® Marketing Materials). Mitrion contains prothioconazole + benzovindiflupyr, and Syngenta recommends combining Mitrion with a multisite fungicide such as mancozeb for effective control of Asian soybean rust. Exhibits 2037 & 2038 (Mitrion® Marketing Materials); Exhibit 2018 (Prates Deposition Transcript) at 64:15-66:11.

277. Thus, reflecting that the claimed compositions meet the long felt need for Asian soybean rust control, Syngenta specifically recommends that soybean producers use a fungicidal combination claimed in the ’727 patent (prothioconazole + benzovindiflupyr + mancozeb) to control Asian soybean rust. Exhibits 2037 & 2038 (Mitrion® Marketing Materials).

XVI. Ground 4 (Written Description)

278. I am informed that a patent must contain a written description of the invention, i.e., a description of the subject matter claimed (called “the written description requirement”).

279. I am informed that the written description requirement is met where the patent’s description allows a person of ordinary skill in the art to visualize or recognize the identity of the subject matter described.

280. I am informed that there is no requirement that the patent describe actual working examples for all embodiments of a claim. Instead, a patent must provide a description that identifies the claimed invention in sufficient detail that a person of ordinary skill in the art would understand that the inventors were in "possession" of it at the time of filing.

281. Here, Syngenta appears to argue that the patent does not satisfy the written description requirement because, according to Syngenta, (1) the claims require synergy and (2) the '727 patent does not adequately describe synergy. Petition at 73-76.

282. I disagree that the claims of the '727 patent require synergy. The claims recite fungicidal combinations and compositions and related methods of use. '727 patent, claims 1-10. The words of the claims say nothing about synergy.

283. Syngenta's argument that the claims require synergy appears to be inconsistent with its own interpretation of the claims. For example, in the section of the Petition titled "Claim Construction," Syngenta states that claim terms should be interpreted "in accordance with the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent." Petition at 18. Syngenta did not propose to interpret any claim term to include synergy.

284. As part of its description of the claimed subject matter, the ’727 patent lists numerous preferred exemplary fungicidal combinations containing (1) mancozeb, (2) benzovindiflupyr and (3) a QoI fungicide and/or (4) an ergosterol biosynthesis inhibitor. Exhibit 1001 (’727 patent) at 7:43:8:30. The patent additionally lists the QoI and EBIs fungicides that are claimed. Exhibit 1001 (’727 patent) at 6:23-45.

285. The ’727 patent also describes the compositions of claim 5 (e.g., Exhibit 1001 (’727 patent) at 15:28-48), the formulations of claim 6 (Exhibit 1001 at 16:23-32), the ratios of claim 7 (e.g., Exhibit 1001 at 16:10-14), the amounts of claim 8 (e.g., Exhibit 1001 at 16:1-9), and the methods of claims 9 and 10 (e.g., Exhibit 1001 at 16:15-22).

286. Thus, in my opinion, a person of ordinary skill in the art reading the ’727 patent would understand it to describe the claimed invention, which does not require synergy.

287. Moreover, even if a description of synergy was required, this is also described in the ’727 patent. In particular, the patent discloses that “combinations of fungicides that possess an enhanced efficacy over the individual fungicides used in isolation.” Exhibit 1001 (‘727 Patent) at 2:7-10. And, as discussed above,

Syngenta's data provides strong evidence of synergy for multiple claimed combinations in multiple conditions.

XVII. Ground 5 (Enablement)

288. I am informed that a patent must describe the invention with sufficient clarity to "enable" a person skilled in the art to make and use the full scope of the invention without "undue experimentation" (called the enablement requirement).

289. I am informed that some experimentation is permitted, and that the key question is whether the amount of experimentation required to practice an invention would be "undue."

290. I was also informed that there are multiple factors that should be considered when determining if a patent claim is enabled, sometimes called the "Wands" factors (named after a case involving a party named Wands). The factors that should be considered are: (1) the quantity of experimentation necessary; (2) the amount of direction or guidance presented; (3) the presence or absence of working examples; (4) the nature of the invention; (5) the state of the prior art; (6) the relative skill of those in the art; (7) the predictability or unpredictability of the art; and (8) the breadth of the claims.

291. Syngenta appears to argue that the claims of the '727 patent are not enabled because, according to Syngenta (1) the patent "confusingly refers to

g/ml/ha," (2) the patent "fails to enable . . . enhanced efficacy and synergy, (3) the patent does not disclose "a practical utility for the invention," (4) the patent does not enable "enhanced greening" and "late senescence," and (5) the patent's data is "not reproducible." Petition at 76-81. Dr. Brannen's declaration includes similar arguments. Exhibit 1003 (Brannen Declaration) at ¶¶ 250-258.

292. I am informed that the enablement standard requires that the specification enable the invention, as set forth in the claims. Here, the claims do not require enhanced efficacy, synergy, enhanced greening, or late senescence. As a result, I do not see the relevance of some of Syngenta's arguments (e.g., arguments (2), (4), and (5) above). Moreover, Syngenta's data discussed above is consistent with the patent enabling "enhanced efficacy and synergy," "practical utility for the invention," "enhanced greening" and "late senescence" (inferred from the increased yield) and is "reproducible."

293. I also disagree that the patent's reference to g/ml/ha supports lack of enablement. In my opinion, a person of ordinary skill in the art could make and use the full scope of the invention without reading the patent examples and the data in Tables 1 and 2. In addition, I disagree that g/ml/ha is confusing. In the context of the '727 patent, a person of ordinary skill in the art would have understood that g/ml/ha means grams (g) *or* milliliters (ml) applied per hectare (ha), with the units of g/ha or

ml/ha corresponding to whether the fungicide was described as having been applied by weight (g) or volume (ml). For example, the specification states that the fungicides were applied at rates of 1500 g/h or 200 g/ha or 150 ml/ha. Exhibit 1001 ('727 patent) at 20:26-30. Thus, the fungicides were applied at rates of either g/ha or ml/ha, which shorthanded patent as "g/ml/ha" (g or ml per ha).

294. As to the notion that the claimed invention does not have a practical utility (Syngenta argument (3)), I disagree. The claimed combinations and compositions have fungicidal activity, and thus they may be used to reduce the incidence of fungus on, e.g., crops. This "practical utility" is exemplified in the declaration of Dr. Caio Prates, which confirms that the claimed fungicidal combinations exhibit superior control of Asian soybean rust versus the individual fungicides. Exhibit 1020 (Prates Declaration), Table 2 and Table 5; *see also* section XV.A.3 above.

295. In my opinion, the declaration of Dr. Prates further shows that a person working in the industry would have been able to make and use the claimed fungicidal combinations, and to practice the claimed methods of use, without any undue experimentation.

296. Thus, I conclude that the claims of the '727 patent are enabled.

Appendix A

Barry J. Jacobsen- Short Personnel Vitae -2022

Personal Information:

Born - August 6, 1947, Racine, Wisconsin
Home Address – 1415 Leisure World, Mesa, AZ, 85206
Email: bjacobsen@montana.edu Cell Phone - (406) 581-1277

Education:

B.S. - 1969, University of Wisconsin-Madison, Plant Pathology/Chemistry (minor)
M.S. - 1971, University of Wisconsin-Madison, Plant Pathology/Entomology (minor)
Ph.D. - 1973, University of Minnesota, Plant Pathology/Entomology (minor)

Employment Experience:

July 1, 2015-2018, Associate Director Montana Agricultural Experiment Station-Montana State University, Head, Department of Research Centers-Retired June 30, 2018-budget responsibility $44 Million
February 1, 2013 – June 30, 2015-Interim Head, Department of Research Centers, Montana State University
July 1, 2013-present, Emeritus Professor of Plant Pathology, Montana State University-Budget responsibility 7 Million
July 1, 1994 – June 30, 2013-Professor, IPM Coordinator, Department of Plant Sciences and Plant Pathology, Montana State University-budget responsibility $11 Million
April 1, 1995 - November 22, 1996 - USDA IPM Coordinator, U.S. Department of Agriculture, Washington, D.C. -Budget responsibility $629 Million
October 1, 1996-October 1998-Extended Faculty, USDA/CSREES
July 1, 1992 - July 1, 1994 - Dean and Director, College of Agriculture/Agricultural Experiment Station, Montana State University, Assistant Director for Agriculture and Natural Resources, Montana Extension Service-Budget responsibility $51 Million
September 1, 1987 - June 30, 1992 - Professor and Head, Department of Plant Pathology, Auburn University
August 21, 1983 - August 21, 1987 - Professor of Plant Pathology, Extension Project Leader, Director of Plant Clinic, University of Illinois
August 21, 1984 - December 21, 1984 - Visiting Professor, Institut fur Pflanzenkrankheiten, Friedrich-Wilhelms Universitat, Bonn, West Germany
August 21, 1978 - August 20, 1983 - Associate Professor of Plant Pathology, Extension Project Leader, Appointment to Graduate College, University of Illinois
October 1, 1973 - August 21, 1978 - Assistant Professor of Plant Pathology, University of Illinois
June 1, 1971 - September 30, 1973 - Instructor and Assistant Extension Plant Pathologist, University of Minnesota
June 1, 1969 - May 30, 1971 - Research Assistant, University of Wisconsin-Madison

Professional Service: American Phytopathological Society:

Vice Chairman, Chairman - Chemical Control Committee (1978- 1979)
Vice Chairman, Chairman - Extension Committee (1980 - 1982)
Chairman Committee on Professional Registration (1981-1982)
Vice Chairman, Chairman - Public Relations Committee (1982 - 1986)
Councilor-at-Large (1983 - 1986)
Chairman, Membership Committee (1984)
Member - Nominating Committee (1985)
Member - Financial Advisory Committee (1984 - 1986)
Chairman - Committee on Committees (1985 - 1986)
Member - Program Committee (1985 - 1986)
Member - Executive Committee (1985 - 1986)
Reviewer - Phytopathology & Plant Disease (1975 - Present)
Member - Chemical Control Committee (1987 - 1992)
Member - Postharvest Disease Committee (1987 - 1992)
Member - International Society of Plant Pathology Executive Committee (1987 - 2000)
Member - Intersociety Consortium for Plant Protection Executive Committee (1987 - Present)
Member - National Plant Pathology Board Steering Committee
Member - IPM Committee (1996-1999)
Member-Phyllosphere Microbiology (1998-2002)
Member Industry (1997-2000)
APS Representative -ARCPACS Subboard for Registry of Certified Plant Pathologists (1991 - 2000)
APS Foundation Board (1992 - 2002), Secretary 1994-1995, Vice Chair-1996-2002)
Associate Editor - Plant Disease (1994-1997)

APS Representative to CAST(1994-2003)
Chair-Biological Control Committee (2003-2004)

EPA/USDA/USAID:
Chairman, Captan Review Team (1980,-1981)
Soybean Industry Research Council - Development of Educational Information on Soybean Cyst Nematode - Co-chairman (1980- 1981)
Member, Committee to Review Inter-Disciplinary Issues in Plant Health (1986 - 2002)
Reviewer, USDA Competitive Grant Programs (1987, 1988, 1989, 1994, 1996, 1997, 1998. 1999, 2000, 2001, 2002)
Reviewer, BIFAD Grants Program - 1985 - 1987
Reviewer, Department of Plant Pathology, North Dakota State University
Member, Advisory Committee for Pesticide Review Program (1988-1991)
Member and Co-chair of Tree Fruits Section - Biointensive IPM Forum and Grant Initiative (1991-1992)
Member - Steering Committee, ESCOP Pest Management Strategies (1991 - 1994)
Chair - Pest Management Strategies Integration Subcommittee (1992 - 1994)
Member-ESCOP Pest Management Strategies Subcommittee (1988-present)
Member - IPM - ECOP TASK FORCE (1994 - 2018)
Reviewer, Department of Plant Pathology and Microbiology, Texas A&M University (1994)
Chair, USDA IPM Program Subcommittee (1995-1996)
Chair Executive Committee- US-AID IPM CRSP(2005-2014)
Chair, Third National IPM Symposium/Workshop (1996)
Panel Manager Pest Management Alternatives Grant Program (1996, 1997,1998)
EPA Mycotoxin Task Force (1996)
Review Panel-Rutgers University, Plant Science Cluster (1996)
Review Panel-University of Florida, Department of Plant Pathology (1997)
Review Panel, Chair-University of Vermont-Departments of Horticulture, Agronomy, Botany and Plant Pathology (1999)
US EPA-Science Advisory Panel-2000, 2001, 2002, 2003, 2004
EPA-FIFRA Science Advisory Panel(1998-2007)
USAID-IPM CRSP, chair EEP committee (2003- 2014).

Honors and Awards
Distinguished Alumnus Award-University of Minnesota-1997
Editorial Review Board, Integrated Pest Management Reviews-1997-2004
Appointed Science Advisory Panel US EPA 1999,2000, 2001, 2002, 2003, 2004
Elected, Fellow, American Phytopathological Society-2004
President, Pacific Division of APS, 2005-2006
Meritorious Service Award, American Society of Sugarbeet Technologists, 2009
International IPM Excellence Award (IPM CRSP), 6th International IPM Symposium, 2009
Senior Editor, Biological Control 2011-2014
Fulbright Senior Specialist Award-Chile, 2011
Montana State University-Meritorious Technology and Science Award, 2012
Lifetime Achievement Award-Pacific Division of American Phytopathological Society- 2014
8 US patents-6 relating to Bacillus Mycoides isolate J
President's Award, National Potato Council, 2016

Publications:
Book Chapters: 53-32 in last 15 years Refereed Journal: 55-34 in last 15 years
Bulletins or Published Reports: 316-64 in last 12 years Abstracts:104-68 in last 14 years

Grants: Total $22.99 million
University of Illinois-$2.15 million Auburn University $198,000 Montana State University-$14.74 million

Student Dissertations Directed or Co-directed: 11 Ph.D, 15 MS

Teaching: PSPP422 Plant Disease Control ; PSPP 553- Fungal Diseases; PSPP524 Advanced Plant Pathology-Course Coordinator

Community Service
Rotary International (1977-2016), Champaign , IL, Opelika , AL, Bozeman ,MT. Vice- President Opelika and Bozeman
Colony West HOA, Board of Directors, Vice- President 1980-1984
Mesa Leisure World Lions (2018-present) Board of Directors, Vice- President, President-elect, President
Leisure World Long Range Planning Committee (2019-2022)
Leisure World Foundation ((2019-present)-Vice President, President elect

Appendix B