

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

SYNGENTA CROP PROTECTION AG,
Petitioner,

v.

UPL LTD,
Patent Owner.

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

PETITION FOR POST-GRANT REVIEW

TABLE OF CONTENTS

	Page
I. Introduction.....	1
II. Requirements Pursuant to 37 C.F.R. § 42.204	2
A. Grounds for Standing	2
B. Timing	3
III. Mandatory Notices Per 37 C.F.R. § 42.8	4
A. Real Party-In-Interest	4
B. Notice of Related Matters	4
C. Lead, Back-Up Counsel and Service Information	5
IV. Identification of Challenge Under 37 CFR § 42.204(b) and Precise Relief Requested.....	6
V. Background.....	7
A. The '727 Patent	7
1. The Specification and Claims	7
2. Prosecution History.....	10
3. Effective Filing Date of the Claims	15
B. Background Regarding the Technology.....	16
VI. The Person of Ordinary Skill In The Art.....	18
VII. Claim Construction.....	18
VIII. It Is More Likely Than Not That At Least One of the Challenged Claims is Unpatentable	19

A.	Ground 1: Claims 1, 3-5, 7, 9, and 10 are Anticipated by Godoy	19
1.	Claims 1, 3, and 4 are Anticipated by Godoy	19
2.	Claim 5 is Anticipated by Godoy	21
3.	Claim 7 is Anticipated by Godoy	21
4.	Claim 9 is Anticipated by Godoy	22
5.	Claim 10 is Anticipated by Godoy	23
B.	Ground 2: Claims 1-10 are Anticipated by Tobler and/or Obvious Over the Combination of Tobler and Godoy.....	27
1.	Claim 1 is Anticipated or Obvious Over Tobler— Optionally in view of Godoy	29
2.	Claim 2 is Obvious Over Tobler—Optionally in view of Godoy.....	34
3.	Claim 3 is Anticipated or Obvious Over Tobler— Optionally in view of Godoy	36
4.	Claim 4 is Anticipated or Obvious Over Tobler— Optionally in view of Godoy	36
5.	Claim 5 is Anticipated or Obvious Over Tobler— Optionally in view of Godoy	36
6.	Claim 6 is Anticipated or Obvious Over Tobler— Optionally in view of Godoy	37
7.	Claim 7 is Anticipated or Obvious Over Tobler— Optionally in view of Godoy	39
8.	Claim 8 is Anticipated or Obvious Over Tobler— Optionally in view of Godoy	39
9.	Claims 9 and 10 are Anticipated or Obvious Over Tobler—and Optionally Godoy	41

C.	Ground 3: Claims 1-10 are Obvious Over De Oliveira— Optionally in view of Wiglesworth, Tobler, and Godoy.	50
1.	Claim 1 is Obvious Over De Oliveira—Optionally in view of Wiglesworth, Tobler, and Godoy	51
2.	Claim 2 is Obvious Over De Oliveira—Optionally in view of Wiglesworth, Tobler, and Godoy	55
3.	Claim 3 is Obvious Over De Oliveira—Optionally in view of Wiglesworth, Tobler, and Godoy	56
4.	Claim 4 is Obvious Over De Oliveira—Optionally in view of Wiglesworth, Tobler, and Godoy	56
5.	Claim 5 is Obvious Over De Oliveira—Optionally in view of Wiglesworth, Tobler, and Godoy	57
6.	Claim 6 is Obvious Over De Oliveira—Optionally in view of Wiglesworth, Tobler, and Godoy	58
7.	Claim 7 is Obvious Over De Oliveira—Optionally in view of Wiglesworth, Tobler, and Godoy	59
8.	Claim 8 is Obvious Over De Oliveira—Optionally in view of Wiglesworth, Tobler, and Godoy	59
9.	Claims 9 and 10 are Obvious Over De Oliveira— Optionally in view of Wiglesworth, Tobler, and Godoy	60
D.	Patentee’s Results are not Unexpected and do not Overcome Obviousness.....	68
1.	As early as 2010, Mancozeb was the “go-to” Fungicide to Add to a Mixture to Improve Disease Control or Efficacy.	69
2.	Synergy Cannot be Determined From the Data in the ’727 Patent by a POSA.	71

E.	Ground 4: Claims 1-10 Are Invalid Under the Written Description Requirement of 35 U.S.C. § 112(a).....	73
1.	Patentable Distinction Argued Not in Claims	73
F.	Ground 5: Claims 1-10 Lack Enablement Under 35 U.S.C. § 112(a).....	76
1.	Patentee’s Data is Not Reproducible/Petitioner is Unable to Reproduce Alleged Synergy	80
Conclusion		81

TABLE OF AUTHORITIES

	Page(s)
Cases	
<i>Ariad Pharm., Inc. v. Eli Lilly & Co.</i> , 598 F.3d 1336 (Fed. Cir. 2010)	75, 76
<i>Biomedino, LLC v. Waters Techs. Corp.</i> , 490 F.3d 946 (Fed. Cir. 2007)	75
<i>Juno Therapeutics, Inc. v. Kite Pharma, Inc.</i> , 10 F.4th 1330 (Fed. Cir. 2021)	75
<i>Kennametal, Inc. v. Ingersoll Cutting Tool Co.</i> , 780 F.3d 1376 (Fed. Cir. 2015)	33
<i>MagSil Corp. v. Hitachi Global Storage Technologies, Inc.</i> , 687 F.3d 1377 (Fed. Cir. 2012)	78
<i>Merck & Co., Inc. v. Biocraft Labs., Inc.</i> , 874 F.2d 804 (Fed. Cir. 1989)	75, 76
<i>Millennium Pharmaceuticals, Inc. v. Sandoz Inc.</i> , 862 F.3d 1356 (Fed. Cir. 2017)	76
<i>Osram Sylvania Inc. v. American Induction Tech. Inc.</i> , 701 F.3d 698 (Fed. Cir. 2012)	32, 33
<i>In re Petering</i> , 301 F.2d 676 (CCPA 1962)	33
<i>Sakraida v. Ag Pro, Inc.</i> , 425 U.S. 273, 282 (1976)	75
<i>Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.</i> , 200 F.3d 795 (Fed. Cir. 1999)	18
<i>In re Wands</i> , 858 F.2d 731 (Fed. Cir. 1988)	77

<i>In re Ziegler</i> , 992 F.2d 1197 (Fed. Cir. 1993)	78
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Statutes

35 U.S.C. § 101	78
35 U.S.C. § 102(a)(1)	6, 10, 11, 12, 19
35 U.S.C. § 103	6, 10, 12, 13, 34, 68
35 U.S.C. § 112(a)	7, 10, 74, 76, 77
35 U.S.C. § 112(b)	10
35 U.S.C. § 282(b)	18
35 U.S.C. §§ 321-329	1
35 U.S.C. § 325(d)	3
35 U.S.C. § 371	10

Other Authorities

37 C.F.R. § 42.6(c)	7
37 C.F.R. § 42.8	4
37 C.F.R. § 42.8(b)(2)	4
37 C.F.R. § 42.8(b)(3)	5
37 C.F.R. § 42.10(a)	5
37 C.F.R. § 42.10(b)	6
37 C.F.R. § 42.63(e)	7

37 C.F.R. § 42.200(b)	18
37 C.F.R. §§ 42.200 <i>et seq.</i>	1
37 C.F.R. § 42.204.	2
M.P.E.P. § 2142.	68, 74

EXHIBIT LIST

Ex. No.	Description
1001	U.S. Patent No. 11,445,727 (“the ’727 Patent”).
1002	Selected Excerpts of the File History of the ’727 Patent
1003	Declaration of Phillip M. Brannen, Ph.D.
1004	Godoy et al. “Eficiência de fungicidas multissítios no controle da ferrugem-asiática da soja, Phakopsora pachyrhizi, na safra 2015/16: resultados sumarizados dos ensaios cooperativos”, Londrina, PR Agosto 2016 (Embrapa Soja, Circular Técnica, 121) (“Godoy”)
1005	Certified Translation of Godoy “Efficiency of multisite fungicides in controlling Asian soybean rust, Phakopsora pachyrhizi, in the 2015/16 harvest: summarized results of cooperative trials”, Londrina, PR August 2016 (Embrapa Soja, Circular Técnica, 121)
1006	U.S. Patent No. 9,314,022 to Tobler et al. of Syngenta (“the ’022 Patent” or “Tobler”)
1007	WO Application Pub. No. 2015/079334 to De Oliveira of UPL, Ltd (the “WO’334” or “De Oliveira”)
1008	Wiglesworth et al. “Solatenol™ fungicide – a new SDHI fungicide from Syngenta” Phytopathology (2015) 105(Supl. 2) No. 4, p. S2.11 (“Wiglesworth”)
1009	Elatus EPA Reg. No. 100-1480 dated 8/28/2015 (“Elatus EPA Label”)
1010	Gullino et al. “Mancozeb Past, Present, and Future”, Plant Disease (2010) Vol. 94, No. 9, pp. 1076-1087 (“Gullino”)

Ex. No.	Description
1011	The Pesticide Manual, 17 th Ed. Turner, J.A. Editor (2015), excerpted monographs
1012	Colby, S.R., “Calculating Synergistic and Antagonistic Responses of Herbicide Combinations”, Weeds, Vol. 15, No. 1 (1967) pp. 20-22 (“Colby”)
1013	Gisi et al. “Synergistic Interactions of Fungicides with Different Modes of Action”, Trans. Br. Mycol. Soc. (1985) 85(2), pp. 299-306 (“Gisi”)
1014	Levy et al. “The joint action of fungicides in mixtures: comparison of two methods for synergy calculation”, European and Mediterranean Plant Protection Organization (EPPO) Bulletin (1986) 16(4), pp 651-657 (“Levy”)
1015	Koller et al. “Evaluation of Tactics for Managing Resistance of <i>Venturia inaequalis</i> to Sterol Demethylation Inhibitors”, Plant Disease (1999) pp 857-863 (“Koller”)
1016	Emery et al. “Assessment of interactions between components of fungicide mixtures against <i>Monilinia fructicola</i> ”, Crop Protection (2002) 21, pp 41–47 (“Emery”)
1017	Moura et al., “Effects of cyproconazole, azoxystrobin and mineral oil on soybean leaf anatomy”, Dourados (2013) v.6, n.20, p.154-160 (“Moura”)
1018	Della Vechia et al., “Physical characteristics of insecticide spraying liquids with mineral oil and droplets formed on citrus leaves”, Citrus Research & Technology, (2016) v. 37, n. 1, pp. 102-107 (Della Vechia”)
1019	Declaration of Sylvia Hall-Ellis, Ph.D.
1020	Declaration of Caio Prates
1021	Declaration of Gilson Aparecido Hermenegildo de Oliveira submitted in U.S. Patent App. Ser. No. 15/673,316

I. INTRODUCTION

In accordance with 35 U.S.C. §§ 321-329 and 37 C.F.R. §§42.200 *et seq.*, Syngenta Crop Protection AG (“Petitioner”) requests Post-Grant Review of claims 1-10 of United States Patent No. 11,445,727 to Fabri *et al.*, titled “Fungicidal Combinations” (“the ’727 Patent”; Ex. 1001), owned by UPL Ltd. This Petition demonstrates that Petitioner is more likely than not to prevail in invalidating at least one of the challenged claims.

The challenged claims, which are directed to combinations and compositions of known fungicides and use thereof should be cancelled as unpatentable. Godoy published September 1, 2016, before the filing date of the ’727 Patent. *See* Ex. 1019, ¶ 47. Godoy discloses a fungicidal combination that falls within the scope of independent claims 1, 5, and 10 of the ’727 as well as dependent claims 3, 4, 7, and 9.

Godoy therefore anticipates claims 1, 3, 4, 5, 7, 9, and 10 and anticipates or renders obvious claims 2, 6, and 8. Because Godoy discloses a species claimed in the ’727 Patent, a POSA would readily understand and be able to identify the genus claimed.

U.S. 9,314,022 (the ’022 or Tobler) anticipates or renders obvious claims 1 and 3-10 and/or claims 1-10 are obvious over Tobler and Godoy.

WO2015079334 (“DeOliveira”) in combination with Wiglesworth, Tobler and Godoy renders claims 1-10 obvious.

UPL argued that using their claimed combinations having the addition of mancozeb resulted in “enhanced efficacy and surprisingly gave a synergistic result.” These results were neither synergistic nor surprising as it was well known in the art to add mancozeb to improve disease control. Further, UPL’s alleged test results do not provide sufficient information for one of ordinary skill in the art to determine synergy. In addition, Petitioner, Syngenta attempted to duplicate the results in an effort to see if synergy occurs; Petitioner was unable to observe synergy. *See* Ex. 1020, ¶ 14.

There is insufficient data or evidence of the alleged synergy, without this the patent and claims are insufficient to support written description and lack enablement under 35 U.S.C. §112(a). For the reasons above, the Petitioner respectfully requests that claims 1-10 be cancelled.

II. REQUIREMENTS PURSUANT TO 37 C.F.R. § 42.204

A. Grounds for Standing

Petitioner certifies that the ’727 Patent is eligible for Post-Grant Review (“PGR”) and that Petitioner is not barred or estopped from requesting PGR challenging the claims of the ’727 Patent on the grounds identified in this Petition.

B. Timing

The '727 Patent was granted on September 20, 2022, and this Petition is being filed on or before the date that is nine months after the date of grant of the patent, or on or before June 20, 2023. See Ex. 1001. As discussed in Section V.A.3, the '727 Patent is subject to the AIA and is eligible for PGR because the effective filing date of the claims is after March 16, 2013.

Pursuant to 35 U.S.C. § 325(d), the prior art and arguments presented in this Petition are not the same or substantially the same prior art and arguments previously presented to the Office. The anticipation argument of Ground 1 was not previously raised by the Examiner as the Examiner was unaware of the Godoy reference and although the Patentee was, they did not disclose Godoy. As a result, Godoy is not in the record of the '727 Patent.

In addition, the anticipation and obviousness argument of Ground 2 using U.S. Patent 9,314,022 was also not raised by the Examiner.

Although the published PCT document, De Oliveira, of Ground 3 was used by the Examiner, the Examiner was not aware of the language at the end of the De Oliveira reference (e.g., regarding the alleged unexpected results when using mancozeb). This language contradicts the Patentee's representation to the

Examiner, that the “invention” of the ’727 was the at all surprising effect of adding mancozeb to other known fungicides. Ex. 1007, p. 25.

Not only was the Examiner unaware of the previous UPL discussion regarding the addition of mancozeb to other fungicides, but as noted above, the Examiner was also unaware that UPL had submitted the Godoy reference (Ground 1) in the prosecution of a related U.S. application corresponding to the published De Oliveira (Ground 3). As such, neither the Godoy reference, U.S. Patent ’022, nor the previous disclosure regarding the alleged unexpected results when using mancozeb was relied on by the Examiner for a rejection.

III. MANDATORY NOTICES PER 37 C.F.R. § 42.8

A. Real Party-In-Interest

The real party-in-interest for this Petition is Syngenta Crop Protection AG, a corporation organized under the laws of Switzerland with its principal offices in Basel, Switzerland (“Petitioner”). While not a real-party-in-interest, Syngenta AG owns 100% of Syngenta Crop Protection AG; Syngenta Group owns 100% of Syngenta AG; and China National AgroChemical Company Ltd. owns 99.1% of Syngenta Group.

B. Notice of Related Matters

Pursuant to 37 C.F.R. § 42.8(b)(2), Petitioner notices the following related U.S. applications in as much as the applications claim priority to the ’727 Patent:

- U.S. App. Ser. No. 17/130,193, filed Dec. 12, 2020, is a continuation of the '727 Patent; and
- U.S. App. Ser. No. 17/936,560, filed Sep. 29, 2022, is a continuation of the '727 Patent.

Petitioner is aware of the following applications to which the '727 claims priority:

- PCT/IB2017/056710, WO2018083577A1, filed Oct. 30, 2017; and
- IN201631037704, filed in India on Nov. 4, 2016.

C. Lead, Back-Up Counsel and Service Information

Pursuant to 37 C.F.R. §§ 42.8(b)(3) and 42.10(a), Petitioner designates counsel as follows:

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IV. IDENTIFICATION OF CHALLENGE UNDER 37 CFR § 42.204(B) AND PRECISE RELIEF REQUESTED

Ground 1: Petitioner challenges claims 1, 3-5, 7, 9, and 10, and seeks a ruling that they are anticipated under 35 U.S.C. § 102(a)(1) by Godoy.

Ground 2: Petitioner challenges claims 1-10, and seeks a ruling that they are anticipated under 35 U.S.C. § 102(a)(1) and/or obvious under 35 U.S.C. § 103 in view of Tobler and Godoy.

Ground 3: Petitioner challenges claims 1-10, and seeks a ruling that they are obvious under 35 U.S.C. § 103 in view of De Oliveira—optionally in view of Wigglesworth, Tobler, and Godoy.

Ground 4: Petitioner challenges claims 1-10, and seeks a ruling that they are unpatentable under 35 U.S.C. §112(a) for lack of written description.

Ground 5: Petitioner challenges claims 1-10, and seeks a ruling that they are unpatentable under 35 U.S.C. §112(a) for lack of enablement.

Petitioner relies upon publications cited therein in support of Grounds 1-5, and upon the Declaration of Phillip M. Brannen , Ph.D., Ex. 1003, Declaration of Caio Prates, Ex. 1020, and the documents cited therein. Filed herewith is an Exhibit List and copies of the references, per 37 C.F.R. § 42.63(e) and 37 C.F.R. § 42.6(c).

V. BACKGROUND

A. The '727 Patent

1. The Specification and Claims

As the title “Fungicidal Combinations” would imply, the '727 Patent is directed to “combination[s] comprising a dithiocarbamate fungicide, a succinate dehydrogenase fungicide and at least one of ergosterol biosynthesis inhibitor fungicide or a quinone outside inhibitor fungicide.” Ex. 1001, title, abstract. The '727 Patent contains 10 claims. *Id.*, 21:40-23:30. Claims 1, 2, 5, and 10 are independent. *Id.* The '727 specification provides disease control test data for three different two fungicide combinations (Table 1) and a fourth with a three fungicide combination as the control. Specifically, each of the combinations contains

prothioconazole combined with another fungicide. Data is then provided for the same combinations with the addition of mancozeb. The four test combinations each contain prothioconazole, mancozeb, and either benzovindiflupyr, isopyrazam, penthiopyrad, or azoxystrobin.

Benzovindiflupyr, isopyrazam, and penthiopyrad are identified as succinate dehydrogenase inhibitor fungicides; and azoxystrobin is identified as a quinone outside inhibitor fungicide. Ex. 1001, 6:49-51, 7:41-43, and 8:33-35. The results of these tests for the addition of mancozeb on the mixtures is described in Table 1 of the '727. Ex. 1001, 20:37-63. The patent discloses what appear to be two test points for each control and test combination; specially "2015/16" and "2016/17." *Id.*

Table 1 of '727 Patent (Ex. 1001 at col. 20)

	Treatment	Dose rates (ml/g/ha)	Mean percent disease control	
			2015/16	2016/17
A1	Prothioconazole + Benzovindiflupyr	150 + 200	88.04	71.04
A2	Prothioconazole + Benzovindiflupyr + Mancozeb	150 + 200 + 1500	95.07	95.07
B1	Prothioconazole + Isopyrazam	150 + 1000	87.14	70.23
B2	Prothioconazole + Isopyrazam + Mancozeb	150 + 1000 + 1500	93.4	93.07
C1	Prothioconazole + Penthiopyrad	150 + 1000	83.33	68.15
C2	Prothioconazole + Penthiopyrad + Mancozeb	150 + 1000 + 1500	93.07	92.18

Table 2 of '727 Patent (Ex. 1001 at col 21)

	Treatment	Dose rates (ml/g/ha)	Mean percent disease control	
			2015/16	2016/17
D1	Prothioconazole + Benzovindiflupyr + Azoxystrobin	150 + 200 + 500	93.07	91.07
D2	Prothioconazole + Benzovindiflupyr + Azoxystrobin + Mancozeb	150 + 200 + 500 + 1500	96.36	95.03

As for discussing or characterizing the data and results, the specification notes

that “[t]able 1 clearly demonstrates the increase in control when mancozeb is added to the combination of ergosterol biosynthesis inhibitors and succinate dehydrogenase inhibitor fungicides.” Ex. 1001 20:60-63. “Table 2 demonstrates efficacy when mancozeb is added to the combinations of succinate dehydrogenase inhibitor fungicides and quinone outside inhibitor fungicides and ergosterol biosynthesis fungicides.” Ex. 1001 20:64-67. The specification then concludes that “the addition of mancozeb enhanced the efficacy of the combination and surprisingly gave a synergistic effect.” Ex. 1001 21:19-21.

Other than the above comments and conclusions centered around mancozeb, the specification is devoid of any discussion as to the existence of any difference between the four examples. *See* Ex. 1001.

2. Prosecution History

The ’727 was filed as a Patent Cooperation Treaty (“PCT”) application on October 30, 2017, and entered under 35 U.S.C. § 371 as Application No. 16/347,283 (“the ’283 Application”) on May 3, 2019. The ’727 claimed priority to Indian application 201631037704 filed on November 4, 2016.

In the first Office Action, dated August 21, 2020, the Examiner made rejections under 35 U.S.C. §§ 112(a) and (b) and § 103, as well as a number of rejections under 35 U.S.C. § 102(a)(1). Ex. 1002. Notably the Examiner utilized

two § 102 references to demonstrate the teaching of a method to improve treatment of soybean rust infection comprising the combination of a dithiocarbamate fungicide (mancozeb) and at least another fungicide selected from the group including quinone outside inhibitors (azoxystrobin), succinate dehydrogenase inhibitors (penthiopyrad and isopyrazam) and demethylation inhibitors (prothioconazole) already existed in the art. Ex. 1002, pp. 203-205.

In particular, the Examiner stated that De Oliveira disclosed a method to improve treatment of soybean rust infection comprising the combination of a dithiocarbamate fungicide (mancozeb) and at least another fungicide selected from the group including quinone outside inhibitors (azoxystrobin), succinate dehydrogenase inhibitors (penthiopyrad and isopyrazam) and demethylation inhibitors (prothioconazole) already existed in the art. Ex. 1002, pp. 204-205.

The Examiner used Gewehr as disclosing a method for controlling pathogenic fungi using penthiopyrad in combination with at least one further fungicide such as prothioconazole, mancozeb, or azoxystrobin. Ex. 1002, p. 207.

In their November 11, 2020, response, the Patentee amended claim 1 to specify the combination must include benzovindiflupyr and mancozeb as well as at least another fungicide selected from an ergosterol biosynthesis inhibitor and a quinone outside inhibitor fungicide. They also argued that De Oliveira “does not

even disclose benzovindiflupyr as one of the systemic fungicides.” Ex. 1002, p.195. While the DeOliveira specification does not specifically disclose benzovindiflupyr, UPL was aware that benzovindiflupyr was used with mancozeb. In fact, UPL submitted a declaration containing and referring to the Godoy reference, which does disclose benzovindiflupyr in combination with mancozeb during the U.S. prosecution of De Oliveira; the U.S. application to De Oliveira is the equivalent of the De Oliveira published PCT that the Examiner was using for her rejection.

As to the §102 rejection involving Gewehr, UPL argued that the reference taught that penthiopyrad was an essential component, whereas their amended claims now did not include penthiopyrad.

An Information Disclosure Statement filed December 14, 2021, identified Tobler as U.S. Patent Application Publication 20100216640. Ex 1002, pp. 66-68. Despite being disclosed, there is no rejection on the record using this reference.

In the Office Action of January 22, 2021, the Examiner dropped all of the §102 rejections but maintained and expanded on the three rejections under 35 U.S.C. §103. In their April 22, 2021, response the UPL substantially amended their claims to replace “a fungicidal combination comprising ...” to “a fungicidal combination consisting of.” In an effort to overcome the §103 rejection involving

De Oliveira and Grammenos, UPL also represented to the Examiner that “the technical effects achieved by the claimed combinations, *i.e.*, an enhancement of the efficacy, and a surprising reduction in fungal disease incidence when mancozeb is added to the claimed combinations.” *See* Ex. 1002, p. 138. The Examiner was unaware that these alleged technical effects achieved were not only anticipated by Godoy, but were also not as unexpected as described.

As for the §103 rejection involving Gewehr and Kemmitt, UPL argued that penthiopyrad is not benzovindiflupyr, mancozeb, or at least another fungicide as defined in the claims.¹

As a result of the above arguments and representations, the Examiner issued a third office action June 14, 2021, maintaining only the double patenting rejections. The Examiner dropped all the §103 rejections in light of UPL’s amendment and representation as to “the technical effects achieved by ... mancozeb ... to the claimed combinations.” *See Id.* The Examiner’s reliance on this was unjustified as UPL’s assertion as to mancozeb was inconsistent with the prior art and in fact incorrect. The Examiner was unaware that UPL had made exactly the same representation regarding mancozeb years earlier in the discussion

¹ Yet benzovindiflupyr like penthiopyrad is a pyrazole carboxamide class of succinate dehydrogenase inhibitor fungicide as defined by UPL in patent. Ex. 1001, 3:56-65.

of data at the end of the De Oliveira patent specification. Ex. 1007 p. 25. There UPL specifically stated that:

it was thus concluded that the addition of a multi-site contact fungicide such as mancozeb acted as a synergist to the combination products ... for the treatment of Asian soybean rust.

Id.

Interestingly, in the U.S. prosecution of De Oliveira, UPL noted that “the addition of a dithiocarbamate increased disease control and **improved** yield of plants.” *Id.* These are the very same words used by UPL in the ’727 specification after their discussion of mancozeb in the results; in particular, the ’727 reads: “the addition of a dithiocarbamate increased disease control and improved yield of plants.” Ex. 1001, 21:20-22.

Not only was the Examiner unaware of this earlier disclosure by UPL in De Oliveira, but UPL also did not disclose the Godoy reference, despite the fact that they had previously submitted it along with a declaration in the De Oliveira U.S. prosecution history. Ex. 1021, ¶ 38.

On June 21, 2022, after the UPL’s last response, the Examiner issued a Notice of Allowability. The Examiner’s Reasons for Allowance stated, in pertinent part, that:

1. the claims are drawn to a fungicidal combination consisting of benzovindiflupyr, mancozeb, and at least another fungicide

2. the references of record, while teaching a composition comprising of the said fungicides or a combination thereof, do not recognize or fairly suggest a combination consisting of the said fungicides... the references teach compositions comprising fungicides that are excluded by the examined claims.

3. Based on the teachings of the prior art, one of ordinary skill in the art is not given a motivation to exclude fungicides to arrive at the claimed combination.

Ex. 1002, pp. 17-18.

3. Effective Filing Date of the Claims

The '727 Patent issued from the '283 application. The earliest claimed priority date of the '283 application is to foreign application IN201631037704, filed November 4, 2016. The effective filing date of all challenged claims 1-10 is no earlier than November 4, 2016. Ex. 1001 p. 1. AIA Section 6(d) states that FITF provisions apply, and thus an application is PGR eligible, when an application contains a claim with an effective filing date after March 16, 2013. The '727 Patent is subject to the AIA provisions of the Patent Statute and

PGR eligible because all claims have an effective filing date after March 16, 2013.

B. Background Regarding the Technology

The discovery and study of compounds and mixtures of compounds for control of fungus in plants involves a number of considerations, including, but not limited to: toxicity; the intended mode of action of the fungicide; potential resistance to the fungicide by the fungi; the identity and nature of the fungus species targeted; amounts and concentrations to be used; the timing and type of application (e.g., direction ... direct to plant, to soil, to seed, whether fungicide is applied wet or dry, etc.); and even how formulated. Ex. 1003, ¶ 44.

Fungicides are compounds that are toxic to fungi and used to control fungal pathogens in plants. There are numerous fungicides available commercially. Some are sold as products having a single fungicidal active ingredient, whereas many are sold as products including a combination of fungicides. Ex. 1003, ¶ 42

The majority of fungicides are applied as aqueous sprays by mechanical sprayers; and can also be applied by dusting. Mechanical sprayers range in size and scale from a backpack sprayer to large tractor mounted boom applicators or airblast sprayers. Ex. 1003, ¶ 43

Fungicides are generally categorized based on whether they act “on” or “within” the plant; for example, contact fungicides act primarily on plants, whereas

systemic ones act within plants. Fungicides can also be categorized based on the timing of the interaction with the fungus, so they can be designated as being preventative, curative, or eradivative in nature. Ex. 1003, ¶ 44.

Some fungicides have multiple modes of action (multisite fungicide), and fungi are not as likely to develop resistance to multisite fungicides; whereas, fungus often develop resistance to fungicides with very targeted or specific modes of action. Ex. 1003, ¶ 46.

Although individual fungicides are used to control fungi, it is conventional to combine fungicides. Fungicides are combined for a number of reason: 1) to broaden the efficacy range of the fungicidal treatment to multiple fungal pathogens; 2) for resistance management; 3) to exploit the location of action (e.g., contact and systemic); and 4) to take advantage of either additive or synergistic interactions that increase disease control. Ex. 1003, ¶ 49.

In the agrochemical field, the methodology for determining whether a fungicidal combination acts additively or synergistically is well known. Synergy is defined as when a combination of fungicides has an observed affect that is greater than the expected effect of the sum of the individual components. Essential to the determination of synergy is that the fungicides in question be tested individually as well as in combination. Ex 1003, ¶ 50; Ex. 1012; Ex. 1013.

VI. THE PERSON OF ORDINARY SKILL IN THE ART

A person of ordinary skill in the art (“POSA”) at the time of the earliest filing date of the ’727 Patent would have at least a Bachelor’s degree in plant biology or plant pathology with several years of practical experience in plant pathology, or alternatively, an advanced degree (Masters or Ph.D) in the fields of plant biology or plant pathology, or a related field, with several years of practical experience in the industry within these fields. Ex. 1003, ¶¶ 71-72.

VII. CLAIM CONSTRUCTION

The Challenged claims “shall be construed using the same claim construction standard that would be used to construe the claim in a civil action under 35 U.S.C. § 282(b), including construing the claim 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.” 37 C.F.R. § 42.200(b).

Claim terms need be construed only to the extent necessary to resolve a potential controversy. *Vivid Techs, Inc. v. Am. Sci & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999). While Petitioner does not anticipate any controversy, it notes that the claims include the term composition or combination which are used interchangeably in the specification. Ex. 1003, ¶ 76.

VIII. IT IS MORE LIKELY THAN NOT THAT AT LEAST ONE OF THE CHALLENGED CLAIMS IS UNPATENTABLE

A. Ground 1: Claims 1, 3-5, 7, 9, and 10 are Anticipated by Godoy

Embrapa Technical Circular 121, published September 1, 2016, contains the article titled “Efficiency of multisite fungicides in controlling Asian soybean rust, *Phakopsora pachyrhizi*, in the 2015/16 harvest: summarized results of cooperative trials,” otherwise referred to as “Godoy.” Ex. 1005, p. 1. Godoy is generally directed to discussing the results of various trials involving fungicidal combinations and their effectiveness for soybean disease control. Ex. 1003, 81-83; Ex. 1005, p.1.

In particular, Godoy discloses the use of six multisite fungicides in two protocols. One protocol involved the multisite fungicides alone; the other protocol involved the use of the multisite fungicides in combination with either azoxystrobin + benzovindiflupyr or picoxystrobin + cyproconazole. Table 3 of Godoy specifically discloses the use of a combination of azoxystrobin, benzovindiflupyr, and mancozeb. Ex. 1005, p. 3. As discussed below, these three compounds used together anticipate claims 1, 3-5, 7, 9, and 10 of the ’727 Patent. Ex. 1005; *See* 35 U.S.C. §102(a)(1).

1. Claims 1, 3, and 4 are Anticipated by Godoy

Claims 1, 3, and 4 of the ’727 patent are directed to various fungicidal

“combinations.” Ex. 1001, 21:40, 22:17, 22:23. Among the possible combinations recited in claims 1, 3, and 4 of the ’727 patent, each include the combination of: benzovindiflupyr + mancozeb + azoxystrobin. *Id.*, 21:40-43, 21:55-6, 22:20, 22:23-24. However, the combination of benzovindiflupyr + mancozeb + azoxystrobin has already been disclosed in Godoy. Ex. 1003 at 108-114; Ex. 1005 at p. 3.

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 [®] /Signal [®]	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 + benzovindiflupyr 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 [®] /Signal [®]	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.

Accordingly, claims 1, 3, and 4 are anticipated by Godoy. Ex. 1003, ¶¶ 108-114

2. Claim 5 is Anticipated by Godoy

Claim 5 of the '727 patent is an independent claim directed to “[a] composition consisting of: at least one agrochemically acceptable excipient; and a fungicidal combination...” Ex. 1001, 22:25-27. The fungicidal combination of claim 5 includes benzovindiflupyr + mancozeb + azoxystrobin. *Id.*, 22:28-31, 22:43-44. However, as discussed above in section VIII.A.1, the combination of benzovindiflupyr + mancozeb + azoxystrobin is not novel. Furthermore, Godoy discloses “[t]o apply the products, a knapsack sprayer pressurized with CO₂ and a minimum application volume of 120 L ha⁻¹ was used.” Ex. 1003, at 115-119; Ex. 1005 p. 4. As would be understood by a POSA, water, or another agrochemically acceptable carrier, would be used to reach the minimum application volume. Ex. 1003, ¶ 118. Water, or another agrochemically acceptable carrier, is an agrochemically acceptable excipient. Accordingly, claim 5 is anticipated by Godoy.

3. Claim 7 is Anticipated by Godoy

Claim 7 of the '727 patent depends on claim 1 and further specifies “benzovindiflupyr and mancozeb are admixed in ratio of 1:80 to 80:1.” Ex. 1001, 22:57-59. As illustrated by the table in section VIII.A.1, in the combination of benzovindiflupyr + mancozeb + azoxystrobin of Godoy, Godoy discloses 30g/ha of

benzonvindiflupyr to 1500g/ha or 2000g/ha of mancozeb. Ex. 1003, ¶¶120-122; Ex. 1005 at p. 3. A ratio of 30 to 1500 corresponds to a w/w ratio of 1:50. *Id.* at 122. A ratio of 30 to 2000 corresponds to a w/w ratio of 1:67. Ex. 1003, ¶ 122. Both the 1:50 and 1:67 ratios fall within the range of 1:80 to 80:1 recited in claim 7. Accordingly, claim 7 is anticipated by Godoy. *Id.*, ¶ 123.

4. Claim 9 is Anticipated by Godoy

Claim 9 of the '727 patent is directed to “[a] method of foliar application, consisting of applying the combination of claim 1 to the foliage of a plant.” Ex. 1001, 23:1-2. In applying the benzovindiflupyr + mancozeb + azoxystrobin combination to soybean crops, Godoy discloses:

In the second protocol (Table 3) three applications were carried out with average intervals of 21 and 15 days after the first and second application, respectively.

Ex. 1003, ¶ 125; Ex. 1005, p. 4. Godoy further discloses “[t]o apply the products, a knapsack sprayer pressurized with CO₂ and a minimum application volume of 120 L ha⁻¹ was used.” *Id.* A POSA would have understood a knapsack sprayer is a foliar sprayer. Moreover, after the approximate 36 day growing period from application one to application three, leaves would be present on the soybean crops. *Id.*, ¶ 127.

Accordingly, claim 9 is anticipated by Godoy. Ex. 1003, ¶¶128-129.

5. Claim 10 is Anticipated by Godoy

Claim 10 of the '727 patent is an independent claim directed to “[a] method of controlling fungal diseases in plants consisting of, applying to the locus of the plant a combination consisting of...,” *inter alia*, benzovindiflupyr + mancozeb + azoxystrobin. Ex. 1001, 23:3-29. The “applying” of benzovindiflupyr + mancozeb + azoxystrobin done in Godoy inherently includes “the locus of the plant.” The '727 Patent defines the “locus” of a plant “to embrace the place on which the plants are growing, ...” Exhibit 1001, 2:55-59. Accordingly, claim 10 is anticipated by Godoy. Ex. 1003, ¶¶ 130-135.

Various features of Godoy discussed above are summarized in the below chart.

Claim Language	Godoy
1. A fungicidal combination consisting of benzovindiflupyr, mancozeb, and <u>at least another</u> 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,	Treatment 17: azoxystrobin + benzovindiflupyr and mancozeb (60+30 and 1500 (Dose g a.i. ha ⁻¹)) (Elatus® and Unizeb Gold®) (0.2 and 2.0 (Dose L-kg C.P. ha ⁻¹)); and Treatment 23: azoxystrobin + benzovindiflupyr and mancozeb (60+30 and 2000 (Dose g a.i. ha ⁻¹)) (Elatus® and PNR) (0.2 and 2.5 (Dose L-kg C.P. ha ⁻¹)). <i>Ex. 1005 p. 3.</i> For applications associated with fungicide azoxystrobin +

fluquinconazole, flusilazole, flutriafol, hexaconazole, imibenconazole, ipconazole, metconazole, myclobutanil, penconazole, propiconazole, simeconazole, tebuconazole, tetraconazole, triadimefon, triadimenol, triticonazole, prothioconazole, imazalil, oxpoconazole, pefurazoate, prochloraz, triflumizole, fenarimol, nuarimol, pyrifenoxy, 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, trifloxystrobin, famoxadone, fluoxastrobin, fenamidone, pyribencarb, and mixtures thereof.	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). <i>Ex. 1005 p. 5.</i>
3. The combination as claimed in claim 1, wherein the at least another fungicide is ... prothioconazole, azoxystrobin,	<i>See citation of claim 1</i>

picoxystrobin, ... or a combination thereof.	
4. The combination as claimed in claim 1, wherein the at least another fungicide is prothioconazole and/or azoxystrobin.	<i>See citation of claim 1</i>
5. A composition consisting of: at least one agrochemically acceptable excipient; and a fungicidal combination of: (a) benzovindiflupyr; (b) mancozeb; and (c) at least one ergosterol biosynthesis inhibitor and/or at least one quinone outside inhibitor; wherein the ergosterol biosynthesis inhibitor is selected from azaconazole, ... propiconazole, ... prothioconazole, imazalil, oxpoconazole, ... and mixtures thereof; and wherein the quinone outside inhibitor fungicide is selected from azoxystrobin, ... and mixtures thereof.	<i>See citation of claim 1.</i> To apply the products, a knapsack sprayer pressurized with CO ₂ and a minimum application volume of 120 L ha ⁻¹ was used. <i>Ex. 1005 p. 4.</i>
7. The combination as claimed in claim 1, wherein the benzovindiflupyr and mancozeb are admixed in ratio of 1:80 to 80:1.	<i>See citation of claim 1.</i> Treatment 17: azoxystrobin + benzovindiflupyr and mancozeb (60+ <u>30</u> and <u>1500</u> (Dose g a.i. ha ⁻¹)) (Elatus® and Unizeb Gold®) (0.2 and 2.0 (Dose L-kg C.P. ha ⁻¹)); and Treatment 23: azoxystrobin + benzovindiflupyr and mancozeb (60+ <u>30</u> and <u>2000</u> (Dose g a.i. ha ⁻¹))

	(Elatus® and PNR) (0.2 and 2.5 (Dose L-kg C.P. ha⁻¹)). <i>Ex. 1005 p. 3.</i> For applications associated with the fungicide azoxystrobin + benzonvindiflupyr 60 + 30 g a.i. per hectare, the highest yields were observed for the treatments with mancozeb 1500 g a.i. per hectare and 2000 g a.i. per hectare (T17 - 3377 kg per hectare; T23 - 3270 kg per hectare, respectively), although the yield of the association with mancozeb 2000 g a.i. per hectare was statistically similar to azoxystrobin + benzonvindiflupyr 60 + 30 g a.i. per hectare alone (T13 - 3186 kg per hectare). <i>Ex. 1005 p. 5.</i> <i>The ratio of benzonvindiflupyr (30g) to mancozeb (1500g and 2000g) in Godoy is 1:50 and 1:67.</i>
9. A method of foliar application, consisting of applying the combination of claim 1 to the foliage of a plant.	<i>See citation of claim 1.</i> In the second protocol (Table 3) three applications were made at average intervals of 21 and 15 days after the first and second application, respectively. <i>Ex. 1005 p. 4.</i>

	To apply the products, a knapsack sprayer pressurized with CO₂ and a minimum application volume of 120 L ha⁻¹ was used. <i>Ex. 1005 p. 4.</i>
10. A method of controlling fungal diseases in plants consisting of, applying to the locus of the plant a combination consisting of: (a) benzovindiflupyr; (b) at least one quinone outside inhibitor and/or at least one ergosterol biosynthesis inhibitor; and (c) mancozeb, wherein the ergosterol biosynthesis inhibitor is selected from azaconazole, ... propiconazole, ... prothioconazole, ... and mixtures thereof; and wherein the quinone outside inhibitor fungicide is selected from azoxystrobin, ... and mixtures thereof.	<i>See citation of claim 1</i> The objective of this work is to present the summarized results of cooperative trials with multisite fungicides, carried out on 2015/16 harvest, to control diseases in soybeans crops. <i>Ex. 1005 p. 1.</i>

B. Ground 2: Claims 1-10 are Anticipated by Tobler and/or Obvious Over the Combination of Tobler and Godoy

U.S. Patent 9,314,022, also referred to as Tobler, issued on April 19, 2016.

Ex. 1006, p. 1. This is seven months before the '727 patent's foreign priority date and 19 months before the filing of the international application. *See Id.*; Ex. 1001,

p. 1. Tobler is directed to combinations of fungicides involving benzovindiflupyr. Ex. 1006, p. 1; Ex. 1003, ¶ 91.

Tobler specifically teaches compositions suitable for control of fungi, such as *Phakopsora pachyrhizi*. See *Id.*, abstract. These compositions include benzovindiflupyr as compound A-1.1. (See Ex. 1006, 13:9-11) in combination with at least one compound selected from the group consisting of (B1) a strobilurin fungicide, (B2) an azole fungicide, etc. *Id.*, 1:40-64, 13:50-14:6; Ex. 1003, ¶ 89, 93.

Tobler provides disclosure of numerous fungicidal combinations which fall within the claims of the '727 patent. Ex. 1003, ¶ 94. For example, Embodiment E1 provides the combination of benzovindiflupyr, mancozeb, and (azoxystrobin, picoxystrobin (strobilurins) or cyproconazole, prothioconazole (azoles)). Ex. 1006, 28:6-11, 28:40, 22:58-62, 22:63-23:21. Embodiment E1 includes the combination of “mancozeb+TX1.” Ex. 1006, 28:40. “The term ‘TX1’ means: ‘the compound A-1.1+a compound selected from the group P.’” *Id.*, 28:10-11. The complete combination of all three is finally taught at col. 22, ln. 63, 65, Col. 23, ln. 14, 21 where azoxystrobin, picoxystrobin (strobilurins) or cyproconazole, prothioconazole azoles are listed as a group P compound. Ex. 1003, ¶ 94.

**1. Claim 1 is Anticipated or Obvious Over Tobler—
Optionally in view of Godoy**

Claim 1 of the '727 patent is directed to “fungicidal combinations” having at least three components. *See* Ex. 1001, claim 1. Two of the three components are (1) benzovindiflupyr and (2) mancozeb. *Id.* The third component is one, or a combination of, 55 possible known fungicides shown below.

ergosterol biosynthesis inhibitors (EBIs)							
1	azaconazole	11	flusilazole	21	tebuconazole	31	triflumizole
2	bitertanol	12	flutriafol	22	tetraconazole	32	fenarimol
3	bromuconazole	13	hexaconazole	23	triadimefon	33	nuarimol
4	cyproconazole	14	imibenconazole	24	triadimenol	34	pyrifenox
5	difenoconazole	15	ipconazole	25	triticonazole	35	pyrisoxazole
6	diniconazole	16	metconazole	26	prothioconazole	36	triforine
7	epoxiconazole	17	myclobutanil	27	imazalil		
8	etaconazole	18	penconazole	28	oxpoconazole		
9	fenbuconazole	19	propiconazole	29	pefurazoate		
10	fluquinconazole	20	simeconazole	30	prochloraz		

quinone outside inhibitor (QoIs)							
37	azoxystrobin	42	pyraoxystrobin	47	kresoxim-methyl	52	famoxadone
38	coumoxystrobin	43	mandestrobin	48	dimoxystrobin	53	fluoxastrobin

39	enoxastrobin	44	pyraclostrobin	49	fenaminostrobin	54	fenamidone
40	flufenoxystrobin	45	pyrametostrobin	50	metominostrobin	55	pyribencarb
41	picoxystrobin	46	triclopyricarb	51	trifloxystrobin		

Like the '727 patent, Tobler generally discloses “fungicidal compositions.”

See Ex. 1006, abstract. Again, Tobler discloses benzovindiflupyr, as Compound A-1.1, which is a “especially preferred” compound. *See Id.*, 13:50-14:3. (“3-difluoromethyl-1-methyl-1H-pyrazole-4-carboxylic acid (9-dichloromethylidene-benzonorbornene-5-yl)amide (compound A-1.1).”) Tobler generally explains:

The compositions according to the invention may also comprise more than one of the active components (B), if, for example, a broadening of the spectrum of phytopathogenic disease control is desired. For instance, it may be advantageous in the agricultural practice to combine two or three components (B) with component (A). An example is a composition comprising a compound of formula (I), azoxystrobin and cyproconazole.

Ex. 1006, 27:65-28:5; Ex. 1003, ¶ 140.

Tobler provides “examples for compositions according to the present invention which comprise three active ingredients are defined as embodiments E1 and E2.” *Id.*, 1006, 28:6-8. In embodiments E1 “[t]he term ‘TX1’ means: ‘the compound A-1.1+a compound selected from the group P.’” *Id.*, 28:10-11. Tobler specifically provides the following:

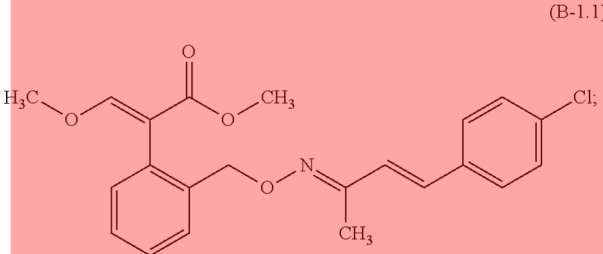
Mancozeb+TX1.

This corresponds to a combination of:

Mancozeb+ benzovindiflupyr+(group P component).

Id., 28:40.

Group P components, which are “Especially Suitable Compounds as Component (B) in the Compositions According to the Invention,” are provided between col. 22, ln 61 to col. 25, ln 67 of Tobler. *See Id.*, 22:61-25:67. Among the 55 possible third components of claim 1 of the ’727 patent—group P of Tobler recites 47 of them. Ex. 1003, ¶ 138-144. The overlapping group P compounds of Tobler and the ’727 patent are illustrated in the below table.

Ergosterol Biosynthesis Inhibitors or Quinone Outside Inhibitor of The ’727 Patent	Tobler Group P Compounds
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,	Group P: Especially Suitable Compounds as Component (B) in the Compositions According to the Invention: a strobilurin fungicide selected from azoxystrobin (47), dimoxystrobin (226), fluoxastrobin (382), kresoxim-methyl (485), metominostrobin (551), orysastrobin, picoxystrobin (647), pyraclostrobin (690); trifloxystrobin (832), a compound of formula B-1.1 (B-1.1) 

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, trifloxystrobin, famoxadone, fluoxastrobin, fenamidone, pyribencarb, and mixtures thereof.	an azole fungicide selected from azaconazole (40), bromuconazole (96), cyproconazole (207), difenoconazole (247), diniconazole (267), diniconazole-M (267), epoxiconazole (298), fenbuconazole (329), fluquinconazole (385), flusilazole (393), flutriafol (397), hexaconazole (435), imazalil (449), imibenconazole (457), ipconazole (468), metconazole (525), myclobutanil (564), oxpoconazole (607), pefurazoate (618), penconazole (619), prochloraz (659), propiconazole (675), prothioconazole (685), simeconazole (731), tebuconazole (761), tetraconazole (778), triadimefon (814), triadimenol (815), triflumizole (834), triticonazole (842), diclobutrazol (1068), etaconazole (1129), furconazole (1198), furconazole-cis (1199) and quinconazole (1378); ... a fungicide selected from the group consisting of ... bitertanol (84), ... famoxadone (322), fenamidone (325), fenaminosulf (1144), fenamiphos (326), fenarimol (327), ... nuarimol (587), ... pyrifenox (703), ... triforine (838)....
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The substantial overlap with the group P demonstrates the ease with which a POSA would envisage 47 of the 55 possible third components when making the claimed combinations. Ex. 1003, ¶¶ 142-144. This substantial overlap anticipates or at the least renders obvious claim 1 of the '727 patent. *See Osram Sylvania Inc. v. American Induction Tech. Inc.*, 701 F.3d 698, 706 (Fed. Cir. 2012) (“how one of

ordinary skill in the art would understand the relative size of a genus or species in a particular technology is of critical importance”). Indeed, “[a] reference disclosure can anticipate a claim even if the reference does not describe ‘the limitations arranged or combined as in the claim, if a person of skill in the art, reading the reference, would “at once envisage” the claimed arrangement or combination.’” *Id.* quoting *Kennametal, Inc. v. Ingersoll Cutting Tool Co.*, 780 F.3d 1376, 1381 (Fed. Cir. 2015) quoting *In re Petering*, 301 F.2d 676, 681 (CCPA 1962); *See* Ex. 1003, ¶¶ 142-144.

Godoy provides further motivation for the combination. Godoy discloses that there are only a few “main modes” of action used to control disease in soybean crops. Ex. 1003, ¶ 148; Ex. 1005, p. 1; These modes include demethylation inhibitors (DMI), quinone oxidase inhibitors (QoI), and succinate dehydrogenase inhibitors (SDHI). Ex. 1003, ¶ 148; Ex. 1005, p. 1. To combat severe rust infections in South America which are noted by Tobler, (Ex. 1006, 1:27-31) Godoy posits “[t]he use of multisite fungicides [such as mancozeb] may be an option for both the control of rust and as an anti-resistance strategy. Ex. 1003, ¶ 148; Ex. 1005 p. 1.

Godoy also provides additional evidence of a reasonable expectation of success. Specifically, Godoy provides a working example which falls within claim

1 of the '727 patent. Ex. 1003, ¶¶ 149-152; Ex. 1005, pp. 3, 5 (Tables 3 and 5).

Finally, it is notable that Tobler not only discloses, but also provides data of various synergistic effects of benzovindiflupyr with an azole fungicide (cyproconazole) or a strobilurin fungicide (cyproconazole). Ex. 1003, ¶¶ 146-153. Accordingly, a POSA would be highly motivated to combine benzovindiflupyr with an azole fungicide (cyproconazole) or a strobilurin fungicide (cyproconazole) based on this data. *Id.* Accordingly, claim 1 is anticipated or obvious over Tobler—optionally in view of Godoy. Ex. 1003, ¶¶ 144-154; 35 U.S.C. § 103.

2. Claim 2 is Obvious Over Tobler—Optionally in view of Godoy

Claim 2 of the '727 patent is directed to “fungicidal combinations” having at least four components. Ex. 1001, claim 2. Like claim 1, claim 2 requires the presence of mancozeb + benzovindiflupyr. *See Id.*, claim 2. However, claim 2 further requires “...an ergosterol biosynthesis inhibitor fungicide[] **and** a quinone outside inhibitor fungicide....” *See Id.*, claim 2 (emphasis added). In addition to disclosing the various three-way mixtures discussed above in VIII.B.1, Tobler also discloses three component (B)s can be used giving a 4-way mixture:

The compositions according to the invention may also comprise more than one of the active components (B), if, for example, a broadening of the spectrum of phytopathogenic disease control is desired. For instance, it may be advantageous in the agricultural practice to

combine two **or three components (B) with** component (A). An example is a composition comprising a compound of formula (I), azoxystrobin and cyproconazole.

Ex. 1006, 27:65-28:5. It follows that POSA would include different modes of action, such as “an ergosterol biosynthesis inhibitor fungicide and a quinone outside inhibitor fungicide” (’727 patent claim 2) for, *e.g.*, “broadening of the spectrum of phytopathogenic disease control is desired,” as stated in Tobler. *Id.*, 27:65-28:5; *Ex. 1003, ¶¶156-157.*

In selecting the fungicides for compound B, a POSA would have selected fungicides with different modes of action for the combination. This would have been known by a POSA as of the Priority Date and is supported by Tobler, which discloses a rationale for including more than one component (B) for “broadening of the spectrum of phytopathogenic disease” See quote in paragraph immediately above. *Ex. 1003, ¶ 158.*

To this end, 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. As such, it would be obvious to use a combination of these three (B) components with benzovindiflupyr. *Ex. 1003, ¶¶ 158-159.*

Godoy further supports the obviousness of claim 2 for the reasons discussed

in sections VIII.A and VIII.B.1. Accordingly, claim 2 is obvious over Tobler—optionally in view of Godoy. Ex. 1003 ¶¶ 155-162.

3. Claim 3 is Anticipated or Obvious Over Tobler—Optionally in view of Godoy

Claim 3 of the '727 patent narrows the fifty-five possible third component of claim 1 to twelve components. Ex. 1001, claim 3. Each of the twelve components listed in claim 3 of the '727 patent are provided in Group P of Tobler. Ex. 1006, 22:61-25:67. This substantial overlap anticipates or renders obvious claim 3 of the '727 patent. Godoy further supports the obviousness of claim 3 for the reasons discussed in sections VIII.A and VIII.B.1. Ex. 1003, ¶¶ 163-165.

4. Claim 4 is Anticipated or Obvious Over Tobler—Optionally in view of Godoy

Claim 4 of the '727 patent narrows the fifty-five possible third components of claim 1 to two components. Ex. 1006, claim 4. Both components listed in claim 4 of the '727 patent are provided in Group P. Ex. 1006, 22:62, 23:21. This substantial overlap anticipates or renders obvious claim 4 of the '727 patent. Godoy further supports the obviousness of claim 4 for the reasons discussed in sections VIII.A and VIII.B.1. Ex. 1003, ¶¶ 163-165.

5. Claim 5 is Anticipated or Obvious Over Tobler—Optionally in view of Godoy

Independent claim 5 of the '727 patent is directed to “[a] composition

consisting of: at least one agrochemically acceptable excipient; and” the fungicidal combination of claim 1 of the ’727 patent. *See* Ex. 1001, claim 5. As discussed above in section VIII.B.1, the fungicidal combinations of claim 1 of the ’727 patent are anticipated or obvious over Tobler. Nevertheless, Tobler additionally discloses:

[The] compositions may be produced in [a] conventional manner, e.g. by mixing the active ingredients with at least one appropriate inert formulation adjuvant (for example, diluents, solvents, fillers and optionally other formulating ingredients such as surfactants, biocides, anti-freeze, stickers, thickeners and compounds that provide adjuvancy effects).

Ex. 1006, 36:23-28. Indeed, Tobler illustrates the addition of “at least one agrochemically acceptable excipient” is “conventional.” *Id.*; Ex. 1003, ¶¶ 168-169. Accordingly, the composition of claim 5 of the ’727 patent is anticipated or obvious over Tobler. Godoy further supports the obviousness of claim 5 for the reasons discussed in sections VIII.A and VIII.B.1. Ex. 1003, ¶¶ 170-171.

6. Claim 6 is Anticipated or Obvious Over Tobler—Optionally in view of Godoy

Claim 6 of the ’727 patent further requires that the composition of claim 5 “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.” Ex. 1006, claim 6. To this,

Tobler discloses:

The composition of the invention may be employed in any conventional form, for example in the form of a twin pack, a powder for dry seed treatment (DS), an emulsion for seed treatment (ES), a flowable concentrate for seed treatment (FS), a solution for seed treatment (LS), a water dispersible powder for seed treatment (WS), a capsule suspension for seed treatment (CF), a gel for seed treatment (GF), an emulsion concentrate (EC), a suspension concentrate (SC), a suspo-emulsion (SE), a capsule suspension (CS), a water dispersible granule (WG), an emulsifiable granule (EG), an emulsion, water in oil (EO), an emulsion, oil in water (EW), a micro-emulsion (ME), an oil dispersion (OD), an oil miscible flowable (OF), an oil miscible liquid (OL), a soluble concentrate (SL), an ultra-low volume suspension (SU), an ultra-low volume liquid (UL), a technical concentrate (TK), a dispersible concentrate (DC), a wettable powder (WP) or any technically feasible formulation in combination with agriculturally acceptable adjuvants.

Ex. 1006, 36:4-22. A POSA would have been motivated to formulate the fungicidal combinations disclosed and suggested by Tobler. *See* Ex. 1003, ¶¶172-174. Notwithstanding this formulated combination falls within the scope of claim 6, the applicable formulation types in claim 6 of the ’727 patent and formulation types in Tobler significantly overlap. Accordingly, the composition of claim 6 of the ’727 patent is anticipated or obvious over Tobler. Godoy further supports the

obviousness of claim 6 for the reasons discussed in sections VIII.A and VIII.B.1.

7. Claim 7 is Anticipated or Obvious Over Tobler—Optionally in view of Godoy

Claim 7 of the '727 patent depends on claim 1 and further requires that “benzovindiflupyr and mancozeb are admixed in ratio of 1:80 to 80:1.” Ex. 1001, claim 7. Tobler discloses these ratios:

In general, the weight ratio of component (A) to component (B) is from 2000:1 to 1:1000. A non-limiting example for such weight ratios is compound of formula I:compound of formula B-2 is 10:1. The weight ratio of component (A) to component (B) is preferably from 100:1 to 1:100; more preferably from 20:1 to 1:50.

Ex. 1006, 34:26-32. Tobler discloses preferable ranges which encompass 1:80 to 80:1 ratio—100:1 to 1:100—and more preferable ranges which are within 1:80 to 80:1—20:1 to 1:50. *Id.* It would be routine to admixed benzovindiflupyr and mancozeb in ratio of 1:80 to 80:1. Ex. 1003, ¶ 176. Accordingly, the subject matter of claim 7 of the '727 patent is anticipated or obvious over Tobler. Godoy further supports the obviousness of claim 7 for the reasons discussed in sections VIII.A and VIII.B.1. Ex. 1003, ¶ 177.

8. Claim 8 is Anticipated or Obvious Over Tobler—Optionally in view of Godoy

Claim 8 of the '727 patent further requires that in the composition of claim 5 “the total amount of benzovindiflupyr in the composition is in the range of 0.1 to

99% by weight, the total amount of mancozeb in the composition is in the range of 0.1 to 99% by weight; the total amount of ergostrol biosynthesis inhibitor in the composition is in the range of 0.1 to 99% by weight; and the total amount of quinone outside inhibitor in the composition is in the range of 0.1 to 99% by weight.” Ex. 1001, claim 8. This is disclosed by Tobler:

In general, the formulations include from 0.01 to 90% by weight of active agent, from 0 to 20% agriculturally acceptable surfactant and 10 to 99.99% solid or liquid formulation inerts and adjuvant(s), the active agent consisting of at least a compound of component (A) together with a compound of component (B), and optionally other active agents, particularly microbiocides or conservatives or the like. Concentrated forms of compositions generally contain in between about 2 and 80%, preferably between about 5 and 70% by weight of active agent. Application forms of formulation may for example contain from 0.01 to 20% by weight, preferably from 0.01 to 5% by weight of active agent. Whereas commercial products will preferably be formulated as concentrates, the end user will normally employ diluted formulations.

Ex. 1006, 36:5 2-65. The ranges recited in claim 8 of the '727 patent overlap with the formulation ranges disclosed in Tobler. Ex. 1003, ¶¶ 178-181. For instance, the composition of claim 8 of the '727 patent embraces a composition having 0.3-100% active agents. This 0.3-100% active agents overlaps with, *e.g.*, the 0.01 to 90% disclosed in Tobler, as well as, concentrated compositions disclosed by

Tobler containing about 2 and 80% active agents. It would be routine for a person of ordinary skill in the art to formulate a composition having 0.1 to 99% by weight benzovindiflupyr, 0.1 to 99% by weight mancozeb, 0.1 to 99% by weight an ergosterol biosynthesis inhibitor, and 0.1 to 99% by weight a quinone outside inhibitor. *Id.* Accordingly, the composition of claim 8 of the '727 patent is anticipated or obvious over Tobler. Godoy further supports the obviousness of claim 8 for the reasons discussed in sections VIII.A and VIII.B.1. Ex. 1003 ¶¶182-185.

**9. Claims 9 and 10 are Anticipated or Obvious Over Tobler—
and Optionally Godoy**

Claim 9 of the '727 patent is directed to “[a] method of foliar application, consisting of applying the combination of claim 1 to the foliage of a plant.” Ex. 1001, claim 9. Claim 10 of the '727 patent is directed to “[a] method of controlling fungal diseases in plants consisting of, applying to the locus of the plant” the combination of claim 1. *See Id.*, claim 1, claim 10. As discussed above in section VIII.B.1, the fungicidal compositions of claim 1 of the '727 patent are anticipated or obvious over Tobler. Moreover, the Tobler patent further discloses:

Some compositions according to the invention have a systemic action and can be used as foliar, soil and seed treatment fungicides.

Ex. 1006, 35:29-31. Here, Tobler discloses the fungicidal compositions can be

used as a foliar application (claim 9) and locus application (claim 10). Ex. 1003 ¶¶187-193. Accordingly, claims 9 and 10 of the '727 patent are anticipated or obvious over Tobler. Godoy further supports the obviousness of claims 9 and 10 for the reasons discussed in sections VIII.A and VIII.B.1. *Id.*

Various features of Tobler discussed above are summarized in the below chart.

Claim Language	Tobler
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 ,	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'. <i>Ex. 1006, 28:6-11.</i> <i>Compound A-1.1 is benzovindiflupyr = 3-difluoromethyl-1-methyl-1H-pyrazole-4-carboxylic acid (dichloromethylidene-benzonorbornene-5-yl)amide.</i> <i>See Ex. 1006, 13:9-11; see also Ex. 1003 ¶ 89.</i> <i>In embodiments E1, Tobler discloses:</i> Mancozeb +TX1

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, trifloxystrobin, famoxadone, fluoxastrobin, fenamidone, pyribencarb, and mixtures thereof.	<i>Ex.1006, 28:40.</i> <i>Group P includes:</i> Group P: Especially Suitable Compounds as Component (B) in the Compositions According to the Invention: a strobilurin fungicide selected from azoxystrobin (47), dimoxystrobin (226), fluoxastrobin (382), kresoxim-methyl (485), metominostrobin (551), oryastrobin, picoxystrobin (647), pyraclostrobin (690); trifloxystrobin (832), a compound of formula B-1.1 (B-1.1) an azole fungicide selected from azaconazole (40), bromuconazole (96), cyproconazole (207), difenoconazole (247), diniconazole (267), diniconazole-M (267), epoxiconazole (298), fenbuconazole (329), fluquinconazole (385), flusilazole (393), flutriafol (397), hexaconazole (435), imazalil (449), imibenconazole (457), ipconazole (468), metconazole (525), myclobutanil (564), oxpoconazole (607), pefurazoate (618), penconazole (619), prochloraz (659), propiconazole (675), prothioconazole (685), simeconazole (731), tebuconazole (761), tetraconazole (778), triadimefon (814), triadimenol (815), triflumizole (834),
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	triticonazole (842), diclobutrazol (1068), etaconazole (1129), furconazole (1198), furconazole-cis (1199) and quinconazole (1378); ... a fungicide selected from the group consisting of ... bitertanol (84), ... famoxadone (322), fenamidone (325), fenaminosulf (1144), fenamiphos (326), fenarimol (327), ... nuarimol (587), ... pyrifenox (703), ... triforine (838)....
2. A fungicidal combination consisting of benzovindiflupyr, mancozeb, 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	<i>Tobler discloses three (B) components can be present and added to (A).</i> The compositions according to the invention may also comprise more than one of the active components (B), if, for example, a broadening of the spectrum of phytopathogenic disease control is desired. For instance, it may be advantageous in the agricultural practice to combine two or three components (B) with component (A). An example is a composition comprising a compound of formula (I), azoxystrobin and cyproconazole. <i>Ex. 1006, 27:65-28:5.</i>

wherein the quinone outside inhibitor fungicide is selected from azoxystrobin, coumoxystrobin, enoxastrobin, flufenoxystrobin, picoxystrobin, pyraoxystrobin, mandestrobin, pyraclostrobin, pyrametostrobin, triclopyricarb, kresoxim-methyl, dimoxystrobin, fenaminostrobin, metominostrobin, trifloxystrobin, famoxadone, fluoxastrobin, fenamidone, pyribencarb, and mixtures thereof.	
3. The combination as claimed in claim 1, wherein the at least another fungicide is cyproconazole, difenoconazole, difenoconazole, hexaconazole, hexaconazole,² tebuconazole, tetraconazole, tetraconazole, azoxystrobin, picoxystrobin, pyraclostrobin, kresoxim-methyl, trifloxystrobin, or a combination thereof.	<i>See citation of claim 1</i>
4. The combination as claimed in claim 1, wherein the at least another fungicide is prothioconazole and/or azoxystrobin.	<i>See citation of claim 1</i>
5. A composition consisting of: at least one agrochemically acceptable excipient; and a fungicidal combination of: (a) benzovindiflupyr; (b) mancozeb; and (c) at least one ergosterol biosynthesis inhibitor and/or at least one quinone outside inhibitor;	<i>See citation of claim 1</i> Such compositions may be produced in conventional manner, e.g. by mixing the active ingredients with at least one appropriate inert formulation adjuvant (for example, diluents, solvents, fillers and optionally other formulating ingredients such as surfactants,

² Duplicate to previous 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, trifloxystrobin, famoxadone, fluoxastrobin, fenamidone, pyribencarb, and mixtures thereof.	biocides, anti-freeze, stickers, thickeners and compounds that provide adjuvancy effects). Also conventional slow release formulations may be employed where long lasting efficacy is intended. Particularly formulations to be applied in spraying forms, such as water dispersible concentrates (e.g. EC, SC, DC, OD, SE, EW, EO and the like), wettable powders and granules, may contain surfactants such as wetting and dispersing agents and other compounds that provide adjuvancy effects, e.g. the condensation product of formaldehyde with naphthalene sulphonate, an alkylarylsulphonate, a lignin sulphonate, a fatty alkyl sulphate, and ethoxylated alkylphenol and an ethoxylated fatty alcohol. <i>Ex. 1006 36:23-39.</i> Throughout this document the expression ‘composition’ stands for 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 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)
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	and (B) is not essential for working the present invention. <i>Ex. 1006, 27:55-64.</i>
6.The composition as claimed in claim 5, wherein 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.	<i>See citation of claim 5.</i> The composition of the invention may be employed in any conventional form, for example in the form of a twin pack, a powder for dry seed treatment (DS), an emulsion for seed treatment (ES), a flowable concentrate for seed treatment (FS), a solution for seed treatment (LS), a water dispersible powder for seed treatment (WS), a capsule suspension for seed treatment (CF), a gel for seed treatment (GF), an emulsion concentrate (EC), a suspension concentrate (SC), a suspo-emulsion (SE), a capsule suspension (CS), a water dispersible granule (WG), an emulsifiable granule (EG), an emulsion, water in oil (EO), an emulsion, oil in water (EW), a micro-emulsion (ME), an oil dispersion (OD), an oil miscible flowable (OF), an oil miscible liquid (OL), a soluble concentrate (SL), an ultra-low volume suspension (SU), an ultra-low volume liquid (UL), a technical concentrate (TK), a dispersible concentrate (DC), a wettable powder (WP) or any technically feasible formulation in combination with agriculturally acceptable adjuvants. <i>Ex. 1006, 36:4-22.</i>

7. The combination as claimed in claim 1, wherein the benzovindiflupyr and mancozeb are admixed in ratio of 1:80 to 80:1.	<i>See citation of claim 1</i> In general, the weight ratio of component (A) to component (B) is from 2000:1 to 1:1000. A non-limiting example for such weight ratios is compound of formula I:compound of formula B-2 is 10:1. The weight ratio of component (A) to component (B) is preferably from 100:1 to 1:100; more preferably from 20:1 to 1:50. <i>Ex. 1006, 34:26-32.</i>
8. The composition as claimed in claim 5, wherein the total amount of benzovindiflupyr in the composition is in the range of 0.1 to 99% by weight, the total amount of mancozeb in the composition is in the range of 0.1 to 99% by weight; the total amount of ergostrol biosynthesis inhibitor in the composition is in the range of 0.1 to 99% by weight; and the total amount of quinone outside inhibitor in the composition is in the range of 0.1 to 99% by weight.	<i>See citation of claim 1</i> In general, the formulations include from 0.01 to 90% by weight of active agent, from 0 to 20% agriculturally acceptable surfactant and 10 to 99.99% solid or liquid formulation inerts and adjuvant(s), the active agent consisting of at least a compound of component (A) together with a compound of component (B), and optionally other active agents, particularly microbiocides or conservatives or the like. Concentrated forms of compositions generally contain in between about 2 and 80%, preferably between about 5 and 70% by weight of active agent. Application forms of formulation may for example contain from 0.01 to 20% by weight, preferably from 0.01 to 5% by weight of active agent. Whereas commercial products will preferably be formulated as concentrates, the end user will normally employ diluted formulations.

	<i>Ex. 1006, 36:2-65.</i>
9. A method of foliar application, consisting of applying the combination of claim 1 to the foliage of a plant.	<i>See citation of claim 1</i> Some compositions according to the invention have a systemic action and can be used as foliar, soil and seed treatment fungicides. <i>Ex. 1006, 35:29-31.</i>
10. A method of controlling fungal diseases in plants consisting of, applying to the locus of the plant a combination consisting of: (a) benzovindiflupyr; (b) at least one quinone outside inhibitor and/or at least one ergosterol biosynthesis inhibitor; and (c) mancozeb, 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,	<i>See citation of claim 1</i> A further aspect of the present invention is a method of controlling diseases on useful plants or on propagation material thereof caused by phytopathogens, which comprises applying to the useful plants, the locus thereof or propagation material thereof a composition according to the invention. <i>Ex. 1006, 12:26-29.</i>

pyrifeno^x, 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, trifloxystrobin, famoxadone, fluoxastrobin, fenamidone, pyribencarb, and mixtures thereof.	
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**C. Ground 3: Claims 1-10 are Obvious Over De Oliveira—
Optionally in view of Wiglesworth, Tobler, and Godoy.**

Independent claim 1 of the '727 patent is directed to “fungicidal combinations” having at least three components. Ex. 1001, claim 1. Two of the three components are (1) benzovindiflupyr and (2) mancozeb. *Id.* The third component is one, or a combination of, 55 possible known fungicides provided in in section VIII.B.1.

De Oliveira discloses fungicidal combinations and methods of using the same. *See* Ex. 1007, abstract, claims 1-5. The fungicidal combinations in De Oliveira encompass the combinations of claim 1 of the '727 patent. For example, De Oliveira provides:

...treating the plant at the locus of the infection with **a dithiocarbamate fungicide**, and concurrently, prior or subsequently to the dithiocarbamate fungicide, with at least another fungicide selected from **a demethylation inhibitor**, **quinone outside inhibitor**, **succinate dehydrogenase inhibitor**, quinone inside inhibitor **or combinations thereof**.

Ex. 1007, p. 7 (emphasis added). De Oliveira discloses mancozeb as a dithiocarbamate fungicide. *Id.*, at p 9.

Both the '727 patent and De Oliveira disclose use of a “quinone outside inhibitor,” which are commonly also known as strobilurins. Ex. 1003, ¶ 159. There is significant overlap between the quinone outside inhibitor disclosure of De Oliveira and those claimed in '727 patent. Ex. 1003, ¶¶ 195-196.

Demthylation inhibitors (DMIs) work by inhibiting the biosynthesis of ergosterol, and De Oliveira discloses “the preferred DMI[sic] inhibitor[sic] is preferably a conazole fungicide...” Ex. 1007, p. 11. While described differently, the '727 patent essentially recasts the conazoles of De Oliveira as ergosterol biosynthesis inhibitors in the '727 patent. *See* Ex. 1001, 6:23-34; Ex. 1007, p. 11. There is significant overlap between the conazoles disclosed in De Oliveira and those claimed in the '727 patent. *See* Ex. 1001, 6:23-34; Ex. 1007, p. 11.

1. Claim 1 is Obvious Over De Oliveira—Optionally in view of Wigglesworth, Tobler, and Godoy

De Oliveira exemplifies the following combinations:

S No.	Combination used	Dosage
A(2)	Mancozeb 750 WDG + 200 g/L azoxystrobin + 80 g/L cyproconazole	1500 g/Ha + 300 mL/Ha
B(2)	Mancozeb 750 WDG + 85 g/L pyraclostrobin + 62.5 g/L epoxiconazole	1500 g/Ha + 500 mL/Ha
C(2)	Mancozeb 750 WDG + Cyproconazole 80g/L+ Picoxystrobin 200g/L	1500 g/Ha + 300 mL/Ha
D(2)	Mancozeb 750 WDG + Picoxystrobin 200 g/L + Tebuconazole 80 g/L	1500 g/Ha + 300 mL/Ha

and states “[i]t was thus found that the incorporation of mancozeb increased the [Asian soybean] rust control of the conventional strobilurin + conazole fungicide treatment standard.” Ex. 1007, p. 25; Ex. 1003 ¶ 196.

De Oliveira concluded from the examples that “[i]t was thus found that the incorporation of mancozeb increased the [Asian soybean] rust control of the conventional strobilurin + conazole fungicide treatment standard.” Ex. 1007, p. 25; Ex. 1003, ¶ 197.

While De Oliveira explicitly states that the combination can further include a succinate dehydrogenase inhibitor, (SDHI) and De Oliveira discloses a number of specific SDHIs, De Oliveira does not disclose benzovindiflupyr. However, the addition of benzovindiflupyr, despite not being specifically disclosed in De Oliveira, would have been obvious based on the general disclosure of De Oliveira

as evidenced by the fact that benzovindiflupyr is an SDHI. Ex. 1003, ¶ 198.

Wiglesworth, Tobler, and Godoy further support the obviousness of claim 1. *Id.*, ¶199.

Wiglesworth discloses that benzovindiflupyr is a new SDHI fungicide which was registered in 2015 by Syngenta. Ex. 1008, pp. S2.11-12. Benzovindiflupyr is “extremely efficacious on soybean rust” and combinable with azoxystrobin. *Id.* A POSA would have combined benzovindiflupyr with any of the fungicidal combinations disclosed in De Oliveira as A(2), B(2), C(2) or D(2) to improve control of soybean rust. In fact, a POSA would have been further motivated to combine benzovindiflupyr with A(2) specifically since Wiglesworth discloses combining benzovindiflupyr with azoxystrobin. Ex. 1003, ¶¶ 199-200; Ex. 1008, p. 11.

This is further supported by Tobler which discloses that benzovindiflupyr (compound A-1.1) is highly effective at controlling *Phakopsora pachyrhizi* (Asian soybean rust). Ex. 1006, 41:20-30, Table B1. In fact, claim 1 of Tobler claims “[a] composition ... comprising a synergistically effective amount of (A) a compound of formula I [which includes benzovindiflupyr]; and (B2) an azole fungicide.” This suggests benzovindiflupyr and azole fungicides—like the ergosterol biosynthesis inhibitors of the ’727 patent—are synergistic when combined. Ex.

1003, ¶ 201.

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, as discussed in sections VIII.A and VIII.B.1. Ex. 1003, ¶ 202.

Accordingly, it would have been obvious to include benzovindiflupyr in any one of combinations A(2), B(2), C(2), and D(2) of De Oliveira because De Oliveira states the combinations can further include an SDHI, and Wiglesworth, Tobler and Godoy provide additional motivation for selection and a reasonable expectation of success. In other words, De Oliveira in view of the Wiglesworth, Tobler, and Godoy specifically renders obvious *at least* the following combinations:

- (1) Benzovindiflupyr + mancozeb + cyproconazole + picoxystrobin;
- (2) Benzovindiflupyr + mancozeb + cyproconazole + azoxystrobin;
- (3) Benzovindiflupyr + mancozeb + epoxiconazole + pyraclostrobin; and
- (4) Benzovindiflupyr + mancozeb + tebuconazole + picoxystrobin.

These combinations all fall within claim 1. As these obvious combinations fall within claim 1, claim 1 is obvious over De Oliveira—optionally in view of the Wiglesworth, Tobler and Godoy, *mutatis mutandis*, discussed *supra*. Ex. 1003, ¶¶

203-205.

2. Claim 2 is Obvious Over De Oliveira—Optionally in view of Wiglesworth, Tobler, and Godoy

Independent claim 2 of the '727 patent is directed to “fungicidal combinations” having at least four components. *See* Ex. 1001, claim 2. Two of the four components are (1) benzovindiflupyr and (2) mancozeb. *Id.* The third component is one, or a combination of, thirty-six known ergosterol biosynthesis inhibitors and the fourth component is one, or a combination of, nineteen known quinone outside inhibitors. *Id.* Both groups are provided in the tables shown in section VIII.A.1. However, as discussed above with respect to claim 1 in section VIII.C.1, De Oliveira, optionally in view of Wiglesworth, Tobler, and Godoy, render obvious the following combinations:

- (1) Benzovindiflupyr + mancozeb + cyproconazole + picoxystrobin;
- (2) Benzovindiflupyr + mancozeb + cyproconazole + azoxystrobin;
- (3) Benzovindiflupyr + mancozeb + epoxiconazole + pyraclostrobin; and
- (4) Benzovindiflupyr + mancozeb + tebuconazole + picoxystrobin.

These combinations all fall within claim 2. *See* Ex. 1001, claim 2. As these obvious combinations fall within claim 1, claim 1 is obvious over De Oliveira—optionally in view of the Wiglesworth, Tobler, and Godoy, *mutatis mutandis*, discussed *supra*. Ex. 1003, ¶¶ 206-208.

3. Claim 3 is Obvious Over De Oliveira—Optionally in view of Wigglesworth, Tobler, and Godoy

Claim 3 of the '727 patent narrows the 55 possible third components of claim 1 to 12 components. *See* Ex. 1001, claim 3. However, the obvious combinations discussed above with respect to claim 1 still fall within claim 3. Ex. 1003, para 209-211. Accordingly, claim 3 remains obvious over De Oliveira—optionally in view of the Wigglesworth, Tobler, and Godoy, *mutatis mutandis*, discussed *supra*. Ex. 1003, ¶¶ 209-211.

4. Claim 4 is Obvious Over De Oliveira—Optionally in view of Wigglesworth, Tobler, and Godoy

Claim 4 of the '727 patent narrows the 55 possible third components of claim 1 to 2 components: “prothioconazole and/or azoxystrobin.” Ex. 1001, claim 4. As discussed in section VIII.C.1, De Oliveira discloses a “...dithiocarbamate fungicide, [such as mancozeb] with at least another fungicide selected from a demethylation inhibitor, quinone outside inhibitor, succinate dehydrogenase inhibitor, quinone inside inhibitor **or combinations thereof**.” Ex. 1007, p 7. As such, De Oliveira suggests mancozeb can be combined with two, rather than the three components. Ex. 1003, ¶ 213. For instance, it would be obvious to remove cyproconazole from combination (2), leaving:

(2a) benzovindiflupyr + mancozeb + azoxystrobin.

Id. The motivation being that the composition could still be used to control soybean rust—as indicated by De Oliveira. *Id.* Furthermore, such three-way combinations are suggested as being known and effective by Wiglesworth, Tobler, and Godoy. Accordingly, claim 4 is obvious over De Oliveira—optionally in view of the Wiglesworth, Tobler, and Godoy, *mutatis mutandis*, discussed *supra*. *Id.* ¶¶ 214-215.

5. Claim 5 is Obvious Over De Oliveira—Optionally in view of Wiglesworth, Tobler, and Godoy

Independent claim 5 of the '727 patent is directed to “[a] composition consisting of: at least one agrochemically acceptable excipient;” and the fungicidal combinations of claim 1 of the '727 patent. Ex. 1001, claim 5. As discussed above, the fungicidal combinations of claim 1 of the '727 patent are obvious over De Oliveira—optionally in view of Wiglesworth, Tobler, and Godoy. De Oliveira also discloses:

[i]n an embodiment, the present invention thus provides a composition comprising any of the fungicidal combinations such as herein described along with agriculturally acceptable excipients.

Ex. 1007, p. 23. In fact, the exemplified combinations of De Oliveira use a water dispersible granule (WDG) for mancozeb. *Id.* at p. 24. WDGs include agrochemically acceptable excipients. Ex. 1003, ¶¶ 217-219. It would be obvious to include agrochemically acceptable excipient because De Oliveira discloses use

of agrochemically acceptable excipient with fungicidal combinations and further exemplifies such use. *Id.*; Ex. 1007, p. 23. Accordingly, claim 5 is obvious over De Oliveira—optionally in view of the Wiglesworth, Tobler, and Godoy, *mutatis mutandis*, discussed *supra*. Ex. 1003, ¶ 220.

6. Claim 6 is Obvious Over De Oliveira—Optionally in view of Wiglesworth, Tobler, and Godoy

Claim 6 of the '727 patent further defines that the composition of claim 5 “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.” Ex. 1001, claim 6. This too is disclosed by De Oliveira:

In an embodiment, the fungicides or the combinations thereof contemplated according to the present invention may be pre-formulated and may be in the form of Water Dispersible Granules (WDG), Wettable Powders, Suspension Concentrates, Emulsifiable Concentrate, Suspoemulsions, Capsule Suspensions etc. However, the choice of any preferred formulation type is not particularly limiting.

Ex. 1007, p. 22. It would be obvious to select any of the overlapping formulation types because De Oliveira discloses “the choice of any preferred formulation type is not particularly limiting.” *Id.*; Ex. 1003, ¶¶ 221-222. Accordingly, claim 6 is

obvious over De Oliveira—optionally in view of Wiglesworth, Tobler, and Godoy, *mutatis mutandis*, discussed *supra*. *Id.* ¶¶ 223-224.

7. Claim 7 is Obvious Over De Oliveira—Optionally in view of Wiglesworth, Tobler, and Godoy

Claim 7 of the '727 patent further defines the subject matter of claim 1 to require that “benzovindiflupyr and mancozeb are admixed in ratio of 1:80 to 80:1.”

Ex. 1001, claim 7. This is still obvious over De Oliveira because:

In an embodiment, the dithiocarbamate may be applied in an effective amount so as to act as a synergist to the systemic fungicides of the present invention. However, the appropriate amounts of the fungicides used in the present invention, whether multi-site contact fungicides or systemic fungicides, is not particularly limiting and may be conveniently chosen by a skilled artisan.

Ex. 1007, p. 22. Here, De Oliveira states selection of ratios would be routine. Ex. 1003, ¶¶ 226-227. Accordingly, claim 7 is obvious over De Oliveira—optionally in view of Wiglesworth, Tobler, and Godoy, *mutatis mutandis*, discussed *supra*.

Ex. 1003, ¶¶ 227-231.

8. Claim 8 is Obvious Over De Oliveira—Optionally in view of Wiglesworth, Tobler, and Godoy

Claim 8 of the '727 patent further defines that the composition of claim 5 in that “the total amount of benzovinidiflupyr in the composition is in the range of 0.1 to 99% by weight, the total amount of mancozeb in the composition is in the range

of 0.1 to 99% by weight; the total amount of ergostrol biosynthesis inhibitor in the composition is in the range of 0.1 to 99% by weight; and the total amount of quinone outside inhibitor in the composition is in the range of 0.1 to 99% by weight.” Ex. 1001, claim 8. As discussed above with respect to claim 7, “the appropriate amounts of the fungicides used in the present invention, whether multi-site contact fungicides or systemic fungicides, is not particularly limiting and may be conveniently chosen by a skilled artisan.” Ex. 1007, p. 22. As such, it would be obvious to use 0.1 to 99% by weight of each agrochemical from the obvious combinations of discussed above with respect to claim 1. Accordingly, claim 8 is obvious over De Oliveira—optionally in view of Wiglesworth, Tobler, and Godoy, *mutatis mutandis*, discussed *supra*. Ex. 1003, ¶¶ 232-240.

9. Claims 9 and 10 are Obvious Over De Oliveira—Optionally in view of Wiglesworth, Tobler, and Godoy

Claim 9 of the ’727 patent is directed to “[a] method of foliar application, consisting of applying the combination of claim 1 to the foliage of a plant.” Ex. 1001, claim 9. Claim 10 of the ’727 patent is directed to “[a] method of controlling fungal diseases in plants consisting of, applying to the locus of the plant” the combination of claim 1. *See* Ex. 1001, claim 1, claim 10. As discussed above with respect to claim 1, De Oliveira discloses “treating the plant at the locus.” Ex. 1003, ¶ 242. Treating the plant at the locus, renders obvious both foliar application and

applying to the locus. *Id.*, ¶ 248. Accordingly, claims 9 and 10 are obvious over De Oliveira—optionally in view of Wiglesworth, Tobler and Godoy, *mutatis mutandis*, discussed *supra*. Ex. 1003, ¶¶ 241-249.

Features of De Oliveira discussed above are summarized in the below claim chart.

Claim Language	De Oliveira												
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, ... tebuconazole, ...and mixtures thereof; and wherein the quinone outside inhibitor fungicide is selected from azoxystrobin, coumoxystrobin, enoxastrobin, flufenoxystrobin, picoxystrobin, pyraoxystrobin, mandestrobin,	<table><tr><td>A(2)</td><td>Mancozeb 750 WDG + 200 g/L azoxystrobin + 80 g/L cyproconazole</td><td>1500 g/Ha + 300 mL/Ha</td></tr><tr><td>B(2)</td><td>Mancozeb 750 WDG + 85 g/L pyraclostrobin + 62.5 g/L epoxiconazole</td><td>1500 g/Ha + 500 mL/Ha</td></tr><tr><td>C(2)</td><td>Mancozeb 750 WDG + Cyproconazole 80g/L + Picoxystrobin 200g/L</td><td>1500 g/Ha + 300 mL/Ha</td></tr><tr><td>D(2)</td><td>Mancozeb 750 WDG + Picoxystrobin 200 g/L + Tebuconazole 80 g/L</td><td>1500 g/Ha + 300 mL/Ha</td></tr></table> Ex. 1007, p. 24. It has surprisingly been found that the use of a contact protective dithiocarbamate fungicide along with <u>at least one systemic fungicide</u> effectively penetrates the dense canopy barrier of the infected leguminous plant while simultaneously not allowing the rust pathogen to move up the plant foliage. Without wishing to be bound by theory, it is believed that the contact protective dithiocarbamate fungicide component of the combination effectively penetrates the dense plant foliage, while the systemic fungicide component effectively prevents the rust pathogen from infecting the remaining portion of the plant effectively reducing the susceptibility of the plant towards the infection. This synergistic complementation was not seen when either the foliar protective fungicide or the systemic	A(2)	Mancozeb 750 WDG + 200 g/L azoxystrobin + 80 g/L cyproconazole	1500 g/Ha + 300 mL/Ha	B(2)	Mancozeb 750 WDG + 85 g/L pyraclostrobin + 62.5 g/L epoxiconazole	1500 g/Ha + 500 mL/Ha	C(2)	Mancozeb 750 WDG + Cyproconazole 80g/L + Picoxystrobin 200g/L	1500 g/Ha + 300 mL/Ha	D(2)	Mancozeb 750 WDG + Picoxystrobin 200 g/L + Tebuconazole 80 g/L	1500 g/Ha + 300 mL/Ha
A(2)	Mancozeb 750 WDG + 200 g/L azoxystrobin + 80 g/L cyproconazole	1500 g/Ha + 300 mL/Ha											
B(2)	Mancozeb 750 WDG + 85 g/L pyraclostrobin + 62.5 g/L epoxiconazole	1500 g/Ha + 500 mL/Ha											
C(2)	Mancozeb 750 WDG + Cyproconazole 80g/L + Picoxystrobin 200g/L	1500 g/Ha + 300 mL/Ha											
D(2)	Mancozeb 750 WDG + Picoxystrobin 200 g/L + Tebuconazole 80 g/L	1500 g/Ha + 300 mL/Ha											

pyraclostrobin, ... and mixtures thereof.	fungicide were individually used in isolation, but was observed when the two fungicides were used in conjunction. This synergistic complementation between the contact preventive dithiocarbamate fungicide and a systemic fungicide for the treatment and control of Phakopsora species of fungicides was unexpected and surprising. <i>Ex. 1007, p. 24.</i> In another embodiment, the systemic fungicide of the present invention is a succinate dehydrogenase inhibitor fungicide (SDHI). 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. <i>Ex. 1007, p. 15.</i>
2. A fungicidal combination consisting of benzovindiflupyr, mancozeb, an ergosterol biosynthesis inhibitor fungicide, and a quinone outside inhibitor fungicide, wherein the ergosterol biosynthesis inhibitor is selected from azaconazole, bitertanol, bromuconazole, cyproconazole,	<i>See citation of claim 1</i>

difenoconazole, diniconazole, epoxiconazole, etaconazole, ... tebuconazole, ... and mixtures thereof; and wherein the quinone outside inhibitor fungicide is selected from azoxystrobin, coumoxystrobin, enoxastrobin, flufenoxystrobin, picoxystrobin, pyraoxystrobin, mandestrobin, pyraclostrobin, ... and mixtures thereof.	
3. The combination as claimed in claim 1, wherein the at least another fungicide is cyproconazole, difenoconazole, epoxiconazole, hexaconazole, hexaconazole,³ tebuconazole, tetraconazole, prothioconazole, azoxystrobin, picoxystrobin, pyraclostrobin, kresoxim- methyl, trifloxystrobin, or a combination thereof.	<i>See citation of claim 1</i>
4. The combination as claimed in claim 1, wherein the at least another fungicide is prothioconazole and/or azoxystrobin.	<i>See citation of claim 1</i>
5. A composition consisting of:	In an embodiment, the present invention thus provides a composition comprising any of the

³ Duplicate term in claim.

at least one agrochemically acceptable excipient; and a fungicidal combination of: (a) benzovindiflupyr; (b) mancozeb; and (c) at least one ergosterol biosynthesis inhibitor and/or at least one quinone outside inhibitor; wherein the ergosterol biosynthesis inhibitor is selected from azaconazole, bitertanol, bromuconazole, cyproconazole, difenoconazole, diniconazole, epoxiconazole, ... tebuconazole, ... and mixtures thereof; and wherein the quinone outside inhibitor fungicide is selected from azoxystrobin, coumoxystrobin, enoxastrobin, flufenoxystrobin, picoxystrobin, pyraoxystrobin, mandestrobin, pyraclostrobin, ... and mixtures thereof.	fungicidal combinations such as herein described along with agriculturally acceptable excipients. Ex. 1007, p. 23. <table><tr><td>A(2)</td><td>Mancozeb 750 WDG + 200 g/L azoxystrobin + 80 g/L cyproconazole</td><td>1500 g/Ha + 300 mL/Ha</td></tr><tr><td>B(2)</td><td>Mancozeb 750 WDG + 85 g/L pyraclostrobin + 62.5 g/L epoxiconazole</td><td>1500 g/Ha + 500 mL/Ha</td></tr><tr><td>C(2)</td><td>Mancozeb 750 WDG + Cyproconazole 80g/L+ Picoxystrobin 200g/L</td><td>1500 g/Ha + 300 mL/Ha</td></tr><tr><td>D(2)</td><td>Mancozeb 750 WDG + Picoxystrobin 200 g/L + Tebuconazole 80 g/L</td><td>1500 g/Ha + 300 mL/Ha</td></tr></table> Ex. 1007, p. 24.	A(2)	Mancozeb 750 WDG + 200 g/L azoxystrobin + 80 g/L cyproconazole	1500 g/Ha + 300 mL/Ha	B(2)	Mancozeb 750 WDG + 85 g/L pyraclostrobin + 62.5 g/L epoxiconazole	1500 g/Ha + 500 mL/Ha	C(2)	Mancozeb 750 WDG + Cyproconazole 80g/L+ Picoxystrobin 200g/L	1500 g/Ha + 300 mL/Ha	D(2)	Mancozeb 750 WDG + Picoxystrobin 200 g/L + Tebuconazole 80 g/L	1500 g/Ha + 300 mL/Ha
A(2)	Mancozeb 750 WDG + 200 g/L azoxystrobin + 80 g/L cyproconazole	1500 g/Ha + 300 mL/Ha											
B(2)	Mancozeb 750 WDG + 85 g/L pyraclostrobin + 62.5 g/L epoxiconazole	1500 g/Ha + 500 mL/Ha											
C(2)	Mancozeb 750 WDG + Cyproconazole 80g/L+ Picoxystrobin 200g/L	1500 g/Ha + 300 mL/Ha											
D(2)	Mancozeb 750 WDG + Picoxystrobin 200 g/L + Tebuconazole 80 g/L	1500 g/Ha + 300 mL/Ha											
6. The composition as claimed in claim 5, wherein the composition is formulated into wettable powders, granules, dusts, soluble (liquid) concentrates, suspension concentrates, oil in water	In an embodiment, the fungicides or the combinations thereof contemplated according to the present invention may be pre-formulated and may be in the form of Water Dispersible Granules (WDG), Wettable Powders, Suspension Concentrates, Emulsifiable Concentrate, Suspoemulsions,												

emulsion, water in oil emulsion, <u>emulsifiable concentrates</u>, capsule suspensions, a combination of a suspension concentrate (SC) and a capsule suspension (CS), or oil dispersions.	<u>Capsule Suspensions</u> etc. However, the choice of any preferred formulation type is not particularly limiting. <i>Ex. 1007, p. 22.</i>
7. The combination as claimed in claim 1, wherein the benzovindiflupyr and mancozeb are admixed in ratio of 1:80 to 80:1.	In an embodiment, the dithiocarbamate may be applied in an effective amount so as to act as a synergist to the systemic fungicides of the present invention. However, <u>the appropriate amounts of the fungicides used in the present invention, whether multi-site contact fungicides or systemic fungicides, is not particularly limiting and may be conveniently chosen by a skilled artisan.</u> <i>Ex. 1007, p. 22.</i> The method of control of the present invention may be carried out by spraying the suggested tank mixes, or the individual fungicides may be formulated as a kit-of-parts containing various components that may be mixed as instructed prior to spraying. <i>Ex. 1007, p. 22.</i>
8. The composition as claimed in claim 5, wherein the total amount of benzovindiflupyr in the composition is in the range of 0.1 to 99% by weight, the total amount of mancozeb in the composition is in the range of 0.1 to 99% by weight; the total amount of ergostrol biosynthesis inhibitor in the composition is in the range of	<i>See citation of claim 7</i>

0.1 to 99% by weight; and the total amount of quinone outside inhibitor in the composition is in the range of 0.1 to 99% by weight.	
9. A method of foliar application, consisting of <u>applying the combination of claim 1 to the foliage of a plant.</u>	It has surprisingly been found that the use of a contact protective dithiocarbamate fungicide along with at least one systemic fungicide <u>effectively penetrates the dense canopy barrier of the infected leguminous plant while simultaneously not allowing the rust pathogen to move up the plant foliage.</u> Without wishing to be bound by theory, it is believed that the <u>contact protective dithiocarbamate fungicide component of the combination effectively penetrates the dense plant foliage, while the systemic fungicide component effectively prevents the rust pathogen from infecting the remaining portion of the plant effectively reducing the susceptibility of the plant towards the infection.</u> This synergistic complementation was not seen when either the foliar protective fungicide or the systemic fungicide were individually used in isolation, but was observed when the two fungicides were used in conjunction. This synergistic complementation between the contact preventive dithiocarbamate fungicide and a systemic fungicide for the treatment and control of Phakopsora species of fungicides was unexpected and surprising. <i>Ex. 1007, p. 7.</i> The method of control of the present invention may be carried out by spraying the suggested tank mixes, or the individual fungicides may be formulated as a kit-of-parts containing

	various components that may be mixed as instructed prior to spraying. <i>Ex. 1007, p. 22.</i>
10. <u>A method of controlling fungal diseases in plants</u> consisting of, applying to the <u>locus</u> of the plant a combination consisting of: (a) benzovindiflupyr; (b) at least one quinone outside inhibitor and/or at least one ergosterol biosynthesis inhibitor; and (c) mancozeb, wherein the ergosterol biosynthesis inhibitor is selected from azaconazole, bitertanol, bromuconazole, cyproconazole, difenoconazole, diniconazole, epoxiconazole, etaconazole, fenbuconazole, ... tebuconazole, ... and mixtures thereof; and wherein the quinone outside inhibitor fungicide is selected from azoxystrobin, coumoxystrobin, enoxastrobin, flufenoxystrobin, picoxystrobin, pyraoxystrobin, mandestrobin,	The present invention relates to a method for the prevention and/or treatment of phytopathogenic fungi. <i>Ex. 1007, p. 1.</i>

pyraclostrobin, ... and mixtures thereof.	
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D. Patentee's Results are not Unexpected and do not Overcome Obviousness

During prosecution of the '727, UPL successfully overcame the Examiner's §103 rejection not only by amending the claims to recite "consisting of" as the transitional phrase, but also by arguing:

"[the prior art did not teach] technical effects achieved by the claimed combinations, i.e., an enhancement of the efficacy, **and a surprising reduction** in fungal disease incidence **when mancozeb is added** to the claimed combinations."

Consistent with the MPEP, the Examiner was then required to "consider evidence supporting the patentability of the claimed invention, such as in the specification or any other evidence submitted by the Applicant." M.P.E.P. § 2142. As UPL did not submit additional evidence, the Examiner would have only had the disclosure and data provided in the specification to rely on. Ex. 1001, 20:37-21:10 (Tables 1 and 2).

In the specification, UPL introduced their Examples by pointing out that:

[a]s will be demonstrated in the examples, the **addition of a dithiocarbamate fungicide** to a combination of **succinate dehydrogenase inhibitors** which are combined with Quinone outside inhibitors and/or ergosterol biosynthesis inhibitors, ... and **demonstrated a**

synergistic effect.

Ex. 1001, 20:4-13. The '727 specification presents the data in Tables 1 and 2 as shown above in V.A.1.

In discussing the results presented in Tables 1 and 2, the patent states: “[i]t was thus concluded that the **addition of mancozeb enhanced efficacy** of the combination **and surprisingly gave a synergistic effect.**” Ex. 1001, 21:19-21.

This statement by UPL was at odds with a number of critical points in their attempt to demonstrate inventiveness: 1) it was not unexpected that the addition of mancozeb would improve disease control of a mixture of fungicides (Ex. 1003, ¶ 87); and 2) nothing in the specification allows a POSA to determine if enhanced efficacy or synergy was actually observed or present (Ex. 1003, ¶ 61-65).

1. As early as 2010, Mancozeb was the “go-to” Fungicide to Add to a Mixture to Improve Disease Control or Efficacy.

It was well known in the art and expected that the addition of a multisite fungicide such as mancozeb would result in an increase in disease control. Ex. 1003, ¶ 87; Ex. 1010, p. 7; and *See* Ex. 1005.

In particular, a 2010 review article by Maria Gullino, noted that mancozeb “plays a significant role in the world fungicide market.” Ex. 1010. The article highlights and discusses “a number of key attributes” of mancozeb:

1) it has a direct effect on “core biochemical processes within the fungus;”

- 2) it works well as a multi-site protectant-only fungicide (it remains on the leaf surface and does not penetrate, thus no systemic redistribution within the plant;
- 3) it has an “excellent record of crop safety over a wide range of crops and environmental conditions;”
- 4) it has no curative effect if disease is already present; and
- 5) it is stable.

Ex. 1010, p. 1078-1080; Ex. 1003, ¶ 85.

The article then details and discusses the use of mancozeb “as a key tool in resistance management.” Ex. 1010, p. 1081.

The need for resistance management in Brazilian crops was recognized by UPL inventor De Oliveira in a declaration he submitted for an earlier UPL patent. Ex. 1021, ¶ 12-13. In that declaration, UPL inventor De Oliveira detailed the “clear trend towards decreasing efficacy in controlling soybean rust severity or increasing yield” between seasons. Ex. 1021, ¶¶ 12-20. After referring to numerous studies demonstrating the trend, he concluded that there was a need for “resistance management of fungicidal combinations” and noted that “different approaches to maintain efficacy of the systemic fungicides were undertaken.” Ex. 1021, ¶¶ 19-20.

One of the many studies he referred to was the Godoy September 2016,

publication wherein trials #17 and #23 utilizing mancozeb with benzovindiflupyr and azoxystrobin demonstrated some of the highest percent disease control. Ex. 2021; Ex. 1005, Table 5. Consistent with what a POSA would expect—an improvement in disease control as discussed in the Gulluno review article. Ex. 1003, ¶ 87.

The Gullino mancozeb review article clearly notes that:

mixtures of fungicides that combine a high resistance risk with a low risk multi-site compound or another single-site fungicide that is not cross-resistant to its mixing partner are a common response to this problem ... mancozeb's role as a key tool within resistance management strategies is firmly grounded on the intrinsically low resistance risk of the molecule itself.

Ex. 1010, p. 1081 . The article concludes “the agrochemical industry has yet to develop another product with the combination of properties (i.e., efficacy, broad-spectrum, crop safety, low resistance risk, and low cost) that make mancozeb so successful.” *Id.* As such, it would have been obvious to a POSA to add mancozeb to a mixture of fungicides. Ex. 1003, ¶ 87.

2. Synergy Cannot be Determined From the Data in the '727 Patent by a POSA.

As to the second point regarding UPL's representation of synergy, from even a cursory review of the data presented in Tables 1 and 2, a POSA would find it impossible to conclude that synergy resulted from the addition of mancozeb to

any of the compositions, for at least the simple fact that no data is presented for disease control percent for any of the active ingredients alone. Ex. 1003, ¶¶ 65-66, 254-258.

Synergy in the agrochemical arts is shown using the Colby formula, as provided below.

A synergistic effect exists whenever the action of an active ingredient combination is greater than the sum of the actions of the individual components. The action to be expected E for a given active ingredient combination obeys the so-called COLBY formula and can be calculated as follows (COLBY, S. R. "Calculating synergistic and antagonistic responses of herbicide combination". Weeds, Vol. 15, pages 20-22; 1967):

ppm=milligrams of active ingredient (=a.i.)
per liter of spray mixture

X=% action by active ingredient A) using p
ppm of active ingredient

Y=% action by active ingredient B) using q
ppm of active ingredient.

According to COLBY, the expected (additive) action of active ingredient A+B) using p+q ppm of active ingredient is

$$E = X + Y - \frac{X \cdot Y}{100}$$

If the action actually observed (O) is greater than the expected action (E), then the action of the combination is super-additive, i.e. there is a synergistic effect. In mathematical terms, synergism corresponds to a positive value for the difference of (O-E). In the case of purely complementary addition of activities (expected activity), said difference (O-E) is zero. A negative value of said

difference (O-E) signals a loss of activity compared to the expected activity.

Ex. 1006, 34:52-35:13; Ex. 1012. Colby requires determination of the percentage disease control for each active ingredient so as to predict or calculate the expected action “E” for synergy to be observed.

Despite being aware of and using the Colby formula, the Patentee did not provide any evidence of having used it to determine synergy in the ’727 patent.

Not only does the UPL patent not provide data of percent disease control in the ’727 for the active fungicide ingredients alone as required by the Colby formula, but it also does not provide the necessary reference number for “the expected combined action of ingredients “E” which the final composition must exceed in order for there to be synergy demonstrated. Ex. 1003, ¶ 50. The patent does not support the claimed “technical effects achieved by the claimed combinations “ Ex. 1003, ¶ 65-66, 254-258.

E. Ground 4: Claims 1-10 Are Invalid Under the Written Description Requirement of 35 U.S.C. § 112(a)

1. Patentable Distinction Argued Not in Claims

The claimed compositions have three or more fungicides in them. Each fungicide is known in the prior art; as such, the claims are directed to known ingredients which were previously used effectively as fungicides in the art. *See* Ex. 1005; Ex. 1006.

As discussed in Section VIII.D above, UPL distinguished its claims from the prior art by arguing the prior art did not teach “the technical effects achieved by the claimed combinations, i.e., an enhancement of the efficacy, and a surprising reduction in fungal disease incidence when mancozeb is added to the claimed combinations.” Therefore, the Examiner necessarily relied on the data and tests presented in Tables 1 and 2 of the specification. M.P.E.P. §2142. As such, the patent is not directed at the combination of fungicidal ingredients, but rather to the alleged synergistic interaction between them.

Although UPL unequivocally utilized their “unexpected .. synergy” to overcome the Examiner’s obviousness rejection, they did not add this patentable distinction to their claims. As a result, the claims are invalid for lack of written description under 35 U.S.C. §112(a).

Section 112(a) requires that a patent specification

shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, ...

When UPL argued their “enhanced efficacy and ... synergy” to the Examiner to rebut obviousness, they were attempting to distinguish their claims from the prior art. In order to do so, their evidence should have at least

demonstrated “an effect greater than the sum of the several effects taken separately.” *Merck & Co., Inc. v. Biocraft Labs., Inc.*, 874 F.2d 804, 808 (Fed. Cir. 1989) *quoting Sakraida v. Ag Pro, Inc.*, 425 U.S. 273, 282 (1976). As previously discussed, it is impossible for a POSA to determine if there is synergy based on the material presented by UPL in Tables 1 or 2. Ex. 1003, ¶¶ 65-66, 254-258. As the Federal Circuit explained, the relevant “inquiry is whether one of skill in the art would understand the specification itself to disclose [the invention], not simply whether that person would be capable of implementing [it].” *Biomedino, LLC v. Waters Techs. Corp.*, 490 F.3d 946, 953 (Fed. Cir. 2007).

Without data or evidence of the alleged synergy, the patent and claims are nothing more than a wish, hope, or conclusory assertion that their “invention” works. This is insufficient to support patentability under 35 U.S.C. §112(a). *Juno Therapeutics, Inc. v. Kite Pharma, Inc.*, 10 F.4th 1330, 1335 (Fed. Cir. 2021). The patentee has not presented any evidence that would allow a POSA to recognize that the claimed combinations would result in the defined utility of synergy.

This requirement exists not only for the purpose of allowing a POSA to understand the invention, but also to show that the inventors actually invented the invention claimed. *Ariad Pharm., Inc. v. Eli Lilly & Co.*, 598 F.3d 1336, 1351 (Fed. Cir. 2010) (en banc). “The purpose of the written description requirement is

to ensure that the scope of the right to exclude, as set forth in the claims, does not overreach the scope of the inventor's contribution to the field of art as described in the patent specification." *Id.* at 1352.

This requirement is consistent with the policy that when one relies on "unexpected results" for claimed compositions, it must be shown that the results are "much greater than would have been predicted" and that the results were "unexpected to a significant degree beyond what was already known about the effect of combining [the components]." *Millennium Pharmaceuticals, Inc. v. Sandoz Inc.*, 862 F.3d 1356, 1368 (Fed. Cir. 2017); *Merck & Co. v. Biocraft Labs., Inc.*, 874 F.2d 804, 808 (Fed. Cir. 1989) ("to show that the cooling effect of the combination of [two components] was unexpected, [the patent owner] needed to demonstrate that the results were unexpected to a significant degree beyond what was already known about the effect of combining [the components].") As discussed above, enhanced efficacy and synergy is highly unpredictable. *See* Ex. 1003, ¶¶254-257. As evidenced by data submitted by Petitioner, it is clear the tests set forth in the '727 patent by UPL cannot be reproduced. *See* Ex. 1020; Ex. 1003 ¶258. Therefore, the disclosure is insufficient to support written description.

F. Ground 5: Claims 1-10 Lack Enablement Under 35 U.S.C. § 112(a)

35 U.S.C. §112(a) requires a patent to describe the invention "in such full,

clear, concise and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same.” *Id.* To satisfy the enablement requirement, a patent specification must teach those skilled in the art at the time of the invention how to make and use the full scope of the claims without undue experimentation. *In re Wands*, 858 F.2d 731, 736-37 (Fed. Cir. 1988). In deciding whether a Person of ordinary skill in the art would have to experiment unduly to make and use the invention, several factors may be considered, including (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 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. *Id.*

Here, one fact which weighs highly in favor of a lack of enabled is that the data presented in the '727 patent is unclear as it confusingly refers to g/ml/ha. Furthermore, the data fails to provide sufficient examples allowing one to predict the impact of a different ratio of fungicides. This is particularly highlighted in view of the fact that when Petitioner attempted to reproduce the data they were unable to do so.

The enablement requirement prevents patentees from claiming more than

was actually invented. By seeking “broad claim language,” a patentee puts itself “at the peril of losing any claim that cannot be enabled across its full scope of coverage.” *Magsil Corp. v. Hitachi Global Storage Technologies, Inc.*, 687 F.3d 1377, 1384 (Fed. Cir. 2012). A patent that fails to explain how to make and use the full scope of its claims is invalid. *Id.*

The ’727 Patent fails to enable the full use of the scope of claims 1-10 as “fungicidal combinations providing ... enhanced efficacy and synergy” as represented by UPL. Although the patent generally uses the term “combination of fungicide,” the only utility specifically referred to by the Patentee was the “enhanced efficacy of the combination and ... synergistic effect.” Ex. 1001, 21:19-21. Although the claims do not recite a specific use, “the how to use prong of §112 incorporates as a matter of law the requirement of 35 U.S.C. §101 that the specification disclose as a matter of fact a practical utility for the invention.” *In re Ziegler*, 992 F.2d 1197, 1200-01 (Fed. Cir. 1993).

While the ’727 Patent mentions in passing that “enhanced greening” and “late senescence” may be potential uses of the claimed combinations (Ex. 1001, 2:12-17), it fails to provide any data to support the use of any of the combinations as such. Such uses would not be enabled for the breadth of the claims for the same reasons that “enhanced efficacy and synergy” is not enabled over the scope of the

claim.

As discussed above, the Patentee stressed and relied on this alleged patentable distinction and utility to support patentability. Ex. 1002, p. 138. Although the patent contains certain experiments which purport to show “synergistic effect”, such experimental support is severely limited, to at best, two examples. The support is limited to only two examples because in addition to arguing the “enhanced efficacy and synergistic combination” UPL also amended the claims from “comprising” to “consisting of.”

The amendment from “comprising” to “consisting of” operated to remove from the claims any combination containing isopyrazam or penthiopyrad. It is noteworthy that the two excluded compounds are two of the four presented as preferred examples (Tables 1 and 2). *See* Ex. 1001, 20:37-21:10. These two disclaimed compositions represent 50% of the combinations for which biological/field experiments were presented.

This disclaimer operated to remove from the claim a significant portion of the combinations having data, leaving only two, biological examples relevant to the subject matter claimed. Other than these two biological examples provided (utilizing the same ratio of components), the patent provides no other teaching to support the unlimited range to effectuate the alleged “enhanced efficacy and

synergy” asserted for patentability. Even assuming *arguendo* the data presented is accurate, this single limited ratio simply cannot support synergy and enhanced efficacy over the unbounded claim. Ex. 1003, ¶¶ 255-256.

1. Patentee’s Data is Not Reproducible/Petitioner is Unable to Reproduce Alleged Synergy

Petitioner’s data, presented in Exhibit 1020 and discussed in the Declaration of Caio Prates (Fungicides Technical Manager) duplicates one of the two combinations, presented in Table 1 of the ’727 patent to support the “synergistic effect.” *See* Ex. 1020.

The test data provided by Syngenta, which is summarized below, shows that the ratio disclosed by UPL does not result in synergy. *See* Ex. 1020, ¶14. Syngenta also attempted to observe synergy as alleged by UPL using different amounts of the tested fungicides; however, once again, synergy was not observed. *See Id.* Notably, both variations in amount of fungicide tested by Syngenta falls within the scope of claims 1-10. These field tests were repeated over the course of two planting seasons, 2020/2021 and 2021/2022. This inability to reproduce the UPL data demonstrates that the claims are not enabled over their unbounded scope, if at all. Ex. 1020, ¶¶ 8, 12, 14 (Tables 3 and 6); Ex. 1003, ¶ 258.

In summary, the biological data presented in Tables 1 and 2 as support for claims 1-10 fails to: 1) describe a ratio other than the single one used; 2) provide

disease control data for each a.i.; 3) provide any formula or reference to one used to calculate synergy; or even 4) provide value for expected disease control percent from formula to observe synergy.

CONCLUSION

Petitioner respectfully requests that the Board institute a Post-Grant Review of claims 1-10 on the grounds set forth above.

Date: January 31, 2023

Respectfully submitted,

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CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. § 42.6(e), I hereby certify that on January 31, 2023, a copy of the foregoing PETITION FOR POST-GRANT REVIEW was provided via UPS Next Day Air to the Patent Owner by serving the correspondence address of record for the '727 Patent:

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Date: January 31, 2023

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CERTIFICATION OF WORD COUNT

The undersigned hereby certifies that the portions of the above-captioned PETITION FOR POST-GRANT REVIEW has 14,501 words, in compliance with the 18,700 word limit set forth in 37 C.F.R. § 42.24, according to the word processing system used to prepare this response, excluding the parts of this response that are exempted by 37 C.F.R. § 42.24(a) (including the table of contents, table of authorities, mandatory notices, a certificate of service and this certificate of word count, appendix of exhibits, and claims listings)

Date: January 31, 2023

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