

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To:

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PCT

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY (PCT Rule 43bis.1)

Date of mailing
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.
PCT/EP2024/050015

International filing date (day/month/year)
02.01.2024

Priority date (day/month/year)
05.01.2023

International Patent Classification (IPC) or both national classification and IPC
INV. A01N35/06 A01N37/06 A01N47/06 A01P13/00

Applicant
SYNGENTA CROP PROTECTION AG

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement
- ☒ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☒ Box No. VIII Certain observations on the international application

2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

Name and mailing address of the ISA:



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Date of completion of
this opinion

see form
PCT/ISA/210

Authorized Officer

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Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of:
- ☒ the international application in the language in which it was filed.
 - ☐ a translation of the international application into , which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1 (b)).
2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43bis.1(a))
3. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing:
- a. ☐ forming part of the international application as filed.
 - b. ☐ furnished subsequent to the international filing date for the purposes of international search (Rule 13ter.1(a)),
 - ☐ accompanied by a statement to the effect that the sequence listing does not go beyond the disclosure in the international application as filed.
4. ☐ With regard to any nucleotide and/or amino acid sequence disclosed in the international application, this opinion has been established to the extent that a meaningful opinion could be formed without a WIPO Standard ST.26 compliant sequence listing.
5. Additional comments:

Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement
- | | | |
|-------------------------------|-------------|-------------|
| Novelty (N) | Yes: Claims | <u>1-15</u> |
| | No: Claims | |
| Inventive step (IS) | Yes: Claims | |
| | No: Claims | <u>1-15</u> |
| Industrial applicability (IA) | Yes: Claims | <u>1-15</u> |
| | No: Claims | |
2. Citations and explanations
- see separate sheet**

Box No. VI Certain documents cited

1. Certain published documents (Rules 43*bis*.1 and 70.10)
and / or
2. Non-written disclosures (Rules 43*bis*.1 and 70.9)
see form 210

Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

Reference is made to the following documents; the numbering will be adhered to in the rest of the procedure.

- D1 WO 2015/197468 A1 (SYNGENTA PARTICIPATIONS AG [CH]) 30 December 2015 (2015-12-30)
- D2 WO 2023/280701 A1 (SYNGENTA CROP PROTECTION AG [CH]) 12 January 2023 (2023-01-12)
- D3 WO 2023/280702 A1 (SYNGENTA CROP PROTECTION AG [CH]) 12 January 2023 (2023-01-12)
- D4 WO 2023/280703 A1 (SYNGENTA CROP PROTECTION AG [CH]) 12 January 2023 (2023-01-12)
- D5 EP 3 954 211 A1 (BASF AGRO BV [NL]) 16 February 2022 (2022-02-16)
- D6 WO 2021/229464 A1 (UPL CORPORATION LTD [MU]; UPL EUROPE LTD [GB]) 18 November 2021 (2021-11-18)
- D7 WO 2018/024906 A1 (RICETEC AG [LI]) 8 February 2018 (2018-02-08)

The present application concerns a method for controlling weeds that are resistant to ACCase-inhibiting herbicides (other than Formula I) by applying Formula (I) at a locus (claim 1) ; the use of Formula (I) to control monocotyledonous weeds that are resistant to an ACCase-inhibiting herbicide other than a compound of formula (I)(claim 15).

Re Item V

Novelty

None of these documents explicitly refers to the use of these compounds in a method for controlling the growth of weeds that are resistant against ACCase inhibitors herbicides.

D1 discloses herbicidally active bicyclic phenyl propynyl dione compounds, including the specific compounds (Ia: page 138, compound A1), (Ib: page 143, compound P1), and (Ic: page 144, compound P7). D1 also teaches the use of such compounds on crops that are tolerant to herbicides, including the ACC-ase inhibitors. On p. 83, l. 15 to 32 is also the list of the grassy weeds that can be interested by resistance. Compounds A1, P1 and P7 are used on *Abutilon*, *Amaranthus*, *Setaria*, *Alopecurus*, *Echinochloa*. Those are known to display resistance. Even though D1 does not explicitly disclose weeds

having the needed mutation to confer ACCase resistance, this event cannot be excluded when compounds Ia, Ib, Ic are applied, because the mutation occurs in nature.

An analogous argumentation concerns **D2** to **D4** which disclose compound Ic in synergistic combinations against weeds, including *Setaria* and *Echinochloa*.

D2 shows the activity of compounds of formula I in combination with ACCase inhibitor herbicides. Clethodim, fluazifop and haloxyfop are used in combination with Ic.

D3 shows the activity of compounds of formula I in combination with halauxifen, triclopyr, florpyrauxyfen. In particular Ic is used in the examples.

D4 shows the activity of compounds of formula I in combination with glyphosate, glufosinate, saflufenacil, diquat. In particular Ic is used in the examples.

D5 shows new compounds to be used on herbicide resistant weeds. In the tables from p. 37 resistant biotype of grass are treated with flufenacet, imazamox or with the claimed herbicide A. Herbicide A exerts a very good herbicidal activity against various biotypes of black grass and ryegrass. Some biotypes are HRAC class A, thus ACCase resistant.

D6 describes the treatment of resistant weeds with a combination of treatment with one type of herbicide and after one week with a second type of herbicide. The first type comprises glyphosate or glufosinate, whereas the second type comprises ACCase inhibitors. Haloxyfop and clethodim are used in the examples. The two treatments need to be performed with herbicides with a different mode of action, according to the claims.

D7 describes rice that is rendered tolerant to herbicides, in particular ACCase inhibitors. Two mechanisms are used: the introduction of a mutation at the site in the protein that is G2096S is one of the methods.

Inventive Step

The present invention is aimed at combating weeds that are resistant against a certain type of herbicides: ACCase-inhibitor herbicides.

The underlying problem thus is the provision of herbicides that can kill ACCase-inhibitors resistant weeds.

The solution to this problem according to present invention, is the method according to claim 1, involving the use of a compound of formula (I).

D5 and **D6** can be considered as being the closest prior art to the subject matter of claim 1: they disclose method of controlling ACCase inhibitor resistant weeds. **D5** shows

new uses of compounds of known formula A and **D6** suggests to combine ACCase inhibitors with herbicides with a different mode of action, to be used after a week of time from the application of the first type of herbicides.

Since there is no comparison with the methodology of the prior art, the technical problem is considered as to provide an alternative method for controlling ACCase-inhibitors resistant weeds.

The technical effect has been demonstrated for Ic in *Lolium multiflorum* with six of the known mutations, *Eleusina indica* with six of the known mutations (in some cases more than one mutation at a time) and displaying non target site resistance, *Digitaria sanguinalis* displaying one type of mutation, *Setaria viridis* displaying three types of mutations. In the case of Voulonteer corn the effect has been observed for around one month after. Comparative data were provided against clethodim. Further comparative data were provided in *Lolium*, for five mutations and in the case of non-target-site resistance for Ic compared to clodinafop, cycloxydim and pinoxaden.

The technical effect has not been demonstrated over the whole scope. The technical effect has been provided only for Ic (metproxybicyclon) which is put in relation with triketones such as benzobicyclon or bicyclopyron, that are HPPO inhibitors.

The problem to be solved is considered to provide an alternative method for controlling ACCase-inhibitors resistant weeds.

Since the compounds of formula I are not known as ACCase inhibitors and since this is suggested for the more general formula of **D1**, it would be obvious to try to use a herbicide with a different mode of action on weeds resistant to herbicides that are ACCase inhibitor.

For a method according to claim 7 in combination with claim 3 an inventive step could be acknowledged. See also item VIII for issues related with clarity of independent method/use claims 1 and 15.

Industrial Applicability

Claims 1 to 15 are considered as industrially applicable.

Re Item VI

Certain Documents

Documents **D2** to **D4** have been published after the priority date of the present application but before its filing date. In some jurisdictions **D2** to **D4** can be considered as prior art for the assessment of novelty since **D2** to **D4** were filed on the 01.07.2022.

Re Item VIII

Clarity

The attention of the applicant is drawn to the fact that "controlling weeds that are resistant to ACCase-inhibiting herbicides" does not reveal any clear limitation and thus the scope of claims 1 to 15 is merely defined as the use of a compound of formula I or controlling the growth of monocotyledonous weeds. A functional limitation should be introduced in the claims: the mutation involved and the mechanism.

Single point mutation sites have been identified within ACCase that confer resistance (see p. 3, I. 30-34). Different weeds display a different origin for the resistance to the ACCase-inhibiting herbicides, therefore the wording used is considered as unclear.

A mutation at a certain codon in the gene coding for the ACCase enzyme will provide ACCase resistance in some weeds but other weeds will show no ACCase resistance when the mutation is at said positions, because the ACCase gene is variable depending on the weed species and other positions are involved. This is why mentioning a particular nucleotide sequence that is modified and the specific mechanism of interaction with that site would enable a more clear understanding of the process in which the molecule of Formula (I) is used and which is to be protected by the wording of the claims.