

PATENT COOPERATION TREATY

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To:

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ROYAUME UNI

PCT

NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(PCT Rule 71.1)

Date of mailing
(day/month/year)

04.07.2023

Applicant's or agent's file reference
P8399.PC/DMH

IMPORTANT NOTIFICATION

International application No.
PCT/GB2022/050927

International filing date (day/month/year)
13.04.2022

Priority date (day/month/year)
14.04.2021

Applicant
Yara UK Limited

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary report on patentability and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

4. REMINDER

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary report on patentability. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

The applicant's attention is drawn to Article 33(5), which provides that the criteria of novelty, inventive step and industrial applicability described in Article 33(2) to (4) merely serve the purposes of international preliminary examination and that "any Contracting State may apply additional or different criteria for the purposes of deciding whether, in that State, the claimed inventions is patentable or not" (see also Article 27(5)). Such additional criteria may relate, for example, to exemptions from patentability, requirements for enabling disclosure, clarity and support for the claims.

Name and mailing address of the international
preliminary examining authority:



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PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference P8399.PC/DMH	FOR FURTHER ACTION		See Form PCT/IPEA/416
International application No. PCT/GB2022/050927	International filing date (day/month/year) 13.04.2022	Priority date (day/month/year) 14.04.2021	
International Patent Classification (IPC) or national classification and IPC INV. A01N57/16			
Applicant Yara UK Limited			
1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36. 2. This REPORT consists of a total of <u>5</u> sheets, including this cover sheet. 3. This report is also accompanied by ANNEXES, comprising: a. ☒ (sent to the applicant and to the International Bureau) a total of <u>6</u> sheets, as follows: ☒ sheets of the description, claims and/or drawings which have been amended and/or sheets containing rectifications authorized by this Authority, unless those sheets were superseded or cancelled, and any accompanying letters (see Rules 46.5, 66.8, 70.16, 91.2, and Section 607 of the Administrative Instructions). ☐ sheets containing rectifications, where the decision was made by this Authority not to take them into account because they were not authorized by or notified to this Authority at the time when this Authority began to draw up this report, and any accompanying letters (Rules 66.4bis, 70.2(e), 70.16 and 91.2). ☐ superseded sheets and any accompanying letters, where this Authority either considers that the superseding sheets contain an amendment that goes beyond the disclosure in the international application as filed, or the superseding sheets were not accompanied by a letter indicating the basis for the amendments in the application as filed, as indicated in item 4 of Box No. I and the Supplemental Box (see Rule 70.16(b)). b. ☐ (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing, in the form of an Annex C/ST.25 text file, as indicated in the Supplemental Box Relating to Sequence Listing (see paragraph 3ter of Annex C of the Administrative Instructions).			
4. This report contains indications relating to the following items: ☒ Box No. I Basis of the report ☐ 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 Article 35(2) with regard to novelty, inventive step or 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			
Date of submission of the demand 22.12.2022		Date of completion of this report 04.07.2023	
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Fax: +49 89 2399 - 4465		Authorized officer Bertrand, Franck Telephone No. +49 89 2399-8606	



INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/GB2022/050927

Box No. I Basis of the report

1. With regard to the **language**, this report is based on
- ☒ 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 (under Rules 12.3(a) and 23.1(b))
 - ☐ publication of the international application (under Rule 12.4(a))
 - ☐ international preliminary examination (under Rules 55.2(a) and/or 55.3(a) and (b))
2. With regard to the **elements*** of the international application, this report is based on (*replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report*):

Description, Pages

1-14 as originally filed

Claims, Numbers

1-18 filed in electronic form on

22-12-2022

- ☐ a sequence listing - see Supplemental Box Relating to Sequence Listing.
3. ☐ The amendments have resulted in the cancellation of:
- ☐ the description, pages
 - ☐ the claims, Nos.
 - ☐ the drawings, sheets/figs
 - ☐ the sequence listing (*specify*):
4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since either they are considered to go beyond the disclosure as filed, or they were not accompanied by a letter indicating the basis for the amendments in the application as filed, as indicated in the Supplemental Box (Rules 70.2(c) and (c-bis)):
- ☐ the description, pages
 - ☐ the claims, Nos.
 - ☐ the drawings, sheets/figs
 - ☐ the sequence listing (*specify*):
5. ☐ This report has been established:
- ☐ taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rules 66.1(d-bis) and 70.2(e)).
 - ☐ without taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rules 66.4bis and 70.2(e)).

**INTERNATIONAL PRELIMINARY REPORT
ON PATENTABILITY**

International application No.
PCT/GB2022/050927

6. ☒ With regard to top-up searches (Rules 66.1 *ter* and 70.2(f)):
- ☒ A top-up search was carried out by this Authority on 27.01.2023 (all discovered documents are listed in the Supplemental Box Relating to Top-up Search).
 - ☐ Additional relevant documents have been discovered during the top-up search.
 - ☐ No top-up search was carried out by this Authority because it would serve no useful purpose.
7. ☐ Supplementary international search report(s) from Authority(ies) has/have been received and taken into account in establishing this report (Rule 45bis.8(b) and (c)).

* If item 4 applies, some or all of those sheets may be marked "superseded".

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	<u>1-18</u>
	No: Claims	
Inventive step (IS)	Yes: Claims	<u>18</u>
	No: Claims	<u>1-17</u>
Industrial applicability (IA)	Yes: Claims	<u>1-18</u>
	No: Claims	

2. Citations and explanations (Rule 70.7):

see separate sheet

Re Item I

Basis of the report

Reference is made to the following documents:

- D1 WO 2020/245586 A1 (YARA UK LTD [GB]) 10 December 2020
- D2 SHCHERBAKOVA E N ET AL: "Combined pre-seed treatment with microbial inoculants and Mo nanoparticles changes composition of root exudates and rhizosphere microbiome structure of chickpea (*Cicer arietinum* L.) plants", SYMBIOSIS, vol. 73, no. 1, 4 January 2017, pages 57-69, XP036312703
- D3 WO 2017/116846 A1 (NOVOZYMES BIOAG AS [DK]; MONSANTO TECHNOLOGY LLC [US]) 6 July 2017
- D4 JP 2013 121901 A (YAMAGUCHI FUKUKO) 20 June 2013
- D5 Donovan P. Kelly ET AL: "Cultivation of Methylophs" In: "SPRINGER PROTOCOLS HANDBOOKS - PATCH CLAMP TECHNIQUES:FROM BEGINNING TO ADVANCED PROTOCOLS 2012 HUMANA PRESS USA", 1 January 2014, XP055566419, pages 197-229

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

The present invention is based upon the finding that cobalamin, molybdenum and some dicarboxylates promote the nodule formation of rhizobia.

D2 does not mention any cobalamin nor any seed dressing.

D3-D5 mention the relevant compounds in relation with rhizobia development, but never in unambiguous combination with each other.

D1 is the closest prior art as having the same purpose and differing only in the acids used.

Therefore, the subject-matter of the present claims 1-18 is considered new (Art.33(2) PCT).

In view of the comparison provided in example 1 involving compositions with and without malic acid (in addition to lactate, propionate and benzoate), an improvement has been shown by the addition of malic acid. This was not expected from the cited prior art. Therefore, the subject-matter of the present claim 18 is considered to involve an inventive step (Art.33(3) PCT).

No comparison was provided for the other claimed acids. Therefore, no improvement over the very closest prior art was made plausible across the entire ambit of the present claims 1-17 and the technical problem is to be seen in the provision of alternative compositions containing cobalamin, molybdenum and an acid to promote the nodule formation of rhizobia.

NB: although the claimed acids are all diacids in contrast to the acids according to D1, they do not substantially differ structurally from those, being relatively small carboxylates, optionally hydroxylated. This difference is comparable in importance with the variability allowed within the presently claimed group of acids. Hence, if the structural difference over D1 is sufficient to cause a surprising effect, the same level of difference within the claimed group of acids must be held sufficient to cast a doubt on the validity of the generalization claimed.

Since the claimed acids are known to be beneficial in the development of rhizobia, the skilled artisan would have contemplated using them with a reasonable expectation of rhizobia stimulation.

Further, it was not shown to which extent the additional technical features of the dependent claims cause any unexpected effect.

Therefore, the subject-matter of the present claims 1-17 is considered not to involve an inventive step (Art.33(3) PCT).



Dummett Copp LLP

PATENT & TRADE MARK ATTORNEYS

European Patent Office
D-80298 Munich
GERMANY

BY ONLINE FILING

17 March 2023
Our ref: P8399.PC/DMH

PCT CHAPTER II

Dear Sir or Madam,

International Patent Application No. PCT/GB2022/050927

In the name of Yara UK Limited

Subject: Seed Coating Composition Comprising An Organic Acid

We refer to the Written Opinion dated 2 February 2023.

A telephone consultation with the Examiner is requested, pursuant to Art. 34(2) EPC and Rule 66.6 PCT.

We would like to discuss the following points in particular.

Comparison against the closest prior art

In the Written Opinion, it is stated that no comparison is provided between the invention and the closest prior art.

As noted in our comments accompanying the Demand, Table 1 of the present application (page 14) compares the effect of a composition representative of D1 (line 3: "example 1 without malic acid", which is accordingly very similar to the examples disclosed in D1), and two compositions according to the present claim 1 (lines 4 and 5), and shows that the addition of malic acid to such a composition significantly increases the nodule counts in soybean plants.

Inventive step of Claim 18

While we maintain that it is reasonable to expect that all of the acids listed in claim 1 can be expected to provide a similar technical effect to

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malic acid; Claim 18 is directed specifically to the case where the compound is malic acid.

The technical effect of increased nodule count resulting from the addition of malic acid to a prior art liquid composition comprising from 10 to 250 g/L of molybdenum and 0.001 to 0.1 weight% of a vitamin B12, but lacking malic acid – and therefore in accordance with the prior art D1 – is clearly demonstrated in the present application, as noted above. For the reasons already outlined in the comments accompanying the Demand, such an addition would not be obvious based on the cited art. It is therefore anticipated that a positive indication of patentability of at least Claim 18 could be provided.

Final remarks

The undersigned representative may be contacted by telephone or email (dholmes@dummett.com) to make arrangements for the telephone consultation.

Yours faithfully

Derek Holmes
European Patent Attorney
Authorised Representative



Dummett Copp LLP

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BY ONLINE FILING

31 March 2023
Our ref: P8399.PC/DMH

PCT CHAPTER II

Dear Sir or Madam,

International Patent Application No. PCT/GB2022/050927

In the name of Yara UK Limited

Subject: Seed Coating Composition Comprising An Organic Acid

We refer to the Written Opinion dated 2 February 2023 and our letter of 17 March 2023.

The request for a telephone consultation with the Examiner is maintained, pursuant to Art. 34(2) EPC and Rule 66.6 PCT.

A telephone consultation has not yet been arranged, so in view of the due date for responding, the following comments are to be taken as our response to the Written Opinion dated 2 February 2023.

Comparison against the closest prior art

In the Written Opinion, it is stated that no comparison is provided between the invention and the closest prior art.

As noted in our comments accompanying the Demand, Table 1 of the present application (page 14) compares the effect of a composition representative of D1 (line 3: "example 1 without malic acid", which is accordingly very similar to the examples disclosed in D1), and two compositions according to the present claim 1 (lines 4 and 5), and shows that the addition of malic acid to such a composition significantly increases the nodule counts in soybean plants.

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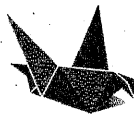
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Inventive step of Claim 1

In view of the comparison provided in Table 1, it is submitted that the technical effect of the addition of the acids listed in Claim 1 to a prior art composition of the type disclosed in D1 is indeed demonstrated in the application, and that the objective technical problem should therefore be formulated as how to increase the nodule count.

For the reasons set out in our letter of 22 December 2022, while D2 to D5 mention such acids, none of them would lead the skilled person to select any of the acids listed in Claim 1 for addition to a seed coating composition of the type disclosed in D1 for the purpose of increasing nodule count.

We therefore submit that Claim 1 is inventive with respect to the prior art.

Inventive step of Claim 18

While we maintain that it is reasonable to expect that all of the acids listed in claim 1 can be expected to provide a similar technical effect to malic acid, Claim 18 is directed specifically to the case where the compound is malic acid.

The technical effect of increased nodule count resulting from the addition of malic acid to a prior art liquid composition comprising from 10 to 250 g/L of molybdenum and 0.001 to 0.1 weight% of a vitamin B12, but lacking malic acid – and therefore in accordance with the prior art D1 – is clearly demonstrated in the present application, as noted above. For the reasons already outlined in the comments accompanying the Demand, such an addition would not be obvious based on the cited art. It is therefore anticipated that a positive indication of patentability of at least Claim 18 could be provided.

Final remarks

With regard to the Euro-PCT Guide, 4.2.031, it is requested that a telephone consultation be arranged and a subsequent invitation to submit further amendments and/or arguments be issued before the issuance of the International Preliminary Report on Patentability.

The undersigned representative may be contacted by telephone or email (dholmes@dummett.com) to make arrangements for the telephone consultation.

Yours faithfully

Derek Holmes
European Patent Attorney
Authorised Representative

Claims

1. A liquid composition for seed coating comprising from 10 to 250 g/l of molybdenum, 0.001 to 1.0 weight% of a vitamin B12, and 0.1 to 10 weight% of a compound selected from the group consisting of succinic acid, malic acid, maleic acid, tartaric acid, fumaric acid, any salts thereof, and any mixtures thereof.
2. The liquid composition according to claim 1, further comprising phosphorus, in particular in the form of phosphoric acid.
3. The liquid composition according to any one of claims 1 to 2, further comprising an ethanolamine, in particular wherein the ethanolamine is monoethanolamine.
4. The liquid composition according to any one of claims 1 to 3, wherein molybdenum is present as sodium molybdate.
5. The liquid composition according to any one of claims 1 to 4, wherein the liquid composition comprises from 50 to 200 g/l of molybdenum, in particular of sodium molybdate.
6. The liquid composition according to any one of claims 1 to 5, wherein the vitamin B12 is selected from the group consisting of cobalamin, cyanocobalamin, hydroxocobalamin, methylcobalamin and adenosylcobalamin.
7. The liquid composition according to any one of claims 1 to 6, further comprising an iron chelate, in particular iron ethylenediamine-N, N'-bis(2-hydroxyphenylacetic acid).
8. The liquid composition according to any one of claims 1 to 7, further comprising an anti-freeze agent, in particular wherein the anti-freeze agent is selected from the group consisting of glycerine, monopropylene glycol, monoethylene glycol, sugars, sugar alcohols, and any mixtures thereof.
9. The liquid composition according to any one of claims 1 to 8, wherein the liquid composition comprises from about 10 to about 250 g/l, in particular from about 50 to about 200 g/l of phosphorus, expressed as P_2O_5 .
10. The liquid composition according to any one of claims 3 to 9, wherein the weight ratio of monoethanolamine to phosphoric acid ranges from 1:5 to 1:1, in particular from 1:3 to 1:1.
11. The liquid composition according to any one of claims 1 to 10, further comprising a biostatic agent, in particular selected from the group consisting of sodium propionate, sodium benzoate, lactic acid, and any mixtures thereof.
12. A leguminous seed comprising a first coating layer of the liquid composition according to any one of claims 1 to 11, and a second coating layer comprising a rhizobia inoculant.

13. A method for preparing seeds of leguminous crops, comprising the steps of:

- a) coating the seeds with a composition comprising a rhizobia inoculant;
- b) coating the seeds with the liquid composition according to any one of claims 1 to 11;

11;

- c) drying the seeds coated with both compositions.

14. Method according to claim 13, wherein the seeds are coated with the liquid composition

according to any one of claims 1 to 11 at a rate of from 1 to 3 L of liquid composition per ton of seeds.

15. Use of a liquid composition according to any one of claims 1 to 11 for the coating of seeds of leguminous crops, in particular to increase nodule formation.

16. Use of a liquid composition according to any one of claims 1 to 11 for soil application.

17. A liquid composition comprising phosphoric acid, an ethanolamine, and 0.1 to 10 weight% of a compound selected from the group consisting of succinic acid, malic acid, maleic acid, tartaric acid, fumaric acid, any salts thereof, and any mixtures thereof.

18. The liquid composition according to any one of claims 1 to 11, wherein the compound selected from the group consisting of succinic acid, malic acid, maleic acid, tartaric acid, fumaric acid, any salts thereof, and any mixtures thereof, is malic acid.

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