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Attn.: Davies Maxwell

Online filing

Sint-Martens-Latem, November 14, 2022

Our ref.: BIPA-008-PCT
Re.: International patent application PCT/EP2022/057720 filed on March 24, 2022
“Methods for improving rice yield and treating blast disease, sheath blight disease,
or a combination thereof on a rice plant”
In the name of BIPA NV

Dear Madam, Dear Sir,

Further to the International Search Report and written opinion dated July 20, 2022 issued by the European Patent Office as International Searching Authority in respect of the above-referenced patent application, please find enclosed the response of the Applicant to the written opinion.

Response to item V of the written opinion – Novelty

Regarding the novelty of claim 16, the disclosure of D1 (WO 2020/104645) is considered to be explicitly novelty destroying for the subject-matter of claims 16, 18-23, 29, and 30.

The Applicant cannot agree and submits that claim 16 is novel over D1 for the following reasons:

Claim 16 recites:

“A method for preventing or controlling blast disease, sheath blight, or a combination thereof on a rice plant or a part thereof, the method comprising applying choline pelargonate or a composition comprising choline pelargonate to the rice plant, part thereof, or locus of growth of the rice plant”.

D1 provides a method for preventing or controlling a fungus infection on a plant or plant part, the method comprising applying a composition comprising a choline salt of a C8-C10 fatty acid, in particular choline pelargonate, to the plant, plant part, or locus of growth of the plant (D1, claims

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10 and 15, emphasis added). D1 does not provide the combination of the specific fungal disease or pathogenic fungus and the specific plant to be treated.

In order to arrive at the subject-matter of claim 16, a selection has to be made of two lists of a certain length of D1, and hence the subject-matter of claim 16 is novel over D1:

1) the fungal disease or pathogenic fungus to be treated has to be selected from the list on p. 14, l. 32 to p. 15, l. 5; and

2) the plant to be treated namely a rice plant or part thereof has to be selected from the lists of plants, see p. 13, l. 16 to p. 14, l. 5 or p. 14, l. 6-14.

The combination of the above two features has not been disclosed in D1. In this regard, D1 on p. 14, l. 32 to 15, l. 2 (emphasis added) mentions: “In certain embodiments, said fungi is a **pathogenic fungus** selected from the group consisting of *Colletotrichum*, *Botrytis*, *Alternaria*, *Fusarium*, *Rhizoctonia*, *Sclerotinia*, *Verticillium*, *Pythium*, *Phytophthora*, *Puccinia*, *Erysiphales* (incl. powdery mildew) and *Peronosporaceae* (incl. downy mildew), *Thielaviopsis* spp (cancker rot, black root rot), *Magnaporthe grisea* (rice blast), *Armillaria* spp (virulent pathogens of trees), *Ustilago* spp. (smuts), *Phakospora pachyrhizi* (soybean rust), *Guignardia bidwellii* (grape black rot), *Blumeria graminis* (powdery mildew on grasses and cereals), *Mychosphaerella* spp., *Venturia* spp. (e.g. *V. inaequalis* (apple scab)), *Monilinia* spp. (brown rot of stone fruits)”.

The written opinion seems to consider the “rice blast” mentioned in between the brackets as the blast disease on rice plants. The Applicant cannot agree. First, the bridging paragraph of pages 14-15 describes certain embodiments of the **pathogenic fungus** to be controlled, not of the plant to be treated. As made clear in the enclosed Annex 1, the fungus *Magnaporthe grisea* is also known as **rice blast** fungus. Further, the disease caused by *Magnaporthe grisea* is called **blast disease** or **blight disease** (see Annex 1 and p. 6, l. 7 of the present application). Annex 1 demonstrates that the fungus *Magnaporthe grisea* causes blast disease on rice but also on other agriculturally important cereals including **wheat, rye, barley, and pearl millet** (see Annex 1, and p. 6, l. 9-10 of the application). Hence, the “rice blast” on p. 15 of D1 solely refers to the pathogenic fungus independently from the plant which is to be treated.

As it entails a selection of two lists of considerable length of D1 to arrive at the subject-matter of claim 16, the subject-matter of claim 16 and claims dependent thereon is novel over D1.

Regarding the novelty of **claim 1**, the written opinion states that the disclosure of D1 is considered to be implicitly novelty destroying for the subject-matter of claims 1, 3-8, 14, and 15.

The Applicant respectfully disagrees and submits that claim 1 is novel over D1 for the following reasons:

Claim 1 recites:

“A method for increasing the rice yield of a rice plant relative to the rice yield of an untreated rice plant, the method comprising applying choline pelargonate or a composition comprising choline pelargonate to the rice plant, part thereof, or locus of growth of the rice plant”.

D1 does not implicitly describe a method for increasing the rice yield of a rice plant relative to the rice yield of an untreated rice plant. Even if D1 would be considered to provide a method for controlling a fungal infection on a rice plant or part thereof by applying a composition comprising choline pelargonate to the plant, plant part, or locus of growth of the plant, it would **not** be immediately apparent to the skilled person that nothing other than improving the rice yield of the plant would be disclosed. It is known that treatment with fungicides may lead to changes in plant physiology including yield but also plant growth (Annex 2, abstract, and p. 315, right column, full paragraph). Further, treatment with fungicides may result in a decrease in both growth and yield of crop plants (Annex 2, abstract, p. 317, right hand column). Therefore, D1 does not provide any disclosure – explicit or implicit – of **increasing the rice yield** of a rice plant relative to the rice yield of an untreated rice plant by applying choline pelargonate or a composition comprising choline pelargonate to the rice plant, part thereof, or locus of growth of the rice plant.

Consequently, the subject-matter of claims 1-30 is novel over the cited prior art.

Response to item V of the written opinion – Inventive step

Regarding the inventive step, D1 is considered as the closest prior art document. D1 provides a method for preventing or controlling a fungal infection on a plant or plant part, the method comprising applying a composition comprising a choline salt of a C8-C10 fatty acid, in particular choline pelargonate, to the plant, plant part, or locus of growth of the plant (D1, claims 10 and 15).

The difference between **claim 16** and D1 is the combination of controlling blast disease (*Magnaporthe grisea*), sheath blight (*Rhizoctonia solani*), or a combination thereof on a rice plant or a part thereof.

The effect of this difference is that the composition comprising choline pelargonate effectively controls blast disease, sheath blight, or a combination thereof on a rice plant or part thereof with similar or even superior efficacy levels compared to commercially available reference products.

The technical problem can thus be formulated as the provision of an alternative fungicidal use of a composition comprising choline pelargonate on a plant or part thereof with similar or even superior efficacy levels compared to commercially available reference products.

By extensive experimental testing, the inventors have found that the efficacy level of the use of choline pelargonate against blast disease and sheath blight on a rice plant or part thereof is similar or even superior to the efficacy level of the use of commercially available reference products (see Examples 1, 2, 3 and 4 of the present application). The present inventors found that the results obtained with choline pelargonate against blast disease on rice plants were unexpectedly superior to those obtained against blast disease on other crops such as barley. Example 1 describes a winter barley pot trial which was established to determine the efficacy of a composition comprising choline pelargonate (referred to as “BPA 056”) as a protective (or preventive) and curative treatment against blast disease (*Magnaporthe oryzae*) on barley. Example 1 illustrates that plants treated with protectant treatment of BPA056 (1%) or curative treatment of BPA056 (0.5%) resulted in a significant ($p = 0.05$) reduction in symptoms caused by *M. oryzae* compared to the inoculated control but the level of control achieved with a

commercially available reference product (Proline 275 at 0.72 L/ha), whether applied as a protectant or a curative treatment, was significantly greater than any of the BPA056 treatments. In view thereof, the excellent results obtained with BPA056 in field trials on rice, as described in Examples 1, 2, 3 and 4, could not be expected from D1.

The finding that choline pelargonate can be used for preventing or controlling blast disease, sheath blight, or a combination thereof on a rice plant or a part thereof can also not be derived from D2 (WO 03/059063). D2 relates to agricultural compositions that find particular use as a fungicide composition. The fungicide composition can include one or more fatty acids and one or more organic acids different from the fatty acid (D2, abstract). The fatty acid may be selected from the group consisting of: pentanoic, hexanoic, heptanoic acid, octanoic acid (i.e. caprylic acid), pelargonic acid, decanoic acid (i.e. capric acid), undecanoic acid, lauric acid, myristic acid, palmitic acid, stearic acid, oleic acid, linolenic acid, linoleic acid, erucic acid, palmitoleic acid, pentadecanoic acid, margaric acid, arachidic acid, arachidonic acid, behenic acid, mixtures thereof (D2, claim 3). D2 only generally refers to rice (D2, p. 9, l. 1-5 and claim 30) and none of the examples involves the treatment of rice.

The written opinion refers to D2 to argue that the skilled person would expect pelargonic acid and its choline salt to have activity against *Rhizoctonia solani*, with the latter being less phytotoxic since D2 *"shows the inhibition of Rhizoctonia solani by using the closely related caprylic acid (D2, example 16) and D2 justifiably treats pelargonic acid as a functional equivalent (D2, example 17 claim 5)"*. The Applicant disagrees because D2 does not show that pelargonic acid is a functional equivalent of caprylic acid **when applied on a plant or part thereof**. Example 16 only uses caprylic acid, and Example 17 compares the effect of caprylic acid and pelargonic acid on the inhibition of fungal growth of pathogens on potato dextrose agar plates and hence not on a plant or part thereof.

The only example in D2 in which pelargonic acid is used in comparison with caprylic acid on a plant part is Example 10. While Example 17 on potato dextrose agar plates indicates that pelargonic acid exhibited slightly better or same fungicidal activity as caprylic acid, Example 10 shows that on a plant or part thereof pelargonic acid does not have a fungicidal effect, while caprylic acid does. Example 10 provides a comparison of various fatty acid species (C6-C10) for the inhibition of fungal infections on fresh raspberries (D2, p. 18). The raspberries were harvested and treated after harvest. Table 10 demonstrates that pelargonic acid has no effect on the number of infected raspberries (i.e., 97% infected raspberries) on day 11 as compared to the control water (i.e. 97% infected raspberries), while there is a higher fungicidal activity with caprylic acid (i.e. 78% infected raspberries) and heptanoic acid (i.e. 89% infected raspberries). The skilled person would thus not have considered pelargonic acid as a functional equivalent of caprylic acid for the inhibition of *Rhizoctonia solani* on a plant or part thereof but would rather have selected caprylic acid itself or heptanoic acid (D2, examples 10, 16, 17). Furthermore, D2 does not provide any example of the use of pelargonic acid as a fungicide on a plant or part thereof growing on the plant. All fungicidal effects of pelargonic acid are shown on potato dextrose agar plates (Examples 12, 17 and 18), the reason likely being the herbicidal effect of pelargonic acid on a plant or part thereof. This further corroborates that D2 could not provide any suggestion that choline pelargonate would be effective as an alternative to treat sheath blight

(*Rhizoctonia solani*) on a rice plant or a part thereof with similar or even superior efficacy levels compared to commercially available reference products.

The same argument applies to the use of choline pelargonate to treat blast disease on a rice plant or part thereof since D2 is entirely silent about blast disease or the fungus *Magnaporthe grisea*.

Furthermore, similar arguments apply to **claim 1** since Example 10 of D2 refers to the percentage of infected berries which could be indicative of the lost yield. In addition, D1 does not provide any suggestion about the use of choline pelargonate to increase the yield of a plant, let alone of a rice plant.

Starting from D1, a skilled person would not have arrived at the present methods in view of D2 since none of these documents provides any suggestion about preventing or controlling blast disease, sheath blight, or a combination thereof on a rice plant or a part thereof with similar or even superior efficacy levels compared to commercially available reference products.

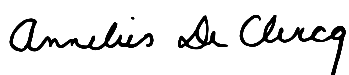
In view thereof, the subject-matter of independent claims 1 and 16, and claims dependent thereon, involves an inventive step over the cited prior art.

Requests

The Applicants submit that the claims fulfil the requirements of the PCT, and a notion thereto is respectfully requested.

Should the Examiner not agree, a second written opinion providing a further opportunity to amend the claims, together with a videoconference using IP technology or a telephone interview with the Undersigned, is requested. The Applicants are of the opinion that such an interview would greatly assist in the understanding of the invention.

Respectfully submitted,



Mrs. De Clercq, Annelies
Professional Representative before the EPO

Encls.: Annex 1_Magnaporthe grisea;
Annex 2_Petit et al (2012)