The present invention relates to a method for treating seeds (7) or for planting seeds and/or plantable material in a substrate (1) having at least one planting position. The method comprises treating the seeds (7) and/or planting material with a treatment substance (6) by depositing the treatment substance (6) at the planting position. The method further comprises depositing the seeds (7) and/or the plantable material at the planting position. The method further comprises also providing depositing means (4, 5) for depositing the treatment substance (6) and/or the seeds and/or the plantable material. The method further comprises also displacing the substrate (1) and the depositing means (4, 5) relative to one another. The method further comprises also providing a control for driving the depositing means (4, 5) to deposit sequentially specimens of the seeds (7) and/or the plantable material and/or a dosed amount of treatment substance (6) for deposition thereof at the planting position.
Title: THE PLANTING OF PLANT MATERIAL

Abstract: The present invention relates to a method for treating seeds (7) or for planting seeds and/or plantable material in a substrate (1) having at least one planting position. The method comprises treating the seeds (7) and/or plantable material with a treatment substance (6) by depositing the treatment substance (6) at the planting position. The method further comprises depositing the seeds (7) and/or the plantable material at the planting position. The method further comprises also depositing means (4, 5) for depositing the treatment substance (6) and/or the seeds and/or the plantable material. The method further comprises also displacing the substrate (1) and the depositing means (4, 5) relative to one another. The method further comprises also providing a control for driving the depositing means (4, 5) to deposit sequentially specimens of the seeds (7) and/or the plantable material and/or a dosed amount of treatment substance (6) for deposition thereof at the planting position.
THE PLANTING OF PLANT MATERIAL

The present invention relates to a method and a device for the treatment and especially planting seed and/or plantable material, such as for instance, though not exclusively, seeds, seedlings, etc.

Such a method and device are known from e.g. US-2004/0.231.575, where seeds are deposited in a trench or furrow, and treatment substance is deposited in correspondence with a location, where individual seeds are expected to drop in the furrow.

In the technology of planting plants it is known to pretreat seeds and/or plantable material, i.e. that for planting the plantable material a treatment can be performed. Then a treatment agent, such as a fungicide, a pesticide, bacteria, etc. or a growth promoting substance, in the form of a coating can be applied on the seeds, seedlings, etc.

Alternatively it has been proposed to deposit seeds or seedlings, etc. and treatment substance separately and approximately simultaneously on a planting position in order to thereby obviate the need to apply a coating on seeds, seedlings, etc.

The present invention relates to an improvement to this last named alternative in the form of a method and a device according to respectively claim 1 and claim 8.

With a method and a device according to the present invention it is possible to realize a very fast process of seeding and/or planting wherein seeds, seedlings, etc. and separately therefrom also treatment substances can be deposited in an arbitrary sequence or simultaneously in or on the planting positions in a substrate. With certainty under such circumstances it is achieved, that the seeds or
plantable material are put into the intended planting position and/or that the treatment substance is put into the envisaged planting position. In embodiments, wherein both of the seed and/or planting material and the treatment substance are to be deposited in a planting position, and wherein according to the present invention the depositing trajectory, etc., is taken into account, it is ensured that not only a specimen of the seed and/or the plantable material is deposited into at least one of the planting positions, but also a predetermined amount of treatment substance.

The present invention comprises several preferred embodiments, such as these are defined in the dependent claims 2-7 and 9. It is obvious, that these preferred embodiments are not limiting on the present invention. For an example claim 2 relates to the feature, that the method is performed in a continuous movement, essentially without interruptions, when displacing the depositing means and the substrate relative to one another. As such it is possible to ensure, that the speed of the process can be increased considerably, without diminishing the security, that upon each desired planting position a specimen of the seed and/or plantable material is deposited, together with a dosed or desired amount of treatment substance.

In many possible embodiments the substrate will be displaced relative to the depositing means. As such the device having depositing means can be arranged in a stationary manner and substrates can be fed there through with the relative displacement speed to arrange therein seeds and/or plantable material and to simultaneously provide a desired amount of treatment substance at each planting position in the substrate. This, however, does not exclude, that the present method can also be performed in an open
field or in the natural ground, where the substrate is interpreted as the soil.

A substrate can be a layer of fibrous material comprising for instance stone wool fibres, pot ground, cocos fibres, etc. with rows of planting positions arranged therein, where the depositing means comprise essentially corresponding rows of depositing elements. As such, at every planting position in a row, a specimen of the seed and/or the plantable material can be deposited, together with a dosed or desired amount of treatment substance. Such a substrate can for instance be made from fibrous material, known as a tray with rows of planting positions at well defined intermediate distances, which are for instance equal to the distances between the planting positions in every row. The depositing elements take care of depositing the seed and/or the plantable material and/or the treatment substance. In such an embodiment the rows can be arranged in a transversal orientation relative to the displacement direction, where the depositing elements are controlled by the control to simultaneously and in correspondence with the rows deposit numbers of specimens of the seeds and/or the plantable material and/or the dosed amounts of treatment substance. As a result at all planting positions in a row a specimen of the seeds and/or the plantable material and/or the treatment substance can be deposited and optimum use can be made of holders of a substrate, that are known as trays, such as plates of fibrous material.

It is noted, that especially in case where depositing both a specimen of the seeds and/or the plantable material as well as a desired amount of treatment substance at a planting position is desired, the control can take into account differences in the depositing trajectory, the depositing speed, etc., for different properties of the seeds and/or the
plantable materials and the drop shaped, granular shaped or powder shaped treatment substance in relation to the weight or the air resistance thereof.

As already has been noted herein above, the present invention also in itself relates to a device for performing the method according to the present invention.

SEE FURTHER FROM PAGE 4, LINE 1, OF THE PRESENT APPLICATION AS ORIGINALLY FILED.
Below a preferred embodiment of the present invention will be described, referring to the accompanying drawings, wherein the same or similar components and elements are designated with the same reference numbers, and wherein:

fig. 1 shows a schematic perspective view of an embodiment of the present invention;

fig. 2 shows a cross sectional view along the line II-II in fig. 1; and

fig. 3 shows the progression of the invention, in the embodiment that is schematically represented in fig. 1 and fig. 2.

In fig. 1 a tray 1 is shown. In the upper surface of the tray 1 planting positions 2 are defined, for instance in the shape of (small) depressions or pits. The tray 1 with the planting positions 2 is filled with for instance a substrate, or is manufactured from a fibrous material, such as stone wool, but additionally or alternatively use can be made of cocos fibres or potting soil. The planting positions 2 are arranged in the upper surface of the substrate 1 in rows 3 within the embodiment shown schematically in fig. 1 seven planting positions 2 per row 3.

Further, in fig. 1, depositing elements 4 are shown for drops of treatment substance, as well as depositing elements 5 for seeds. It is evident, that additionally or alternatively for drops of treatment substance also granular or powder shaped treatment substances can be employed, and in the place of seeds also seedlings, etc., can be planted in the substrate 1.

The substrate 1 in the form of the tray with the planting positions is advanced in the direction of arrow A relative to the depositing elements 4, 5 with transport means (not shown), where the depositing elements 4, 5 are themselves stationary and form part of a device for
performing the method according to the present invention. It is noted, that also such a device, of which here only the depositing elements 4, 5 are shown in fig. 1, can be mobile, where for instance no substrates 1 pass under the depositing elements 4, 5, but where the depositing elements 4, 5 can even be arranged on a transportable frame in order to be pulled over a agricultural field or the full soil or any other stationary ground underneath. Such a solution can also provide in making the ground underneath flat and forming therein pits in correspondence with the planting positions 2, such as those that have been shown in fig. 1.

As shown in fig. 2, the substrate 1 is displaced in the direction of arrow A. In the cause of this action regularly (rows of) planting positions are arranged underneath the depositing elements 4, shown in fig. 1, for drops of treatment substance and underneath the depositing elements 5 for depositing seeds in the planting positions. The depositing elements 4, providing drops of treatment substance, and the depositing elements 5 for seeds are at some distance from one another in the direction of movement of arrow A, relative to one another. This fact is to be taken into account when it is desired, that a drop 6 and a seed 7 subsequently or simultaneously arrive at or in one of the planting positions 2. In this process also the depositing speed and the air resistance of drops 6 and seeds 7 can be taken into account, in order to drive the depositing elements 4, 5 with a control (not shown) on the basis of these differences in position and depositing properties. In the embodiment as shown first a drop 6 is deposited in a planting position 2 formed by a depression, followed by a seed 7, while it is possible under other circumstances due to legislature, etc. that it is desirable to reverse this sequence. Then first a seed 7 is deposited, followed by the
drop 6, so that there is no pretreatment of the substrate 1, prior to depositing the seed.

Fig. 3 shows the situation in a reversed order, such as it has already been described herein above, where the depositing elements 4, 5 are moved in the direction of arrow A' over a ground underneath, for instance the soil of an agricultural field, where it should also be taken into account at which moment a drop of treatment substance and a seed is to be deposited in order to be brought into correspondence with one another, and so that at each planting position not only a seed 7, but also a drop of treatment substance 6, is deposited.

With the present invention a highly automated process is made available, which is very favourable in relation to costs, without requiring that precoated seeds 7, which are relative expansive, must be purchased. According to the present invention positional differences are taken into account of the depositing elements 4, 5, as well as differences in depositing properties and trajectories of the individual treatment substances in distinguishable shapes (drops, powder, granules, etc.) and the seeds and/or the plantable material, for instance seeds, seedlings, etc. By taking all these different factors into account it is possible to ensure with certainty, that at each planting position to a treatment substance is deposited in combination with seeds and/or a plantable material.

After having been confronted with the description herein above, many alternative and additional embodiments will become apparent to the skilled person. For instance it can be possible, that the depositing elements for the treatment substance or for specimens of the seeds and/or the plantable material are not exactly downward oriented. For instance a drop 6 of treatment substance can be "fired" onto
a falling seed to encompass the seed 7, before the seed 7
lands in a planting position. It is also possible to combine
the depositing elements 4, 5 in order to dip the seeds and/or
the plantable material in treatment substance or to encompass
the seed therein, just prior to depositing at least a
specimen of the seeds and/or the plantable material, as long
as it is ensured, that thereafter the movement in the
direction of arrow A or A' is taken into account, when it
comes to letting go of the specimen of the plantable
material, that is thus treated with pretreatment substance,
as well as the envisaged location, where this should arrive,
i.e. at one of the planting positions. It can also be
preferred, under certain circumstances, to first deposit the
seed, followed by the treatment substance. Further
alternative and additional embodiments are all considered to
lie within the scope of protection of the present invention
in as far as these embodiments do not diverge in letter or
spirit from the definitions of the present application in
accordance with the accompanying claims.
NEW CLAIMS

1. Method of treatment and seeding or planting of
seeds and/or plantable material (7) in a substrate with at
least one planting position (2), comprising in an arbitrary
sequence:
- treating the seeds and/or the plantable material with a
treatment substance (6) by depositing the treatment substance
in or at the planting position with the aid of treatment
depositing means (4); and
- depositing the seeds and/or the plantable material at the
planting position with the aid of depositing means (5);
- displacing (A) the substrate (1) and at least one of the
treatment means and the depositing means relative to one
another,

CHARACTERISED BY
- providing a substrate having at least two plant positions
formed independently from the process in advance thereof at a
pre-defined distance in the direction (A) of relative
displacement; and
- controlling the treatment means and the depositing means
for depositing at least one specimen of the seeds and/or the
plantable material and a desired amount of treatment

substance for deposition thereof at the pre-defined planting
positions in the tray on the basis of at least one of the
aspects from the group, comprising: a depositing trajectory,
a depositing time, and a speed of movement from the
depositing means relative to the substrate.

2. Method according to claim 1, further comprising
displacement in a continuous movement, essentially without
interruptions, of the depositing means and the substrate
relative to one another.
3. Method according to claim 1 or 2, further comprising: displacement of essentially the substrate relative to the depositing means.

4. Method according to claim 1, 2 or 3, where the treatment substance is chosen from the group, comprising: fungicide, pesticide, plant growth promoting substance, bacteria, etc.

5. Method according to at least one of the preceding claims, where the seeds and/or the plantable material is chosen from the group, comprising seeds, seedlings, etc.

6. Method according to at least one of the preceding claims, where the substrate comprises a plate of fibrous material, such as stone wool fibres, pot soil, cocos (fibres), etc., with rows (3) of planting positions and wherein the depositing means and the treatment means comprise essentially corresponding rows.

7. Method according to at least one of the preceding claims, where rows of planting positions are oriented transversely relative to the direction of displacement (A) with rows of depositing elements (5) and treatment elements (4), which are driven by a control to simultaneously deposit a number of seeds and/or the plantable material and a desired amount of treatment substance in correspondence with the number of planting positions in each of the rows.

8. Device for treatment and seeding or planting of seeds and/or plantable material in at least one substrate with at least one planting position, comprising: - treatment means (4) to treat the seeds and/or the plantable material with a treatment substance (6) by depositing the treatment substance in or at the planting position; and - depositing means (5) to deposit the seeds and/or the plantable material (7) at planting positions;
- transport means for relative movement of the substrate (1) and at least one of the treatment means and the depositing means relative to one another,

CHARACTERISED IN THAT

5 - the substrate has at least two plant positions formed independently in advance at a pre-defined distance in the direction (A) of relative displacement; and

- a control for the treatment means and the depositing means for depositing at least one specimen of the seeds and/or the plantable material and a desired amount of treatment substance for deposition thereof at the pre-defined planting positions in the tray on the basis of at least one of the aspects from the group, comprising: a depositing trajectory, a depositing time, and a speed of movement from the depositing means relative to the substrate.

9. Device for depositing in accordance with claim 8, further comprising means for achieving a step in the method in accordance with at least one of the claims 2-7.