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(54) **Title:** PLANT FERTILIZER COMPOSITION COMPRISING IODINE AND METHOD FOR MANUFACTURING IT

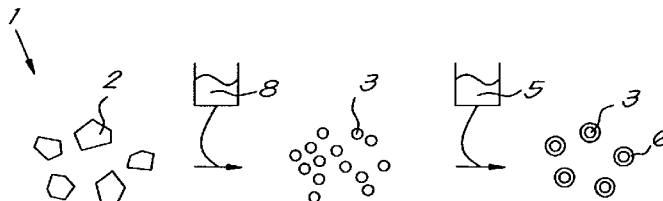


Fig. 2

(57) **Abstract:** Plant fertilizer characterized in that it comprises artificially added iodine containing substances that can be taken up by plants.



WO 2011/000061 A1

PLANT FERTILIZER COMPOSITION COMPRISING IODINE AND METHOD FOR MANUFACTURING IT

5 The present invention relates to a plant fertilizer composition.

10 Iodine is an essential trace element for mammals. Lack of iodine in the human diet results in negative effects on human health. It is known from studies by the World Health Organization that a third of the world population (35 %) suffers from iodine deficiency disorders. These disorders result in endocrinological problems such as goiter or enlargement of the thyroid, 15 cretinism or a form of mental retardation, risk of stillbirth and spontaneous abortion during pregnancy and growth impairment.

20 In addition to iodine, adequate selenium nutrition supports efficient thyroid hormone synthesis and metabolism and protects the thyroid gland from damage by excessive iodine exposure. In regions of combined severe iodine and selenium deficiency, normalization of iodine supply is mandatory before initiation of 25 selenium supplementation in order to prevent hypothyroidism (Zimmermann MB, Köhrle J. Thyroid, 2002 Oct; 12(10):867-78).

30 The World Health Organization (WHO) recommends the following daily iodine intake for the following population groups :

Table I

Group	Iodine intake (I)	
	µg/day	µg/kg/day
Infants and children, 0-59 months	90	6.0 - 30.0
Children, 6-12 years	120	4.0
Adolescents and adults, from 13 Years of age through adulthood	150	2.0
Pregnant women	200	3.5
Lactating women	200	3.5

Source : Assessment of the iodine deficiency disorders and monitoring their elimination. Geneva, World Health Organization, 2001 (WHO/NHD/01.1)

5

Traditionally iodine has been supplemented through iodized salt and oil. Iodine has been supplemented as potassium iodate and potassium iodide. Because iodate is more stable under extreme climatic conditions it is preferred to iodide, especially in hot and humid climates (WHO, UNICEF and ICCIDD, Recommended iodine levels in salt and guidelines for monitoring their adequacy and effectiveness. Geneva, World Health Organization, 1996 (WHO/NUT/96.13)).

10

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For historical reasons, North America and some European countries use potassium iodide, while most tropical countries use potassium iodate (WHO 2001 source used in table I).

20

These supplements do not address the underlying issue of environmental iodine deficiency and the iodine content of natural food intake.

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It is an objective of the invention to provide a solution for low iodine levels in natural food. This is achieved by the use of a plant fertilizer that comprises artificially added iodine containing substances that can be taken up by plants.

10

The use of such a fertilizer according to the invention allows the uptake by humans of a significant part of the recommended daily intake of iodine, as defined by the WHO, and this preferably without the need for iodine supplements in the shape of salt, oils or nutritional supplements or medicines.

15

Preferably the artificially added iodine results in amounts of at least 10 p.p.m. of iodine in the total dry mass of the fertilizer so as to be effective in providing improved iodine uptake by the human consumer of the edible plant part(s) grown on this fertilizer.

20

The amounts of iodine added are preferably chosen to be of a level that meets the recommended daily iodine intake to a significant level with regular food intake quantities of vegetables and fruits.

25

Preferably the fertilizer is a solid fertilizer, for example in the form of crystals or prills with

30

artificially added iodine containing substances homogeneously distributed over the solid mass meaning that the relative amount of iodine to the total mass for each particle of the fertilizer is practically identical.

This formulation provides as a benefit the guaranteed even distribution of iodine in the total fertilizer solution after dissolution in water.

10

The invention also concerns methods for manufacturing a plant fertilizer comprising the step of adding iodine to a basic solid fertilizer and homogeneously distributing the added iodide or iodate in the solid plant fertilizer. The preferred methods for adding iodides differ from the preferred methods for iodates since iodides decompose more readily at higher temperatures to iodine which is then lost as a gas.

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Methods were developed to add iodides or iodates to solid fertilizers such as nitrates, in either the shape of prills or in the shape of crystals.

20

For the product shaped as prills, coated with an anti-caking and anti-dust solution, the preferred method for adding iodide is to dissolve iodide in the coating solution of the anti-caking and anti-dust additive, in a manufacturing step.

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For the product shaped as prills coated with an anti-caking and anti-dust solution obtained by prilling

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molten fertilizer crystals, the preferred method for adding iodate is to add the iodate to the molten fertilizer crystals before prilling.

5 For the product shaped as crystals coated with an anti-caking and anti-dust solution, the preferred method for adding iodide or iodate was to premix iodide or iodate in the anti-caking and anti-dust coating solution during manufacturing.

10

With the intention of better showing the characteristics of the invention, hereafter, as an example without any limitative character, a preferred form of embodiment is described of a method for manufacturing a plant fertilizer, with reference to the accompanying drawings, wherein:

15

figure 1 schematically represents a method for manufacturing a fertilizer according to the invention adding iodine in the form of iodide to a basic solid plant fertilizer that is shaped in the form of prills;

20

figure 2 schematically represents the same as figure 1 but for adding iodine in the form of iodate instead of iodide;

25

figure 3 schematically represents a method for manufacturing a fertilizer according to the invention by adding iodine containing substances to a basic solid plant fertilizer that is shaped in the form of crystals.

30

The method shown in figure 1 starts from a basic fertilizer 1 in the shape of crystals 2 such as nitrates, that are prilled into prills 3 after melting the crystals according to known methods. The method additionally comprises the step of adding iodine in the form of iodide 4 to an anti-caking and anti-dust solution 5 used to provide the prills with a coating 6 containing iodide, resulting in a solid plant fertilizer 7 according to the invention.

The application of the iodide in the form of a coating on the fertilizer prills results in a homogeneous distribution of iodine in the fertilizer, thereby ensuring a constant ratio of iodine to nitrate.

The concentration of the added iodine in the form of iodide 4 is preferably at least 10 p.p.m. of the total dry mass of the solid fertilizer 7.

In controlled trials with potassium nitrate fertilizer containing 91 and 130 p.p.m. potassium iodide, applied at a dose rate of 1,29 grams of potassium nitrate per litre nutrient solution in order to obtain 90 and 129 microgram I/litre nutrient solution, lettuce was grown and was shown to have taken up sufficient iodide to provide 26-31 % of the WHO daily iodine intake recommendation of 150 µg iodine (I), or 39 tot 46 µg I when a portion of 60 gram of lettuce leaves would be consumed.

In addition to iodine containing substances, selenium containing substances can be added to the fertilizer 7, since a good selenium and iodine balance is essential for sufficient hormone production in humans. In order to be effective, a level of at least 5 p.p.m. of selenium in the mass of the dry fertilizer is desirable.

Figure 2 shows the preferred method for manufacturing using alkali metal or alkaline earth metal iodates which are added to the molten crystals such as nitrates, which are subsequently turned into uncoated prills, which in a final step are then coated with an anti-caking and anti-dust additive solution.

The method shown in figure 2 also starts from a basic fertilizer 1 in the form of crystals 2 that are transformed into prills 3 by melting, whereby according to the invention the iodine is added in the form of iodate 8 (KIO₃) to the molten crystals before prilling them. The obtained prills are then further coated with an anti-caking and anti-dust solution 5 to obtain a final fertilizer 7 comprising prills 3 with homogeneously distributed iodine and coated with an anti-caking and anti-dust coating 6.

The method shown in figure 3 is an alternative method according to the invention to add iodine in the form of iodide or iodate to a basic plant fertilizer in the shape of crystals 2. The alkali metal or alkaline earth metal iodide 4 or iodate 8 is added in a premix

containing anti-caking and anti-dust agents 5 which is then added to the crystals as a coating 7.

5 The present invention is in no way limited to the form of embodiment described by way of an example and represented in the figures, but the invention can also be realized in various forms without leaving the scope and original purpose of the invention.

Claims.

- 5 1.- Plant fertilizer (7) characterized in that it comprises artificially added iodine containing substances (4,8) that can be taken up by plants.
- 10 2.- Plant fertilizer (7) according to claim 1, characterized in that the artificially added iodine results in amounts of iodine of more than 10 p.p.m. of the total dry mass of the fertilizer.
- 15 3.- Plant fertilizer (7) according to claim 1, characterized in that the fertilizer is a solid fertilizer.
- 20 4.- Plant fertilizer (7) according to claim 3, characterized in that the iodine containing components are homogeneously distributed over the solid mass meaning that the relative amount of iodine to the total mass for each particle of the fertilizer is practically identical.
- 25 5.- Plant fertilizer(7) according to any of the preceding claims, characterized in that the iodine containing substances are alkali metal or alkaline earth metal iodides (4) or iodates (8).
- 30 6.- Plant fertilizer (7) according to any of the preceding claims, characterized in that it has been supplemented with a selenium containing substance

resulting in an amount of at least 5 p.p.m. of selenium in the total mass of the dry fertilizer.

5 7.- Method for manufacturing a plant fertilizer (7) according to any of the preceding claims, characterized in that the method comprises the step of adding iodine to a basic solid fertilizer (2) as an alkali metal or alkaline earth metal iodide (4) or iodate (8) to said basic fertilizer (2) and
10 homogeneously distributing the added iodide (4) or iodate (8) in the solid plant fertilizer (7).

8.- Method according to claim 7, characterized in that the solid fertilizer (7) is shaped as prills (3)
15 coated with an anti-caking and anti-dust solution (5), and that iodine is added as iodide (4) or iodate (8) by adding the iodide (4) or iodate (8) to the anti-caking and anti-dust solution (5) in a manufacturing
20 step.

9.- Method according to claim 7, characterized in that the solid fertilizer (7) is shaped as prills (3) coated with an anti-caking and anti-dust solution (5),
25 , and that iodine is added as iodate (8) to the molten fertilizer crystals (2) before prilling them.

10.- Method according to claim 7, characterized in that the solid fertilizer (7) is shaped as crystals(2) coated with a premix containing an iodine source and
30 anti-caking and anti-dust agents by adding the premix to the plant fertilizer crystals.

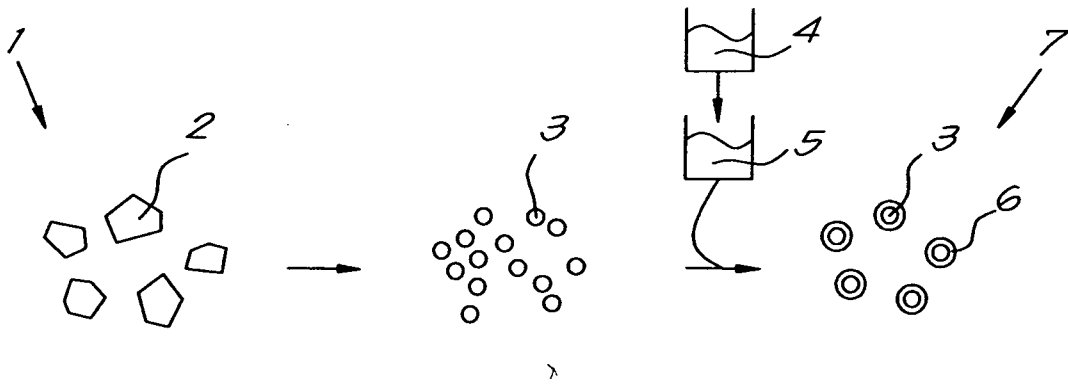


Fig. 1

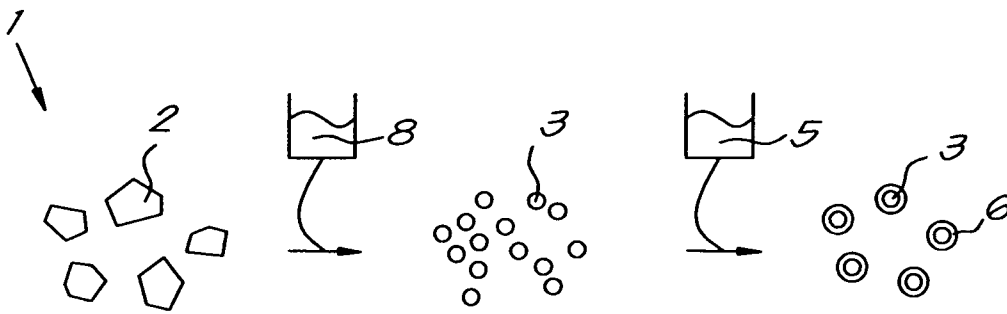


Fig. 2

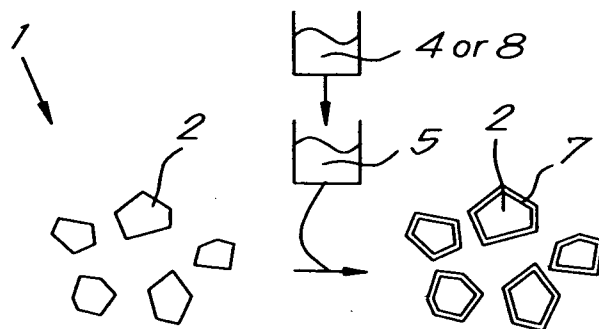


Fig. 3

INTERNATIONAL SEARCH REPORT

International application No
PCT/BE2009/000034

A. CLASSIFICATION OF SUBJECT MATTER		
INV. C05D9/02 C05G3/00		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols) C05D C05G		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practical, search terms used) EPO-Internal, WPI Data, PAJ, BIOSIS		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2008/102056 A (KEMIRA GROWHOW OYJ [FI]; PAEFFGEN STEFAN [BE]; JOKINEN KARI [FI]) 28 August 2008 (2008-08-28) claims page 1, line 30 - page 2, line 25	1
X	EP 1 153 901 A (CONSORZIO PER LA PATATA TIPICA [IT] CONSORZIO DELLE BUONE IDEE SOC [IT]) 14 November 2001 (2001-11-14) claims 1,2,5,6	1,2,5,6
X	GB 743 244 A (ICI LTD) 11 January 1956 (1956-01-11) page 1, line 12 - line 56	1-7
	-/--	
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.		
* Special categories of cited documents : "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art. "&" document member of the same patent family		
Date of the actual completion of the international search 12 January 2010		Date of mailing of the international search report 20/01/2010
Name and mailing address of the ISA/ European Patent Office, P.B. 5918 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016		Authorized officer: Rodriguez Fontao, M

INTERNATIONAL SEARCH REPORT

International application No
PCT/BE2009/000034

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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