(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
20 January 2022 (20.01.2022)

WIPO | PCT

(10) International Publication Number
WO 2022/013206 A1

(51) International Patent Classification:
A01G 24/20 (2018.01) *A01G 24/44* (2018.01)

(21) International Application Number:
PCT/EP2021/069432

(22) International Filing Date:
13 July 2021 (13.07.2021)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
2026050 13 July 2020 (13.07.2020) NL

(71) Applicants: **VAN DER KNAAP DIENSTEN B.V.** [NL/NL]; Bovendijk 50, 2295 RZ Kwintsheul (NL). **DAMGRO B.V.** [NL/NL]; Geestweg 150, 2671 MC Naaldwijk (NL).

(72) Inventors: **VAN DER KNAAP, Robertus Johannes Hendrikus**; c/o Bovendijk 50, 2295 RZ Kwintsheul (NL). **GROOTSCHOLTEN, Johannes Petrus Wilhelmus Maria**; c/o Geestweg 150, 2671 MC Naaldwijk (NL).

(74) Agent: **ARNOLD & SIEDSMA**; Bezuidenhoutseweg 57, 2594 AC THE HAGUE (NL).

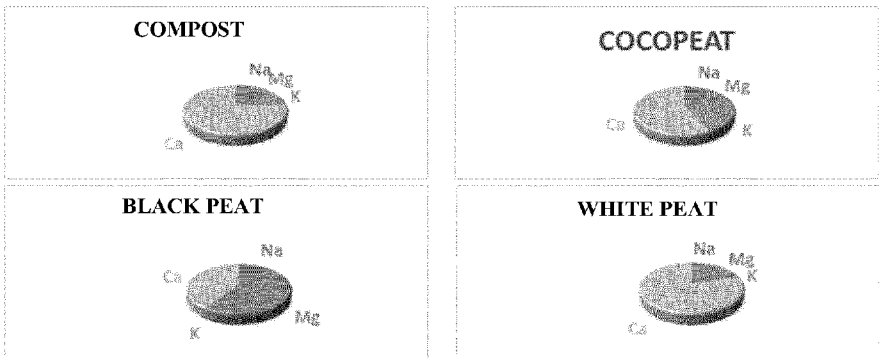
(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, IT, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, WS, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ,

WO 2022/013206 A1

(54) Title: PRESSED CULTIVATION BLOCKS OR CULTIVATION PLUGS FOR USE AS SUBSTRATE FOR CULTIVATION OF PLANTS

FIGURE 1



(57) Abstract: The present invention relates to pressed, or compacted, cultivation blocks or cultivation plugs for use as a substrate for cultivation of plants, thereby providing an alternative for pressed, or compacted, cultivation blocks or cultivation plugs based on black peat. In addition, the present invention relates to methods for providing the present pressed, or compacted, cultivation blocks or cultivation plugs. Specifically, the present invention relates to pressed cultivation blocks or cultivation plugs suitable to be used as substrate for the cultivation, or growth of plants, wherein the pressed cultivation blocks or cultivation plugs comprise: a) 9 wt.% to 39 wt.% of an composted organic material; b) 90 wt% to 60 wt% of one or more additional organic materials and c) an additional mineral source comprising sufficient cations for adhesion or bonding said pressed cultivation block or cultivation plug.

[Continued on next page]

UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report (Art. 21(3))*

PRESSED CULTIVATION BLOCKS OR CULTIVATION PLUGS FOR USE AS SUBSTRATE FOR CULTIVATION OF PLANTS

Description

The present invention relates to pressed, or compacted, cultivation blocks or cultivation plugs for use as substrate for cultivation of plants and particularly to pressed cultivation blocks or cultivation plugs providing an alternative for pressed, or compacted, cultivation blocks or cultivation plugs based on black peat. In addition, the present invention relates to methods for providing the present pressed, or compacted, cultivation blocks or cultivation plugs.

Peat is comprised of dried decayed, or partially decayed, organic material and is found in peatlands under a top layer also designated as bolster. A traditional form of peat is black peat present in the lower peat layers. In plant cultivation, or growth, and particularly glass house plant cultivation or growth, previously frozen black peat is used as growth/cultivation substrate or growth/cultivation plug at a large scale. Although organic in origin, the availability of black peat is limited and the natural sources thereof.

Therefore, in the art of plant cultivation, there is an urgent need for an alternative for black peat as growth/cultivation substrate.

A major issue with respect to such an alternative is the cohesion or shape retention thereof. For providing sufficient cohesion, or shape retention, of an alternative growth/cultivation substrate based on compost or other renewable organic sources, adhesion, bonding, or improving the stickiness is required. Although chemical bonding agents, such as polyurethane, can used, from environmental and food safety aspects, such bonding agents are generally not acceptable nor desired.

It is an object of the present invention, amongst other objects, to provide in the above need in the art of plant cultivation.

This object of the present invention is met, amongst other objects, as outlined in the appended claims.

Specifically, this object, according to a first aspect of the present invention, amongst other objects, is met by providing pressed cultivation blocks or cultivation plugs suitable to be used as substrate for the cultivation, or growth, of plants, preferably without the requirement of the use of a container, the pressed cultivation blocks or cultivation plugs comprise:

a) 9 wt.% to 39 wt.% of a composted organic material;

b) 90 wt% to 60 wt% of one or more additional organic materials;

c) an additional mineral source comprising sufficient cations for adhesion, or bonding, said pressed cultivation block or cultivation plug;

wherein said composted organic material or said one or more additional organic materials are not dried black peat;

wherein said composted organic material is subjected to a mechanical size reduction step; and

wherein the sufficient amounts of cations in said pressed cultivation block or cultivation plug are at least 12 mmole/kg dry matter of the mixture of compost, organic material and cationic source.

According the present invention, preferred amounts (in the total mixture) of cations are in the range of 12 mmole/kg dry matter to 6150 mmole/kg dry matter, such as from 1000 mmole/kg dry matter to 5000 mmole/kg dry matter, from 2000 mmole/kg dry matter to 4000 mmole/kg dry matter, from 3000 mmole/kg dry matter to 4000 mmole/kg dry matter.

The present inventors have surpassingly discovered that a combination of size reduction of composted organic material and the additional supplementation of cations sufficiently increases adhesion of pressed cultivation blocks or cultivation plugs such that no additional container, or other restraint, is necessary for allowing shape retention of the pressed cultivation blocks or cultivation plugs during use.

According a preferred embodiment, the present one or more organic materials are fibrous organic materials. Fibrous materials provide a less dense structure to the substrate blocks or plugs thereby providing controlled access to water and/or nutrients in optimal amounts. Further, fibrous materials improve the structure of the present pressed cultivation, or growth, blocks or cultivation, or growth, plugs.

According to another preferred embodiment, the present one or more organic materials are selected from the group consisting of cocopeat, white peat, wood chips, saw dust, non-treated, such as size reduced, compost, nut shells, cocochips, rice husks, coco doir and wood fiber.

White peat, such as Baltic peat, is harvested from the upper layers of peat grounds. White peat is characterized by a less (as compared to black peat) dense structure allowing optimized oxygen supplementation. Another beneficial property of white peat is the ability to absorb water 8 times its own weight. Further, white peat is a better water retainer than black peat.

Cocopeat is a raw material that is extracted from the coconut husk. It mainly consists of the grit of the coconut husk in combination with fiber occasionally enriched with microorganisms and/or seaweed.

According to the present invention a mixture of cocopeat and white peat is considered and preferred.

According to yet another preferred embodiment, the present cations are multivalent cations, preferably two valent cations and especially calcium (Ca^{2+}) and/or magnesium (Mg^{2+}) although Al^{3+} and similar cations are contemplated.

Methods and means for mechanical size reduction of organic materials are commonly known to the skilled person. Examples of mechanical size reduction according to the present invention are grinding, sieving, stamping and combinations thereof.

For further improvement of plant cultivation, growth promoting agents can be added to the present pressed cultivation blocks or cultivation plugs such as fertilizers, growth promoting agents, growth hormones, pesticides and herbicides.

According to a second aspect, the present invention relates to methods for providing the pressed cultivation blocks or cultivation plugs as defined above, the method comprises the steps of:

1) mechanical size reduction of composted organic material or a mixture of a composted organic material and the one or more additional organic materials;
2) adding , optionally before step (1), an additional mineral source comprising sufficient cations for adhesion, or bonding, said pressed cultivation block or cultivation plug;
3) pressing the material obtained in a cultivation block or cultivation plug suitable to be used as substrate for the cultivation, or growth of plants;

wherein the amounts of cations in said pressed cultivation block or cultivation plug are at least 12 mmole/kg dry matter of the mixture of compost, organic material and cationic source.

According the present invention, preferred amounts (in the total mixture) of cations are in the range of 12 mmole/kg dry matter to 6150 mmole/kg dry matter, such as from 1000 mmole/kg dry matter to 5000 mmole/kg dry matter, from 2000 mmole/kg dry matter to 4000 mmole/kg dry matter, from 3000 mmole/kg dry matter to 4000 mmole/kg dry matter.
said pressed cultivation block or cultivation plug.

According to a third and fourth aspect, the present invention relates to the use of a composted material for providing pressed cultivation blocks, or cultivation plugs, suitable to be used as substrate for the cultivation, or growth of plants and the use of multivalent, preferably two valent, cations for adhesion, or bonding, of pressed cultivation blocks or cultivation plugs suitable to be used as substrate for the cultivation, or growth of plants without the requirement of a container or other restrain means. Preferred cations are calcium (Ca^{2+}) and/or magnesium (Mg^{2+}).

The present invention will be further detailed in the following example. In the example, reference is made to figure 1 wherein:

Figure 1: shows the cationic element ratio in percentages of black peat (zwartveen). White peat (witveen), compost (vermicast) and cocopeat.

Example

Introduction

With the aim of researching an alternative bonding agent for black peat, sieved composted organic material was mixed with 70% v/v cocopeat. This example describes tests researching the mechanism responsible for influencing the cohesion of composted organic material especially in relation to pressed blocks.

Taking into account the ever increasing regulations involving harvesting black peat, the total production is decreasing in Europe. The decreased availability of black peat creates a need in the art for alternatives. In the art, the bonding of growth blocks or plugs using a chemical bonding agent such as polyurethane is generally not regarded as a suitable alternative. Organic farmers completely reject chemical bonding agents as alternatives for black peat. Considering this, the suitability of compost as an accepted alternative was investigated.

Compost, i.e. composted vegetable or animal biomass, was subjected to a series of separation techniques for determining whether the biomass is composed of homogenous material. Techniques used are sieving, drying, solution, flocculation and incineration.

Further, tests were performed to characterize the biomass with respect to cohesion or bonding capacity. The characterizations were a chemical analysis using a 1:1.5 extract, total analysis, determination of cation exchange capacity (CEC) and base saturation. Pressed growth blocks were prepared using different mixtures of materials and the resulting pressed growth blocks were tested using an universal testing machine (UTM) to assess the tensile strength and compressive strength.

Material and methods

Materials

As starting material, flushed and sieved compost was used. The compost was composed of composted manure with a dry bulk density (DBD) of 268 grams per liter (g/l). Before use, de dried material was hammered to reduce the size until a dry bulk density of 488 grams per liter was obtained. Subsequently, part of the hammered compost was mixed with cocopeat. The dry bulk density of cocopeat was 90 grams per liter. As references, previously frozen black peat was used with a dry bulk density of 157 grams per liter and peat moss fraction 0-10 with a dry bulk density of 112 grams per liter.

Table 1: *Field weight, dry bulk density (BDB) and water number (the amount of moisture per gram dry matter) of four composing materials used: compost (compacted); cocopeat, black peat and white peat.*

	Field weight (g/liter	BDB (g/liter)	Water number (g/g)
Compost	488	488	0.1
Cocopeat	482	90	4.3
Black peat	458	157	1.9
White peat	235	112	1.1

Treatments

For the production of pressed growth blocks used for cohesion, or structural integrity, tests, mixtures of the above materials were prepared. As a standard, pressed growth block of a mixture of 70% v/v black peat and 30% v/v white peat supplemented with 5.5 grams per liter calcium fertilizer (Dolokal) were prepared. Pressed growth blocks of mixtures of 50% v/v compost and 50% cocopeat and 30% v/v compost and 70% cocopeat were also prepared.

Measurements

Determining the ratio of materials used for pressed growth blocks was based on bulk density determination. In this example, bulk density determination was performed in accordance with the method Naaldwijk: using the material, a double ring with a known volume was filled and subsequently compressed under 10 kPa during 1 minute. Then, the rings were separated and the weight of the lower ring was determined and expressed in grams per liter. Subsequently, the mixture in the ring was saturated in a pF container during 24 hours and thereafter placed at a pressure height of -31.5 cm during 24 hours. After completion, the mixture was weighed, dried at 105°C and weighed again. This provides determination of the water number, i.e. number of grams water per gram dried material.

Sieve analysis

The materials were sieved using a standard set of sieves and, per fraction, the amounts of organic mater (obtained by incineration) and calcium were assed to determine a deviation from average.

For a total analysis, the material was resolved in a mixture of strong acids and oxidizers. The total extract obtained was nebulized in a plasma flare resulting in emittance of element characterizing wavelengths. The wavelengths were quantified and qualified using a spectrometer. After correction, the amounts of the elements were obtained except for nitrogen

(nitrogen in the air hinders the measurements). Accordingly, nitrogen in the total extract was separately measured using a wet chemical analysis method.

For 1:1.5 extractions, the sample was saturated and subsequently supplemented with 1.5 volume demineralized water. The mixed suspension was filtered and the filtered aqueous phase was nebulized in a plasma flare resulting in the emittance of element characterizing wavelengths. The wavelengths were quantified and qualified using a spectrometer. After correction, the amounts of the elements were obtained except nitrogen (nitrogen in the air hinders the measurements). Thus ammonium and nitrate were separately measured using a wet chemical analysis method.

CEC and element ratio

Organic matter in soil is mainly comprised of large molecules bonded by carbon atoms. Multiple side chains are generally attached to a carbon backbone. Part of these side chains contain organic acid moieties capable of binding cations. The binding of cations is sufficiently strong to avoid leaching of the cations by water. However, the bonded cations can be exchanged by other cations. The total of negative binding sites of organic mater is designated as the cationic exchange capacity (CEC).

The binding strength of cations differs. Smaller cations with a high charge bind better than larger ones with a smaller charge. The preferred order from low to strong binding is $Na^+ < K^+ < Mg^{2+} < Ca^{2+} < Al^{3+}$. This preferred order is a drawback for farmers and growers because much of Mg^{2+} and Ca^{2+} is immobilized and adding additional calcium and magnesium generally results in an undesirable release of Na^+ and K^+.

CEC is a major issue in horticulture. Firstly, a farmer, or grower, needs to know the amounts of available cations including amounts bound cations in order to optimize cultivation. Secondly, bound cations can cause an unexpected release of generally undesired potassium and sodium. Thirdly, due to the cations, organic matter can bind itself and other charged soil particles such as clay in case a cation binds multiple sites on different surfaces, i.e. electrostatic bridge forming.

CEC is measured by saturating a leached sample with barium chloride. The barium will occupy all available binding sites thereby releasing previously bound potassium, sodium, magnesium, calcium and aluminum which can subsequently be measured in solution. The sum of all elements provides the CEC in mmol per gram or charged sites per gram.

Element ratio on the exchange complex is often also provided. This is designated as the base saturation and provides the ratios between Na^+, K^+, Mg^{2+} and Ca^{2+}. The ratio can be provided as %mol/mol or % occupied binding sites. Because magnesium and calcium are two valent this can result in large differences.

Separation through flocculation

Hydrophilic organic matter can be stirred in water and remains more than 10 minutes in suspension. Sedimented larger particles allow separation thereof. In case floating organic matter remains, either negatively charged or not, further adding strongly charged positive particles allows flocculation and sedimentation of negatively charged floating organic matter. In the present example, alum (Al^{3+}rich) was used for flocculation and sedimentation.

Structural integrity and cohesion of the pressed block

Structural integrity and cohesion was determined using a universal testing machine (UTM) to test the tensile strength and compressive strength. A blunt blade is lowered at a constant speed until the pressed growth block fractures. The resistance force of the growth block is expressed in Newton. The time point of fracture is influenced by the moisture content.

Results

Analysis of 1:1.5 extracts and total analysis

Table 2: *A: concentration of available elements in 1:1.5 extracts expressed in mmole/liter (EC is 1.1 dS/m) spore elements in µmole/l. B: concentration of elements in a total analysis in mmol/kg dry matter (spore elements in µmole/kg). C: concentration of elements of the total analysis in mmole/l substrate (spore elements in µmole/l). The dry bulk density of compost (compacted) was 488 kg/m^3.*

	K	Na	Ca	Mg	NO_3	Cl	SO_4	HCO_3	P	Fe	Mn	Zn	B	Cu	Mo
A	5.2	3.2	1	1.1	3.3	2.5	0.4	1.1	1.1	0.1	0.7	<4	<4	0.2	0.1
B	82	35	3650	907					58	25	1.7	0.7	1	644	<10
C	40	17	178	443					28	12	1	0.3	0.5	314	<5

In row A, **Table 2** shows that hammered compost contains, for plants, useable amounts of potassium, a for plants undesirable excess of sodium (and chloride) and not for plants relevant amounts of calcium, magnesium and other elements. In row B the amounts per kilogram are shown after total destruction. For ease of reference, row C is provided wherein the amounts are calculated as to amounts per liter allowing a comparison with row A.

As shown, the material contains large amounts of elements not readily solvable in water. An eight times larger amount of potassium is present in the material which is not solvable in

water. A 200 times larger amount is bound with respect to calcium and magnesium and for nitrate this is 400 times.

For the spore elements, only copper is increased present in immobilized amounts. The amounts of sodium, chloride and copper are indicative that manure was used for composting.

Analysis CEC and element ratio in percentages

Table 3 shows that hammered compost per kilogram contains 4 times more charged moieties than cocopeat and more than 2 times more than peat. For allowing a comparison, the charged moieties per liter are provided. When these values were calculated, the hammered compost (much more than not hammered compost) contains 20 times more charged moieties than cocopeat and 10 times more than black peat.

In **Table 3** and also **figure 1**, percentages are shown of cations present. As expected, cocopeat has the potential for releasing large amounts of potassium and sodium. In compost, more than 70% of the cations are calcium, in white peat even 80%. In black peat almost half of the cations are magnesium.

Table 3: *Dry bulk density in kg/m^3 and CEC determination in mmol/kg and in mmol/l. Element ratios are expressed in relation to the total number of cations (100%).*

	DBD kg/m^3	CEC mmole/kg	CEC mmole/l	K^+ %	Na^+ %	Ca^{2+} %	Mg^{2+} %
Compost	488	390	190	11.4	4.8	74.4	9.4
Cocopeat	90	93	8	23.7	5.6	56.9	13.8
Black peat	157	152	24	1	10.8	40.6	47.6
White peat	112	154	17	1.4	2.9	79.3	16.4

Table 4 shows the amounts of cations in grams per liter material. The amounts of calcium in compost are relatively large (42 grams per liter). In the pressed growth blocks, approximately 5.5 grams calcium/magnesium carbonate is added resulting in 1 to 2 grams per liter added.

Table 4: *Cations in grams per liter*

	Total	Na^+	Mg^{2+}	K^+	Ca^{2+}
Compost	53.6	1.6	3.2	6.4	42.4
Cocopeat	4.4	0.2	0.4	1.1	2.7
Black peat	2.4	0.2	0.9	0	1.3
White peat	0.6	0	0	0	0.5
Pressed soil Grow	19.1	0.6	1.3	2.7	14.6
Pressed soil traditional	1.9	0.1	0.7	0	1.0

Flocculation

If hammered compost is stirred in water, the resulting suspension is maintained for more than 10 minutes. When alum (aluminum sulphate) is added, all organic is sedimented within 30 seconds. No organic matter remains in suspension. Because hardly (< 5% g/g/) any organic material sediment is observed before the addition of alum, the organic mass can not readily be separated through flocculation. Aluminum is a very effective cation for binding organic matter.

Determination of structural integrity of the pressed growth block

As shown in **Table 5**, the peak value of the resistance measured is comparable for all three materials tested. This confirms that compost/cocopeat mixture is a suitable alternative for traditional growth blocks based on black peat. Further, suitability of the mixture at a relatively low volume of composed material is obtained, i.e. 30%.

Table 5 *Water number of pressed growth blocks when pressed and force needed to loose structural integrity.*

	Water number when pressed	Water number at break	Vol % moisture	Peak (N)
Compost/cocopeat 50/50	2.4	1.6	44	18.9
Compost/cocopeat 30/70	2.8	2.8	56	18.8
Black peat	3.7	2.9	56	17.7

Discussion

The bonding properties of compost amd black peat appear to be mainly based on the formation, through cations, of electrostatic bridges between organic particles. The total strength of these bridges appears to be dependent on a combination of:

a) sufficient availability of cations and particularly two or more valent cations;

b) sufficient moisture;

c) size reduction of organic materials allowing larger surfaces for interaction an increasing the exposure of charged moieties.

Conclusions

1) In combination with size reduced composted organic material, cocopeat and white peat can be used for the production of pressed growth blocks;

2) When compost is used, three times lesser amounts are needed as compared to traditional pressed growth blocks based on black peat,

CLAIMS

1. Pressed cultivation block or cultivation plug suitable to be used as substrate for the cultivation, or growth of plants, wherein said pressed cultivation block or cultivation plug is composed of a mixture comprised of:

a) 9 wt.% to 39 wt.% of an composted organic material;

b) 90 wt% to 60 wt% of one or more additional organic materials;

c) an additional mineral source comprising sufficient cations for adhesion or bonding said pressed cultivation block or cultivation plug;

wherein said composted organic material or said one or more additional organic materials are not dried black peat;

wherein said composted organic material is subjected to a mechanical size reduction step; and

wherein the sufficient amounts of cations in said pressed cultivation block or cultivation plug are at least 12 mmole/kg dry matter of said mixture.

2. Pressed cultivation block or cultivation plug suitable to be used as substrate for the cultivation, or growth of plants, according to claim 1, wherein said one or more organic materials are fibrous organic materials.

3. Pressed cultivation block or cultivation plug suitable to be used as substrate for the cultivation, or growth of plants, according to claim 1 or claim 2, wherein said one or more organic materials are selected from the group consisting of cocopeat, white peat, wood chips, saw dust, non-treated compost, nut shells, cocochips, rice husks, coco coir and wood fiber.

4. Pressed cultivation block or cultivation plug suitable to be used as substrate for the cultivation, or growth of plants, according to any one of the claims 1 to 3, wherein said cations are multivalent cations, preferably two valent cations.

5. Pressed cultivation block or cultivation plug suitable to be used as substrate for the cultivation, or growth of plants, according to any one of the claims 1 to 4, wherein said cations are calcium (Ca^{2+}) and/or magnesium (Mg^{2+}).

6. Pressed cultivation block or cultivation plug suitable to be used as substrate for the cultivation, or growth of plants, according to any one of the claims 1 to 5, wherein said mechanical size reduction step is selected from the group consisting of grinding, sieving, stamping and combinations thereof.

7. Pressed cultivation block or cultivation plug suitable to be used as substrate for the cultivation, or growth of plants, according to any one of the claims 1 to 6, wherein said pressed cultivation block or cultivation plug further comprises one or more selected from the group consisting of fertilizers, growth promoting agents, growth hormones, pesticides and herbicides.

8. Method for providing a pressed cultivation block or cultivation plug according to any one of the claims 1 to 7, the method comprises the steps of:

1) mechanical size reduction of composted organic material or a mixture of a composted organic material and the one or more additional organic materials;
2) adding , optionally before step (1), an additional mineral source comprising sufficient cations for adhesion, or bonding, said pressed cultivation block or cultivation plug;
3) pressing the material obtained in a cultivation block or cultivation plug suitable to be used as substrate for the cultivation, or growth of plants;

wherein the amounts of cations in said pressed cultivation block or cultivation plug are at least 12 mmole/kg dry matter of said pressed cultivation block or cultivation plug.

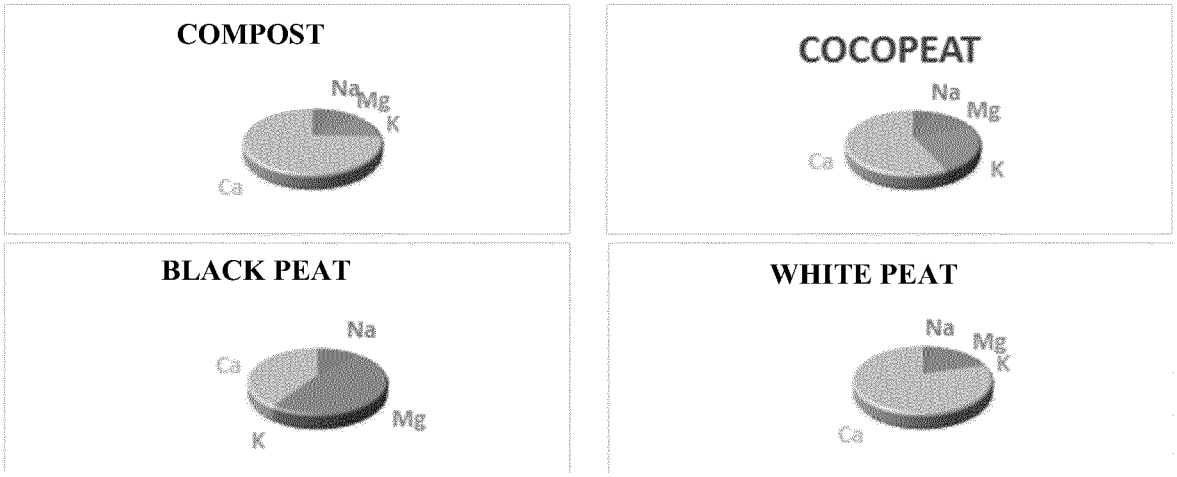
9. Pressed cultivation block or cultivation plug suitable to be used as substrate for the cultivation, or growth of plants obtainable by the method according to claim 8.

10. Use of a composted material for providing pressed cultivation blocks or cultivation plugs suitable to be used as substrate for the cultivation, or growth of plants.

11. Use of multivalent, preferably two valent, cations for adhesion, or bonding, of pressed cultivation blocks or cultivation plugs suitable to be used as substrate for the cultivation, or growth of plants.

12. Use according to claim 11, wherein said cations are calcium (Ca^{2+}) and/or magnesium (Mg^{2+}).

FIGURE 1


COMPOST
Na
Mg
K
Ca
COCOPEAT
Na
Mg
Ca
K
BLACK PEAT
Na
Ca
Mg
K
WHITE PEAT
Na
Mg
K
Ca

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2021/069432

A. CLASSIFICATION OF SUBJECT MATTER
INV. A01G24/20 A01G24/44
ADD.

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)
A01G

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 practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2018/140607 A1 (JIFFY INT AS [NO]) 2 August 2018 (2018-08-02)	1-10
A	abstract; figures 1A-8 paragraph [0052] paragraph [0041] paragraph [0061] paragraph [0053] paragraph [0015] - paragraph [0017]	11,12

X	WO 2015/044526 A1 (TEKNOLOGIAN TUTKIMUSKESKUS VTT OY [FI] ET AL.) 2 April 2015 (2015-04-02)	11,12
A	page 11, line 33 - page 12, line 6 page 2, line 1 - line 22 page 7, line 1 - line 4	1-10

	-/--	

[X] Further documents are listed in the continuation of Box C.

[X] 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 application or patent 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	Date of mailing of the international search report
16 August 2021	25/08/2021

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Balzar, Maarten

1

Form PCT/ISA/210 (second sheet) (April 2005)

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2013/019813 A1 (RUBIN PATTI D [US] ET AL) 24 January 2013 (2013-01-24) the whole document	1-12
A	WO 2005/070852 A1 (ZANDER CORP LTD [GB]; BEVAN RUPERT [GB]) 4 August 2005 (2005-08-04) the whole document	1-12
A	WO 2016/097301 A1 (DAMGRO BV [NL]; MULTI PLANT GROENTE SAAILING KWEKERY PTY [ZA]) 23 June 2016 (2016-06-23) the whole document	1-12

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2021/069432

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2018140607 A1	02-08-2018	CA 3051410 A1	02-08-2018
		EP 3573460 A1	04-12-2019
		US 2019364751 A1	05-12-2019
		WO 2018140607 A1	02-08-2018
WO 2015044526 A1	02-04-2015	CA 2925409 A1	02-04-2015
		EP 3048872 A1	03-08-2016
		FI 125943 B	15-04-2016
		RU 2016114407 A	31-10-2017
		US 2016219810 A1	04-08-2016
		WO 2015044526 A1	02-04-2015
US 2013019813 A1	24-01-2013	NONE	
WO 2005070852 A1	04-08-2005	NONE	
WO 2016097301 A1	23-06-2016	NONE	