Plant cultivation medium and Method of Producing Dry Soy Pulp

Specification

[Field of the Invention]

[0001] The present invention relates to a plant cultivation medium to grow plants. More specifically, it relates to a material usable in place of soil for plant cultivation. The present invention also relates to a method of manufacturing dry soy pulp (or okara), which is suitably used for the above plant cultivation medium. Here "okara" means a soy pulp being a by-product from tofu (bean curd)-producing process.

[Background Art]

[0002]

Organic wastes have been used as plant fertilizer. For example, Patent References 1 and 2 (Japanese Patent Application Laid-Open Nos. 2001-120054 and 2001-199780) disclose use of soy pulp as an organic waste.

[0003]

Since wet soy pulp directly obtained from the tofu production process contains a lot of water and tends to decompose, wet soy pulp is dried to make dry soy pulp with a certain treatment for convenience of handling such as storage and transportation, and dry soy pulp is used for various purposes. For example, Patent Reference 3 (Japanese Patent Application Laid-Open No. 2005-21770) discloses a technique to make dry soy pulp from wet soy pulp by treating the latter at a relatively high temperature using a heating drum etc.

[0004]

On the other hand, greening of building walls and rooftops, sides of wall fences has been carried out in view of alleviation of the heat island phenomenon, clean up of air therefore environment protection. One of such greening structures is disclosed in the Patent Reference 4 (Japanese Patent Application Laid-Open No. 2004-248550).

[Disclosure of the Invention]

[Problem(s) to be Solved by the Invention]

[0005]

In reality, however, the greening structure disclosed in the Patent Reference 4 utilizes base soil composed of light-weight materials such as a foam material. Thus it is relatively expensive and has a relatively heavy effect on the environment. That is, it consumes energy during the manufacturing process and discharges harmful materials, and when disposed after use, it becomes an industrial waste. For this reason, materials for plant cultivation of easy production, low cost and of little

environmental effect are desired.

[0006]

Recently, users' needs for greening structure have become diversified, and the plant cultivation mediums are used as a unit (planting unit) for greening of gardens, balconies, rooftops, or wall surface of the buildings, and fence surfaces for various purposes such as aesthetic purpose, blinder and/or sunshade. Also various plants are used for greening, such as small trees, grasses, flowers, turf-grass, mosses, sedums and fruit trees. In addition, there is a need for seasonal change of the planting units.

[0007]

Further, planting units have been used as objects or advertising media in exhibitions etc. For example, planting units are used as communication media by making flower letters. Planting units are also used to create amenity spaces.

[0008]

Accordingly, planting units are required to have greater design freedom to meet the diversified demands. Also required is easy handling including installation and disinstallation.

[0009]

On the other hand, as the Patent Reference 3 discloses, wet soy pulp is processed under relatively high temperature conditions using a heating drum etc., to produce dry soy pulp efficiently within a short term.

[0010]

However, such a method consumes energy for heating, and when petrol or natural gas is used for heating, harmful substances are discharged into the air. Or when an energy source for heating such as electric power or gas is produced, harmful substances are discharged into the air. Thus the environmental load is relatively heavy.

[0011]

Accordingly, it is desirable to find a method of producing dry soy pulp from wet soy pulp, of which environmental load is as small as possible.

[0012]

The present invention was made in view of the above conditions to provide a plant cultivation medium which can be produced easily at a low cost and provide excellent plant growth, which is also eco-friendly, high in design freedom, easy in handling, and usable in various purposes. The present invention also provides a manufacturing method which can produce dry soy pulp suitable for use in the above plant cultivation medium, with little effect on the environment and within a relatively short term.

[Means to solve the problem]

[0013]

The plant cultivation medium of the present invention is characterized in that it is obtained by mixing at least the following three components:
a plant-derived material in a form of chip, fiber, or powder of a predetermined size, a dry soy pulp and a water-soluble binder, to form a mixture; and
by solidifying the mixture into a predetermined form.

[0014]

Characteristically in the present invention, the dry soy pulp may be one prepared by adding at least yeast cells to the wet soy pulp obtained from the tofu-manufacturing process for fermentation, followed by drying of the soy pulp to a given dryness using fermentation heat.

[0015]

Characteristically in the present invention, the plant-derived material is based on the plant-derived materials such as logged wood, bark, pruned branches, leaves, grains, grain husks, fruits, fruit peel and seeds.

[0016]

Characteristically in the present invention, the water-soluble binder may be an acrylic emulsion adhesive.

[0017]

Characteristically in the present invention, the plant cultivation medium may be obtained by press-forming the above mixture at a certain pressure.

[0018]

Characteristically in the present invention, the plant-derived material and the dry soy pulp may be respectively adjusted in such a manner that the major components thereof have a size to pass through a sieve mesh of about from 0.5 x 0.5 mm to 3 x 3 mm.

[0019]

Characteristically in the present invention, the plant cultivation medium may be surrounded by a mesh-like surrounding member.

[0020]

Characteristically in the present invention, the plant cultivation medium may be reinforced with a reinforcement member that is inserted when the mixture is solidified into a predetermined form.

[0021]

The manufacturing method of dry soy pulp according to the present invention is characterized in that at least yeast is added to soy pulp obtained from the

tofu-producing process, the soy pulp is fermented with the yeast added, and the soy pulp is dried using the fermentation heat.

[0022]

Characteristically in the dry soy pulp manufacturing process of the present invention, at least one of electrolytic water containing active oxygen species, a photocatalyst, a root stimulator, a moisturizing agent and a growth stimulator may be added in addition to the yeast.

[Effect of the Invention]

[0023]

According to the present invention, there provided is a plant cultivation medium which can be produced with ease at a low cost to provide excellent plant growth, which is also eco-friendly, high in design freedom, easy in handling, and usable in various purposes. The present invention also provides a method for manufacturing dry soy pulp eco-friendly and in a relatively short term, where the soy pulp product is suitable to be used for the above plant cultivation medium.

[Best mode of the Invention]

[0024]

An embodiment of the present invention is described in detail referring to the attached Drawings. The present invention, however, should not be limited to the embodiment described below.

[0025]

The plant cultivation medium according to one embodiment of the present invention is a material for grow any plants such as small trees, grasses, flowers, turf-grass, sedums, fruit trees and vines, usable in the place of culture soil or cultivation base to grow plants, where the present cultivation material contains a plant-derived material as a major component, where the plant-derived material is corresponding to for example, a plant chip, fiber or powder (hereinafter may be referred to as plant chip etc.) prepared by crushing or pulverizing plant-derived wastes such as logged wood such as thinned wood, barks, pruned branches, leaves, grains, grain husks, fruits, fruit peels, seeds and so on. It is clear for a person skilled in the art that plant material other than the plant-derived wastes can be used.

[0026]

Most of the thinned wood, barks, pruned wood discharged from trimming and pruning of boulevard trees and park planting are discarded by burning etc., without effective utilization. According to the embodiment of the present invention, such plant wastes can be used to reduce the cost, further to reduce CO_2 discharge from burning treatment

thus to lessen environmental load.

[0027]

According to the embodiment, the plant-derived material is made into plant chip, fiber or powder by using a crusher etc. The size of the chip, fiber or powder is about from 0.5 mm to 3 mm in length, width, and thickness, those passed through a sieve of a mesh size of about from 0.3 mm x 0. 3 mm to 0.5 mm x 0.5 mm. However, the size is not limited to the above, and materials of a larger or smaller size can be used.

[0028]

Such plant chips, fibers or powder etc. may be those available at garden centers etc.

[0029]

In the plant cultivation medium of the embodiment, the size adjusted plant-derived material such as plant chips, fiber or powder is mixed with dry soy pulp used as a fertilizer.

[0030]

To obtain dry soy pulp, wet soy pulp obtained from the tofu-producing process can be dried naturally, or dried by heat treatment or by a method found by the present inventor described later.

[0031]

Since dry soy pulp is less perishable than wet soy pulp, the former is more advantageous than the latter in view of storage stability of the plant cultivation medium to which relatively long shelf-life at shops and warehouses is demanded when distributed on commerce. Also dry soy pulp is more suitable than wet soy pulp in view of plant growth. Thus dry soy pulp is more suitable to be contained in the plant cultivation medium as fertilizer. In addition, since most of wet soy pulp is discarded at present, utilization of dry soy pulp is preferable in view of reduction of cost and environmental load.

[0032]

The dry soy pulp may be a powder or fiber form passable through a sieve mesh of about from 0.5 mm x 0.5 mm to 3 mm x 3 mm in order to achieve uniform mixing and dispersion in the plant chips etc., which is a component of the plant cultivation medium of the present embodiment.

[0033]

Although commercial dry soy pulo may also be used, it is preferable to use dry soy pulp prepared according to the method found by the present inventor because of excellent plant growth and less environmental load.

[0034]

In the present embodiment, the plant cultivation medium is prepared by mixing the plant-derived material and dry soy pulp as described above using a binder (adhesive) to combine the components.

[0035]

The binder to combine the plant chip etc. and dry soy pulp may be a water-soluble binder (an emulsion adhesive), which has little bad effect to the human body and plants, and also eco-friendly. For example, polyacrylate emulsion adhesives can be used. Also polyvinylacetate or polyethylenevinylacetate adhesives may be used.

[0036]

The plant cultivation medium of the present embodiment can be produced as follows:

(1) First, the plant-derived material and dry soy pulp are mixed well using a mixer or by hand to a state of almost uniform dispersion.

[0037]

(2) Then, a solution of a water-soluble binder (emulsion adhesive) is poured or sprayed to the mixture and processed in a mixer or by hand to a paste form.

[0038]

(3) Next, the well mixed paste of the plant-derived material, the dry soy pulp and the water-soluble binder obtained in the step (3) is put in a mold (20) of a given shape (see FIG. 1(A)). After pressing the mixture using an oil press etc. in a predetermined manner (see FIG. 1(B)), the plant cultivation medium 10 is taken out from the mold (20) (see FIG. 1(C)).

[0039]

(4) The plant cultivation medium taken out from the mold is dried to provide the plant cultivation medium of the present embodiment of the invention. It is also possible to solidify to a certain form without pressing.

[0040]

As shown in FIG. 2, in order to protect the plant cultivation medium 10 from damage, or when relatively high strength is required, the peripheral portion of the molded plant cultivation medium 10 may be surrounded by a surrounding member 30 having openings communicating inside and outside in a given pattern, for example, a mesh or net made of metal or so, and then the plant cultivation medium 10 is dried. In this case, the mesh size is properly selected considering both planting properties and strength. For example, a mesh size of from about 10 mm x 10 mm to about 50 mm x 50 mm may be used, but not limited thereto. Larger or smaller mesh can be also used. In view of decay prevention, the surrounding member may be made of stainless steel, aluminum, resin or plant fiber such as bamboo and wood.

[0041]
Further, it is possible to insert a reinforcement member into the mixture during the molding step (3), where the reinforcement member may be a mesh of a metal etc. having a mesh size of about from 10 mm x 10 mm to 50 mm x 50 mm. In view of decay prevention, the material of the reinforcement member may be stainless steel, aluminum, resin, synthetic resin, or plant fiber such as bamboo or wood. Instead of or with the reinforcement member, the surrounding member 30 may be inserted in the mixture during the molding step. It may be carried out referring to the steps 1-8 shown in FIGS. 3-6.

[0042]
Here, the mesh structure of the above surrounding member and reinforcement member is useful when the plant cultivation medium of the invention is used as a unit for wall greening etc., because hooks etc. to attach the cultivation material to the wall face can be engaged without providing brackets etc to the plant cultivation medium.

[0043]
After the above molding process, the plant cultivation medium of the present embodiment will become to a relatively high temperature state for a certain period of time of approximately 7 days, where the exothermal reaction by microbes such as bacteria contained in the plant chips etc. is activated. It should be noted, however, the above period will vary according to the environment where the plant cultivation medium is kept.

[0044]
Thus, the plant cultivation medium is dried well from inside, without active drying process using electricity or fuel, and it is prevented from decomposition for relatively a long period.

[0045]
Further, as the plant cultivation medium is kept in a relatively high temperature state for a certain period, if the medium is contaminated with pests or eggs thereof, they will be killed. Thus sanitary condition can be maintained over a long term to satisfy the demand for long storage.

[0046]
Plants can be planted to the plant cultivation medium after it was left for the above mentioned predetermined period.

[0047]
Here, in the above component-mixing steps (1) and (2), the composition may be approximately 70-90% by weight of plant chips etc., 5-25 wt% of process dry soy pulp,

and 5-25 wt% of water-soluble binder, where the ratio may be suitably chosen according to the various demands such as the usage type of the plant cultivation medium or growth conditions of the planted plant. For example, the ratio of process dry soy pulp may be increased or when strength is required for the plant cultivation medium, the binder ratio may be increased. When used for mixing, the binder may be 2-5 fold diluted with water.

[0048]

The other components other than the plant chips etc. and dry soy pulp, for example, a moisturizer and fertilizer such as inorganic fertilizer, organic fertilizer and chemical compost may be mixed as required. Blending of a moisturizer allows control of the moisture-retaining property, which is advantageous for the plant grown with the plant cultivation medium of the present embodiment according to the growing environment. Further, sand or soil may be blended according to the circumstances.

[0049]

The plant cultivation medium prepared as above may be formed into various shapes as required, for example, in a shape of polyhedron such as a cubicle, disc, multi-sided pyramid such as three-side pyramid and four-sided pyramid, or cone. Also the molded plant cultivation medium of a given shape can be cut with a cutter or saw into a suitable form, which allows high design freedom.

[0050]

Further, the present plant cultivation medium may be placed horizontally or vertically. This also means high design freedom.

[0051]

Therefore, the present plant cultivation medium is suitable when the home garden, balcony, rooftop, wall surface or fence is used according to various needs of the users such as aesthetic purposes, decoration, blind, sunshade, flower bed or kitchen garden. Also it may be used in place of the hedge. It is also possible to pave the rooftop, balcony or garden with the present plant cultivation medium to grow plants.

[0052]

Since the plant cultivation medium of the present embodiment is mainly composed of plant-derived material and dry soy pulp both combined with a harmless binder, there is minimum possibility of polluting or damaging the environment, i.e., no muddy water or harmful substances will flow out when it is watered, exposed to rain, put in water or floated on water with an attached float.

[0053]

Accordingly, when the present plant cultivation medium is utilized for greening

carried out as a countermeasure against the urban heat-island phenomenon, or placed in an exhibition site, it will neither soil the installation site nor expose residents and users to harmful substances, making the present plant cultivation medium preferable as the greening unit.

[0054]

Further, since the main component of the present plant cultivation medium is plant chips etc. having a relatively small specific gravity, it is possible to reduce the weight in comparison with other similar products using soil as the main component.

[0055]

Further, the plant cultivation medium of the present embodiment can be formed (or molded) or cut into blocks of a proper size so that one or a few persons can carry. In such a case, there is an advantage that storage or carrying in and out of a plurality of plant cultivation medium can be done efficiently and rapidly because handling is easy.

[0056]

Accordingly, the present plant cultivation medium is easy to carry in and out a building etc., which shortens the construction period for greening and enables seasonal change with ease In addition, when the present plant cultivation medium is advantageously used as objets or commercial media in exhibitions where carrying in and out at relatively short intervals is required.

[0057]

In the meantime, plant can be planted to the present plant cultivation medium on any face thereof.

[0058]

To plant a plant to the present plant cultivation medium, in case of flowers etc., holes are opened on the surface using a drill etc., into each of which the flower root or seed can be planted. Accordingly, the present plant cultivation medium can meet various designs such as flower letters by considering the planting arrangement and the flower colors.

[0059]

In addition, it is possible to form a certain design including flower letters viewed as a whole by changing plants and flower colors of each block of the plant cultivation medium and arranging these blocks properly.

[0060]

In case of a plant that grows thickly such as turf-grass and mosses, the plant is first grown to a certain extent and then a certain mass is taken out and transplanted

to the surface of the present plant cultivation medium.

[0061]

In FIGS.7-10, planting examples using the plant cultivation medium of the present embodiment are shown.

FIG.7 shows an example utility as a hedge where plural blocks of the plant cultivation medium of the embodiment are planted with plants and arranged horizontally and vertically.

FIG. 8 shows an example where the plant cultivation medium of the embodiment is molded (or formed) or cut into a flat triangle form having two triangle planes facing each other, and planted with plants showing applicability to various designs.

FIG. 9 shows the frontal view of columns of the plant cultivation medium of the embodiment where the units are arranged vertically to form a column and plural columns are arranged.

FIG. 10 shows a side view of the columns of FIG. 9 to show that the plants are planted on both of the front and rear surfaces.

[0062]

As described above, the plant cultivation medium of this embodiment has advantages such as easy production, low cost, excellent plant growth, little environmental load, high design freedom, easy handling and a variety of utility.

[0063]

Also as a result of various experiments, the inventor of the present invention found a novel treating method to obtain process dry soy pulp that is suitably usable as a component of the plant cultivation medium of the embodiment, with small environmental load and in a relatively short time (soy pulp-manufacturing method).

[0064]

Next, the treating method found by the present inventor is explained in detail.

First, in step S1 of FIG. 11, soy pulp is brought in an airy place with a roof to prevent rain, or in a room where temperature and humidity are controllable. Here the soy pulp is wet soy pulp obtained from the tofu-producing process but may include those dried naturally to some extent. According to the situation, the step S1 can be omitted to proceed to step S2, or the soy pulp is dried naturally in the step S1 for a certain period, e.g., a few hours, a few days or a period in which no decomposition will occur, and then proceeds to step S2.

[0065]

In step S2, the wet soy pulp is put into a rotating drum mixer etc. and agitated in a predetermined manner to break lumps. Alternatively, the wet soy pulp is stirred

manually to break lumps and spread on the floor.

[0066]

In step S3, yeast extract containing yeast is added to the wet soy pulp in the rotating drum mixer, and the soy pulp and yeast extract are stirred and mixed in a predetermined manner. Alternatively, when manually carried out, the yeast extract is added to the wet soy pulp spread on the floor by spraying and the wet soy pulp and the yeast extract are stirred and mixed in a predetermined manner.

[0067]

In this embodiment, the yeast extract may be added as a 10-20 fold dilution with water to obtain good mixing with the wet soy pulp. Types, amount and dilution rate of the yeast extract may be suitably chosen or adjusted based on the observation of the growing condition of the plant planted to the plant cultivation mediums containing dry soy pulp obtained by the treating method of the present invention.

[0068]

In this embodiment, the above yeast extract is not specified and it may be prepared by dissolving tablets or granules into water, or it may be commercially available yeast extract for microbial culture or food additive.

[0069]

In this embodiment, electrolytic water containing active oxygen species, which is eco-friendly, low cost and safe, may be added to the yeast extract to stimulate generation of a plant hormone ethylene which then increases inherent pest resistance of the plant. Also there can be added to the yeast extract the following additives: a photocatalyst such as titanium oxide to accelerate photosynthesis, a root stimulator such as methionine, a moisturizing agent and a tree-maintaining/an agent that promotes growth of useful microbes, for example, trehalose.

[0070]

That is, commercial yeast extract containing the above or other additives of various properties may be chosen and used based on the observation of plants growing on the plant cultivation medium containing the dry soy pulp obtained by the treating method of the invention.

[0071]

In step S4, the soy pulp mixed with yeast extract in the step S3 is taken out from the rotating drum mixer or when manually mixed on the floor, taken out from the floor, and then transferred onto a mesh and spread to a depth of about 50 mm, where the mesh is of 0.5-1 meter-square, made of metal such as aluminum and stainless steel, wood, resin, or synthetic resin, and its mesh size is about 10 mm x 10 mm.

[0072]
In step S5, a plurality of the mixture of soy pulp and yeast extract spread on the mesh in the step S4 are set up in a rack as shown in FIG. 12 to keep a certain interval between meshes, for example, the space between the upper surface of the mixture and the lower surface of the mesh of the above stage may be about 50 mm, where fermentation is carried out. Fermentation leads to heat generation from the wet soy pulp, which accelerates drying of the soy pulp inside as well as outside.
[0073]
The place of fermentation to accelerate drying may be, for example, an airy place with a roof to prevent rain exposure, or in a room where temperature and humidity are controllable and properly fanned. However, when the soy pulp mixture is spread on plural meshes, and these meshes are tiered as described above, a relatively large amount of soy pulp mixture can be treated at once even in a small space, leading to higher working efficiency.
[0074]
When the soy pulp mixture is left under such conditions for several days, e.g., around 7 days, the wet soy pulp is fermented accompanying temperature rise. As a result of fermentation, soy pulp-drying process is accelerated and the soy pulp becomes to contain components useful for plant growth such as nitrogen (N), phosphor (P) and potassium (K) etc.
[0075]
In step S6, dry soy pulp obtained after the steps from S1 to S5 is taken out from the mesh. Such dry soy pulp obtained as above is suitable for use as the dry soy pulp for the plant cultivation medium of the present invention, having such advantages as little effect on the environment and a relatively short preparation time from wet soy pulp.
[0076]
Next, more preferable treating method is explained.
In step S7, the dry soy pulp taken out in the step S6 is mixed with wet soy pulp in the step S1 (wet soy pulp not-fermented yet) in such a manner that the dry okara becomes about 50-70% by volume of the total.
[0077]
In step S8, the mixture of wet and dry soy pulp obtained in the step S7 is put in a rotating drum mixer and stirred to break lumps in the same manner as the step 2. Alternatively, the mixture is manually stirred to break lumps and spread on the floor.
[0078]

In step S9, as in the step S3, an yeast-containing yeast extract is added to the wet soy pulp in the rotating drum mixer, and the soy pulp and yeast extract are stirred and mixed in a predetermined manner. Alternatively, when manually carried out, the yeast extract is added to the wet soy pulp spread on the floor by spraying, and the wet soy pulp and the yeast extract are stirred and mixed in a predetermined manner. In this case, the yeast extract may be one described above.

[0079]

In step S10, the soy pulp properly mixed with yeast extract in the step S9 is taken out from the rotating drum mixer or, when manually mixed on the floor, moved from the floor, and then as explained in the step 4, transferred onto a mesh or meshes and spread to a depth of about 50 mm, where the mesh is of about 0.5-1 meter-square, made of metal, wood, resin, or synthetic resin, and its mesh size is about 10 mm x 10 mm, for example.

[0080]

In step S11, as explained in the step S5, a plurality of the mixture of soy pulp and yeast extract spread on the mesh are set up in a rack as shown in FIG. 12 to keep a certain interval, for example, about 50 mm in the vertical direction, to carry out fermentation in a predetermined manner.

[0081]

When the soy pulp mixture is left under such conditions for several days, e.g., around 7 days, the wet soy pulp is fermented accompanying temperature rise. As a result of fermentation, soy pulp-drying process is accelerated and the soy pulp becomes to contain components useful for plant growth such as nitrogen (N), phosphor (P) and potassium (K) etc. In this case, already fermented dry soy pulp is contained by about 50-70%, drying is more speedy and the composition is more suitable for plant growth.

[0082]

In step S12, dry soy pulp obtained through the steps 7-11 is taken out from the mesh. In addition, the dry soy pulp obtained from the step 6 or 12 may be crushed or pulverized into a powder or fiber of 0.5-3 mm in size, when it is used for the plant cultivation medium of the invention, for uniform mixing and dispersion in the plant chips, fiber or powder.

[0083]

When dry soy pulp is manufactured from wet soy pulp according to the above-described treating method, heat from yeast fermentation helps the drying process. Thus, dry soy pulp containing plenty of nutrients important to plant growth can be obtained within a relatively short time with the least effect to the environment when compared

with a drying process which uses heating means using fossil fuel-based energy such as electricity and fuels.

[0084]

Further, since the dry soy pulp obtained by the treating method of the embodiment has gone through a fermentation process at a relatively high temperature, soy pulp is sufficiently dried by itself from inside, protected from decomposition for relatively long term without active drying treatment using fossil fuel-based energy such as electricity or fuels. Also, for example, even when pest contamination or egg deposition has occurred in the wet soy pulp, they are killed or damaged during fermentation, so that sanitary state can be maintained for a long term to meet the needs such as long storage.

[0085]

The dry soy pulp relating to the present embodiment, obtained by the above-described treating method, is suitable for use as a component of the plant cultivation medium of the embodiment, but not limited thereto. It is useful as general plant fertilizer.

[0086]

Specifically, the dry soy pulp relating to the present embodiment uses wet soy pulp being an organic waste as a starting material. Thus it is economical, and the treating process has the least effect on the environment, so that its application as an eco-friendly and safe fertilizer, not causing environmental pollution, is expected to blossom.

[0087]

The embodiments as described above are mere examples to describe the present invention, not limited thereto. Various variations are possible within the gist of the present invention.

Brief Description of Drawings

[0088]

[FIG. 1] FIG. 1 illustrates part of the manufacturing process of the plant cultivation medium of an embodiment of the present invention.

[FIG. 2] FIG. 2 illustrates encasing of the plant cultivation medium of the embodiment into a mesh surrounding member.

[FIG. 3] illustrates a method for inserting a mesh surrounding member in the manufacturing process of the plant cultivation medium of the embodiment (Steps 1 and 2).

[FIG. 4] illustrates a method for inserting a mesh surrounding member in the

manufacturing process of the plant cultivation medium of the embodiment (Steps 3 and 4).

[FIG. 5] illustrates a method for inserting a mesh surrounding member in the manufacturing process of the plant cultivation medium of the embodiment (Steps 5 and 6).

[FIG. 6] illustrates a method for inserting a mesh surrounding member in the manufacturing process of the plant cultivation medium of the embodiment (Steps 7 and 8).

[FIG. 7] FIG. 7 shows an example of utility of the plant cultivation medium of the embodiment as a hedge, where units of the plant cultivation medium of the embodiment planted with plants are arranged in vertical and horizontal directions.

[FIG. 8] FIG. 8 shows an example of the plant cultivation medium of the embodiment where the plant cultivation medium is formed or cut into a unit having two triangle planes facing each other and is planted with plants, to be adaptable to various designs.

[FIG. 9] FIG. 9 shows the frontal view of columns of the plant cultivation medium where the units are arranged vertically to form a column and a plurality of the columns are arranged.

[FIG. 10] FIG. 10 is a side view of the columns of FIG. 9 to show that the plants are planted on both of the front and rear surfaces.

[FIG. 11] FIG. 11 is a flow chart to illustrate the production method of the dry soy pulp of one embodiment.

[FIG. 12] FIG. 12 illustrates an example of the fermentation/drying process of dry soy pulp of an embodiment.

Description of Notations

[0089]

10 Plant cultivation medium

20 Mold

30 Surrounding member

Claims

1. A plant cultivation medium characterized in that the medium is obtained by mixing at least (1) a plant-derived material in a form of chip, fiber or powder of a given size, (2) process dry soy pulp and (3) a water-soluble binder, and solidifying the mixture into a given shape.

2. The plant cultivation medium according to claim 1, wherein the process dry soy pulp is produced by adding at least an yeast to a soy pulp obtained from a tofu production process to cause fermentation, followed by drying using heat generated from the fermentation.

3. The plant cultivation medium according to claim 1 or 2, wherein the plant-derived material is selected from a group consisting of logged wood, bark, pruned branches, leaves, grains, grain husks, fruits, fruit peels and seeds.

4. The plant cultivation medium according to any of claims 1-3, wherein the water-soluble binder is an acrylic emulsion adhesive.

5. The plant cultivation medium according to any of claims 1-4, wherein the medium is obtained by pressing the mixture into shape at a given pressure.

6. The plant cultivation medium according to any of claims 1-5, wherein the plant-derived material and the dry soy pulp are adjusted in such a manner that the main components pass through a sieve mesh of about from 0.5 mm x 0.5 mm to 3 mm x 3 mm.

7. The plant cultivation medium according to any of claims 1-6, wherein the plant cultivation medium is surrounded by a mesh-like surrounding member.

8. The plant cultivation medium according to any of claims 1-7, wherein a reinforcement member is inserted into the plant cultivation medium when the mixture is solidified into a given shape.

9. A method of manufacturing a process dry soy pulp comprising the steps of:
adding an yeast to a soy pulp obtained in a tofu-producing process;
fermenting the soy pulp by the action of the added yeast; and
drying the soy pulp using fermentation heat.

10. The method according to claim 9, wherein, in addition to the yeast, at least one selected from the group consisted of an electrolytic water containing active oxygen species, a photocatalyst, a root stimulator, a moisturizing agent and a growth stimulator is added.