Notice

DESCRIPTION CN114041409A

A method for cultivating high-protein duckweed

一种高蛋白浮萍的培养方法

[0001]

Technical Field

技术领域

[n0001]

This invention relates to the field of duckweed cultivation technology, and in particular to a method for cultivating high-protein duckweed.

本发明涉及浮萍培养技术领域，特别是涉及一种高蛋白浮萍的培养方法。

[0003]

Background Technology

背景技术

[n0002]

Duckweed (Lemna minor L.)

浮萍(Lemna minor L.)

It is a monocotyledonous floating aquatic plant belonging to the genus Lemna in the family Lemnae. It is widely distributed throughout the world. It is small in size, spreads rapidly, has a strong ability to adapt to the environment, has a certain resistance to saline-alkali water environments, and has the ability to accumulate heavy metal cadmium ions.

是单子叶水面漂浮植物，隶属于浮萍科浮萍属，广布于世界各地，其个体小，扩繁快，对环境的适应能力强，对盐碱水环境有一定的抗性，对重金属镉离子有富集能力。

Meanwhile, duckweed itself is rich in protein and various amino acids, and is often used to make livestock feed and aquaculture feed.

同时浮萍本身富含蛋白质及各种氨基酸，常用于制作畜牧饲料以及水产养殖饲料等。

[n0003]

Duckweed is a simple aquatic monocotyledonous plant that is widely distributed in warm regions of the world, but is not found in Java, Indonesia.

浮萍本身是一种简单的水生单子叶植物，全球温暖地区广布，但不见于印度尼西亚爪哇。

It is distributed in paddy fields, ponds, or other still water bodies throughout China's northern and southern provinces.

中国南北各省，生于水田、池沼或其它静水水域均有分布。

It not only has a high nitrogen and phosphorus adsorption capacity, which can reduce the nitrogen and phosphorus content in water, but also has rich nutrients, such as a variety of

amino acids, and is often used as pig feed, duck feed and grass carp bait. Scientists now believe that duckweed, with its rich content of various nutrients and proteins, can be used to make food. The protein content of common duckweed is generally around 25%, which greatly limits its application as animal feed.

其不仅具有很高的氮磷吸附能力，能够降低水体氮磷含量，同时也具有丰富的营养物质，例如多种氨基酸等，常用来做猪饲料、鸭饲料以及草鱼饵料等。 目前已有科学家认为浮萍以其富含多种营养蛋白等特点可以被用来制作食物。 现有普通紫萍的蛋白质含量交底，一般在25%左右，在作为饲料应用时，存在很大的局限性。

[0006]

Summary of the Invention

发明内容

[n0004]

The purpose of this invention is to address the problem of low protein content in duckweed in existing technologies by providing a method for cultivating high-protein duckweed.

本发明的目的是针对现有技术中存在的浮萍蛋白含量较低的问题，而提供一种高蛋白浮萍的培养方法。

[n0005]

The technical solution adopted to achieve the purpose of this invention is:

为实现本发明的目的所采用的技术方案是：

[n0006]

A method for cultivating high-protein duckweed includes the following steps:

一种高蛋白浮萍的培养方法，包括以下步骤：

[n0007]

Step 1: Select duckweed strains with the highest protein content from wild duckweed;

步骤1，从野生浮萍中筛选蛋白质含量最高的浮萍品系；

[n0008]

Step 2: Under sterile conditions, prepare a high-protein duckweed culture medium, which includes the following components:

步骤2，在无菌的环境下，配置高蛋白浮萍培养液，所述高蛋白浮萍培养液包括以下组分：

[n0009]

MgSO₄・7H₂O：0.4-0.5mM

MgSO₄・7H₂O：0.4-0.5mM

[n0010]

Ca(NO₃)₂・4H₂O：1.4-1.5mM

Ca(NO₃)₂・4H₂O：1.4-1.5mM

[n0011]

KNO₃: 1.0-1.2mM

KNO₃：1.0-1.2mM

[n0012]

KH₂PO₄：0.4-0.5mM

KH₂PO₄：0.4-0.5mM

[n0013]

Mg(NO₃)₂・6H2O: 0.4-0.5mM

Mg(NO₃)₂・6H2O：0.4-0.5mM

[n0014]

CaCl₂・2H₂O: 50-60μM

CaCl₂・2H₂O：50-60μM

[n0015]

KCl: 50μ-60M

KCl：50μ-60M

[n0016]

Na₂MoO₄・2H₂O: 6.1-6.3μM

Na₂MoO₄・2H₂O：6.1-6.3μM

[n0017]

H₂BO₃：69-72μM

H₂BO₃：69-72μM

[n0018]

K₂H₂EDTA・2H₂O: 30-32μM

K₂H₂EDTA・2H₂O：30-32μM

[n0019]

FeNH₄-EDTA: 56.7-57.1μM

FeNH₄-EDTA：56.7-57.1μM

[n0020]

MnCl₂・4H₂O：13.8-14.2μM

MnCl₂・4H₂O：13.8-14.2μM

[n0021]

ZnNa₂EDTA・4H₂O：2.8-3.2μM

ZnNa₂EDTA・4H₂O：2.8-3.2μM

[n0022]

CoSO₄・7H₂O: 4.8-5.2μM

CoSO₄・7H₂O：4.8-5.2μM

[n0023]

Na₂-EDTA・2H₂O: 18.6-19.2μM

Na₂-EDTA・2H₂O：18.6-19.2μM

[n0024]

The pH of all components was adjusted to 5.6-5.8;

所述组分中均调节pH5.6-5.8；

[n0025]

Step 3: Transfer the duckweed strains selected in Step 1 to the high-protein duckweed culture medium in Step 2 for further cultivation.

步骤3，将步骤1筛选出的浮萍品系转移到所述步骤2中的高蛋白浮萍培养液中进行培养；

[n0026]

Step 4: Propagate the species using the methods described in Steps 2-3.

步骤4，按照所述步骤2-步骤3的方法进行继代扩繁。

[n0027]

In the above technical solution, in step 1, the duckweed strain with the highest protein content is screened out by the protein content identification method.

在上述技术方案中，所述步骤1中，通过蛋白质含量鉴定的方法，筛选出蛋白质含量最高的浮萍品系。

[n0028]

In the above technical solution, in step 1, duckweed strains with a protein content higher than 35% are screened out.

在上述技术方案中，所述步骤1中，筛选出蛋白质含量高于35%的浮萍品系。

[n0029]

In the above technical solution, in step 2, after preparing the high-protein duckweed culture medium, it is subjected to high-pressure sterilization.

在上述技术方案中，所述步骤2中，配置高蛋白浮萍培养液后，进行高压灭菌。

[n0030]

In the above technical solution, in step 3, after burning with an alcohol lamp for 1-2 seconds, tweezers are used to pick up 8-10 pieces of duckweed obtained in step 1 and transfer them to a high-protein duckweed culture medium for cultivation.

在上述技术方案中，所述步骤3中，酒精灯灼烧1-2秒后的镊子沾取8-10片步骤1得到的浮萍品系，将其转移至高蛋白浮萍培养液中，进行培养。

[n0031]

In the above technical solution, in step 3, the high-protein duckweed culture solution containing the transferred high-protein duckweed is sealed with a sealing film and then cultured in an incubator.

在上述技术方案中，所述步骤3中，利用封口膜将转移有高蛋白浮萍的高蛋白浮萍培养液密封后，在培养箱内进行培养。

[n0032]

In the above technical solution, the cultivation conditions in step 3 are 23-25°C.

在上述技术方案中，所述步骤3的培养条件为23-25℃。

[n0033]

In the above technical solution, step 3 involves culturing under a photoperiod of 16-18 hours /day and a light intensity of 95-100 μmol m⁻²s⁻¹.

在上述技术方案中，所述步骤3在16-18小时/天的光周期，95-100μmol m⁻²s⁻¹的光强条件下培养。

[n0034]

In the above technical solution, in step 4, the generation is repeated every 6-10 days.

在上述技术方案中，所述步骤4中，每6-10天继代一次。

[n0035]

In another aspect of the present invention, a feed comprises high-protein duckweed obtained using the aforementioned cultivation method.

本发明的另一方面，一种饲料，包括利用所述培养方法得到的高蛋白浮萍。

[n0036]

Compared with the prior art, the beneficial effects of the present invention are:

与现有技术相比，本发明的有益效果是：

[n0037]

1.

1.

The cultivation method of this invention can produce duckweed with high protein content, which can greatly improve the nutritional content of feed. At the same time, it can reduce the amount of imported soybeans used in feed to a certain extent, further reducing the cost of feed production.

利用本发明的培养方法，可得到具有高蛋白含量的浮萍，可以极大提高饲料营养含量，同时可以在一定程度上减量替代进口大豆在饲料中的使用，进一步降低饲料的制作成本。

[n0038]

2.

2.

The specific composition of the high-protein culture medium of the present invention is more suitable for the cultivation of high-protein duckweed, achieving efficient propagation of high-protein duckweed.

本发明的特定的高蛋白培养基的组成更适用于高蛋白浮萍的培养，实现高蛋白浮萍的高效扩繁。

[n0039]

3.

3.

The cultivation method of this invention is simple and easy to commercialize and apply.

本发明的培养方法简单，便于商业化推广应用。

[0043]

Attached Figure Description

附图说明

[n0040]

Figure 1 shows the protein content of high-protein duckweed.

图1是高蛋白浮萍蛋白质含量。

[n0041]

Figure 2 shows the protein content of common duckweed.

图2是普通紫萍蛋白质含量。

[0046]

Detailed Implementation

具体实施方式

[n0042]

The present invention will be further described in detail below with reference to specific embodiments.

以下结合具体实施例对本发明作进一步详细说明。

It should be understood that the specific embodiments described herein are merely illustrative of the invention and are not intended to limit the invention.

应当理解，此处所描述的具体实施例仅仅用以解释本发明，并不用于限定本发明。

[n0043]

Example 1

实施例1

[n0044]

A method for cultivating high-protein duckweed includes the following steps:

一种高蛋白浮萍的培养方法，包括以下步骤：

[n0045]

Step 1: Collect common wild-type duckweed, identify the protein content of the collected duckweed, and screen out the duckweed strain with the highest protein content (L. minor).

步骤1，采集普通野生型浮萍，对采集得到的浮萍进行蛋白质含量鉴定，筛选出其中蛋白质含量最高的浮萍品系(浮萍属L.minor)。

[n0046]

Step 2: In a sterile laminar flow hood, pour 40 mL of high-protein duckweed culture medium into a 50 mL Erlenmeyer flask. The composition and content of the high-protein duckweed culture medium are as follows:

步骤2，在无菌超净台中，于50mL锥形瓶中倒入40mL高蛋白浮萍培养液，高蛋白浮萍培养液成分及含量为：

[n0047]

MgSO₄·7H₂O：0.4mM

MgSO₄·7H₂O：0.4mM

[n0048]

Ca(NO₃)₂・4H₂O：1.4mM

Ca(NO₃)₂・4H₂O：1.4mM

[n0049]

KNO₃: 1.0mM

KNO₃：1.0mM

[n0050]

KH₂PO₄：0.4mM

KH₂PO₄：0.4mM

[n0051]

Mg(NO₃)₂・6H2O: 0.4mM

Mg(NO₃)₂・6H2O：0.4mM

[n0052]

CaCl₂・2H₂O: 50μM

CaCl₂・2H₂O：50μM

[n0053]

KCl: 50μM

KCl：50μM

[n0054]

Na₂MoO₄・2H₂O: 6.1μM

Na₂MoO₄・2H₂O：6.1μM

[n0055]

H₂BO₃：69μM

H₂BO₃：69μM

[n0056]

K₂H₂EDTA・2H₂O: 30μM

K₂H₂EDTA・2H₂O：30μM

[n0057]

FeNH₄-EDTA: 56.7μM

FeNH₄-EDTA：56.7μM

[n0058]

MnCl₂・4H₂O: 13.8μM

MnCl₂・4H₂O：13.8μM

[n0059]

ZnNa₂EDTA・4H₂O：2.8μM

ZnNa₂EDTA・4H₂O：2.8μM

[n0060]

CoSO₄・7H₂O: 4.8μM

CoSO₄・7H₂O：4.8μM

[n0061]

Na₂-EDTA・2H₂O: 18.6μM

Na₂-EDTA・2H₂O：18.6μM

[n0062]

All reagents were adjusted to pH 5.6 and then autoclaved.

以上试剂均调至pH5.6，并进行高压灭菌处理。

[n0063]

Step 3: After igniting the duckweed with an alcohol lamp for 2 seconds, use tweezers to pick up 10 pieces of the selected high-protein duckweed and transfer them to an Erlenmeyer flask containing high-protein duckweed culture medium.

步骤3，用酒精灯灼烧2秒后的镊子沾取10片筛选得到的高蛋白浮萍，将其转移至倒好高蛋白浮萍培养液的锥形瓶中。

[n0064]

Step 3: Seal the conical flask with sealing film and place it in an incubator for incubation.

步骤3，用封口膜将锥形瓶密封后放入培养箱培养。

Several bottles can be cultured at a time, and subculture should be carried out every 7 days. The subculture operation is the same as step 2-3.

一次可培养若干瓶，每7天进行一次继代扩繁，继代扩繁操作同步骤2-3。

The culture conditions were 23°C, photoperiod of 16 hours/day, light intensity of 95 μmol m⁻²s⁻¹, and subcultured once a week.

培养条件为23°C，光周期为16小时/天，光强为95μmol m⁻²s⁻¹，每周继代一次。

[n0065]

Example 2

实施例2

[n0066]

A method for cultivating high-protein duckweed includes the following steps:

一种高蛋白浮萍的培养方法，包括以下步骤：

[n0067]

Step 1: Collect common wild-type duckweed, identify the protein content of the collected duckweed, and screen out the duckweed strain with the highest protein content (L. minor).

步骤1，采集普通野生型浮萍，对采集得到的浮萍进行蛋白质含量鉴定，筛选出其中蛋白质含量最高的浮萍品系(浮萍属L.minor)。

[n0068]

Step 2: In a sterile laminar flow hood, pour 40 mL of high-protein duckweed culture medium into a 50 mL Erlenmeyer flask. The composition and content of the high-protein duckweed culture medium are as follows:

步骤2，在无菌超净台中，于50mL锥形瓶中倒入40mL高蛋白浮萍培养液，高蛋白浮萍培养液成分及含量为：

[n0069]

MgSO₄·7H₂O：0.5mM

MgSO₄·7H₂O：0.5mM

[n0070]

Ca(NO₃)₂·4H₂O：1.5mM

Ca(NO₃)₂・4H₂O：1.5mM

[n0071]

KNO₃: 1.2mM

KNO₃：1.2mM

[n0072]

KH₂PO₄：0.5mM

KH₂PO₄：0.5mM

[n0073]

Mg(NO₃)₂・6H2O: 0.5mM

Mg(NO₃)₂・6H2O：0.5mM

[n0074]

CaCl₂・2H₂O: 60μM

CaCl₂・2H₂O：60μM

[n0075]

KCl: 60μM

KCl：60μM

[n0076]

Na₂MoO₄・2H₂O: 6.3μM

Na₂MoO₄・2H₂O：6.3μM

[n0077]

H₂BO₃：72μM

H₂BO₃：72μM

[n0078]

K₂H₂EDTA・2H₂O: 32μM

K₂H₂EDTA・2H₂O：32μM

[n0079]

FeNH₄-EDTA: 57.1μM

FeNH₄-EDTA：57.1μM

[n0080]

MnCl₂・4H₂O: 14.2μM

MnCl₂・4H₂O：14.2μM

[n0081]

ZnNa₂EDTA・4H₂O：3.2μM

ZnNa₂EDTA・4H₂O：3.2μM

[n0082]

CoSO₄・7H₂O: 5.2μM

CoSO₄・7H₂O：5.2μM

[n0083]

Na₂-EDTA・2H₂O: 19.2μM

Na₂-EDTA・2H₂O：19.2μM

[n0084]

All reagents were adjusted to pH 5.8 and then autoclaved.

以上试剂均调至pH5.8，并进行高压灭菌处理。

[n0085]

Step 3: After igniting the duckweed with an alcohol lamp for 2 seconds, use tweezers to pick up 8 pieces of the selected high-protein duckweed and transfer them to an Erlenmeyer flask containing high-protein duckweed culture medium.

步骤3，用酒精灯灼烧2秒后的镊子沾取8片筛选得到的高蛋白浮萍，将其转移至倒好高蛋白浮萍培养液的锥形瓶中。

[n0086]

Step 3: Seal the conical flask with sealing film and place it in an incubator for incubation.

步骤3，用封口膜将锥形瓶密封后放入培养箱培养。

Several bottles can be cultured at a time, and subculture should be carried out every 10 days. The subculture operation is the same as step 2-3.

一次可培养若干瓶，每10天进行一次继代扩繁，继代扩繁操作同步骤2-3。

The culture conditions were 25°C, photoperiod of 18 hours/day, light intensity of 100 μmol m⁻²s⁻¹, and subcultured once a week.

培养条件为25°C，光周期为18小时/天，光强为100μmol m⁻²s⁻¹，每周继代一次。

[n0087]

Example 3

实施例3

[n0088]

This product is a high-protein duckweed obtained after screening and cultivation in Example 1. The protein content is as high as 36.03% (Figure 1), and the contents of nitrogen, phosphorus and potassium are 1.24%, 1.09% and 1.02% respectively. It contains 18 kinds of amino acids. After efficient propagation through high-protein duckweed culture medium, it has a higher protein content than ordinary wild duckweed (Figure 2). It plays an important role in making feed and supplementing important plant protein sources.

本产品是经过实施例1筛选培养后得到的高蛋白浮萍，蛋白质含量高达36.03%的高蛋白浮萍(图1)，氮磷钾的含量分别为1.24%、1.09%、1.02%，其中包含18种氨基酸，并通过高蛋白浮萍培养液进行高效扩繁后，与普通野生型浮萍相比，具有更高的蛋白质含量(图2)，对于制作饲料，补充重要植物蛋白源具有重要作用。

[n0089]

The above description is only a preferred embodiment of the present invention. It should be noted that, for those skilled in the art, several improvements and modifications can be made

without departing from the principle of the present invention, and these improvements and modifications should also be considered within the scope of protection of the present invention.

以上所述仅是本发明的优选实施方式，应当指出的是，对于本技术领域的普通技术人员来说，在不脱离本发明原理的前提下，还可以做出若干改进和润饰，这些改进和润饰也应视为本发明的保护范围。