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(54) **A DEVICE AND METHOD FOR EXTRACTING OXYGENATED ANTHRAQUINONE COMPOUNDS FROM MANGOSTEEN PEELS.**

(57) The invention discloses a device and method for extracting oxygenated anthraquinone compounds from mangosteen peel. In the disclosed apparatus, the upper end of the extraction cylinder is fixed with a horizontal partition inside. On one side of the extraction cylinder, along the upper end of the horizontal partition, a driving motor is installed. Inside the extraction cylinder, a upper driving chamber is formed along the upper end of the horizontal partition. Inside the upper driving chamber, a rotating shaft is installed along the output shaft end of the driving motor. The rotating shaft consists of a worm section, an intermediate dividing block, and a threaded section. The worm section is located between two intermediate dividing blocks, and the threaded section is located on the outside of the intermediate dividing blocks. Two threaded sections are symmetrically arranged. The external part of the threaded section is slidably connected to a sliding block.

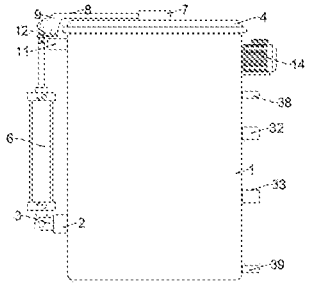

Figure1

DESCRIPTION

A DEVICE AND METHOD FOR EXTRACTING OXYGENATED ANTHRAQUINONE COMPOUNDS FROM MANGOSTEEN PEELS

TECHNICAL FIELD

The present invention relates to a device and method for extracting oxygenated anthraquinone compounds from mangosteen peels in the field of compound extraction.

BACKGROUND

Natural products serve as a vast source for drug development, with many natural medicines such as paclitaxel, etoposide, camptothecin, and vincristine successfully entering clinical applications. Mangosteen, a perennial fruit tree grown in tropical climates, is distributed in Thailand, Vietnam, Malaysia, Indonesia, the Philippines, and southern China. The fruit peel is a valuable remedy for infections, injuries, and diarrhea. Modern research indicates that mangosteen fruit peel contains a high content of oxygenated anthraquinone compounds, exhibiting anti-inflammatory, anti-tumor, and antioxidant activities. Among these, α-mangostin is the most abundant chemical component with significant biological activity. Various studies have shown its potential to inhibit tumors by suppressing cell proliferation and inducing apoptosis. The observed anti-tumor effects are associated with inhibited cell proliferation, accelerated mitochondrial-controlled apoptosis, and non-toxic cell cycle arrest in normal human PDLF cells. Other liposoluble active components in mangosteen peel include β-mangostin and γ-mangostin. Therefore, the extraction of effective substances from mangosteen peel is crucial. The process involves crushing mangosteen fruit peel, extracting it with hexane at room temperature, concentrating the extract, and repeatedly using anhydrous ethanol to remove hexane and concentrate the solution, resulting in the extraction of liposoluble effective components from mangosteen peel. Hexane extraction of effective components from

mangosteen fruit peel requires the use of an extraction container to enhance the mixing effect between mangosteen peel fragments and hexane solvent, facilitating the extraction of effective components from mangosteen peel. Currently, extraction devices primarily involve horizontal disturbance of internal mixtures. However, the weight of the fragments and their limited relative movement with the liquid under the rotational inertia effect result in insufficient mixing efficiency.

SUMMARY

The purpose of the present invention is to provide a device and method for extracting oxygenated anthraquinone compounds from mangosteen peels. This aims to address the issue raised in the background technology, where current extraction devices primarily involve horizontal disturbance of internal mixtures. The problem arises from the heavy weight of the fragments and their limited relative movement with the liquid under the rotational inertia effect, resulting in insufficient mixing efficiency.

To achieve the above objectives, the present invention provides the following technical solution: A device for extracting oxygenated anthraquinone compounds from mangosteen peels, comprising an extraction cylinder. The extraction cylinder's internal upper end is fixed with a horizontal partition, and one side of the extraction cylinder along the upper end of the horizontal partition is equipped with a driving motor. Inside the extraction cylinder, along the upper end of the horizontal partition, an upper drive chamber is formed. The upper drive chamber has a rotating shaft along the output shaft end of the driving motor. The rotating shaft is composed of a worm section, an intermediate dividing block, and a threaded section. The worm section is located between two intermediate dividing blocks, and the threaded section is on the outer side of the intermediate dividing block. Two symmetrical threaded sections have sliding connections with sliding blocks, and the lower end of the sliding block is fixed with a third fixing seat. The third fixing seat has a rotating rod connected through an axis, and the extraction cylinder's internal lower end, along the horizontal partition, forms an extraction chamber. Inside the extraction chamber, a debris holding unit is centrally located. The debris holding unit's upper ends on both sides have inner

positions with fourth fixing seats. The rotating rod extends to the fourth fixing seat on the other end and is connected through an axis. Inside the upper drive chamber, along the front and rear ends of the worm section, there are engaging connections with a rotating worm gear. The lower end of the rotating worm gear is fixed with a drive shaft, and the drive shaft's lower end passes through the horizontal partition and connects to the extraction cylinder's internal lower end face through a bearing for rotational connection. The external lowest end of the drive shaft is equipped with a stirring blade.

Additionally, the preferred embodiment includes that the debris holding unit comprises upper connecting disks, a hollow connecting column, and lower connecting disks. These are set from top to bottom, with adjacent upper connecting disks, a hollow connecting column, and lower connecting disks being fixedly connected. The upper connecting disk has upper fixing rings fixed at its upper end, and the fourth fixing seat is fixed on both sides of the upper fixing ring's upper end. Inside the extraction cylinder, a debris holding groove is formed along the upper connecting disk and the lower connecting disk.

Furthermore, the preferred embodiment involves upper connecting disks and lower connecting disks with multiple filtering holes piercing through them.

Preferred embodiments include the following features:

The upper end of the extraction cylinder is equipped with a top cover. The lower end of the top cover has an embedded sealing disk, which is embedded inside the extraction cylinder.

The other side of the extraction cylinder's lower end is fixed with a first-side fixing block. The outer side of the first-side fixing block is fixed with a first fixing seat. A driving hydraulic cylinder is connected through an axis inside the first fixing seat, and the output rod end of the driving hydraulic cylinder serves as the driving rod. The upper end of the top cover, in the middle, is fixed with an upper fixing disk. The upper fixing disk has a connection arm fixed on one side close to the driving rod. The other end of the connection arm is fixed to one of the corners of a triangular connecting

block. The other corner of the triangular connecting block is connected through an axis to the other end of the driving rod.

Near the side of the extraction cylinder where the driving hydraulic cylinder is located, the upper end is fixed with a second-side fixing block. The upper end of the second-side fixing block is fixed with a second fixing seat. The second fixing seat is connected through an axis to the third corner of the triangular connecting block.

The horizontal partition has a rectangular groove along the rotational trajectory of the rotating rod.

Away from the side where the driving hydraulic cylinder is located, the lower end along the horizontal partition is equipped with an inlet pipe, and the lowest end is equipped with a drainage pipe. The inner ends of the drainage pipe and the inlet pipe extend into the interior of the extraction chamber.

Away from the side where the driving hydraulic cylinder is located and when the debris holding unit is in the upper position, an inlet pipe is installed at the lower end of the upper connecting disk, and a discharge pipe is installed at the upper end of the lower connecting disk. The inlet pipe and the discharge pipe are both in communication with the interior of the debris holding groove.

The extraction method includes the following steps:

Step 1: The driving motor drives the rotation of the rotating shaft. The threaded connection between the threaded section on the rotating shaft and the sliding block causes the sliding block to move outward. Due to the rotational connection relationship between the third fixing seat, the rotating rod, and the fourth fixing seat, the debris holding unit is pulled upward.

Step 2: The debris from mangosteen peel is introduced into the debris holding groove through the inlet pipe, which is then sealed. Subsequently, n-hexane solvent is introduced into the extraction chamber through the inlet pipe, flowing down through the crevices of the mangosteen peel debris and gradually immersing them.

Step 3: The driving motor drives the reverse rotation of the rotating shaft. The threaded connection between the threaded section on the rotating shaft and the sliding block causes the sliding block to move inward. This pushes the debris holding

unit downward, pressing the mangosteen peel debris downward. Simultaneously, the worm section on the rotating shaft engages with the rotating worm gear, driving the rotation of the drive shaft and the stirring blade, disturbing the internal solvent.

Step 4: The driving motor drives the rotation of the rotating shaft, causing the mangosteen peel debris to move upward. Meanwhile, the internal solvent is disturbed.

Step 5: Repeat steps 3 and 4 to extract substances from the mangosteen peel debris into the solvent.

Step 6: Open the control valve on the drainage pipe to release the mixed solution. After the liquid level drops to the position of the stirring blade, the driving motor drives the forward and reverse rotation of the rotating shaft in a cyclic motion. This causes the mangosteen peel debris to move up and down, facilitating the outflow of the internal liquid. Finally, the debris holding unit remains at the upper position, and the discharge pipe is opened to discharge the debris.

Compared to the existing technology, the beneficial effects of the present invention are:

In this invention, the driving motor cyclically rotates the rotating shaft in both forward and reverse directions. The threaded connection between the threaded section on the rotating shaft and the sliding block causes the sliding block to slide. Due to the rotational connection relationship between the third fixing seat, the rotating rod, and the fourth fixing seat, the debris holding unit is cyclically lifted and lowered. Simultaneously, the engagement relationship between the worm section on the rotating shaft and the rotating worm gear drives the rotation of the drive shaft and the stirring blade, disturbing the internal solvent. By introducing up-and-down movements and utilizing the disorderliness of debris movement to disturb the internal motion state, the invention avoids inertial motion. This ensures the mixing effect of mangosteen peel debris with n-hexane solvent, enhances the extraction efficiency, and solves the problem of insufficient mixing effect caused by the current extraction device mainly relying on horizontal agitation of internal mixtures, where the debris's weight and limited relative motion with the liquid hinder efficient mixing.

In this invention, after the liquid level drops to the position of the stirring blade, the driving motor cyclically rotates the rotating shaft in both forward and reverse directions. This causes the mangosteen peel debris to move up and down, allowing some liquid that has not flowed out to be expelled. Under the structural interaction forces, the liquid in the mangosteen peel debris is pressed out, facilitating the effective extraction of components and further improving the extraction efficiency.

In this invention, when the driving hydraulic cylinder drives the elongation and contraction of the driving rod, the rotational connection relationship between the triangular connecting block, the driving rod, and the second fixing seat leads to the opening or closing of the top cover. This is advantageous for observing and inspecting the internal structure of the upper driving chamber's driving relationship.

BRIEF DESCRIPTION OF THE FIGURES

Figure 1 is a front view of a device for extracting xanthone compounds from mangosteen shells according to the present invention;

Figure 2 is a schematic diagram of the internal structure of a device for extracting xanthone compounds from mangosteen shells according to the present invention;

Figure 3 is a top view of the connection structure of the rotating shaft and the rotating worm gear of a device for extracting xanthone compounds from mangosteen shells according to the present invention;

Figure 4 is a schematic three-dimensional structural diagram of a chip holding unit of a device for extracting xanthone compounds from mangosteen shells according to the present invention;

Figure 5 is a diagram showing changes in the internal structure and operation of a device for extracting xanthone compounds from mangosteen shells according to the present invention.

wherein, 1. Extraction cylinder; 2. First side fixing block; 3. First fixing seat; 4. Top cover; 5. Embedded sealing disk; 6. Drive hydraulic cylinder; 7. Upper fixing plate; 8. Connecting arm; 9. Triangular connecting block; 10. Drive rod; 11. Second side fixing block; 12. Second fixing seat; 13. Horizontal partition; 14. Drive motor; 15. Upper drive

chamber; 16. Rotating shaft; 17. Worm section; 18. Intermediate dividing block; 19. Threaded section; 20. Sliding block; 21. Third fixing seat; 22. Rotating rod; 23. Fourth fixing seat; 24. Rectangular groove; 25. Debris holding unit; 26. Upper connecting plate; 27. Hollow connecting column; 28. Lower connecting plate; 29. Filtration hole; 30. Upper fixing ring; 321. Debris holding groove; 32. Inlet pipe; 33. Outlet pipe; 34. Rotating worm gear; 35. Extraction chamber; 36. Drive shaft; 37. Stirring blade; 38. Inlet pipe; 39. Outlet pipe.

DETAILED DESCRIPTION OF THE INVENTION

The technical solutions in the embodiments of the present invention will be clearly and completely described below with reference to the accompanying drawings in the embodiments of the present invention. Obviously, the described embodiments are only some of the embodiments of the present invention, rather than all the embodiments.

Refer to Figures 1-5. The embodiment provided by the present invention is a device for extracting oxygenated anthraquinone compounds from mangosteen shells. It includes an extraction cylinder (1) with a horizontal partition (13) fixed at the upper end inside. A drive motor (14) is installed on one side of the extraction cylinder (1) along the upper end of the horizontal partition (13). Inside the extraction cylinder (1) along the upper end of the horizontal partition (13), an upper drive chamber (15) is formed. The upper drive chamber (15) has a rotating shaft (16) installed along the output shaft end of the drive motor (14). The rotating shaft (16) is composed of a worm section (17), an intermediate dividing block (18), and a threaded section (19). The worm section (17) is located between two intermediate dividing blocks (18), and the threaded section (19) is located on the outer side of the intermediate dividing block (18). Two threaded sections (19) are symmetrically arranged. The outer side of the threaded section (19) is slidably connected to a sliding block (20), and the lower end of the sliding block (20) is fixed with a third fixing seat (21). The third fixing seat (21) is rotatably connected to a rotating rod (22), and a rectangular groove (24) is opened along the rotation trajectory of the rotating rod (22) on the horizontal partition

(13). At the lower end of the extraction cylinder (1) along the horizontal partition (13), an extraction chamber (35) is formed, and a debris holding unit (25) is placed in the middle of the extraction chamber (35). The debris holding unit (25) can be driven to move up and down. The inner side positions on both sides of the upper end of the debris holding unit (25) are fixed with the fourth fixing seat (23). The other end of the rotating rod (22) extends into the fourth fixing seat (23) and is rotatably connected to the fourth fixing seat (23) through an axis. The upper drive chamber (15) is meshed with the worm section (17) at both ends along the front and rear ends of the worm section (17). A rotating worm gear (34) is fixed at the lower end of the rotating worm gear (34), and the lower end of the drive shaft (36) passes through the horizontal partition (13) and is rotatably connected to the lower end surface inside the extraction cylinder (1) through a bearing. The lowest end of the drive shaft (36) on the outside is equipped with a stirring blade (37). The debris holding unit (25) includes an upper connecting plate (26), a hollow connecting column (27), and a lower connecting plate (28). The upper connecting plate (26), hollow connecting column (27), and lower connecting plate (28) are fixedly connected from top to bottom. Multiple filter holes (29) are provided on the upper connecting plate (26) and the lower connecting plate (28) to allow the incoming liquid to drip down and filter the mixed liquid after extraction. The upper connecting plate (26) is fixed with an upper fixing ring (30) at the upper end. The fourth fixing seat (23) is fixed on both sides of the upper fixing ring (30). Inside the extraction cylinder (1), a debris holding groove (31) is formed along the upper connecting plate (26) and the lower connecting plate (28). The drive motor (14) drives the rotating shaft (16) to perform a cyclic motion in the forward and reverse directions. The threaded connection between the threaded section (19) on the rotating shaft (16) and the sliding block (20) drives the sliding block (20) to slide. Due to the rotational connection relationship of the third fixing seat (21), the rotating rod (22), and the fourth fixing seat (23), the debris holding unit (25) is driven to perform cyclic lifting and lowering movement.

The drive motor (14) rotates the rotating shaft (16), and the engagement connection relationship between the worm section (17) on the rotating shaft (16) and the rotating worm gear (34) drives the drive shaft (36) and the stirring blade (37) to rotate, disturbing the internal solvent.

After the liquid level drops to the position of the stirring blade (37), the drive motor (14) drives the rotating shaft (16) to perform a cyclic motion in the forward and reverse directions, causing the mangosteen shell debris to move up and down. Some of the liquid that has not flowed out will flow out, and under the mutual structural interaction force, the liquid in the mangosteen shell debris will be pressed out.

Furthermore, on one side of the extraction cylinder (1) away from the drive hydraulic cylinder (6) along the lower end of the horizontal partition (13), there is an inlet pipe (38), and at the lowest end on the side away from the drive hydraulic cylinder (6), there is a drain pipe (39). The inner ends of the drain pipe (39) and the inlet pipe (38) extend into the interior of the extraction chamber (35). On one side of the extraction cylinder (1) away from the drive hydraulic cylinder (6) and when the debris holding unit (25) is in the upper position, an inlet pipe (32) is installed at the lower end of the upper connecting plate (26), and on one side of the extraction cylinder (1) away from the drive hydraulic cylinder (6) and when the debris holding unit (25) is in the upper position, an outlet pipe (33) is installed at the upper end of the lower connecting plate (28). The inlet pipe (32) and the outlet pipe (33) are both connected to the interior of the debris holding groove (31). Control valves or stoppers are installed on each pipe to achieve liquid inlet, liquid drainage, feeding, and discharging operations.

Furthermore, the upper end of the extraction cylinder (1) is equipped with an upper cover (4), and the lower end of the upper cover (4) is centrally embedded with an embedded sealing plate (5), which is embedded inside the extraction cylinder (1). On the other side of the extraction cylinder (1), the lower end is fixed with a first-side fixing block (2), and the outer side of the first-side fixing block (2) is fixed with a first fixing seat (3). The first fixing seat (3) is rotatably connected to the drive hydraulic

cylinder (6) through an axis. The output rod end of the drive hydraulic cylinder (6) is the driving rod (10). The upper end of the upper cover (4) is fixed with an upper fixing plate (7) in the middle. The upper fixing plate (7) is fixed with a connecting arm (8) on the side close to the driving rod (10). The other end of the connecting arm (8) is fixed to one of the angles of the triangular connecting block (9), and the other end of the driving rod (10) is connected to the other angle of the triangular connecting block (9) through an axis. On the side of the extraction cylinder (1) away from the drive hydraulic cylinder (6), the upper end is fixed with a second-side fixing block (11), and the upper end of the second-side fixing block (11) is fixed with a second fixing seat (12). The second fixing seat (12) is rotatably connected to the third angle of the triangular connecting block (9) through an axis. When the drive hydraulic cylinder (6) drives the driving rod (10) to extend and contract, the rotation relationship between the triangular connecting block (9), the driving rod (10), and the second fixing seat (12) adjacent to each other drives the upper cover (4) to open or close.

An extraction method comprises the following steps:

Step One: Drive motor 14 rotates the rotary shaft 16. The threaded connection between the threaded portion 19 on the rotary shaft 16 and the sliding block 20 causes the sliding block 20 to move outward. Due to the axial rotation relationship between the third fixing seat 21, the rotating rod 22, and the fourth fixing seat 23, the debris storage unit 25 is pulled upward.

Step Two: Introduce mountain mangosteen shell debris into the debris storage groove 31 through the feeding pipe 32. Seal the feeding pipe 32, then introduce hexane solvent into the extraction chamber 35 through the inlet pipe 38. The hexane solvent flows downward through the crevices of the mountain mangosteen shell debris, gradually saturating the debris.

Step Three: Drive motor 14 reverses the rotation of the rotary shaft 16. The threaded connection between the threaded portion 19 on the rotary shaft 16 and the sliding block 20 causes the sliding block 20 to move inward. This, in turn, pushes the debris storage unit 25 downward, pressing the mountain mangosteen shell debris downward. Simultaneously, the helical engagement between the worm part 17 on the

rotary shaft 16 and the rotating worm wheel 34 drives the drive shaft 36 and the stirring blade 37 to rotate, disturbing the internal solvent. LU506654

Step Four: Drive motor 14 rotates the rotary shaft 16. The mountain mangosteen shell debris moves upward, and the internal solvent is disturbed.

Step Five: Repeat the processes of Step Three and Step Four, allowing substances from the mountain mangosteen shell debris to be extracted into the solvent.

Step Six: Open the control valve on the drain pipe 39, releasing the mixed solution. After the liquid level drops to the position of the stirring blade 37, drive motor 14 rotates the rotary shaft 16 in a forward and reverse cycle. This causes the mountain mangosteen shell debris to move up and down, facilitating the outflow of some remaining liquid under the structural interaction forces. The debris storage unit 25 is then left in the upper position, and the discharge pipe 33 is opened to discharge the debris.

It is obvious to those skilled in the art that the present invention is not limited to the details of the above-described exemplary embodiments, and that the present invention can be implemented in other specific forms without departing from the spirit or essential characteristics of the present invention. Therefore, the embodiments should be regarded as illustrative and non-restrictive from any point of view, and the scope of the present invention is defined by the appended claims rather than the above description, and it is therefore intended that all claims falling within the claims All changes within the meaning and scope of equivalent elements are included in the present invention. Any reference signs in the claims shall not be construed as limiting the claim in question.

CLAIMS

1. An apparatus for extracting oxygenated anthraquinone compounds from mangosteen peel, comprising the extraction cylinder (1) is internally fixed with a horizontal partition (13) at the upper end, on one side of the extraction cylinder (1), a driving motor (14) is installed along the upper end of the horizontal partition (13); inside the extraction cylinder (1), an upper driving cavity (15) is formed along the upper end of the horizontal partition (13); inside the upper driving cavity (15), a rotating shaft (16) is installed along the output shaft end of the driving motor (14); the rotating shaft (16) consists of a worm portion (17), an intermediate dividing block (18), and a threaded portion (19); the worm portion (17) is located between the two intermediate dividing blocks (18), and the threaded portion (19) is located on the outer side of the intermediate dividing block (18); two threaded portions (19) are symmetrically arranged, and the external of the threaded portion (19) is slidably connected with a sliding block (20); the lower end of the sliding block (20) is fixed with a third fixing seat (21); inside the third fixing seat (21), a rotating rod (22) is rotatably connected through an axis; at the lower end of the extraction cylinder (1) along the horizontal partition (13), an extraction cavity (35) is formed; in the middle of the extraction cavity (35), a debris storage unit (25) is arranged; the inner sides of the upper end of the debris storage unit (25) are equipped with fourth fixing seats (23); the other end of the rotating rod (22) extends into the fourth fixing seat (23) and is rotatably connected to the fourth fixing seat (23) through an axis; inside the upper driving cavity (15), both ends of the worm portion (17) are meshingly connected with a rotating worm gear (34); the lower end of the rotating worm gear (34) is fixed with a driving shaft (36); the lower end of the driving shaft (36) passes through the horizontal partition (13) and is connected to the lower end surface inside the extraction cylinder (1) through a bearing for rotation; the lowest end of the external driving shaft (36) is equipped with a stirring blade (37).

2. The apparatus for extracting oxygenated anthraquinone compounds from mangosteen peel according to claim 1, wherein the debris holding unit (25) comprises an upper connecting disk (26), a hollow connecting column (27), and a lower connecting disk (28), which are fixedly connected from top to bottom.

3. The apparatus for extracting oxygenated anthraquinone compounds from mangosteen peel according to claim 2, wherein the upper connecting disk (26) and the lower connecting disk (28) are provided with multiple water filtration holes (29) penetrating through them.

4. The apparatus for extracting oxygenated anthraquinone compounds from mangosteen peel, according to claim 3, characterized in that: the upper end of the extraction cylinder (1) is provided with an upper cover (4), and the lower end of the upper cover (4) is centrally provided with an embedded sealing disk (5), which is embedded inside the extraction cylinder (1).

5. The apparatus for extracting oxygenated anthraquinone compounds from mangosteen peel, according to claim 4, characterized in that: the lower end on the other side of the extraction cylinder (1) is fixed with a first side fixing block (2), the outer side of the first side fixing block (2) is fixed with a first fixed seat (3), a driving hydraulic cylinder (6) is rotationally connected inside the first fixed seat (3), and the output rod end of the driving hydraulic cylinder (6) is a driving rod (10); the upper end of the upper cover (4) is centrally fixed with an upper fixed disk (7), the upper fixed disk (7) is fixed with a connecting arm (8) on the side close to the driving rod (10), the other end of the connecting arm (8) is fixed to one corner of a triangular connecting block (9), and the other end of the driving rod (10) is rotationally connected to another corner of the triangular connecting block (9) through an axis.

6. The apparatus for extracting oxygenated anthraquinone compounds from mangosteen peel, according to claim 5, characterized in that: the upper end near the side of the driving hydraulic cylinder (6) of the extraction cylinder (1) is fixed with a

second side fixing block (11), the upper end of the second side fixing block (11) is fixed with a second fixed seat (12), and the second fixed seat (12) is rotationally connected to the third corner of the triangular connecting block (9) through an axis. LU506654

7. The apparatus for extracting oxygenated anthraquinone compounds from mangosteen peel, according to claim 1, characterized in that: the horizontal partition (13) is provided with rectangular grooves (24) along the rotational trajectory position of the rotating rod (22).

8. The apparatus for extracting oxygenated anthraquinone compounds from mangosteen peel, according to claim 5, characterized in that: on the side of the extraction cylinder (1) away from the drive hydraulic cylinder (6), along the lower end of the horizontal partition (13), there is an inlet pipe (38) installed, and at the lowermost end on the side away from the drive hydraulic cylinder (6), there is a drainage pipe (39) installed; the inner ends of the drainage pipe (39) and the inlet pipe (38) extend into the interior of the extraction chamber (35).

9. The apparatus for extracting oxygenated anthraquinone compounds from mangosteen peel, according to claim 8, characterized in that: on the side of the extraction cylinder (1) away from the drive hydraulic cylinder (6), and when the debris holding unit (25) is at the upper end position, an inlet pipe (32) is installed at the lower end of the upper connecting plate (26), and on the side of the extraction cylinder (1) away from the drive hydraulic cylinder (6), and when the debris holding unit (25) is at the upper end position, a discharge pipe (33) is installed at the upper end of the lower connecting plate (28); the inlet pipe (32) and the discharge pipe (33) are both communicatively connected to the interior of the debris holding groove (31).

10. An extraction method, based on the apparatus for extracting oxygenated anthraquinone compounds from mangosteen peel as claimed in claim 9, characterized by the following steps: step 1: the drive motor (14) drives the rotation of the rotating shaft (16), and through the threaded connection relationship between the

threaded portion (19) on the rotating shaft (16) and the sliding block (20), the sliding block (20) is driven to slide outward; due to the rotational connection relationship of the axis between the third fixed seat (21), the rotating rod (22), and the fourth fixed seat (23), the debris-holding unit (25) is pulled upward; step 2: mangosteen peel debris is fed into the debris holding groove (31) through the inlet pipe (32); after sealing the inlet pipe (32), n-hexane solvent is introduced into the extraction chamber (35) through the inlet pipe (38); the n-hexane solvent flows downward through the crevices of the mangosteen peel debris, gradually immersing the mangosteen peel debris; step 3: the drive motor (14) drives the reverse rotation of the rotating shaft (16), and through the threaded connection relationship between the threaded portion (19) on the rotating shaft (16) and the sliding block (20), the sliding block (20) is driven to slide inward, pushing the debris holding unit (25) downward and driving the mangosteen peel debris downward; at the same time, the rotational connection relationship between the worm portion (17) on the rotating shaft (16) and the rotating worm (34) drives the drive shaft (36) and the stirring blade (37) to rotate, disturbing the internal solvent; step 4: the drive motor (14) drives the rotation of the rotating shaft (16), causing the mangosteen peel debris to move upward, and simultaneously disturbing the internal solvent; step 5: repeat the process of step 3 and step 4 to extract substances from the mangosteen peel debris into the solvent; step 6: open the control valve on the drainage pipe (39) to release the mixed solution; after the liquid level drops to the position of the stirring blade (37), the drive motor (14) drives the rotating shaft (16) to rotate in the forward and reverse directions in a cyclic motion; this causes the mangosteen peel debris to move up and down, driving the internal liquid to flow out; finally, the debris holding unit (25) is left at the upper-end position, and the discharge pipe (33) is opened to discharge the debris.

REVENDICATIONS

1. Appareil d'extraction de composés anthraquinoniques oxygénés d'écorces de mangoustan, comprenant le cylindre d'extraction (1) est fixé intérieurement avec une cloison horizontale (13) à son extrémité supérieure ; sur un côté du cylindre d'extraction (1), un moteur d'entraînement (14) est installé le long de l'extrémité supérieure de la cloison horizontale (13); à l'intérieur du cylindre d'extraction (1), une cavité d'entraînement supérieure (15) est formée le long de l'extrémité supérieure de la cloison horizontale (13); à l'intérieur de la cavité d'entraînement supérieure (15), un arbre rotatif (16) est installé le long de l'extrémité de l'arbre de sortie du moteur d'entraînement (14); l'arbre rotatif (16) est constitué d'une partie vis sans fin (17), d'un bloc de division intermédiaire (18) et d'une partie filetée (19) ; la partie vis sans fin (17) est située entre les deux blocs de division intermédiaires (18), et la partie filetée (19) est située sur le côté extérieur du bloc de division intermédiaire (18) ; deux parties filetées (19) sont disposées symétriquement, et l'extérieur de la partie filetée (19) est relié de manière coulissante à un bloc coulissant (20) ; l'extrémité inférieure du bloc coulissant (20) est fixée avec un troisième siège de fixation (21) ; à l'intérieur du troisième siège de fixation (21), une tige rotative (22) est reliée de manière rotative à travers un axe ; à l'extrémité inférieure du cylindre d'extraction (1) le long de la cloison horizontale (13), une cavité d'extraction (35) est formée ; au milieu de la cavité d'extraction (35), une unité de stockage de débris (25) est disposée ; les côtés intérieurs de l'extrémité supérieure de l'unité de stockage de débris (25) sont équipés de quatrièmes sièges de fixation (23) ; l'autre extrémité de la tige rotative (22) s'étend dans le quatrième siège de fixation (23) et est reliée de manière rotative au quatrième siège de fixation (23) par l'intermédiaire d'un axe; à l'intérieur de la cavité d'entraînement supérieure (15), les deux extrémités de la partie vis sans fin (17) sont reliées par engrènement à un engrenage à vis sans fin rotatif (34) ; l'extrémité inférieure de l'engrenage à vis sans fin rotatif (34) est fixée à un arbre d'entraînement (36) ; l'extrémité inférieure de l'arbre d'entraînement (36) traverse la cloison horizontale (13) et est reliée à la surface d'extrémité inférieure à l'intérieur du cylindre d'extraction (1) par l'intermédiaire d'un roulement pour rotation ; l'extrémité inférieure

de l'arbre d'entraînement externe (36) est équipée d'une pale d'agitation (37).

2. Appareil pour extraire les composés anthraquinoniques oxygénés de la peau de mangoustan selon la revendication 1, dans lequel l'unité de maintien des débris (25) comprend un disque de connexion supérieur (26), une colonne de connexion creuse (27) et un disque de connexion inférieur (28), qui sont reliés de manière fixe de haut en bas.

3. Appareil pour extraire les composés anthraquinoniques oxygénés de la peau de mangoustan selon la revendication 2, dans lequel le disque de connexion supérieur (26) et le disque de connexion inférieur (28) sont pourvus de multiples trous de filtration d'eau (29) pénétrant à travers eux.

4. Appareil pour extraire les composés anthraquinoniques oxygénés de la peau de mangoustan, selon la revendication 3, caractérisé en ce que : l'extrémité supérieure du cylindre d'extraction (1) est munie d'un couvercle supérieur (4), et l'extrémité inférieure du couvercle supérieur (4) est pourvu au centre d'un disque d'étanchéité intégré (5), qui est intégré à l'intérieur du cylindre d'extraction (1).

5. Appareil pour extraire les composés anthraquinoniques oxygénés de la peau de mangoustan, selon la revendication 4, caractérisé en ce que : l'extrémité inférieure de l'autre côté du cylindre d'extraction (1) est fixée avec un premier bloc de fixation latéral (2), l'extrémité extérieure le côté du premier bloc de fixation latéral (2) est fixé à un premier siège fixe (3), un vérin hydraulique d'entraînement (6) est relié en rotation à l'intérieur du premier siège fixe (3), et l'extrémité de tige de sortie du vérin hydraulique d'entraînement (6) est une tige d'entraînement (10) ; l'extrémité supérieure du couvercle supérieur (4) est fixée centralement avec un disque fixe supérieur (7), le disque fixe supérieur (7) est fixé avec un bras de liaison (8) du côté proche de la tige d'entraînement (10), l'autre extrémité du bras de liaison (8) est fixée à un coin d'un bloc de liaison triangulaire (9), et l'autre extrémité de la tige

d'entraînement (10) est reliée en rotation à un autre coin du bloc de liaison triangulaire (9) par l'intermédiaire un axe. LU506654

6. Appareil pour extraire les composés anthraquinoniques oxygénés de la peau de mangoustan, selon la revendication 5, caractérisé en ce que : l'extrémité supérieure proche du côté du vérin hydraulique d'entraînement (6) du cylindre d'extraction (1) est fixée avec une seconde fixation latérale bloc de liaison triangulaire (11), l'extrémité supérieure du deuxième bloc de fixation latérale (11) est fixée avec un deuxième siège fixe (12), et le deuxième siège fixe (12) est relié en rotation au troisième coin du bloc de connexion triangulaire (9) à travers un axe.

7. Appareil pour extraire les composés anthraquinoniques oxygénés de la peau de mangoustan, selon la revendication 1, caractérisé en ce que : la cloison horizontale (13) est munie de rainures rectangulaires (24) le long de la position de trajectoire de rotation de la tige rotative (22).

8. Appareil d'extraction des composés anthraquinoniques oxygénés des écorces de mangoustan, selon la revendication 5, caractérisé en ce que : du côté du cylindre d'extraction (1) éloigné du vérin hydraulique d'entraînement (6), le long de l'extrémité inférieure de la cloison horizontale (13), un tuyau d'entrée (38) est installé, et à l'extrémité la plus basse du côté opposé au vérin hydraulique d'entraînement (6), un tuyau de drainage (39) est installé ; les extrémités internes du tuyau de drainage (39) et du tuyau d'entrée (38) s'étendent vers l'intérieur de la chambre d'extraction (35).

9. Appareil pour extraire les composés anthraquinoniques oxygénés de la peau de mangoustan, selon la revendication 8, caractérisé en ce que : du côté du cylindre d'extraction (1) éloigné du vérin hydraulique d'entraînement (6), et lorsque l'unité de maintien des débris (25) se trouve dans la position extrême supérieure, un tuyau d'entrée (32) est installé à l'extrémité inférieure de la plaque de liaison supérieure (26), et sur le côté du cylindre d'extraction (1) éloigné du vérin hydraulique d'entraînement (6), et lorsque l'unité de retenue de débris (25) est dans la position d'extrémité

supérieure, un tuyau d'évacuation (33) est installé à l'extrémité supérieure de la plaque de liaison inférieure (28) ; le tuyau d'entrée (32) et le tuyau d'évacuation (33) sont tous deux reliés en communication à l'intérieur de la rainure de retenue de débris (31). LU506654

10. Procédé d'extraction, basé sur l'appareil pour extraire les composés anthraquinoniques oxygénés de la peau de mangoustan selon la revendication 9, caractérisé par les étapes suivantes : étape 1 : le moteur d'entraînement (14) entraîne la rotation de l'arbre rotatif (16), et grâce à la relation de connexion filetée entre la partie filetée (19) sur l'arbre rotatif (16) et le bloc coulissant (20), le bloc coulissant (20) est entraîné pour coulisser vers l'extérieur ; en raison de la relation de connexion rotative de l'axe entre le troisième siège fixe (21), la tige rotative (22) et le quatrième siège fixe (23), l'unité de maintien de débris (25) est tirée vers le haut ; étape 2 : les débris de pelure de mangoustan sont introduits dans la rainure de retenue des débris (31) à travers le tuyau d'entrée (32) ; après avoir scellé le tuyau d'entrée (32), le solvant n-hexane est introduit dans la chambre d'extraction (35) par le tuyau d'entrée (38) ; le solvant n-hexane s'écoule vers le bas à travers les crevasses des débris de peau de mangoustan, immergeant progressivement les débris de peau de mangoustan ; étape 3 : le moteur d'entraînement (14) entraîne la rotation inverse de l'arbre rotatif (16), et grâce à la relation de connexion filetée entre la partie filetée (19) sur l'arbre rotatif (16) et le bloc coulissant (20), le bloc coulissant (20) est entraîné pour glisser vers l'intérieur, poussant l'unité de maintien des débris (25) vers le bas et entraînant les débris de pelure de mangoustan vers le bas ; dans le même temps, la relation de connexion rotative entre la partie de vis sans fin (17) sur l'arbre rotatif (16) et la vis sans fin rotative (34) entraîne l'arbre d'entraînement (36) et la pale d'agitation (37) à tourner, perturbant le mouvement interne ; solvant ; étape 4 : le moteur d'entraînement (14) entraîne la rotation de l'arbre rotatif (16), provoquant le déplacement des débris de pelure de mangoustan vers le haut et perturbant simultanément le solvant interne ; étape 5 : répétez le processus des étapes 3 et 4 pour extraire les substances des débris de peau de mangoustan dans le solvant ; étape 6 : ouvrez la vanne de régulation du tuyau de drainage (39) pour libérer la

solution mélangée ; une fois que le niveau de liquide chute jusqu'à la position de la pale d'agitation (37), le moteur d'entraînement (14) entraîne l'arbre rotatif (16) pour qu'il tourne dans le sens avant et arrière dans un mouvement cyclique ; cela provoque le mouvement de haut en bas des débris de peau de mangoustan, entraînant l'écoulement du liquide interne ; enfin, l'unité de maintien des débris (25) est laissée dans la position d'extrémité supérieure et le tuyau d'évacuation (33) est ouvert pour évacuer les débris.

FIGURES

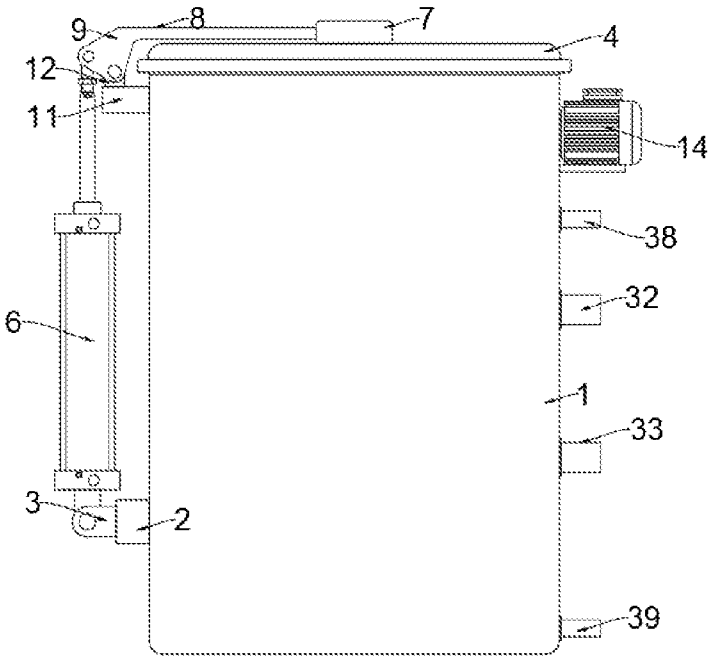

Figure1

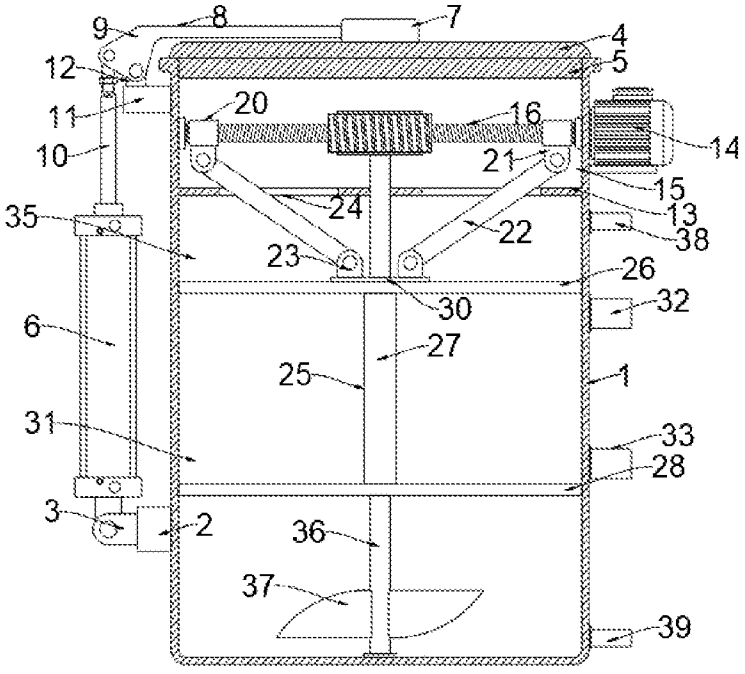

Figure2

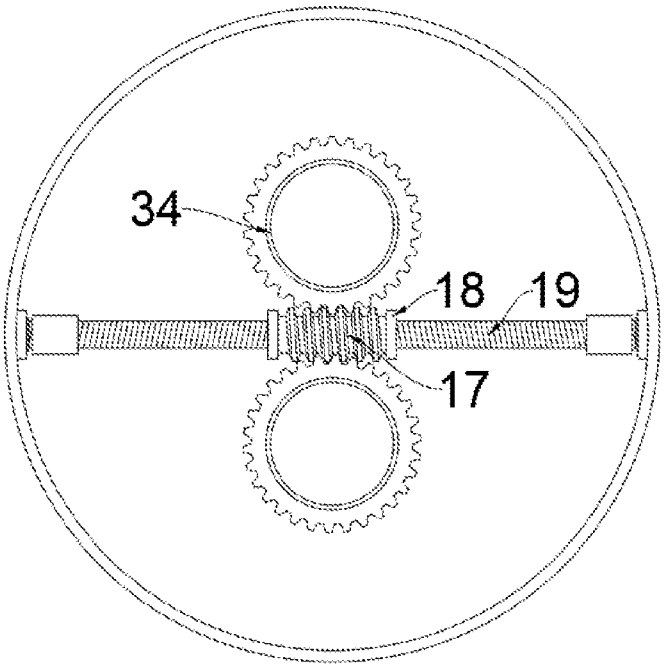

Figure3

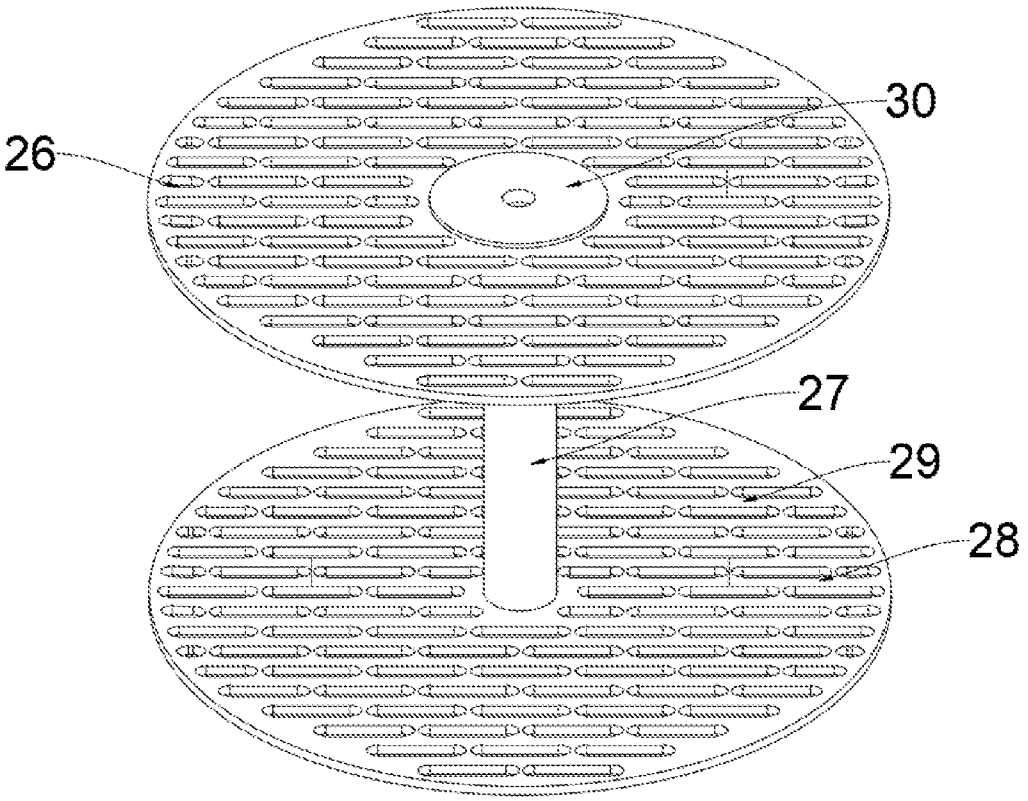

Figure4

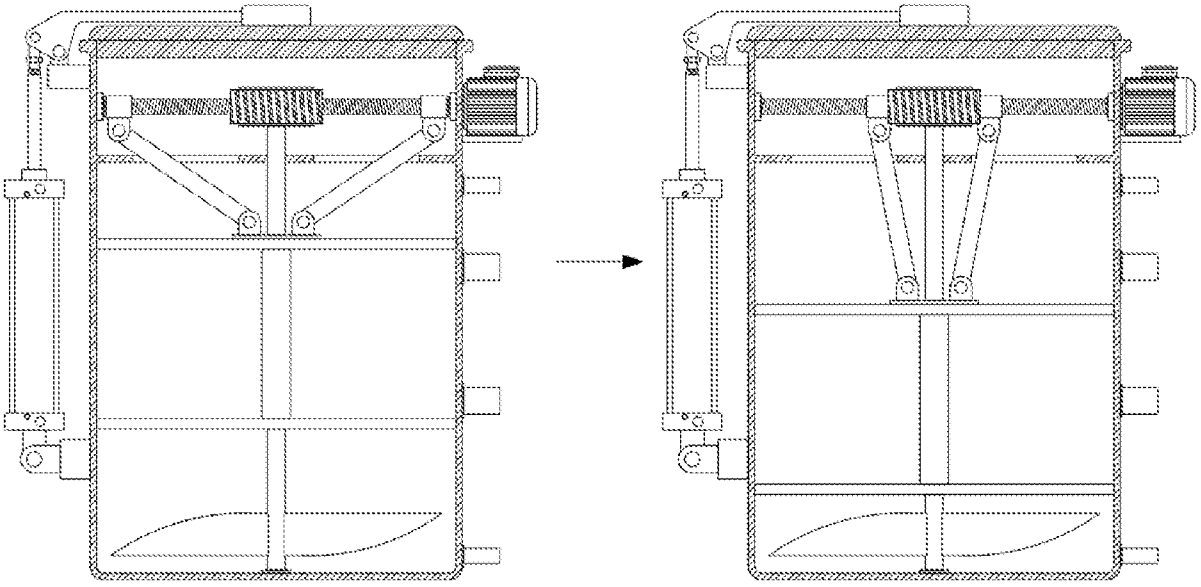

Figure5