Integrated Device for Collection of Garden Waste and Production of Auricularia Auricula Medium

Xinzhe Shao*, Jiawen Wang, Xuewei Cao, Zhen Yan, Bingjie Zhao, Yifan Lv and Yiwei Li
Wuhan University of Technology, WuHan, China
*Corresponding author: shaoxinzhe@whut.edu.cn

Abstract. With the acceleration of greening process in China, the output of garden greening waste is also increasing, but the treatment method of greening waste is single and the utilization degree of resources is low. Therefore, this work puts forward a method that integrates waste collection and Auricularia auricula culture medium production. Taking garden waste as raw material, the original material of Auricularia auricula culture medium is obtained through the process of collection, primary crushing and secondary crushing, and mixing ratio process. After simple packaging and subsequent sterilization and disinfection process, the regenerated Auricularia auricula culture medium is made.

Keywords: Green waste, culture medium, integration, emission reduction.

1. Introduction
This work puts forward a method of collecting and making Auricularia auricula culture medium. Taking garden waste as raw material, the original material of Auricularia auricula culture medium is obtained through the process of collection, primary crushing and secondary crushing, and mixing ratio process, and then the regenerated Auricularia auricula culture medium is made by simple packaging and subsequent sterilization and disinfection process. For the society, it can protect the environment, make resource use of garden greening waste, promote the implementation of green manufacturing project; for the culture medium production industry, it promotes the product technology conversion; for consumers, it reduces the space and human resource pressure required for medium production.

2. Project background
With the acceleration of urbanization, landscaping as a carrier of urban life quality has increased significantly. On November 20, 2018, the national Greening Committee and the State Forestry and grassland administration proposed to actively promote large-scale land greening action, pointing out that it is necessary to continuously increase the ecological system restoration with forest and grass vegetation as the main body, and effectively expand the ecological space. On March 12, 2019, the office of the national Greening Committee issued the "bulletin on the state of land greening in China in 2018", which shows that China will harness more than 6.66 million hectares of degraded grassland in the new year. The greening rate of urban built-up area is 37.9%, and the per capita park green area is 14.1 m2. The waste generated by greening is also increasing, which also brings the problem of
greening digestion. How to deal with garden plant waste has become a new problem. According to relevant calculations, the amount of landscape waste in China will be 2183-32.155 million tons in 2018.

**Figure 1** Withered branches and withered leaves

Generally speaking, the current utilization methods of garden greening wastes in China are mainly concentrated in organic fertilizer composting and soil mulching, which are single, coupled with the restriction of storage yard requirements, treatment time and other factors, the degree of resource utilization is generally low. At present, most of the cities are less than 10%, and the highest in Shenzhen is no more than 30%.

**Figure 2** landfill, composting and incineration

3. Project content

3.1. General work introduction

The working process of the device is as follows: firstly, the residual leaves are absorbed by the absorption device, and a crushing device is added inside the absorption device, and the inhaled waste is preliminarily crushed through the primary crushing device, and then transported to the earphone crushing device to finely crush the materials, so as to meet the standard of making agaric culture medium, and the processed raw materials are temporarily stored in the upper right of the whole device in the raw material storage device. The mixing device is connected with the storage device of raw materials and auxiliary materials. During the operation of the device, the main materials required by the culture medium and the auxiliary materials such as calcium carbonate and gypsum are added to the mixing cylinder through the feeding port at the lower part of the storage device. The mixing barrel is driven by the main cylinder of the mixing device to make the main materials and auxiliary materials mix evenly. Finally, the mixed medium is discharged from the lower part to the lower trolley for storage.
3.2. Collection and crushing module

The main function of the collecting device is realized by the structure similar to vacuum cleaner. The front end of the device is an air suction outlet which can adjust the height in a small range. The air in the device is discharged to the outside of the device through a blower with a power of 1000W, so that the pressure difference between inside and outside of the device is generated, and the external air is driven into the pipe to form a strong suction force. After the roadside greening is cut, the fallen leaves and small branches on the ground enter the device under the force to complete Collection.

There is a primary crushing device in the absorption and transportation pipeline. The device is composed of many spiral films. The larger branches and leaves are broken by the high-speed rotation of the film to complete the preliminary crushing. The crushed debris continues to be transported along the pipeline, and finally reaches the secondary crushing device for finishing.

Figure. 3 overall diagrams of the device

Figure. 4 internal structure - collection module

The device is composed of an outer cylinder and an inner cylinder. Three mixing cylinders are added horizontally in the inner cylinder. The size of the mixing cylinder is designed according to the size of the agaric culture medium to ensure that the volume of the mixing cylinder is slightly larger than that of the medium. The outer cylinder and the inner cylinder are designed with three holes according to the principle of dividing the cylinder equally. The wall of the mixing cylinder with holes in the inner cylinder inclines from the boundary to the central through-hole, which increases the mixing cylinder Part of the volume facilitates the full mixing of the raw materials and ensures the normal discharge of the mixed medium materials.

Figure. 5 mixing devices
3.3. Transmission hybrid module
The purpose of the module is to make the outer cylinder and the inner cylinder rotate in the same direction, increase the rotation circle of the inner cylinder to drive the inner cylinder to rotate, and the outer ring inner meshing gear on the right side is connected with the outer cylinder to drive the outer cylinder to rotate. Through the structure of gear internal meshing and bevel gear combination, the mixing device can rotate in the same direction with differential speed, and the movement period is prolonged, which is conducive to the mixing work.

Since there are three mixing cavities in the mixing device, and the angle between the adjacent mixing cavities is 120 °, in order to make the mixing more uniform, the differential rotation method is proposed to realize the function. According to the simple experiment, in order to make the outer cylinder and the inner cylinder have the same three through holes to cooperate with each other to achieve the mixing effect, and the device must have a certain processing efficiency, which can only be achieved when each process of the device runs one more cycle to better effect. According to the calculation, in order to realize this motion mode, a transmission ratio of 4:3 is needed, that is, the inner cylinder moves around and the outer cylinder moves three times. At the beginning of the device operation, the three through holes of the inner and outer cylinder are overlapped with each other. Outside the two through holes are the filling device, one is the main material filling device and the other is the auxiliary material filling device. In the first cycle of operation, only the mixing drum connected with the crushing waste receives the packing. Due to the existence of differential velocity, the mixing drum inside the device needs to rotate 4 / 3 for the next process. According to the calculation, the inner cylinder will move 1 / 3 circle more than the shell, and the coincidence position will not appear in other positions outside the design due to the small rotation. Using this phenomenon, after the first main material filling and placing, the receiving mixing cylinder will move to the auxiliary material filling and discharging port, while the other two cylinders will enter the mixing process in sequence, and finish at the bottom after one cycle of the device the mixture is finished. The power of the hybrid drive is provided by a motor at the rear.

The mixing device is a continuous working device. After mixing, the mixed medium needs to be discharged. Therefore, a storage device is designed to temporarily store the final product, which can be taken out manually for the production of agaric culture medium.

3.4. Control module
Sensors are added to the two storage devices, and the sensors are set as differential bridge type, so as to determine the linear output relationship and improve the sensitivity. The addition number of raw materials and auxiliary materials can be controlled by the sensor. At the same time, the data is collected and fed back, while the materials are put in. The PID closed-loop control is adopted to make the addition of raw materials and auxiliary materials meet the requirements of the device as soon as possible. Please. Ensure that the required proportion of agaric culture medium can be reached, and at
the same time, the device can meet the normal operation cycle of the equipment, that is, the input material rate can be proportional to the output material rate, so as to realize the green waste treatment and the normal production of the culture medium. Sensors are added to the two storage devices, and the sensors are set as differential bridge type, so as to determine the linear output relationship and improve the sensitivity. The addition number of raw materials and auxiliary materials can be controlled by the sensor. At the same time, the data is collected and fed back, while the materials are put in. The PID closed-loop control is adopted to make the addition of raw materials and auxiliary materials meet the requirements of the device as soon as possible. Ensure that the required proportion of agaric culture medium can be reached, and at the same time, the device can meet the normal operation cycle of the equipment, that is, the input material rate can be proportional to the output material rate, so as to realize the green waste treatment and the normal production of the culture medium.

4. Benefit analysis

In the garden maintenance project, the branches and leaves must be pruned almost every month, for pruning Evergreen Street Trees, such as Cinnamomum camphora, Ligustrum lucidum, etc. For example, if the trunk diameter is 15-25cm, taking 1000 plants as an example, the garbage generated by one pruning is 10000 kg. If it is pruned twice a year. There are about 3952 camphor street trees in Taizhou City, so the annual garbage generated by camphor trees is 16383kg. For the pruned deciduous street tree, the trunk diameter is 14-26cm, and 1000 trees are taken as an example, and the garbage generated by one pruning is nearly 50000kg. In this way, there are nearly 40000 roadside trees in the whole urban area, which are pruned twice a year, resulting in 4 million kg of Paulownia garbage.

According to the above data, at present, the total amount of landscaping waste is huge. At present, 80% of landscaping waste in Beijing is transported to landfill, and the resource treatment rate is only 2% - 3%.

According to 80% of every 1kg landscape waste is landfilled and burned, and 20% is used for resource utilization, of which 2% - 3% of the total amount is used. Only 4 million kg of garbage and 800 000 kg of carbon emission are produced by the plant every year. The device is applied to the treatment and collection of urban landscape waste and made into black Agaric medium can reduce the carbon emission by 600000.

5. Conclusions

The method of collection and production of Auricularia auricula culture medium in this work has sufficient raw material reserve and no cost. The original material of Auricularia auricula culture medium was obtained by collection, primary and secondary grinding, and mixing proportion process. After simple packaging and subsequent sterilization and disinfection process, the regenerated
Auricularia auricula culture medium was made. For the society, it can protect the environment, make resource use of garden greening waste, promote the implementation of green manufacturing project; for the culture medium production industry, it promotes the product technology conversion; for consumers, it reduces the space and human resource pressure required for medium production.

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