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Research Article

REMOTE CONTROL SYSTEM IN MOBILE SILKWORM HOUSES FOR ENHANCING SILK WEIGHT AND QUALITY

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ABSTRACT

This research focuses on the implementation of a remote control system in mobile silkworm houses to improve the weight and quality of silk fibers. The use of a lightweight and portable worm house, equipped with a mechatronic system, resulted in significant improvements in the weight and quality parameters of the obtained silk fibers compared to the traditional method. The integration of special sensors within the greenhouse allows for remote monitoring of CO_2 levels. In case of CO_2 exceeding the permissible limit, the ventilation system can be remotely activated, and it will be deactivated once the CO_2 levels return to the normal range. Comparative analysis was conducted between the silk yield from the mobile worm house and other conventional worm houses, demonstrating the favorable outcomes of the portable wormery with the mechatronic system.

KEYWORDS

CO_2 exceeding the permissible limit, the ventilation system can be remotely activated, and it will be deactivated once the CO_2 levels return to the normal range.

INTRODUCTION

A portable shed with light construction.Keeping silkworms in such portable silkworm houses gives us many opportunities, including partially eliminating the problem of transportation of mulberry leaves, which are the main food of silkworms. Mulberry leaves, which are the main food of silkworms, are usually transported from specially prepared mulberry trees to the silkworm rearing room, which causes some inconvenience. One of the disadvantages of silkworm breeding is the fact that mulberry leaves become less moist due to the

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transportation costs and the long time spent before the leaves reach the silkworms. As a solution to these problems, silkworm care becomes a little simpler in the lightweight construction of portable silkworm houses. By taking the portable silkworm houses we are researching and setting them up in specially designed cages, we will be able to care for the silkworms in the cages themselves. The light construction of the portable sheds allows us to move the sheds to the desired location without any problems.

Figure 1. A view of the mobile home we offer

Since the mobile worm houses are installed on specially prepared cages, during the care of silkworms, special films are covered over the worm house. This serves to ensure that the air temperature and humidity are moderate enough for the viability and productivity of the silkworms being cared for. By feeding the mulberry leaves freshly cut from the mulberry tree to the silkworms reared in mobile silkworm houses, the time and economic costs of transporting the leaves are saved.

One of the main disadvantages of the mobile worm house is the large amount of carbon dioxide gas released from the silkworms kept in the light construction mobile worm houses. In the process of growth and development, worms release carbon dioxide gas and moisture from their body. In addition, moisture is also released from the mulberry leaf being served. All these accumulate in the worm house and eventually have a negative effect on the normal growth of worms, reduce the yield of cocoons and decrease its quality. Changes in the air content in the worm house have a significant effect, especially on older worms, because they digest more food, absorb more oxygen and release more carbon dioxide.

When the worm house is ventilated in a simple way (by opening the door or window every 2-3 hours for 15-20 minutes in the young age, 25-30 minutes in the old age), the amount of carbon dioxide gas in the air of the worm house increases with the age of the worm. For example, in the first year of the worm before ventilating the wormhole, its amount is 0.32 percent, and in the third year it is 0.35 percent. After the third sleep, that is, as the worms move into adulthood, the amount of SO_2 increases further, reaching 0.45 percent and reaching 0.60 percent in the fifth year. The amount of oxygen, on the contrary, decreases with age. So, when the worm is young, open the door or

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window for 15-20 minutes every 2-3 hours, and for 20-25 minutes when the worm is old, during the recommended period, the air in the wormhole should be full.

MATERIALS AND METHODS

In order to increase silk weight and quality indicators, we have developed a mechatronic system that prevents the increase in the amount of carbonic anhydride gas in the air during our research in mobile silkworm houses. With the help of the mechatronic system that we offer for the mobile worm house, it is possible to remotely monitor the information about the amount of carbon dioxide gas in the worm house and, if necessary, ventilate the mobile house remotely. Using a new method of ventilation, carbon dioxide gas in the room decreases in a short period of time and reaches the required level when the air flow is replaced by an additional electric motor with a speed of 0.12-0.15 or 0.22-0.25 m/s. , and the amount of oxygen reaches the norm.

The MQ-135 sensor helps us to obtain information about the amount of carbon dioxide gas in the air in a mobile home. It works at 5 V and transmits the information about the air content in digital form to the microcontroller.

Figure 2. A view of the air content monitoring sensor used in the mobile home.

The microcontroller analyzes the digital data received using the MQ-135 sensor and sends the data to us remotely through the GPS module. When the amount of carbon dioxide gas rises above the norm, it sends information about it to us remotely and starts the ventilation system. A sim card is placed in the GPS module and the data received from the MQ-135 sensor is sent remotely to the user by the microcontroller through the sim card number.

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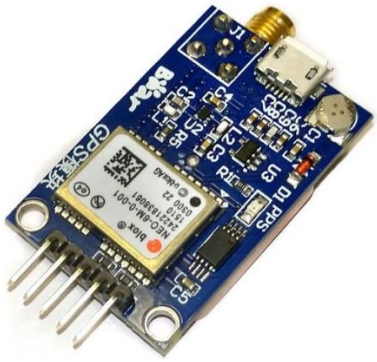

Figure 3. A view of the GPS module used in the mobile home

If the microcontroller senses that the amount of CO_2 in the air has increased, it will start the ventilation system through the relay module. The relay module was used to turn on and off the ventilation system based on the signal from the microcontroller.

Figure 4. A view of the ventilation shafts used in the mobile home

When the oxygen and carbon dioxide gas levels in the mobile home are reached, the ventilation system is turned off through the relay module. As a result of our research, the productivity of silkworms raised by a mechatronic system that regulates carbon dioxide gas in a mobile silkhouse, which affects silk fiber weight and quality indicators, was significantly improved compared to the conventional method.

RESULTS AND DISCUSSIONS

The advantage of our mechatronic system, which we used in our research on a light construction mobile home, is that we have achieved the possibility of remote control of the amount of carbon dioxide gas in the air, ventilation works are carried out automatically without the intervention of the human factor. In the course of our research, we compared the weight of silk

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obtained in a mobile worm house with the yield obtained in other worm houses in a simple way.

Figure 5. The cocooning process of silkworms reared in a mobile silkworm house

The yield of silk fiber from 1 box of silkworms raised in the portable worm house we conducted research reached 69 kg, while in other worm houses it was 64 kg and less. As can be seen from the results, the remote control of carbon dioxide content in the air in the mobile silkworm house caused the production of silkworms to be more productive and the quality indicators to be higher.

CONCLUSION

In other words, controlling the amount of carbonic anhydrite gas in the air in mobile silkworm houses is an important step in the care of silkworms in order to obtain high-quality and high-quality silk fiber. We have found a solution to ensure the amount of CO_2 in the air of the mobile silkworms in the process of silkworm care, automatically and remotely by using a mechatronic system. In the course of our research, we compared the weight of silk obtained in a mobile worm house with the yield obtained in other worm houses in a simple way. We can see that the results of our research in a portable worm house with a mechatronic system paid off.

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