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Research Article

IMPLEMENTATION OF PREVENTIVE MEASURES USING A MECHATRONIC SYSTEM IN SILKWORM FARMS TO ENHANCE SILK WEIGHT

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ABSTRACT

Preventive measures play a crucial role in ensuring the health and productivity of silkworms in silk farming. In this study, we focus on the implementation of preventive works using a mechatronic system to increase the weight of silk. Disinfection is recognized as a vital tool in combating silkworm diseases by neutralizing pathogenic microbes. The disinfection process targets worm houses and areas where disease transmission is more prevalent during warm feeding. By eliminating potential sources of infection, final disinfection is carried out at the end of the current worm feeding season, particularly in locations with a higher incidence of infectious diseases among silkworms. The integration of a mechatronic system in the preventive measures demonstrates its effectiveness in promoting healthier silk production.

KEYWORDS

In this study, we focus on the implementation of preventive works using a mechatronic system to increase the weight of silk.

INTRODUCTION

In this article, the results of our research on the effect of preventive measures on crop productivity in cocooning with the help of mechatronic system are presented. Pathogenic microbes that cause silkworm diseases are neutralized by disinfection. In the following years, preventive work on farms, including

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disinfection, has been significantly reduced. In the next 7-10 years, the main reason for the decrease in the yield of each box of worms and the decrease in the quality of rice is the lack of satisfactory preventive disinfection. As a result of feeding worms without disinfection, disease-causing microbes increase year by year. They reduce the number of worms that reach the bales, and in turn, increase productivity. Non-disinfection or non-compliance with the rules of disinfection seriously harms the harvest of rilla and the national economy. Therefore, it is necessary to pay great attention to these measures. Before disinfecting the buildings, the temperature of the building is raised to 24-25 0C, and tools used for feeding worms are brought into the room. The doors and windows of the rooms are tightly closed so that formaldehyde gas does not escape. After that, spray the disinfectant solution. After the work is completed, the room is closed for 3-4 days. We offer a mechatronic system that keeps the temperature of the room at 24-25 0C for the disinfection process. The reason is that the disinfected room must be hermetically sealed for 3-4 days, and the mechatronic system that we offer for temperature control will not work in this process. The microcontroller is instructed to maintain the desired room temperature at 24-25 0C, when the temperature drops, the microcontroller starts the heat source, when the temperature is normal, it gives the command to turn off the heat source. and quality levels were compared. From the obtained results, we can see that the mechatronic system developed by us has justified itself.

Chemical disinfection, neutralization. It uses chemicals that kill microorganisms. Disinfection mechanism of chemical substances, dissolved substance particles are absorbed through the cell shell and membrane of microorganisms, penetrate into the cell and react with its components, neutralizing microbes. Chemicals in liquid form can easily pass through the cell membrane of microorganisms. There are many types of chemical disinfectants. For example, substances containing chlorine, formaldehyde, phenol, ammonium, heavy metals are among them. Among disinfectants, chloramine and calcium hypochlorite are relatively widely used. Nesting facilities are mainly disinfected with formalin.

Formalin is produced in chemical plants as a solution of formaldehyde (formic acid aldehyde) gas in water. Buildings - worm houses are usually disinfected with a 4 percent formalin solution. Chemical plants produce 40, 36 or 30 percent phonnalin. From these, the amount of water to be added to prepare a 4 percent disinfectant solution is determined using the following formula:

$$C = \frac{\mathrm{x} - 4\%}{4\%}$$

C is the amount of water added to prepare a 4 percent formalin solution; x is the concentration of formalin in the passport from the factory.

If the concentration of formalin brought to the farm is 40 percent, the amount of water added to prepare a 4 percent disinfectant solution will be as follows:

$$C = \frac{\mathrm{x}-4\%}{4\%} = \frac{40-4\%}{4\%} = 9\mathrm{L}$$

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So, to prepare a 4 percent solution, add 9 L of water to 1 L of 40 percent formalin solution.

Preparation of chloramine solution. Monochloramine is produced in powder form in chemical plants. To prepare a disinfectant solution, 10 L of water is first poured into this container and monochloramine powder is added to it. Then, an amount of ammonium nitrate equal to the weight of monochloramine is added and thoroughly mixed with a wooden shovel. In this case, monochloramine and ammonium nitrate should not remain at the bottom of the container. The amount of chlorine in monochloramine powder from factories varies. The amount of monochloramine powder obtained during the preparation of the solution is given in

Table 1.Variation of the amount of monochloramine powder depending on the chlorine concentration

Monoxloramin kukunidagi xlor konsentratsiyasi	10L suvga qo'shiladigan monoxloramin miqdori, g	Monoxloramindagi xlor konsentratsiyasi, %	10L suvga qo'shiladigan monoxloramin miqdori, g
16	312	26	192
18	276	28	178
20	250	30	166
22	228	32	156
24	208	34	146
25	200	40	136

The formation of thick foam on the solution indicates that it is ready to use. The finished solution can be used for 5-6 hours.

Disinfection. Before disinfecting the buildings, the temperature of the building is raised to 24-25 0 C, and tools used for feeding worms are brought into the room. The doors and windows of the rooms are tightly closed so that formaldehyde gas does not escape. After that, spray the disinfectant solution. Manual or electric sprayers are used for this.

Structure and use of sprinklers. In some farms, tractors, cars or hanging sprayers are used for centralized disinfection. All of this increases productivity.

In order to improve the quality of disinfection, the solution should be evenly sprayed on the walls, ceiling, floor, doors and equipment in the room. Disinfectant shows its effect only when it comes into contact with the microorganism. If the given amount is sprayed, the room walls, floor, and equipment should be evenly wetted with the disinfectant solution.

After spraying the solution, the doors and windows of the disinfected room are tightly closed. After two or three days of continuing to heat the room, the doors

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and windows are opened and the room is ventilated to remove the odor from disinfection.

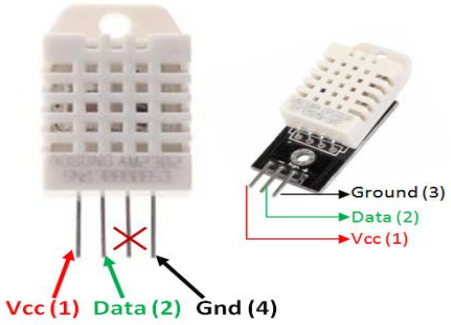
In the following years, preventive work on farms, including disinfection, has been significantly reduced. In a number of farms, worm breeding started without disinfection of worm breeding rooms. In the next 7-10 years, the main reason for the decrease in the yield of each box of worms and the decrease in the quality of rice is the lack of satisfactory preventive disinfection.

As a result of feeding worms without disinfection, disease-causing microbes increase year by year. With the start of worm feeding, the microorganisms that remain in the worm house, equipment and surroundings cause the spread of disease and the destruction of worms. They reduce the number of worms that reach the rilla coiling and, in turn, increase productivity. Due to the numerous spots on the pods, the diseased worms are accepted as inferior varieties. As a result, the farmers work hard day and night for a year and do not get the expected income. Non-disinfection or non-observance of disinfection rules seriously damage the rilla crop and the national economy. Therefore, it is necessary to pay great attention to these measures.

Based on the above information, it is necessary to keep the room temperature at 24-250C during the disinfection process. If the required temperature is ensured, taking into account the high quality and productivity of the silk product obtained from the silkworm after the preventive works, the following researches were conducted.

MATERIALS AND METHODS

We have conducted several researches in the field of sericulture in order to improve preventive measures in cocooning, which affects the productivity and quality of silk. As a result of our research, we have seen that by keeping the temperature of the disinfected worm house at 24-25 oC, the efficiency of neutralizing pathogenic microbes that cause silkworm diseases has increased several times. With the help of the mechatronic system proposed by us in prophylactic work, the issue of maintaining the temperature of the disinfected worm house at a moderate 24-25 oC has become somewhat simpler and a solution to this problem in the field has been found. The mechatronic system offered by us controls the temperature of the house through a program written on a microcontroller without the intervention of the human factor. The mechatronic system that maintains the temperature of the disinfected worm house at 24-25 oC consists of the following devices: 1) DHT-22 digital sensor - the function of this sensor allows us to receive information about air temperature and humidity in a digital display.



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Used for the mechatronic system in the disinfected worm house

Figure 1. DHT-22 sensor

By installing this sensor in the worm house, we will get information about the air temperature of the worm house. 2) Microcontroller - allows controlling the whole process by counting one of the main components of the mechatronic system.

Figure 2. Microcontroller used for mechatronic system in disinfected wormery

The microcontroller analyzes the temperature data received by the temperature sensor through the program we wrote. If the temperature in the hermetically sealed chamber drops below the set standard, the heat source for the chamber is activated, and after the temperature reaches the set standard, the heat source is turned off. 3) relay module - executes the commands received from the microcontroller to turn off or turn on the heat source in the house. We used a relay module with a parameter of 250 volts and 10 Amperes, operating at a voltage of 5V. 4) LCD display.

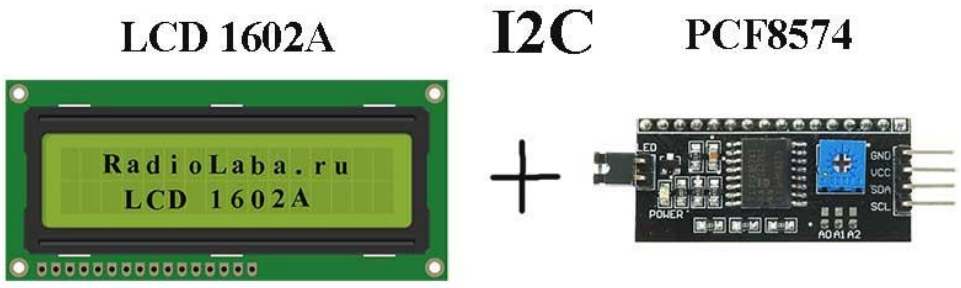

Figure 3. LCD display used for mechatronic system in disinfected wormery

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help us monitor the data in the wormhole transmitted by the microcontroller.

In the course of our research, we managed to maintain the temperature of the cocoon at the specified level in preventive works affecting the productivity and quality indicators of silk fiber. We have achieved good results through the preventive works carried out through the mechatronic system that we offer.

RESULTS AND DISCUSSIONS

Otkazgan tadqiqotimizda qo'llagan mexatronik tizimimizning afzalligi shundan iboratki, dezinfeksiya qilingan qurthonadagi kerakli 24-25 oC hararatni taminlash inson omili aralashuvisiz avtomatik tarzda amalga oshiradi. Biz tadqiqotimizni O'zbekiston respublikasi, Namangan viloyatidagi qurtxonada o'tkazdik va taklif qilgan mexatronik tizimi qo'llandik. Bir mavsumda biz tadqiqot o'tkazgan qurthonada yetishtrilgan xosil bilan, boshqa qurtxonalarda olingan xosilni bir biri bilan taqqosladik. Natijada biz tadqiqot o'tkazgan qurthonada parvarishlagan 1 quti ipak qurtlari o'ragan ipak tolasi xosildorligi 68 kg ga yetgan, boshqa qurtxonalarda esa 64 kg va undan ozni tashkil qilgan. Natijalardan ko'rinib turibdiki parvarishlangan ipak qurtlari kassaliklrga chalinmadi, xosil unumdorligi boshqa qurtxonalarga nisbatan 4 kg ga yaxshilandi.

Figure 4. The cocooning process of silkworms kept in the researched worm house

Through the preventive works carried out with the help of the mechatronic system that we offer, the Republic of Uzbekistan helps to deliver competitive quality and productive silk fiber to the world market in the field of cocooning. In addition, as a result of the prevention work carried out in this way, the number of diseases and deaths of silkworms has been reduced.

CONCLUSION

In conclusion, the prevention process in the wormhouses is an important step in order to obtain productive and high-quality silk fiber. During the disinfection process, we found a solution to provide the air temperature of the worm house in an automatic manner, without the intervention of the human factor,

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by using a mechatronic system. During the disinfection process, the required temperature in the worm house was kept at 24-25 oC according to the request. The silk fibers obtained from cocoon worms kept in this worm house were compared with the quality and productivity of silk fibers obtained from silk worms kept in worm houses where preventive measures were carried out in a simple way. From the obtained results, we can see that the mechatronic system we made has justified itself.

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