The automatic temperature control device that stimulate the silkworms' food intake to increase the quantity and quality of native silk varieties.

Organizing teams: Miss Patsayapond Kanlayason,Miss Wachiraya Layakul,Miss Supparada Kongjinda
Advisor: Mister Chumpon Chareesan Miss Tarntip Chantaranima

Abstract

Growing mulberries and creating products from silkworms has been considered Thai wisdom for a long time. Kalasin Province is another province where fibers from silkworms are applied. By weaving it into Praewa silk until becoming famous around the country. The organizing team therefore raised it in different places and the silkworms grew differently. Silkworms that raised by using temperature-controlled equipment grew better than those that raised without using temperature-controlled equipment. It was found that the average weight of 100 silkworms was 10.60±1.33 grams, the average length was 38.70±4.98 millimeters, the average width was 4.78±1.00 millimeters. The pods of the silkworms that raised by using temperature-controlled equipment entered the pods 4 days earlier than the silkworms that raised without using temperature-controlled equipment and also it was found that the size of the silkworm pods was larger. The weight of 100 pods was 46.38 grams, the average length was 33.06 ± 1.27 millimeters, and the average width was 11.38 ± 2.15 millimeters.

And when the silk threads obtained from silkworms using a temperature control device were able to withstand a tensile force of 11.41±1.53 newtons with a cross-sectional area of 0.02±0.00 square millimetres. Can be used to calculate the tensile stress as 600.80±132.78 newtons per square meter more than silk from silkworms that raised without using temperature-controlled equipment. Can withstand a tensile force of 9.58±1.31 newtons with a cross-sectional area of 0.02±0.01 square millimeters. Can be used to calculate the tensile stress as 482.46±114.78 newtons per square meter

Introduction

—Goal of the project—

- To develop the automatic temperature control device that stimulate the silkworms' food intake to increase the quantity and quality of native silk varieties.
- To increase the quantity and the quality of native silk varieties.

Methodology

Part1 Study of climate change in the year 2018-20Part1.1 Study of climate change in Kalasin Province

Part1.2 Study of weather changes during October 2565 to 31 January 2023

Materials

1.Control circuit board 4.Server box
2.Temperature sensor 5.Cover box
3.Incandescent bulb 60w 6.Ventilation fan 80w model LOOSEN

Part2 Studying the raising of silkworms involves the use of automatic temperature control equipment that promotes the feeding of silkworms.

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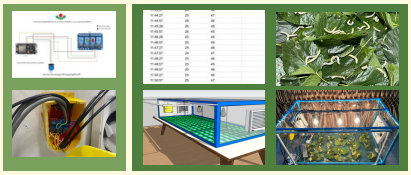


The automatic temperature control device

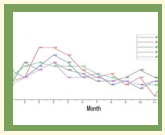
Part3 Comparative study of the quality of silk from different rearing locations.

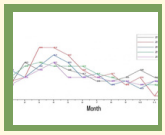
Materials

1. Force sensor model DFS-BTA 4. Ruler
2. Vernier model Electronic digital caliper 5. Hook
3. Cienytec Vernier Labquest 2

Comparative study of the quality of silk.

Experimental results and Discussion

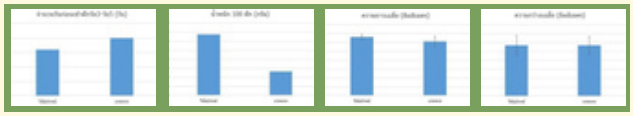




Show the average maximum temperature in the Kalasin province since the year 2018- 2022

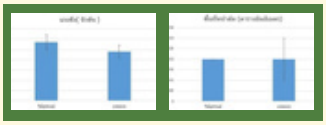
Part 2 Studying the raising of silkworms involves the use of automatic temperature control equipment that promotes the feeding of silkworms.

From the chart it is found that Silkworms raised in different places have different growth patterns. Worms raised in temperature-controlled facilities grew better than those raised by farmers.

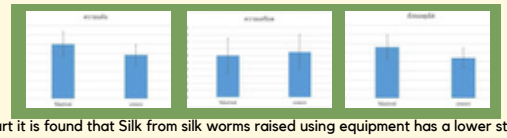


From the chart it was found that the pods of the worms that were raised using temperature control equipment There is a pod first. Silkworms were raised in a farmer's greenhouse for 4 days and it was also found that the size and weight of the silkworm pods larger than that of farmers.

Part 3 Comparative study of the quality of silk from different rearing locations.



From the chart it is found that Silk obtained from silkworms raised using equipment can withstand higher tensile forces and stress values than agricultural silk and has a slightly different cross-sectional area.



From the chart it is found that Silk from silk worms raised using equipment has a lower stress value than silk produced by farmers. But it still has a higher modulus.

Conclusion

Silkworms reared using automated temperature control equipment exhibited superior growth compared to those raised without equipment. It was observed that the average weight of 100 worms was 10.60±1.33 grams, with an average length of 38.70±4.98 mm and an average width of 4.78±1.00 mm. Moreover, silkworms raised in temperature-controlled environments cocooned 4 days earlier than those raised conventionally. Additionally, the cocoons of silkworms reared in controlled environments were notably larger than those of their conventional counterparts, with a weight of 46.38 grams for 100 cocoons, an average length of 33.06 ± 1.27 millimeters, and an average width of 11.38 ± 2.15 millimeters.

Furthermore, silk threads obtained from silkworms raised using temperature-controlled equipment demonstrated enhanced mechanical properties. They withstood a tensile force of 11.41±1.53 newtons with a cross-sectional area of 0.02±0.00 square millimeters, resulting in a tensile stress of 600.80±132.78 Newtons per square meter. This surpasses the tensile strength of silk obtained from silkworms reared in conventional farmer greenhouses, which withstood a force of 9.58±1.31 newtons with a cross-sectional area of 0.02±0.01 square millimeters, yielding a tensile stress of 482.46±114.78 Newtons per square meter.

A comparative analysis of the silk quality derived from silkworms raised in temperature-controlled environments and those from conventional farmer greenhouses revealed that silk from temperature-controlled environments exhibited superior mechanical characteristics. The calculated tensile stress was 600.80±132.78 Newtons per square meter, with a strain of 1.08±0.05. Conversely, silk obtained from conventional farmer greenhouses demonstrated a tensile stress of 482.46±114.78 Newtons per square meter, with a strain of 1.09±0.05. The calculated Young's modulus value for silk from temperature-controlled environments was 557.97±131.56 N/m^2, indicating superior mechanical resilience compared to silk from conventional farmer greenhouses, which had a Young's modulus value of 443.74±103.31 N/m^2.

References

The Queen Sirikit Department of Sericulture (2009). How to raise silkworms. Available : https://qsds.go.th/newqssckkm/
Northeastern Meteorological Center (Lower Part) (2023). Weather in Kalasin province. Available : http://www.khonkaen.tmd.go.th/