

## AN ELECTRON SCAN MICROSCOPE ANALYSIS RESULT OF DAMAGE ON WOOLLEN FIBER BY CLOTHES MOTH (TINEOLA BISSELLIELLA)

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### ABSTRACT

*We have studied a type of damage on woollen fiber by clothes moths. 10 pieces of hurentser were put into each washed wool, raw wool and thick fiber of wool at the same temperature and did observation every 2 days. After 14 days, a number of dead and alive larvae, their length were noted down. Also we noted down that if they were moving or not and grew up or away. Samples were put in thermostat at 24.5 C. Each damage of every sample by clothes moth were not the same as each other.*

**KEY WORDS:** method, type of damages of - washed wool, cashmere, fiber

### BACKGROUND

Clothes moths live in wet and warm condition and spread over most countries in the world. Robinson summerized a number of damaged keratinous material by group of /Tineolapellionella/ in 1979. He prepared a simulated birdnest and collected by a trap during 8-12 weeks in knothole and cliffs. Also he propagated the insects at the lab and described keratofag /Tineinae/ and vermin were there. \7\ A.K. Zagulaev \1954\, described that the clothes moths damage on wearings and furs ... a lot, and he started to draft a technique to control them. \8\

First, in 1956, Hinton produced several methods to propagate Tineola at the lab, he described that it fed on powdered dry fish,

wool, high protein containing products, meat and feather \5\ He believed that it would be efficient to observe the biology of Tineinae at evolutionary early stages \7\ In recent years IPM monitoring and protecting methods are required urgently as the propagation of clothes moth are increasing. \3,4\

Clothes moths have long, narrow hair on the wings. Wing span is less than ½ inch. These moths feed on mammal's nest, dead vertebrata's body and wheat but it infected to our resident use by food and clothes \3\ Fabric insect-pests damage on museum textile, blanket, carpet, domestic clothes, warehouse carpet and antique. But damage is fewer on washed wool comparatively \2\.

### RESEARCH MATERIAL, METHOD

Researchers described that keratin is the most important to the growth of Tineola as experiment results. \2,3\ Entree of clothes moth larvae is contaminated woollen material, also it feed on dirty silk, felt, skin, feather and

fur. Woollen clothes /mainly old army uniform/, feather hat, doll, textile wall hanging \3\.

We prepared samples, which are 1 kilogramm of each washed wool, raw wool and thick fiber of wool from 3 factories.

Experiments were done according to MNS 2951-2007, ГОСТ 9.055-75 standards. The result worked out after 2 weeks by loss of weight.

**RESEARCH RESULT**

Clothes moths spread more in dark warehouse at 22-24 temperature 17-25 degree of

Food effect is described by number of dead larvae and the type of damage is described by certified method. Damage rank of clothes moth is described by G.A Zakladoy’s method. Damage rank of clothes moth was determined by number of clothes moths in 1 kg sample.

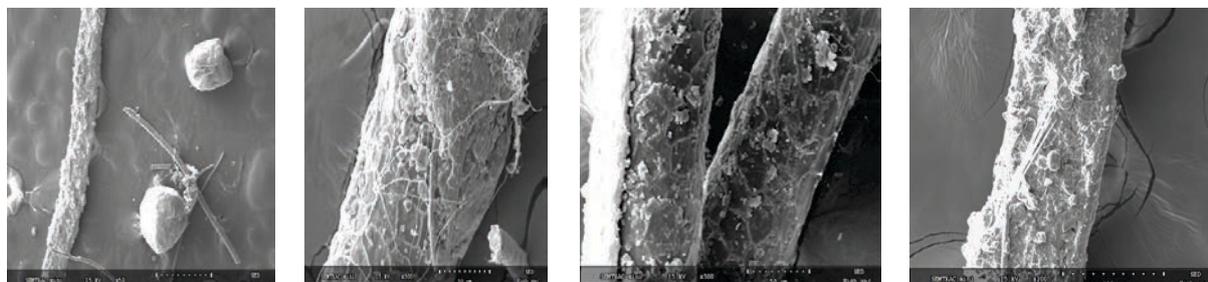
humidity. There were 17-21 clothes moths in 1 kg sample by the experiment.

Table 1

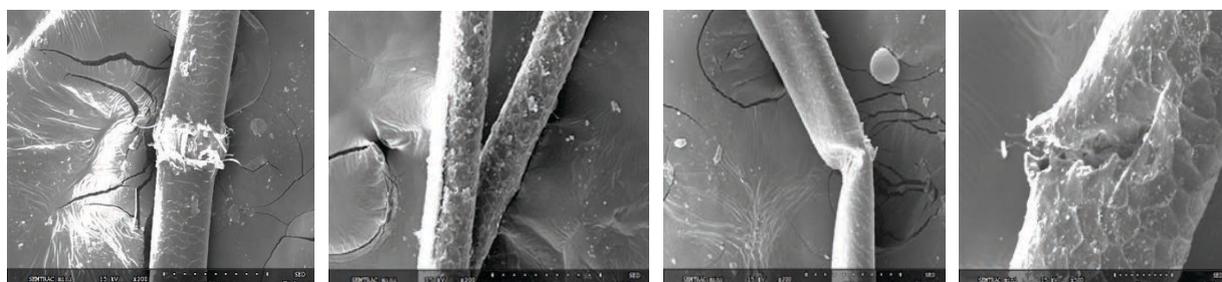
| № | Name of sample      | Growth of clothes moth (by mm) | Dependency of clothes moth growth from food effect |                    |               |
|---|---------------------|--------------------------------|--|--------------------|---------------|
|   |                     |                                | Per sample   |                    |               |
|   |                     |                                | Grew up (number)                                   | Grew away (number) | Dead (number) |
| 1 | Washed wool         | 5mm                            | 6  | 2                  | 2             |
| 2 | Raw wool            | 6-8                            | 8  | 1                  | 1             |
| 3 | Thick fiber of wool | 4-7                            | 5  | 3                  | 2             |

Structure reduction, flaky layer breakage and a type of woollen fiber surface which are damaged by clothes moth described by ISO17751:2007(E), IWTO DTM-XX-97, ASTM-D-2130 analysis technique with an electron scan microscope (SEM) at the

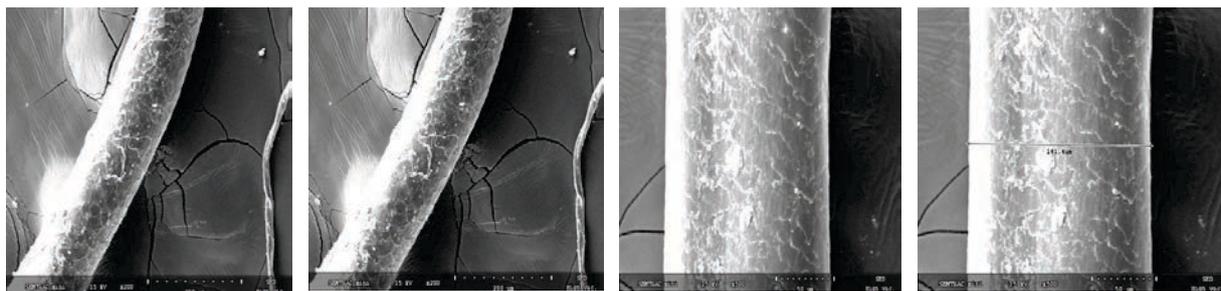
laboratory of “Nano-science, nano-technology center”, National university of Mongolia /NUM/. The results were shown by pictures. (Exposure of damaged fiber wool (SEM) multiplied by 3000)



Picture 1. Exposure of damaged raw wool



Picture 2. Exposure of damaged woollen fiber



Picture 3. Washed wool



Picture 4. Exposure of damaged fur skin, wool, lamb skin at households

## CONCLUSION

1. Clothes moths propagate in the sealed habitat of manufactories with 24-25 constant temperature much more.
2. Damage rank was determined by G.A.Zaklady's method. On average, 17-21 moths came out in 1 kg of sample, is 1<sup>st</sup> rank of damage.
3. In experimental results, clothes moth damaged the washed wool less and growth

of larvae was slow and some of hurentser were dead. When observing reduction structure and the damage type of each fiber by SEM, the moths damage the contaminated wool more and the fiber was broken (when it's dry and inflexible) while inflexible while washed wool were damaged less.

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