CRYONITE
POISON FREE PEST CONTROL

Combatting stored product insect pests by freezing

[excerpt]

”Bekæmpelse af museumsskadedyr ved nedfrysning”
by
Toke Skytte
Naturhistorisk Museum, Århus, Denmark
1993

CTS Technologies AG
2005-09-27

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Contents

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Determining point of death

Each experiment involved one individual egg, larva, pupa or adult, which was provided with a temperature sensor and was put in a small glass container and lowered into a "cold-bath".
The test-objects temperature was continuously measured.

Normally, an insect's cooling curve shows an even drop in temperature, until a critical point is reached, namely when ice-crystals begin forming. This has such a destructive effect on the cells and tissues of all stored product insects examined to date that the insects quickly die.

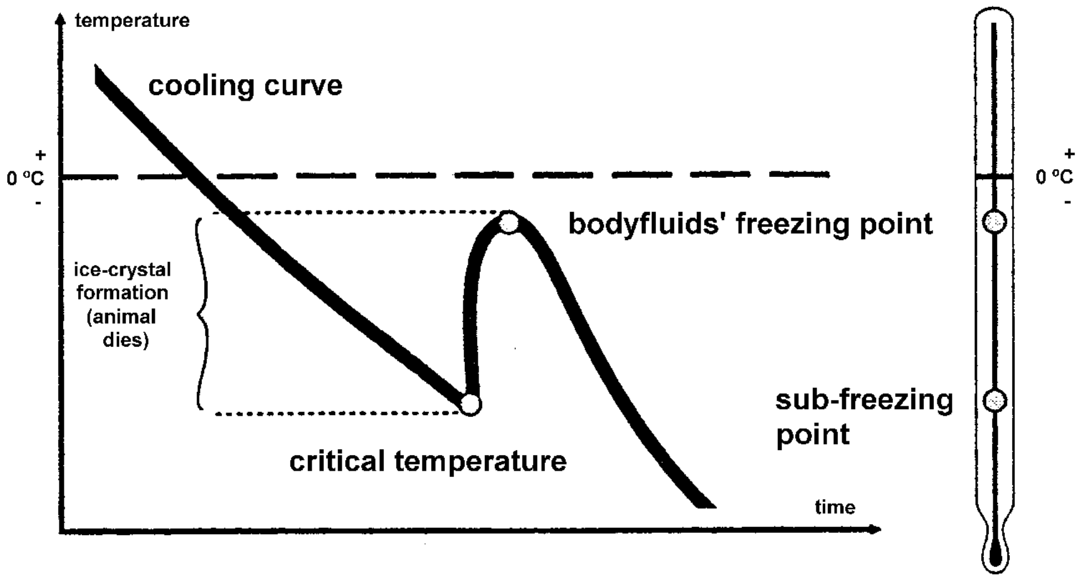
The temperature will then suddenly rise due to released heat from the formation of ice. (Figure 1)

The temperature will subsequently continue to fall steadily, during continued cooling.

For each species, 25-100 trials were made.

Most of the tests started from room-temperature, and stopped at the sudden temperature rise, indicating ice-formation.

Figure 1



Results

Table 1 gives an overview of the results.
The table shows that egg and larval stages of most species are more resistant to cold than adults.
As will be shown, the critical temperature is also dependent on other factors.

Table 1

	Lethal temperature in °C			
species	**eggs**	**larvae**	**pupae**	**adults**
Anobium punctatum				-19,2
Anthrenus flavipes		-26.2		-22,3
Anthrenus museorum		-27,3		
Anthrenus verbasci	-27,8	-27,0	-23,5	-20,6
Attagenus sminorvi		-25,3		-22,3
Attagenus woodroffei		-24,0	-18,5	-20,8
Dermestes haemorrhoidalis	-26,2	-26,3		-20,4
Dermestes lardarius		-18.2		
Hylotrupes bajulus		-26,9		
Lasioderma serricorne	-28,8	-26,2	-25,3	-20,2
Oryzaephilius surinamensis				-30,0
Ptinus tectus		-26,8		-23,7
Reesa vespulae		-25,1		-23,1
Stegobium paniceum		-24,0		-24,0
Tenobrio molitor	-25,8	-24,7	-21,3	-14,3
Tinea pellionella	-33,4	-23,1	-23,5	-23,1
Tineola bisselliella	-29,8	-28,1	-25,6	-24,0
Tribolium confusum		-24,3		-20,2
Tribolum destructor		-20,8		22,0

Significance of speed of cooling

In the trials different cooling speeds were used, to evaluate any effect on the critical point. The effect was unexpectedly strong.
For all examined species, an increase in the speed of cooling resulted in death at a higher temperature for all stages.

The biological background for this effect is probably the ability to produce anti-freezing substances.
With a slower cooling, the animals can, for a while, compensate for the fall in temperature with production of these substances.
At a higher cooling pace, the maximum production rate cannot compensate quickly enough, and the body fluids freeze quicker.

Figure 2

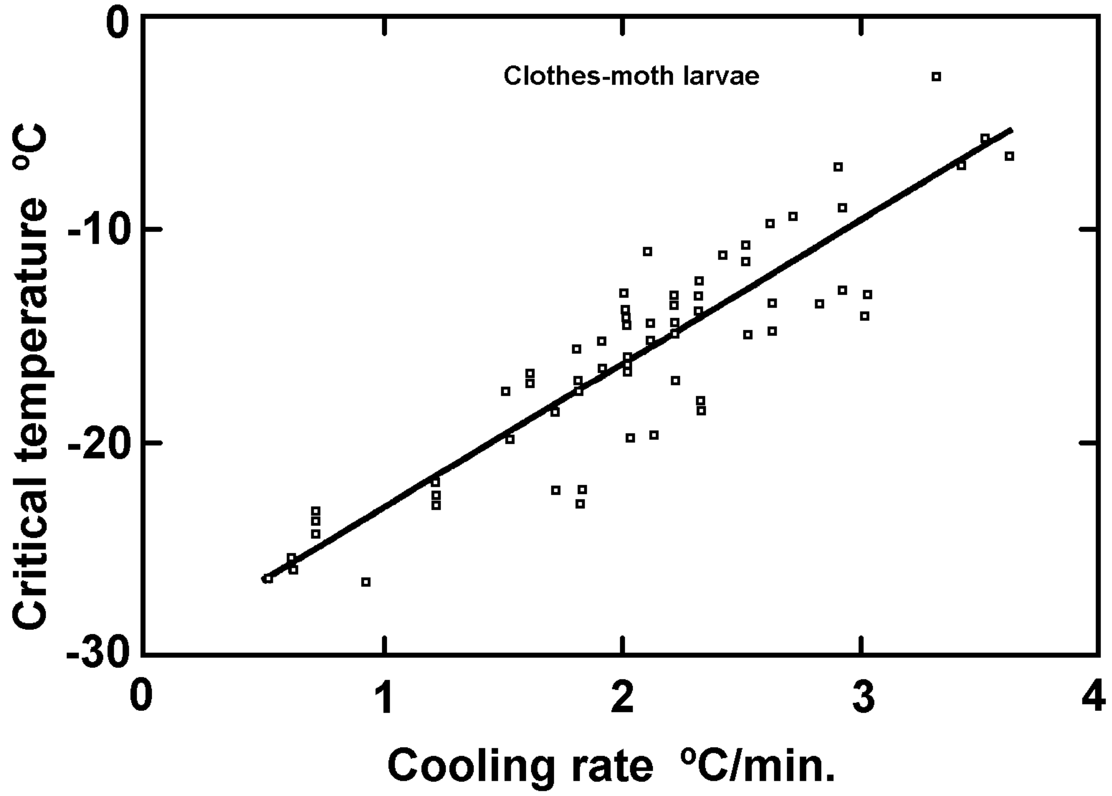
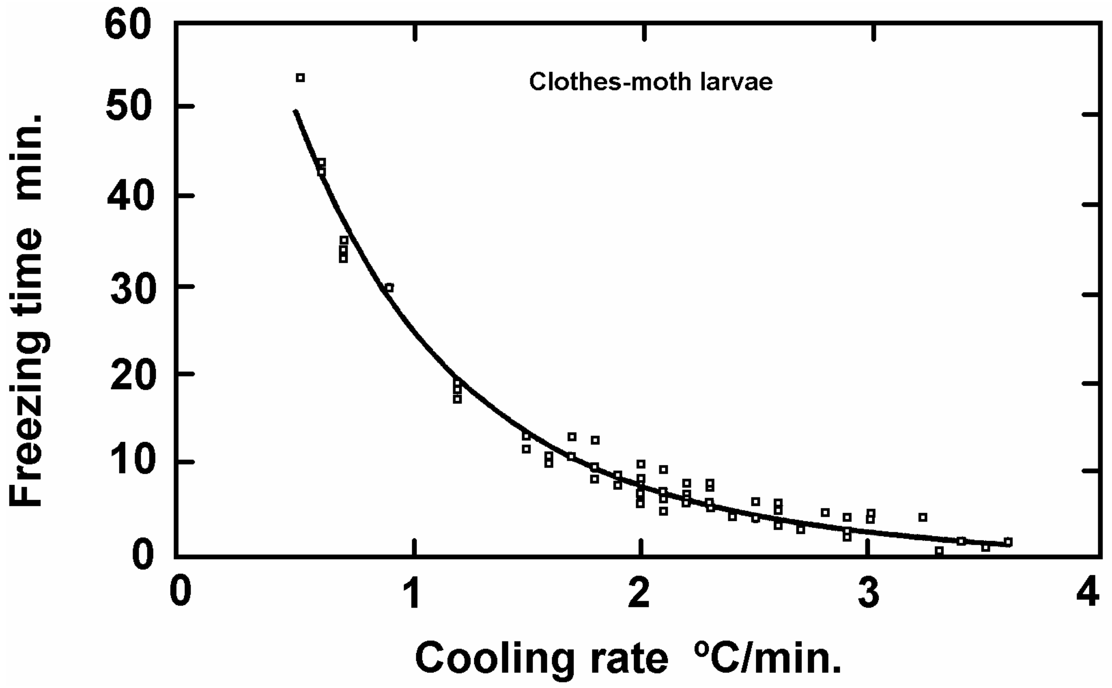


Figure 3



Conclusion

The tests have shown that freezing of stored product insects to -35 °C is an effective method of control.

Does desinfection by freezing cause damage?

In cooperation with curators from some other museums, we did a series of standard-freezing tests on a plethora of materials (e.g. painted wood).
The method was the same as is used for freezing-desinfection by the museums in Århus county.
Photo-comparison, before and after, has shown damages, in the form of ruptures, only for water-soaked pieces.

- end of excerpt -

Cryonite

At a cooling rate of 3.5 ºC / minute, the clothes-moth larvae die at a temperature of about -5 ºC.

The freezing time at that cooling rate is one minute or less.

Cryonites cooling rate is very much higher than that, and can often be 800 ºC / minute.

Cryonite also easily produce a temperature of around -25 ºC or lower, and that temperature returns towards ambient temperature rather slowly (in this context).

You may draw your own conclusions.

We have ours:
Cryonite works.

Stefan Hansson, CEO, CTS Technologies AG