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Safe High Temperature Pest Eradication - is the answer in the bag?

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When the dermestid beetle *Anthrenus sarnicus* first burst upon the scene in South Kensington around 1980, high temperature was used for eradication. To facilitate this, a modified slide oven [internal dimensions 210cms high x 65cms x 65cms] was purchased from LTE Scientific Ltd. Some hundreds of insect collection drawers and store boxes passed through the oven, heated to 52C for at least 3 hours.

While heating achieved total success in terms of 'kill', it soon fell out of favour because of obvious deterioration in the condition of the collection containers. Following treatment, cracking or warping of collection drawers and store boxes increased markedly rendering the contents even more susceptible to future pest attack! In addition, one type of collection drawer that had proved especially vulnerable to pest intrusion had a glazed lid in which the glass was held in place with putty. Subsequent loosening and cracking of the glazing putty is assumed to be attributable to exposure to this high temperature regime. Such experiences led to the adoption of low temperature treatments for routine eradication of pests in our collections (Ackery, Doyle & Pinniger, 2000).

But more recently, led by Tom Strang's pioneering work on high temperature pest eradication, (see for instance Strang, 2001) we have revisited this option. Practically, it has a clear advantage over 'freezing' - a three-hour treatment period compared to 72 hours for low temperature regimes. It is now widely appreciated that 'freezing' requires bagging of objects within a water-impermeable barrier to ensure rapid equilibrium in any water movement to or from the object, and to prevent problems with condensation as the temperature of the object returns to ambient. Our preliminary tests reported upon here investigated the likelihood of similar buffering effects of bagging in high temperature regimes.

Our Test 1 employed four Tinytag Ultra data loggers to record temperature and relative humidity within the oven itself, within an exposed drawer, within a drawer 'sealed' within a standard bin liner, and within a drawer 'sealed' within a heavy duty bin liner. The results with respect to relative humidity are tabulated in Table 1. Based upon an ideal natural variation of plus or minus 5%RH (see

	Ambient RH	Minimum RH	Maximum RH	Differential
Within chamber	32%	15%	37%	22%
Inside exposed drawer	37%	29%	45%	16%
Inside drawer/ standard bin	36%	34%	46%	12%
Inside drawer/ heavy duty bin liner	39%	39%	47%	8%

Test 1

	Ambient RH	Minimum RH	Maximum RH	Differential
Within chamber	32%	13%	35%	22%
Inside drawer/ standard bin liner	35%	32%	42%	10%
Inside drawer/ heavy duty bin liner	36%	36%	45%	9%
Outside drawer/ heavy duty bin liner	35%	34%	44%	10%

Test 2

Moore, 1992), we have assumed that a 10% differential between extremes is the maximum acceptable over the duration of the treatment. The test showed that the use of a heavy duty bin liner will ensure sufficient stability with respect to RH, with just an 8% differential between the maximum and minimum levels. Test 2 largely verified this finding although this time the recordings from within the standard and heavy duty bin liners approximated more closely. In Test 2 we did not monitor an isolated unbagged drawer; rather we took an additional reading from within the heavy duty bag but outside the contained drawer. This we felt was relevant to the problems that we had previously experienced with external glazing putty. At a 10% differential between maximum and minimum, it was within the acceptable limits.

Our methods were simple but practical. Obviously, the subjects of barrier films and methods of sealing can provide research programmes in themselves and are being investigated in other research areas (eg. A. Doyle and E. Lam, in preparation). We know nothing of the structure of our off-the-shelf bin liners beyond a thickness of 30-45 microns and 145-170 microns for the standard and heavy duty bags respectively. Sealing was simply with synthetic cord, tied as tightly as possible. But whatever these shortcomings, and the limited nature of our tests, it is clear that vapour barrier films have the potential to ensure that safe high-temperature treatments can be achieved without exposing the contents to unacceptable variation in humidity.

Suppliers:
Tinytag Ultra - Meaco, Unit 8, Smithbrook Kilns, Cranleigh, Surrey GU 6 8JJ.
Incubator - LTE Scientific Ltd, Greenbridge Lane, Greenfield, Oldham, Lancashire.

References

Ackery, P.R., A.M. Doyle and D. Pinniger. 2000. Are low temperature pest disinfestation procedures 'safe'? The Biology Curator 18: 28-30.

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