

Susceptibility of *Liposcelis entomophilus* (Enderlain) to Carbon Dioxide

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Liposcelis entomophilus (Enderlain) is common in food stores in the tropics where the prevailing hot and humid conditions provide an ideal environment for its proliferation. *L. entomophilus* has been reported in rice warehouses in Indonesia and Malaysia (Semple 1985), Thailand (J. van S. Graver, personal communication), and in Singapore. Densities as high as 1500 live insects per kilogram of rice have been encountered in Singapore (S.H. Ho, unpublished data), while even higher densities (up to 4000 live psocids per kilogram) were recorded from Indonesia (C.P. Haines, unpublished data). The occurrence of these psocids in large numbers would pose both a cosmetic problem in stored grain and a nuisance to workers.

In a recent review (Annis 1986), the absence of information on the response of stored product psocids to controlled atmospheres was obvious. The work reported here was therefore undertaken to establish the time-to-100% kill of *L. entomophilus* exposed to various concentrations of carbon dioxide (CO₂).

Mixed-age samples of *L. entomophilus* (>150 individuals per cage) were exposed to various concentrations of CO₂ and the time-to-100% kill determined. Five cages were placed in each exposure chamber. Chambers were constructed from vacuum desiccators, which were placed in incubators. All tests were carried out at 30°±1°C and 75±3% relative humidity. There were three replicates of each treatment. The CO₂ concentrations were monitored daily with a Riken interferometer (Model 18) calibrated for CO₂.

The results, incorporating additional data obtained after the conference, suggest an inverse relationship between concentration and time required for 100% kill (Table 1). Increasing the concentration of CO₂ from 30 to 90% decreased the time-to-100% kill from 5 days to 1 day. Observations on the susceptibility of the different life stages suggests that the egg stage is the most tolerant to CO₂. Further work is presently in progress to ascertain the order of susceptibility of the other life stages.

Table 1. Time-to-100% kill of mixed-age sample of *Liposcelis entomophilus* exposed to various concentrations of CO₂ at 30°±1°C and 75±3% RH.

| %CO ₂ concentration (mean±S.D.) | Time-to-100% kill (days) |
|---|-----------------------------|
| 20.9±0.7 | >1 week |
| 30.7±1.5 | 5 |
| 41.0±1.1 | 4 |
| 51.4±1.2 | 3 |
| 60.8±1.5 | 3 |
| 70.7±1.4 | 3 |
| 80.8±1.3 | 2 |
| 92.8±1.3 | 1 |

Currently suggested dosage regimes (Annis 1986) for constant as well as declining CO₂ concentration would be adequate for the control of *L. entomophilus* in well sealed enclosures.

References

- Annis, P.C. 1986. Towards rational controlled atmosphere dosage schedules: a review of current knowledge. In: Donahaye, E., and Navarro, S., ed. Proceedings of the 4th International Working Conference on Stored-Product Protection, Tel Aviv, Israel, 1986, 128-148.
- Semple, R.L. 1985. Pest control in grain storage systems in the ASEAN region. ASEAN Crops Post-Harvest Program Technical Paper Series No. 1. 77p.