HIGH STRESS CONTROLLED ATMOSPHERE DISINFESTATION OF FRESH EXPORT ASPARAGUS

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Confidential Report to:

Research Committee
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RECOMMENDATIONS

1. That a trial shipment of asparagus to Japan be sent in the 1990/91 season.

2. That further development of this technology for asparagus disinfestation.

EXECUTIVE SUMMARY

The Controlled Atmosphere (C.A.) disinfestation technology developed over the last 5 years with New Zealand Asparagus Council support appears to have a great deal of commercial promise. Some final scientific investigations remain to be completed, despite this, it seems most cost-effective to do a preliminary market test.

A C.A. of 60% CO_2 in Air should be applied for 5 days at 0°C, then the product can be shipped by air to export markets. Mortality of insects after 5 days may not be quite 100% but it is highly likely that any residual insects will die under the stress of the transportation system. The trial shipment should be under the aegis of MAF New Zealand and MAFF Japan so that its appropriateness as a quality management system for insect quarantine can be determined.

Because of budgetary restraints the trial shipment will need to be treated in Levin and transported to Auckland. This will place another day or two in the system that will affect the end quality.

METHODS

Asparagus was purchased from local growers already packed in 5 kg wooden cases.

Product was kept at 0°C throughout the trials.

Treatments were - untreated, 40% CO_2 + 2% O_2, 40% + Air, 50% CO_2 + 2% O_2, 50% CO_2 + Air, 60% CO_2 + 2% O_2, 60% + air.

Thrips were collected from the field and aphids were reared in a greenhouse.

Pair of asparagus boxes were held in gas tight tins and the relevant atmosphere was passed through the system from the gas mixer at 200 ml minute.

Product was left for a day after removal from the atmosphere and then 20 spears were dissected to determine the numbers of dead and alive insects. The remaining spears were tapped in the standard quarantine manner and dead and live insects removed and counted.

RESULTS

The results are shown in Figure 1.

Mortality of thrips in air increased from day 4 to day 6. At day 6 mortality was a little over 95%. The pattern of aphid mortality was erratic.

In the two atmospheres which had 40% CO_2 little data was collected. In these atmospheres neither aphid or thrips mortality followed any coherent pattern. The low aphid mortality was unacceptable even after 5 days and these two treatments were abandoned.

The remaining 4 treatments can be taken together - 50% CO_2 + 2% O_2, 50% CO_2 + Air, 60% CO_2 + 2% O_2, 60% CO_2 + Air.

After 3 days insect mortality was too low to be useful. However a day later mortality of both thrips and aphids was around 80-95%. The data are somewhat variable. Aphid mortality in 60% CO_2 + 2% O_2 at 5 days and in 50% CO_2 + 2% O_2 after 6 days seem to be out of the overall pattern. Otherwise a useful 95% and after 6 days it was at or very close to 100%.

DISCUSSION

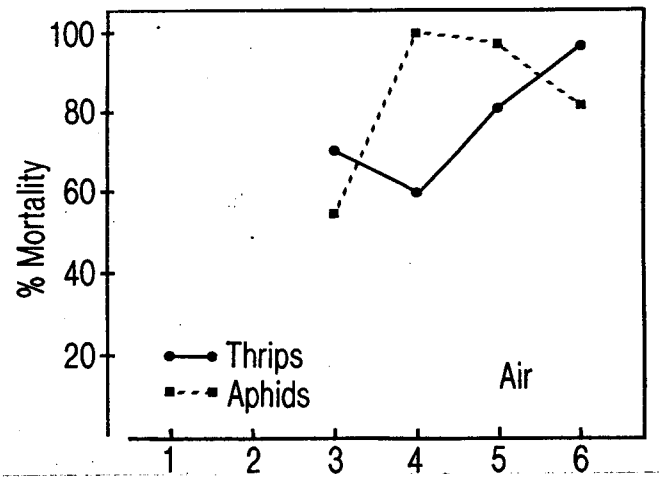
The research described here was originally designed to be spread over two seasons. About 85% of this research was completed in 1989/90 and that gives enough data for assessing the methodology.

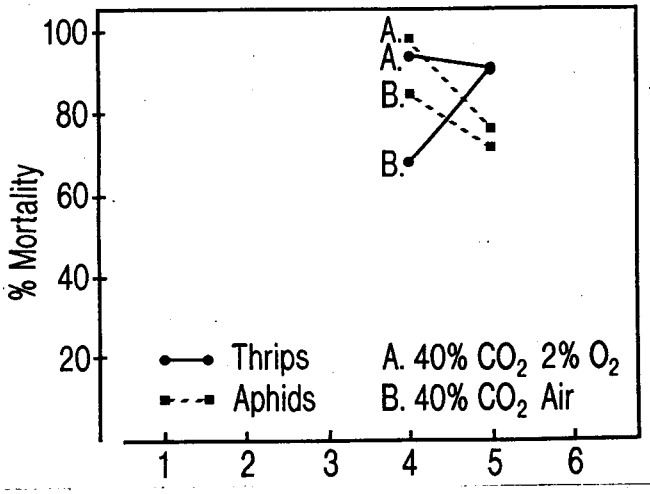
In these experiments using thrips and aphid numbers that were far higher than would be encountered in practice by the industry, high stress controlled atmospheres give insect mortalities close to 100% in 5-6 days.

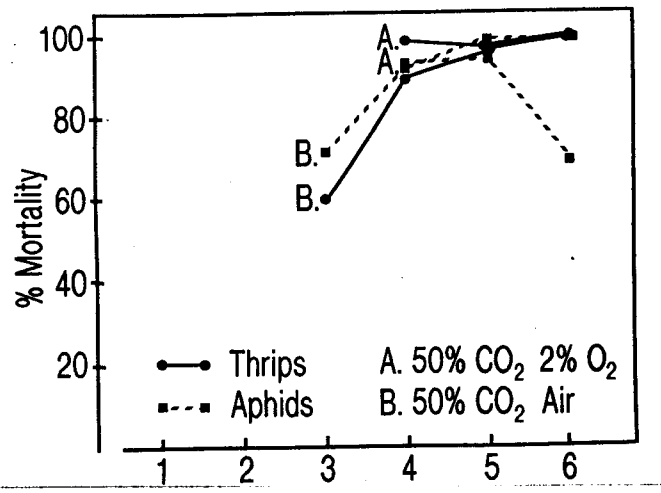
As the atmospheres would need to be applied in New Zealand prior to air freighting to Narita, the additional 24 hours until the product is presented to MAFF for inspection means that there is likely to be further mortality.

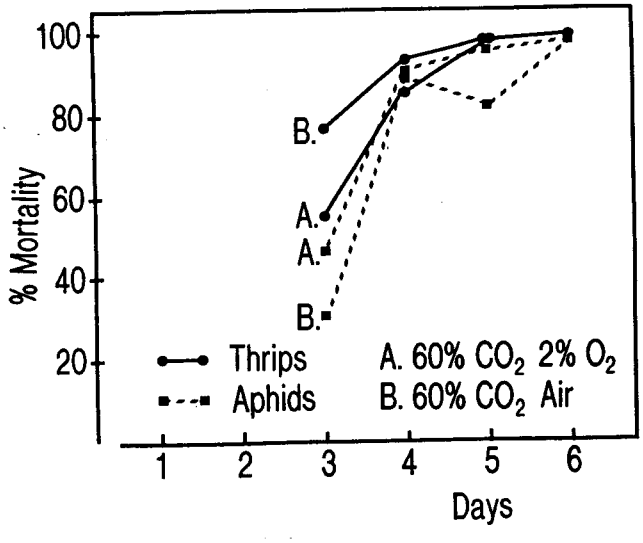
For the coming season this hypothesis should be tested by running 2 small shipments through a simulated process at Levin and then sending a 50-60 case lot to Narita for MAFF consideration. As well the rest of the replications should be completed for the scientific experiments.

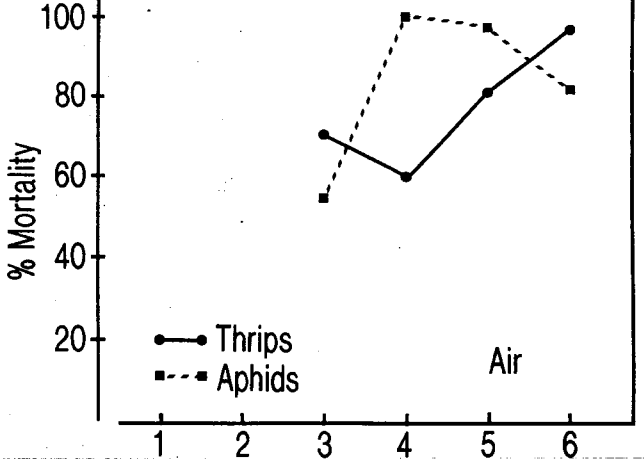
TABLE 1. Thrips and aphid mortality on asparagus under various controlled atmosphere regimes.

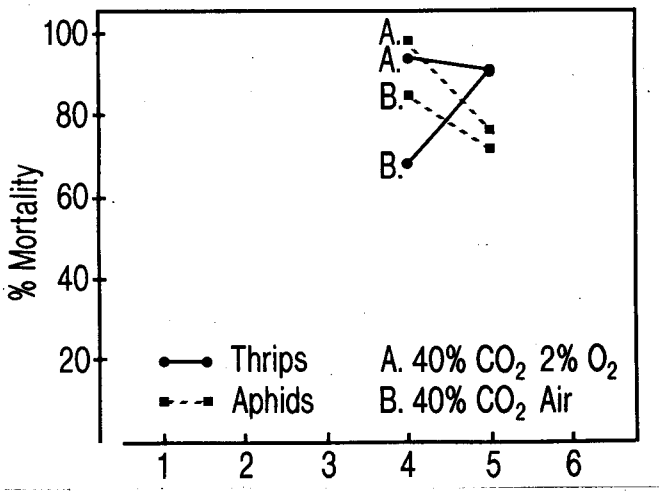


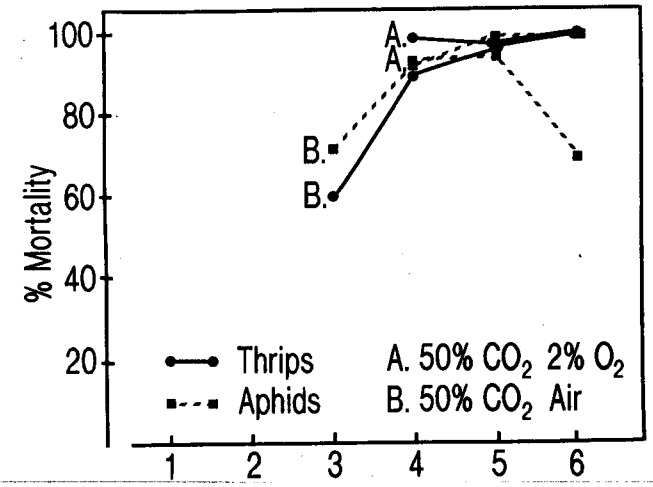


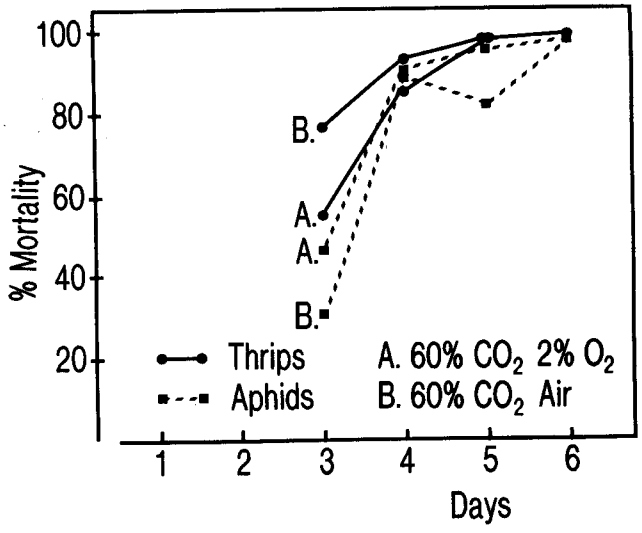












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