CONTROLLED ATMOSPHERES INHIBIT STORAGE ROT OF CHERRIES

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Sweet cherries are an important export crop for New Zealand. Currently they are sent to overseas markets by airfreight because they have a short storage life. Controlled atmosphere (CA) storage can extend the storage life of perishable fruits and allow the use of cheaper seafreight to export markets. Previous research has obtained 5 weeks storage in CA at 0°C, with an extension of shelf-life over conventional air storage (Brash *et al* 1991). CA can also reduce losses from decay in stored cherries (Gerhardt *et al* 1956). Brown rot caused by *Monilinia fructicola* (Wint.) Honey, and other rots caused by species of *Botrytis*, *Mucor* and *Penicillium*, often markedly reduce cherry quality during air storage. While the use of pre- and postharvest fungicide treatments can prevent rots during storage, there is renewed interest in non-chemical approaches, such as CA, for postharvest disease control. This paper reports on the effect of a range of CO₂/O₂ mixes on the development of storage rots on wounded inoculated cherries during 46 days CA storage followed by 7 days shelf-life in air.

The experimental methods used were similar to those of de Vries-Paterson *et al* (1991). Fruit of 'Bing' cultivar at commercial maturity were obtained from Central Otago. Fruit were picked, packed, cooled to 0-4°C, then transported by road and air to Levin HRC. The experiment started within 72 h of harvest. After bruised and cracked fruit were removed, the remaining fruit were sorted for uniformity of maturity and size. Forty fruit with pedicels were placed into 14 plastic trays with individual cells to keep fruit separate. Fruit were wounded (with four pins held in place with a cork) and then inoculated with *M. fructicola* (DSIR, PCC 7639) and *Botrytis cinerea* Pers. (DSIR, PCC 8521) spore suspensions (about 2000 spores per fruit of each culture) using a hand-sprayer.

Immediately after fruit inoculation, trays were placed in 600 mm x 900 mm polythene bags fitted with an inlet port. Bags were closed using wire ties and assigned randomly to a continuous gas supply (200 ml/min) in a coolroom held at 0°C for 5 weeks. The seven treatments, replicated twice, were:-

1. Air.
2. 2% O₂, 7% CO₂
3. 2% O₂, 15% CO₂
4. 2% O₂, 25% CO₂
5. 15% O₂, 7% CO₂
6. 15% O₂, 15% CO₂
7. 15% O₂, 25% CO₂

During storage, each fruit was examined periodically through the clear plastic bags for presence of storage rots. The low temperature inhibited storage rots for 5 weeks (Fig. 1) so the temperature was raised to 5°C for a further 11 days. Temperatures close to 5°C could be expected in commercial shipments. After a total of 46 days storage all treatments were supplied with air and the temperature was raised to 10°C for 7 days to simulate shelf-life. During this period, fruit were removed from their bags for a short period and examined for the presence of storage rots. All data were examined using analysis of variance.

The results showed a marked contrast between air storage and the CA treatments (Fig. 1). Within the CA treatments incidence of rots was closely related to CO₂ level

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but not to oxygen level. Fig. 1 shows the effect of air and CO₂ levels on incidence of rots during storage and simulated shelf-life. Rots developed slowly at 0°C, although development was faster in air than any of the CA treatments. During 11 days at 5°C, rots developed rapidly in air-stored cherries. Towards the end of this period rots also began to develop in cherries at the lowest level of CO₂. A level of 25% CO₂ completely suppressed disease development for 46 days. During shelf-life in air, rots developed rapidly in all CA treatments but the level of decay after 7 days shelf-life in the 15 and 25% CO₂ treatments was still about half that in the air and 7% CO₂ treatments.

Fig. 1: Effect of carbon dioxide and air on incidence of storage rots during storage of sweet cherries. LSDs ($P < 0.05$) are indicated.

The results show that elevated CO₂ can markedly suppress storage rot of cherries, particularly at slightly above optimum storage temperatures. The effect of CA treatments on particular diseases, and on lesion diameter, are being further investigated.

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REFERENCES

- Brash, D.W., Corrigan, V.K., Wright, S., and Balasubramaniam, R., 1992. Controlled atmosphere storage of cherries. (Abstract only) *N.Z.J. Crop and Hort. Sci.* 20:250.
- de Vries-Patterson, R.M., Jones, A.L., and Cameron, A.C., 1991. Fungistatic effects of carbon dioxide in a package environment on the decay of Michigan sweet cherries by *Monilinia fructicola*. *Plant Disease*. 75:943-946.
- Gerhardt, F., Schumer, H., and Wright, T.R., 1956. Sealed film lug liners for packing Bing cherries. U.S. Agric. Mark. Serv. AMS Ser. 121. 8 pp.