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## Ethyl formate application trials for in-transit fumigation of shipping containers

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Two ethyl formate/nitrogen in-transit trials have been conducted on containerized goods in shipping containers under winter and summer temperature ranges to provide a representative dataset of year round temperature conditions in Western Australia. The winter trial was conducted in September 2017 and the summer trial in December 2017. Overall, the trials demonstrated that ethyl formate/nitrogen fumigation exposure periods could be successfully completed in-transit, with zero risk to the public or workers from exposure to ethyl formate throughout the two-day journey. The results show that more than half of the applied ethyl formate/nitrogen concentration was maintained over the six-hour exposure period. This is consistent with the fumigant decay of a shipping container undergoing a stationary fumigation exposure period. These results also show that the environmental influence on a moving container under fumigation was negligible in reducing the efficacy of the treatment. Environmental gas concentration measurements taken throughout the journey indicated nil presence of ethyl formate in the immediate surroundings of the containers up to 15 metres downwind, as well as inside the cab of the truck. These results further suggest that there would be zero risk to workers if the containers were vented at the end of the two-day journey. Continuing the in-transit period would eliminate the requirement for ventilation screens to be installed whilst undergoing ventilation.

## Safe and cost-effective method for application of liquid ethyl formate (Fumate™) as a methyl bromide alternative for perishable commodities

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### Abstract

The cylinderized liquid ethyl formate (EF) formulated with CO<sub>2</sub> is one of the great potential fumigants to replace methyl bromide (MeBr) for fresh fruit. However, it is too expensive to adapt commercial practices, and also involves work place safety issue including handling of heavy cylinders as well as restrict emission of CO<sub>2</sub>, particularly for use in large scale commercial fumigation. Therefore, it is urgently needed to develop environmental friendly, safe for workers and cost-effective alternative method for application of liquid ethyl formate as a MeBr alternative for perishable commodities. Recently, the environmentally friendly, cost-effective and practically safe use of liquid EF (Fumate™, registered name) with nitrogen gas has been developed and commercialized in Republic of Korea and Australia. The new technology for application of liquid EF is 100 times safer than MeBr in terms of threshold values (EF, TLV = 100 ppm). Ethyl formate is known as food additive and naturally occurred substances as well as a non-ozone depletion chemical. In this report, we demonstrate the liquid EF application technology that offers a clean environment (no ozone depletions and CO<sub>2</sub> emissions), safe to fumigators and related workers and practically cost-effective technology to fumigation industry.

**Keywords:** Quarantine fumigation, Ethyl formate, Fumate™, perishable commodities.