

Donahaye, E.J., Navarro, S., Bell, C., Jayas, D., Noyes, R., Phillips, T.W. [Eds.] (2007) Proc. Int. Conf. Controlled Atmosphere and Fumigation in Stored Products, Gold-Coast Australia. 8-13th August 2004. FTIC Ltd. Publishing, Israel. p. 601

AN ESTIMATION METHOD FOR THE FUMIGANT GAS PERMEABILITY RATE THROUGH PLASTIC FILMS BY A CUP METHOD

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ABSTRACT

Plastic films currently used during soil fumigation to control fumigant emissions have been shown to be permeable to fumigant vapors, resulting in appreciable losses to the atmosphere. However, among the physicochemical properties of fumigants it is generally difficult to measure gas-permeability rates of plastic films to fumigants. Therefore, hardly any information exists with regard to gas-permeability of fumigants. Here, we describe an apparatus that is useful for obtaining gas-permeability data, and the effect of temperature and film thickness. This approach uses a cup method, where a sample of film to be tested is set on the top of a stainless steel vessel, and the upper side is left open to allow for sufficiently low concentrations. Fumigant liquids are put into the vessels, and gas-permeability rates are estimated from weight losses of fumigants at several temperatures for 23 hours. The method was tested using conventional polyethylene and polyvinylchloride and gas-barrier films (0.05 mm thickness) and showed that the method produces a sensitive and reproducible measure of gas permeability. The quantitative limit of gas-permeability rate, which depends on the balance performance, is 0.009 g/m²/hr. The results of these experiments showed that gas-permeability of film depended greatly on temperature but was relatively constant despite changes in film thickness.