UPDATE OF FILM PERMEABILITY MEASUREMENTS FOR USDA-ARS AREA-WIDE RESEARCH PROJECT

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Soil fumigation is an important component in the production of many specialty crops and play a critical role in increasing crop production and improving produce quality. Increased use of soil fumigants, however, can lead to air pollution problems and may cause public health problems. A clear example is methyl bromide which has been used for decades to control nematodes, weeds and fungi and has been shown to deplete stratospheric ozone and is now being replaced by other soil fumigants. The replacements include producers of methyl isothiocyanate (MITC), 1,3-dichloropropene (1,3-D), chloropicrin (PIC), iodomethane (MI), and others. These chemicals also possess high vapor pressures relative to herbicides and insecticides and have the potential to cause atmospheric pollution.

Improved plastic tarps can be used to control emissions of soil fumigants. However, there is a need to have accurate film permeability values so that research scientists, producers and regulators can better understand the relationships between different types of film, agricultural practices, pest management, emissions and crop production.

A rapid, reliable, and sensitive method to measure the permeability of various films has been developed, which allows estimating the mass transfer coefficient (*h*). The mass transfer coefficient is a measure of the resistance to fumigant diffusion, is a function of the films composition and the fumigant chemical, but is independent of the concentration gradient across the film. In general, each chemical-fumigant-temperature combination produces a unique *h* value. For some films, other factors may also affect *h*, (e.g., presence of water vapor).

The objectives of this presentation are to (a) briefly describe the method to obtain accurate film permeability (i.e., mass transfer coefficient) values; (b) provide measured mass transfer coefficients for films used in the Area-wide research project; and (c) provide information on the effects of relative humidity on the mass transfer coefficient.