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DATE: March 4, 2011

SUBJECT: STUDY REQUIREMENTS FOR FILM PERMEABILITY MEASUREMENTS

Minimum requirements for film permeability study:

1. **Test method and test conditions**

    a. General descriptions provided in Papiernik et al. (2001, 2002, 2010). A more detailed methodology presented in Qian et al. (undated).
    b. Temperatures 20-25 C
    c. Two humidity conditions
        i. Source cell humidity $< 45\%$, receiver cell humidity $< 45\%$
        ii. Source cell humidity $> 90\%$, receiver cell humidity $<45\%$
            1. Papiernik et al. (2010) describes humidity modifications
    d. Study duration
        i. Until reaching one of the following
            1. 7 days
            2. $Cr/Cs=0.95$
    e. Sampling frequency
        i. Structured to sample more intensively at the beginning where the fastest concentration change will occur
    f. Three replicates per humidity condition
        i. A single film will require six determinations
        ii. Replications in three physically different cells
    g. Analysis using "Film Permeability Analysis" FilmPC as provided by SR Yates

2. Reporting requirements

a. Cell dimensions and location of ports
b. Spiking procedure – enough information to calculate the initial concentration
c. Initial concentrations (actual concentrations as mass/volume)
    i. Measured initial concentration
    ii. Theoretical initial concentration (based on spiking procedure)
d. Method of gas analysis
e. Detection limit for analysis
f. Measured time course of concentrations in source and receiving chambers
g. Results of analysis using PC FILM software
    i. Plot of measured values vs model solution
    ii. Estimates for h (mass transfer coefficient),
h. Conditions
    i. Laboratory temperature
    ii. Laboratory humidity
    iii. Source cell humidity
        1. describe how determined
i. Tarp information
    i. Name
    ii. Manufacturer
    iii. Thickness
    iv. Color
    v. Color digital photographs of film identification label
    vi. Is film embossed
j. Sample instrument linearity determinations
    i. Frequency of linearity determinations in relation to samples

REFERENCES

Papiernik, Sharon K., S.R. Yates and Jianying Gan. 2001. An approach for estimating the permeability of agricultural films. Environmental Science and Technology 35(6):1240-1246.

Papiernik, S.K., F.F. Ernst, and S.R. Yates. 2002. An apparatus for measuring the gas permeability of films. J. Environ. Qual. 31:358-361.

Papiernik, Sharon K., Scott R. Yates and Daniel O. Chellemi. (In press). A standardized approach for estimating the permeability of plastic films to soil fumigants under various field and environmental conditions. JEQ Volume 39. Published online 13 Sept 2010.

Qian, Yaorang, Alaa Kamel, Chuck Stafford, Thuy Nguyen and Scott Yates. (undated) Film Permeability Determination Using Static Permeability Cells