Department of Pesticide Regulation

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MEMORANDUM

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SUBJECT: DURATION OF TARPING FOR METHYL IODIDE APPLICATIONS

Mitigation of potential air concentrations associated with methyl iodide (MeI) applications requires an estimate of how long a tarp must remain in place following application. Very little data is available to estimate the tarp duration. The data volume 52875-0008 entitled "Terrestrial Field Dissipation of Iodomethane (TM-425) in California and Florida Bareground soils" measured soil concentrations in California for 57 days following application and in Florida for 90 days following application. The data volume 52875-0007 entitled "Volatility of Iododmethane (TM-425) Under Field Conditions in California and Florida" measured air concentrations of MeI and estimated the flux and emission ratio (proportion of the application rate lost) for a total of ten days beginning the day of application.

A broadcast/tarp application and a bed/tarp application was monitored in California and Florida, respectively. Details of the applications, the soil core techniques, and the laboratory analysis methods can be found in the data volume.

In the California study the maximum soil concentration of MeI was 7.04ppm (0-6"cores 8 hrs after the application). The Florida study showed a maximum soil MeI concentration of 12.29ppm (0-12"cores 1.7 hrs after the application). The half-life of MeI in soil was estimated for each application. The California study showed a MeI half-life in soil of 4.8 days, while the Florida study showed a MeI half-life in soil of 5.0 days. By 28 days after application soil concentrations were at or below 0.01ppm at both sites.

For the California site the decline function fit for the average air concentration 0"-24" depth was:

$\log(\text{conc}) = -0.1454(\text{days}) + 0.3343$
$R^2 = 88.7\%$

Thus at 14 days following application the soil concentration is estimated at:

$\text{Log(conc)} = -0.1454(14) + 0.3343 = -1.7013$

$\text{Conc} = 0.18\text{ppm}$

Air concentrations are likely most directly related to the concentration in the first 6 inches of the soil. The decline function and half-life obtained using the average soil concentration in 0"- 6" is:

$\log(\text{conc}) = -0.253(\text{days}) + 1.13$
$R^2 = 85.1\%$

The concentration in the first 6 inches at 14 days is:

$\text{Log(conc)} = -0.253(14) + 1.13 = -2.412$

$\text{Conc} = 0.09\text{ppm}$

This soil concentration at 14 days in the first 6 inches of the soil is less than the average concentration at 14 days in the soil 0" to 24" because the soil concentrations deeper remain higher for a longer period of time.

24 hr air concentrations were also measured at the California site. The air concentrations are represented as the 24 hr emission ratio for each day because the emission ratio incorporates the mass loss for the field. Emission ratios were available for the first 9 days following application. The soil concentrations were not measured on all days so there are only six matched pairs of emission ratio versus soil concentrations in Figure 1. As expected, there is a statistically significant relationship between the decline in soil concentrations between 0" and 6" and the decline in air concentrations. This fit function can be used to get a rough estimate of the emission ratio on day 14.

That relationship is shown below and in Figure 1:

em ratio = - 0.0254 + 0.0571 (soil 0"- 6")
$R^2 = 85.1\%$

Using the soil concentration decline function for 0" to 6" the soil concentration at 14 days was estimated as 0.09ppm

The emission ratio for that soil concentration is:

em ratio = - 0.0254 + 0.0571 (soil 0"- 6") = -.0254 + 0.0571(0.09ppm) = -0.02 = 0

This estimated emission ratio of 0 at 14 days is consistent with the decline in emission ratio observed in the California study Figure 2:

24 hr emission ratio = - 1.16 - 0.530 (days)
$R^2 = 94.3\%$

In the California study the tarp was cut at five days and removed at seven days. There is no obvious pattern in the emission ratio around these events. The emission ratios for days 5–9 vary between 0.5% and 2% of the amount applied (Table 1).

Table 1. Emission ratios for ten days following the application of MeI by broadcast tarp method in Watsonville, California.

Days after application	24 hr Emission Ratio
1	0.3600
2	0.0960
3	0.0500
4	0.0330
5	0.0098
6	0.0180
7	0.0069
8	0.0057
9	0.0030
10	0.0017

The soil concentrations were measured at four days and eight days so there is no way to quantitatively characterize the tarp cutting and removal events. However, the decline over time in the soil concentrations is relatively smooth on log scale. These estimates indicate that a tarp duration of 14 days is likely acceptable to mitigate air concentrations for applications tarps with standard HDPE tarps. The behavior of MeI in the soil and the emission ratio profile for Virtually Impermeable Film (VIF) or Totally Impermeable Film is not known and can not be characterized with the studies submitted thus far. Three studies were submitted (list the studies) but there are significant issues with the laboratory procedures and the Department of Pesticide Regulation staff has recommended against using any results from those studies (Barry 2010, Fong 2010, and Tao 2010). It is possible that the half-life of MeI in the soil will be longer for applications using VIF or Totally Impermeable Film tarps. A longer soil half-life may lead to higher emission ratios when the tarp is cut and/or removed.

References

Baker, F.C., L.Estigoy, R. Reiss, M.D. Nelson, M Bolda. 2002. Volatility of Idodmethane (TM-425) Under Field Conditions in California and Florida. Arvesta Corporation. PTRL Project Report No. 893W-1. CDPR Registration Data Volume 52875-007.

Baker, F.C., M.D. Nelson, M. Bolda, and R. Hiler. 2002. Terrestrial Field Dissipation of Iodomethane (TM-425) in California and Florida Bareground soils. Arvesta Corporation. PTRL Project Report No. 892W-1. CDPR Registration Data Volume 52875-008.

Barry, T. 2010. Evaluation Report–Pesticide Review of Data Volume 52875-0128. Direct and indirect flux determination of Iodomethane and Chloropicrin under field conditions following tarped/raised bed/shallow shank injection application of Midas 50:50 in Dover, FL. PTRL Report No. 1595W-1. Department of Pesticide Regulation. April 21, 2010.

Fan, S. 2010. Evaluation Report – Pesticide Review of Data Volume 52875-0130. Direct and indirect flux determination following tarped/raised bed/shallow shank injection of Midas 50:50 in Hart, MI. PTRL Report No. 1646W-1. Department of Pesticide Regulation. April 23, 2010.

Tao, J. Evaluation Report – Pesticide Review of Data Volume 52875-0129. Direct and indirect flux determination of Iodomethane and Chloropicrin under field conditions following tarped/raised bed/shallow shank injection application of Midas 50:50 in Bainbridge, GA. PTRL Report No. 1619W-1. Department of Pesticide Regulation. April 29, 2010.

Figure 1. The relationship between the 24 hr MeI emission ratio and the MeI soil concentration (ppm) in the first 6 inches of the soil profile.

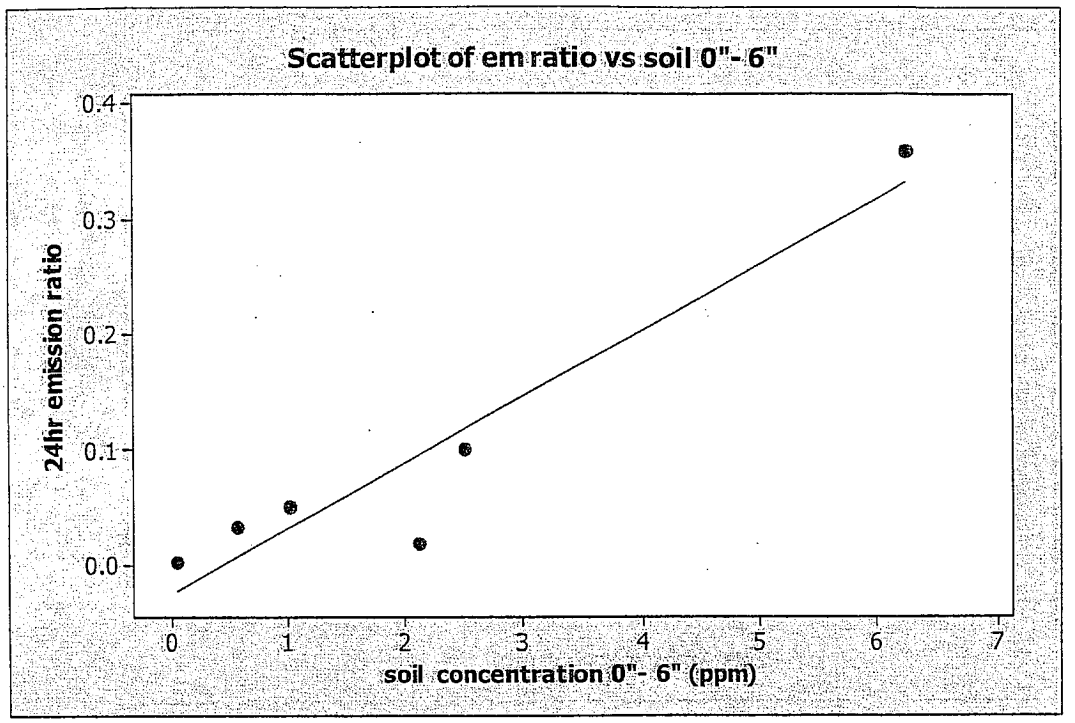

Figure 2. The function of log (24 hr MeI emission ratio) with days after application.