



MEMORANDUM

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SUBJECT: COMPILATION OF STUDIES ESTIMATING NEAR SURFACE
CONCENTRATIONS OF 1,3-DICHLOROPROPENE OR CHLOROPICRIN

For the purpose of checking the realism of computer simulation studies and gauging assumptions about soil concentrations of fumigants, I have compiled a list of studies which have measured the soil air concentration of 1,3-dichloropene or chloropicrin at or near the surface beneath tarped applications (Table 1) shortly after fumigation. I found 19 measurements from 6 different studies. I converted the study units into ug and cm in order to provide units that were easy to compare with simulation results and consistent across studies. There were both drip and injection methods of application. The application depths ranged from 3 to 46 cm. The measurement depths were most commonly at ten cm, but a few more shallow. The time after application ranged about 2 h to 48 h. Finally, I normalized the concentration by dividing the reported measured concentration (ug/cm³) by the application rate (ug/cm²), which gives units of cm⁻¹.

The normalized concentrations for the higher barrier tarps (VIF and SIF) appear to be higher than those of the lower barrier tarps (HDPE and LDPE). I coded these two groups and tested the hypothesis that the medians were equal versus unequal using Kruskal-Wallis test. They were not statistically different (p~0.11). The sample size is small and associated factors such as length of time after application, measurement depth and application depth and application method all play a role.

The normalized concentrations ranged from 0.0003 to 0.026 cm⁻¹. The median normalized concentrations were 0.0018 cm⁻¹ and 0.0010 cm⁻¹ for high and lower barrier tarps, respectively.



References

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Table 1. Measurements of 1,3-D or chloropicrin at or near the surface in tarped studies.

| Source | Soil Type | Active Ingredient | App. Type | App. Depth (cm) | Rate Applied (ug/cm ²) | Meas. Depth (cm) | Time After Application (h) | Conc. (ug/cm ³) | Normalized Conc. (1/cm) | Tarp | Comments |
|----------------------|------------|-------------------|-----------|-----------------|------------------------------------|------------------|----------------------------|-----------------------------|-------------------------|------|-----------------------------------|
| Thomas et al. 2003 | fine sand | 1,3-d (CIS) | injection | 30 | 975 (CIS only) | 2 | 5 | 2 | 0.002 | VIF | Containerized microplots |
| Ashworth et al. 2008 | sandy loam | chloropicrin | drip | 5 | 1500 | 5 | (1st day) | 39.2 | 0.026 | SIF | SIF tarp, packed sampling chamber |
| Thomas et al. 2006 | sand | 1,3-d | injection | 30 | 1982 | 0.5 | 43 | 0.6 | 0.0003 | HDPE | Combined CIS and Trans |
| Gao et al. 2008 | sandy loam | 1,3-d | injection | 46 | 4545 | 10 | 24 | 8 | 0.0018 | VIF | Near shank line |
| Gao et al. 2008 | sandy loam | 1,3-d | injection | 46 | 4545 | 10 | 24-48 | 7 | 0.0015 | VIF | Between shank lines |
| Gao et al. 2008 | sandy loam | 1,3-d | injection | 46 | 4545 | 10 | 24 | 8 | 0.002 | HDPE | Near shank line |
| Gao et al. 2008 | sandy loam | 1,3-d | injection | 46 | 4545 | 10 | 48 | 4 | 0.001 | HDPE | Between shank lines |
| Gao et al. 2008 | sandy loam | 1,3-d | drip | 20 | 3837 | 10 | 24 | 8 | 0.002 | HDPE | Near drip line |
| Gao et al. 2008 | sandy loam | 1,3-d | drip | 20 | 3837 | 10 | 48 | 4 | 0.001 | HDPE | Between drip lines |
| Gao and Trout 2007 | sandy loam | 1,3-d | injection | 46 | 3721 | 10 | 11 | 7 | 0.0019 | VIF | Near shank line |
| Gao and Trout 2007 | sandy loam | 1,3-d | injection | 46 | 3721 | 10 | 36-48 | 5 | 0.0013 | VIF | Between shank lines |
| Gao and Trout 2007 | sandy loam | chloropicrin | injection | 46 | 2135 | 10 | 7-24 | 2.5 | 0.0012 | VIF | Near shank line |
| Gao and Trout 2007 | sandy loam | chloropicrin | injection | 46 | 2135 | 10 | 11-24 | 2 | 0.0009 | VIF | Between shank lines |
| Gao and Trout 2007 | sandy loam | 1,3-d | injection | 46 | 3721 | 10 | 7-24 | 4 | 0.001 | HDPE | Near shank line |
| Gao and Trout 2007 | sandy loam | 1,3-d | injection | 46 | 3721 | 10 | 24 | 4 | 0.001 | HDPE | Between shank lines |
| Gao and Trout 2007 | sandy loam | chloropicrin | injection | 46 | 2135 | 10 | 24 | 2.5 | 0.001 | HDPE | Near shank line |
| Gao and Trout 2007 | sandy loam | chloropicrin | injection | 46 | 2135 | 10 | 24 | 2.5 | 0.001 | HDPE | Between shank lines |
| Qin et al. 2008 | sandy loam | chloropicrin | drip | 3 | 3200 | 0 | 2 | 14.5 | 0.005 | VIF | In tarp-soil air space |