# SOIL DISTRIBUTION OF ALTERNATIVE FUMIGANTS TO METHYL BROMIDE APPLIED TO STRAWBERRY BEDS BY DRIP IRRIGATION SYSTEMS

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**The soil fumigants 1,3-dichloropropene (1,3-D), methyl isothiocyanate (MITC), and chloropicrin are potential alternatives to MeBr. Application of soluble liquid formulations of fumigants through drip irrigation systems to seed beds reduces the amounts applied and may enhance efficacy. The application technique to deliver alternative fumigants to the target soil profile is the major factor in determining its efficacy and emissions. The objective of this study is to determine the distribution in soil and efficacy of 1,3-D, MITC, and Chloropicrin applied alone or in combination through drip irrigation systems.**

## Materials and Methods

**Preplant treatments (Table 1) were applied in October to strawberry field plots located in Salinas (USDA-ARS Spence Farm) and Watsonville (Monterey Bay Academy), California. Variables that were evaluated include amount of water used to apply the fumigants; application of combinations of fumigants; initial soil water content; number of drip lines; and an impermeable film (Table 1). The soil gas concentrations of 1,3-D, MITC, and Chloropicrin in the Telone® C35 EC and Vapam® treatments were monitored beginning 24 hrs following application for seven to 10 days. Soil gas samples were collected from 20,40,60, 80, and 100 cm depth midway between the two drip lines and at the edge of the raised bed (76 cm top width). Soil samples were collected 14 days after the application.**

## Results and Discussion

**The concentrations of 1,3-D and chloropicrin from Telone® C35 EC in the soil gas were greatest after 24 to 36 hrs following application. The sampling detected only small concentrations of MITC in the soil gas. This experiment will be repeated and refined using automated sampling equipment to include earlier and shorter sampling intervals.**

**The results suggest that a minimum of 25 mm of water is needed to deliver chemicals to the edge of the bed. The greatest distribution uniformity of fumigants across the bed was obtained with 35 mm of irrigation water. Only trace concentrations of fumigants were detected in the soil gas at depths below 60 cm. Minute amounts of fumigants were detected in the soil gas or soil samples after 14 days following application.**

**Although larger amounts of irrigation water reduces the chemical concentration, indices of general microbial population suggest greater efficacy in the 35 mm than in 25 mm of irrigation water. Strawberry yield data from the various treatments are presented in a companion paper.**

**Table 1. Fumigant Application Rates[1]**

| Trt # | Treatment Description |
|---|---|
| 1 | Untreated control |
| 2 | MeBr/Chloropicrin bed shank injection @ 425 lb/ac |
| 3 | Telone/Chloropicrin (Telone C35) bed shank injection @ 425 lb/ac |
| 4 | Telone C35 EC drip applied @ 425 lb/ac in 15 mm net irrigation |
| 5 | Telone C35 EC drip applied @ 425 lb/ac in 25 mm net irrigation |
| 6 | Telone C35 EC drip applied @ 425 lb/ac in 35 mm net irrigation |
| 7 | Telone C35 EC drip applied @ 255 lb/ac in 25 mm net irrigation |
| 8 | Vapam (42%) drip applied @ 75 gal/ac in 25 mm net irrigation |
| 9 | Vapam (42%) drip applied @ 75 gal/ac in 35 mm net irrigation |
| 10 | Vapam (42%) drip applied @ 50 gal/ac in 25 mm net irrigation |
| 11 | Telone C35 EC @ 255 lb/ac + Vapam (42%) @ 50 gal/ac simultaneously drip applied in 25 mm net irrigation |
| 12 | Chloropicrin @ 160 lb/ac + Vapam (42%) @ 50 gal/ac simultaneously drip applied in 25 mm net irrigation |
| 13 | Vapam (42%) drip applied @ 75 gal/ac in 15 mm net irrigation |
| 14 | Chloropicrin @ 160 lb/ac in 25 mm net irrigation |
| 15 | Telone C35 EC 425 lb/ac + Vapam (42%) @ 75 gal/ac simultaneously drip applied in 35 mm net irrigation |
| 16 | Telone C35 EC drip applied by 4 drip lines @ 255 lb/ac in 35 mm net irrigation |
| 17 | Telone C35 EC drip applied @ 255 lb/ac in 25 mm net irrigation after adding 15 mm water |
| 18 | Telone C35 EC drip applied @ 425 lb/ac in 25 mm net irrigation and covered with virtually impermeable film |

[1] All fumigant and water application rates are based on bed area treated. To convert to equivalent rates on the gross field area, multiply by 0.6 (32" bed width/52" bed spacing).