PROPYLENE OXIDE, A SOIL STERILANT WITH POTENTIAL AS A METHYL BROMIDE REPLACEMENT

Propylene Oxide (PPO) has the potential for being the most versatile agricultural fumigant under development as an alternative to Methyl Bromide. It is EPA registered for control of stored pests in spices, in-shell nuts, nutmeats, cocoa, cocoa beans and as will be shown below. Propylene oxide has shown good potential when applied to soil for control of soil borne diseases, nematodes and weeds. This product is one of few products that would not rely upon chloropicrin for broad spectrum control of soil pests. Because of its chemical and physical characteristics buffer zones should be minimal if needed at all, a factor limiting the use of most registered soil applied fumigants.

Propylene oxide is a product with an excellent safety profile as is supported by the fact that it has been used as a post-harvest fumigant for over 35 years with no reported incidences of adverse effects to fumigators or others. It has been shown to convert to propylene glycol (GRAS status by FDA) in water making it quite safe as a soil applied product. Also, in the likely event PPO was consumed by man, it would rapidly convert to propylene glycol at the pH of man's stomach.

Many field research trials have been run with PPO where it was evaluated in direct comparison to methyl bromide/chloropicrin (MB/PIC) in areas where growers have relied on MB/PIC as a crop production tool for several years. These trials used MB/PIC as the "standard," generally applied by shank injection at 350-400 lbs ai per treated acre. The tests compared the standard and the PPO treatments to untreated controls (UTC) in all tests. Most rating criteria were efficacy against the plant pest complexes comprised of one or more plant parasitic nematodes, phytopathogenic fungi and annual and perennial weed species. Most trial also provide full seasonal commercial yield data. In some cases early tests with PPO the product was unnecessarily applied with metam sodium for weed control, or shank-injected too shallow for effective residual control. The data from these trials are not included in this summary because of mixed and scientifically compounded results. However, these reports will be made available by ABERCO upon request.

The purpose of this report is an attempt to compile field research and laboratory data collected to date across all crops and based on the data compilations drawing statistically supportable conclusions on the usefulness of PPO as an alternative to MB/BIC. The report summarizes the data by crop. Most of the available data are from trials run in strawberries and tomatoes but some trials were run in multiple mulched vegetable crops. A few were conducted in ornamental bulb crops and the perennial crop, Walnuts (Carpathia spp.) against some of the replant disorder causal agents and plant parasitic nematodes. Since the use of fumigants in the crops that have relied on MB/PIC is similar from crop to crop and in many cases the pests affecting the production of these crops are the same, the conclusions drawn on one crop can be used for other crops having similar cultural practices and pest spectra (e.g. tomato data should also support conclusions for peppers, eggplants and other mulched vegetables). Likewise pest control data from ornamental bulbs and grapes should be useful for conclusions drawn from vegetables and strawberries if the use of PPO and the MB/PIC in these tests is the same as for vegetables and strawberries and if the pests are the same.

Below is a table which summarizes the crops, rates of applications and methods of applications studied with PPO over several years of field investigations. Following this table will be a test by test summary of each tes showing the efficacy of PPO in direct comparison to MB/PIC and UTC. Refer to the individual report summaries for comments concerning pest pressures.

For the tests summarized in this report, means are separated statistically using analysis of variance (ANOV) at the 0.05 level and probability. Means followed by common letters are statistically the same.

RESULTS COMPARABLE TO OR BETTER THAN COMMERCIAL STANDARDS INCLUDING METHYL BROMIDE IN MOST CASES

Crop	Dose Range (Gal/A	Primary pests	Method of Application
Strawberry	35-45	"Root Nibbling Fungi"-CA	Drip tapes
Tomato	50-75	Root Knot Nematode- FL	Drip Tapes
Tomato	45	Fusarium oxysporum-FL	Shank Injection
Tomato	45	Ralstonia spp-FL	Shank Injection
Tomato	45	Tylenchorhynchus spp- FL	Shank Injection
Tomato	45	Belonolaimus-FL	Shank Injection
Tomato	60	Annual Weeds- NC	Drip Tapes
Tomato	60	Annual Weeds- NC	Shank Injection
Cantaloupes	60	Annual Weeds-NC	Shank Injection
Cantaloupes	60	Annual weeds-NC	Shank Injection
Gladiolus	30	Torpedograss-FL	Shank Injection
Gladiolus	30	Evening Primrose-FL	Shank Injection
Gladiolus	30	Pigweed - FL	Shank Injection
Gladiolus	30	Dollar Weed – FL	Shank Injection

The tests results used to prepare this chart are also available at the ABERCO poster display or by visiting www.ir4.rutgers.edu

ABERCO would like to thank: IR-4, Dr. Jack Norton, Dr. Jim Gilreath, Dr. Joseph Noling, Dr. Rodrigo Rodriguez-Kabana, Dr. Rob Weller, Dr. Jose Manuel Lopez-Aranda , Dr. Frank Louws and Mansun Kong for their enthusiastic guidance, support, friendship and advice that made this work possible.

Presented by Morris Warren , ABERCO Inc