# A REVIEW OF METHYL BROMIDE ALTERNATIVES EVALUATED BY IR-4

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IR-4's methyl bromide (MeBr) alternatives programs have been run since 1998 and they involved field evaluations of several EPA-registered and experimental soil-applied products in direct comparison to the MeBr standard shank-injected treatment and non-treated controls in many crops and locations, including strawberries in CA and FL, fresh market tomatoes in CA, FL, MI, NC, and AL, cucurbit vegetables in FL, AL, and MI, cut flowers and bulb crops in CA and FL, peppers in FL, and turf in FL and AL. All IR-4 MeBr alternatives trials were run in replicated experimental field plot designs with the aim of collecting full season harvestable yield and crop quality data to enable the possibility of calculating statistically supportable economic viability information for the various treatments. IR-4 has also been actively involved in the development of products to replace the post harvest use of MeBr for stored agricultural commodities. The IR-4 MeBr alternatives programs included the evaluation of products meeting short term objectives for availability by 2005, intermediate term objectives for products registered for other uses but not on crops needing MeBr alternatives, and longer term objectives involving not yet registered experimental products but with known biological activity against pests that growers and commodity organizations have relied upon in their respective MeBr-dependent specialty crops and stored agricultural commodity situations. For soil uses, IR-4 has evaluated as short term objectives Telone/Inline (1, 3-dichloropropene + chloropicrin), Chloropicrin alone, and Vapam/K-Pam (metam sodium/metam potassium) alone and in combinations with Telone/Inline or Chloropicrin. Intermediate term soil uses products included Basamid (dazomet) and propylene oxide. Longer term objective products included Midas (iodomethane), fosthiazate, Sandea (halosulfuron methyl), Envoke (trifloxysulfurn methyl) MULTIGUARD PROTECT (furfural), SEP-100 (sodium azide), STAN seed treatments (abamectin + mefenoxam + fludioxonil), sulfentrazone, and F3825 200CS.

## Synopsis of Findings/ Accomplishments

Telone or Chloropicrin alone shank injected or InLine applied through drip tapes were excellent products for control of pests controlled by MeBr except a general weakness was weed control. Partnering these products with Vapam/K-Pam almost always improved the overall performance by improving the weed control over that of Telone/InLine used alone. Using Vapam at 37.5 gal product per acre or K-Pam at 30 gal product per acre over shank or drip applied Telone or InLine was generally adequate for weed control except Cyperus spp and some winter annuals in FL. For those weeds in FL and other areas and for full spectrum pest control the best treatments were Telone/InLine applied in the beds, followed 5-7 days later with drip applications of Vapam/K-Pam at full use rates (75 gal/acre for Vapam and 60 gal per acre for K-Pam) through 2 tapes per bed. While these treatments have generally resulted in biological performance and consequent yields and harvestable fruit quality statistically comparable to Me Br, there are issues that must be taken into account, especially in FL and the SE US. When these combinations are used, the grower must accept an additional risk that would not occur from MeBr and this

is the planting window will be narrowed significantly to from as short as 7 days for MeBr to nearly a month if the combinations are used. Also, drip applications are currently not being used on much of the FL tomato acreage and to enable this, significant additional costs will be imposed on the growers.

Products that received fast track regulatory decisions from EPA as a consequence of the IR-4 MeBr alternatives programs and are now EPA-registered include the weed control products, Sandea (halosulfurn methyl) and Envoke ( trifloxysulfuron sodium). These products are effective against Cyperus spp and are registered for weed control in tomatoes. Fosthiazate nematocide was registered for nematode control in tomatoes but there are labeling issues needing resolution before the registrant will allow sales. The registrant is actively involved in the resolution of the labeling problems.

Propylene oxide, a product EPA-registered for several years for the protection of nutmeats, spices and cocoa in storage obtained several label amendments making it more useful as a post harvest replacement for MeBr. The new uses include the protection of in-shell nuts and cocoa beans in storage. Additionally, EPA registered a new product containing propylene oxide, PROPOXIDE 892. This product which contains 8% propylene oxide and 92% carbon dioxide may be used for the protection of the same stored commodities as propylene oxide alone but with reduced fire hazard potential giving it greater flexibility concerning the seed treatment facilities where it may be used. Other propylene oxide amendments for post harvest use are pending EPA acceptance.

Products showing significant promise but not yet registered for soil use include Midas (iodomethane), Basamid (dazomet), Propylene Oxide, MULTIGUARD PROTECT, and SEP-100. These products will be discussed in detail during the oral presentation. Of special interest at the time of this writing is Iodomethane, for a number of food and non-food uses, Basamid for strawberries and fresh market tomatoes, MULTIGUARD PROTECT which has as a pending registration action for greenhouse use and SEP-100 for terrestrial non-food uses.