EQUIPMENT MODIFICATIONS FOR SUCCESSFUL APPLICATION OF LOW FUMIGANT RATES

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Research has demonstrated effective soilborne pest control with rates of methyl bromide as low as one-fourth the normal rate when combined with virtually impermeable film (VIF) or metalized film mulch in various horticultural crops. Commercial tomato growers in Florida have committed significant acreage to use of metalized film with a one-half rate (175 lb./acre) of methyl bromide / chloropicrin (67/33) mixture for the first time this fall. Additionally, low rates of 1,3-dichloropropene are used in cotton in the southeastern U.S. for nematode control with good results. The one thing all of these low rates have in common is the need for uniformity of application in order to assure consistent efficacious results.

Current design of fumigation rigs on farms is based on the use of methyl bromide / chloropicrin mixtures at rates of approximately 350 lbs./treated acre. Since methyl bromide has a high vapor pressure it readily fills the delivery tubing, thus assuring sufficient back pressure to achieve uniformity among gas knives. Products with lower vapor pressure, such as 1,3-D and iodomethane, do not experience this phenomenon and their delivery may be non-uniform from one knive to the next, especially where multiple beds are being treated in one pass.

Research has documented some of the results of this non-uniformity and two means of over coming this have been explored. Each involves some minimal modification of existing equipment. All focus on maintaining a reasonable level of back pressure from the gas knives back to the flow divider or manifold. We have determined that at least 15 psi of back pressure is needed at the manifold in order to achieve the degree of uniformity required.

The first method of achieving this back pressure is to use orifice plates at the top of the gas knife. The appropriate size plate must be calculated based on the flow characteristics of the fumigant in question. The small size of the orifice in these plates mandates the use of screen filters at each orifice to

catch any debris which might pass through the primary filter and clog the orifice. This approach requires very clean fumigant.

The second method involves the use of specially designed poly tubing of an appropriate size for the desired flow rate. Major adjustments in flow are made by choosing a tubing with the correct flow capacity. Fine adjustments are made by changing the length of the tubing since frictional loss in flow increases as tubing length increases. The tubing is color coded for ease in selection of the appropriate size tubing. The smallest tubing has an inside diameter of one-sixteenth inch and is yellow in color. This tubing is required for accurate and uniform application of 88 lbs./acre of methyl bromide / chloropicrin (67/33).

The pros and cons of each method are discussed and results are illustrated. Also discussed will be the use of check valves as a means of controlling drips and maintaining full lines back to the manifold. The significance of sufficient back pressure on product distribution uniformity and maintenance of full lines will be illustrated. Results may help other scientists and growers understand the source of erratic performance and methods of minimizing it so that low rate technology can be used successfully.