Tree Planters' Notes
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Cover: Transplanting plugs of sedge at the Lone Peak Nursery's constructed wetland (Draper, Utah) (photograph courtesy of the *Salt Lake Tribune).*

Comments

Back to the Future—Pest Management Without Methyl Bromide

The proposal by the Environmental Protection Agency (EPA) to ban the production and use of methyl bromide has been well publicized by the media, trade journals, and growers' organizations. Soil fumigation for the production of bareroot tree seedlings is but one of many uses of this important chemical. Production of agricultural commodities such as strawberries, tomatoes, peppers, and melons is also highly dependent on methyl bromide for eliminating soilborne pests in fields before planting. This fumigant is also used for postharvest treatment of stored fruits and nuts and for quarantine treatment of exported and imported fresh fruits and vegetables and other commodities. A ban on use of methyl bromide will have far-reaching impacts on agricultural production in the United States and on U.S. trade with foreign countries.

How did this situation develop? In 1991 an assessment made by the parties of the Montreal Protocol, an international treaty for the protection of earth's ozone layer, indicated that methyl bromide was one of the chemicals responsible for the depletion of the stratospheric ozone layer. Under terms of the agreement signed by the parties of the Montreal Protocol, methyl bromide was listed as a controlled substance to be phased out of production and use in a currently unspecified period of time. Amendments to the United States Clean Air Act of 1990 also mandate the phase out of Class I ozone-depleting chemicals, which includes methyl bromide. As a result, the EPA initiated a proposal to ban the production and use of methyl bromide by the year 2000. This proposal was published in the Federal Register in March 1993 and public hearings were held in April 1993.

The United States Department of Agriculture (USDA) was alerted early by the EPA that this ban was being considered. In response the USDA prepared a biological and economic assessment of the impact that the loss of methyl bromide would have on U.S. agriculture; this document was released in April 1993. The USDA also organized a 3-day workshop in Washington, DC, at the end of June to determine the available alternatives to methyl bromide and their attributes and to discuss the types of research that are needed to develop new alternatives. The workshop was divided into 9 working sessions based on commodity type. One session was devoted to the use of methyl bromide and its alternatives in the production of forest tree seedlings and ornamental crops. This session was attended by

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pest management specialists and researchers from various industries, universities, and State and Federal agencies. Workshop sessions were designed to facilitate discussions among participants. In preparation for the workshop we sent a questionnaire on soil fumigation practices to many nurseries that produce bareroot tree seedlings. The results of this survey helped the workshop participants to evaluate current soil fumigation practices, pest problems, and the availability and effectiveness of alternatives to methyl bromide in nurseries that produce tree seedlings. The survey also provided information from the nursery managers on research needs for the future. We thank all who took the time to participate in the survey and apologize to any individuals who we inadvertently missed in the mailing of the questionnaire.

Briefly, the results of the survey indicated that 86% of the nurseries that produce bareroot tree seedlings fumigate soils in preparation for planting to control soilborne diseases, insects, nematodes, and weeds. In the South 96% of the forest nurseries rely on soil fumigation; in the North and West about 80% of the nurseries fumigate nursery soils. Methyl bromide was the preferred fumigant; at least 80% of those who fumigate soils make use of this chemical and others still consider this chemical as an effective pest management tool even if they may not have used it recently. Dazomet (Basamid®) was used or tried by 51% of the nursery managers who fumigate nursery soils, but 73% of these managers found this compound to be less effective than methyl bromide. A small percentage of managers have used or tried other soil fumigants. Some have been satisfied with the performance of metham sodium (Vapam®, Busan® 1020, and Soil-Prep®), but Telone-C17® and Vorlex® were generally considered to be less effective than methyl bromide. A clear message was sent by many nursery managers that they are highly dependent upon methyl bromide to control soilborne nursery pests, and that current alternatives are either not available or not as effective as methyl bromide.

Workshop discussions in the session on forest tree and ornamental nurseries included (a) identification of the many major pest problems currently controlled by methyl bromide; (b) identification and attributes of current and potential alternatives to replace methyl bromide for the control of these pests; and (c) the prioritization of the research needs as a recommendation to the USDA. There was agreement among most participants that short-term (2 to 5 years) research efforts should focus on the development of

integrated pest management systems that make maximum use of existing chemical, cultural, physical, and biological control practices. The focus of these short-term efforts should include determining application rates and the most effective application methods for other existing soil fumigants. There was strong but not universal agreement that nursery managers in the future will be forced to rely increasingly on nonchemical control methods. Many participants maintained that issues regarding environmental quality and concerns over public health and safety will only become greater with time. Thus, the workshop participants concluded that it is important that our long-range research focus on the development of biologically based integrated pest management (IPM) systems and their components. The goal of this research would be to eliminate the strong dependency on soil fumigants and other chemicals that adversely impact the environment. Therefore, long-term research in order of priority should include development and improvement of the following techniques:

1. Cultural pest control practices (cover crops, crop rotation, soil amendments, etc.)
2. Physical pest control practices (solarization, steam pasteurization, electronic heating, irradiation, trapping, etc.)
3. Chemical pest control practices (new, safer chemicals that target specific pest problems)
4. Biological pest control practices (introduction of biological control agents, suppressive soils, behavioral chemicals, soil amendments, etc.)
5. Genetic resistance to pests (through classical breeding systems or genetic engineering).

It is essential that research and application efforts in each of these areas be continued until newly developed practices are appropriately combined into the development of IPM systems that include effective combinations of existing and new cultural, physical, biological, and chemical control practices. Future IPM programs will require the application of a combination of control techniques at various times to achieve the level of control that we now obtain with methyl bromide. Methods to detect pest population levels and accurately forecast their impact will also be a necessity for future IPM programs of this type.

It is imperative that efforts to develop new effective IPM systems be supported by fundamental research on understanding the biology of pests and their hosts. Support for investigations on the biology and control of soilborne pests in forest nurseries has continually eroded since the 1960's. Methyl bromide has been a highly effective soil fumigant, and our increasing reliance on this chemical for the last three decades has generally reduced the necessity for investigations on the biology and ecology of soilborne pests. It is this kind of information that is now required to develop consistently effective, environmentally sound alternative means of pest control.

One thing seems to be clear: there is no currently available alternative to methyl bromide that is as effective against such a wide spectrum of soilborne pests. Because of the great variation in climate, soils, pests, crops, and management systems, IPM programs will need to be designed for specific areas of the country and very possibly for individual nurseries. The development of these IPM programs will take close cooperation between nursery managers, extension specialists, and researchers. Universities and government agencies have a primary role in researching and developing alternative control methods. The private sector has a responsibility to assist in the development of application technology. It is essential that we all cooperate in the process of technology development and transfer.

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