ALTERNATIVES TO PREPLANT SOIL DISINFESTATION WITH METHYL BROMIDE IN HORTICULTURAL CROPS IN SOUTH EASTERN AUSTRALIA

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Preplant soil fumigation with methyl bromide, first introduced into Australia in 1954, is currently a common practice in horticultural industries in Australia with a GVP of over $500 million. Two of the most important users of methyl bromide (MBr) are the strawberry runner and fruit industries ($150 million) and the flower bulb industry ($50 millon). Most (96%) of the certified strawberry runnners are produced in Victoria and more than two-thirds of Australias' bulb crops and flowers.

The evaluation of alternative treatments to methyl bromide has been a major focus in Victoria since 1992, primarily through two major projects. The first evaluated alternatives to MBr for control of Sclerotium rot of flower bulbs. The second involving the strawberry industry evolved as a result of Australia's commitment to the Montreal Protocol, and is part of a nationally coordinated approach to seek out alternatives for a range of horticultural industries. Programs are aimed at maximising the efficacy of available stocks of MBr, and also identifying cost effective alternative treatments that maintain and sustain crop production.

Projects have already evaluated;

(i) alternative fumigants, dazomet and metham sodium applied alone or combined with solarisation, chloropicrin or lime.

(ii) reduced dosage rates of methyl bromide and other fumigants. **Note**: In Australia either 1000kg/ha of 98%:2% MBr/chloropicrin (C) or 500 kg/ha of 70%:30% MBr/C have traditionally been applied. Registered formulations containing less MBr (25:75% and 50:50% MBr/C) are now being evaluated.

(iii) integrated strategies with and without fumigants, such as the use of Ca cyanamide, lime and solarisation.

(iv) improved monitoring procedures and diagnostic tests for pathogens and pests are also considered essential.

.Sclerotium rot of flower bulbs

This project, funded by flower growers and the Horticultural Research and Development Corporation, commissioned Agriculture Victoria to identify improved methods for control of *Sclerotium rolfsii* on flower bulbs. The disease was causing up to 80% loss of crops despite continual use of methyl bromide.

Research on Sclerotium rot of flower bulbs identified two main sources of disease - latent infections on stock bulbs, and infested soils. Field trials have shown that broadacre applications at 500kg/ha, of dazomet, were comparable with MBr/C (70:30), and increased productivity of healthy bulbs over two years between 220 and 525%, compared to untreated controls. Solarisation also proved equally effective, but only in

compared to untreated controls. Solarisation also proved equally effective, but only in seasons where temperatures above 50°C were regularly reached at 5cm. The use of metham sodium, green crops and biocontrol agents (Nemacheck, Tri-D25), failed to provide added protection against *S. rolfsii*.

Microbial studies showed that population densities of saprophytic microorganisms were reduced 10,000 fold in the 0-30cm layer of fumigated plots (MBr, MBr/C and dazomet) compared to the untreated control. Even though it took less than three months for numbers of soil fungi to return to normal the diversity of organisms was still reduced.

Bulb treatments have been shown to be extremely effective and are based on preplant applications of fungicides in storage or at sowing. Tolclofos-methyl, Terraclor®, and the triazole fungicides, tebuconazole and diniconazole, reduced disease from 61% to less than 4% of the bulbs affected at harvest. The triazole fungicides have been particularly effective, because at rates less than 1L/ha they have given long term protection against disease for up to 9 months. The greatest advantage, however, is that the cost of treatment is less than $200/ha compared to $5,000 to $12,000/ha for MBr fumigation.

Clean sources of bulbs, either clean stock bulbs or imported BKD bulbs from Holland, have dramatically reduced disease incidence (up to 25% of bulb sown) and the need for bulb treatments. Using clean stock alone, however, has not prevented Sclerotium rot, because most of the traditional bulb growing soils have high population densities of sclerotia of *S. rolfsii*. In these soils, soil disinfestation is still required to reduce population densities of sclerotia. Consequently growers are being advised to consider a combination of the above strategies to control Sclerotium rot.

Evaluation of Alternatives to Methyl Bromide in Horticulture (Montreal Protocol)

A series of national meetings involving EPA, industry and researchers has developed a national program which aims to evaluate cost effective alternatives to methyl bromide across a range of horticultural industries. The program also aims to provide EPA with a rational position statement for industries affected by restrictions on MBr which can be presented to future meetings of the Montreal Protocol.

A new research project funded by the strawberry runner and fruit industries, bulb growers, NuFarm and AgrEvo, forms a major component of this program. As the industries believe there are no suitable alternatives, the current focus is to evaluate methods which maximise the efficacy of methyl bromide by reduced application rates of MBr, improved application methods and mixtures with alternative fumigants, ie. metham sodium, dazomet and chloropicrin. Methyl iodide is also being considered. Telone is not being considered as it is unlikely to be reregistered in Australia. Future work will evaluate treatments which are compatible with a sustainable integrated pest management program, such as solarisation, hot water treatments, calcium cyanamide, nutrient treatments and improved pest monitoring.