

Alternatives to Metham Sodium

Integrated
Crop Protection

PROTECTING CROPS



Soil Wealth

NURTURING CROPS

Metham sodium (MS) is a broad-spectrum fumigant used to control a variety of soil-borne pests and diseases including nematodes, fungi, insects and weeds.

Why we need an alternative

It is not environmentally friendly - MS is highly mobile in the soil and may move through the root zone faster than it is able to convert to its active form. This can lead to increased leaching and/or runoff to nearby waterways causing toxicity to fish and other water life. MS also results in long-term changes in the composition and activity of soil organisms and has the potential to alter important functions like nutrient cycling and pollutant degradation.

It can hurt humans - In the United States, MS is listed as a carcinogen and toxicant. Respiratory, eye and throat irritation, diarrhea and rashes are some symptoms of exposure to MS. Poisonings have been reported at some distance from the application site.

Diminishing chemical options - The increasing cost and decreasing availability of agricultural chemicals means options for growers are becoming more limited.

Consumer demand and trade restrictions - Consumers are increasingly driving a shift away from broad spectrum pesticide use. Tightening international regulations around the use and application of MS may also restrict future trade and exports.

Enhanced biodegradation - Biodegradation is the process by which organic substances are broken down by living organisms. Repeated application of MS can lead to enhanced biodegradation of the active methyl isothiocyanate (MITC), substantially reducing the efficacy of MS for control of soilborne pests and diseases. This occurs when there is an increase in soil microorganisms that are capable of rapidly degrading MITC.

Enhanced biodegradation can be prevented by using an integrated approach to pest and disease management.

Key Messages

- Sole reliance on fumigants like MS often changes soil conditions and reduces inherent disease suppressive soil properties, reinforcing continued reliance on fumigation to deal with soilborne diseases, pests and weeds.
- The environmental and human health impacts of MS are other good reasons to look for effective, commercially viable alternatives.
- There is no direct 'drop-in' product to replace MS.
- Alternatives to MS (such as biofumigation) will work most effectively as part of a broader, integrated crop protection approach.
- Changing established systems involves uncertainty and risks while new practices are adapted to existing production systems.
- New ICP strategies must be developed within a local context that considers:
 - local soil types and production systems
 - disease pressures
 - environmental conditions.



ICPSW1/012/1504



Alternatives to Metham Sodium

Are there suitable chemical alternatives to MS?

Chemical alternatives to MS are limited:

- Some new generation nematicides are under development and new fungicides have been registered overseas. However few alternative broad-spectrum fumigants are registered for use in Australia and they are not considered viable substitutes due to their toxicity.
- Reviews of chemical soil fumigants in the United States and Europe have led to a tightening of regulations and the development of other resources to improve the safe use of MS. The general use of MS in Europe is to be phased out by December 2014. These moves make the future use of such chemicals in Australia uncertain.
- Biopesticides could replace MS but none are currently available in Australia.
- Solarisation and soil steaming are not considered good alternatives to MS due to their high costs and lack of environmental benefits.
- In the US the use of anaerobic soil disinfestation (ASD) and mustard seed meal methods are currently being investigated as practical and sustainable options.



Incorporating a biofumigant crop (Caliente 199™) into which a lettuce crop will be planted.

Biofumigant crops may be the most promising replacement for MS

Biofumigation is the suppression of soilborne pests and diseases by growing plants that contain inhibitory chemicals, which are then ploughed back in as green manure.

Plants from the mustard family (such as mustards and oil seed radish) or sorghum and rocket species have shown potential. Mustards produce chemicals called glucosinates in the plant tissue, which are released when cut or chopped. Enzymes break these down further into isothiocyanates that act like fumigants – these are the same chemicals that are released from MS.

Biofumigant crops also:

- Improve soil structure
- Add organic carbon to soil
- Reduce weeds and soilborne pathogens
- Do not persist for long in soil

For further information on biofumigation have a look at our fact sheet available from [here](#).



Lettuce after biofumigation.



Lettuce without biofumigation affected by Sclerotinia.



Alternatives to Metham Sodium

Integrated Crop Protection (ICP): the way forward

ICP moves away from sole reliance on fumigants and offers alternative options for management of pests and soilborne diseases.

It requires changing some practices and trying multiple approaches. In doing so, you may avoid pesticide resistance or enhanced biodegradation of soil-applied plant protection products.

Integrated Crop Protection:

- can reduce costs of unnecessary chemical applications (by being more targeted)
- takes a proactive risk management approach (not a blanket approach)
- is a long-term economically and environmentally sustainable option
- may withstand external changes such as increasing chemical regulation
- allows marketing of food produced in an environmentally responsible manner.

An integrated approach relies on monitoring for early detection of pests, weeds and diseases. It is based on the use of cultural methods and selective products that protect crops while minimizing negative effects on water, air and soil, and on pollinators and beneficial insects.



Biopesticides, biological control, biofumigation and site-specific nutrition management generally all fit well into an integrated crop protection approach.

Remember that any single one of the ICP alternatives, by itself, will lack the cost effectiveness, broad efficacy, and reliability of chemical fumigants. But it is possible to combine a range of integrated approaches to achieve a viable production system.

A range of ICP approaches is recommended, including:

- Biofumigation
- Proven amendments or 'soil/plant health enhancers'
- Rotation or break crops such as seed crops and pasture breaks
- Biocides/biological control

Things to consider

There are some challenges for ICP to replace MS, including:

- The availability of suitable land for crop rotation
- Resources and time required to implement monitoring and multiple management approaches.
- Costs associated with different products required in an ICP system.
- There may still be a need for weed control.

These challenges are offset by the reduced cost and environmental benefit of less pesticide usage.

Further Information

To find out more about ICP, alternatives to metham sodium or biofumigation please contact:

- Anne-Maree Boland at RMCG on 03 9882 2670 or anne-mareeb@rmcg.com.au
- Gordon Rogers at AHR on 03 86271040 or gordon@ahr.com.au