METAM SODIUM AS AN ALTERNATIVE TO METHYL BROMIDE FOR **FRUIT** AND VEGETABLE PRODUCTION AND ORCHARD REPLANTING

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Background

First marketed in the 1950's, metam sodium degrades rapidly to methylisothiocyanate, the product's primary bioactive agent. Used as part of an Integrated Pest Management system, metam sodium is a broad spectrum soil fumigant that can be used to control plant parasitic nematodes, weeds, germinating weed seeds, and soil-borne plant pathogenic fungi affecting a variety of economically important fruit and vegetable crops. Overall, metam sodium is considered a cost effective, technically viable alternative to methyl bromide for controlling soil pests affecting high value fruit, vegetable, and orchard crops across the United States.

Metam sodium is a readily available and versatile pesticide product which has no effect on the atmospheric ozone layer. In its current use patterns there are no residues left on crops. For over four decades, metam sodium has been used in a variety of experimental and commercial applications. By using metam sodium to treat soils prior to planting, fruit and vegetable growers can control tough annual weeds, reduce nematode populations, and control soil-borne pathogens. In California, because of the low cost, ease of application, safety, and effectiveness in controlling soil pests, over 15 million pounds of metam sodium were used in the production of melons, peppers, tomatoes, potatoes, strawberries, nurseries, ornamentals, cut flowers, container plants, forest tree seedlings, citrus, grapes, almonds, artichokes, asparagus, and carrots. Metam sodium reduces competition from soil pests, promotes healthier crops and higher yields, provides early uniform crop maturity and fruit ripening, and allows growers to greatly increase economic returns by achieving maximum early season yields.

Commercially Viable Alternative to Methyl Bromide

Metam sodium's low cost and wide-range of control makes it a strong candidate for fumigation on many crops. Metam sodium is registered for use in controlling a wide array of soil-borne pests. It can be used to control weeds, and soil diseases. Metam sodium is also useful in Integrated Pest Management systems, as metam sodium can be used in conjunction with resistant varieties, improved sanitation techniques, biological control agents, and soil pasteurization (i.e., solarization, hot water or steam). Overall, metam sodium use could be expanded across a wide range of fruit and vegetable crops including tomatoes, strawberries, and peppers which currently account for nearly 60% of domestic methyl bromide consumption.

Fruit and Vegetable Production

Improved growth responses and yield increases have been experimentally and

commercially documented. In the production of carrots and tomatoes, metam sodium has been used to significantly reduce populations of stubby root and root-knot nematode prior to planting. Application of metam sodium applied through drip irrigation on California tomato and carrot beds before planting significantly reduced nematodes in the soil as well as root gall ratings at midseason and harvest and increased yields in most case. The application of metam sodium to carrots in Florida resulted in improved plant vigor and stand, reduced root-knot nematode damage and increased yields.

A fresh market tomato study comparing metam sodium and methyl bromide fumigation to an untreated control reported that yields and fruit quality obtained with metam sodium were equivalent to those achieved with methyl bromide fumigation. In the production of tomatoes in southwest Florida, Fusarium crown and root rot have been the most prevalent soil-borne diseases. Metam sodium has been demonstrated to significantly reduce crown rot incidence and when combined with solarization, control was equivalent to methyl bromide + chloropicrin.

In California strawberry production, methyl bromide and metam sodium are rated comparable in chemical effectiveness to control annual and perennial weeds. Field experiments conducted over a three-year period on broccoli, cauliflower and strawberries demonstrated that metam sodium will effectively control several annual weeds common in these crops. Additionally, in two strawberry field trials, metam sodium was applied at 240 lbs per acre through sprinkler system; methyl bromide/chloropicrin was applied at 325 lbs per acre. Overall, during the early part of the season, yields achieved with metam sodium were 26% greater than those obtained with methyl bromide. Although methyl bromide yields for the overall season were 14% greater than yields achieved with metam sodium, because metam sodium treatment costs were 1/3 less than methyl bromide costs and higher early season yields achieved by metam sodium received significantly higher prices, economic returns with metam sodium were greater than those achieved by using methyl bromide.

Orchard Replant Sites

Pathogenic soil organisms present in the soils of most mature orchards often reduce root growth of young fruit trees when the site is replanted. Poor root development leads to reduced vegetative growth and poor fruit yields throughout the life of the replanted orchard. While many soil fumigants, fungicides, fertilizers and soil amendments have been tested for effect on the orchard replant disease, only three have shown long-term growth and yield benefits in Washington orchard trials: methyl bromide, metam sodium, and fumigants containing chloropicrin.

Trials conducted to evaluate the use of methyl bromide alternatives to orchard replant sites demonstrated that metam sodium provided comparable control to methyl bromide. Site C, a vineyard with root lesion and root knot nematodes was replanted to strawberries. Soil drenching replant sites with 300 lbs of metam sodium gave equivalent nematode

control for 24 months. Site E, a 20 year old plum site, with root lesion and ring

nematodes, was replanted to nectarines. Soil drenching with 330 lbs of metam sodium gave equivalent nematode control for 24 months. At another site, F, soil drenching a 15 year old peach and plum orchard, infested with root lesion and citrus nematode, with metam sodium gave comparable nematode control. Additionally, at site G, an old almond orchard, infested with root lesion and ring nematode, replanted to grapes was treated with metam sodium at 327 lbs. Results showed comparable nematode control and plant growth when compared to methyl bromide.

Successfully Applying Metam Sodium

Research and advances in application techniques have the potential to increase the consistency and efficacy of metam sodium as a soil fumigant. Effectively using metam sodium to control pests currently treated with methyl bromide will require low-cost modifications of cropping systems, including the adoption of drip irrigation systems, narrower bed widths, multiple drip tubes per bed, and planting practices which place plants closer to drip tubes.

Cost Effective Alternative to Methyl Bromide

Because metam sodium is water soluble and has low volatility, it is the only soil fumigant that can be applied through irrigation systems. In addition, the environmental and health risks posed by metam sodium are lower than those posed by methyl bromide. One of the greatest advantages to the use of metam sodium, however, is the low cost. Based on today's metam sodium market, the cost of metam sodium applications is less, by a twofold factor, than the cost of methyl bromide applications.

Because of its familiarity, availability, effectiveness and low cost, metam sodium is one of the most effective alternatives to methyl bromide for the production of fruits and vegetables in the United States.

Table 1. 1995 Pesticide Use in California: Lbs active ingredient		
Crop	**Methyl Bromide**	**Metam Sodium**
Grapes	**575,000**	**15,500**
Peppers	**49,000**	**7,600**
Tomatoes	**266,000**	**243,000**
Processed Tomatoes	**-0-**	**2,888,000**
Strawberries	**4,200,000**	**30,000**

Source: CDPR pesticide use summary database, April 1997.

Source: Methyl Bromide Consumption Estimates, U.S. Environmental Protection Agency, Stratospheric Protection

Division, Washington, D.C.

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