

NON-FUMIGANTS AS METHYL BROMIDE ALTERNATIVES FOR MANAGING VEGETABLE DISEASES AND WEEDS

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With the phaseout of methyl bromide from use, the search for methyl bromide alternatives is desperately needed to control troublesome pests on vegetables. Among the most troublesome pests in plasticulture-grown vegetables in the southeastern U.S. are root-knot nematodes, nutsedges, and soilborne pathogens. Intensive efforts have been made to develop methyl bromide alternatives and the majority of studies have focused on other soil-applied fumigants. However, buffer restrictions, rising costs, and efficacy of the fumigants limit their use. Given the availability of non-fumigant pesticides that provide good suppression of nematodes, soilborne pathogens, and weeds, effective pest control on vegetables without fumigants should be an attainable goal. The objective of this study was to develop an integrated system for managing soilborne diseases and weeds in vegetable production using non-fumigant nematicides, fungicides, and herbicides as alternatives to chemical soil fumigation.

Materials and Methods

Field studies were conducted in 2010 in Tifton, GA, to evaluate several herbicides for purple nutsedge control and pepper and cucumber tolerance as compared to methyl bromide and the Georgia 3-way combination of Telone II, chloropicrin, and Vapam. A number of nematicides and fungicides were evaluated for control of root-knot nematodes and soilborne diseases. In spring 2011, combinations of herbicides, nematicides, and fungicides were evaluated for control of weeds and diseases for cucumber and pepper. Methyl bromide/chloropicrin 50/50 (MBrC) was included along with a non-treated control for comparisons. For bell pepper, thiazosulfene, fluopicolide or mefenoxam were combined with herbicide applications of clomazone plus fomesafen, *S*-metholachlor plus fomesafen, or colomazone plus fomesafen plus *S*-metolachlor. For cucumber, the nematicide and fungicides were combined with halosulfuron, *S*-metolachlor plus clomazone plus fomesafen, or halosulfuron plus *S*-metolachlor.

Results

In 2010, no single herbicide application provided acceptable purple nutsedge control as compared to methyl bromide or the GA 3-way mixture. A combination

of clomazone, *S*-metolachlor, and fomesafen or sulfentrazone were required to provide acceptable control (>80%). Cucumber was tolerant to combinations of clomazone, *S*-metolachlor with fomesafen, but not sulfentrazone. Bell pepper early season injury also occurred with sulfentrazone alone and when used in combination with other herbicides. The experimental product thiazosulfene used at 3.56 lb /acre in the spring caused phytotoxicity. Yields in both pepper and cucumber were significantly reduced compared to plots receiving soil fumigants, although nematode control was generally best with thiazosulfene in the spring. A reduced rate of thiazosulfene (1.58 lb /acre) was used in the fall experiments and compared with methyl bromide, GA 3-Way and Vydate. Conversely, pepper plots treated with thiazosulfene in the fall yielded significantly better than those receiving the Georgia 3-way and MBrC while maintaining nematode control. This was attributed to the fumigants causing phytotoxicity in the fall crop and a reduced rate of thiazosulfene applied. Yields in the fall cucumber trial were not different and thiazosulfene provided nematode control comparable to fumigant treatments but significantly better than the control. Treatments receiving Vydate as the sole nematicide demonstrated significantly more nematode galling than fumigant treatments but generally outperformed the non-treated plots for both crops. Fluopicolide and mefenoxam significantly reduced incidence of *Phytophthora* blight compared with the non-treated control. The efficacy of these products in disease suppression was not significantly different from MBrC.

In 2011, no combination of herbicides plus nematicide plus fungicide affected stand or growth of pepper or cucumber up to 8 weeks after transplanting. Control of purple nutsedge was variable by crop. For cucumber, only those treatments that had a combination of halosulfuron plus clomazone plus *S*-metholachlor provided control equal to MBrC. However, by the end of the harvest, this herbicide combination provided 53% control of purple nutsedge as compared to 75% for MBrC. For pepper, the purple nutsedge control was 60% for *S*-metholachlor plus clomazone plus fomesafen as compared to 95% for MBrC. Thiazosulfene and the fungicides provided significant root-knot nematode and *Phytophthora* blight reduction that was comparable to the application of MBrC.

Summary

The loss of methyl bromide requires alternative methods for control of weeds, nematodes, and soilborne diseases. Studies in this project indicated that combinations of clomazone, *S*-metolachlor, and halosulfuron provided acceptable weed control and did not cause season long pepper injury. The results also indicated that certain nematicide and fungicides had the promise to be used as an alternative to methyl bromide for control of root-knot nematodes and important soilborne diseases such as *Phytophthora* blight.