Tomato, Pepper, and Watermelon Tolerance to EPTC Applied under Mulch in Florida

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For over 35 years, Florida tomato (Lycopersicum esculentum L.) growers have relied on methyl bromide for their soilborne pest, disease, and weed control problems. The use of methyl bromide as a soil fumigant is now being phased out internationally under the Montreal Protocol. Yellow nutsedge (Cyperus esculentus L.) and purple nutsedge (Cyperus rotundus L.) are among the major weed control challenges in many tomato production systems. Since the leading alternative fumigants provide less than satisfactory control of nutsedge, Florida growers may have to consider the use of a preplant herbicide for control. EPTC (s-ethyl dipropylthiocarbamate) is an effective material that provides selective pre-emergent control of grasses, sedges, and many broadleaf weeds. Three years of small plot trials in Florida have shown that application of EPTC to the bed surface just prior to mulch application with a 14 day pre-transplant waiting period delivered excellent crop safety with very good nutsedge control. On-farm demonstration trials in Southwest Florida on tomato using EPTC applied to the bed and immediately covered with polyethylene film also demonstrated excellent nutsedge control and had no apparent effect on the crop. Early indications are that EPTC may be an important tool in tomato weed management in the development of methyl bromide alternative strategies.

Materials and Methods

In 2006, the Gowan representative in South Florida initiated discussions aimed at looking at the potential of EPTC for the control of nutsedge in tomato in Florida. It was felt that it might have some application due to its broad spectrum of activity and also on the fact that it had a Federal tolerance for tomatoes and was already labeled in other states. Initially the idea was to use EPTC as a preplant fallow application; however, the need to incorporate the product and seal the soil following application met some resistance as South Florida growers using plasticulture simply did not have the equipment to perform this type of operation.

In the fall of 2006 an opportunity presented itself in the form of a flawed methyl bromide operation that left several beds unfumigated. It was decided to lift the polyethylene mulch and apply EPTC at 5 pts/acre and a combination of EPTC (1 pt/acre) and halosulfuron (Sandea) (0.75 oz/acre) on top of the beds and reaply the low density polyethylene (LDPE) mulch film. An untreated area was left as a control and tomatoes were planted 14 d after treatment, and plant vigor and weed emergence were noted several times during the season.

Following the small demonstration study, a large scale on-farm demonstration plot was planned. Treatments included 3.5 pts/acre EPTC 5 pt/acre EPTC, 3.5 pt/acre EPTC + 0.75 oz/acre halosulfuron, 5 pt/acre EPTC + 0.75 oz/acre halosulfuron, methyl bromide (grower standard) and an untreated control. Herbicides were applied to the top of the finished bed immediately before the application of LDPE polyethylene mulch. Plots were not replicated and were approximately 1 acre in size. Methyl bromide was applied by shank injection in front of the bed-making equipment.

The on-farm demonstration trials in Southwest Florida were followed by 3 years of small plot work at the UF/IFAS Horticulture Research Unit in Citra, FL, on a variety of crops including tomato, eggplant, pepper, and watermelon. These trials were set up as a randomized complete-block design and treatments included various rates of EPTC and halosulfuron alone and in combination with halosulfuron and other herbicides.

Results and Discussion

The on-farm demonstration trials in Southwest Florida on tomato using EPTC applied to the bed and immediately covered with low density polyethylene film demonstrated excellent nutsedge control and had no apparent effect on the crop. With the on-farm demonstration trials, preliminary observa-
tions regarding nutsedge control were striking. With the small scale demonstration plot, nutsedge emergence was evaluated by counting the number of plants emerged in a randomly selected 3-ft section of the bed in each treatment approximately 1 month after planting. Nutsedge emergence with all treatments was much less—less than one-tenth of that of the untreated control. No effect was observed on plant vigor.

The large-scale demonstration plots were evaluated approximately 1 and 2 months after planting by counting nutsedge emergence in six randomly chosen 3-ft sections of bed in each treatment. With all the herbicide treatments and the methyl bromide treatment averaged less than one nutsedge plant per 3-ft section of bed when counts were taken 1 month after treatments were applied. With the untreated control there was an average of 43 nutsedge plants per 3-ft section of bed after 1 month. This level of control persisted out to 2 months after planting with all the herbicides and the methyl bromide treatment still averaging less than one nutsedge plant per 3-ft section of bed. EPTC alone provided equal control as the EPTC/halosulfuron tank mixes.

Differences in plant height and the incidence of soilborne diseases, primarily pythium, were observed between the methyl bromide-treated plot and all other treatments. It is presumed that while the herbicides did provide excellent weed control, the failure to provide control of soilborne diseases had a negative effect on plant performance and provides an indication that any use of EPTC will have to be combined with other materials to provide an acceptable level of disease control.

Results from tomato small plot trials conducted in 2006–07 indicated that the EPTC treatments along with pendimethalin (Dual) and sulfentrazone (Spartan) had the greatest nutsedge control. There were no differences in vigor due to herbicide treatment, nor differences in yield.

Results from pepper (Capsicum annum L.) small plot trials conducted in 2006–07 indicated that the EPTC pre-treatments and EPTC/pendimethalin (Prowl), s-metolachlor (Dual Magnum), clomazone (Command), and halosulfuron (Sandea) all demonstrated excellent nutsedge control. There was a large variation in the yield of the plots. Only the pendimethalin at 0.75 lb a.i., the s-metolachlor/pendimethalin, the s-metolachlor/clomazone and the s-metolachlor/EPTC treatments had total yield significantly greater than the control.

Results from the eggplant (Solanum melongena L.) small plot trials in 2007 indicated that early control of purple nutsedge was best with the EPTC and EPTC plus treatments as well as the two highest rates of V-10142 pre-treatments.

Results from watermelon (Citrullus lanatus L.) small plot trials in 2007 indicated that the pre-applications of EPTC and V-10142 significantly reduced fruit number. Late control of nutsedge was good to excellent with EPTC.

Three years of small plot trials in Florida have shown that application of EPTC to the bed surface just prior to mulch application with a 14-d pre-transplant waiting period delivered excellent crop safety with very good nutsedge control.

Early indications are that EPTC may be an important tool in tomato weed management in the development of methyl bromide alternative strategies. A 24c state label has been issued in Florida. Small plot trial results warrant further study of this compound for use also in eggplant, pepper, and watermelon.

More recent work by Culpepper et al. (personal communication) at the University of Georgia using EPTC under high density mulches has demonstrated severe plant damage and even plant mortality in pepper planted at 14 d following an application.1

These observations point to the need for further research with use of EPTC under high barrier films as well as in combinations for a comprehensive methyl bromide alternative solution.