Effective alternatives to methyl bromide exist, but selecting the ideal fumigant, mulch, and herbicide program is challenging. Growers must better understand how soil texture, moisture, bed compaction, and cultural practices influence fumigant activity, planting intervals, and off-gassing concerns. This circular is provided to assist growers with developing the most effective fumigant system for their farm. Figure 1 compares the most effective fumigant options; more detailed information regarding each system is provided on the next page.

**Figure 1. Fumigant Systems for Weeds and Nematodes in Order of Consistency**

<table>
<thead>
<tr>
<th>Rank</th>
<th>Fumigant</th>
<th>Mulch</th>
<th>Weeds</th>
<th>Nematodes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Paladin Pic + Vapam</td>
<td>TIF</td>
<td>Good to excellent on all common weeds</td>
<td>Excellent on nematode</td>
</tr>
<tr>
<td>2</td>
<td>UGA 3-WAY</td>
<td>TIF</td>
<td>Good nutseed, Fair grass and pigweed</td>
<td>Excellent on nematode</td>
</tr>
<tr>
<td>3</td>
<td>Paladin Pic</td>
<td>TIF</td>
<td>Good to excellent on all common weeds</td>
<td>Excellent on nematode</td>
</tr>
<tr>
<td>4</td>
<td>UGA 3-WAY</td>
<td>LDPE</td>
<td>Fair nutseed, Excellent grass and pigweed</td>
<td>Excellent on nematode</td>
</tr>
<tr>
<td>5</td>
<td>Pic Chlor 60</td>
<td>TIF</td>
<td>Fair nutseed, Good grass and pigweed</td>
<td>Fair/Good on nematode</td>
</tr>
</tbody>
</table>

On-going research continues to suggest cultural methods that increase the length of time a fumigant remains in the soil will result in greater pest management (longer plant back intervals). Moisture, soil temperature, and bed compaction directly influence how long a fumigant remains in the soil. Research has also noted the time of year fumigant applications occur can influence fumigant activity. Fumigants applied on Dec. 11, 2014, remained in the soil nearly twice as long as when applied on Feb. 5, 2015. Greater fumigant concentrations in the soil over time with the December application resulted in 89% less nutseed plants at pepper harvest (Figure 2); nematode control was excellent with fumigants at both application dates.

**Figure 2. Fumigant Activity Influenced by Fumigation Time of Year, Tifton, 2015**

- December application remained in the soil for nearly twice as long as February application.
- December application resulted in 89% less nutseed plants at pepper harvest.
- Nematode control was excellent with fumigants at both application dates.

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**MULCH SELECTION AND FUMIGANT PLANT BACK INTERVALS**

1. LDPE = Low Density Polyethylene; VIF = Virtually Impermeable Film; TIF = Totally Impermeable Film.
2. For Paladin Pic systems, TIF must be used to avoid serious off-gassing concerns. However, with the UGA 3-WAY and Pic Chlor 60, one could use LDPE, VIF, or TIF. Research has shown little value with VIF; thus, the two mulch types to consider are LDPE vs. TIF. LDPE is cheaper while fumigants applied under TIF often remain in the soil about twice as long thereby improving pest management.
3. Fumigant systems applied under TIF are often so effective that fumigants usually remain in the soil for more than 35 days in the spring and more than 18 days in the fall; thus, check beds for presence of fumigants prior to planting.
4. Wet conditions often trap fumigants in the bed and can be problematic, especially with Telone II.

*The primary funding source for this research is the Georgia Vegetable Commodity Commission.*
FUMIGANT OPTIONS IN DETAIL (rates provided as broadcast only)

1. **The UGA 3-WAY** includes Telone II at 12+ GPA, chloropicrin at 150 lb/A, and metam sodium (Vapam, etc.) at 75 GPA. Telone II is typically applied 12-16” deep followed by chloropicrin applied with three knives in a typical 32” wide bed top at a depth of 8-10” deep. Metam must be placed in the final bed with injection points 4” deep and 4” apart (Figure 3). If replacing Telone II and chloropicrin with Pic Chlor 60, the rate of at least 21 GPA is in order, but one may experience less nematode control. An LDPE mulch is effective for loamy sand soils during spring fumigation of fields lightly infested with nutsedge; however, a TIF would be far more effective in controlling nutsedge on sandy soils, during summer fumigation, and in fields with heavy nutsedge infestations.

2. **Paladin Pic** includes a 79:21 mixture of DMDS:chloropicrin and should be injected at 40-50 GPA at a depth of 8-10” under TIF; use higher rates for intense nutsedge infestations or when soil temperatures are warmer. The system is effective on nutsedge, but poor control of annual grasses and broadleaf weeds are expected; thus, an herbicide program will likely be needed. Paladin has a distinct odor, and applicators must be careful to avoid off-target odor issues. Apply Paladin only in areas where odor concerns for one’s neighbors do not exist.

3. **Paladin Pic + metam sodium** under TIF has proven to be extremely effective. Paladin Pic at 40-45 GPA should be injected 8-10” deep followed by 50 GPA of metam sodium (Vapam, etc.). Metam must be placed in the final bed with injection points 4” deep and 4” apart (Figure 3). Apply Paladin only in areas where odor concerns for one’s neighbors do not exist.

4. **Pic Chlor 60** applied under TIF at 28GPA (340 lb/A) can be an effective option, especially when 1) producing only one or two crops prior to mulch removal, 2) applying in fields containing light nutsedge and nematode infestations, and 3) when growing crops that allow topical use of Sandea herbicide. In most fields, this fumigant system should be accompanied by an herbicide program for the control of annual weeds.

It is important to always read any pesticide label before use. Use the product strictly according to the label directions. It is particularly important to follow all safety precautions. Trade and brand names are used only for information. The University of Georgia does not guarantee nor warrant published standards on any product mentioned; neither does the use of a trade or brand name imply approval of any product to the exclusion of others, which may also be suitable.