

Chemical Control of Weeds

Students should know what classes of synthetic pesticides are used for weed control

Be familiar with the advantages and disadvantages of herbicide use.

Be familiar with ways in which herbicides are classified esp wrt time of application, contact vs systemic, selectivity.

Characteristics of plants that affect their susceptibility to herbicides.

2 classes of chemicals are used for weed control: soil fumigants and herbicides

Soil fumigants are important tools in high value crops such as:

Solanceous vegetables and strawberries.

- Broad spectrum biocides
- Typically applied for the control of soilborne pathogens and nematodes
- They also control many weed species as well.

With the phaseout of methyl bromide in 2005 and critical use exemptions in 2015, alternative soil fumigants are being utilized that are less effective in suppressing weeds.

Fumigants have high vapor pressure and low water solubility. Fumigants are placed in the soil where they volatilize and disperse in gaseous form through soil pores.

To improve efficacy and limit off-gassing plastic tarps are used, which are generally retained as a production mulch for the crop season if applied to the beds only.

Soil factors that influence soil fumigant effectiveness:

- Soil temperature, moisture, organic matter, dosage, time of exposure.
- Warm soil temperatures and moisture make weed seeds more susceptible to fumigants,
- Well decomposed organic matter facilitates good fumigation.

Methods of Application

- Broadcast: fumigant and tarp applied to the entire field.
- Row fumigation: fumigant and mulch applied to planting beds only.
- Shank and chisel application of gases and liquids that volatilize into gases.
- Some liquid formulations are intended for application via drip irrigation.
 - In Florida sandy soils result in inadequate drip fumigation depending on bed width and number of drip tapes. A single drip tape on a wide bed results in nutsedge plants penetrating bed shoulders.
- Alternative soil fumigants – buffer zone requirements to protect the public from fumigant exposure. These can be decreased by use of Virtually Impermeable Films (VIF) and Totally Impermeable Films (TIF). VIF and TIF mulches reduce off-gassing and increase the length of time the fumigants are retained in the soil so that soil fumigants are often effective at lower rates with these films.

Noling, J.W. 2013. Fumigant nematicides registered for vegetable crop use in Florida. UF/IFAS EDIS Factsheet ENY-064. <https://edis.ifas.ufl.edu/pdffiles/IN/IN98000.pdf>

Table 3. Generalized summary of maximum use rate and relative effectiveness of various soil fumigants for nematode, soilborne disease, and weed control in Florida.

FUMIGANT CHEMICAL ¹	Maximum UseRate / A	Relative Pesticidal Activity		
		Nematode	Disease	Weed
1) Methyl bromide 50/50	350 lb	Good to Excellent	Excellent	Fair to Excellent
2) Chloropicrin ²	300 lb	None to Poor	Excellent	Poor
3) Metam Sodium	75 gal	Good to Poor	Good to Poor	Good to Poor
4) Telone II	18 gal	Good to Excellent	None to Poor	Poor
5) Telone C17	26 gal	Good to Excellent	Good	Poor
6) Telone C35	35 gal	Good to Excellent	Good to Excellent	Poor to Fair
7) Pic-Clor 60	300 lb	Good to Excellent	Good to Excellent	Poor to Fair
8) Metam Potassium	60 gal	Good to Poor	Good to Poor	Good to Poor
9) Dimethyl Disulfide ²	53 gal	Good to Excellent	Good to Excellent	Poor to Excellent

¹With new product labels, certified applicators must now consider label changes to maximum application rate, new fumigant training certifications, personal protective equipment, buffer zone, mandatory good application practices, and other new restrictions and requirements.

² Broad spectrum pest control achieved when coapplied with chloropicrin (21% wt/wt). Provides excellent control of nutsedge but poor to fair control of annual grasses and requires the use of a herbicide for adequate control.

Noling, J.W. 2013. Reducing fumigant application rates and soil emissions with plastic mulch technology. UF/IFAS EDIS Factsheet ENY-046. <https://edis.ifas.ufl.edu/pdffiles/IN/IN40300.pdf>

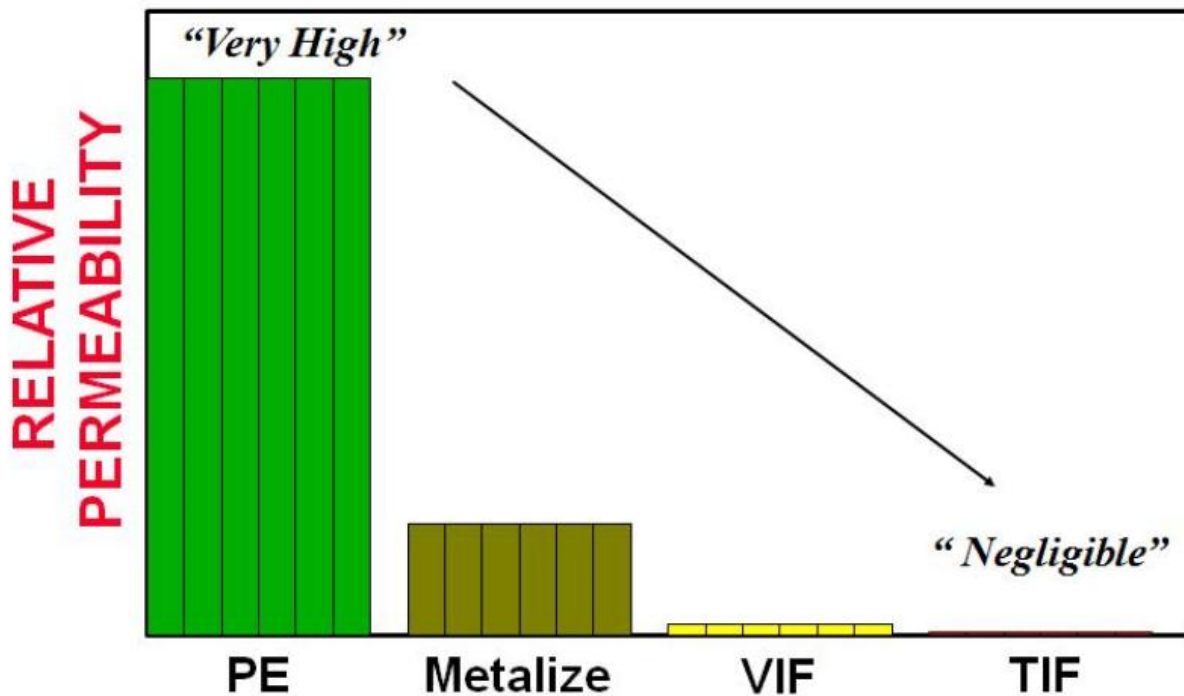


Figure 1. Relative permeability of fumigant gases through polyethylene (PE), metalize, virtually impermeable (VIF) and totally impermeable (TIF) plastic mulch films. Taller bars indicate higher permeability.