

Fumigation Use in Potato Production Systems



Fumigants (non-specific, gaseous chemicals) are widely used in potato production systems with the goal of reducing soil-borne pests¹ and should be applied with specific management plans since off-gassing is a concern when applying near populated areas.

Why fumigate?

Fumigation is both an effective and economically beneficial management practice in high-value cropping systems such as potato. The main chemicals used are metam sodium, chloropicrin and 1,3-dichloropropene. In many potato production areas, fumigants are injected prior to planting primarily to protect yield from loss due to early vine death and reduced tuber quality caused by soil-borne pests.

Growers should have a fumigant management plan that includes implementing buffer zones around applied areas if necessary^{1,2,3}.

How to fumigate

Always consult the fumigant label for specific recommendations, but generally, fumigation is most effective under the following conditions^{1,2,3}.

- **Prepare** soil with tillage to break-up soil clods and allow the fumigant to move laterally and horizontally throughout the target region.
- **Distribute** the fumigant evenly at the correct depth. In general, apply at depths of 6-8 inches for fungi and deeper (up to 24 inches) for nematodes.
- **Apply** when soil moisture is at 80% throughout the desired profile.
- **Pay attention** to soil temperature; it can affect fumigant efficacy. In some soils, higher temperatures result in lower microsclerotia reductions and higher disease levels.
- **Ensure** a waiting period (usually 2-3 weeks) between application and crop planting.

New research

Due to soil-borne pathogen pressures increasing over time, some growers are opting to fumigate before every potato crop. ***What can be done to mitigate those concerns, and what practices can help enhance overall soil health to limit the need for fumigation?***

Growers have benefited from improving their soil's health, although there is not a single formula for doing this. At present, there is a lot of interest and research being done in soil health, so new solutions may emerge as fumigation alternatives.

A key aspect of the Potato Soil Health Project⁴ is microbiomes. Researchers are evaluating how microbial communities interact and potentially help limit the effects of soil pests, while still encouraging a high quality, productive crop.

Take home message

Fumigation is a useful tool for potato production when there are serious pressures from soil-borne pathogens, but it should be used judiciously and alternatives should be investigated.

Research is being done by the Potato Soil Health Project to learn about the links between soil microbial communities, disease expression, and how farming practices (including fumigation) impact those relationships⁴.

Alternative approaches

Researchers and growers continue to explore alternatives to fumigation:

- **Extending rotations with non-host crops:** This limits pest build-up in the non-potato years and can extend the need for a fumigant prior to the potato crop.
- **Site specific fumigation:** Identifying potential early dying "hot spots" to locate and treat only those specific sites. This method decreases the amount of fumigant applied to the entire field. Another site specific approach is to apply within potato rows; these in-furrow applications can reduce overall fumigant use.
- **Biofumigation:** Researchers are investigating cover crops to limit the use of fumigants, see the Potato Soil Health factsheet *Biofumigation: Is it a viable alternative?* for further information⁴.



Authors: Deana Knuteson and Amanda Gevens (UW-Madison), Bryn Evin and Ken Frost, (Oregon State University), Andy Robinson (North Dakota State University/University of Minnesota) and Julie Pasche (North Dakota State University).

Enhancing Soil Health in U.S. Potato Production Systems is a USDA-NIFA funded Specialty Crop Research Initiative involving the University of Maine, Michigan State University, the University of Wisconsin-Madison, the University of Minnesota, North Dakota State University, Colorado State University, the University of Idaho, the University of Washington, Oregon State University, and Montana State University.

potatosoilhealth.cfans.umn.edu

Contact Matt Ruark at 608-263-2889
ruarklab.soils.wisc.edu



United States
Department of
Agriculture

National Institute
of Food and
Agriculture

¹ EPA Soil Fumigation Tool Box - <https://www.epa.gov/soil-fumigants> ² Potato Soil Fumigation. A Field Guide to Fumigant Management Plans: With Special Reference to Potato Early-Die in Michigan (2011 Review) Loren G. Wernette1 and George W. Bird. https://www.canr.msu.edu/ent/uploads/files/George_Bird_bio_PDFs/potato_soil_fumigation.pdf ³ BiolPM Potato Production Workbook. 2012. Knuteson, Deana L. (Nutrient and Pest Management Program), Russell L. Groves (Department of Entomology), Jed B. Colquhoun (Department of Horticulture), Matt Ruark (Department of Soil Science), Amanda J. Gevens (Department of Plant Pathology), Alvin J. Bussan (Department of Horticulture). University of Wisconsin-Madison, College of Agricultural and Life Sciences, University of Wisconsin-Extension, Cooperative Extension. NPM Program Document. https://ipcm.wisc.edu/download/pubsGuides/BiolPM_Potato.pdf ⁴ Potato Soil Health Project. Specialty Crop Research Initiative, 2020. <https://potatosoilhealth.cfans.umn.edu/>