



## PEST MANAGEMENT PRACTICES FOR HEMP GROWERS IN MONTANA

### PESTS OF HEMP IN MONTANA

Hemp pests vary according to production type (grain, fiber, flower, etc.), whether the plants are grown indoors or outdoors, and where the plants are grown geographically. The pests included in this review are preliminary and based on the findings of other states, MDA staff, and professionals cited.

### PRODUCTS THAT CAN BE APPLIED TO HEMP PRODUCTS IN MONTANA

A pesticide product can be applied to hemp under federal law if the active ingredients found in the product are exempt from residue tolerance requirements<sup>1</sup> and the product is exempt from registration requirements<sup>2</sup>.

Residue tolerance requirements are set by U.S. EPA for each pesticide on each food crop and are the amount of pesticide residue allowed to remain in or on each treated crop with “reasonable certainty of no harm.” Some pesticides are exempted from the tolerance requirement when they are found to be minimal risk.

Active ingredients exempt from registration requirements are generally food-grade essential oils, such as peppermint oil or rosemary oil.

***MDA must have on file a letter of authorization from the manufacturer that their product may be used on hemp.***

### GUIDANCE TABLES

Pages 2-6 include tables that provide guidance to hemp growers seeking information on pest management practices in Montana. Listing of a product should not be construed as an MDA endorsement or recommendation to use these products in the production of hemp in Montana. These products have not been tested to determine their health effects if used on hemp that will be consumed and thus the health risks to consumers is unknown. By including products on this list, MDA makes no assurances of their safety, effectiveness, or marketability of products depending on end use when used on hemp and accepts no responsibility or liability for any such use.

<sup>1</sup> 40 C.F.R., § 180, et seq.

<sup>2</sup> under FIFRA section 25(b) and MCA 80-8-2.

### PESTS NOT OFFICIALLY IDENTIFIED IN MONTANA.

Several hemp pests in other states are not yet known in Montana. These pests would add to the russet mites, aphids, cutworms, budworms, borers, and flea beetles already in Montana. As more and more hemp is planted throughout the state, collecting potential pests will enable entomologists to identify new species to state.

**THE IMPORTANCE OF CORRECT IDENTIFICATION.** It is essential to identify the potential pest or you may launch a futile program for a mite or insect that isn't a pest. And likewise, you need to know the correct species or you may use the incorrect management strategy. For accurate identification, bring specimens to an entomologist.

**HOW TO PRESERVE SPECIMENS FOR IDENTIFICATION.** If the insect specimen is hard bodied (e.g., a beetle), carefully place it in a small pill vial and cushion with crumpled tissue paper. If your specimen isn't yet dead, put it in a jar and place in a freezer overnight. Do not wrap specimens in tissue and seal them in plastic bags or you'll end up with smashed bug parts.

Place soft-bodied specimens (e.g., mites, leafhoppers, aphids, caterpillars) in a jar filled with rubbing alcohol. Include written information such as where on the plant you found the specimen, the general location of the plant, and date captured. Note original color and texture, since these will change once you immerse the specimen in alcohol. Also helpful are photographs of the specimen in its original habitat.

### IPM PRACTICES.

Most of these are standard practices for pests on plants other than hemp. For more detailed explanations, see information compiled by the Montana State University statewide IPM Program (MSU Extension IPM) at [www.ipm.montana.edu](http://www.ipm.montana.edu). You can enter a pest name in the search box (e.g., cutworm) and read about IPM practices for the pest on crops other than hemp. For hemp grown indoors, a good source is the University of California Statewide IPM [home page](#), click on [Agricultural Pests](#) and scroll down the alphabetical list until you reach [ornamental nurseries](#).

**Table 1. Active ingredients that are exempt from residue tolerance requirements<sup>a</sup> and exempt from registration requirements<sup>b</sup>. [updated on July 3, 2019]**

Table 1 lists examples of active ingredients that fit these criteria. This is *not* an exhaustive list of active ingredients that may fit the use criteria. Note that MDA does not track products that fit the criteria and the user bears the responsibility for ensuring product labels meet the criteria. In addition to the active ingredients listed in Table 1, there may be federally registered products available as pesticide companies add hemp to their label.

	ACTIVE INGREDIENT	PEST OR DISEASE
1	castor oil <sup>b</sup>	repellent (voles and gophers)
2	cinnamon, cinnamon oil <sup>b</sup>	slugs and snails, mites, leafhoppers, aphids, whiteflies, moth larvae
3	citric acid <sup>b</sup>	bacteria, fungi, mites, insects
4	cloves and clove oil <sup>b</sup>	bacteria, fungi
5	corn oil <sup>b</sup>	fungi, mites, insects
6	cottonseed oil <sup>b</sup>	fungi, mites, insects
7	garlic and garlic oil <sup>b</sup>	mites, leafhoppers, aphids, whiteflies, moth larvae
8	geraniol <sup>b</sup>	fungi, rodent repellent, mites, insects
9	peppermint, peppermint oil <sup>b</sup>	bacteria, fungi, mites, leafhoppers, aphids, whiteflies, moth larvae
10	potassium sorbate <sup>b</sup>	fungi, mites, insects
11	putrescent whole egg solids	squirrel, rabbit, and deer repellent
12	rosemary and rosemary oil <sup>b</sup>	bacteria, fungi, leafhoppers, aphids, whiteflies, moth larvae
13	sesame and sesame oil <sup>b</sup>	mites, leafhoppers, aphids, whiteflies, moth larvae
14	sodium chloride <sup>b</sup>	[minor active ingredient in some fungicide and insecticide formulations]
15	soybean oil <sup>b</sup>	mites, insects
16	thyme oil <sup>b</sup>	mites, leafhoppers, aphids, whiteflies, moth larvae

<sup>a</sup> 40 CFR (Code of Federal Regulations)

<sup>b</sup> FIFRA §25(b) and MCA 80-8 Subsection 2

[FIFRA = the Federal Insecticide, Fungicide, and Rodenticide Act;  
MCA = Montana Code Annotated]

**Table 2. OUTDOOR PEST MANAGEMENT PRACTICES FOR HEMP**

An explanation of the column labels for Tables 2 are as follows.

**PESTS.** The table show the most likely pests in Montana based on Ward Gauthier’s presentation and McPartland’s list and gleaned from California-based web sites and blogs. Some pests (e.g., russet mites) may be worse during drought years. Many pests have cyclic population fluctuations and others are mainstays of cultivation (e.g., whiteflies and thrips,). There are currently no approved products for weed mitigation.

**DAMAGE.** For outdoor pests when there wasn’t any overlap with indoor pests, McPartland’s list was used and information from University of California IPM for various crops. Accounts of damage by rodents are anecdotal.

**PESTICIDES.** These are covered below in the Table 1 description and are exempt from residue tolerance requirements and exempt from registration requirements.

PEST	DAMAGE	IPM PRACTICES (monitoring; cultural, physical, mechanical, biological)	PESTICIDES
<b>MITES &amp; INSECTS</b>			
<b>two-spotted spider mites</b> ( <i>Tetranychus urticae</i> and other Tetranychidae)	Suck plant sap; stipple <b>leaves</b>	<ul style="list-style-type: none"> <li>▪ Keep dust down by hosing off plants (if dust is a problem)</li> <li>▪ Release predatory mites</li> </ul>	Refer to Table 1
<b>broad mites</b> ( <i>Polyphagotarsonemus latus</i> )	Distort <b>leaves</b> and <b>buds</b>	<ul style="list-style-type: none"> <li>▪ Inspect plants; disinfest or dispose of infested plants</li> <li>▪ Release predatory mites and six spotted thrips</li> </ul>	Refer to Table 1
<b>russet mites</b> ( <i>Aculops</i> spp., <i>A. cannabicola</i> )	Suck plant sap; kill <b>leaves</b> and <b>flowers</b>	<ul style="list-style-type: none"> <li>▪ Release predatory mites</li> </ul>	Refer to Table 1
<b>leafhoppers</b>	Suck plant sap; weaken plants	<ul style="list-style-type: none"> <li>▪ Encourage natural enemies by planting nectar sources</li> </ul>	Refer to Table 1
<b>whiteflies</b> ( <i>Trialeurodes vaporariorum</i> , <i>Bemisia tabaci</i> , <i>B. argentifolii</i> )	Suck plant sap; weaken plants	<ul style="list-style-type: none"> <li>▪ Hang up yellow sticky cards</li> <li>▪ Use reflective plastic mulch</li> </ul>	rosemary & peppermint oils
<b>thrips</b> ( <i>Heliothrips haemorrhoidalis</i> , <i>Frankliniella occidentalis</i> , <i>Thrips tabaci</i> )	Stipple and scar <b>leaves</b> ; vector viruses	<ul style="list-style-type: none"> <li>▪ Hang up yellow or blue sticky cards</li> </ul>	rosemary & peppermint oils
<b>aphids</b> ( <i>Myzus persicae</i> , <i>Aphis fabae</i> )	Suck plant sap; weaken plants	<ul style="list-style-type: none"> <li>▪ Hang up yellow sticky cards (alates)</li> <li>▪ Hose off plants</li> </ul>	Refer to Table 1
<b>leafminers</b> ( <i>Liriomyza</i> spp.)	Bore into <b>roots</b> and <b>leaves</b>	<ul style="list-style-type: none"> <li>▪ Remove older infested leaves</li> <li>▪ Use biocontrol: release <i>Diglyphus</i> parasitoids</li> </ul>	Refer to Table 1
<b>lygus bug</b> ( <i>Lygus lineolaris</i> , <i>L. elsius</i> , <i>L borealis</i> , <i>L. keltoni</i> )	Suck on plant sap and seeds; weaken plants	<ul style="list-style-type: none"> <li>▪ Heavy rainfall could lower the numbers of early-instar nymphs of lygus bugs.</li> </ul>	Refer to Table 1

PEST		DAMAGE	IPM PRACTICES (monitoring; cultural, physical, mechanical, biological)	PESTICIDES
LEPIDOPTERA	<b>cutworms</b> ( <i>Agrotis ipsilon</i> , <i>Spodoptera exigua</i> , Noctuidae)	Eat <b>seedlings</b>	<ul style="list-style-type: none"> <li>Use pheromone traps to detect adults.</li> <li>Remove weeds, which serve as a reservoir for cutworms and other noctuids</li> </ul>	Refer to Table 1
	<b>budworms</b> ( <i>Helicoverpa zea</i> , Noctuidae)	Eat flowering <b>buds</b>	<ul style="list-style-type: none"> <li>Shake plants to dislodge larvae</li> <li>Remove infested buds</li> <li>Plant corn as trap crop</li> </ul>	Refer to Table 1
	<b>borers</b> ( <i>Grapholita delineana</i> , <i>Ostrinia nubilalis</i> )	Bore into <b>stems</b> feeds on	<ul style="list-style-type: none"> <li>Remove hemp crop debris between growing seasons to remove overwintering habitat.</li> <li>Crop rotation</li> </ul>	Refer to Table 1
COLEOPTERA	<b>flea beetles</b> (Chrysomelidae)	Bore into <b>stems</b> (grubs); feed on seedlings and <b>leaves</b> of larger plants (adults)	<ul style="list-style-type: none"> <li>Use reflective mulches</li> <li>Plant trap crops (e.g., radish or Chinese mustard)</li> </ul>	Refer to Table 1
	<b>scarab grubs</b> ( <i>Scarabaeidae</i> ) possibly other beetles)	Eat roots		Refer to Table 1
<b>MAMMALS</b>				
<b>house mice</b> ( <i>Mus musculus</i> ) <b>deer mice</b> ( <i>Peromyscus</i> spp.)	Eat <b>young sprouts</b> and <b>seeds</b>	Strip bark from <b>stems</b> to build nests	<ul style="list-style-type: none"> <li>Double wrap a fence around plants that is 3'-tall ¼ " welded wire fence. Use aluminum flashing at least 18 inches tall as it is too smooth to climb.</li> <li>Trap (minus rodenticides)</li> <li>Weed-free zones</li> </ul>	rodenticides*
<b>Norway rats</b> ( <i>Rattus norvegicus</i> ) <b>wood rats</b> ( <i>Neotoma</i> spp.)	Eats <b>seeds</b> , strips <b>bark</b> , and burrows			
<b>pocket gophers</b> , ( <i>Thomomys</i> spp.)	Tunnel through planting areas; feed on plants; gnaw on irrigation lines			
<b>white-tailed deer</b> ( <i>Odocoileus virginianus</i> ) <b>mule deer</b> ( <i>Odocoileus hemionus</i> ) <b>elk</b> ( <i>Cervus canadensis</i> )	Knock over plants; leave dander, droppings, and ticks behind		<ul style="list-style-type: none"> <li>Install deer fencing</li> </ul>	Refer to Table 1
<b>black bears</b> ( <i>Ursus Americana</i> )	Knock over plants		<ul style="list-style-type: none"> <li>Install electric fencing</li> </ul>	Refer to Table 1

\* If using a rodenticide always read and follow the label and check to make sure that the target site and rodent is listed. Any federally restricted use pesticide must be applied by a certified applicator consistent with the registered labeling.

**Table 3. INDOOR PEST MANAGEMENT PRACTICES FOR HEMP**  
(e.g., greenhouses, sheds, and grow rooms)

An explanation of the column labels for Table 3 are as follows.

**PESTS.** The tables show the most likely pests in Montana based on Ward Gauthier’s presentation and McPartland’s list and gleaned from California-based web sites and blogs. Some pests (e.g., russet mites) may be worse during drought years. Many pests have cyclic population fluctuations and others are mainstays of general greenhouse cultivation (e.g., whiteflies, thrips, and fungus gnats).

**DAMAGE.** For damage caused by greenhouse pests, information provided relied on from Ward Gauthier’s presentation, McPartland’s list, and information from University of California IPM for various crops.

**PESTICIDES.** These are covered below in the Table 1 description and are exempt from residue tolerance requirements and exempt from registration requirements.

PEST	DAMAGE	IPM PRACTICES (monitoring; cultural, physical, mechanical, biological)	PESTICIDES
<b>DISEASES</b>			
<b>powdery mildew</b> ( <i>Sphaerotheca macularis</i> )	Grow on <b>leaves</b> as white and gray powdery patches	<ul style="list-style-type: none"> <li>▪ Use fans to improve air circulation</li> <li>▪ Reduce humidity</li> </ul>	Refer to Table 1
<b>pythium root rots</b> ( <i>Pythium</i> spp.)	Attack root tips and worsens when plants grow in wet soil	<ul style="list-style-type: none"> <li>▪ Avoid hydroponic production or wet soil conditions</li> </ul>	Refer to Table 1
<b>MITES &amp; INSECTS</b>			
<b>two-spotted spider mites</b> ( <i>Tetranychus urticae</i> and other Tetranychidae)	Suck plant sap; stipple <b>leaves</b>	<ul style="list-style-type: none"> <li>▪ Disinfest cuttings before introducing to growing area</li> <li>▪ Release predatory mites (<i>Amblyseius</i> spp., <i>Phytoseiulus persimilis</i>), or lacewings (<i>Chrysoperia</i> spp.)</li> </ul>	Refer to Table 1
<b>broad mites</b>	Distort <b>leaves</b> and <b>buds</b>	<ul style="list-style-type: none"> <li>▪ Inspect plants; disinfest or dispose of infested plants</li> <li>▪ Release predatory mites (<i>Amblyseius</i> spp.) and six- spotted thrips</li> </ul>	Refer to Table 1
<b>leafhoppers</b>	Suck plant sap; weaken plants	<ul style="list-style-type: none"> <li>▪ Encourage natural enemies by planting nectar sources</li> </ul>	Refer to Table 1
<b>whiteflies</b> ( <i>Trialeurodes vaporariorum</i> , <i>Bemisia tabaci</i> , <i>B. argentifolii</i> )	Suck plant sap; weaken plants	<ul style="list-style-type: none"> <li>▪ Hang up yellow sticky cards</li> <li>▪ Use biocontrol: <i>Amblyseius swirskii</i>, <i>Encarsia formosa</i>, <i>Delphastus catalinae</i>, <i>Steinernia feltiae</i></li> </ul>	cinnamon oil
<b>thrips</b> ( <i>Heliiothrips haemorrhoidalis</i> , <i>Frankliniella occidentalis</i> , <i>Thrips tabaci</i> )	Stipple and scar <b>leaves</b> ; vector viruses	<ul style="list-style-type: none"> <li>▪ Sterilize soil and pots before growing</li> <li>▪ Hang up yellow or blue sticky cards</li> <li>▪ Use biocontrol <i>Stratiolaelaps scimitus</i>, <i>Amblyseius cucumeris</i>, <i>Amblyseius swirskii</i>, <i>Orius insidiosus</i></li> </ul>	rosemary & peppermint oils
<b>russet mite</b> ( <i>A. cannabicola</i> )	Suck plant sap; kill <b>leaves</b> and <b>flowers</b>	<ul style="list-style-type: none"> <li>▪ Release predatory mites</li> </ul>	Refer to Table 1

PEST	DAMAGE	IPM PRACTICES (monitoring; cultural, physical, mechanical, biological)	PESTICIDES
<b>rice root aphid</b> <i>(Rhopalosiphum rufiabdominalis)</i>	Feed on roots; stunt and weaken plants	<ul style="list-style-type: none"> <li>▪ Dispose of weakened infested plants</li> <li>▪ Mix in sharp soil amendments such as diatomaceous earth</li> <li>▪ Use biocontrol: <i>Stratiolaelaps scimitus</i>, <i>Dalotia coriaria</i>, <i>Steinernema feltiae</i></li> </ul>	Refer to Table 1
<b>dark-winged fungus gnats</b> (Diptera: Sciaridae, <i>Bradysia</i> spp.)	Damage <b>roots</b> and stunt plant growth	<ul style="list-style-type: none"> <li>▪ Avoid overwatering</li> <li>▪ Use growing media that deters gnat development</li> <li>▪ Hang up yellow sticky cards</li> <li>▪ Use biocontrol: <i>Stratiolaelaps scimitus</i>, <i>Dalotia coriaria</i>, <i>Steinernema feltiae</i></li> </ul>	Refer to Table 1

## REFERENCES

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