



Pesticide Use in Marijuana Production: Safety Issues and Sustainable Options

As states legalize cannabis, toxics in cultivation intersect with health and the environment, and ecological practices

By Jay Feldman*

As states legalize the production of cannabis (marijuana) for medical and recreational purposes, regulations governing its cultivation may allow the application of pesticides untested for use in the plant's production, raising safety issues for patients and consumers. In the absence of federal regulations governing pesticides in cannabis production, the use of pesticides not registered by the U.S. Environmental Protection Agency (EPA)[†] is understood to be illegal. Several states have codified this understanding by adopting policies that prohibit all federally registered pesticides. Other states have taken the position that state policy is unnecessary, since EPA has not registered any pesticides for cannabis production and registered pesticide use is illegal. A review of state laws conducted by Beyond Pesticides finds a patchwork of regulations with varying degrees of protection for consumers and the environment.

Is the public adequately protected from pesticide use in cannabis production and residues on the crop that could be inhaled, ingested, or absorbed? Are states doing an adequate job to enforce the law?

The range of state standards and the lack of a federal role in establishing which pesticides are allowed for use in the plant's production raises critical concerns related to: (i) exposure from inhalation, ingestion, or absorption of pesticide residues on the crop; (ii) exposure to workers cultivating the plant; and (iii) environmental contamination and wildlife effects. Since the federal government classifies cannabis as a Schedule 1 narcotic, EPA does not establish restrictions for pesticides used in cannabis production, or tolerances (or exemptions from tolerances) for allowable pesticide residues on cannabis. As a result, EPA-permitted pesticide labels do not contain allowances for pesticide use in cannabis production. That might seem to be the end of the story, but, in fact, states have sought to address this issue and in some cases affirm the prohibition (either with clear prohibitory language or through regulatory silence with an explanatory note on pesticide prohibition), allow certain toxic pesticides with generalized label language that are exempt from tolerances, or permit pesticides that EPA has determined are exempt from registration.

In this context, toxic pesticide use in cannabis cultivation ranges from allowances of pre-plant herbicides to restrictions that only allow organic management systems without any synthetic materials. While much of the focus is on residues in inhaled, ingested, or absorbed cannabis, environmental impacts associated with growing practices are mostly not addressed.

**Drew Toher contributed research and analysis to this investigative report.*

†For purposes of this review, federally registered pesticides are distinguished from pesticide exempt from federal registration under Section 25(b) of the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA). Registered pesticides are subject to EPA-required testing by the manufacturer for health and environmental effects, while 25(b) pesticides exempt from registration are waived from data requirements because they have been determined to contain ingredients identified as harmless.

State of Cannabis Legalization

Twenty-three states¹ and the District of Columbia (DC) have passed medical cannabis laws as of January 2015, and, of these, four states² and DC have voted through ballot initiatives to allow recreational use. Of the 23 states, 17 states³ and DC have adopted policies or rules governing pesticide use in cannabis production. A review of state laws reveals a mix of approaches in the absence of federal oversight. Six states,⁴ generally those without medical marijuana dispensaries (where medical marijuana is sold and often grown in greenhouses), but including California (which has legalized medical marijuana and comprises nearly 50% of cannabis sales⁵ nationally), are silent on pesticide use in cannabis production, while five⁶ others specifically outlaw any application of a federally registered pesticide. Of these, three states⁷ have adopted a specific requirement that cannabis is grown without any pesticides.⁸ As with all crop production systems, cannabis grown without toxic pesticides not only protects the consumer from pesticide exposure, but also the workers who grow the crop, and the environment where it is grown.

Pesticide Residues in Cannabis

Pesticide residues in cannabis that has been dried and is inhaled have a direct pathway into the bloodstream.⁹ Like other foodstuffs, contaminants consumed through foods mixed with cannabis may present an exposure hazard. It is logical to assume that the prohibition on the use of a federally registered pesticide would result in a zero tolerance or allowable residue on the consumed cannabis. However, three states¹⁰ allow cannabis to contain pesticide residues of any federally registered pesticide up to a level less than the lowest legal residue of the pesticide on food. Oregon has set a generally acceptable level of .1ppm.¹¹ This allowance of pesticide exposure does not account for the lack of EPA review of cumulative risk or toxic body burden associated with the additional exposure to pesticide residues from cannabis.

Inhalation of Pesticide Residues

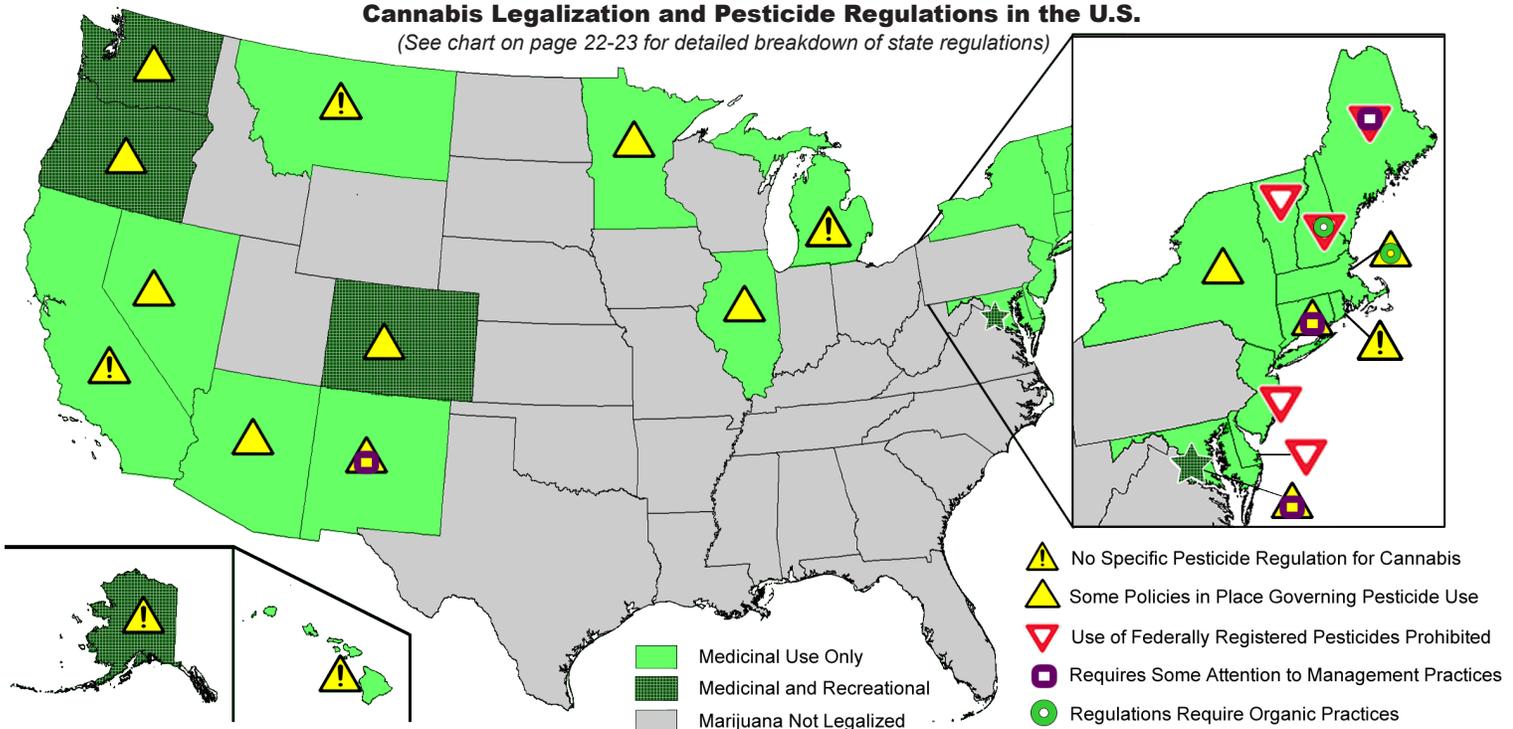
Very little peer-reviewed research has been published on the health and safety risks associated with pesticides on dried cannabis. However, the tests that have been performed show cause for significant consumer concern, particularly medical patients or those with elevated risk factors.

Studies on tobacco provide good indications of the threats that may arise from smoking pesticide-laced products and, thus, the importance of state enforcement. A 2002 study, published in the *Journal of Chromatography A*, found that 1.5-15.5% of pyrethroid insecticides on treated tobacco is transferred to cigarette smoke.¹² Significant levels of pesticide residues were found within the cigarette's cotton filter. In addition to the transference of pesticide residue from the dried plant to the smoker, burning can cause pyrolysis (decomposition) of the pesticide, forming toxic mixtures¹³ or other toxic pesticide contaminants.¹⁴ Additionally, unlike most packaged tobacco products, cannabis is not typically filtered when its smoke is inhaled, and therefore smokers may expose themselves to much higher levels of pesticides and degradates.

A 2013 study, published in the *Journal of Toxicology*, found that up to 69.5% of pesticide residues can remain in smoked marijuana.¹⁵ Filtering the smoke through water showed only a slight reduction in pesticide residues.¹⁶ However, when filtered through cotton, pesticide levels were similar to levels in tobacco, with 1-11% of tested pesticides reaching the user. Authors of the *Journal of Toxicology* study note that, "High pesticide exposure through cannabis smoking is a significant possibility, which may lead to further health complications in cannabis users." The significance of these results may confound studies that have associated cannabis use with negative health outcomes, according to researchers.¹⁷

Cannabis Legalization and Pesticide Regulations in the U.S.

(See chart on page 22-23 for detailed breakdown of state regulations)



Federal Pesticide Law

Pesticide use in the U.S. is governed by the *Federal Insecticide Fungicide and Rodenticide Act* (FIFRA), which establishes a goal of preventing “unreasonable adverse effects”¹⁸ from pesticide use. The law, passed in 1947 and overhauled in 1972, sets minimum use restrictions regarding the registration and labeling of pesticides. FIFRA is implemented in coordination with the *Federal Food Drug and Cosmetic Act*, which establishes tolerance limits for allowable pesticide residues on specific crops, unless the agency determines the pesticide is exempt from a tolerance limit. Pesticides considered minimum risk under FIFRA’s section 25(b) criteria are exempt from federal registration. Examples of minimum risk pesticides include lauryl sulfate, white pepper, and certain essential oils such as castor oil, eugenol, cinnamon oil, and soybean oil. (See box, right, on 25(b) pesticides.)

Except for 25(b) pesticides, FIFRA requires federal registration of all pesticides produced or sold in the U.S. and establishes minimum standards for allowable uses. State and local governments may adopt more stringent standards than those set by EPA under FIFRA,¹⁹ however, 43 state legislatures have stripped localities of the authority to restrict pesticide use in their communities under laws that preempt local jurisdictions.²⁰ The label on a pesticide product delineates the legal uses, application rates, and other restrictions, such as protection of agricultural workers and others who handle pesticides, limitations regarding threatened and endangered species (in coordination with the *Endangered Species Act*), and other special use and disposal requirements. Because EPA is barred from registering a pesticide for use on cannabis or setting

Breakdown of Pesticide Product Categories

Federally Registered Pesticides: Unless determined to be minimum risk and exempt from registration, pesticides, (including herbicides, insecticides, rodenticides, antimicrobial products, and biopesticides) must undergo EPA’s formal registration process, which includes a scientific assessment of the active ingredient that is included in pesticide products.

Organic pesticides: Pesticides allowed for use in organic production must be evaluated by the National Organic Standards Board for their essentiality, impacts to human and environment health, and compatibility with organic practices. In general, natural pesticides are allowed unless specifically prohibited and synthetic pesticides are prohibited unless specifically recommended by the NOSB.

List 25(b) – Federally Exempt Minimum Risk Pesticides: Minimum risk pesticides under section 25(b) of FIFRA are not required to undergo the federal registration process if their ingredients are “demonstrably safe for its intended use.”²¹ Some states require state-level registration of 25(b) pesticides, but do not conduct safety testing.

Pesticides Exempt from a Tolerance: EPA determines certain pesticides are exempt from a tolerance on a food crop based on toxicity and exposure data specific to the pesticides’ use pattern. Not all 25(b) pesticides are exempt from a tolerance.

(or exempting from) tolerance limits for pesticide residues on cannabis crops, and given the plant’s classification as a narcotic, the evaluation of pesticide use, assessment of exposure hazards, and the setting of pesticide use restrictions by EPA is also prohibited at the federal level.

The California Response –Medical Cannabis Use

California exemplifies a state with a cannabis legalization law at odds with U.S. narcotics law. Voters in the state in 1996 passed the first medical marijuana law in the country, the *Compassionate Use Act*, Prop 215. The measure allows patients to grow their own cannabis and assigns the regulation of cultivation facilities to county agencies. Because California state law and regulations are silent on the use of pesticides on cannabis, and given that there are no pesticides registered by EPA for use on the plant, use of federally registered pesticides in cannabis cultivation is not compliant with the law.

The California regulatory response to Prop 215 raises policy gaps specific to cannabis as both an agricultural crop and a medical drug. A 2012 report commissioned by California Assembly member Linda Halderman, M.D., and produced by the nonpartisan California Research Bureau, investigated the policy gaps in medical cannabis culti-



Medical marijuana dispensary in Denver, Colorado. Photo by O’Dea at WikiCommons.

vation regulation within the state. The report raised more questions than it answered. To address regulatory uncertainty, it was determined critically important that medical marijuana be legally defined.

However, as it stands, there is no clear determination as to whether medicinal cannabis is an agricultural crop or a medical drug.²² In the medical context, cannabis as a medicine is nevertheless derived from a crop, and the cultivation of the crop is subject to production input use restrictions. The report finds that because there are no pesticide products registered for use on cannabis by EPA under FIFRA, and given that applying a pesticide for an unregistered use is illegal under pesticide law, “[California Department of Pesticide Regulation] CDPR could confiscate all medical marijuana crops treated illegally with pesticides. . .” However, the report also notes that confiscation would violate the *Compassionate Use Act*, which guarantees ill Californians access to medical marijuana. California’s report notes that growers can simply not spray pesticides²³ in order to avoid potential confiscation of their crops. However, Anthony Silvaggio, Ph.D., Professor at California State University Humboldt, states in the report, “There are very, very, very few 100% organic growers.”

The Washington State Approach –Legalization of Recreational Cannabis Use

With the passage of laws legalizing recreational use of cannabis in the states of Washington and Colorado in 2012 and Alaska, Oregon, and DC in 2014, there is a growing question of pesticide use in cannabis cultivation. States have begun to look to EPA for guidance and legal authorities.

Washington state took the proactive step of requesting guidance from EPA, according to a September 2014 document released by the Washington State Department of Agriculture (WSDA),²⁴ the pesticide lead agency in the state. The state received the following response from EPA:

“In determining which pesticides, if any, might be used legally on marijuana, the WSDA asked the EPA if marijuana might fit into any general crop groups, such as herbs, spices or vegetable gardens. EPA’s current position is that marijuana is not an herb, a spice or a vegetable. EPA considers marijuana to be a controlled substance, and has indicated that marijuana is not listed as a crop/site on any pesticide label. However, EPA does concede that, depending on actual label language, pesticides may be legally used on marijuana under certain other very general types of crops/sites when there is an exemption from the requirement of a tolerance.”

While WSDA had indicated that its regulation of pesti-

cides in cannabis cultivation “may be rescinded or superseded at any time,” the state is allowing pesticides (i) registered by EPA and the state,²⁵ (ii) with active ingredients exempt from tolerances, and (iii) with directions for use on “unspecified food crops, home gardens, or herbs.”²⁶ Regarding 25(b) pesticides exempt from registration, WSDA indicates that the product must be registered with the state, and must also be labeled for use on “unspecified food crops, home gardens, or herbs” in order to be applied to cannabis plants. However, WSDA does not specifically acknowledge that not all 25(b) pesticides are exempt from tolerances on food crops. Further, WSDA explains that it finds pesticide use, including broad spectrum herbicides and soil fumigants, to be acceptable prior to planting marijuana outdoors as long as the label on the pesticide product does not specify the food crop to be planted after the pesticide application.

Other states are investigating standards similar to those adopted by WSDA. Colorado has proposed new rules that call for the development of an approved pesticide list.²⁷ In the state of Nevada, regulators have convened an Independent Laboratory Advisory Committee to establish a list of approved pesticides. As part of Illinois’ *2013 Medical Cannabis Pilot Program Act*, the state’s regulations include a list of allowed active ingredients, rather than a list of products. However, Illinois rules do not allow synthetic active ingredients, and disallows the application of pesticides to cannabis crops after its vegetative stage.²⁸

Pesticides that May Be Used and Health Effects

The use of pesticides not specifically registered for use on a crop raises health and safety issues. An allowance of a pesticide use and exposure pattern not evaluated for its potential health impacts remains a concern among health advocates.

WSDA has compiled a list of 271 allowed pesticide products that fit the criteria it developed in its opinion on cannabis production.²⁹ A review of the list finds pesticides exempt from tolerances by EPA, such as pyrethrins, sulfur, and essential oils. However, it appears that WSDA does allow a 25(b) material (sodium lauryl sulfate) that is not exempt from a tolerance.³⁰ On the other hand, the synthetic piperonyl butoxide (PBO), frequently used as a synergist to enhance the toxicity of a pesticide product’s active ingredient, is allowed by WSDA because its use in crop production is exempt from a tolerance.³¹ (See box at left on environmental effects of pesticides.) PBO has been linked to numerous adverse human health impacts, including cancer, neurotoxicity, and adverse impacts on liver function.³² Further, while natural pesticides are usually preferable to synthetic counterparts, products containing pyrethrins and metals present an exposure risk to workers and wildlife.³³

Environmental Effects of Pesticides

Analysis of the environmental effects of pesticides is a part of the federal registration process, and is based upon where a pesticide is used and its rate of application. Given the volume of pesticides used in the cultivation of cannabis, and its potential to be grown both indoors and outdoors, the lack of an environmental assessment of pesticides exempt from tolerance raises questions about potential effects to nontarget plants and wildlife, as well as the entire ecosystem in which they are used.³³

Of concern is the use of broad spectrum synthetic herbicides and soil fumigants prior to the planting of cannabis. Although regulators in those states that allow herbicide use in cannabis cultivation may not consider this a human health issue because the chemicals are not being applied directly to consumable cannabis, chemicals in the soil can be taken up by the plants, and herbicide use can result in water contamination, wildlife effects, and injury to workers.

Testing and Labeling for Production Practices

States have taken a wide variety of approaches to the testing and labeling of cannabis for pesticide residue and other contaminants. Twelve states³⁴ require regulators to test random samples of cannabis batches, a quantity of cannabis produced at one time, for pesticide residues. New Mexico and Vermont require testing only after a complaint of contaminants has been received. The District of Columbia requires growers to create a plan to test and ensure patients that cannabis is free of contaminants. Delaware requires dispensaries to develop a protocol for testing cannabis, but does not explicitly state that pesticides must be included. While rules for recreational cannabis in Colorado do not mandate laboratory analysis, if testing is not conducted, cannabis products must display a label statement that reads, "The marijuana contained within this package has not been tested for contaminants."

Four states³⁵ and DC require both residue testing and the labeling of all chemical pesticides used in the production of cannabis. Connecticut and Illinois require labels to indicate only whether the cannabis batch passed or failed laboratory tests. Oregon does not require an indication of pass or fail, but does require the label to indicate the laboratory that performed the analysis. Delaware and Massachusetts require labels to include an indication that the cannabis is free of contaminants, while New Hampshire, which mandates testing, also requires a label to note that the product is not certified to be free of contaminants.

The Maine Experience

In early 2013, Wellness Connection, a medical marijuana dispensary with several locations throughout the state of Maine, was fined \$18,000 by the Maine Department of Health and Human Services (MDHHS) for illegal pesticide applications. A tip from an employee led to an investigation.³⁶ At the time, Maine's law prohibited the use of any pesticides in cannabis production, both federally registered and exempt from fed-

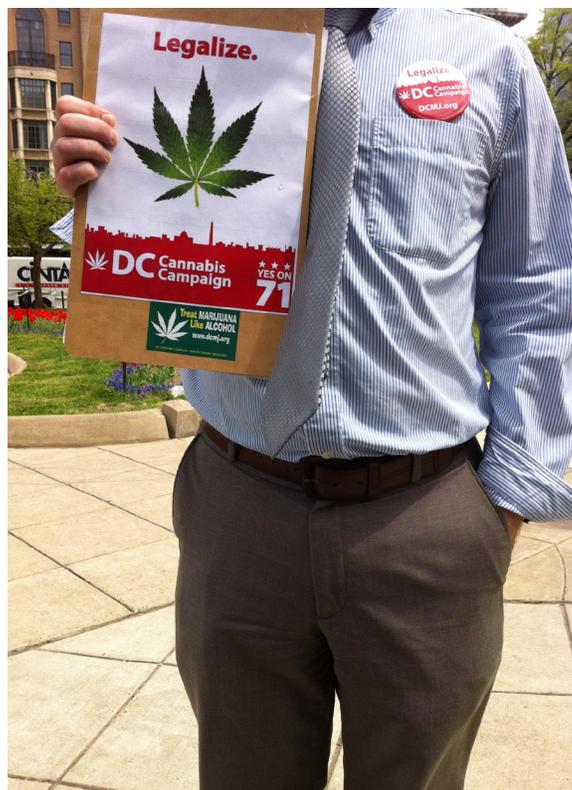
eral registration. After the citation, Wellness Connection and other medical cannabis providers in the state successfully lobbied for a bill, LD 1531, *An Act to Maintain Access to Safe Medical Marijuana*, that allows the application of 25(b) pesticides in the production of cannabis. Subsequently, Becky DeKeuster, Wellness Connection executive director, told the *Portland Press Herald* that the company is now using environmental and mechanical methods, including beneficial predaceous insects, such as parasitic wasps, to control pests, and that it has no need to use even the 25(b) pesticides. "It's good to have the 25(b)'s in the toolkit," Ms. DeKeuster said to the *Press Herald*. She continued, "Are they one of the first things we'll use? No, they're probably one of the last."

A Systems Approach to Cannabis Cultivation

Five states³⁷ and DC are currently regulating medical cannabis with some focus on ensuring proper growing practices that avoid or prohibit the use of pesticides as a priority. The state of Connecticut banned the use of all pesticides except in cases where infestation would result in catastrophic loss (which is not defined). And, before this application can occur, producers must obtain authorization from state regulators. This strategy puts a focus on pest prevention, yet provides a backstop in the event of an emergency. However, Connecticut's law does not require growers to have a production or pest management plan in place. Regulators have discretionary authority to allow pesticide exemptions for producers. Moreover, the state does not detail what chemicals may be allowed to be used in the event of an emergency, raising the question of illegal use of a federally registered pesticide.

Maine and DC, which prohibit cultivation centers from using synthetic pesticides, require producers to be able to demonstrate knowledge of organic growing methods. New Mexico has a similar requirement on organic practices, but new rules may strike this provision, weakening safety standards.

Minnesota regulators have adopted rules that require producers to design the cultivation process in a way that limits contamination. Although this language is broad, it shows a focus on a systems approach to pest management. Massachusetts and New Hampshire have similar language within their regulations, but go further in protecting patient health. These two New England states are the only ones that require growers to follow cultivation practices consistent with organic methods. While Massachusetts allows only the use of



A canvasser for the Washington DC Cannabis Campaign, soliciting signatures for Initiative 71. Photo by Matthew Vanitas

pesticides permitted in certified organic production,³⁸ New Hampshire specifically permits only pesticides that are allowed in certified organic and also exempt from federal registration.

In fact, seven states³⁹ and DC cite organic production in their regulations. Most include the subject only to note that cannabis cannot be labeled organic unless certified by the U.S. Department of Agriculture (USDA). As with EPA, given cannabis' status as an illegal narcotic, USDA is barred from applying the organic seal to any end-use marijuana consumer product. However, in theory, independent certifiers could use their own seals to identify compliance with their standards. Despite this absence of the USDA certified organic seal and mandated organic production practices,

regulations in Maine require dispensaries to indicate whether the cannabis sold meets organic standards. Under USDA organic regulations, growers are required to create and follow an organic system plan (OSP) for their production process. The OSP must include: a detailed description of the practices and procedures that will be undertaken by the certifier producer, a list of substances to be used as a production input, a description of how practices will be monitored, and recordkeeping requirements to ensure the plan is followed. Growers following organic standards must implement cultural, mechanical, physical, or biological controls before considering the use of an allowed pesticide. Moreover, conditions governing the use of any such pesticide must be included within the grower's OSP.

Survey Findings Summary

Beyond Pesticides' survey evaluates the pesticide use policies on cannabis production in 23 states and DC that have passed medical cannabis laws as of January 2015, including the four states and DC that have voted through ballot initiatives to allow recreational use of marijuana. The survey findings identify state actions regarding general pesticide restrictions, testing for pesticide contaminants, labeling of pesticide products applied to cannabis, and whether organic practices are addressed by regulations.⁴⁰ (See chart on page 22 for a summary.)

Allowed and Prohibited Pesticides by State:

- **Silent on Pesticide Use Restrictions:** Six states are silent on pesticides, the assumption being that their use is illegal because they have not received federal registration for use on cannabis. It can be assumed that pesticides exempt from federal registration are in use, however, there is a lack of clarity due to inaction on policy in these states.
- **No Federally Registered Pesticides:** Five states have adopted regulations that affirmatively prohibit federally registered pesticides in cannabis production.
- **No Synthetics:** Six states and DC effectively prohibit the use of synthetic pesticides in cannabis production.
- **Strict Limits:** Two states specifically allow only federally exempt 25(b) pesticides to be applied to cannabis plants.
- **No Pesticides:** Three states have adopted regulations that prohibit pesticide use in cannabis production. However, discussions with state regulators indicate confusion on the allowance of 25(b) pesticides. (See endnote 8.)
- **Pesticide Use Lists:** Washington state maintains a list of allowed pesticide products, and three states are investigating the use of similar lists.

- **In the Works:** Four states and DC (recreational) are in the process of creating regulations that may or may not address pesticide use. Two of these states and DC are writing their first rules regarding legalized cannabis.

Growing Practices:

- **System Focus:** Five states and DC are currently regulating medical cannabis by focusing on requiring growing practices that prevent the use of pesticides.
- **Catastrophic Loss:** Connecticut allows pesticide use only when authorized by a regulator to address catastrophic loss.
- **Organic Knowledge:** Two states and DC require a dispensary applicant's knowledge of organic practices.
- **Organic Practices:** Two states require growers to follow organic practices.

Pesticide Testing:

- Fourteen states address the testing of cannabis plants for pesticide residue.
- **Required:** Twelve states require regulators to test random samples of cannabis batches for pesticide residue.
 - **After a Complaint:** Two states require testing only after a complaint about contaminants has been received.
 - **Uncertain:** In one state and DC, the

law is not explicit in requiring pesticide residue analysis.

- **Lowest Acceptable Residue Standard:** In three states, if the residues detected on the cannabis plant are lower than the most stringent acceptable standard for a pesticide residue on any food crop, the plant is deemed in compliance.
- **Less than .1 ppm:** Oregon deems a pesticide residue test to fail if found to be greater than .1 parts per million.

Pesticide Labeling:

Nine states and DC require some form of labeling regarding contaminants on cannabis plants.

- **Label Pesticides Used:** Four states and DC require the labeling of all pesticides used in the production of cannabis.
- **Pass/Fail:** Two states require labels to indicate whether cannabis passed or failed laboratory tests (based on lowest acceptable residue standard).
- **Generalized Statement:** Three states require a generalized label statement regarding contaminants in cannabis. One state (recreational)⁴¹ requires a generalized statement if lab testing is not conducted.
- **List the Lab:** One state requires the label to indicate the name of the testing facility.

Analysis/Recommendations

The survey results raise serious questions about pesticide exposure, inadequate regulatory oversight, and incentives or requirements to adopt sustainable practices in the cultivation of cannabis. While most state regulations currently offer some level of protection for patients and consumers, it is important that this growing \$1.5 billion industry,⁴² authorized by numerous state laws, has clearer standards that restrict pesticide use and establish required sustainable cultivation systems based on the organic model. The restrictions should specifically prohibit pesticides registered by EPA, but allow those exempt 25(b) pesticides.

Allowed and Prohibited Pesticides: In the absence of adequate testing at the federal level on the potential impacts of pesticide use on cannabis to consumers, workers, and the environment, states should provide clear rules to producers regarding sustainable production practices that protect public health and the environment. Beyond Pesticides recommends that states follow an approach similar to New Hampshire, which restricts growers to pesticides that are (i) allowed for use in organic production and (ii) exempt from federal registration (25(b)). It is critical that these restrictions also require a system plan that governs the potential use of a pesticide after alternative means have been exhausted.

Pesticide Testing: State regulations should be written to include the batch testing of pesticide contaminants in cannabis sold. Testing laboratories should be independently certified, and the laboratory name should be disclosed on the product label. Relying on a complaint to investigate a supplier is not an effective means of enforcing safety standards, and unfairly places the burden on consumers and patients, who are likely to submit a complaint only after suffering injury or harm.

Pre-plant Use of Pesticides:

Pre-plant (used on soil prior to planting) use of registered pesticides should be prohibited. These chemicals typically leave residues in the soil that can be taken up by plants and result in exposure through inhalation or ingestion of the crop.

Pesticide Labeling: Regardless of what pesticides are current-

ly allowed under state law, all states should require the labeling of all pesticides that have been applied to a cannabis plant throughout its entire production and processing.

Environmental Protection: Exemption from tolerance should not alone allow the use of a registered pesticide. Use patterns (in addition to those federally registered) could cause environmental damage that has not been evaluated. These include impacts on waterways and wildlife (including endangered species).

Organic Practices: States should pass laws or implement rules that require a systems approach to cannabis production. State requirements that growers follow national organic standards (with only exempt pesticides permitted in organic) represent a positive trajectory for the industry.

EPA Guidance: Current EPA guidance is misleading and suggests allowances of pesticide use that can be damaging to public health and the environment due to a lack of federal assessment of pesticide use and exposure patterns. EPA should simply notify the states that pesticides registered by the agency that are applied to fields or greenhouses before planting, or on plants during cultivation or post-harvest are illegal and subject to a violation of the pesticide product label.

EPA allowances of pesticide product labels that permit toxic pesticide use on “unspecified food crops, home gardens and herbs” undermines the agency’s fundamental responsibility to evaluate use patterns and exposure.

Conclusion

Pesticide use in the legal cultivation of cannabis in 23 states raises serious concerns about protection of public health and the environment. Those states that have adopted affirmative policies governing cannabis cultivation vary in their clarity in restricting pesticide use. EPA’s guidance has muddied the waters on this by suggesting the allowance of pre-planting pesticides and those with exemption from tolerances, or used under generalized labels that allow use on unspecified crops. Most importantly, six states of the total that have legalized cannabis production are silent on the issue of pesticide use, which raises serious questions about their efforts to



Entryway to a medical marijuana shop in Durango, Colorado.

enforce against the use of pesticides. The public and environment require uniform protections that include the following three basic elements:

1. Prohibition of federally registered pesticide use.
2. Allowance of pesticide exempt from federal registration, but

not those that are only exempt from tolerances.

3. Requirements for an organic system plan that focuses on sustainable practices and only 25(b) products as a last resort.

Matthew Porter contributed to this piece.

Endnotes

1. AK, AZ, CA, CO, CT, DE, HI, IL, ME, MD, MA, MI, MN, MO, NV, NH, NJ, NM, NY, OR, RI, VT, and WA.
2. AK, CO, OR, and WA.
3. AZ, CO, CT, DE, IL, ME, MA, MN, NV, NH, NJ, NM, OR, VT, and WA states.
4. AK, CA, HI, MI, MO, and RI.
5. Ferner, Matt. 2015. Huffington Post. Legal Marijuana is the Fastest-Growing Industry in the U.S.: Report. http://www.huffingtonpost.com/2015/01/25/marijuana-industry-fastest-growing_n_6540166.html.
6. DE, MA, NH, NJ, and VT.
7. DE, NJ, and VT. Personal communication with state regulators suggests that the laws citing "pesticide" prohibition are referring to "federally registered" pesticides and may allow pesticides exempt from federal registration, known as FIFRA 25(b) pesticides.
8. **Delaware:** Title 16 Health and Safety, 4470 State of Delaware Medical Marijuana Code, 7.1.4 "Use of pesticides is prohibited: There are no pesticides authorized for use on marijuana; as such, a compassion center shall not apply pesticides in the cultivation of marijuana."
New Jersey: Adopted New Rules NJAC 8:64 -10.9 Pesticide Use Prohibited "Inasmuch as there are no pesticides authorized for use on marijuana, and the unauthorized application of pesticides is unlawful, an ATC shall not apply pesticides in the cultivation of marijuana."
Vermont: Rules Governing the Vermont Marijuana Program, Section 6 "No pesticide use. There are no pesticides authorized for use on marijuana, and unauthorized application of pesticides is unlawful."
8. Ogg, Clyde L. et al. 2012. Managing the Risks of Pesticide Poisoning and Understanding the Signs and Symptoms. University of Nebraska Extension. <http://ianrpubs.unl.edu/live/ec2505/build/ec2505.pdf>.
9. CT, IL, NV.
10. Oregon: "A sample of usable marijuana shall be deemed to test positive for pesticides with a detection of more than 0.1 parts per million of any pesticide."
11. Cai, Jibao et al. 2002. Determination of pyrethroid residues in tobacco and cigarette smoke by capillary gas chromatography. DOI: 10.1016/S0021-9673(02)00586-1.
12. Lorenz, W. et al. 1987. Thermolysis of Pesticide Residues During Tobacco Smoking. *Chemosphere*. Vol.16, Nos.2/3, pp 521-522, 198.
13. Rodgman, Alan and Perfetti, Thomas. 2013. The Chemical Components of Tobacco and Tobacco Smoke, Second Edition. Page 1105, Table 21.2 Degradation Products of Pesticides in MSS.
14. Sullivan, Nicholas et al. 2013. Determination of Pesticide Residues in Cannabis Smoke. *Journal of Toxicology*. Volume 2013 (2013), Article ID 378168, 6 pages <http://www.hindawi.com/journals/jt/2013/378168/>.
15. Ibid.
16. Ibid.
17. For more of Beyond Pesticides take on risk assessment in FIFRA, see Kepner, John and Feldman, Jay. 2006. Taking off the Blindfold, EPA ignores toxic exposures in risk assessment. *Pesticides and You*. Beyond Pesticides.
18. See *Wisconsin Public Intervenor, et al., Petitioners v. Ralph Mortier et al.* 501 U.S. 597 (1991).
19. See Porter, Matt. 2014. State Preemption Law. *Pesticides and You*. Beyond Pesticides.
20. Environmental Protection Agency. 2014. Minimum Risk Pesticides. http://www.epa.gov/pesticides/biopesticides/regtools/25b_list.htm.
21. Lindsey, Tonya D. 2012. Medical Marijuana Cultivation and Policy Gaps. *California Research Bureau*. http://www.canorml.org/prop/CRB_Pesticides_on_Medical_Marijuana_Report.pdf.
22. It appears that the reference to "pesticides" in California is to federally registered pesticides and not those exempt from federal registration (25(b) pesticides) and not registered by the state of California.
23. Washington State Department of Agriculture. 2014. Criteria for Pesticides Used for the Production of Marijuana in Washington. <http://agr.wa.gov/FP/Pubs/docs/398-WSDACriteriaForPesticideUseOnMarijuana.pdf>.
24. State registration, with the exception of California, is simply a licensing process and does not impose independent toxicological or environmental assessments as a routine.
25. **EPA and WSDA registration is required:** (i) Prior to distribution of the pesticide; (ii) Prior to planting marijuana outdoors (such as a field), use of a pesticide (e.g., broad spectrum herbicide, soil fumigant) is allowed if the food crop to be planted following application is not specified on the label; (iii) Prior to planting marijuana in an enclosed facility (such as a greenhouse), use of a pesticide (e.g., disinfectant, sanitizer) is allowed to control microorganisms on surfaces (such as benches, floors, pallets, pots, skids).
Use of a pesticide on marijuana is allowed if: (i) The active ingredient is exempt from the requirements of a tolerance (e.g., auxins, biopesticides [most active ingredients], copper, cytokinins, gibberellins, petroleum oil, phosphorous acid, pyrethrins, soap, sulfur), and (ii) The label has directions for use on unspecified food crops, home gardens or herbs (outdoor or enclosed), including unspecified food crops or herbs grown as bedding plants. (Marijuana will not be specifically listed as a crop on the pesticide label.)
Section 25b minimum risk pesticides (exempt from federal registration): (i) WSDA registration is required prior to distribution of the pesticide; (ii) Use on marijuana is allowed if the product is labeled for use on unspecified food crops, home gardens or herbs (outdoor or enclosed), including unspecified food crops or herbs grown as bedding plants. (Marijuana will not be specifically listed as a crop on the pesticide label.)
25. Colorado Department of Agriculture Plant Industry Division. 2014. Proposed Rule: Criteria for Determining the Legal Use of Pesticides in Marijuana Cultivation. 8 CCR 1203-25.
26. The consumable product of the cannabis plant is the flower, which is produced after the vegetative stage. Barring pesticide applications after the vegetative stage prevents pesticide applications from being made directly to the end-use product.
27. Washington State University Pesticide Information Center Online. 2014. WA I502 list. <http://cru66.cahe.wsu.edu/labels/Labels.php?SrchType=>.
28. The product in question is Messina Wildlife's Mole and Vole Stopper. <http://cru66.cahe.wsu.edu/~picol/pdf/WA/54761.pdf>.
29. <http://www.gpo.gov/fdsys/pkg/CFR-2008-title40-vol23/xml/CFR-2008-title40-vol23-sec180-905.xml>.
30. Beyond Pesticides. 2006. ChemicalWATCH Factsheet - Piperonyl Butoxide. <http://www.beyondpesticides.org/pesticides/factsheets/Piperonyl%20Butoxide.pdf>.
31. Environmental Protection Agency. 2014. Pesticides: Environmental Effects. Ecological Risk Assessments. <http://www.epa.gov/pesticides/ecosystem/ecorisk.htm>.
32. AZ, CO (medical), CT, IL, ME, MA, MN, NV, NH, NJ, OR, and WA.
33. AZ, CO (medical), NV, and WA.
34. Ricker, Nok-Noi. 2013. Maine marijuana growing center cited for using pesticides. *Bangor Daily News*. <http://bangordailynews.com/2013/03/25/news/state/maine-marijuana-cultivation-center-used-pesticides-state-official-says/>.
35. CT, MA, ME, NH, and NM.
36. Since federally registered pesticides may be used in organic agriculture, their use in cannabis production (a non-labeled used) should be considered an illegal application, except that EPA allows some pesticides to be used on "unspecified crops."
37. CT, ME, MA, NV, NH, NJ, and WA.
38. Note that most states address pesticide use on cannabis through rules or regulations, which are subject to change. This analysis does not address other cannabis related issues such as user access, caretakers, ability to grow your own, licensing fees, or taxes.
39. Statement must read: "The marijuana product contained within this package has not been tested for contaminants."
40. Karnes, Matthew. 2014. State of the Emerging Marijuana Industry Current Trends and Projections. GreenWave Advisors. https://www.greenwaveadvisors.com/wp-content/uploads/GreenWave_Report_ES.pdf.

Pesticide Laws in States with Legalized Cannabis (Marijuana) Production

State	Pesticide Restrictions	Pesticide/Contaminant Testing	Pesticide Labeling	Organic Discussed	State Act or Regulation
<i>Alaska</i> – <i>Medical</i>	No	No	No	No	Alaska Statutes, Chapter 37: Medical Uses of Marijuana Program.
– <i>Recreational</i>	To be determined.	To be determined.	To be determined.	To be determined.	“An Act to Tax and Regulate the Production, Sale, and Use of Marijuana.”
<i>Arizona</i>	No	Testing for pesticide residues required.	Yes –list of all chemical additives used in production.	No	Title 9. Health Services. Chapter 17. Department of Health Services Medical Marijuana Program.
<i>California</i>	No	No	No	No	SB 420, Lindsey, Tonya D. 2012. Medical Marijuana Cultivation and Policy Gaps. California Research Bureau.
<i>Colorado</i> – <i>Medical</i>	Individual localities may further regulate.	Testing for pesticide residues required.	Yes –list of all chemical additives used in production.	No	Colorado Department of Revenue. 1 CCR212-1.
– <i>Recreational</i>	No	Not required, but, if not performed, must state on label, “The marijuana contained within this package has not been tested for contaminants.”	Yes –list of all non-organic pesticides used in production.	No	Colorado Department of Revenue. 1 CCR212-2.
<i>Connecticut</i>	Pesticide use not allowed unless authorized by regulator to address infestation that would result in catastrophic loss.	Testing for pesticide residues required; those that exceed acceptable levels (higher than most stringent residue standard on any food as set by EPA) must be disposed.	Must list whether the product passed/failed laboratory tests.	Not allowed to be labeled organic unless certified to be consistent with national organic standards.	State of Connecticut. Department of Consumer Protection Regulations. Sec. 21a-408.
<i>Delaware</i>	Use of pesticides prohibited.	Dispensaries required to develop testing protocol, which may or may not include pesticide contaminants.	Dispensaries required to develop labeling that includes details indicating the medical marijuana is free of contaminants.	No	4470 State of Delaware Medical Marijuana Code.
<i>District of Columbia</i> – <i>Medical</i>	Cultivation centers forbidden from using synthetic pesticides.	Dispensaries required to describe plan for testing or verifying medical marijuana received from a cultivation center and ensuring that all medical marijuana is free of contaminants.	Yes –list of all chemical additives used in production.	Cultivation center applicants must demonstrate knowledge of organic growing methods.	District of Columbia Title 22-C.
– <i>Recreational</i>	To be determined.	To be determined.	To be determined.	To be determined.	DC Initiative 71
<i>Hawaii</i>	No	No	No	No	Hawaii Administrative Rules. Chapter 23-202
<i>Illinois</i>	Department created a list of approved pesticide active ingredients; pesticides may not be applied after the vegetative stage of a cannabis plant.	Testing for pesticide residues required –product deemed to pass if lower than most stringent acceptable standard for the pesticide residue on any food item, as set by EPA; publish list of labs that can test medical cannabis.	Must list whether the product passed/failed laboratory tests, producer must have plan for ensuring cannabis is free of contaminants.	No	Illinois Department of Agriculture. 8 Ill. Adm. Code 1000.
<i>Maine</i>	Only pesticides exempt from a federal registration allowed.	Testing for pesticide residues required.	No	Require producer knowledge of organic practices; not allowed to be labeled organic unless certified to be consistent with national organic standards; must provide patients information whether products meet organic certification standards.	Rules Governing the Maine Medical Use of Marijuana Program. 10-144CMR Chapter 122.

Maryland	To be determined.	To be determined.	To be determined.	To be determined.	Senate Bill 923
Massachusetts	Non-organic pesticide use prohibited –cultivation process requires best practices to limit contamination.	Testing for pesticide residues required –frequency of testing determined by regulators.	Requires statement that product has been tested for contaminants and there were no adverse findings.	Cultivation must be consistent with USDA national organic standards.	105.CMR:Department of Health. (725.105).
Michigan	No	No	No	No	Department of Licensing and Regulatory Affairs. R 333.101.
Minnesota	Product must be designed in a way that limits contamination.	Testing for pesticide residues required –rules regarding testing of pesticides To be determined. by regulator.	No	No	Minnesota Department of Health. 4770.
Montana	No	No	No	No	Montana Public Health and Human Services. 37.107 Marijuana Registry.
Nevada	Regulators to establish a list of pesticides approved for cultivation.	Testing for pesticide residues required –product deemed to pass if lower than most stringent acceptable standard for the pesticide residue on any food item, as set by EPA.	Yes –must disclose all pesticides applied.	Not allowed to be labeled organic unless certified to be consistent with national organic standards.	Division of Public and Behavioral Health. R004-14.
New Hampshire	Regulators created list of prohibited chemicals –only pesticide approved for organic cultivation and exempt from federal registration allowed– cultivation process must be designed to limit contamination.	Testing for pesticide residues required.	Label must note that the product is not certified to be free of contaminants.	Cultivation requires growing methods consistent with USDA national organic standards.	Therapeutic Cannabis Program He-C 402.
New Jersey	Pesticide use prohibited.	Testing for pesticide residues required.	No	Not allowed to be labeled organic unless certified to be in compliance with national organic standards.	Medical Marijuana Program Rules. NJAC 8:64.
New Mexico	No	Regulators may conduct unannounced inspection and testing if complaint over contaminants received.	No	Requires producer knowledge of organic practices (proposed rule removes this provision).	Medical Use of Cannabis. Title 7 Chapter 34 Part 4.
New York	To be determined.	To be determined.	To be determined.	To be determined.	Compassionate Care Act A06357.
Oregon –Medical	No	Testing for pesticide residues required –a sample shall be deemed to test positive with a detection of more than .1 parts per million of any pesticide.	Label must include name of testing facility.	No	Oregon Health Authority 333-008.
–Recreational	To be determined.	To be determined.	To be determined.	To be determined.	Measure 91.
Rhode Island	No	No	No	No	Rhode Island 21-28.6MMP.
Vermont	Pesticide use prohibited.	Regulators may conduct unannounced inspection and testing if complaint over contaminants received.	No	No	18 VSA Chapter 86 Subchapter 2.
Washington –Medical	Washington State Department of Agriculture created a list of pesticides it believes can be legally used on cannabis –Individual localities may further regulate.	No	No	No	Washington State University Pesticide Information Center Online, and Chapter 69.51A.140.
–Recreational	Regulating a list of pesticides that can be used on cannabis; producers must list pesticides utilized in the production process and must record pesticide applications –violations may result in cancellation of license.	Testing for pesticide residues required –lab name and results available to customers upon request.	Yes –must disclose all pesticides applied.	Not allowed to be labeled organic unless permitted by USDA in accordance with national organic standards.	Washington State University Pesticide Information Center Online, and Chapter 314-55.