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FREQUENTLY ASKED QUESTIONS

Pyrethroid and Pyrethrin Use in Cannabis Production

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1. What are pyrethrins?

Pyrethrins are naturally-occurring botanical pesticides that have been used since the 1950s to control mosquitoes, fleas, flies, moths, ants, and other insects (Bond et al., 2014). Pesticide products containing pyrethrins are applied on plants, pets, livestock, and crops. They can also be found in head lice products and in pet sprays and shampoos (Bond et al., 2014; USEPA, 2018).

Pyrethrins are well-suited for use in indoor environments as they are rapidly broken down in the presence of light, air, and moisture and have low mammalian toxicity (TOXNET, 2012). When applied to indoor crops, less than 3% of applied pyrethrin remains on crops 5 days after an application (Bond et al., 2014). The half-life of pyrethrins is approximately 12 hours in water and soil but is increased to 14 to 17 days in the absence of sunlight (Bond et al, 2014). Because pyrethrin is rapidly degraded and has low mammalian toxicity, many pyrethrin products can be applied on crops until the day of harvest.

2. My pyrethrin product also lists "piperonyl butoxide" as an ingredient. What is this?

Most pyrethrins are some pyrethroids are used in tandem with a synergist compound, such as piperonyl butoxide (PBO). A synergist is a chemical that enhances the effect of another chemical – For example, PBO enhances the toxicity of pyrethrins which allows the applicator to use less pyrethrin. PBO itself has no pesticidal activity and is a registered synergistic ingredient in over 1500 pesticide products registered with the United States Environmental Protection Agency (USEPA 2018). PBO works by slowing down an insect's ability to metabolize pyrethrin. Applying a combination of PBO and pyrethrins allows the pyrethrins to be effective at lower concentrations. PBO has very low mammalian toxicity and is allowed as a residue on foods in concentrations ranging from 100 parts per billion (ppb) to 20,000 ppb, depending on the food.

3. What are pyrethroids and how do they differ from pyrethrins?

Pyrethroids are a class of synthetic pesticides that are made to resemble pyrethrins, but are longer-lasting and are more toxic in their pesticidal activity and are more stable in sunlight than pyrethrins (Bond et al., 2014; USEPA, 2018). Out of 1,000 pyrethroids in the market, approximately 23 are registered for use in the United States (USEPA 2018).

4. How can humans be exposed to pyrethrins/pyrethroids?

While being sprayed on crops, humans can be exposed to pyrethrins and pyrethroids through inhalation and skin contact (ATSDR, 2003). As pyrethrins and pyrethroids are relatively non-volatile, the most likely inhalation pathway is via inhalation of aerosols during spraying activities, particularly in windy conditions. Pyrethrins and pyrethroids can also enter the body if food contaminated with these compounds is consumed. Other potential sources of exposure include products such as pet sprays, household insecticides, shampoos, and lice treatments (ATSDR,

2003). Inhalation of pyrethrins or pyrethroids from cannabis use is unlikely as these chemical classes decompose quickly when exposed to heat (Ensley 2018).

The average exposure of an average-sized adult male to permethrin (the most commonly-used pyrethroid) is approximately 3.2 micrograms per day (µg/day). This level is 1,000 times less than the acceptable daily intake established by the World Health Organization (WHO) and the United Nations' Food and Agriculture Organization (FAO) (ATSDR, 2003).

5. Are pyrethrins and pyrethroids toxic to humans?

Pyrethrins and pyrethroids have relatively low mammalian toxicity when used appropriately, making their use ideal for food and cannabis crop production. Pyrethrins and pyrethroids are rapidly removed from the body when consumed and have very limited absorption once they enter the body (Roberts 2013; Bond et al., 2014).

If inhaled while spraying or from accidental drift, pyrethrins and pyrethroids can irritate the airways and, at very high concentrations, can cause difficulty in breathing, wheezing, coughing, runny nose, and sometimes diarrhea and vomiting (Bond et al., 2014). Exposure to very high concentrations of these compounds may also cause changes in awareness, convulsions, and loss of consciousness (ATSDR, 2003). Pyrethrins are not well-absorbed through the skin; however, dermal contact with concentrated pyrethrins can cause skin irritation in addition to a tingling sensation and numbness that usually resolves in a few hours (Bond et al., 2014; ATSDR, 2003). Eye-contact with concentrated pyrethrins can cause irritation, burns, and blurred vision.

There is currently no evidence that pyrethrins or pyrethroids cause cancer in people or in animals (ATSDR, 2003). There is no evidence that these compounds can cause birth defects (ATSDR, 2003)

6. What are the regulatory standards for pyrethrins and pyrethroids in foods and how do food standards compare to state compliance standards for cannabis?

The USEPA has established a tolerance range of 0.01 to 75 ppm for residues of pyrethrins and pyrethroids in food (ATSDR, 2003). A limit of 20 µg/L or less of pyrethrins in drinking water is recommended by WHO (ATSDR, 2003). Cannabis products are routinely tested for pyrethrins and pyrethroids in several states. For example, in California where it is not permissible to use pyrethrins on cannabis products, medical cannabis must contain concentrations of pyrethrins less than 500 ppb for inhalables and 1,000 ppb for all other processed cannabis. Similarly, prallethrin, a pyrethroid insecticide, must be below 100 ppb and 400 ppb in inhalables and all other processed cannabis, respectively. In contrast, Oregon permits the use of certain pyrethrin- and pyrethroid-containing products for cannabis cultivation. The action levels for pyrethrins in cannabis products is 1,000 ppb and the lowest action level across all pyrethroids is 200 ppb (OHA 2018, accessed at https://secure.sos.state.or.us/oard/viewSingleRule.action?ruleVrsnRsn=52294).

7. Is there regulatory guidance for the use of pyrethrins and pyrethroids in cannabis products?

The use of pyrethrins and/or pyrethroids during cannabis cultivation is legal in Colorado, Washington, Nevada, and Oregon. Alaska has released a partial list of pesticides that are approved for use in cannabis cultivation, one of which has pyrethrin as an active ingredient (DEH, 2018). Both medical and recreational cannabis are legal in Massachusetts. However, Massachusetts has not yet released a list of approved pesticides for cannabis cultivation.

Not all states have specific guidance on a general action level for pyrethrins and pyrethroids detectable in cannabis products, including flower. The Oregon Department of Agriculture set an action level for pyrethrins of 1 ppm based on the lowest federal food tolerance for pyrethrins in edible plant material (Farrer, 2015).

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