Cannabis Pest and Disease Management

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agenda

INTRODUCTION

Control Methods

Common Pests in Cannabis

Common Diseases in Cannabis

Questions?

What is Crop Protection?

- Crop protection is the management process for keeping insects and disease within the grow at a minimum. This is done by integrating specific control methods for any given pest.

Why is crop protection important?

- When action is not taken to combat the spread of insect and disease within a crop, the result is always crop loss.
- Even when it may not apparent that a pest or disease is present it is essential to have measure in place to help mitigate their spread
- It is especially important to prevent the spread of specific insects as they act as spreaders for several severe diseases
- The most assured way of combating pest and disease in cannabis is through a process called Integrated Pest Management (IPM)

What is Integrated Pest Management?

The University of California Statewide IPM Program defines IPM as …

…an ecosystem-based strategy that focuses on long-term prevention of pests or their damage through a combination of techniques such as biological control, habitat manipulation, modification of cultural practices, and use of resistant varieties. Pesticides are used only after monitoring indicates they are needed according to established guidelines, and treatments are made with the goal of removing only the target organism. Pest control materials are selected and applied in a manner that minimizes risks to human health, beneficial and nontarget organisms, and the environment.

What are the steps in executing an IPM strategy?

1. Identify and Monitor: Keeping a tight on your crop is essential to proper IPM.
2. Evaluate: Determine when action needs to take place. This may be when an insect reaches a specific population or when diseases is identified at a specific stage in production
3. Prevent: For certain pests and diseases certain measure can be taken to prevent the spread all together
4. Action: If action is needed, what kind of action is it? This may be a release of a beneficial insect or a possible spray
5. Monitor: how effective was your action? If further action required?

What are some Control Methods?

- Pesticides
- Biorational Pesticides
- 25b Products
- Bio Stimulants
- Biological control agents

What is a pesticide?

DEFINITION

- A Pesticide is a substance used for destroying insects or other organisms harmful to cultivated plants or to animals.

CAN I USE PESTICIDES IN CANNABIS PRODUCTION?

- Most conventional pesticides can not be used in commercial cannabis production as they pose a health risk to the end user
- However companies such as BioWorks, Biosafe, ProFarm, and Certis have developed Bio-Rational based pesticides that when used properly have proven safe for use on cannabis

What is a Bio-Rational Pesticide?

DEFINITION

- Bio Rational pesticides are derived from materials found in nature such as beneficial fungi, bacteria, virus's, plant extracts, oils, and insect grow hormones (to name a few)

ARE THEY SAFE TO USE ON CANNABIS?

- Most Bio-Rational pesticides are safe to use on cannabis so long as they are used properly
- Timing is critical when using Bio-Rational pesticides. Some materials should not be used past week 4-5 of flower

25b Products

DEFINITION

- 25b products are chemical products containing active and inert ingredients considered minimum risk are registered under Section 25(b) of FIFRA (Federal Insecticide, Fungicide Rodenticide Act). They are NOT required to have an EPA registration number and are exempt from EPA regulations on efficacy and toxicity.

ARE THEY SAFE TO USE?

- Yes they are safe to use when used properly, similarly to Bio-Rational pesticides these products should not be used after week 4-5 of flower

Biostimulants

DEFINITION

- A Plant Biostimulant is a substance or micro- organism that, when applied plant tissue or the rhizo- sphere, stimulates a natural processes

HOW ARE THEY USED

- Biostimulants are used to mostly to enhance or benefit nutrient uptake, nutrient efficiency, tolerance to abiotic stress, or crop quality and yield. Certain Biostimulants will also mitigate infection by disease or damage by insects

Biological Control Agents

DEFINITION

- A Biological Control Agent (BCA) is a living organism used control pests and manage the populations of harmful organisms in cannabis. These organism can be very small such as a beneficial bacteria or larger such as a predatory mite

HOW ARE THEY USED?

- BCAs are used to keep the spread of pests in a grow to a minimum. Each BCA has a role to play in this and understanding the pest and the BCA make all the difference

BCA Release Options

- Bulk Releases- Bulk Releases are the BCA plus a carrier material. These are typically applied using a BCA Blower or done by hand.
- Sachets- Sachets are a control release mechanism. They are essentially a self contained eco system where the BCA reproduces on its own and then exits into the grow. They typically last 4-6 weeks
- Blister Packs- Blister packs are simple way off hanging pre-portioned amounts of BCAs throughout your grow

Kopperts Proprietary BCA Blower

Release Options

BULK

SACHET

BLISTER PACK

What are the most Common Pests in Cannabis?

- Two Spotted Sider Mite
- Cannabis Aphid
- Green Peach Aphid
- Rice Root Aphid
- Western Flower Thrip
- Hemp Russet Mite

Two Spotted Spider Mite

- Most pervasive plant pest on the planet
- Very difficult to control with conventional chemistries
- Once webbing occurs, they are almost impossible to control regardless of the methods used
- Despite popular misconceptions spider mites can move over trichomes on flower
- Control measures most be in place throughout the entire grow

Biological Control Agents

1. Phytoseiulus persimilis- Persimilis are an extremely aggressive and specialized beneficial mite that can be released when you have identified an increase in Two Spotted Spider Mite population. These are the most effective control method to knocking down populations of TSSM. Persimilis will only eat TSSM
2. Amblyseius andersoni- These are a generalist predator and will attack and consumer TSSM and Thrips. These are best used in a control release sachet introduced every 4-6 weeks
3. Amblyseius californicus- Another specialized predatory mite. These are less aggressive than p. persimilis however they do come in a control release sachet. Californicus prefer dryer climates then other predatory mites

Spray Options

- Mineral Oil!- Mineral oil such as the active ingredient in SuffOil-X is the effective/cost effective spray available.
- Botanical Oils- Botanicail oils such a Geranium and Clover Oil are effective on knocking back TSSM. Epishield is an Excellent 25b botanical oil with a high degree of efficacy
- Certain Pathogenic fungi- Some pathogenic fungi have been found to be effective on TSSM population so long as you stay ahead of population increase.

Cannabis Aphid

- Most Common Aphid in cannabis crops
- Co-evolved with Cannabis, follow the photo period of the crop
- Become reproductive when cannabis enters flowering period
- If not under control when entering flower, they are nearly impossible to get rid of
- Because of these factors, it is important to have control measure in place early on in production

Biological Control Agents

- Aphidius ervi- Ervi are a parasitoid that they their egg within the cannabis aphid. When the egg hatches their larvae then consume the aphid from the inside side. Upon maturing they cut their way out of the aphid to seek out a host for their offspring
- Aphelinus abdominalis- Similar to Ervi, Abdominalis are a parasitoid that lay their eggs within the aphid. Abdominalis are a generalist parasitoid and will ley their eggs in numerous different aphid host. Because of this they tend to not be as aggressive as A. Ervi
- Chrysoperla carnea- Common name Green Lace Wing. The larvae stage of this insect are voracious killers. Green Lace Wing are great for breaking up aphid cluster on a crop improving the efficacy of other control measures sure as A. ervi or A. abdominalis

Spray Options

- Cannabis aphid are easily affected by spray rotations
- Entomopathogenic fungi such as Metarhizium brunneum, Beauveria bassiana, and Isaria fumosorosea are all highly effective when used properly
- Using materials such as Azadiractin, Burkholderia, and Chromobacterium can help improve the efficacy of entomopathogenic fungi and even prevent damage while the fungi act on the aphid
- Suffocants such as mineral oil are also very helpful if it becomes necessary to knock back a population of cannabis aphid
- Potassium salts of fatty acids also known as soap salts have also been proven to be very effective in controlling populations of cannabis aphid
- When populations get out of control it may become necessary to use pyrethrins to knock them down again. This is generally regarded as a last-ditch effort to clean up a crop. Do not spray pyrethrins past week 4 of flower

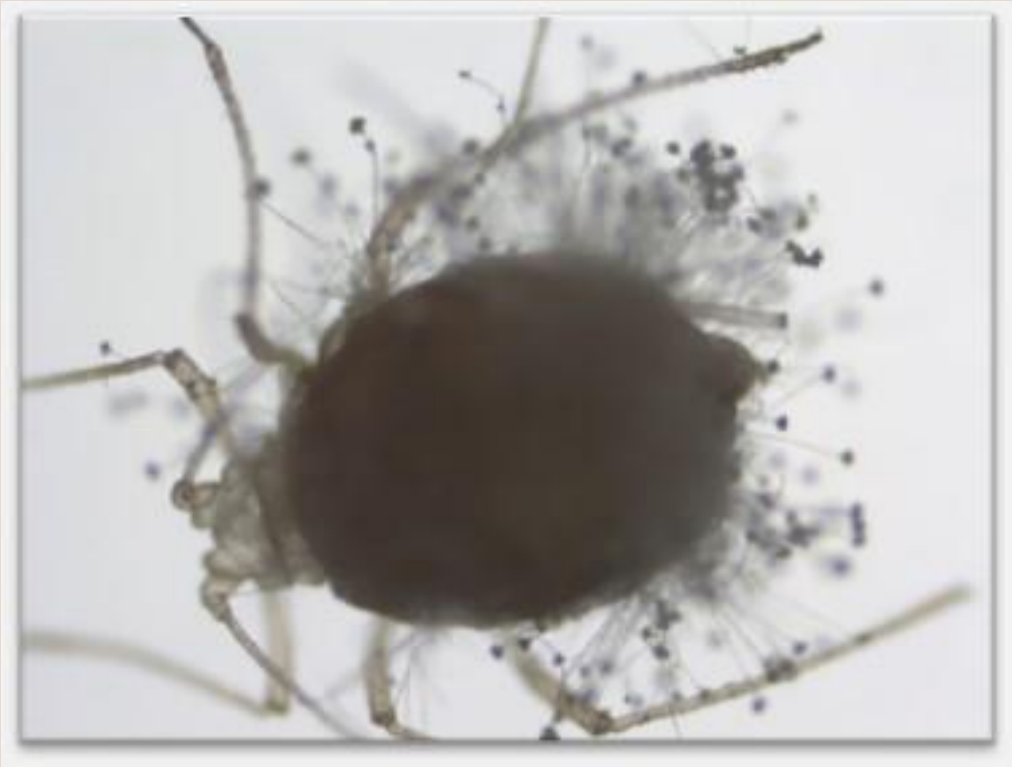


Photo Courtesy of BioWorks Inc

Green Peach Aphid

- Not as common as Cannabis aphid but still can be a major problem
- Many of the same control measures are the same as cannabis aphid
- When controlling Green Peach Aphid it is important to use a diverse set of control methods to insure effectiveness
- As is with Cannabis Aphid, it is important to maintain control before entering flower. Once Cannabis is flowering it is very difficult to remove pests

Biological Control Agents

- Aphidius Colemani- Colemani are a parasitoid that they their egg within the Green Peach Aphid . Colemani are very similar to A. Ervi except they tend to target smaller species of aphid such as Green Peach Aphid.
- Aphelinus abdominalis- Similar to Colemani and ervi, Abdominalis are a parasitoid that lay their eggs within the aphid. Abdominalis are a generalist parasitoid and will ley their eggs in numerous different aphid host. Because of this they tend to not be as aggressive as Aphidius species
- Chrysoperla carnea- Common name Green Lace Wing. The larvae stage of this insect are voracious killers. Green Lace Wing are great for breaking up aphid cluster on a crop improving the efficacy of other control measures sure as A. colemani/eriv or A. abdominalis

Rice Root Aphid

- Rice root aphid are a soil dwelling aphid, because of this they are very difficult to control, especially once a population has been establish
- Rice Root Aphid feed on the root system of the plant.
- Because they are soil dwelling, many growers may not know there is a problem until it is too late.
- Sense the feed on the root system, root aphids not only inhibit the growth of the root system but also the entire plant
- Scouting for Rice Root Aphid is wildly important. Once Root Aphids have been established it may take months if not more to gain control once again

Biological Control Agents

- Because Root Aphids are a soil dwelling pest biological control agents have limited effectiveness on them
- Dalotia coriaria- Also known as the rove beetle are an aggressive generalist predator. But because they only live in the top layer of the soil, they can only mitigate the spread of root aphid
- Chrysoperla carnea- Green Lace Wing larvae when place on the top of the soil will aggresvily consume Root Aphid, this will also help to slow the spread in the grow
- Hypoaspis miles- Hypoaspis are a soil dwelling generalist predatory mite, as is the case with Dalotia and Green lace wing these will only serve to mitigate the spread in the grow

Media Drench's

- Drenching the media has proven to be the most effective method to controlling Rice Root Aphid
- Azadiractin is the most common material used for this application. However, with the rising cost of azadiractin many growers are seeking out alternative
- Entomopathogenic fungi, especially Isaria fumosorosea have also been proven to be effective in controlling this pest
- It is especially important to be proactive when planning a drench. It may be that by the time you identified you have an infestation it may be too late

Western Flower Thrip

- Western Flower thrip are a manageable pest so long as proactive measure are taken to ensure they do not get out of hand
- Thrip can be managed successfully using BCA and biological sprays
- Thrip can act as vectors for serious disease such as hop latent viroid and phytoplasma
- Once these diseases enter a crop there is no getting rid of them, so managing your thrip populations is critical

Biological Control agents

- BCAS will serve to be most growers primary control method for thrips
- Amblyseius swirskii- Swirskii are a predatory mite they primarily feeds on Western Flower Thrip, they are a highly aggressive and effective predatory of thrip. Swirskii can be released in bulk or applied in a sachet
- Amblyseius andersoni- Being a generalist predator will not only feed on TSSM but also Wester Flower Thrip
- Orius insidious- Orius are a highly aggressive member of the Hemiptera family. They are voracious hunters of western flower thrip and can be regarded as a knockdown BCA for them

Spray options for Thrip

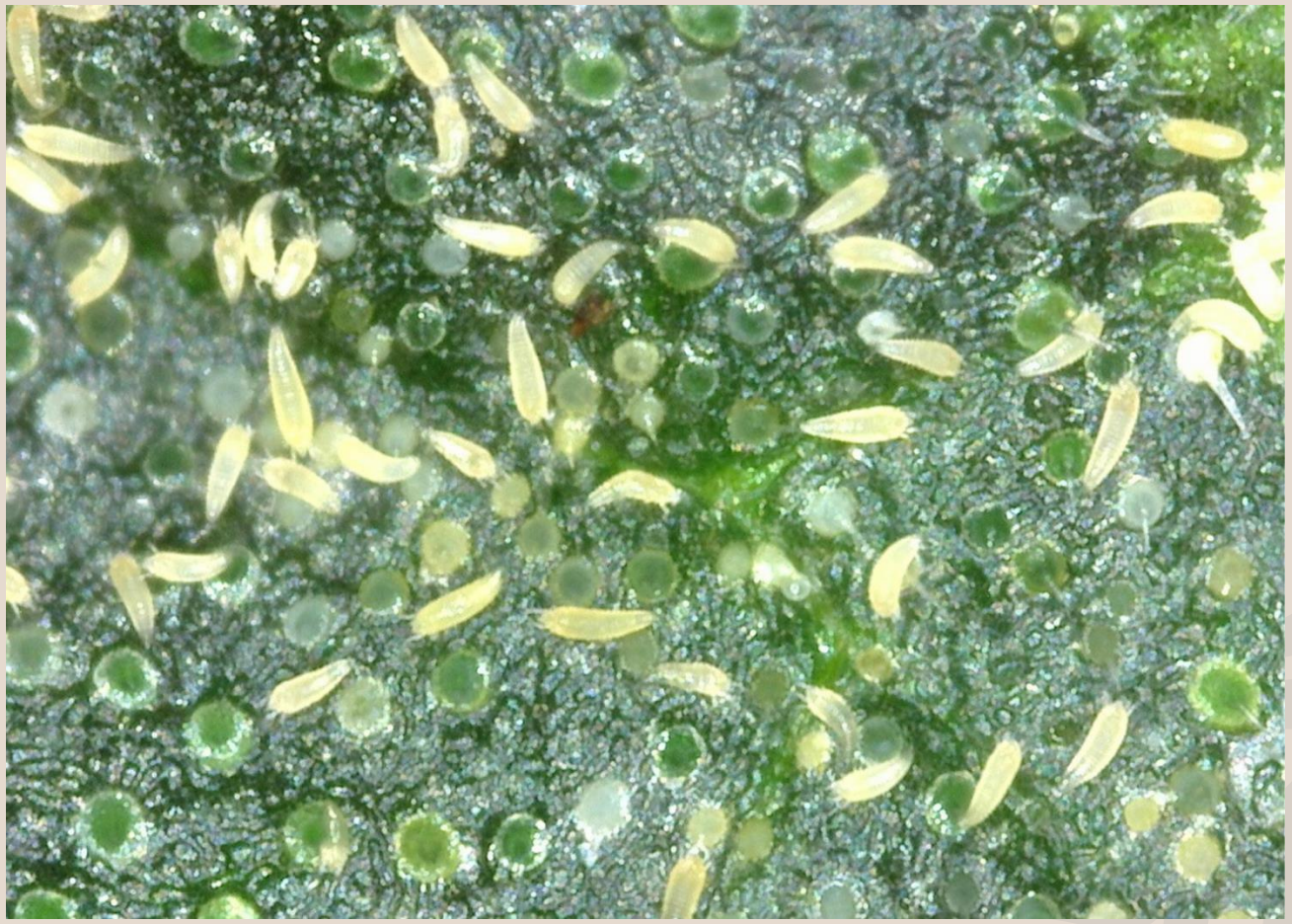
- Many of the spray suggestions we would use on aphids would be the same for Thrips
- By combining an Entomopathogenic fungi with a insect growth regulator such as azadiractin or a material to inhibit feeding or compromise the exoskeleton you can expect to gain control over thrips easily
- Thrip are easy to control so long as you stay ahead of the population, scouting is essential to determining application timing
- If populations get out of control material such as pyrethrins or soap salts can used so long as they are not applied to late into flower

Hemp Russet Mite

- Hemp Russet Mite are a less common cannabis pest; however, it is important to keep an eye out for them
- Once hemp russet mite establish themselves in a grow, they are nearly impossible to get rid of
- This is because they lay their eggs in the growing points on the plant. This can severely damage the plant and reduce yield
- There are no practical BCA options for Hemp russet mite.

Hemp Russet Mite Spray Options

- When dealing with hemp russet mite it is best to start clean and stay clean
- When new material enters the grow immediately treat with a mineral oil spray such as SuffOil-X
- Spray coverage is especially important when dealing with these pests
- 3-5 days after your first application hit them again



Most Common Diseases in Cannabis

- Powder Mildew
- Botrytis AKA Bud Rot
- Fusarium
- Hope Latent Viroid

Powdery Mildew in Cannabis

- Powdery mildew is the most common disease in cannabis, however it is easily controlled via environmental conditions and bio-rational pesticide applications
- Powdery mildew can grow on leaves, buds and stems, because of this it is sometimes miss diagnosed as Botrytis
- Powdery mildew is easily treated in the vegetative portion of production. But once flower has been initiated it can become more difficult

Control methods

- Maintaining an environment with a humidity lower then ~60° can help drastically when dealing with powdery mildew
- Marinating good airflow using HAF and exhaust fans will also aid in preventing powdery mildew
- Cleaning the grow between cycles by removing dead plant material and excess organic build is essential
- Actively scouting for signs of powdery mildew will give you an advantage in the battle against PM
- Using appropriate fungicides can help ensure your success against PM

Spray Options

- Proactively using beneficial microbes against powdery mildew has been proven to be very effective at preventing infection
- Microbes such as Bacillus amyloliquefaciens, Bacillus pumilus Clonostachys rosea, among many others when used on a dedicated schedule will prove to be highly beneficial. These are all available as Bio-Rational Pesticides
- Using products to bolster the plants systemic immune response will also prove to be helpful in preventing powdery mildew. Products such as Regalia are excellent as triggering the SIR of the plant
- If need be you can use an oxidizer to clean up plants safely and effectively.

Botrytis (Bud Rot)

- Botrytis is the most destructive cannabis disease.
- Even in small amount Botrytis will run large amounts of flower
- Some growers can salvage a botrytis infected crop by pivoting to extracts, but the yield will be far lower
- Modern breeding and cultivation techniques have led to more resistant plants that utilize smaller more frequent bud sites (popcorn buds)
- Control measures must be set in place at flower set to ensure botrytis infection is at a minimum
- Control measures for Botrytis are largely the same as Powder Mildew with some additions

Control Measures

- Maintaining a humidity below 60°F will drastically reduce instances of Botrytis
- Maintaining constant airflow over the crop is a must
- Using Biorational-Pesticides such as BotryStop (Ulocladium oudemansii strain U3) has proven to be one of the best control measure in preventing botrytis from becoming rampant
- Again, cleaning the grow between cycles is invaluable. Spraying the surfaces with a good surface cleaner such as SaniDate 5 or any oxidizer will help tremendously.

Fusarium oxysporum in Cannabis

- Fusarium is a soil and vascular fungal disease that is common in outdoor crops and mothers
- Fusarium is easily avoided so when proper measure are taken
- Once Fusarium has infected the vascular system of a cannabis plant it is there forever, the plant will need to be discarded to prevent infection to other plants
- Fusarium is spread via infected soil, this can be on the bottom of shoes, equipment, tools, or benches

Fusarium Control

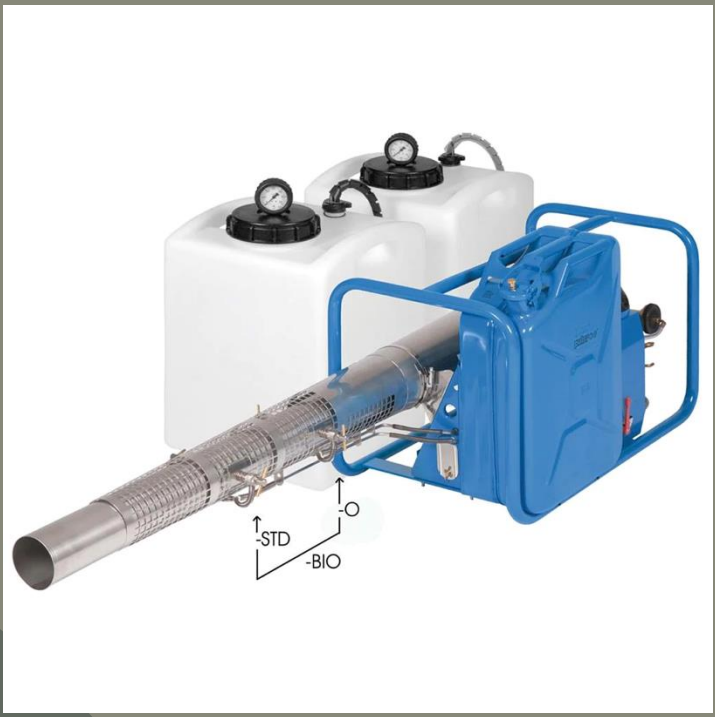
- Fusarium can be controlled in several ways
- The most common and easiest way to prevent fusarium infection is through sanitary practices.
- Removing old mothers from grows can help prevent fusarium from taking hold
- Cleaning the grow diligently between grows is invaluable
- Inoculating media with a bio-rational fungicide such as Rootshield plus (Trichoderma harzianum Rifai strain T-22 and Trichoderma virens strain G-41) or Tenet (Trichoderma asperellum and Trichoderma gamsii) can be wildly beneficial in preventing fusarium infection and transmission

Application Equipment Options

HYDRAULIC SPRAYER

AUTO FOG

PULSE JET FOGGER



Any Questions?

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