HEMP NEWSLETTER

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Hemp Flower Buds: Susceptible to Corn Earworm Damage

It's the time of year when hemp fields are beginning to flower, and corn earworm caterpillars love to feed on hemp flowers (Fig. 1).

Here are some details about the appearance of corn earworm caterpillars:

- The newly hatched caterpillars are tiny (ca. 2 mm).
- Caterpillars develop rapidly and fully-matured caterpillars are about 25 mm in 2-3 weeks.
- There are multiple color forms including green, pink, dark brown to almost black, but so far mainly the green form has been observed in hemp.
- The caterpillar has a black or brown head with rows of dark-colored bumps and bristles along the body.

Figure 1. *Corn earworm caterpillar feeding on hemp plant bud. Photo Credit: Govinda Shrestha*

The caterpillar feeding can cause significant damage to hemp crops grown for smokable flower and CBD extraction. Therefore, the **time** has come for hemp growers to be proactive about monitoring the corn earworm populations in their hemp fields.

We have no research on the correlation between the number of male moths that are in a trap and the economic damage to hemp buds. The general corn earworm monitoring recommendations during hemp flowering season are: check and record moth numbers on each trap twice a week (example Tuesday and Friday); change the pheromone lure every other week; and track moth numbers at each sample date to determine if there is a pattern in the trap catch.

According to Whitney Cranshaw, Colorado State University Extension Professor and Entomologist, when moth numbers are increasing incrementally in a trap, female corn earworms will be actively laying eggs on the crop. It is suggested to wait about one week after moth trap numbers increase to apply biological pesticides. This one-week delay allows the eggs to hatch into caterpillars. This is important because the currently available pesticides are effective on caterpillars but not on eggs. Please check out this article for a suggested **management plan**- https://webdoc.agsci.colostate.edu/hempinsects/PDFs/Corn%20Earworm%20in%20Hemp%20Management%20September%202018.pdf

In our Southern Oregon monitoring sites, the adult numbers varied from 0 to 3 in the last three weeks of sampling (Table 1).

While our trap numbers remain low, **we have observed young caterpillars feeding mainly on early maturing hemp flower buds at one of the monitoring sites**. **Therefore, start to inspect your hemp fields for caterpillar feeding on flower buds.** We have observed that damage begins first on the earliest maturing plants, so if you grow multiple strains, concentrate your scouting by focusing on the strains with the most advanced maturity. Currently, there is no economic threshold level for caterpillar counts on hemp, but this is the type of information that will be generated as we continue to collect data across sites and years.

Table 1. Corn earworm adult counts (adult/trap/week) on Southern Oregon hemp fields, 2021

Hemp Farm	Adult Counts		
	4 Aug	11-Aug	18-Aug
Farm 1	3	0	1
Farm 2	2	0	2
Farm 3	1	0	0
Farm 4	1	0	0

Going Rogue on Hemp: Scouting for Male Plants

Kristie Buckland, Vegetable and Specialty Seed, OSU-NWREC, Aurora
Lloyd Nackley, Nursery Production, OSU-NWREC, Aurora

Many hemp growers prefer to take steps to keep the pollen out of their CBD production fields, often referred to as exclusion. While there is little literature published on this subject, industry standard practices suggest that if a female plant is pollinated, the production of CBD quantity and possibly quality declines. This concern about pollination drives most CBD operations to aggressively manage against the presence of male plants, or more troubling, female plants that spontaneously produce pollen sometimes called hermaphroditic plants. Our Extension article titled Hemp Sex Ed (https://catalog.extension.oregonstate.edu/em9279/html) goes into more detail.

Below is a brief description of the amazing biology of this plant.

Hemp is a dioecious plant, meaning that male and female flowers exist on separate plants, unlike most plants we grow for agriculture. While it seems simple to plant only feminized seeds or cloned transplants that would result in female plants in production fields, it is often difficult to get a stand that is 100% females. Visual scouting of the field is required to detect male plants early in the season. Male plants tend to be thinner and more spindly in appearance than female plants (Fig. 2) with flowers that hang like an ornament on a tree. Female plants have a shorter inter-node space (stem length between the leaves) with dense flower heads.

Although a plant may be genetically female and exhibit only female flowers for the majority of the growing season, it may be possible for the female plant to **spontaneously** produce male flowers that will release pollen. Some researchers and field agronomists have tried to predict or detect this response with remote sensing with limited success.

Currently, visual scouting with an experienced crew is the most reliable way to spot and remove pollen-producing plants. Crews often work in teams of 2 or more to walk the rows of hemp and check plants for any irregular growth habits.

It is essential to train scouting crews on how to identify both genetically male plants and female plants that have begun to produce pollen—different coloring on leaves or different shape of the plant canopy can often be seen on a female plant that has one or more branches producing pollen. Any 'irregular' growth habits in female plants can be an indication that scouting crews should closely examine the plant for pollen.

When a male plant or female pollen-producing plant is located, workers carefully cut the entire plant at the soil surface, place in a bag, and close the bag securely, then remove the bag from the field for disposal. Use caution to remove any gloves or clothing that might have touched pollen before continuing to scout the entire field. Until other detection methods become more reliable, regular intervals of scouting are likely the best way to detect any plants that are producing spontaneous male pollen, for the entire length of the growing season.

Photo: Lloyd Nackley, © OSU

Figure 2. *Hemp in the field (left) and diagram of hemp plants (right). Both images above show a male hemp plant at left and female plant on the right. Male plants have longer spaces on the stem between leaves, called inter-node space. Female plants have a dense flower head while male plants have flowers with pollen that hang like an ornament on a tree (subset left).*

Hemp Gray Mold (Botrytis Bud Blight and Stem Canker)

Cynthia M. Ocamb, OSU-Corvallis, Extension Plant Pathologist

The fungus, *Botrytis cinerea*, is a common pathogen that infects many different crops and occurs worldwide. This fungus invades weak, damaged, or senescing tissues when environmental conditions are favorable. *Botrytis* causes brown, water-soaked spots on hemp buds and pale to light-brown colored areas on stems. Infected buds may die and turn brown (Fig. 3A & B) whereas stem cankers can develop to the point of limb breakage or splitting. Infected *Cannabis* tissues can be killed rapidly, potentially within one week, depending on environmental conditions. Young hemp seedlings can be killed by *Botrytis*.

Infected hemp buds and stems produce a gray-brown mass of asexual spores known as conidia (Fig. 3C) that can be wind-blown and further spread the disease. Small, black sclerotia can develop within affected hemp tissues; these durable structures consist of dense fungal masses that can fall from affected tissues and survive in the soil for months to years. Conidia are produced throughout the growing season under a wide range of temperatures and relative humidity levels. Cool temperatures between 50-80°F (68°F is optimal), high humidity, and free water on plant surfaces favor infection and development of symptoms. Rainy periods during bud maturation can bring on large disease outbreaks in hemp.

To minimize conductive conditions for gray mold, increase plant spacing, row spacing, and row orientation to promote air movement within and keep the relative humidity below 50%.

Avoid mechanical injuries to plants since *Botrytis* can infect easily through wounds.

Avoid practices that keep plants wet for 12 hours or longer. Limit irrigation during and after bloom. Use bottom-watering methods rather than overhead irrigation. Irrigate in the morning so that plants' foliage can dry before sundown. Do not over-water in the greenhouse, and prevent standing water or pooled water inside greenhouses.

Avoid over-fertilization with nitrogen. Too much nitrogen creates a denser plant canopy that impedes air movement and promotes high humidity within the canopy.

Apply a protective fungicide during bud development that is efficacious on gray mold; very few materials are registered but the Oregon Department of Agriculture maintains a pesticide list at https://www.oregon.gov/oda/shared/Documents/Publications/PesticidesPARC/GuidelistPesticideCannabis.pdf.

Materials that may aid the management of gray mold on hemp include LifeGard WG (OMRI listed for organic production), Regalia (OMRI listed), and Stargus (OMRI listed). A field trial conducted by Bates & Ocamb in 2020 showed that Stargus at 2 quarts/A on a weekly interval during bud development reduced gray mold incidence and severity on hemp compared to nontreated plants.

***Figure 3**. Hemp plant with early stage of gray mold development on a cola denoted by the dead, brown-colored tissues (A); later stage of gray mold development on a hemp plant with multiple dead colas (B); and (C) a portion of a hemp bud area infected with Botrytis that is exhibiting the gray-brown sporulation characteristic of this fungal pathogen. Photo Credit: Cynthia M. Ocamb*

Biology, Ecology, and Management of the Beet Leafhopper, Vector of *Beet Curly Top Virus* in Hemp

Tiziana Oppedisano, OSU-Hermiston, Postdoctoral Researcher

The beet leafhopper (*Circulifer tenellus*) is an economically important pest worldwide. In the Pacific Northwest of the US, it is a well-known issue in many field crops and most recently in industrial hemp. It can feed and reproduce in many wild hosts (e.g., kochia, Russian thistle, tumble mustard, pigweed, lambsquarters, and groundsel) and crop hosts (sugar beet, potato, carrots, tomato, and cucurbits).

***Figure 4**. Nymph (left) and adult (right) of the beet leafhopper. Photo Credit: Tiziana Oppedisano*

In early spring, the beet leafhopper adults move into fields from overwintering sites to search for suitable hosts. They are tiny insects (3.4-3.7 mm long) (Fig. 4) usually yellowish or whitish in color during the warm seasons and become mostly dark during cold seasons. Females deposit whitish to yellow colored elongated and slightly curved single eggs in the tissue of the leaves and stems. Under optimal conditions, each female can lay 300–400 eggs in their life cycle.

Young leafhoppers (nymphs) are transparent to white but become yellowish within a few hours; later they can show black, red, and brown spots on the body (Fig. 4). Both nymphs and adults show high mobility and jump away when disturbed. In Oregon and Washington, the leafhopper generally completes three generations per year.

The beet leafhopper is considered a “super vector” for its ability to transmit several plant pathogens such as phytoplasma, spiroplasma, and viruses. The *Beet Curly Top Virus* (BCTV)

transmitted by this insect pest has caught the attention of the hemp community around the nation.

Figure 5. *Healthy (left) and Beet Curly Top Virus infected (right) plants. Photo Credit: Govinda Shrestha*

Several strains of BCTV have been reported in hemp growing regions of the US including Arizona, Colorado, and more recently in Oregon. Symptoms of BCTV infections in hemp include yellowing and stunting, up curled leaf, twisting, and flat stem (Fig. 5). This virus is transmitted by infected beet leafhoppers during feeding. Once the leafhopper ingests the virus, it moves from the digestive tract to the salivary glands. Infected beet leafhoppers move and feed on healthy plants, thus transmitting the virus by eating the phloem. Younger plants appear more susceptible to damage.

Monitoring of beet leafhoppers is recommended to evaluate population dynamics. An efficient method to monitor is by using yellow sticky cards placed on the edge of the field (Fig. 6). As other species of leafhopper are regularly present in hemp fields, it is important to correctly identify the beet leafhopper. Weed control as a cultural method can be considered to reduce beet leafhopper infestations since several weed hosts are commonly found around hemp fields in Oregon.

Varieties of hemp resistant to BCTV and beet leafhoppers still needs to be researched.

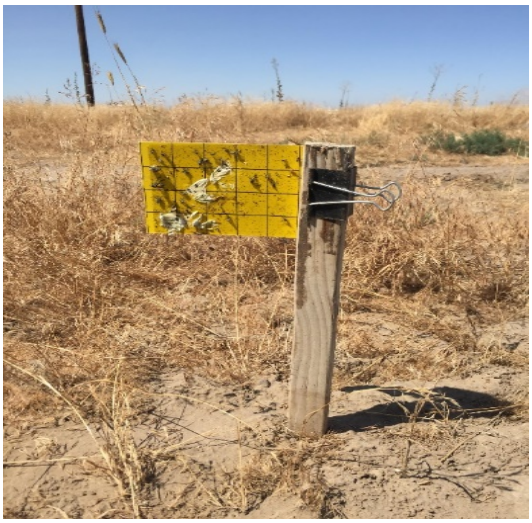

Figure 6. *Yellow sticky card mounted to monitor beet leafhoppers. Photo Credit: Tiziana Oppedisano*

News and Updates

Southern Oregon Hemp Growers Forum
The monthly Southern Oregon Hemp Growers Forum will take place via Zoom on Tuesday, September 7th at 5:30pm.

The program will include presentations by:

- **Ryan Sandler,** National Weather Service Medford, Harvest Season Weather Update
- **Emily Roque,** Oregon Department of Agriculture, Rules and Reminders about Pre-Harvest Testing
- **Gordon Jones,** OSU SOREC, Cannabinoid Accumulation & Harvest Timing

Follow this link to register for the Forum: bit.ly/JacksonExtAgriculture