Most significant potential pest of the crop in Colorado?

Corn earworm

*Helicoverpa zea*
Corn earworm is known by several common names.
On corn eggs are laid on green silks.

Adult moths are strong fliers and can disperse very widely.

Photograph courtesy of Phil Sloderbeck, Kansas State University.
In sweet corn, after eggs hatch the larvae soon move into the ear tip.
The caterpillars are quite variable in coloration.
Corn earworm shows wide range in coloring and patterning on hemp (as with most crops)
Corn earworm tunnels into and can extensively damage developing buds of hemp.
Corn earworm moths lay eggs at night

Photographs of eggs courtesy of Kansas State University
In 2016 and 2018 corn earworm caused serious losses to CBD hemp in southeastern Colorado

One night’s light trap capture, September 8, 2016

Adults of the corn earworm
Pheromone Traps to Monitor Corn Earworm Flights
At what plant growth stage is hemp attractive (and not attractive) to corn earworm?
Risk factor of corn earworm damage to hemp?

Maturing corn next to flowering hemp
Corn Earworm

The insect that has shown the most potential to damage hemp in Colorado is the corn earworm (Helicoverpa zea). This is one of the most widespread and commonly damaging insects in much of the United States, affecting both field crops and vegetable crops. Evidence of its importance is indicated by it having three accepted common names: corn earworm (when in corn), tomato fruitworm (when feeding on fruits of peppers, tomatoes, etc.), and bollworm (when feeding on cotton bolls).

In hemp the primary damage occurs when they tunnel into buds and developing seeds. Damage to
Proposed Management Plan for Corn Earworm in Hemp

Background. Corn earworm (*Helicoverpa* *zea*) is a key pest of hemp grown in Colorado. Damage is caused by the larva (caterpillar) that tunnels through and destroys maturing buds. This insect is present every growing season in Colorado, where it may be found on a wide variety of crops and weed hosts. However, population size, and associated damage, can vary greatly from season to season and by location.

Traps (light, pheromone) can be used to capture the adult stage of this insect, a night flying moth. When used over a period of time these traps can provide information on in changes in abundance of the insect, with high trap captures being associated periods of peak egg laying on plants.

The insecticides that have the most potential to control corn earworm - and are allowable by the Colorado Department of Agriculture for use on cannabis crops – are certain strains of the microbial insecticide *Bacillus thuringiensis* (Bt). These are best applied at times coinciding with periods of peak egg laying by the adult moths and subsequent egg hatch, which occurs a couple of days after eggs are laid.

Use of Traps for Monitoring Corn Earworm

Two types of traps can be used to capture the night flying moths of the corn earworm, light traps or pheromone traps.

Basic design of a light trap uses a light, preferably UV, to attract insects that fly at night. The insects then hit a vane and are funneled into a collecting container below. Usually a killing agent (often a dichlorvos Pest-Strip) is placed in the collecting container to minimize damage to the collected insects, particularly damage to the delicate wings of moths, which may be torn by “June bugs” and other other active insects that come to these traps.

Light traps will capture a wide variety of insects, mostly various kinds of moths and beetles. Traps should be situated high and far apart to prevent the overlap of traps, to trap of interest in this area.
Outline of Corn Earworm Management Program in Hemp

• Establish a program to monitor flights of adult corn earworms using pheromone traps
  – This should *begin by midsummer* to establish baseline of adult captures
  – Traps should be *checked twice a week* and the number of new moths recorded
Pheromone trap used to monitor corn earworm
Outline of Corn Earworm Management Program in Hemp

• If very high numbers of moths are discovered during flowering, treatment should be considered
  – *Bacillus thuringiensis* var. *aizawi*
    • Agree WG, XenTari Biological Insecticide
  – *Helicoverpa NPV*
    • HelicoVex
Colorado allowed insecticides that can be used to control corn earworm in hemp.

**Bacillus thuringiensis (aizawi strain)**

**Helicoverpa Nucleopolyhedrosis Virus**
Trichogramma wasps attack the eggs laid by moths.
Parasites/Parasitoids of Insects

Trichogramma Wasps. Several species of *Trichogramma* wasps exist, all of which attack and kill various kinds of insect eggs. Insect larvae already hatched are not susceptible to *Trichogramma* attack. Eggs that *Trichogramma* will parasitized are from insects in the order Lepidoptera (moths and butterflies), which includes cutworms, codling moth, cabbageworms and armyworms. Commercially available *Trichogramma* wasps are often used as a form of a biological insecticide where they are expected to eliminate most of the developing eggs of pests shortly after release. High levels of control are not often achieved in practice, but the wasps may effectively supplement existing controls. Multiple releases of *Trichogramma* wasps are recommended, since persistence of the parasites may be short-term. Several different species of *Trichogramma* wasps are produced (e.g., *T. minutum*, *T. platneri*, *T. pretiosum*) and they have different habits. The more sophisticated suppliers will provide advice on which species is most appropriate for the intended crop and pest.

Sources (*Trichogramma minutum*): 1, 4, 10, 13, 18, 20, 23, 29, 30
Sources (*Trichogramma brassicae*): 4, 6, 10, 13, 14, 18, 20, 29, 30
Sources (*Trichogramma platneri*): 4, 10, 13, 19, 29, 30, 33
Sources (*Trichogramma pretiosum*): 1, 4, 6, 10, 13, 18, 19, 20, 23, 29, 30
Sources (*Trichogramma bactrae*): None
Sources (*Trichogramma ostriniae*): 23
Sources (Unspecified *Trichogramma* spp. and/or Mixture): 2, 5, 6, 14, 21, 24, 25, 26, 27, 28