Mountain, High Country, & Foothills regions, Western North Carolina

2019 Small-Farm, Late-Season Hemp Production Notes: *Flowering, Harvest, & Post-Harvest Management*

Field Production

From late-vegetative growth onward, scout for stem borers (European Corn Borer and Hemp Borer) whose presence is indicated by branches breaking for no apparent reason and/or the presence of a hole and sawdust-like frass in a branch crotch. Remove damaged branches and destroy the worm inside.

Caterpillar frass visible at base of stem where the borer entered.
Borer just visible inside stem at top.
Photo by Richard Boylan, NC Cooperative Extension.

As flowers mature, scout for Corn Earworms, Climbing Cutworms, Armyworms and other caterpillars feeding in or on buds. Cull and dispose of all damaged flowers in order to prevent molds from starting where feeding has occurred. Destroy any caterpillars found on plants.

Other insects noted sampling on hemp include grasshoppers, leafhoppers, cucumber beetles, stink bugs, aphids, mites, and more!

Corn Earworm feeding on a pollinated hemp flower.
Photo by Janna Beckerman, purduehemp.org

Scout for and Manage Fungal and Bacterial Issues

As night time temperatures drop and daytime humidity climbs, disease pressure on cannabis plants increases. Some yellowing and spotting of older leaves on the interior of the plant is normal, but spotting or yellowing that moves to newer leaves and flowers is a problem. Disease problems can be prevented or reduced by increasing air flow via wider plant and row spacings (if you experience mold problems this year, widen your spacing for next year and/or plant in a drier, more ridge-top field), avoiding low, humid, or shady locations. Irrigation can be reduced or even eliminated entirely during the weeks just before flower harvest.

At this time, for small scale production you can aid good air circulation by removing all branches from the lowermost ~12” of the plant, where flowers are likely to be small, loose, and

contaminated by soil splash. Pruning tools should be periodically sanitized with alcohol or another disinfectant in order to reduce the chance of spreading disease between plants. Diseased and pruned material should be promptly removed from the field and burned or bagged. An air-blast sprayer run empty (i.e.- air only, no water) or even a leaf blower directed toward flowering plants to quickly dry dew each morning can also help to reduce disease pressure.

Some leaf yellowing of older fan leaves is normal, and only requires removal for management.

Yellowing or spotting that moves to newer leaves or flowers would indicate disease pressure.
Photo by Dwayne Tate, NCDA.

If certain root diseases, such as southern blight or *Fusarium* spp. have been confirmed, it may be advisable to remove entire plants and soil around those plants from the field. For specific recommendations, see:
https://plantpathology.ces.ncsu.edu/2019/08/root-diseases-prevalent-in-industrial-hemp/

At present, the NCDA only permits “exempt” (i.e. - 25b) pesticides, broadly-labeled for use on herbs to be used on hemp crops. For more information, see
https://industrialhemp.ces.ncsu.edu/2018/09/what-pesticides-can-i-apply-to-my-industrial-hemp-in-nc/
Even 25b products should be avoided for a minimum of the final two weeks before flower harvest, in order to reduce the chance of any pesticide residues causing problems in later product testing.

Monitor Maturity & Plan for Testing, Harvest, and Drying

Once plants enter their flowering stage, you should contact NCDA for a THC compliance test to determine that your crop is legal. You can view pictures of flowering stages and find a link to the testing request form here:
https://industrialhemp.ces.ncsu.edu/2019/07/hemp-flower-testing-for-thc/

Flowering also demands a lot of the plant. Final applications of Potassium, Phosphorus, Boron, and other nutrients may be needed, depending upon your initial soil test, and any tissue tests you may have taken. Generally, Nitrogen is not applied in later stages of cannabis flowering.

“Endurance” hemp plant showing signs of Boron deficiency. Tissue-testing cannabis plants with the NC Department of Agriculture during both vegetative and flowering stages can help avoid preventable nutrient deficiencies. Photo by Dwayne Tate, NCDA.

Given the likelihood of tropical storms and other severe weather before harvest, some growers with larger plants or windy sites will need to trellis their cannabis. One good guide on trellising options can be found here:
https://www.wikileaf.com/thestash/best-trellis-cannabis/
And another here:
https://www.royalqueenseeds.com/blog-the-art-of-cannabis-trellising-n908

One example of a field trellising system. This may run between $800-$1100/acre depending on material pricing and row spacing. Photo credit: Eli Snyder, NC Cooperative Extension.

As flowers mature past the testing stage, continue to monitor for disease and insect pressure. Also keep an eye on the color of the flower parts (pistils) and small dots of resin on the flowers (trichomes). CBD compounds are thought to be highest in most cannabis strains as 50% or more of the pistils turn from white to brown. Over time, trichomes will transition from clear to cloudy to amber. Another indicator of maximum CBD is some (widely-debated and strain-specific) percentage of cloudy to amber trichomes. A guide for assessing the flower maturity of higher-THC (i.e.- illegal in NC) cannabis crops, complete with good close-up photos can be found at:
https://www.alchimiaweb.com/blogen/harvest-marijuana-plants-trichome-ripeness/

More good trichome photos and discussion can be found here:
https://www.leafly.com/news/cannabis-101/what-are-trichomes-on-cannabis

Well-before harvest, you should have a clean, dry, sheltered, and at least somewhat climate-controlled area prepared for drying your crop. One local hemp grower with past experience in tobacco estimates that she will need triple the barn space per acre of hemp crop compared to tobacco.

Post-harvest: Drying & Curing

After cutting-down your plants, you will need to remove all large fan leaves, cut branches from the main stem, and hang individual branches for drying. Some producers of top-cut smokable flower are even cutting branches into individual flower sections for drying (on screens or by leaving a small branch section or “hook” at the base of each bud to facilitate hanging).

Hemp flower needs to be thoroughly dried before marketing. Crops destined solely for CBD oil extraction can be dried at ~100 degrees Fahrenheit, with ample fans and air circulation. Dehumidifiers will likely also be necessary in order to dry material quickly enough to prevent molding. Flower material must remain completely mold-free in order to be marketable!

For smokable flower (central colas and larger, denser buds of excellent appearance only), quality and marketability can be improved via a slower final drying process known as “curing.” Cured cannabis flower is rapidly dried at 65-75 degrees Fahrenheit and 60% Relative Humidity or less to a point that won’t grow mold in open air (buds should feel dry to touch but stems still somewhat flexible when bent), and then stored in a cool dark and at least partially-sealed environment to continue dehydrating slowly down to <10% total moisture (stems will snap if bent, at which point it should not grow mold even in a sealed environment). Again, fans, dehumidifiers, and even air conditioners may be necessary to achieve optimal temperature and relative humidity drying conditions. See:

https://www.rollitup.org/t/simple-harvest-and-cure-step-by-step.385918/ for an example of smokable flower (again, the crop pictured would be illegal in NC) harvest and curing.

Growers store their mostly-dried flowers in plastic totes, plastic "turkey" bags for baking, or glass jars for the final curing step. Curing flower material should be checked for moisture and the container "burped" or opened for a period of time (~1-2 hours) every day, making sure there are no wet spots. One option is to place partially dried top-cut flower material shallowly in plastic totes in the same dehumidified space where later-cut, oil-extraction harvests are being dried. Another option is to seal in glass jars or turkey bags, and place in any moderate-temperature, dark, dry environment. Humidity can be monitored inside containers by placing small hygrometers in with the flower material, as pictured and described here:
https://www.icmag.com/ic/showthread.php?t=156237
As the link notes, in the case of any reading higher than 65% RH, jars or totes should be kept open and the material dried down before attempting further curing.

Marketing

Because CBD and smokable flower are such new markets in NC, with ever-expanding pools of both producers and consumers, it becomes impossible to predict market prices with any accuracy. For 2019 and early 2020 at least, prime, top-cut flower, properly cured and trimmed can be legally direct retailed or wholesaled by the grower for the greatest potential farm gate prices. Growers can monitor retail prices of reputable hemp flower companies such as:

The Old Globe Cultivation Company:
https://www.globecultivation.com/
(see below for a case study of this NC hemp farm and business)

Med Hemporium:
https://medhemporium.com/

Fields of Hemp:
https://fieldsofhempllc.com/

Tweedle Farms:
https://tweedlefarms.com/

These four businesses are established enough for national distribution, and their retail prices should reflect the national market price for clean, trimmed, smokable flower. Individual growers seeking to sell to a local dispensary or other hemp flower vendor will receive some fraction of

the listed retail prices depending upon quantities sold, quality, and number of middlemen between the producer and retail buyer.

Crops sold for CBD oil will be priced much lower than smokable flower. In 2018, we heard of NC growers receiving $15-$30 per pound of dried flower material (depending upon percentage of CBD, etc.), but these numbers did not come from any comprehensive survey. Seeds in your crop will drive the price down further. A 2019 supply glut is predicted for a few months after harvest, which will likely also affect prices that processor buyers offer in the short term. Your ability to dry and safely store (rodent-free, controlled temperature & humidity, etc.) cannabis flower may become an important factor in the eventual price you receive.

Grower Case Study- The Old Globe Cultivation Company

The Old Globe Cultivation Company is in its first year of hemp production in NC. The team of West Coast growers produces cannabis on 6 acres, in five greenhouses and does their own indoor propagation. Located in The Globe community of Caldwell County, the company operates on a 130 acre family-owned farm, historically used for a small ranching operation. The farm also has a history of feed corn production to support livestock. As the farm moves into a new era of agriculture, the experienced team has broken into the burgeoning new industry of hemp cultivation in North Carolina.

Owner/grower Ben Caruso entered the West Coast cannabis industry in 2011, primarily using experience from his family's hydroponic farm to build out new grow operations. Discovering a true interest in the cannabis plant itself, he brought knowledge, experience and an expert team back to NC after the passing of the Farm Bill in 2018. Fulfilling a long dream to revitalize his family lands in NC, the team broke ground on hemp in January '19. By performing their own construction, propagation, field preparation, planting, plant care, and light-deprivation greenhouse harvests, the operation has quickly grown from an idea to a small-size, high-output hemp grow.

Harvest take place from June through December. Some outdoor plants may be ready for harvest as early as September 1, others not until November or later. Generally, harvest peaks around October 1. There are several reasons that the harvest is staggered: OGCC grows multiple cultivars, cannabinoids are monitored to hit peaks, the production model includes both seedlings and clones, initial planting dates were staggered, some plants were direct seeded instead of transplanted, and they grow in greenhouses and the field.

Traditionally, outdoor harvests are centered around the first week of October. However, earlier harvests are a strategic goal of the greenhouse light deprivation process, accelerating the plant life cycle and greenhouse yields.Their first light-deprived greenhouses are ready to harvest in June, with final greenhouse harvests in late November continuing into December.

Individual harvest dates and times are chosen within the guidelines of the Biodynamic calendar, where the growers rely on the moon phases and planetary positions to delineate which times are best for plant tending. In addition to following Biodynamic practices, to determine the ideal harvest time, the grow team evaluates plant health, disease/environmental threats, flower density/weight, trichome coloration, CBD content, and aesthetic appearance of the top-cut flower.

When harvest begins, the harvest methodology is selected based on variety, type (clone vs. seed), and overall yields. Depending on the final product, and quality of the plants, OGCC may harvest whole plants, branches or colas (the cannabis flower and its attachment to the plant). Ben advocates working backwards from your planned (ideal) final product. For top-shelf smokable flower (that demands the highest prices at market), the utmost care needs to be taken in each stage, with harvest being the first of many stages to insure high quality final product. Because biomass for extraction will not garner the same high dollar amounts per pound, it is not necessary to waste time and energy giving it the absolute perfect treatment.

The plants are very resilient when freshly cut until they start to wilt, at which point the plant will settle into its final shape. If the plants are stacked for transport and left that way through the harvest day, those plants will look like they've been smashed flat. This aesthetic damage can result in monetary losses for top-cut flower, but is not a significant consideration for biomass.

Splitting the purpose of the different flowers on a single plant is a very reasonable and, often times, more lucrative way to harvest. Colas, or top-cut flower, are known as the best buds, while the "sucker buds" rarely dense-up enough and end up getting tossed aside anyways. OGCC harvests the colas and dense side branches first, handles them with the highest level of care, then comes back and harvests the rest of the plant like the field crop it is.

Drying is the next step in the process. OGCC hangs their colas to dry, and uses circulating airflow from fans. Their goal is to maintain humidity at less than 65%, with a temperature between 55-90F for seven to ten days. They consider longer drying times fine if mold isn't an issue. Currently, they are using an interior room with horizontal plastic mesh trellising and a residential dehumidifier that you can buy at a home improvement store. When they trim their colas, they trim to one node below the inflorescence leaving a "hook" to hang the flower from the mesh trellising. During the drying process, it is key to minimize light exposure, especially UV. The grow team strives for a moisture content from 10-15%, which can vary slightly depending on the final product and future handling/storage practices. Once the colas are dry, they are stored by variety in large storage totes that are kept in the drying room.

For the top-cut flower, trimming insures a top quality product that demands the highest price point. Ben describes the trimming process as "arduous". For all top-cut flower, from both the greenhouses and fields, OGCC hand trims only. For second tier quality, which is the majority of what comes from the fields, they machine trim and hand finish. This two-step process for

second tier flower gives a noticeably better result than using only a machine trimmer. If dried and trimmed appropriately, top-cut flower will usually be green with dense buds. By contrast, second tier flower is usually what one sees on shelves in gas stations, and is leafy and brown with airy, less dense flowers.

During trimming, the way the plants are broken down and stored makes a big difference in the ease of handling for the next stage - bucking. Bucking is removing the flowers from the stems, which get discarded along with the fan leaves. The bucked flowers are then individually hand trimmed with bonsai shears to remove sugar leaves and any excess stem material. At this point in the process, OGCC has arrived at their marketable smokeable flower product. After the flower is trimmed and bucked, it is stored in airtight plastic containers in a humidity controlled room while it awaits sale.

The Old Globe Cultivation Company:
https://www.globecultivation.com/

Disclaimer Regarding these Notes:

These notes were collaboratively developed and edited by New River Headwaters Area Extension Agent Richard Boylan (rjboylan@ncsu.edu), independent hemp farmer/consultant William Johnson (pettyjwill@gmail.com), Caldwell County Extension Agent Eli Snyder (emsnyde2@ncsu.edu), NC State University Researcher Meagan Roberts (mmconeyb@ncsu.edu), NCDA Agronomist Dwayne Tate (Dwayne.Tate@ncagr.gov, and NC State University Researcher Margaret Bloomquist (Margaret_Bloomquist@ncsu.edu). Every effort has been made to include current, reliable, and geographically-suitable small-farm-scale hemp production guidelines for Western NC. However, controlled research has not been done on every aspect of cannabis production discussed above, and different farms, seasons, and regions will experience variations. Growers are welcome to send feedback and their own observations from Western NC Hemp production to the authors to help further improve future hemp production documents.