

# UF/IFAS Industrial Hemp Pilot Project: Mid Florida Research and Education Center (MREC) Greenhouse production of industrial hemp for CBD production

UF/IFAS MREC's develops the knowledge to grow and use high value horticultural plants, including CBD hemp. Faculty expertise and excellent facilities means MREC is ideally suited to study the genetics, two-stage production and economics of CBD hemp as a high value horticultural crop.

**Challenges.** Hemp is challenging to grow. It is a short day plant needing from 12 (low latitude) to 16 (high latitude) hours of daylight in spring to become large enough to produce maximum flower number when days are shorter after midsummer. This means CBD hemp adapted to a northern climate when grown in Florida may flower too soon and have lower yield. Also, hemp is dioecious with male and female plants but only females produce high cannabinoid concentrations. This means that production depends on using clones from female plants that can be transplanted into the different finish production methods.

Since some CBD hemp products may be ingested in commercial applications, MREC will study how to minimize synthetic pesticides in all types of finish production by using biological control of pests and hygienic production protocols.

**Research goals.** MREC has two overall goals. The first is genetic/physiology studies, with the second being development of the most economical production practices.

**1. Genetics/physiology.** Currently MREC has 11 CBD hemp varieties and growing. We will screen each variety for basic physiology (light, water, fertilizer) and pest issues.

- **Light/Fertilizer/Water Needs.** MREC will screen hemp strains for maximum flowering within Florida's range of day lengths. We also will screen for the most efficient water and fertilizer use varieties, as well as optimum fertilization and irrigation rates to ensure Florida's water quantity and quality and high cannabinoid production. We will also study how water, temperature, and nutrient deficiency affects cannabinoid concentration to ensure growers create the right conditions to avoid high and illegal psychoactive THC levels.

- **Pest susceptibility.** Hemp seems to attract disease and insect problems. MREC will screen hemp varieties for susceptibility to key insect pests and diseases, as well as appropriate integrated biological control options acceptable for organic production.
- **Cannabinoid concentrations.** Cannabinoid concentrations vary with hemp variety, both CBD, and THC. THC above 0.3% requires that the crop be remediated to reduce THC levels before being sold, at potentially great expense to growers. We will test all incoming CBD hemp varieties for THC, CBD, and other key cannabinoids under standard conditions to ensure that growers use varieties that will be legal through harvest.

**2. Economics-Life Cycle Production.** The economics of CBD hemp's two stage production need to be understood before Florida growers can make a profit. The first stage is propagating and growing high CBD hemp clones based on knowledge of basic physiology. In particular, we aim to understand basic physiology of fertilizer and nutrient needs to determine how best to grow CBD hemp as organically as possible that will meet high standards for human consumption. The second stage is transplanting and finishing production either outdoors under full sun (in field soil or in above ground nursery containers) or in a controlled environment (in a greenhouse or enclosed grow room under artificial lighting) with biological pest control and as small an environmental footprint as possible with the highest quality cannabinoids.

- **Stage 1 Propagation.** MREC will assess cost-effective propagation technique to yield the largest number of healthy plants for finish production through both rooting vegetative cuttings and tissue culture of plantlets.

- **Stage 1. Transplanting.** Since CBD hemp can be finished for harvest and extraction several ways, we will study how best to grow and transplant small plants field, nursery, greenhouse, and indoor finish production for the highest survivability and cannabinoid yield.
- **Stage 2 Full life cycle.** This research will compare duration and management methods for finishing production and extraction yield of CBD hemp in outdoors under full sun (in field soil or in nursery containers) or indoors in a greenhouse or enclosed grow room under artificial lighting. We will assess the economics of each finish method so potential growers can determine which method best suits potential grower resources, experience, and interest.

## Observations to Date

**Propagation.** High cannabinoid female plants can be produced three ways: rooted cuttings from mother stock plants of a desirable variety, tissue-cultured plantlets from a desired variety, or feminized seed produced by chemically treating female plants to produce male flowers with female genetics. So far, rooting cuttings or growing from seed is easy, but tissue culture less so.

**Production.** Hemp grows very fast, so needs constant water from irrigation and fertilizer, and they need appropriate growing media to provide water and nitrogen.

Hemp quickly shows nitrogen deficiency by yellowing of lower leaves as N is translocated to the fast growing plant tip. Water stress is the reverse, as wilting starts at the rapidly growing shoot tips. The shoot tips recover quickly once re-watered.

**Photoperiod.** Photoperiod and variety differences. Genetic variation in hemp photoperiod comes in two flavors: short day plants that varies between 13-16 hours daylength to grow, then 11-8 night hours to bloom. The other type are day neutral (autoflowering) that are not sensitive to day length; their flowering is related to growth stage

## Research Funding

The UF/IFAS pilot project mandate is funded by industry; no state funds support the pilot project. MREC's research is funded exclusively by generous industry gifts to the University of Florida Foundation. Further industry funding will expand our research into biological pest control, water use, controlled environment continuous year-round production, and economic analysis. Gifts may be directed to MREC research (please include a note as such) through the Florida Industrial Hemp Endowment at:

<https://www.uff.ufl.edu/giving-opportunities/023614-florida-industrial-hemp-endowment>

**Further questions?** Contact UF/IFAS Advancement director Cody Helmer at [chelmer@ufl.edu](mailto:chelmer@ufl.edu) | Ph: 352.392.5457 | Mobile: 352.246.4136

