

Industrial hemp research update

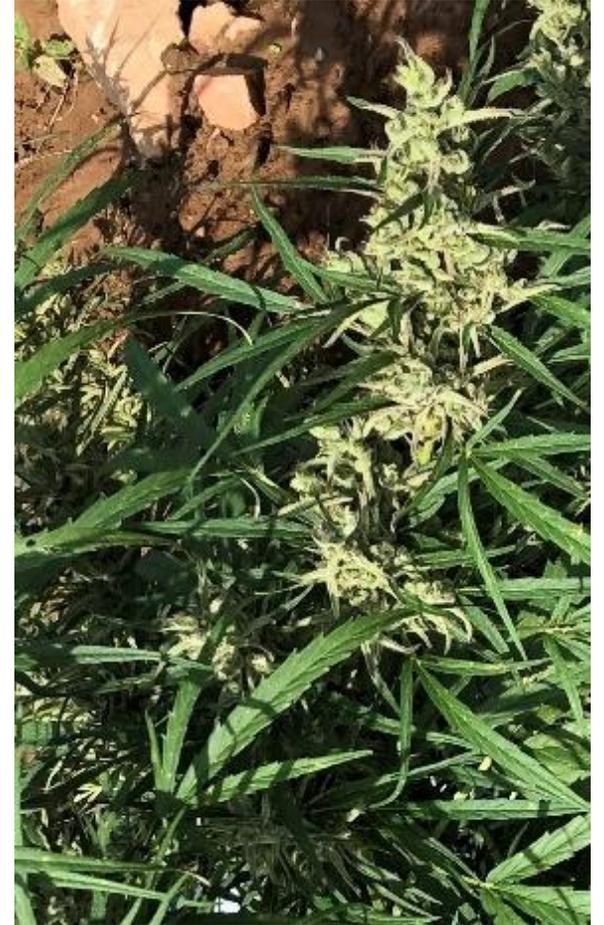


Research started June 2019

- Established a “team” of researchers; Tim Coolong (Professor; organic ag, vegetables, recently moved from Tifton to Athens) and Matthew Johnson (PhD student with Jason Wallace, genetics).
- Goal for the first year – exploratory genetics, field trials
- Brought in ~30 different varieties
- Began phenotyping (genetics) and field trials (Blairsville, Watkinsville, Tifton)

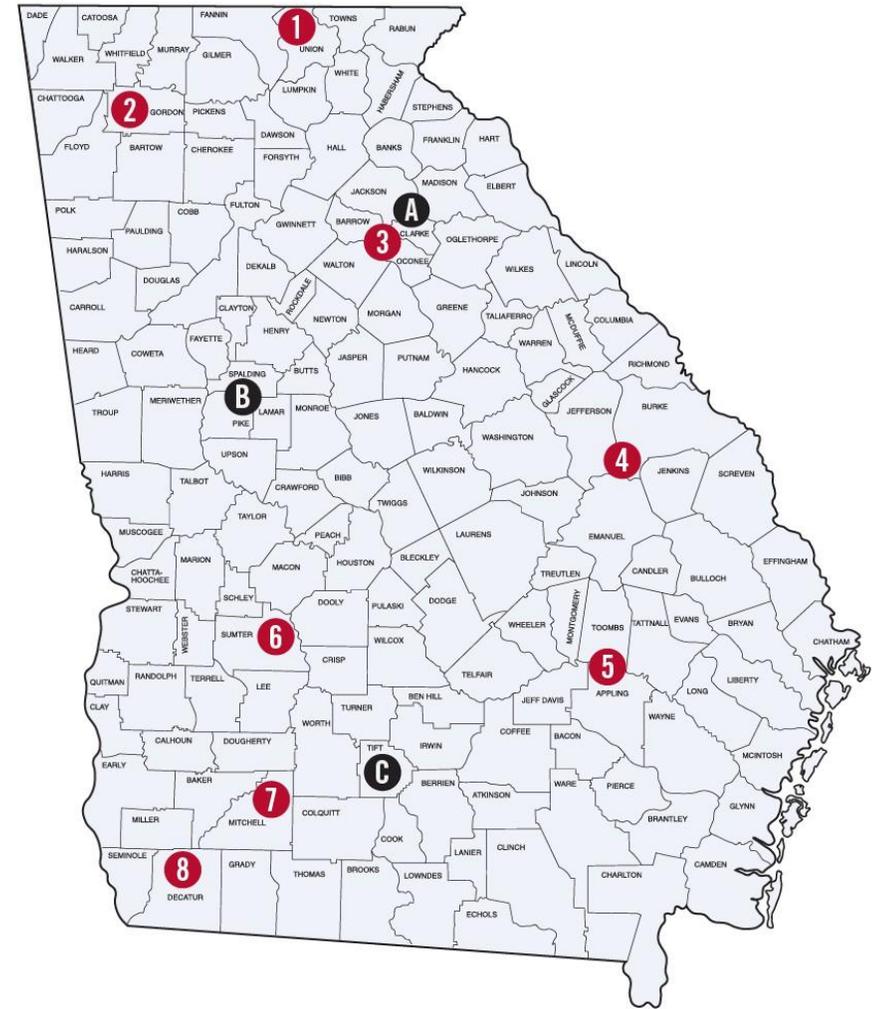
Industrial hemp

- Industrial hemp
 - Must have delta-9-THC [THC] concentration below 0.3% on a dry weight basis
 - Still *Cannabis sativa* or *indica* plants – only difference are THC levels
 - With low THC levels does not have any psychoactive effects
 - Medical cannabis has THC levels up to 15-20% or more (100x stronger)
 - Only working with varieties with certificates of analysis below the 0.3% threshold



2019 UGA field research

- Started May 2019
 - 5 research trials
 - Variety trial containing between 12-24 commonly available strains grown in 3 climate zones of Georgia
 - Blairsville (UGA Mountain Research and Education Center) (1 trial)
 - Watkinsville (Durham Horticulture Research Farm) [primary location] (3 trials)
 - Tifton (UGA Tifton Campus Horticulture Farm) (1 trial)



2019 Trials

- Grown for CBD production and not fiber and seed
 - Fiber and seed hemp is grown more like a row crop (see pics)



Pictures: Univ. of Kentucky

2019 Trials

- A mix of day-length sensitive varieties as well as autoflower varieties
 - Typically hemp flowers below 14 hr of daylight (May 18 and July 28 in Athens)
 - Autoflower types will flower based on days after planting independent of daylength
- Grown on a wide spacing (low plant population 1500-1800 plants/acre) when grown for CBD production
 - Maximize floral yield (desirable) as your product comes from the trichomes on the flowers

Typical production system for CBD

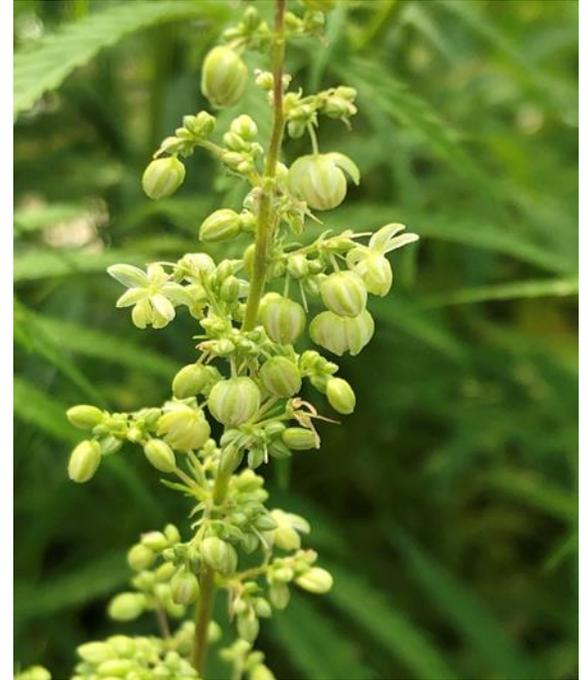


Trichomes on a flower



Utilize female plants

- Males will result in pollination and seed production
- This reduces flower yield and CBD yield per flower
- Female plants are the result of cuttings from “mother” plants OR
- Femized seeds (seeds produced that are supposed to be 99% female)



Male flowers

Pollination



Pollinated (L) and Non Pollinated (R)

Results

- Trials are being harvested and dried currently
- Preliminary results
 - Watkinsville biomass yields between 600 and 2000 lbs/acre with most in the 1200-1500 lbs range (dry weight 10% moisture)
 - Blairsville biomass likely will be 2x Watkinsville results
 - Tifton is still being harvested, likely lower than Watkinsville based on plant appearance
- CBD/THC levels still to be analyzed
 - Samples taken and stored

Genetics & Greenhouse

- Plants with loose branch architecture appear to have lower incidents of bud rot. Proper air flow in the high humidity and high heat is likely a necessary trait for summer production.
- If greenhouses don't have good light exposure, need supplemental lighting to stop the plants from flowering before being planted in the field.
- Developing test to screen for plants that will likely produce a lot of male flowers.
- An accession called abacus that had about 5 distinct phenotypes, this accession seems to handle the heat the best, but further selection to get uniform production and heat resistance is needed.
- Poor germination rates from seed for all varieties (~50%-70%). Cuttings are a much safer route to go until high quality seeds can be produced.
- Beginning selection program for desirable traits.

Hemp and the environment

Blairsville



Watkinsville