

Title of the project:

Developing a molecular-based sex determination assay for hemp.

Principal investigators:

Dr. Karl Ravet (Res. Scientist III; Soil and Crop Sciences), karl.ravet@colostate.edu

Dr. Stephen Pearce (Ass. Professor; Soil and Crop Sciences),

Rick Novak (Director of Seed Programs – Extension Seed specialist; Soil and Crop Sciences),

Randy Crowl (Certified Seed Analyst, Colorado Seed Lab).

Seth Urbanowitz (Extension Agent)

Location:

Larimer County, Fort Collins (CSU main campus and experimental station ARDEC)

Internship goals, scope and objectives:

- The goal of the internship is to contribute to the development of a sex determination assay for hemp that will be offered to regional hemp growers as a paid service by the Colorado Seed lab at ARDEC.

- The rapid expansion of hemp as a crop in Colorado requires the concomitant development of numerous services to assist hemp growers with seed selection. One specific feature of hemp, especially of high CBD varieties, is the need to grow only female plants which produce high levels of CBD in female flowers. By contrast, male plants produce low levels of CBD in their flowers. Additionally, fertilization of female plants by male plants in the field decreases CBD production in female flowers. Therefore, robust predictive sex determination is crucial for growers to optimize CBD production and for assisting breeding programs.

- The objective of the intern's proposed research is to test and to optimize a novel protocol (Toth et al., 2020) that uses molecular techniques to identify the presence of sexual chromosomes. The intern will assist growing and phenotyping hemp plants in the field and in the greenhouse, extracting DNA, running the PCR-based sex determination assay and interpreting results. The intern will also assist the Colorado Seed lab with hemp sample management and will initiate the development of the paid service (website page, ordering documents, advertising material).

How was this applied research project identified?

A collaboration between molecular biologists Karl Ravet and Stephen Pearce (Soil and Crop Sciences) and seed specialists Rick Novak and Randy Crowl (Colorado Seed programs) is currently established in order to develop this sex determination assay. It provides a timely and unique opportunity for a student to learn and apply molecular biology techniques to address CSU's regional extension goals.

With which stakeholder group(s) will the intern work? What student learning outcomes do you anticipate and are there opportunities for professional development?

The student will gain experience in hemp cultivation, molecular assay development, and data management and interpretation. The student will interact with students, researchers, extension specialists, and growers to gain first-hand experience of these working environments, which will help shape his/her thoughts about career prospects. The student will also have the opportunity to present a poster on their project at the CURC conference.

Do you have a specific mentor style that you would like to share with potential interns?

The principal mentor Dr. Karl Ravet is a thorough educator who provides the mentee with plenty of space for self-learning and personal development.

Are travel funds available? Opportunities to provide student assistance with housing?

The work being conducted at CSU's main campus and at ARDEC, there is no travel or housing assistance.

Reference: Toth et al "Development and validation of genetic markers for sex and cannabinoid chemotype in Cannabis sativa L.GCB Bioenergy. 2020; 12:213-222.