The Future of Hemp

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I have spent most of my career developing new/alternative crops, and working to incorporate them into existing agricultural systems. One of my first was seedless watermelon (actually one that helped me get advancement to Associate Professor and tenure). A number of things were different from the standard growing practices in Arizona: transplants instead of direct seeding; interspersing triploid seedless transplants with diploid pollinator plants; time of planting; soil type and irrigation; and weed control and other cultural practices. The two most common questions I am asked with any new crop are 1) how are we going to deal with weeds, and 2) when and how much do we irrigate (remember this is Arizona). Although most of what I did was genetics and plant breeding, because we were often the only game in town we also worked on all aspects of cultivation. This is often the case with new/alternative crops, where you are doing the work of several disciplines to bring a new crop into cultivation.

That brings us to hemp, which has the potential to become a major agricultural commodity in the United States and worldwide. I am happy to say that ASHS is right at the forefront of this hemp resurgence. With the inclusion of hemp in the 2018 Farm Bill, the crop was removed from the Schedule I controlled substance list, making it a legal agricultural commodity. This change in the legal status of the crop has significantly changed the agricultural landscape across the country.

ASHS’s newest Professional Interest Group is Hemp Research and Extension, and the first Chair is Scott Lukas of Oregon State University (who I have asked to co-author this “Reflections” column). The Hemp Research and Extension Professional Interest Group provides a forum to share recent advances, challenges, and future directions in the research and outreach of this swiftly expanding crop. This group of multi-state collaborators will be able to leverage their interdisciplinary strengths into funding and communicating hemp research findings.

At this point, it is important to define hemp, and tell how it differs from marijuana. Hemp and marijuana are both \textit{Cannabis sativa}, but are differentiated by their active chemical profiles. Specifically the level, or lack thereof, of $\Delta 9$-tetrahydrocannabinol ($\Delta 9$-THC), which is the hallucinatory compound associated with marijuana. Each state determines the rules for commercialization with federal approval, and in all states currently growing hemp (except West Virginia) the biomass must have 0.3% or less $\Delta 9$-THC as specified under the 2014 Farm Bill. The USDA newly offered interim final rules are different than 2014 and state 0.3% or less total THC (there are up to 15 different forms of this compound recognized, including THCA). This is important, since, when tested, if the THC concentration is greater than 0.3%, the crop must be destroyed.

So, why the interest? Hemp has a wide array of potential applications including fiber, grain, oil from seed, extracts of flowers, and pharmaceuticals. In addition, there is potential as a food product for human, pet, and livestock consumption, as well as being as source of renewable industrial materials such as bioplastic and “hempcrete.” However, the most common reason for production is the hemp essential oil cannabidiol (CBD) for therapeutic and pharmaceutical applications. Hemp
grown for CBD extracts has drawn the spotlight due to the high-market value, making current production potentially very lucrative (some estimates are a market value of more than $6 billion in 2020). Due to the great value of hemp for this use, and the rapidly changing perceptions, production has expanded like a “gold rush” across the country (more than 500,000 acres of hemp were licensed in 34 states). However, the boom of the 2019 hemp-cropping season has shown its growing pains, and highlights the urgent need for research and extension. Since research on hemp has been heavily restricted before the 2018 Farm Bill, many fundamental questions still need addressing—from molecular characterization of the genome, to development of sustainable in-field production recommendations, testing procedures to ensure accurate THC measurements before harvest, and biomass processing guidelines.

Unfortunately, without understanding some basics such as genotype x environment interactions, and differences in cultural practices by location, many of these plantings may fail. This became very clear to me while listening to Zack Brym’s (the Chair-elect of the Hemp Research and Extension Professional Interest Group) Webinar on “The Early Days of Hemp in the US: Insights from the UF/IFAS Pilot Project” (after you sign-in to the ASHS website, go to https://ashs.org/general/custom.asp?page=Webinars to view the Webinar). During Zach’s presentation I had the feeling of “déjà vu all over again!” There are common problems bringing any new crop into cultivation, and we see the same problems repeatedly happening with hemp.

The best way to address these problems is through the development of interdisciplinary teams. I am presently part of a team to bring two new crops into production in the arid southwestern United States, and our team includes geneticists, biochemists, plant breeders, horticulturists, agronomists, economists, extension personnel, transportation engineers, chemical engineers, and K–12 educators. ASHS’s organization (through the Professional Interest Groups) is ideal to form these teams. To move hemp forward, these Professional Interest Groups were the first to come to my mind: Ecological Physiology, Genetics and Germplasm, Growth Chambers and Controlled Environment, Intellectual Property Rights, Invasive Plants Research, Plant Biotechnology, Plasticulture, Propagation, Seed and Stand Establishment, Water Utilization and Management, and Weed Control and Pest Management. No matter your disciplinary emphasis, if you are interested in becoming part of this effort, please join the Hemp Research and Extension Professional Interest Group by visiting the ASHS website.

We are looking forward to the future developments in hemp, and are here to help guide the industry in a sustainable direction. The Hemp Research and Extension Professional Interest Group is an ideal way for you to become involved. They are currently soliciting presentations for a hemp special session at the 2020 Annual Conference in Orlando, and if interested please contact Scott Lukas for more information. In addition, Jay Noller, the Director of the Oregon State University, Global Hemp Innovation Center (https://agsci.oregonstate.edu/hemp) will give one of our Keynote talks. Noller is a global leader in hemp research, with several years of experience leading transdisciplinary research and development with scholars and industry in North America, Europe, and Asia. His keynote will provide insights into how recent research developments by a great number of scientists around the world are urgently needed to ensure the sustainable rapid global expansion of this crop, can achieve its full potential.