

Hemp Production: Genetic(s) Matter(s)

J.P. Wenger

Research Associate UMN Twin Cities Weiblen Lab wenge020@umn.edu

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Importance of barriers to profitability UMN-MDA survey



Known traits = plant genetics

Traits that matter...

- Average height
- Plant architecture
- Light:dark
 - Vegetative
 - Flowering
- Sex ratio
- Drought tolerance
- Pest resistance
- Potency potential
 - %CBD = \$
 - %THC = risk

Importance of plant genetics for profitability - UMN-MDA survey



Grain and Fiber varieties

- Certified seed; stable
- Canadian/N. European
- Strong regional field traits
- THC reliably < 0.3%

CBD varieties

- CBD-type X into MJ
- Less regionally adapted
- Manicured and/or indoors
- Desire high %CBD
- High risk of THC > 0.3%

Cannabis genetic tools developed at UMN Supported by MDA Crop Research

Botany

Validating a predictive model of cannabinoid inheritance with feral, clinical, and industrial *Cannabis sativa*

Jonathan P. Wenger¹, Clemon J. Dabneylli¹, Mahmoud A. ElSohly^{2,3}, Suman Chandra³, Mohamed M. Radwan³, Chandrani G. Majumdar³ and George D. Weiblen^{1,4} ¹



DNA test for THC:CBD type

- MN feral, Canadian IH, NIDA varieties
- Breed to remove THC-type gene
- Seed certification & QC



REGULAR ARTICLE

A new Cannabis genome assembly associates elevated cannabidiol (CBD) with hemp introgressed into marijuana



Cannabinoid potency

- Independent from THC:CBD type
- Multiple genes involved
- Developing HTP tests
- Breeding, certification, QC



Illustration courtesy of Harvard University Herbaria.

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Improving your process Enhancing your products Increasing your profits

Hemp Seed Certification

Fawad Shah, Ph.D.

President/CEO Minnesota Crop Improvement Association Adjunct Associate Professor, Agronomy & Plant Genetics, U of M



MCIA: An Organization

- Founded in 1903 "Field Crop Breeders Association"
- 1919: Name changed to Minnesota Crop Improvement Association
- Distribute University developed varieties
- Maintain seed identity and seed quality
- 1955: Designated as official seed certifying agency in MN





MCIA: An Organization

- Official seed certification agency of MN
- Non-profit organization, funded through users fees
- Governed by 11 Board of Directors represented by the U of M, and elected members of the seed industry
- Member of AOSCA (USA) OECD Seed Schemes (EU)
- Organic Program Cooperative Agreement with USDA NOP
- Work closely with U of M, MDA, and MnDOT









What is Certified Seed?

- Certified seed is the product of a production process designed to deliver specific plant breeding achievements to farmers (food industry)
- In other words, it is true-to-type, i.e., all the benefits developed by the plant breeder are retained as the seed is multiplied over specific number of generations (certified seed classes) from the small amount of seed developed by the plant breeder



Seed Certification - Purpose

- Certified seed are seed of a known variety produced under strict seed certification standards to <u>maintain</u> <u>varietal Identity and purity</u>
- Certified seed must pass field inspection, conditioned by an approved plant, meet standards for germination, inert matter, seed from other crops, and weed seeds. Must also be free of seed from prohibited noxious weeds.

Make genetically pure crop seed available to farmers



Why use Certified Seed?

- Seed of know genetic identity and purity
- Produced under strict field and seed standards
- Fee of prohibited noxious weed seeds, limited quantity of inert matter, other crop & weed seed
- Conditioned in an approved facility
- Certified seed is required for certain export markets
- Not required in the United States, but quite common
- USDA research: 1.2 to 2.5 bu/ac yield advantage

Certified Seed does not cost, it pays!



Classes of Seed Certification

• Breeder Seed:

A class of seed under the control of the breeder and labeled by the breeder

Foundation Seed:

Class of seed is produced under the authority of the variety owner or the breeder

Registered Seed:

Class of seed that is the progeny of the Foundation Seed

• Certified Seed:

Class of seed that is the progeny of the Registered Seed



Seed Certification Classes **AOSCA : OECD Seed Schemes**

<u>AOSCA</u>

Breeder Seed Foundation Seed Registered Seed Certified Seed

OECD Seed Schemes

Breeder Seed

Pre-Basic Seed

Basic Seed

Certified Seed





Industrial Hemp: THC content less than 0.3%

 Anything with a THC concentration of 0.3% - 0.9% is considered to have "only a small drug potential" but is legally *not hemp*

Marijuana: THC content between 5-10%

- THC may be as high as 25-30%
- THC at a level of 1% considered the threshold for marijuana to have some intoxicating potential. Any material with a THC above 0.3% is legally marijuana

Sources:

Recommended methods for identification and analysis of cannabis and cannabis products. Manual for use by National Drug Analysis Laboratories. UNODC (United Nations Office on Drug and Crime) 2009 Small, E. and D. Marcus. 2002. Hemp: A new crop with new uses for North America. P. 284-326. In J. Janick and A. Whipkey (eds), Trends in new crops and new uses. ASHS Press, Alexandria, VA.

Hemp Characteristics

Two most common "types" of industrial hemp crops are: MONOECIOUS and DIOECIOUS

MONOECIOUS types have Male and Female flowers on the "same" plant just like corn

<u>DIOECIOUS</u> types have Male and Female flowers on " separate", different plants

Hemp Certification

Hemp certification includes:

- a) Verifying Eligibility of Seed Stock
- b) Verifying Land Requirements
- c) Performing Field Inspections
- d) Checking Isolation, Off-types, Weed Pressure
- e) Meeting Seed Standards

Hemp Certification Seed Stocks

Verifying Eligibility of Seed Stocks

Fill out field application

Tags showing upper class for the proof of seed source for the upper class (Foundation or Registered class) to apply for certified seed inspection

Industrial Hemp Certification Land Requirements

Hemp should not be planted on land where volunteer growth from a previous crop may cause contamination

Certified seed <u>must not</u> be grown on land, a) certified crop of same variety was grown the preceding year; b) non-certified crop of hemp or a different variety grown preceding 2 years

Foundation and Registered classes of Hemp seed must not be planted on land which in previous 3 years grew Hemp

Fields may be refused certification due to excessive weeds

Hemp Certification Field Inspection

- Fields inspected twice before swathing or harvesting
- Ist Inspection: Monoecious Type: just before or early flowering
- Diecious Type: after flowering when male begin to senesce
- 2nd Inspection: after seed are well forming
- Isolation areas inspected for volunteer hemp plants

Hemp Certification ISOLATION Distance

Dioecious Type: Certified

Same class, same variety = 3 ft lower class, same variety = 656 ft (0.12 miles) Different varieties / non-cert variety = 2,624 ft

Monoecious Type and Hybrids - Certified

Same class, same variety 3 ft Different varieties / lower cert class = 656 ft (0.12 miles) Dioecious variety / non-cert crop = 3,230

Dioecious Type: Foundation & Registered

Same class, same variety = 10 ft lower class, same variety = 6,460 ft (1.22 miles) Different varieties / non-cert variety = 15,748 ft (3 miles)

- Samples must be representative of the lot
- Sampling and Testing protocol are performed according to one of two associations rules:
- Samples must be drawn according to AOSA or ISTA protocol (depending on country)
- Samples must be drawn by trained individuals
 - Association of Official Seed Analysts (AOSA)
 - International Seed Testing Association (ISTA)

Industrial Hem p Certification SEED TESTING

Samples sent to authorized lab for testing

Seed Standards:

Pure Seed: 98.00% Inert matter: 2.00% Other Crop Seed: 0.08% Weed Seed: 0.10% Germination: 80.00%

Hemp Certification

Certification is complete and tags are issued when... a) Field passed field inspection standards b) Seed passed seed quality standards

Both field and seed standards have to be independently met in order to pass seed certification

Seed must have certified tags (blue tags) or a bulk certificate to be qualified as Certified Seed

Resources on MCIA website

https://www.mncia.org/ Client Resources Certification

Hemp Apply for Industrial Hemp Field Inspection Guidelines—Production of Hemp Seed MINNESOTA CROP IMPROVEMENT ASSOCIATION 1900 HENDON AVE SAINT PAUL MN 55108

Improving your process Enhancing your products Increasing your profits

Questions/Comments

phone: **612-625-7766** toll free: **800-510-6242** fax: **612-625-3748**

e-mail: mncia@mncia.org web site: www.mncia.org

2020 Minnesota Hemp Producer Survey

Swan Ray

Supply Chain Development Specialist Regional Sustainable Development Partnerships University of Minnesota Extension

MAKING A DIFFERENCE IN MINNESOTA: ENVIRONMENT + FOOD & AGRICULTURE + COMMUNITIES + FAMILIES + YOUTH

Regional Sustainable Development Partnerships

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About the Survey

- UMN & MDA collaborative effort
- Open July September 2020

Goals:

- Gather baseline producer data for Minnesota
- Identify grower barriers to profitable production
- Identify agronomic information most important to growers

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Survey Respondents

- 187 Total Responses
 - 114 Growers (current + past)
 - 40 Non-growers (interested)
- 61 Counties Statewide
 - Highest survey response from:
 - Renville, Washington, Otter Tail, Hennepin, Sherburne, and Chisago counties
- Years Growing Hemp in MN

Grower Profile: Small & New Farmers

- Total Acres Farmed (all crops):
 - 60%, 1-10 acres
 - 13%, 11-100 acres
 - 13%, 500+

Hemp Acres

- 46%, less than 1 acre

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- 45%, 1-10 acres

New Farmers

- 44% Of Those Interested Do Not Currently Farm
- 10% Of Current Growers Do Not Identify As Farmer

Grower Profile: Business Ownership

- 76% Private Ownership
 - (61% Interested Growers)

- 14% Cooperative, 5% Tribal
 - (30% Interested in growing prefer cooperative ownership)
 - Most desired services: shared processing, access to affordable & reliable seed, shared market access

Soil Health Is Important To Growers

- Agronomic Practices of Top Importance to Growers
 - Soil Health, 88%
 - Nitrogen Fertility, 85%
 - Organic Practices, 71%
 - Weed Control Options, 70%

- Agronomic Practices of Top Importance to Prospective Growers
 - Seeding Rates, 85%
 - Planting Dates, 75%
 - Weed Control Options, 74%
 - Soil Health, 67%
 - Nitrogen Fertility, 63%
 - Organic Practices, 35%

(Respondents rating = Extremely Important or Very Important for Profitable Production)

Plant Genetics Is Important To Growers

- Top Issues For Growers
 - Trustworthy seed source
 - **77% & 14%**
 - Plant materials with known chemical traits (THC, CBD)
 - 64% & 28%
 - Dependable seed supply
 - **55% & 29%**

- Top Issues For Prospective Growers
 - Trustworthy seed source
 - **58% & 38%**
 - Reasonable seed costs
 - **46% & 54%**
 - Plant materials adapted to your environment
 - **38% & 38%**

(Respondents rating = Extremely Important, Very Important for Profitable Production)

Top Barriers To Profitable Production

- How important are each as barriers to profitable production?
 - 1. Lack of value chain and markets, 86%
 - 2. Regulatory uncertainty, 75%
 - 3. Access to varieties with known traits, 75%

- Most important factors related to value chains and markets:
 - 1. Trust & transparency between buyers and sellers / contract reliability, 78% & 13%
 - 2. Stable market pricing, 54% & 34%
 - 3. Number and availability of processors, 52% & 28%

Next Steps: Survey Report & UMN Research

- 2020 Hemp Survey Report, spring 2021
- Current research ongoing
- Further identification of information and resources most important to hemp producers, processors, and product innovators
- Continued focus on market development that addresses current supply chain bottlenecks and grower pain-points

UNIVERSITY OF MINNESOTA EXTENSION Driven to Discover⁵⁴⁴

Questions?

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