



Growing Cannabis in Wine Country: Shone Farm Hemp project

By
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Brief Hemp Background and Timeline

- Hemp- *Cannabis sativa* L. is a biotype of Cannabis
- Different forms of hemp (flower/oil, fiber, dual & tri-crop)
- Flower crop is produced for oil or flower (THC \leq 0.3%)
- Hemp declared a scheduled drug in the 1930s
- De-scheduled and classified as an agricultural commodity in 2018

Plants in the Cannabaceae family: Marijuana,
Hemp, hops & Hackberries

Problem Statement

- What are the best agronomic practices for cultivating industrial hemp in the Sonoma County?
- How can hemp be successfully cultivated with other agricultural crops?

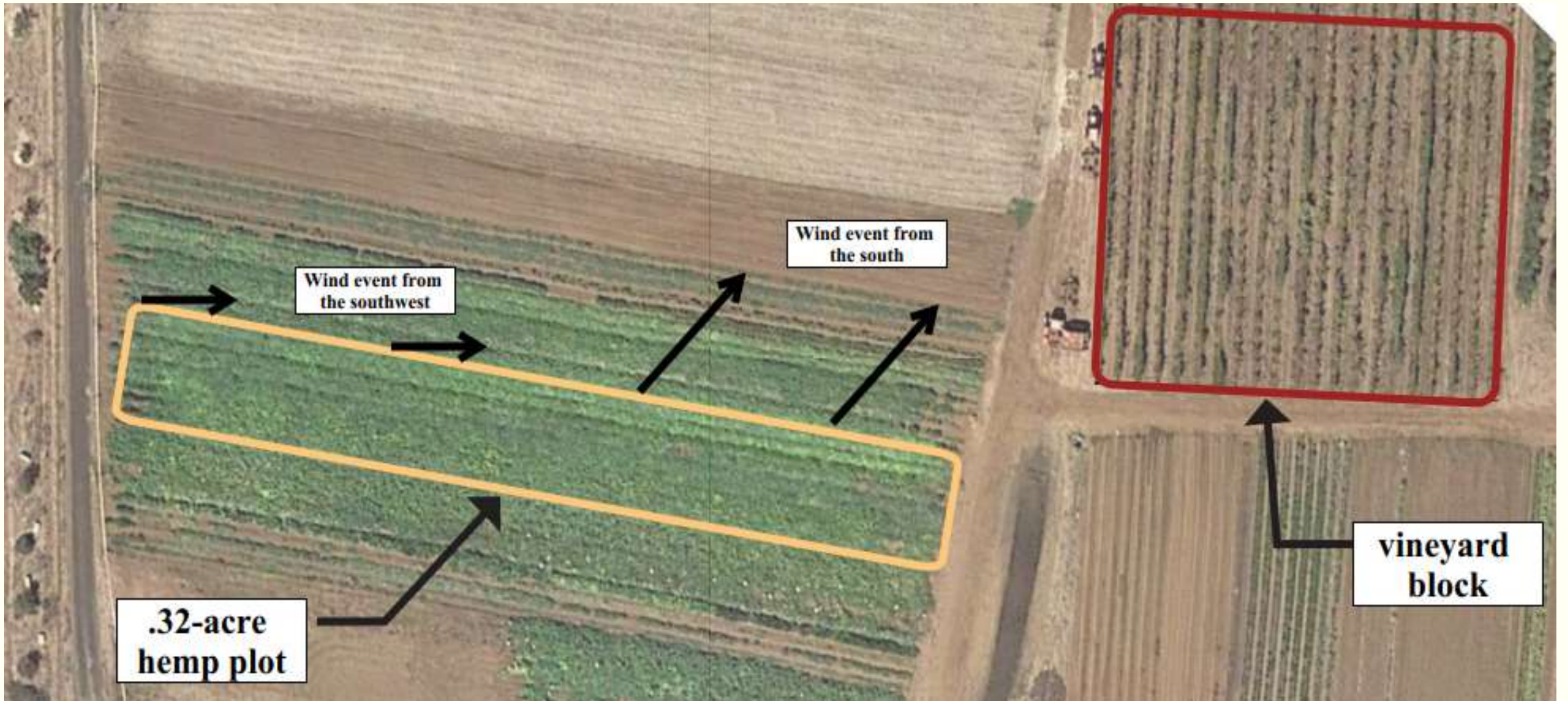
Objectives

- Identify and quantitate terpene production of two CBD hemp varieties over the growing cycle
- Identify and quantitate hemp terpene on wine grapes planted in close proximity
- Identify and quantitate hemp terpene in resultant wine made from the vineyard in close proximity
- Determine whether hemp terpene taints wine grapes or wine

Design

- Two CBD hemp varieties planted
- Boax (360 plants)
- Cherry wine Boax cross (240 plants) [complex terpene profile]
- Hemp field-68.5 ft from the vineyard [local ordinance requires a 200ft [easement]
- Border of hemp field planted with sunflower and corn

Field Layout



Field Layout



Looking into hemp plot from Eastern edge.



Sativa-dominant hemp plant in flower.



View of entire hemp plot from Eastern edge. Note buffer plantings on both sides.



View of buffer planting of Corn and Sunflower. Approximately 8 ft wide.



Looking from vineyard block corner towards corner of hemp plot 68.5 ft away.



SW Corner of vineyard block, 68.5 ft from Hemp plot.







FARM4



SHONE FARM SANTA RENA JUNIOR COLLEGE
2801 - Industrial Hemp Research Drives
Highly resistant to mold, No THC
Highly resistant to insects, No insecticide

Comes in compliance with Section 2801 of the 2014 Federal Farm Bill, Section 201 of the California Food and Agricultural Code, California Food, Beverage & Nutrition Code, California Code of Regulations, Title 7, Division 9, and the California Department of Agriculture's Industrial Hemp Research & Education Program.

Grower: Professor Kathleen Aquilino, Santa Rosa Junior College, Department of Agriculture, Natural Resources and Culture Arts



Brief Background on Volatile Organic Compounds (VOCs)

Terpenes are volatile organic compounds formed by the union of hydrocarbon of 5 carbon atoms, known as isoprene

- Hemiterpenes: 5 Carbon atoms or 1 isoprene unit
 - Monoterpenes: 10 Carbon atoms or 2 isoprene units
 - Sesquiterpenes: 15 Carbon atoms or 3 isoprene units
- } **Most Common in Hemp**

Terpenes (such as monoterpenes and sesquiterpenes) are volatile secondary metabolites, that produce aromas and flavors in plants and essential oils.

Terpenes in Agricultural Crops

Terpenes	Crops
Myrcene, or β -myrcene	Hemp, wine grapes, hops, mango, thyme
Ocimene	Hemp, wine grapes, carrots
Caryophyllene (Sesquiterpenes)	Hemp, wine grapes, hops, cloves, lavender, rosemary
Pinene, α -pinene, β -pinene (Monoterpenoid)	Hemp, wine grapes, raspberries, carrots, Chrysanthemum (e.g. Dahlia spp.), pine and other conifers
Limonene (second most abundant terpene)	Hemp, wine grapes, lemons, other citrus,
Linalool (monoterpene)	Hemp, wine grapes, Lavender (used in insect repellants)
Eucalyptol (monoterpene)	Eucalyptus, Arabidopsis (Mouse-ear cress), Chrysanthemum (e.g. Dahlia spp.)

Understanding Terpene Transport

Factors that influence Terpene Transport

- Temperature
- Wind speed
- Wind direction
- Stage of plant growth
- Season

Eucalyptus & Pine Terpene Studies

Studies:

1. Eucalyptus Aromas: A Mystery

- Dimitra L. Capone, I. Leigh Francis, Markus J. Herderich and Daniel L. Johnson
<https://winesvinesanalytics.com/features/article/110906/Eucalyptus-Aromas-A-Mystery>

2. Eucalyptol (1,8-cineole) in wine

- Dimitra L. Capone (Australian Wine Institute)
<https://www.awri.com.au/wp-content/uploads/2013/08/capone-W07-AWITC15.pdf>

3. Pine Forest VOC Emission

- Hakola, H., Laurila, T., Lindfors, V., Hellen, H., Gaman, A., and Rinne, J.: Variation of the VOC emission rates of birch species during the growing season, *Boreal Environ. Res.*, 6, 237–249, 2001.

What are the differences between Eucalyptus and Hemp? Life cycle, type of terpenes

Materials & Methods

Hemp Inflorescence

- Collected three random samples of hemp inflorescence for both the Cherry Wine Boax and Boax varieties once a week over a four-week period (five weeks before harvest)
- Created composite samples for each variety and sent to lab for testing

Wine Grapes

- Random grapes clusters from specific blocks closest to the hemp field and sent to the lab for terpene analysis. Samples were collected once a week over a four-week period (five weeks leading up to harvest)

Wine

- Wine grape samples collected and used to make wine
- Wine analyzed for hemp terpene using a headspace GC-MS
- Wine sensory panel (taste and evaluate wine)

Data Sources

A. Plant Materials:

- Wine Grape samples
- Hemp flower
- Wine (without MOG)
- Wine (with MOG)

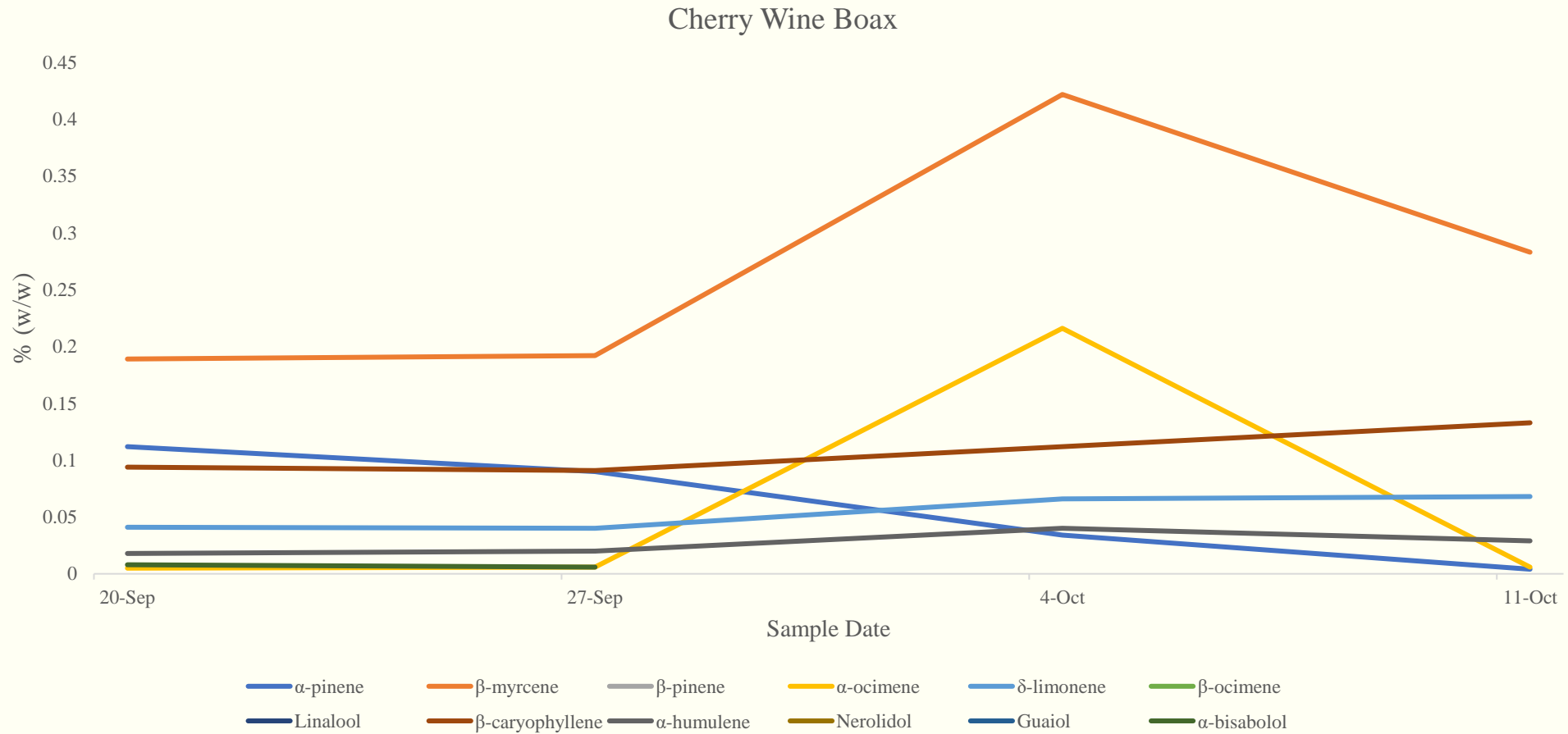
B. Environmental Factors:

- Wind direction & Wind speed
- Temperature
- Relative humidity
- **C. Sensory Panel**

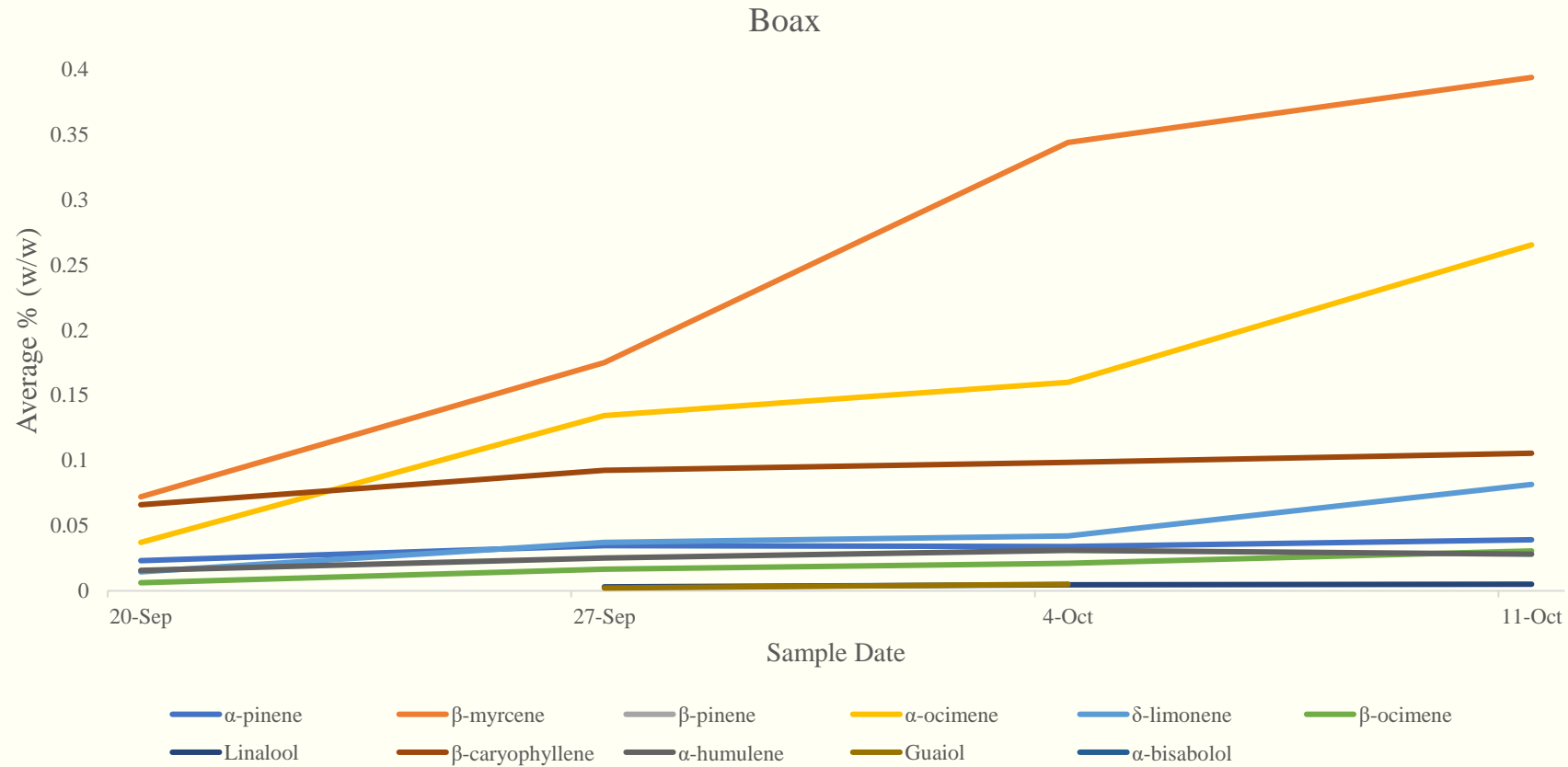
Results

- Increase in major terpenes (myrcene, ocimene, caryophyllene) in hemp as plants approached harvest
- Hemp terpenes not detected on freshly harvested wine grapes
- Hemp terpenes not detected in wine made from the wine grapes
- Wine sensory panel did not detect hemp terpene in wine

Terpene profile of Cherry Wine Boax Hemp variety



Terpene profile of Boax Hemp variety



Conclusion and Future Research

- No evidence of hemp terpene drift based on current industry instruments

Future Research

Improve experimental design

Replications, several years, multiple sites

Field Layout

Data collection & Analysis

VOC capturing and measuring in the field

Improve the detection capacity of GC-MS

Aging wine samples

Video Presentation URL:

<https://www.youtube.com/watch?v=zQxmhdOCdNo>

Article Q&A Follow-up from Live Broadcast Chat:

<https://wineindustryadvisor.com/2020/07/01/growing-cannabis-in-wine-country-the-shone-farm-project>

THANK YOU! QUESTIONS?

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