Growing Hemp For Maximum Sustainability

By

Lawrence Serbin

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How To Grow Hemp for Maximum Sustainability

And produce the world's tallest hemp plant

Introduction

Being in the hemp industry since1990, I have always dreamed of seeing thousands of acres of industrial hemp cultivated in my home state of California. In 2021 after hemp became legal, I partnered with Tom Pires to grow nine test plots of fiber hemp on 3.6 acres of land using imported seeds. Despite being our first time cultivating, we surprised ourselves by growing the world's tallest hemp plant and achieving the highest yield of fiber on record. This paper was written to share our experience and provide farmers with the information they need to grow hemp profitably on a commercial scale.

Background

Growing hemp profitably for fiber has remained elusive. Cannabis has been outlawed federally since 1937, and harvesting fiber hemp productively has not been attempted in California for over a century. Few modern reports or studies have been done on the subject. For the industrial hemp industry to mature and prosper, it is important hemp farmers know exactly how to grow this crop. Raising yields and maximizing the quality of the fiber increases revenue for farmers, and if the farmers can earn a profit, they will continue to grow. Furthermore higher yields lower overall costs, making hemp fiber viable in a wider range of markets.

In both 2019 and 2020 after hemp became legal to grow in California, I provided fiber seed to several famers in the area to see how

well it would grow. Unfortunately most never planted, and the ones who did never harvested. I realized that if I wanted information on growing hemp for fiber in California I was going to have to organize it myself. I had never farmed, but I did have access to some Chinese fiber varieties. Fortunately I met Tom Pires several years earlier. We were both on the board of the California Department of Food and Agriculture's Industrial Hemp Advisory Board. Mr. Pires owned land in the central valley, and was the manager of a local cotton gin. We agreed to grow industrial fiber hemp on nine plots of Tom's land near the gin. The goal was to conduct experiments on growing hemp to determine how to maximize output and determine actual costs.

The majority of the information we relied upon was derived from the papers: *Fiber Crops* by James M. Dempsey,1975. *USDA Yearbook* by Lyster H. Dewey, 1913. And the *USDA Report on the Culture of hemp and Jute in the United States*, by Chas. Richard Dodge, 1896. *Fiber Crops report* was extremely detailed and provided lots of important information on crop production, yields, and percentage breakdown of the stalks. While some statistics from other countries are included, most of the relevant information was gathered from hemp being grown in Kentucky in the early 20th century.

History

Cultivated for over 12,000 years, hemp was traditionally grown for industrial fiber. Sailors relied upon hemp cordage for strength to hold their ships and sails, and the coarseness of the fiber made hemp useful for canvas, sailcloth, sacks, rope, and paper.

The history of hemp in California begins with fiber production in the early 20th century. Hemp was first cultivated on a commercial scale under irrigation at Lerdo, near Bakersfield in 1912, with cultivation expanding in 1913. The seed for both crops was obtained from Kentucky. Unfortunately

later that year, California outlawed hemp to grow with the 1913 *Poison Act Amendments*. The United States followed in 1937 and outlawed cannabis federally. During World War II, the *Marihuana Tax Act* of 1937 was lifted briefly to allow for hemp fiber production to create ropes for the U.S. Navy but after the war hemp reverted to its de facto illegal status.

In the mid 1980's, researchers in China developed a chemical process to successfully remove lignin from the hemp fiber without compromising its strength. This allowed for the individual bast fibers to separate from one another. For the first time, hemp fiber could be spun alone or with other fibers to produce yarns suitable for apparel textiles. This technological breakthrough has catapulted hemp to the forefront of modern textile design and fashion. Given hemp's unique properties, the benefits of this breakthrough are enormous.

California ended industrial hemp prohibition in November 2016 with proposition 64. This was the same initiative which legalized recreational marijuana in the state. The federal government again followed by legalizing industrial hemp with the 2018 Farm Bill, defining industrial hemp as having less than 0.3% THC. State cultivation required registering with the local county agricultural commissioner. The first California industrial hemp registrations were made available by the CDFA in May 2019.

Location

Location is critical to where you wish to cultivate. There are two main reasons: One is the feasibility of hemp to be grown in the area. The other is its proximity to a processing facility.

Is your land zoned for farming? Growing industrial hemp for fiber cannot take place in an indoor grow or in a greenhouse. It must be grown outdoors on a farm scale. The exception would be if you were growing

cannabis as part of an experiment in genetics or seed breeding where indoor cultivation is preferred.

What type of crops are normally grown in your area? If you can successfully grow corn or cotton, you can probably grow hemp. It is important to remember that freezing temperatures will kill hemp plants. California normally doesn't have any freezing weather in the winter unless you get to higher elevations. Our farm was located near Lemoore, in California's central valley. The elevation is 230 feet and the latitude is 36 degrees.

The scale of the farm and its location are tied to the size of the local processing facility. The greater the scale of the factory, the more acreage of hemp can comfortably be grown. The size of the farm should be at least 50 acres or greater to efficiently utilize planting and harvesting equipment. Smaller scale farming is feasible if local planting and harvesting equipment or services could be outsourced, or offered by the processing facility.

Distance from the processing facility should be considered. The closer the hemp is grown to a processing facility the better. Within 25 miles would be optimal.

Soil

Any well drained soil is best. A clay loam of rather loose texture and containing a supply of decaying organic matter should be chosen. The soil should allow for adequate drainage since hemp does not like wet roots.

Buyers/Agreements

One of the most important matters before putting seeds into the ground is to make sure you have a buyer for your hemp. Agreements

should be in writing, state exactly how many acres will be grown, and the price paid for the hemp stalks after harvest. Also pay attention to the details of cultivation. Does the person asking you to grow hemp know specifically what they want? Will they be providing the seeds? These details can prevent disaster if the buyer claims you did not grow or harvest the hemp fiber to their specifications.

Registration

Industrial hemp may be grown in all counties of California except Humboldt county, Placer county, and Contra Costa county. Other counties may have additional requirements for registration in addition to the state requirements. Such requirements are usually in response to local concerns of the odor of growing CBD flower. Fiber hemp is harvested prior to flowering and emits no odor.

Information on obtaining a hemp registration can be found on the website of the California Department of Food and Agriculture: www.cdfa.ca.gov/plant/industrialhemp/. As of December 2021 the fee was $900 and required a criminal background check within 60 days prior to obtaining the registration.

While the registration form can be obtained from the state website, the program is administered by your local county agricultural commissioner. You will need to contact the county agricultural commissioner's office to determine if any county specific paperwork is required in addition to the regular state registration. Their office will handle the filing the the paperwork, as well as coordinate the testing requirements, and destruction protocols if the field tests higher than 0.3% THC.

Lastly you may want to notify the local law enforcement community about your crop. Not every officer is familiar with industrial hemp, and if

someone complains you are growing marijuana, it's better they know about your legal hemp field ahead of time.

Seed Selection

Make sure you have the right strain of industrial cannabis with a THC level less than 0.3% prior to flowering. Registered seed should guarantee a THC level of less than 0.3% after flowering, but not all fiber varieties are registered. Harvesting prior to flowering helps prevent fields from going hot. The fiber strain should be suited to the latitude you are

Seed size can vary by variety. Seeds were weighed to ensure accuracy of trials

growing. A variety which is conditioned to a more northerly latitude may flower early, ending the growth phase and stunting the plants. Duel crops are not recommended since the best quality fiber is harvested prior to flowering. Auto-flowering crops are not suitable since they will begin to flower prior to reaching any meaningful height. Proper latitude is critical.

For our crop we used a Chinese fiber variety which was suited to our latitude of 36 degrees.

Planting Density

When planting for fiber, it is important you use the correct amount of seed. Generally 75-100 pounds per acre is sufficient. Depending upon seed size, this could be anywhere from 750,000 to 1,000,000 plants per acre. The goal is to germinate the highest density of plants to achieve long thin stalks and the highest possible production. When growing for fiber, smaller seeds are recommended since you will obtain more sprouts per acre compared to using the same weight of larger seeds.

Field Prep

Some hemp varieties germinate at temperatures as low as 35°F, but germination is quicker and more dependable when the soil is around 50°F. The field was chisel plowed, then pressed with a , disc roller. The pH should be from 6.0 to 7.5. Good soil moisture is important for germination. Don't plant hoping for rain.

Planting Time

The best planting time for fiber hemp in California is early to mid March, but can stretch into mid April. Hemp will successfully grow when planted as late as May or June, but won't achieve the higher yields. One of the greatest advantages we have in California is our mild climate without the fear of frost. This allows California to have an extended growing season for hemp, creating the conditions for a bountiful harvest. It is early enough to get a great start on growing, but late enough to avoid early flowering.

Planting Method

A grain drill was used for planting. Rows were spaced 7" apart. It was noted that the hemp plants didn't seem to mind being in close proximity to one another after sprouting. It did not seem to inhibit the growth, and in fact seemed to increase the competition for height. Higher yield will most likely be obtained using rows spaced only 3"-4".

This grain drill spaced the crops 7" apart in neat rows

Irrigation System

Hemp requires a plentiful supply of moisture throughout its growing season, particularly during the first 6 weeks after planting. Our plants were first irrigated with a sprinkler system for about 2-4 weeks after drilling. Afterwards, a drip irrigation system was added . This system allowed us to accurately monitor the amount of water being used throughout the season.

Water Usage

Hemp requires 18”-19” of water per acre (1.6 acre foot) In comparison, cotton requires 20”-24” of water per acre (2 acre foot).

If you are in a part of the country which relies upon rain water for irrigation, then the preferred rainfall should average 5 inches per month.

Sprouting

Sprouting occurred at 2-3 weeks after planting.

It should be noted that areas of the field which did not get adequate water with our sprinkler system did not germinate. However the seeds did germinate later when we added our drip irrigation system. Plants which germinated earlier outcompeted the plants which germinated later, resulting in a higher mortality rate. Therefore to achieve a lower mortality rate and a higher yield, make sure you get all the plants to sprout evenly at the same time.

Not all areas sprouted evenly

Fertilizer

The historic literature states that fertilization rates for hemp should be 54 pounds per acre for nitrogen, 27 pounds per acre for phosphorus, and 36 pounds per acre for potassium.

At our farm, UN32 with humid acid nitrogen fertilizer was applied twice to the drip irrigation system. The fist time was when the plants were waist high at 7 weeks, and the second application was the first week of July at 17 weeks. Other farmers have recommend 3 applications per season totaling 100-120 lbs./Acre

Herbicides

Hemp's quick growth rate easily outcompeted all the weeds. The most common weed in our area was the *fiddleneck* which posed no problem for our crop. The hemp created a shady canopy which blocked out the sunlight, prohibiting the growth of the weeds. No herbicides were required.

Hemp easily outcompeted the fiddleneck weeds

Pesticides

Insect pests were few and scattered. Occasionally we noticed some leaves being eaten in the field, but overall it had no effect on our crop.

Our field was very popular with birds, bees, ladybugs and other helpful insects. No pesticides were used on our field.

Ladybugs were especially fond of hemp

Growth

Fiber hemp has an incredible growth rate. Densely planted hemp limits the lateral branches and forces the plant to grow taller to compete for the sunlight. At four weeks, the plants just averaged 4 inches. But by seven weeks, they averaged 2-3 feet. And by 10 weeks the plants were

By late spring, the stalks were growing at a rate of 1 foot per week

6-7 feet, increasing in height by 1 foot per week. By harvest time, the plants were 15-20 feet tall.

Density and thickness of stalks

Planting densely causes the stalks to be thinner. An average stalk diameter should be between 1/4" - 1/2". Hemp plants which develop thicker stalks become more woody, decreasing the value of the bast fiber.

Testing

Strains which are intended for industrial hemp must have a THC level below 0.3%. Testing may be performed 30 days prior to harvest. The chance of testing hot on a fiber crop is significantly less when harvested prior to flowering. It's possible if the plants were allowed to flower, the tests done at that time might show a higher presence of THC.

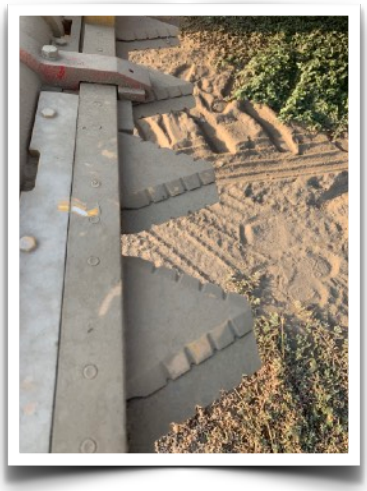
Our first test was on July 12. No male or female flowers were present, and testing was done on the top leaves of the stalks. This test showed 0% THC and 1.1% CBD. Our second test was performed on July 28th and submitted to a separate lab which was certified by the state. That test showed 0.17% THC which was still below the limit required by law. That test we submitted to the county agricultural commissioner for our official results. We performed a third test on September 15th. At that time the male flowers were just starting to show but no female flowers were present. Again that test showed a the level of 0.22%. Higher but still below the legal limit.

Harvest

Harvesting of fiber hemp should take place prior to flowering. The actual date will depend upon the strain you are growing as well as your latitude. Male flowers usually show 2-3 weeks before the females start flowering.

Harvesting hemp at dawn

The harvesting of our fiber hemp in California took place at the very end of August through the middle of September. We experimented in harvesting with both a sickle bar as well as a silage chopper. The sickle



The sickle mower worked best at cutting the stalks

bar worked much better providing an even, clean cut. If the bar is angled, or there is a shield in front, the stalks will all fall in one direction. Just make sure the space between the blades is greater than the thickness of the hemp stalks. Otherwise you will just be pushing the stalks without cutting them.

After the stalks were cut down with the sickle bar, they were left to dry. The leaves dried out within 1-2 days and disintegrated into the soil. The stalks completely dried out within 1-2 weeks.

The hemp dried out in the field in 1-2 weeks

The silage chopper also performed nicely as well to cut down the stalks. But the silage chopper also reduces the stalks and fiber into small

The silage chopper made quick work harvesting, but produced shorter fibers

pieces which makes it difficult to dry. The value of shorter bast fibers is lower than longer bast fibers. But this may be a way to salvage a crop if something goes wrong.

Raking

After the stalks dried, they were raked and put into neat rows.

The rake pushed the dried stalks into rows.

Baling

Hemp was easily baled using traditional straw baling equipment

After raking, the rows were picked up by a baling machine and converted into square bales.

Square bales vs. round bales?

The type of processing equipment at the decortication facility, as well as the end use for the fiber will determine whether a round bale or square bale is preferred.

Square bales or round bales is determined by the factory equipment

Storage and Transport to factory

The bales may be left in the field or piled up for storage. In case of rain, they can be stored in an open air cover or a plastic sheeting may be put over the bales to keep them dry. The raw hemp bales are then transported to the factory via a flat bed truck or trailer.

Bales of hemp stalks may be left on the farm or taken directly to the factory

Riverdale Production Costs

Costs

	Fixed Costs	Cost per Acre	
Drip Irrigation System			
Registration	$900		
Testing	$150-$900		
Land Cost/Rent		**$400**	
Seed Cost		**$300**	
Field Prep			
Chizzel/rip field		$40	
Disc Roller		$25	
Float		$25	
List/beds		$30	
Subcontractor Costs		$20	
		$140	**Total Field Prep**
Planting			
Labor for Pre-Irrigation		$20	
Work Beds		$15	
Plant (drill)		$25	
		$60	**Total Planting**
Irrigation			
Water		$222	
Fertilizer		$130	
		$352	**Total Irrigation**
Harvest			
Sickle bar		$40	
Raking		$20	
Baling		$40	
Transport to Factory (5 Tons @ 15/Ton)		$75	
		$175	**Total Harvest**
		$1,427	**TOTAL FARM COSTS**

Yield

Our yields surpassed our expectations. We achieved between 32% to 55% higher yields than the historical record on our first attempt. In doing so, we grew the tallest hem plant on record which we submitted to the Guinness Book of World Records

Breakdown of Stalk

The drying, retting and subsequent components of the stalks are shown. Our results aligned with the historic records on stalk breakdown. On average the hurd will makeup 75% of the stalk weight while the bast fiber will be 25% of the weight.

Pounds per Acre	Historic Yield*	Riverdale Low Yield	Riverdale High Yield
Green Hemp Plants	35,600	47,207	55,437
Green Stems	24,920	33,045	38,806
Dry Unretted Stems	**9,363**	**12,415**	**14,580**
Dry Retted Stems	7,832	10,386	12,196
After Decortication			
Dry Hurd	6,230	8,261	9,702
Dry Fiber	1,602	2,124	2,495
Dry Line Fiber (Long fiber)	1,246	1,652	1,940
Dry Tow Fiber (Short fiber)	356	472	554

The word's tallest hemp plant 24' 1"

Potential Revenue

For this report, we are taking the yield of the **Dry Un-retted Stems** to serve as our revenue. We will compare our low yield and high yield in terms of potential revenue.

Potential Revenue and net Profit Per Acre

	Riverdale Low Yield (lbs)	Riverdale High Yield (lbs)
	12,415	**14,580**
Revenue		
@ $0.15/lb.	$1,862	$2,187
Cost	**$1,427**	**$1,427**
Net Profit	**$435**	**$760**
@ $0.20/lb.	$2,483	$2,916
Cost	**$1,427**	**$1,427**
Net Profit	**$1,056**	**$1,489**
@ $0.25/lb.	$3,104	$3,645
Cost	**$1,427**	**$1,427**
Net Profit	**$1,677**	**$2,218**
@ $0.30/lb.	$3,725	$4,374
Cost	**$1,427**	**$1,427**
Net Profit	**$2,298**	**$2,947**

North Carolina Costs, Yields, and Revenue

We are also fortunate to have detailed farm costs for growing hemp in North Carolina for comparison. The row for Cornell was the research done by Cornell University for comparison. A quick glance shows that farm cost are much lower in North Carolina when compared to California.

Detailed Farm Cost for Growing Hemp in North Carolina

Hemp Fiber Budget (Cost per acre)				
	Regular	Regular	Organic	Cornell
	Low side	High side		
Seed	$240.00	$320.00	$280.00	$209.43
Equipment	$75.00	$100.00	$80.00	$88.23
Spray	$0.00	$40.00	$0.00	$17.67
Fertilizer	$80.00	$175.00	$180.00	$81.60
Rent	$80.00	$200.00	$120.00	$101.88
Labor	$20.00	$60.00	$100.00	$37.41
Interest/Misc	$0.00	$20.00		$9.51
Organic Certification	$0.00	$0.00	$60.00	$0.00
License	$7.00	$50.00	$27.00	$0.00
Storage	$5.00	$20.00	$10.00	$0.00
Transportation	$40.00	$200.00	$60.00	N/A
	$547.00	**$1,185.00**	**$917.00**	**$545.73**
Revenue				
	5000 lbs per acre	10,000 lbs per acre	2000 lbs per acre	5293 lbs per acre
@ $0.15/lb	$750.00	$1,500.00		$794.00
@ $0.30/lb			$600.00	
Net Profit	**$203.00**	**$315.00**	**-$317.00**	**$248.27**

Historic Yield vs Riverdale Yield, Pounds/Acre

	Historic Yield	Riverdale Hemp Row #2	Riverdale Hemp Row #3	Riverdale Hemp Average Rows #5-8	Flax	Cotton
Green Hemp Plants	35,600	50,000	47,207	55,437		
Green Stems	24,920	35,000	33,045	38,806		
Dry Unretted Stems	9,363	13,150	12,415	14,580	4,000-5000	
Dry Retted Stems	7,832	11,000	10,386	12,196		
Dry Hurd	6,230	8,750	8,261	9,702		
Dry Fiber	1,602	2,250	2,124	2,495	1,200-1,500	
-Dry Line Fiber	1,246	1,750	1,652	1,940		
-Dry Tow Fiber	356	500	472	554		900

Comparison

This table shows the historic yield vs the yield we obtained on our 3.6 acre plot. The stalks are also broken down into their various components. Flax, cotton, and corn silage are also compared to show fiber yield and overall biomass produced.

Summary

In presenting this paper, we want to share our knowledge and experience growing hemp in 2021. We also presented research done in North Carolina for comparison. Different areas of the country will have different costs. And it is our desire for some people to read this and proclaim they can do it for less!

Sustainable Alternative

As an annual crop with an incredible growth rate, not only is hemp renewable, but it can provide all the fibers we need to preserve our natural resources. Hemp absorbs more CO2 per acre than any other agricultural crop. Using a drip irrigation system, hemp uses 20% less water per acre compared to cotton. There is no need to apply any herbicides since hemp's incredible growth rate outcompetes all weeds. Hemp promotes an abundant ecosystem for helpful insects like ladybugs

and bees who thrive on a crop which doesn't require any pesticides. Hemp can lighten our dependance on wood, cotton, and petroleum based products, allowing nature to regenerate our forests and providing after alternatives to plastics.

Future

We are not stopping here. With the knowledge we obtained this year we believe see ourselves doubling these yields again in two years, furthering the ability for hemp to be utilized as a sustainable alternative to timber and petroleum.

Biography

Lawrence Serbin

Lawrence Serbin has been in the hemp industry since 1990 and started his company, Hemp Traders in 1994 specializing in hemp textiles, twine, yarn rope, and fiber. Today Hemp Traders is the largest supplier of hemp fiber products in the United States. Mr. Serbin served as the president of the Business Alliance for Commerce in Hemp (BACH) from 1991-1992. He was on the board of directors of the Hemp Industries Association (HIA) from 2008 -2018, serving as its president from 2016-2017. Mr. Serbin was the chair of the California Industrial Hemp Advisory Board from 2018-2020.

Tom Pires

Tom Pires grew up on a farm and livestock ranch in Lemoore, California. He has a B.S. Degree in Natural Resources Management with a concentration in soils. He obtained a PCA License and sampled soils and and made recommendations for soil amendments and fertilizers and irrigation to

maximize yields. Tom Pires is the past President of the California Association of Grower Owned Mills. Director and past chairman of the California Cotton Ginners and Growers AssociationCurrent Board member of the National Cotton Council. Past board member of Western Growers Association/RSP. Past Board member of the California Department of Food and Agriculture on the Hemp Advisory Board. Past Board member of the U.S. Hemp Farmers Alliance. In 1977 Mr. Pires took a cotton gin management position with West Valley Cotton Growers Inc. Currently he is working with Western Fiber to convert to cotton gin machinery to process hemp fibers.

July 12th Test

CannaSafe

CannaSafe - LA
7027 Hayvenhurst Ave.
Van Nuys, CA 91406

(818) 922-2416
https://www.csalabs.com
Lic# C8-0000040-LIC

Hemp QA Testing

Field 1 A

Sample ID: 2107CSALA6232.5508

Matrix: Hemp
Type: Industrial Hemp
Sample Size: 2 grams
County Sample ID:

Produced: N/A
Collected: 07/12/2021
Received: 07/12/2021
Completed: 07/13/2021

Physical Address:
Sampler:
Sample Received By:
Sample Tested By: Faith Mori

Hemp Traders
Registration #:
Registrant Name:
Registrant Contact #:

ND	1.1393%	1.4516%
Δ9-THC	Total CBD	Total Cannabinoids

Cannabinoids

Testing method: HPLC-SOP 101

Analyte	LOD	LOQ	Results	Results
	mg/g	mg/g	%	mg/g
CBDa	0.0129	0.0244	1.2990	12.9904
THCa	0.0181	0.0244	0.0653	0.6533
CBCA	0.0217	0.0244	0.0524	0.5244
CBDVA	0.0232	0.0244	0.0348	0.3478
CBC	0.0207	0.0244	ND	ND
CBD	0.0171	0.0244	ND	ND
CBDV	0.02	0.0244	ND	ND
CBG	0.0224	0.0244	ND	ND
CBGa	0.0183	0.0244	ND	ND
CBN	0.0239	0.0244	ND	ND
CBT	0.0205	0.0952	ND	ND
THCV	0.0237	0.0244	ND	ND
THCVA	0.0237	0.0244	ND	ND
Δ8-THC	0.0215	0.0244	ND	ND
Δ9-THC	0.0203	0.0244	ND	ND
Total THC			**0.0573**	**0.5730**
Total			**1.4516**	**14.5160**

Date Tested: 07/12/2021

Total THC = THCa * 0.877 + d9-THC

Total CBD = CBDa * 0.877 + CBD

LOQ = Limit of Quantitation; LOD = Limit of Detection; NT = Not Tested; ND = Not Detected. The reported result is based on a sample weight with the applicable moisture content for that sample;

72.92%	- NT	NT
Moisture	Water Activity	Foreign Matter
Moisture Analyzer SOP-103	Water Activity Meter SOP-102	Visual Inspection SOP-600
Date Tested: 07/12/2021	-	-

ISO / IEC 17025:2017 ACCREDITED LABORATORY
Accreditation No. 73653

Neya Jourabchian
Laboratory Director
07/13/2021

Brandon Hill
COA Review
07/13/2021

The values reported pertain only to the product tested. R&D Sample Only. Tested as-is/received from client. Unless otherwise stated all Laboratory Quality Control (LQC) samples performed within specifications established by the BCC in 16 CCR section 5730. Sample tested per CALIFORNIA CODE OF REGULATIONS, TITLE 16, DIVISION 42. BUREAU OF CANNABIS CONTROL.

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July 28th Test

Certificate of Analysis

OFFICIAL CALIFORNIA REGULATORY SAMPLE

PASSED AS CALIFORNIA INDUSTRIAL HEMP

Twin Arbor Analytical
3990 Ruth Way Suite D
Paso Robles, CA 93446
(805) 369-2123

TWIN ARBOR

CDFA Registrant:
Thomas J. Pires
16-210003G
559-804-5783
P.O. Box 366
Riverdale, CA 93656

Plot:
7664 20th Avenue
Lemoore, CA 93245
36.3634, -119.8178
4 Acres
S/W Fremont Ave & 20th Ave, Lemoore CA

Report Date/Time	7/28/21 3:00 PM
Sampled by	Bruce Perez
Client Sample ID	16-210003G-001
Collection Date/Time	7/23/21 9:45 AM
Cultivar Name	SS Fiber/Hoevener
Received by	Savannah Perez
Tested by	Christopher Gray
Internal Sample ID	210723-148-1
Lab Batch ID	210728-1
Testing Date/Time	7/28/21 11:10 AM

Analysis: Total THC

Instrumentation: HPLC/DAD Intrument ID: HPLC1 Method: TM0014 (Twin Arbor Analytical Proprietary)

	LOD / LOQ	% by dry weight [2]	Uncertainty [3]
Total THC [1]	0.018% / 0.054%	0.170%	±0.028

ND = Not Detected

[1] Totals account for decarboxilation of the acid and equal THC + (THCA * 0.877)

[2] THC totals are corrected for moisture content

[3] Uncertainty determined at 95% confidence level

ilac-MRA

PJLA Testing 99531

DEA LICENSE RT0598550

Christopher Gray, PhD
Laboratory Director

Savannah Perez
Quality Control Manager

September 15th Test

Certificate of Analysis

OFFICIAL CALIFORNIA REGULATORY SAMPLE

PASSED AS CALIFORNIA INDUSTRIAL HEMP

Twin Arbor Analytical
3990 Ruth Way Suite D
Paso Robles, CA 93446
(805) 369-2123

TWIN ARBOR

CDFA Registrant:
Thomas J. Pires
16-210003G
559-804-5783
P.O. Box 366
Riverdale, CA 93656
Plot: 7664 20th Avenue
Lemoore, CA 93230
36.3634 , -119.8178
4 (+) (-) Acres
S/W Fremont & 20th Ave., Lemoore

Report Date/Time	9/15/21 12:00 AM
Sampled by	Bruce Perez
Client Sample ID	16-210003G-002
Collection Date/Time	9/13/21 9:30 AM
Cultivar Name	SS Fiber/Hoevener
Received by	Savannah Perez
Tested by	Sadie Wessel
Internal Sample ID	210913-207- 1
Lab Batch ID	210913-207-1
Testing Date/Time	9/14/21 12:00 AM

Analysis: Total THC

Instrumentation: HPLC/DAD Intrument ID: HPLC1 Method: TM0014 (Twin Arbor Analytical Proprietary)

	LOD / LOQ	% by dry weight [2]	Uncertainty [3]
Total THC [1]	0.018% / 0.054%	0.228%	±0.028

LOD = Limit of Detection | LOQ = Limit of Quantification | ND = Not Detected

[1] Totals account for decarboxilation of the acid and equal THC + (THCA * 0.877)

[2] THC totals are corrected for moisture content

[3] Uncertainty determined at 95% confidence level

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