Valoya

CANNABIS CULTIVATION WITH LED

SOLUTION GUIDE

SUCCESSFUL CANNABIS CULTIVATION REQUIRES:

- **High intensity light**
- **Optimal light spectrum for all growth phases**
- **Uniform light distribution**

As a client you will come to appreciate Valoya is different. We have sought to differentiate your customer experience with an underlying foundation of mutual respect, honesty and trust. Something not common in this industry. Perhaps that is why 8 out of 10 world's largest agricultural companies have trusted Valoya. You will too.

CANNABIS PLANT

Cannabis is cultivated for its multiple secondary metabolites, cannabinoids, which are used for pharmaceutical, medical and recreational purposes. LED can expedite the growth cycle and produce plants with greater flower dry weight and a consistent concentration of THC, CBD, THCV and CGB cycle after cycle.

1	**Wide, patented spectra based on more than 400 trials**
IP67	**Durable fixtures resistant to humidity, dust, harsh cleaning agents etc.**
	Support from a team of photobiologists

Research Grade LEDs

But with a great price!

Built for the toughest research grade environments and exacting standards, our pharmaceutical grade fixtures are relied on by the most demanding research institutions.

But now we have priced to match the competition and designed for large commercial roll-outs to provide the best value for yield/square foot in the industry.

FOCUS ON QUALITY. EXPERTISE IN PHOTOBIOLOGY.

Research institutions and growers worldwide depend on the Valoya precision spectrums, and uniform photon delivery, and now, you can enjoy industry leading cannabinoid expressions and biomass using our patented spectra.

Designed for large scale installations with easy to install daisy chained fixtures that are easy to sterilize between crops.

Commercial Applications

Light is essential for optimal cannabis plant development. Professional cultivators need reliable lighting systems and growth protocols that result in consistent yields time after time.

KEYS TO SUCCESS

- A comprehensive light plan with state-of-the-art light planning software defining optimal fixture positions
- Spectra optimized for each growth phase of cannabis, resulting in **industry leading cannabinoid expressions** and **biomass**
- Powerful, long lasting fixtures that produce **high intensity**, minimal heat and can be easily cleaned with water and chemicals
- Support from **photobiology experts** and product engineers who can consult and troubleshoot when needed

Indoor. Greenhouse. Multitier.

Valoya's fixtures are suitable for various settings. The choice of spectrum will determine plant morphology (compact vs. elongated) while maintaining competitive chemical profiles and flower weight.

» **Fixtures sold in 46 countries**

» **Spectra developed through over 400 trials**

» **Research grade lighting system at a competitive price**

::: **Above: NS1 Spectrum**
A close match to sunlight. Suitable for all stages of cannabis cultivation, from seed to harvest. Will create compact plants.

::: **Below: AP673L Spectrum**
A spectrum designed for strong vegetative growth. Suitable for all stages. Will create large plants with long internodes.

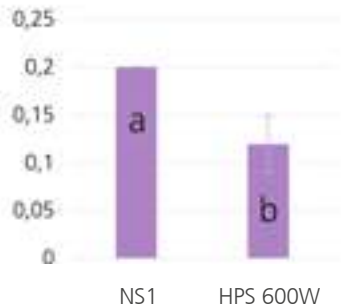
Research Applications

Valoya has been doing in-depth research work with Cannabis for three years. Research has been focused on the effect of different wavelength combinations and ratios on the growth and cannabinoid content of C. sativa.

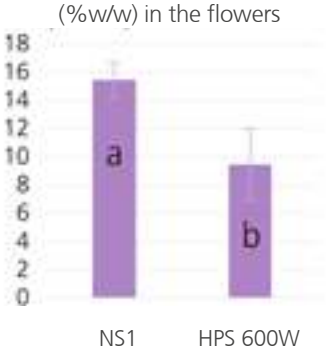
RESULTS

- 26-38 % more THC was produced under NS1 spectrum compared to HPS
- 29-40 % more CBD was produced under NS1 compared to HPS
- Compact and less elongated plants with Valoya AP673L and NS1 compared to HPS, but with higher cannabinoid yield
- More uniform crop with Valoya compared to HPS

CBD
(%w/w) in the flowers

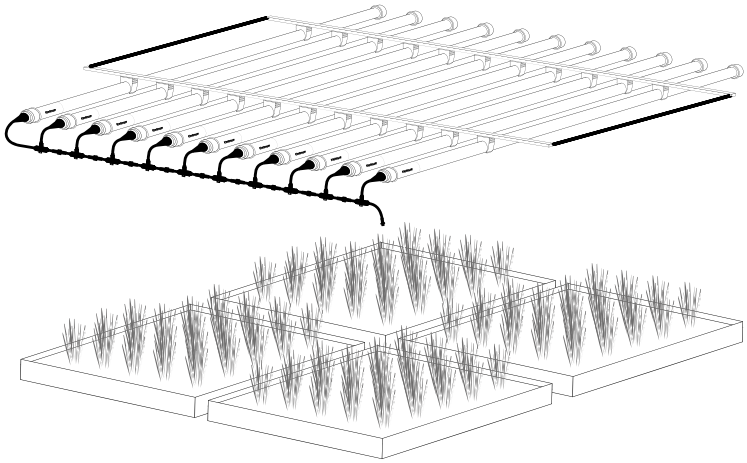


THC
(%w/w) in the flowers



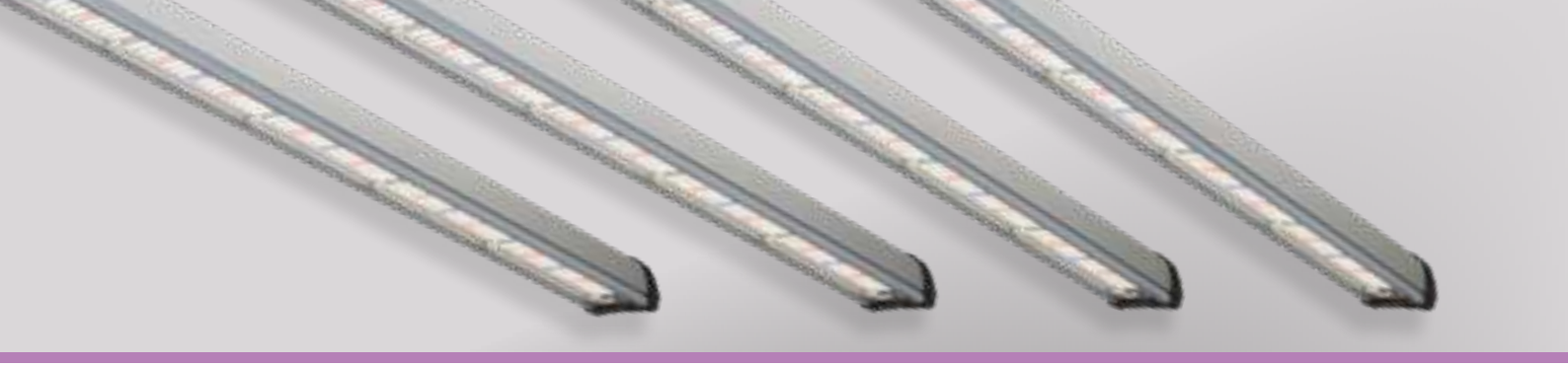
» **Higher THC and CBD levels**
» **Uniform crop quality**
» **Control over plant size: compact or elongated**

Sunscale VEG

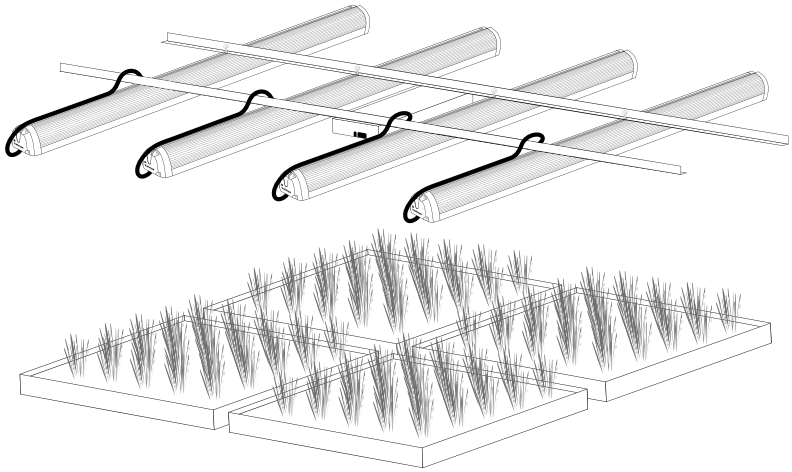


- Research grade fixtures with international certifications
- 11 high intensity tubes in a 4'x4' configuration
- Suitable for S.O.G. or multi-tiered
- Not bothered by dust, humidity or harsh cleaning agents (alcohol, peroxide, chlorine etc.)
- No finns or fans collecting dirt
- Best light uniformity on the market

	Sunscale VEG
Power consumption	**308 W**
Weight	**13.2 lb**
Dimensions (L x W / Tube diameter)	**4' x 4' / Ø 1.02"**
Certifications (LED tubes)	CE marked, Tested and certified to **UL/CSA** standards
Distance from the plants (rec.)	< 20"
Light intensity decay	Max 10% at 35 000 h. Typical usage 50 000 h
Light efficacy, (380 - 820 nm)	Up to **2.1 µmol/W** (spectrum dependent)
Ambient operating temperature	32 - 86 °F
No.of fixtures with a 10A circuit breaker	Up to 3
No.of fixtures with a 16A circuit breaker	Up to 5
Ingress Protection rating IP64: dust and humidity resistant; RoHS compliance; 3 years limited warranty (5 year optional warranty). Product shipped disassembled.	



Sunscale BLOOM



- Research grade fixtures with international certifications
- 4 high intensity bars in a 4'x4' configuration
- Suitable for S.O.G. or multi-tiered
- Not bothered by dust, humidity or harsh cleaning agents (alcohol, peroxide, chlorine etc.)
- No finns or fans collecting dirt
- Best light uniformity on the market

	Sunscale BLOOM
Power consumption	**480 W**
Weight	**32 lb**
Dimensions (L x W x H)	**4' x 4' x 2.3"**
Certifications (bars and LED driver)	CE marked, Tested and certified to **UL/CSA** standards
Dimming	1-10 V, PWM, light output: 10 - 100%
Minimum distance from plants	4"
Light efficacy, (380 nm ~ 820 nm)	Up to **2.1 µmol/W** (spectrum dependent)
Ambient operating temperature	32 - 104 ˚F
No.of fixtures with a 10A circuit breaker	Up to 2
No.of fixtures with a 16A circuit breaker	Up to 3
Ingress Protection rating IP67: dust, humidity and water submersion down to 3.3' depth resistant; RoHS compliance; 3 years limited warranty (5 year optional warranty). Product shipped disassembled.	

Lighting the **Cannabis Cultivation** Process

Mother Plants

VALOYA BENEFIT

- Valoya spectra promote strong vegetative growth, enabling higher production of good quality cuttings
- Minimized losses due to healthy, resistant plants

Sunscale VEG

The greater the vegetative growth the more high quality cuttings the mother plant will produce.

The cuttings are taken during the vegetative phase and this point 100µmol/m^2/s is the desired light intensity.

Cloning

VALOYA BENEFIT

- Valoya's fixtures have high IP rating meaning they are resistant to conditions of high humidity and dust
- With optimal light distribution, cloned plants will have uniform growth and will reach further growth stages simultaneously

Sunscale VEG

Cuttings from mother plants become clones. This step replaces the germination process and makes the entire growth cycle quicker. Typically, mother plants should not be older than 3 years.

High humidity is required for the cloning to be successful. The required light intensity for this stage is between 100 and 200 µmols/m^2/s.

Vegetative Stage

VALOYA BENEFIT

- NS1 spectrum results in compact and slim plants, perfect for vertical farming
- AP673L spectrum results in large plants with longer internodes
- Tight internodal length

Sunscale VEG

The photoperiod during the vegetative stage lasts 18-24 hours. Valoya's spectra support healthy foliage, development of tight internodes, strong structure and a healthy uptake for the root system.

Light intensity should start around 200 µmol/m^2/s and end around 400 or even 600 µmol/m^2/s.

Flowering

VALOYA BENEFIT

- High amount of dry flower weight
- Consistent flower quality and chemotype, cycle after cycle
- Quicker flowering period
- Decreased cost per pound of the final product

Sunscale BLOOM

The flowering period is triggered by adjusting the daily photoperiod to 12 hours of light and 12 hours of darkness (unless it's an autoflowering seed).

Light intensity should start at 600/700 µmol/m^2/s, then be raised to 850/1350 µmol/m^2/s for the final weeks of flowering.

RH must be closely monitored to avoid powdery mildew.

Valoya's Patented Spectra

Valoya holds 57 patents on its spectra and technology thus making it the second largest patent holder in the entire LED grow lights industry globally.

Our NS1 spectrum has been designed to replicate sunlight closely and is a true **wide** (also known as **full** or **continuous**) spectrum. This means it contains bits of all spectrum colors, including outside of the PAR area, unlike those of most manufacturers which are made up of off-the-shelf red and blue LED chips. Because it contains more spectrum colors, it feeds the plants with more information they need, just like the sunlight. Simple red-blue combinations that dominate the market serve only plants' basic needs and get them from seed to flower much slower.

The appearance of the NS1 spectrum is white making visual inspection of plants possible. Additionally, we also recommend our AP673L spectrum which results in large plants with longer internodes.

Go Vertical

Growing in two layers instead of one would double your yields. With traditional lighting methods this is impossible as they produce too much heat.

...the use of LED technology reduces leaf temperature by about 1.3°C (2.34°F) compared to HPS technology under typical, indoor growing conditions. (Nelson JA, Bugbee B. Analysis of environmental effects on leaf temperature under sunlight, HPS and LED. PloS one. 2015)

By choosing the NS1 spectrum your plants will be more compact while producing the same amount of flowers. This enables you to make even more than two layers. The fact that the single spectrum can be used for the entire growth cycle, means you would not have to move the plants at all.

Going vertical means a reduction in HVAC costs and water and fertilizer usage.

- **Spectra used by world's leading research institutes**
- **Fixtures resistant to humidity, dust, chemical exposure and even water submersion**
- **Free-of-charge light plan and support of a team of photobiology experts**

REBATES AVAILABLE

LEDs are affordable, especially with a rebate, and a lease finance contract.

Most power companies offer a cash rebate, and the amount depends on a number of factors. Work with us, as we can use a rebate to bring the cost of the LED fixture down to the same price for a 1,000-watt high pressure sodium (HPS) fixture. Also, Valoya fixtures are qualified for a lease. Even if you are a cannabis business.

With a lease, your Valoya fixtures, require no capital upfront.

At the end of the lease the LED lighting products can be bought for a very small dollar amount.

Benefits of the Valoya Lease Program

- Divide the equipment cost by the number of months to calculate the monthly payment – one advanced payment with 12 - 48 remaining payments
- Let the ROI (return on investment) of the LED lighting help pay for itself through its use
- Conserve your working capital
- Simple application/approval process
- Finance installation and training costs in one lease
- $1 purchase option allows you to own the LED product at lease end

To learn more about our rebates program, please contact Valoya's Business Development Manager for North America, **Ms.Erin Sharp - erin.sharp@valoya.com**

Standards applied:

NORTH AMERICA

UL1598: UL Standard for Safety for Luminaires.
CSA C22.2: #250.0: Standard for Safety for Light emitting diode (LED) equipment for lighting applications.

EUROPE

EN60598-1: Luminaires. General requirements and tests.
EN60598-2-1: Luminaires. Part 2: Particular requirements. Section one – Fixed general purpose luminaires.
EN62031: LED modules for general lighting. Safety specifications.
EN 62493: Assessment of lighting equipment related to human exposure to electromagnetic fields.
EN55015: Limits and methods of measurement of radio disturbance characteristics of electrical lighting and similar equipment.
EN61547: Equipment for general lighting purposes. EMC immunity requirements.
EN61000-3-2: Electromagnetic compatibility - Limits - Limits for harmonic current emissions.
EN61000-3-3: Electromagnetic compatibility – Limits - Limits for Voltage Fluctuations and Flicker.
IEC EN 61000-4-2: Electromagnetic compatibility (EMC)- Part 4-2: Testing and measurement techniques - electrostatic discharge immunity test.
IEC EN 61000-4-3: Electromagnetic compatibility (EMC)- Part 4-3: Testing and measurement techniques - radiated, radio-frequency, electromagnetic field immunity test.
IEC EN 61000-4-4: Electromagnetic compatibility (EMC) - Part 4-4: Testing and measurement techniques - Electrical fast transient/burst immunity test.
IEC EN 61000-4-5: Electromagnetic compatibility (EMC) - Part 4-5: Testing and measurement techniques - Surge immunity test.
IEC EN 61000-4-6: Electromagnetic compatibility (EMC) - Part 4-6: Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields.
IEC EN 61000-4-8: Electromagnetic compatibility (EMC) - Part 4-8: Testing and measurement techniques - Power frequency magnetic field immunity test.
IEC EN 61000-4-11: Electromagnetic compatibility (EMC) - Part 4-11: Testing and measurement techniques - Voltage dips, short interruptions and voltage variations immunity tests.
IEC 61347-2-13: Lamp controlgear. Particular requirements for d.c. or a.c. supplied electronic controlgear for LED modules.
IEC 61347-1 + A1: Lamp controlgear - Part 1: General and safety requirements.
IEC 62384 + A1: DC or AC supplied electronic control gear for LED modules. Performance requirements.
EN62471: Photobiological safety of lamps and lamp systems.

Head office

Melkonkatu 26,
00210 Helsinki,
Finland

T +358 10 2350 300
E sales@valoya.com
W www.valoya.com

Distributor list can be found at:

www.valoya.com/contact

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