

LED grow lights for horticulture

TECHNOLOGY
AND PRODUCTS

c^{led}

Better light for better growth

**EVERY PLANT SPECIES
HAS SPECIFIC NEEDS:
WE UNDERSTAND THEM
AND PROVIDE YOU WITH**

**THE RIGHT
SOLUTION.**

WE DEVELOP AND PRODUCE
LAMPS AND MODULES
LED FOR HORTICULTURE
TECHNOLOGICALLY AVANT-
GARDE, DESIGNED TO MAXIMIZE
THE YIELD OF PLANTS KEEPING
THE NUTRACEUTICAL PROPERTIES.

What sort of plants do you want to grow?

THE RIGHT LIGHT WHATEVER THE GROWING SET-UP

We started building our lighting know-how over twenty years ago, when we began developing electronic applications with a specific focus on the LED technology that has, for many years now, been changing the way light is designed, opening up new horizons also in the area of cultivation.



INTENSIVE CROPS

Production of Solanaceae (tomato, aubergine) and Cucurbitaceae (cucumber, melon) uninterrupted and guaranteed for 365 days a year, using customised light spectra according to crops. Produce shelf life is increased and greater plant compactness reduces manpower requirements.

GROWING

- GREENHOUSE
- VERTICAL FARM

SPECTRA

- Hortis spectrum
- Fruits spectrum (intra-canopy)
- Extended White spectrum "Come il Sole" ("Like the sun")

LAMPS

- Combo lamp



ALGAE

Growing algae suitable for human consumption such as spirulina and chlorella, marketed as fresh or freeze-dried products, is a business not linked to a specific production season and highly appreciated by the food supplement industry. LED lamps speed up algal growth ensuring earlier harvests and at the same time, products rich in antioxidants.

GROWING

- GREENHOUSE
- VERTICAL FARM

SPECTRA

- Purple EVO spectrum
- Custom spectra

LAMPS

- Penta-Circular lamp
- Combo lamp



MUSHROOMS

Mushrooms include several very popular varieties, such as pleurotus or champignon (button mushrooms). With C-LED, it is possible to achieve improved product characteristics, such as better size and a shorter waiting time between one harvest and the next.

GROWING

- VERTICAL FARM

SPECTRA

- Mushroom spectrum

LAMPS

- Slim lamp
- Futura lamp



SMALL FRUITS

Raspberries, strawberries, blackberries and blueberries are typically summer crops that require special care and lots of light. Thanks to LED lamps fruit growth can be regulated to obtain higher yields as well as firmer fruits, with brighter colouring which consequently are better sellers.

GROWING

- GREENHOUSE
- VERTICAL FARM

SPECTRA

- Hortis and Extended white

LAMPS

- Combo lamp



EDULOUS FLOWERS

GROWING

- GREENHOUSE
- VERTICAL FARM

SPECTRA

- Extended white
- Hortis

LAMPS

- Combo lamp (greenhouse)
- Slim lamp (vertical farm/indoor)



ORNAMENTAL PLANTS

Roses, gerberas, chrysanthemums, tulips, peonies and daffodils are just some of the floricultural products that can be very successfully grown thanks to the C-LED technology: longer stems with larger diameter, earlier, more homogeneous flowering, and more compact inflorescence.

GROWING

- GREENHOUSE

SPECTRA

- Bloom spectrum
- Fr extended white spectrum

LAMPS

- Combo lamp



LEAFY VEGETABLES

Leafy vegetables include lettuce, chicory, thyme, parsley, basil and other crops that are harvested at the time of maximum leaf growth. C-LED lamps ensure shorter production cycles, guaranteeing thriving production throughout the year and making it easier to control flowering.

GROWING

- GREENHOUSE
- VERTICAL FARM

SPECTRA

- Hortis spectrum
- Extended white spectrum
- Natural Indoor spectrum

LAMPS

- Slim lamp
- Combo lamp
- Futura lamp



BABY LEAF

Baby leaf crops include plants of lettuce, rocket, spinach, corn salad, cabbage and many others normally sold once they have grown 3-5 true leaves, about 20-40 days after sowing. Early harvesting, to ensure a higher number of cycles per year, is one of the primary goals that the C-LED research activity aims at.

GROWING

- GREENHOUSE
- VERTICAL FARM

SPECTRA

- Hortis spectrum
- Extended white spectrum
- Natural Indoor spectrum

LAMPS

- Slim lamp
- Combo lamp
- Futura lamp



MICROPROPAGATION

All the phases preceding field planting of micropropagated fruit plants are carried out in a completely sterile environment: cell multiplication, distension, rooting and finally, acclimatising, in order to obtain, with C-LED lamps, certified and virus-free material.

GROWING

- VERTICAL FARM

SPECTRA

- Micro-propagation spectrum

LAMPS

- Slim lamp



MICROGREEN

Microgreens can be defined "baby" vegetable varieties as they are harvested as soon as they grow the first two true leaves, i.e. after about 7-20 days. The peculiarity of these crops is the very high levels of vitamins and antioxidants contained in their tissues, which, with C-LED lamps, can be up to 40 times higher than in traditional vegetables.

GROWING

- GREENHOUSE
- VERTICAL FARM

SPECTRA

- Hortis spectrum
- Extended white spectrum
- Natural Indoor spectrum

LAMPS

- Slim lamp
- Futura lamp



HEMP

Production of Hemp inflorescences for active principle extraction. C-LED offers solutions to ensure earlier production and shortening of plant internodes: this increases the amount of flowers and dry matter of the harvested product resulting in lower drying costs and higher production yields.

GROWING

- GREENHOUSE
- VERTICAL FARM

SPECTRA

- Extended White spectrum (vegetative and flowering)
- Cool White spectrum (cutting and seedling)

LAMPS

- Slim lamp
- Combo lamp
- Futura lamp

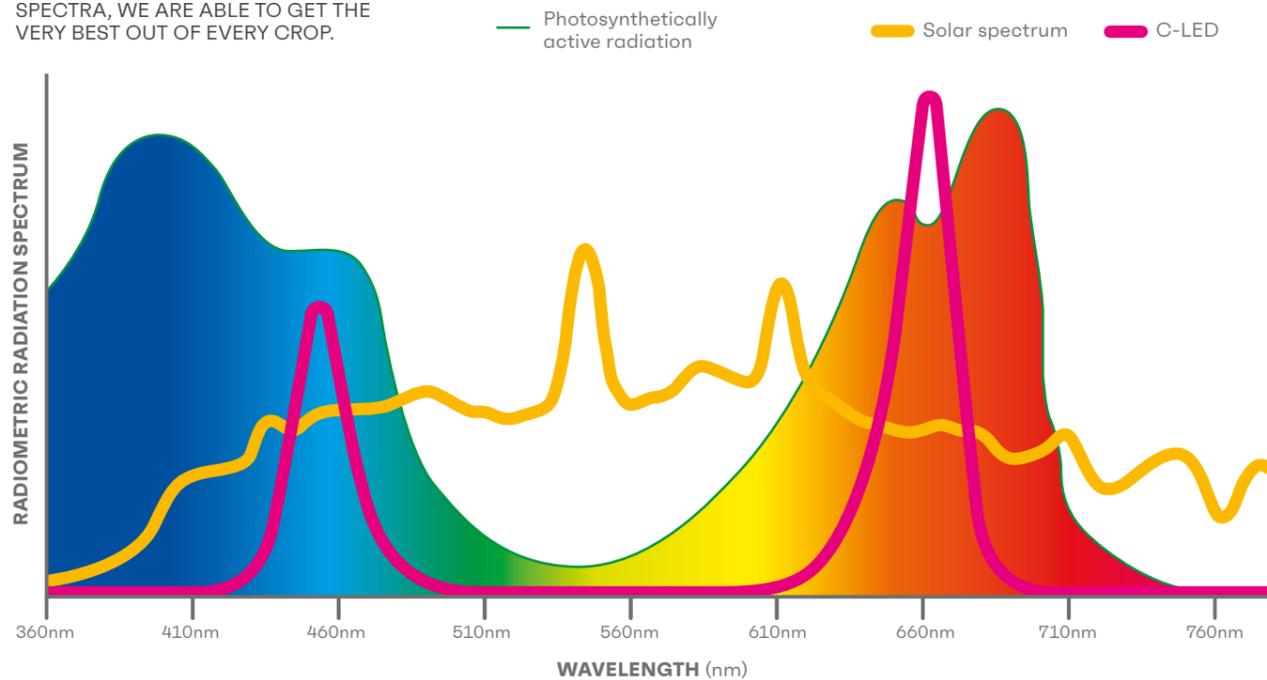
EXPERTISE THAT GROWS AND GROWS.

EACH PLANT HAS SPECIFIC LIGHT INTENSITY/TYPE REQUIREMENTS. HOW CAN WE GET THE BEST PERFORMANCE FROM OUR PLANTS?

C-LED studies the correct recipe for each type of plant, at every stage of its growth. C-LED can count on a highly experienced research team: the company provides scientists and researchers at universities and research facilities with constant close support and they, in turn, support C-LED in developing cutting-edge products. Together with you, we can study and choose the right light recipe to optimize yield, also in line with your objectives. The best recipe combines several factors: light spectrum, intensity, schedules, uniformity and positioning.

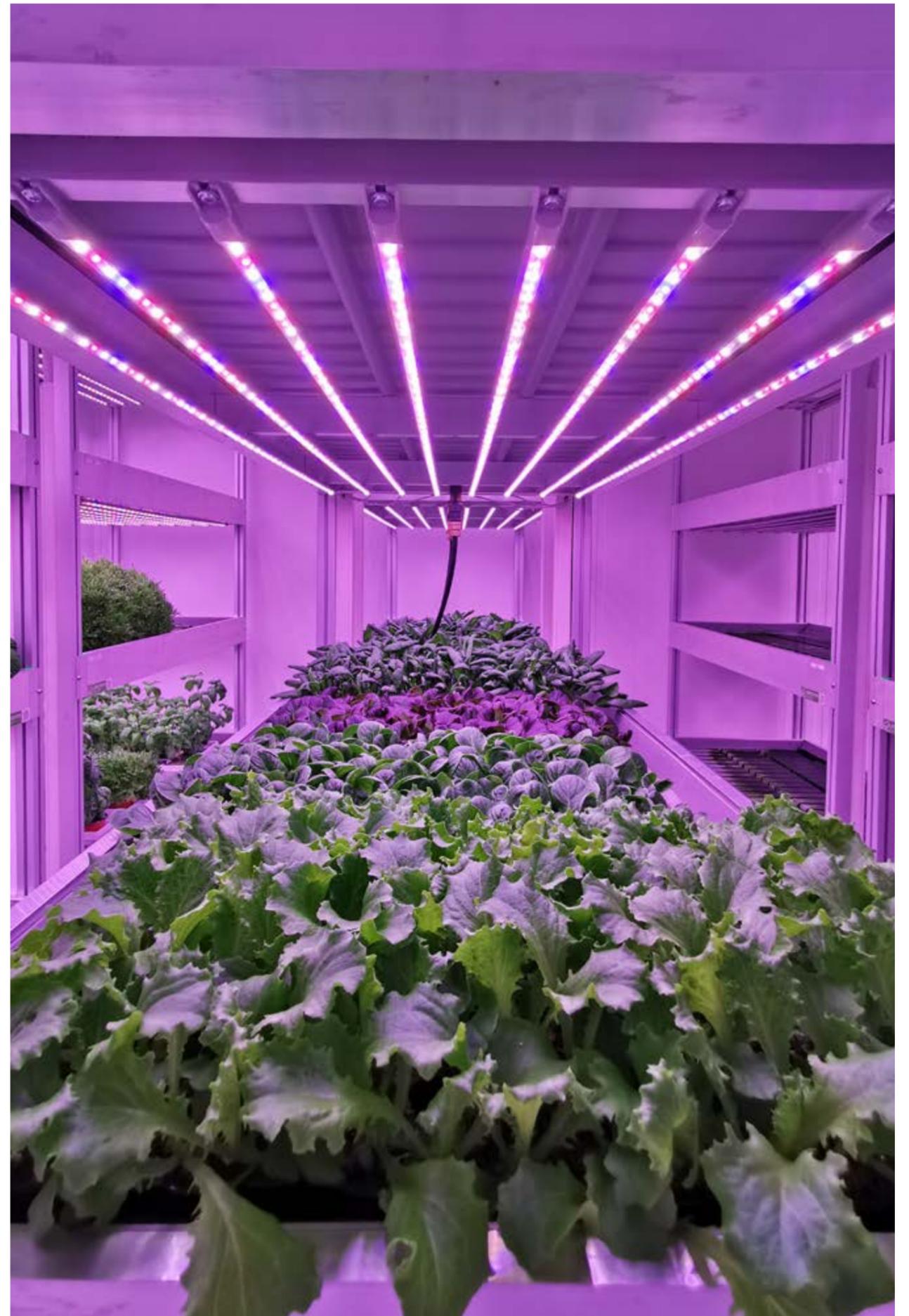
DIFFERENT COMBINATIONS OF LIGHT LET YOU CONTROL HIGHLY SPECIFIC PLANT CHARACTERISTICS, FROM COMPACTNESS TO COLOUR INTENSITY AND FOLIAGE DEVELOPMENT, THUS BOOSTING RESULTS.

WE INVEST CONTINUOUSLY TO ENSURE THAT OUR LIGHTING PROPOSALS ARE ALWAYS STATE-OF-THE-ART. THROUGH CAREFUL DIFFERENTIATION OF LIGHTING SPECTRA, WE ARE ABLE TO GET THE VERY BEST OUT OF EVERY CROP.



LIGHT THAT PLANTS LIKE

Chlorophylls (the molecules that make up plants) don't capture all wavelengths in the same way. Instead, they have a liking for some spectra rather than others. It is intuitively understandable that leaves reflect green light with ease; that is why they appear green, as they absorb only minimal amounts of this light. Blue and red spectra, instead, are vital to plants. Indeed, it is not by chance that the absorption peaks in chlorophyll types that play the main role in photosynthesis - chlorophyll a and chlorophyll b - are found across the blue and red wavelengths.



Combo

HIGH-EFFICIENCY LED TOPLIGHT LAMPS.



A SPECIFIC SPECTRUM FOR EVERY CROP

IN COLLABORATION WITH MAJOR ITALIAN UNIVERSITIES, WE IDENTIFY THE RIGHT LIGHT SPECTRA FOR EVERY PRODUCTION NEED.



**HIGH ENERGY EFFICIENCY
MAXIMUM**
PHOTOSYNTHETICALLY ACTIVE LIGHT EMISSION WITH REDUCED ENERGY CONSUMPTION.



**HOME FARMING
AUTOMATION AND
COMPATIBILITY WITH 4.0**
ALL OUR LATEST GENERATION LAMPS ARE CONTROLLABLE WITH 4.0 HOME FARMING AUTOMATION SYSTEMS.



REPLACES HPS AND MH
PERFECT FOR A FACILITY UPGRADE, IT REQUIRES NO WORK-INTENSIVE MAJOR CHANGES



COMPACT
DESIGN SPECIFICALLY DEVELOPED TO REDUCE THE WEIGHT OF THE LAMP AND THE SHADOW EFFECT ON GREENHOUSE CROPS.



FULLY CONTROLLABLE
AN ADJUSTABLE LIGHT FLUX MEANS THAT IT IS POSSIBLE TO ADJUST THE AMOUNT OF EMITTED LIGHT

THE NEW C-LED COMBO LAMPS INCORPORATE AN EXTENDED WHITE SPECTRUM AND ENSURE OUTSTANDING CROP YIELDS, **CONSUMING 40% LESS ELECTRICITY**; SINCE THE LIGHT CAN BE DIMMED, THE TECHNOLOGY LETS USERS RECREATE SOLAR-LIKE DAWN-TO-DUSK CONDITIONS, MAXIMISING PRODUCTION.

AVAILABLE SPECTRA



EXTENDED WHITE



COOL WHITE



HORTIS



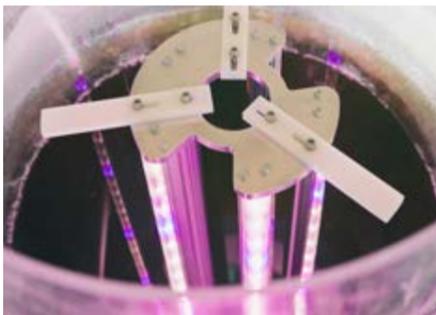
-  fruit vegetables
-  leafy vegetables
-  small fruits
-  cannabis
-  greenhouse growing
-  indoor growing
-  flowers

COMPLETE TECHNICAL
INFORMATION ON PAGE 20

Microalgae



C-LED DESIGNS AND PRODUCES LED LAMPS WITH SPECIFIC SPECTRA FOR THE GROWING OF MICROALGAE IN TANKS OR WITH A PHOTOBIOREACTOR. LAMPS MAY BE INSTALLED CLOSE TO THE PLANTS TO OBTAIN BETTER PHOTOSYNTHETIC EFFICIENCY.



Penta-Circular

We study the effect of LED light on the growth and development of algae within enclosed and sheltered systems, such as photobioreactors. We have developed this specific lamp, already tested and used at a number of research centres.

Slim



THE USE OF LED LAMPS IN THE MICROGREENS AND MICROPROPAGATION SECTOR IS AN INNOVATION THAT OFFERS NUMEROUS ADVANTAGES OVER CONVENTIONAL NEON LAMPS.

Tests conducted by C-LED in collaboration with university research institutes have enabled us to develop a lamp specifically for micropropagation, to offer a high-performance solution for a wide variety of plants.

The greater energy savings obtained with Slim lamps allow for efficiency enhancement as well as shorter switch-on and switch-off times. The size and the weight of the lamps, reduced to a minimum, together with their lower heat emission, allows us to keep the Slim lamps at a closer distance in plant factories or other similar seedling growing systems, improving their photosynthetic efficiency and reducing consumption.

COMPLETE TECHNICAL INFORMATION ON PAGE 19

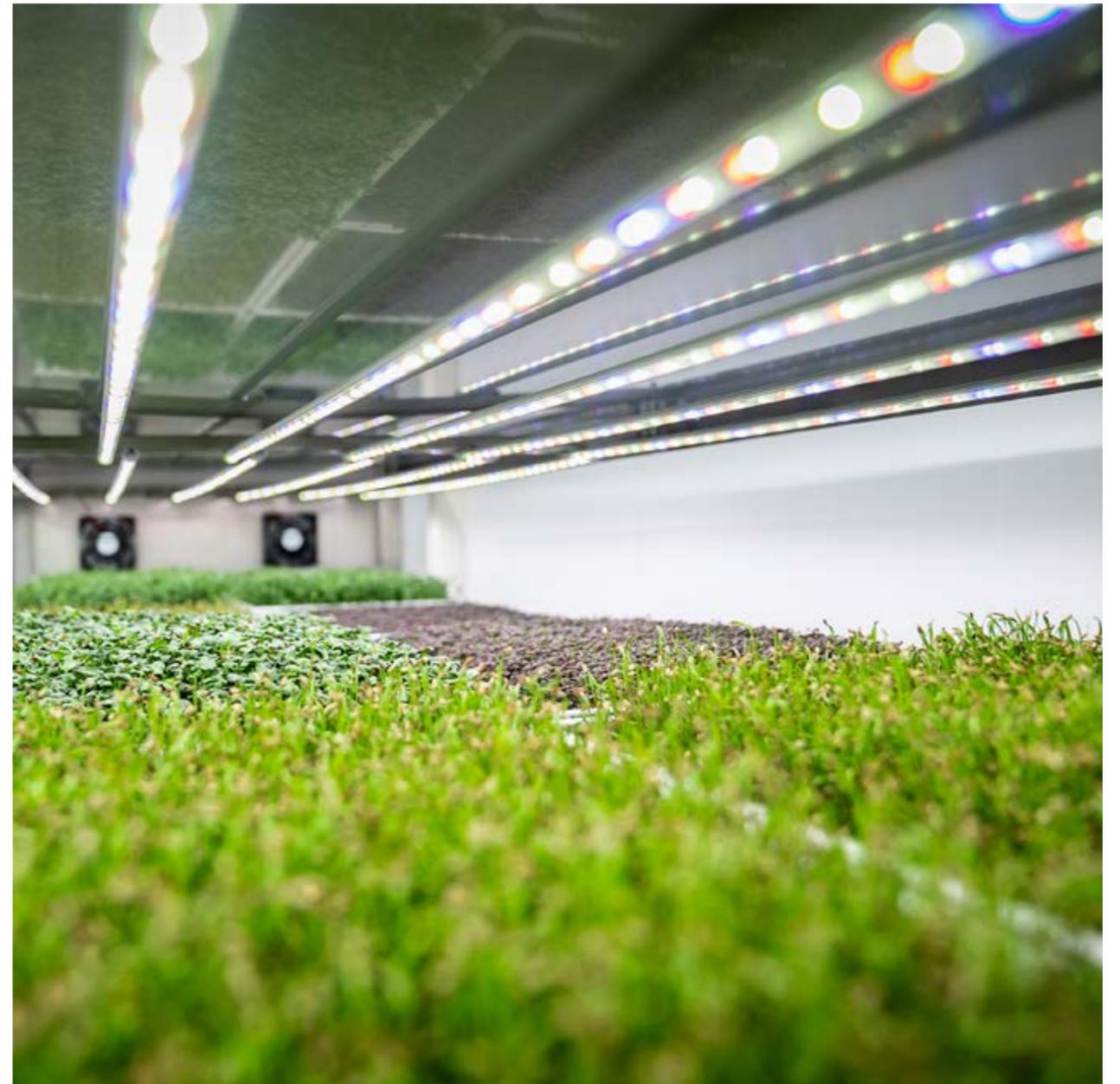
THE SPECTRUM OF LIGHT EMITTED BY THE C-LED LAMPS HAS BEEN SPECIALLY DESIGNED TO ENSURE HARMONIOUS DEVELOPMENT AND BETTER OVERALL HEALTH OF THE PLANT.

All these aspects facilitate the optimisation of environment management and production yields.



Futura

HIGH EFFICIENCY LAMP SUITABLE FOR INDOOR VERTICAL-FARMING CROPS



THE FUTURA LAMP IS SPECIFICALLY DESIGNED FOR VERTICAL-FARMING: ITS COMPLETE PAR SPECTRUM **MAXIMISES CROP YIELDS IN BOTH QUANTITATIVE AND QUALITATIVE TERMS.**

ITS BROAD SPECTRUM AND LIGHT DIMMING FEATURE MAKE IT SUITABLE FOR GROWING ALL TYPES OF MICROGREEN, BABY LEAF AND HERB PLANTS.

FEATURES

- EFFICIENCY up to 3.7 $\mu\text{mol}/\text{J}$
TLed=25° (3.1 for natural indoor)
- Does not contain mercury or other chemical substances harmful to the environment
- Dimmable light intensity
- 40,000 h \geq L90
- 5-year warranty
- Different lengths available
P85 – P100 – P125 – P195
- IP65 protection rating
- Connectable in series up to a maximum of 135 W
- Power supply 24 V DC
- Impact resistant

INFORMAZIONI TECNICHE
COMPLETE A PAG. 21

Cooperating and sharing skills.

SOME INDUSTRIAL PARTNERSHIPS



PARTNERSHIPS

WE FIRMLY BELIEVE THAT BY SHARING DIFFERENT SKILLS AND KNOWLEDGE, WE CAN DEVELOP MORE INNOVATIVE AND EFFICIENT PROJECTS.

MUTUAL EXCHANGES OF EXPERIENCE AND NETWORKING FORM THE BASIS OF OUR GROWTH STRATEGY.

MICROPROPAGATION

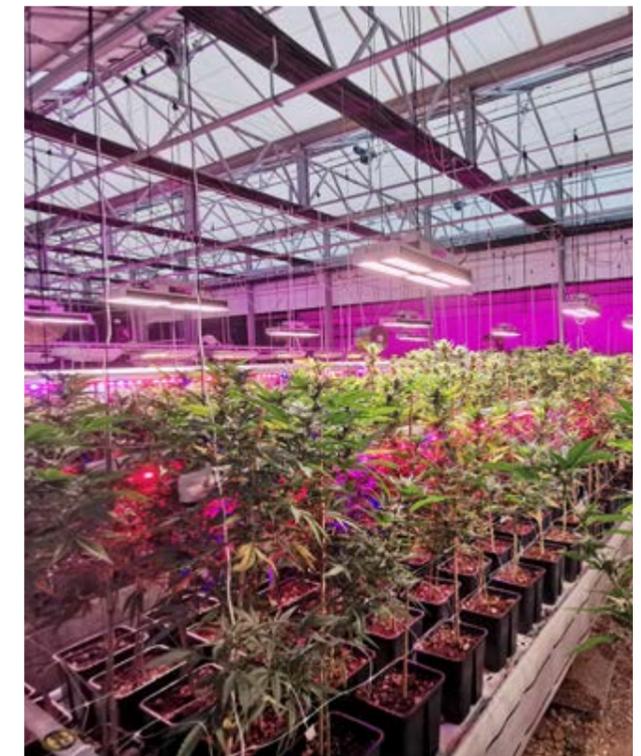
Micropropagation is the core business of Vitroplant, a farming company specialising in the multiplication of high-value plants such as small fruit shrubs or fruit trees, and in open field acclimatizing. Lighting management, the most critical and important process factor, is achieved with our technology. We have designed Slim lamps, suitable for confined spaces without natural lighting, and the PROPAGATION spectrum, specifically created to positively influence plants. The acclimatisation phase is carried out in nurseries and to support the growth of already grown plants, Circular lamps have been installed, with the special NATURAL spectrum, particularly suitable for plants that have undergone stress, such as those that must adapt to open field conditions or have just been grafted.

PHYTOTRONS

Agroservice Spa is a company based in the Marche region, in Italy, specialising in seed multiplication and research activities in the field of new cultivar breeding for herbaceous, forage and leguminous crops. In conjunction with C-LED, Agroservice has decided to invest in a new research project, in which the growth of hybrid wheat seedlings (the basic genetic material) occurs in a phytotron and lighting is guaranteed by our C-LED technology. To help growers obtain seedlings with a stronger stem, a more intense shade of green and a higher number of spikes, we have installed Toplight Plus units and designed a completely new light spectrum specifically for wheat in a wholly innovative set-up.

HEMP

Anubias, located in Villanova di Castenaso (Bologna, Italy), grows a Cannabis variety with low THC content using a hydroponic, soilless growing technique. Thanks to the C-LED lamp technology, in terms of light distribution, intensity and spectrum, the quantity and quality of the harvest are enhanced.



Installation of Interlight lamps at Anubias

NUTRIENTS

Biolchim Spa is a company based in the Bologna area and specialising in the production and marketing of high-tech fertilizers, and in particular biostimulants, designed to maximise crop productivity. Biolchim is particularly interested in LED lamps for horticulture, so much so that it recently installed a phytotron for specific trials on the nutrient requirements of plants under LED lighting, with a view to rewriting the fertigation formula. For trial purposes, Circular lamps have been installed, particularly suitable for indoor environments.

ALGAE

The "Photosynthetic & Microbiological" University of Florence spin-off initiative, founded by Professor Mario Tredici in 2004, which specialises in research, consultancy and sales of technological solutions for the cultivation of photosynthetic microorganisms (microalgae and cyanobacteria) for industrial applications, has chosen C-LED as its partner for the study of the effects of LED lights on algae, in order to evaluate the effects of LED light on the physiology and biochemistry of photosynthetic microorganisms.

FLOWERS

Nozza Luciano is a farm in the province of Bergamo that has been producing and marketing flowers since 1984. In order to improve production, mainly in autumn and spring, Nozza involved C-LED in a new trial, along with the University of Bologna, on the use of LED lights for different ornamental varieties, with excellent results in terms of flowering time, compactness, flower colour and plant habit.



TOPLIGHT LAMPS FOR GROWING MICRO-ALGAE IN A PROTECTED ENVIRONMENT



300 W EXTENDED WHITE COMBO LAMPS FOR GREENHOUSE FARMING.



FULL SPECTRUM DIMMABLE INDOOR FARMING LAMPS, SPECIFICALLY DESIGNED TO GROW MICROGREENS, AROMATIC PLANTS AND BABY LEAF CROPS.



FULL SPECTRUM DIMMABLE 600 W COMBO LAMPS FOR INDOOR AND GREENHOUSE HEMP CROPS.

Supporting each other and growing together

OUR RESEARCH PARTNERSHIPS

PEOPLE HAVE ALWAYS GIVEN C-LED ITS COMPETITIVE ADVANTAGE.

THE RELATIONSHIP WITH UNIVERSITIES WAS STARTED TO TRIGGER AND DEVELOP THE VIRTUOUS CIRCLE THAT RESULTS IN MOTIVATED PEOPLE AND INNOVATIVE AND SUSTAINABLE PROJECTS.

RESEARCH ON ORNAMENTAL AND HORTICULTURAL PLANTS

- Studies and tests on the effects of Inter-Light lamps on vertical-growing plants such as tomatoes and raspberries.
- Tests on strawberry plants in plant factories and in greenhouse gutter systems.
- Imola headquarters, ornamental plants: studies on effects of light spectra compared to natural light on ornamental plants illuminated with Toplighting Plus.

RESEARCH ON MICROPROPAGATION

Founded in 1923, CNR is Italy's largest public research organisation. In the agro-environmental science field, its studies mainly focus on the conservation of genetic resources, sustainable agriculture and traceability of production. The performed tests concern micro-propagation, that is, the growth of arboreal plant shoots (mainly peach) inside special containers with a substrate containing glucose and other elements to obtain virus-free plants with optimal production standards.

MICRO-ALGAE RESEARCH

The University of Florence studies a wide range of topics spanning from arboreal sciences to genetics and land management.

C-LED experimentation largely focus on the cultivation of spirulina and chlorella in water-filled photobioreactors: light for photosynthesis is provided by special waterproof C-LED lamps with a 360° light flow.

BASIC PHYSIOLOGICAL RESEARCH

Studies on the nutraceutical aspects of leafy plant varieties under differentiated LED light spectra. In addition to the quantity of light administered to the plants, the light spectrum plays an essential role in determining the build-up of antioxidant substances and vitamins.

- Controlled-environment experimentation on the correlation of exposure to UV-A and UV-B radiation with the synthesis of antioxidant molecules inside leaf tissues (in completely safe working conditions);
- Study on the nutraceutical properties of leafy products following exposure to spectra with different ratios of red light and blue light.

RESEARCH ON TOMATO AND MICROGREENS

Several experimental projects focusing on testing the best production set-ups attainable with C-LED lamps in tomato and microgreen growing.

COMBO SERIES LAMP

STANDARD OUTPUT/HIGH OUTPUT

UP TO 3 $\mu\text{mole}/\text{J}$

	COMBO 150W			COMBO 300W		
	Cool	Extended white	Hortis	Cool	Extended white	Hortis
ELECTRICAL CHARACTERISTICS						
Power supply (V ac)	200-480			200-480		
Frequency (Hz)	50/60			50/60		
Power consumption (W)	120	150	135	240	300	270
LIGHTING TECHNOLOGY CHARACTERISTICS						
PPF ($\mu\text{mole}/\text{J Tled} = 25^\circ\text{C}$)	310	420	443	620	840	886
Efficiency ($\mu\text{mole}/\text{J}$)	2,6	2,8	3,3	2,6	2,8	3,3
LED average life	L70 > 50.000 ore / L90 > 25.000 ore			L70 > 50.000 ore / L90 > 25.000 ore		
Dimmability	sì			sì		
MECHANICAL CHARACTERISTICS						
Working environment temperature ($^\circ\text{C}$)	-10/+40			-10/+40		
Protection class	IP66			IP66		
Dimensions (mm)	339x98x160			683x98x162		
Weight (kg)	2,75			5,3		
Certifications	CE / UL / RoHS Compliant			CE / UL / RoHS Compliant		

	COMBO 600W			COMBO 900W		
	Cool	Extended white	Hortis	Cool	Extended white	Hortis
ELECTRICAL CHARACTERISTICS						
Power supply (V ac)	200-480			200-480		
Frequency (Hz)	50/60			50/60		
Power consumption (W)	480	600	540	720	900	810
LIGHTING TECHNOLOGY CHARACTERISTICS						
PPF ($\mu\text{mole}/\text{J Tled} = 25^\circ\text{C}$)	1240	1680	1772	1860	2520	2658
Efficiency ($\mu\text{mole}/\text{J}$)	2,6	2,8	3,3	2,6	2,8	3,3
LED average life	L70 > 50.000 ore / L90 > 25.000 ore			L70 > 50.000 ore / L90 > 25.000 ore		
Dimmability	sì			sì		
MECHANICAL CHARACTERISTICS						
Working environment temperature ($^\circ\text{C}$)	-10/+40			-10/+40		
Protection class	IP66			IP66		
Dimensions (mm)	683x219x167,5			1017x219x173		
Weight (kg)	10			15,3		
Certifications	CE / UL / RoHS Compliant			CE / UL / RoHS Compliant		

LAMPADA FUTURA

TECHNICAL SPECIFICATIONS						
SKU	Description	Spectrum	Electrical Power (W)	Lenght (mm)	PPF ($\mu\text{mol}/\text{s}$)	Efficacy ($\mu\text{mol}/\text{J}$)
P85 97666832	24V P85	Natural indoor	15W	840 mm	46,5 $\mu\text{mol}/\text{s}$	3,1 $\mu\text{mol}/\text{J}$
P100 97666826	24V P100	"	18W	933 mm	58,9 $\mu\text{mol}/\text{s}$	3,1 $\mu\text{mol}/\text{J}$
P125 97666664	24V P125	"	22W	1235 mm	68,2 $\mu\text{mol}/\text{s}$	3,1 $\mu\text{mol}/\text{J}$
P195 97666833	24V P195	"	36W	1965 mm	111,6 $\mu\text{mol}/\text{s}$	3,1 $\mu\text{mol}/\text{J}$

SLIM LAMP

MECHANICAL CHARACTERISTICS	
Power supply	24V dc
Absorbed power	Fino a 17W/mt
LIGHTING TECHNOLOGY CHARACTERISTICS	
PPF	PPF=fino a 35 $\mu\text{mol}/\text{sec}/\text{mt}$
MECHANICAL CHARACTERISTICS	
Protection class	IP65
Dimensions (L x W x H)	da 380 a 1630 x 12 x 16,3 mm
Average LED lamp lifetime	L70 > 50.000 ore
Work environment temperature	-10 $^\circ\text{C}$ / +35 $^\circ\text{C}$

C-LED IS A GROUP COMPANY OF

cefla



CEFLA IS A SOLID ORGANISATION OPERATING INTERNATIONALLY IN VARIOUS FIELDS OF BUSINESS, WITH CORE VALUES INCLUDING SHARING, INVOLVEMENT AND ENCOURAGING ENTREPRENEURSHIP AS A JOINT PERSONAL EFFORT.

OUR SITES

Cefla was founded in Imola, where we still maintain our headquarters. We also have **26 LOCATIONS** around the world.

PLANTS

We have **14 PRODUCTION SITES** in Italy, China, Germany, Russia and the USA, with a total surface area of 176,000 sqm.

EMPLOYEES

Currently, we can rely on the professionalism and passion of **2000 EMPLOYEES**.

ACTIVE CUSTOMERS

We have **55,000 ACTIVE CUSTOMERS**, who believe and invest in innovation as much as we do.

CEFLA'S BUSINESS UNITS COMBINE SKILLS AND ABILITIES IN ORDER TO ATTAIN IMPORTANT GOALS IN THEIR SPECIFIC FIELDS OF BUSINESS, BUT SHARING A COMMON PROJECT WHERE NETWORKS OF RELATIONS AND TALENT BLEND AND SUPPORT EACH OTHER.

ENGINEERING

Civil and technological plants, cogeneration, trigeneration and systems for power generation and recovery.

FINISHING

World leader in the design and production of solutions for painting, decoration and digital printing of wood and wood derivatives.

MEDICAL EQUIPMENT

Development and production of high-tech medical devices for the medical sector, for dental professionals and radiologists.

LIGHTING

Lighting solutions with LED technology, architectural lighting and wireless connectivity.



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| innova

c-led

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