

TotalGrow™

Indoor Cannabis Cultivation Evaluation

The California Cannabis Company, with assistance from a California medical marijuana collective, California Cannabis Collective (**CCC**), evaluated the TotalGrow Lighting technology. Christian Barrett was the cultivator for the collective. An additional cultivator for the collective assisted by growing the same strain, Temecula-Rex, in an additional grow room (**Standard**).



Based on high grams harvested per watt of lighting used in our testing, we expect to produce up to 1.5 grams of product per watt of lighting with TotalGrow lights in our full production environments.

-Christian Barrett

Grow Room specifications: CCC

- A partitioned space of approximately 240 sq. ft. Only a portion used for growing. Lighted growing space approximately 40 sq. ft. each. 1 veg. 1 flower.
- No air conditioning, only a small air cooler for temperature control. Small amount of CO₂ added.
- Lighting used for clones was fluorescent tube lighting.
- Vegetative lighting was a combination of fluorescent and very inexpensive LED 12x12 panels. 1 TotalGrow fixture was added during the evaluation. All lighting was kept between 1-2 ft from the top of the plants. Adjusting as needed. Only illuminating a portion of the room, except for light escaping the grow area. Plants and lights were kept close to walls to use as light reflecting surfaces. One side was kept open for access and air flow.
- Flowering area lighting consisted of 2 TotalGrow TG15A Broad Grow Spectrum Light fixtures and were kept between 1-2 ft from the top of the plants, adjusting as needed. Only illuminating a portion of the room, except for light escaping the grow area. Plants

and lights were kept close to walls to use as light reflecting surfaces. One side was kept open for access and air flow.

- Medium - Soil
- Total wattage for vegetative lighting = 410 (155 TG, 255 FL)
- Total wattage for flowering lighting = 310 (155 each TG)
- Plants grown - Cannabis, indica, Temecula-Rex strain

Standard

- 2 rooms. 1 room for vegetative growth, and 1 room for flowering. Veg. room consisted of approximately 70 sq. ft. Flower room was approximately 800 sq. ft.
- Both rooms had air conditioning, fans and air filters. CO2 added automatic/continuously.
- Clone & Veg. lighting consisted of fluorescent tubes of varying lengths, and 1 **LED**. Lights were kept at 2-4' above the top of plants, illuminating the entire room. All of the room could support plant growth.
- Flowering rooms consisted of **LED** lighting. Lights were kept 3-6' above top of plants, illuminating the entire room. Most of the room could support plant growth.
- Medium - Soil
- Total wattage for vegetative lighting = unknown, more than 1,000
- Total wattage for flowering lighting = unknown, more than 6,000
- Plants grown - Cannabis, indica, Temecula-Rex strain

Considering the difference between the two test grow rooms, we will focus on a plant to plant comparison, as opposed to room to room. The average growth and harvest of this particular strain are as follows. Plants grow an additional 25% during flower, and produce 25-30 grams of dried flower, per plant. This is based on the height of 24" when moved to flowering.

CCC

Within 3-5 days of placing our plants under the TotalGrow lighting we noticed new growth was a darker green color, and larger leaves were being produced. It was very apparent visually that there was a difference between old and new growth. This was replicated time and again, as we placed more and more plants under the TG lights. Even existing leaves would seem to expand in size within 5 days of placement under TG. During testing the veg. lighting was left on 24 hours a day. We have since switched to our standard of 18 hours on, and 6 hours off.

Every time we moved a new clone or slightly older plant under TG, the leaves would grow larger and darker. The leaves looked healthier!



During vegetative growth we were very pleased with the growth, especially when we started counting wattage used. Even using fluorescents required more wattage than the TG lighting did. One light 2-3 ft above plants could support growth for multiple plants, depending on container sizes. We could place 2-12 plants under 1 TG. These were grown to about 24-28" in height, from the bottom of the plant, not the container. At 24", we would move the plants into the flower area. Most plants, on most days, grew 1" per day.

The first plants we flowered under TG were mother plants and were closer to 3' in height. These plants only spent 2 weeks under TG lighting before being switched to a flowering cycle of 12 hours on, and 12 hours off. These plants were slightly taller and older than our normal plant cycle. We were concerned that these plants might grow taller than we would like during flowering. The result was that the plants grew 20-25% more in height during flowering, just as they would under HPS lighting. I believe slightly less height increase under TG.

We placed 2 plants under each TG light with two lights total in the flower space. The plants were kept close together, focusing the lighting on the tops of the plants. Almost a sea of green method, without the grid. We did use some string and stick support to get the most light on the top branches. These plants had more top branches than normal, as they had been topped several time to produce clones. Each plant had 8-10 top branches.



We at first added some LED panels to the side of the plants, but near the tops. In just a few days we noticed the plants would turn their leaves toward the TG lighting, no matter how close we placed the LED lights. It was obvious they preferred the TG spectrum, or intensity. So we removed the LED lights from the grow space. This was slightly surprising, as the LED were much closer to the plants. I will say, these lights are very cheap and likely not very good lighting. We have had plants respond well with these lights, but mostly smaller plants.

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The flowers produced were nice and dense. Color of the flowers was nice, everything always looked healthy. Lots of terpenes, and nice dark buds. The lower branches were much smaller buds and lighter in color. This is not uncommon with standard lighting to produce the same

results. In hindsight, we should have added some single TG bulbs for the lower branches. Since this lighting doesn't produce hardly any heat, bulbs can be very close to vegetation. I even allowed one flower to grow within 5-6" of the TG light. The result was a slightly denser bud, and no burning of the plant at all. This cannot be done with most lighting sources. The plants tips would be burnt up in a day or two. The flower stayed within inches for weeks.



Our harvested flowers were simply beautiful. We harvest an average of 45 grams per plant. A 50% increase, but the plants were larger than average. We expected, or were looking for something near this amount. Current plants that are more the average size currently flowering are looking to be producing the 25-30 grams average. We have to consider though, the wattage per plant being used. Our current and new setup for the flowering plants utilizing TG lighting is, 4 plants per light, or 155 watts. $155 / 4 = 38.75$ watts per plant, or 27.5 grams. 1 gram for every 1.4 watts used. If this was a more reflective and closed grow room, with added CO₂, possibly hydroponic, we would get more than a 1 to 1 ratio. We will test this theory in the near future. I would expect we could possibly get to a 1.5 grams produced, per 1 watt used. I believe it is possible. Also, this particular strain is not a big producer based on weight. Another strain could produce more than a 1 to 1 ratio, in the grow space we have currently set up with TG lights.

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Standard

I'm going to point out the differences of the standard grow results of the exact same strain, clones from the same mother plants. The standard room lighting was 10 Lush lighting Dominator 2x's with 1 MH/HPS 1000 watt. The bulb was changed at times as a separate test also. These plants were more spread out and received lighting even down toward the bottom of the plants. Due to their stretched branches, light could penetrate the branches all the way to the bottom, much easier.

These plants were taller and stretched out in height, branch lengths and distance between nodes. Flowers look to be about the same size, possibly, slightly less dense and possibly

slightly longer. Even with these differences, they appear to be producing about the same amount of dried flower. Wattage wise, they are producing less! These also have the added AC needs, which are constant when the lights are on.

Leaves of these plants are noticeable smaller, and lighter in color. Plants stretched more under this lighting, possible 50% growth after moving into flowering room.

Overview

One of our favorite results from the TG lighting is the lack of heat! You can touch the light practically anywhere, and find only slight warm. We reduce our electrical needs on the lighting and in the air conditioner use. To the point, that the TG lighting allowed us to run in up to 90 degree temperatures outside, and our grow room did not get above 85 degrees, even when the lights were on. If we were at full capacity for our space and running 8-10 TG lights, then we may have required to add AC to the room. We will know as soon as we build this space out, with TG lighting exclusively. We are very pleased with our results with TotalGrow lighting!

The look of the plants seems very positive at this point. We are looking forward to testing additional strains, under additional conditions. Hydroponic and aeroponic testing is on our list.

Being able to use one lighting source throughout the life of the plant is another bonus. We did not notice any lack of growth moving a plant from veg. to flower, as the same lighting was being used. No changing of bulbs, or switching out the light source. I even had the thought, that a veg. room, could be turned into a flowering room, by simply adjusting a timer. Changing the light cycle, and nothing more. Just another nice option to have.

Being able to use standard power outlets was another big plus!

Based on overall startup and running expenses, the TG lighting is superior. The initial startup cost, on the lights only, is pretty much the same. But, consider the AC needs and the TG's become cheaper.

Long term use expense is still not known at this time. We could review life expectancies of the different lighting, and TG appears to be cheaper here also.

We were able to slightly angle these lights to direct the light in a certain direction when needed.

The size and shape of these lights were another benefit. A benefit we were feeling the opposite about at first. At first glance, we thought the lights were too small. But during use we found we liked the size and shape of them.

Favorite Features

- Lack of heat
- Reduced electrical needs (lighting & AC)
- Same light for veg. & flower
- Standard outlets
- No bulb changing
- Lower startup + running expenses
- Angling ability
- Size and shape
- Best long term costs
- 1.5 g/W potential

We are planning at this time to promote TotalGrow lighting in our grow facility designs, consulting and to improve sustainability of cannabis cultivation.

There is a slightly higher start up cost to use TG over MH and HPS, but compared to LED and other new lighting options, TG's are comparable in cost. Within just a few months, and the reduction in electricity makes the TG's better on long term cost.

The TG lighting is superior.

