

Benefits Observed in Cannabis Cultivation with the Use of EA (Electro Airation) Water

By: [REDACTED]

In Cannabis Cultivation, increasing the dissolved oxygen that's being delivered to the root zone can directly affect the transition rates between the vegetative stage to flowering stage. The dissolved oxygen levels can be crucial to maximizing yields and its effects have been observed to have upwards of a 30% increase in harvested flower. Also using EA technology has allowed my facility to bypass the use of a Reverse Osmosis (RO) system altogether in the rooms its implemented in. This cuts down on water consumption costs, waste (sewer) costs, and the overall environmental impact of drain to wastewater that is produced at on average a 2:1 ratio by using this filtration application.

SETTING

[REDACTED] is an Indoor Cannabis business located in [REDACTED]. [REDACTED] has (3) flower production rooms that each house (60) 800w LED lights and 800 plants in each. The rooms are controlled and automated by 2 systems (Aroya & TrolMaster) that ensure a stable environment for optimal cultivation and flower production. The cannabis plants are cultivated and processed their entire life cycle in a Rockwool media and are watered between 6-8 times a day which is determined by the rock wool dry back levels that are measured by the hardware instrument that are inserted into the media. The Cannabis plants are given Athena Fertilizer throughout their entire life cycle. This fertilizer is salt based and comes in (3) three parts Core (14-0-0), Grow (2-8-20), and Bloom (0-14-24). These salts are dissolved into a concentrate and mixed in a 1:2 ratio between the Core and Grow or Core and

Bloom depending on which life cycle you are in with the plants you are feeding.

WATER PREPARATION

The average dissolved oxygen in water is between 6.5-8 mg/L in untreated water. We observed very similar base values in the stock tank water before using the EA technology with values of our water at baseline measuring between 6.5 – 7.2 mg/L. After processing the water with the EA unit for 3-4 hours before preparing a fertilizer solution we measured values of the treated water between 9.0 - 11.0 mg/L.


Because the “excited” water has a shelf life before falling back to a “ground state” we implemented the procedure of batching fertilizer solutions daily to maximize the benefits of the treated water.

CULTIVARS

Cultivars, also known as “strains,” are the different genetic mixes of cannabis plants which have 3 specific species


Cannabis Sativa, Cannabis Indica, and Cannabis Ruderalis.

This is important to note because genetic phenotypical expression is directly related to mixing of breeds. This contributes to Terpene expression, flower color, growth vigor, flower density and production.

 has several in-house Cultivars that were used in the experiment of implementing EA processed water which had control groups in adjacent rooms with the same environmental settings and Cultivars. The top increase in yield was observed in our Cultivar we have named Lemon Oreo and compared to the room without the use of EA water the production of this strain was on average 1.2 g/watt. The room utilizing the EA water had an average production of 1.55 g/watt showing nearly a 30% increase in yield.

It was also observed that flower production sites on the plants were more pronounced and developed quicker in transition on the plants fed with the EA treated water. The typical life cycle of our flowering rooms is set for a 65-day schedule. The room utilizing the EA water was harvested in full confidence on day 56. This is a 9-day savings that is a shortened life cycle of almost 14%. Calculating that value over a year of production means you can essentially get an entire extra harvest from a room utilizing EA technology with cultivars that react similarly to our Lemon Oreo.

FEEDING RATE AND CONCENTRATION

 implements a crop steering technique that manipulates the feeding frequency of the rooms as well as the dose volume of fertilizer. Each room is fed from a 1000-gallon stock tank where the fertilizer solution is prepared with a desired concentration that we measure in value of Electric Conductivity (EC).

Prior to implementing the use of EC water in mixing our fertilizer solutions we had a desired EC value of 3.5. The production test runs while using the EA water produced the increase in yield previously mentioned while having the fertilizer batch tank being mixed to a lower EC value or 2.7.

To achieve the EC value of 3.5 we would have to use 25 gallons of concentrate between the respective Athena products. In dropping the EC to 2.7 we only had to use 20 gallons of Concentrate dropping the usage of needed fertilizer by 20%

CONCLUSION

Many factors must be taken into consideration when talking about Cannabis Cultivation and Production. When talking specifically about the business of Cannabis above all else cost analysis is key in this competitive market. The effects of implementing the EA water have shown an increase in yield that can directly produce increased profits for my facility as well as lowering water consumption costs and sewer fees that can be an overhead cost in the thousands per production round.

EA Room

| Date | Cultivar | ** DO before treatment (mg/L) | ** DO after treatment (mg/L) |
|-----------|------------|-------------------------------|------------------------------|
| 4/1/2024 | Lemon Oreo | 7.22 | 10.11 |
| 4/8/2024 | Lemon Oreo | 8.15 | 11.16 |
| 4/15/2024 | Lemon Oreo | 8.24 | 10.88 |
| 4/22/2024 | Lemon Oreo | 6.51 | 9.34 |
| 4/29/2024 | Lemon Oreo | 6.32 | 9.36 |
| 5/6/2024 | Lemon Oreo | 7.81 | 10.53 |
| 5/13/2024 | Lemon Oreo | 7.62 | 11.17 |
| 5/20/2024 | Lemon Oreo | 6.28 | 11.55 |
| 5/27/2024 | Lemon Oreo | 8.11 | 10.25 |

| Total Watts | Total Harvest (grams) | Grams per watt | Total Days in Flower |
|-------------|-----------------------|----------------|----------------------|
| 48000 w | 74400g | 1.55g/w | 56 |

RO Room

| Date | Cultivar | ** DO reading of RO water (mg/L) |
|-----------|------------|----------------------------------|
| 4/1/2024 | Lemon Oreo | 6.10 |
| 4/8/2024 | Lemon Oreo | 6.18 |
| 4/15/2024 | Lemon Oreo | 7.19 |
| 4/22/2024 | Lemon Oreo | 8.02 |
| 4/29/2024 | Lemon Oreo | 6.99 |
| 5/6/2024 | Lemon Oreo | 8.24 |
| 5/13/2024 | Lemon Oreo | 8.37 |
| 5/20/2024 | Lemon Oreo | 7.58 |
| 5/27/2024 | Lemon Oreo | 6.65 |
| 6/3/2024 | Lemon Oreo | 6.91 |
| 6/10/2024 | Lemon Oreo | 7.00 |

| Total Watts | Total Harvest (grams) | Grams per watt | Total Days in Flower |
|-------------|-----------------------|----------------|----------------------|
| 48000 w | 58,560 g | 1.22 g/w | 65 |

** DO - Dissolved Oxygen: the amount of oxygen gas that is dissolved in water.

| TESTING | CULTIVAR | YIELD INCREASE | DURATION DIFFERENCE | CONTROL | Delivery System | Benefits |
|----------|------------|------------------------|---------------------|---------------------------|----------------------------------|--------------------------------|
| Cannabis | Lemon Oreo | 1.22g/watt to 1.55 g/w | 56 days vs 65 days | RO water vs EA city water | Irrigation via (2) 3gph drippers | 9 day shorter harvest timeline |
| | | 30% increase | 14% savings | | | 20% less fertilizer |

Figure 1



Figure 2



Figure 3



Figure 4



Figure 1: The plants experience their vegetative state (18 hours of light) in 4"x4" rockwool. The use of EA water produced healthy vigorous roots that exhibited a beautiful pearl white color indicating no contamination or rot.

Figure 2: When the plants reach a certain height they are transferred to 3"x6"x36" slabs and a flower light cycle of 12 hours is initiated. This picture shows healthy abundant roots throughout the entire slab are on day fifty (50) of flower in the room utilizing EA water. After fifty (50) days the root zone shared by three (3) plants per slab exhibited the same pearl white color with no sign of contamination or rot.

Figure 3: The Cultivar "Lemon Oreo" was the strain we chose for this case study. This picture shows a heavy onset of flowering sites on day twenty-one (21) and beautiful vibrant green canopy. This stage in the plants life is where we noticed the most significant impact by the use of the EA water system. We had grown Lemon Oreo in five (5) other flower rooms before the case study and compared to the previous harvest cycles this one showed a significantly shortened period for flower sites to onset and develop in volume.

Figure 4: Lemon Oreo Flower Day Fifty-four (54). This is one (1) day before harvest with flowers showing full signs of maturation including color, density, and milky trichome hue.