

Cannabis Production and its Impact on the Aquaponics Industry

By Stephen Raisner

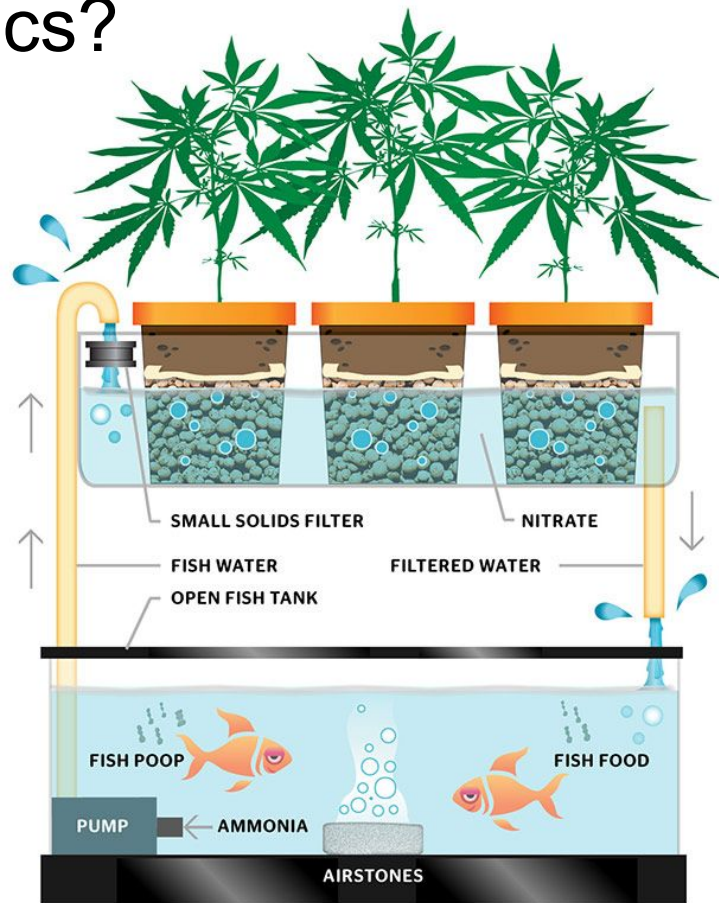
Commercial Aquaponic Cannabis Production

- Commercial Aquaponic Cannabis Facilities are opening every few months now
- Exceeds water usage requirements for cannabis cultivation
- Favorable to local governments
- Multiple Large 10,000+ sqft commercial grows online now with MANY more coming online next year



Why Grow Cannabis in Aquaponics?

- By using 10% of the water compared to most methods we easily meet even the strictest water usage laws
- We use 30 - 35% of the supplemental nutrients compared to soil or hydro with same or better yields
- Fish, Fish Waste, Compost Teas, Worms, and Ferments add additional revenue streams locally
- Improved flavor and terpene profile as well as increased CBD production in some strains



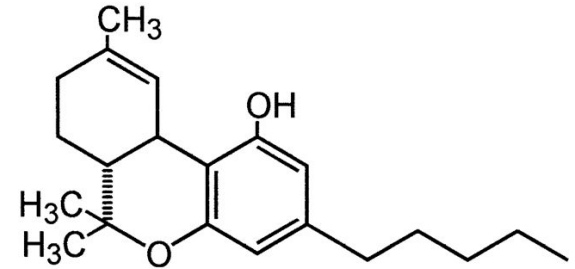
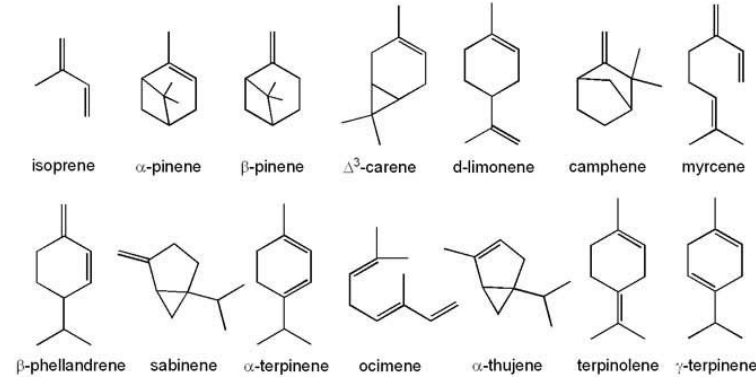
Cannabis Will Accelerate Aquaponic R & D

- Many new and different equipment innovations
- Real Time monitoring of nutrient levels not only in the water but also the plant tissue
- Greenhouse design innovations
- Light Deprivation greenhouses
- Improved Ventilation and air filtration
- Plummeting cost of commercial high quality grow lights, systems, and equipment



Aquaponics Increases Certain Cannabinoids And Terpenes In Testing

- Early testing has show increases in CBD and THCV our testing so far when grown against soil controls
- Working on multiple research papers now to get that formally documented in an academic setting
- Increased Terpene levels for every strain we have tested so far
- Will have more information to release on this next year



Δ -9-tetrahydrocannabinol (THC)

Root Setup is Key to Growing Aquaponic Cannabis

- Dual Root Zone Planting is Key to keeping high nutrient feeding plants and trees happy
- Allows the most control possible for supplementing plants in a fully recirculating system
- Allows for both a terrestrial and aquatic microbial root layers which increases the plant resistance to molds and mildews
- Eliminates the need for expensive decoupled systems that require regular water discharge which is expensive to dispose of in most states now



A Tale of Two Biomes

Terrestrial

- Mycorrhizal Networks
- Terrestrial Bacteria
- Supplemental Soil Mixture
- Nemetodes
- Protozoa
- Top Watered Nutrients
- Ferments

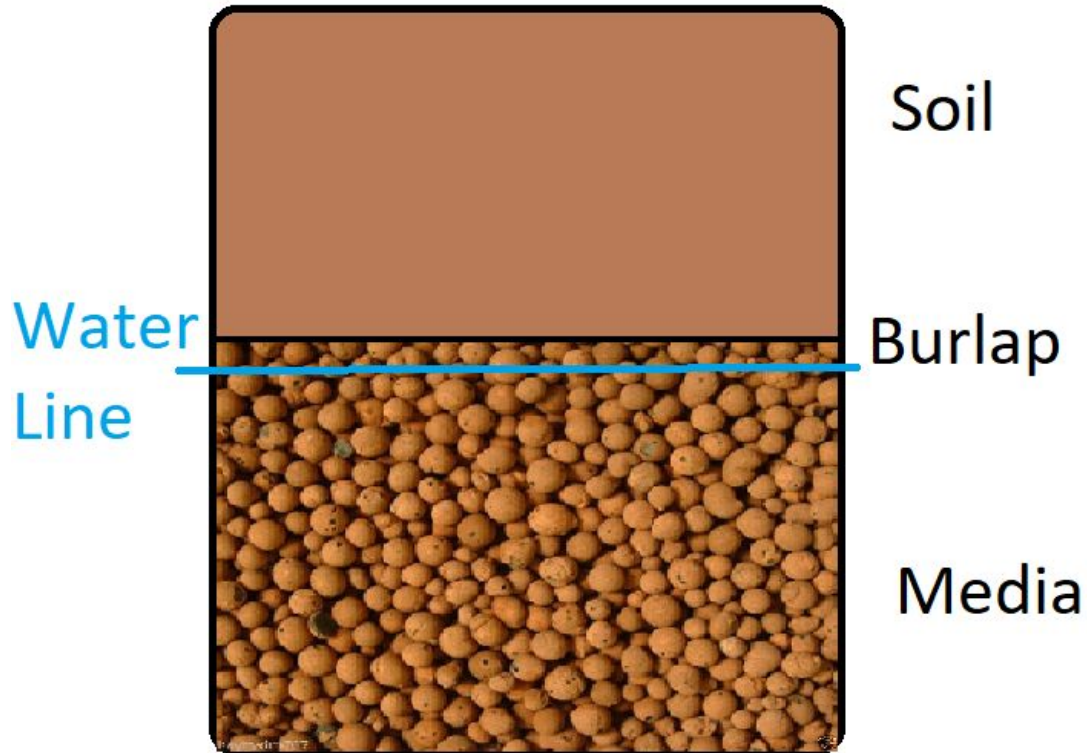
Aquatic

- Aquatic microbes
- Fish Safe Nutrient adjustments
- Increased Gas Exchange



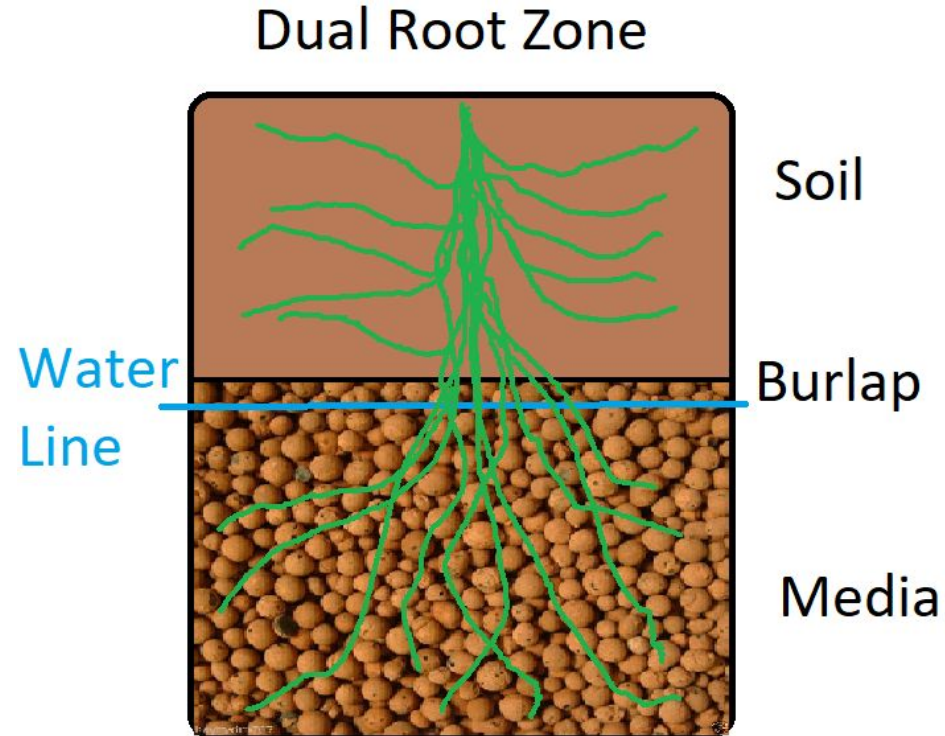
Proper Depth

Dual Root Zone



Dual Root Zone Planting

- Planting depth is important
- Too deep and the soil wicks and stays too wet
- Too high and the plants take longer to find the water
- To determine dosing measure the water retention level of your soil and cut that in half for dosing the soil layer



Dual Root Zone Benefits

- Increased nutrient dosing control
- Allows for a layer conducive for mycorrhizal network development for plants that depend on them like Cannabis, trees, woody and long growth duration crops
- Ability to have different pH in soil than the water for things like berries and herbs
- Allows you to add time releases nutrient mixes and other organic soil supplements for long term plant health on heavier feeding plants
- Increased immune response in the plants from the larger microbial exposure in the roots increases resistances to molds and mildews

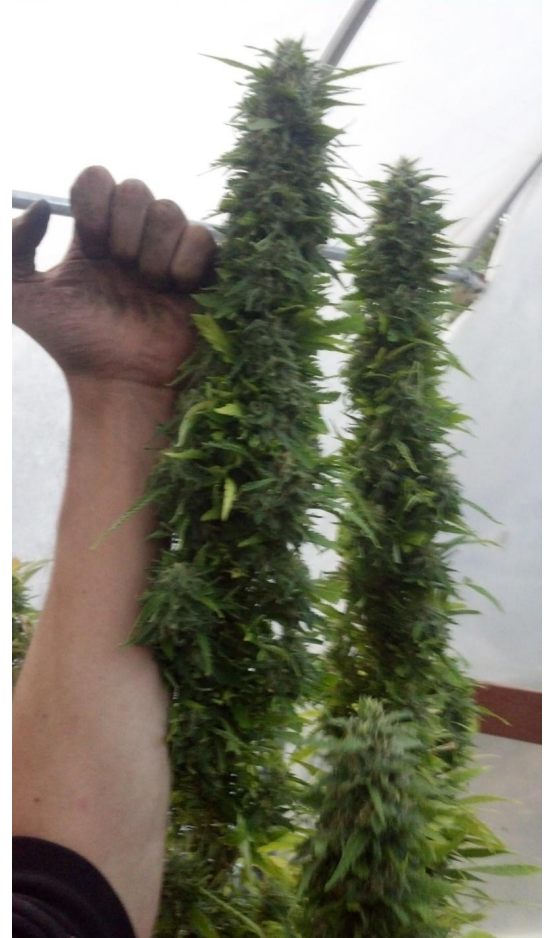


Dual Root Pot VS Media Bed Control From Clone



Common issues for both aquaponics and cannabis industries

- Pesticide Concerns
- Regulatory Overreach
- Lack of Good SOPs Available
- Lack of Good Education Available
- Local Permitting Issues
- Managing Labor Costs
- Constantly Changing Regulations



Pesticide Whitelists Instead of Blacklists

- Cannabis industry has introduced whitelists for pest control options instead of blacklisting
- Any product found on your crop that is not on the white list below threshold is banned from sale
- The aquaponic industry could greatly benefit from following their model
- Help separate us even more from soil and hydro producers
- Make it easier for producers to know what to use with pests or crops they might not have experience with

Mineral Input Whitelists

- Similar to pest control lists there is the clean green certification that has a whitelist of approved organic and natural inputs for cannabis
- A similar input list for aquaponics would help solve alot of the guest work alot of newer producers run into
- Crowd source nutrient levels for the various commonly grown crops in aquaponics in the same way other industries have to make determining dosing for a given crop easier for newer producers
- Getting away from non organic compounds like hydroxides that only harm our aquaponic image

Compost Teas and Advanced Remineralization

- Compost Teas are a better way to utilize your remineralization methods
- Increased Microbial Counts
- Reduced plant response time
- Increases bioavailability of your nutrients
- Reduce supplemental microbial costs
- Allows you to combine worm castings and other mineral inputs you generate from your other waste streams and re input them into the system



Lactobacillus Ferments For Plants And Fish

- Lactobacillus ferments greatly benefit aquaponic systems and have been used in cannabis for years
- Increases fish growth and health
- Eliminates fish waste that makes it past the filter
- Increases plant growth
- Consumes pathogens like pythium, e coli, salmonella, and more
- Increases beneficial microbial network growth



Isolated Plant Proteins

- Organically isolated plant proteins can give you incredible increases in yields and plant growth
- Isolated Phytocyanin as seen here increases plant growth by providing base building block proteins for chlorophyll and other complex plant proteins allowing the plant to produce more per day and increase metabolic rate in a way that normally is only controlled by PGRs



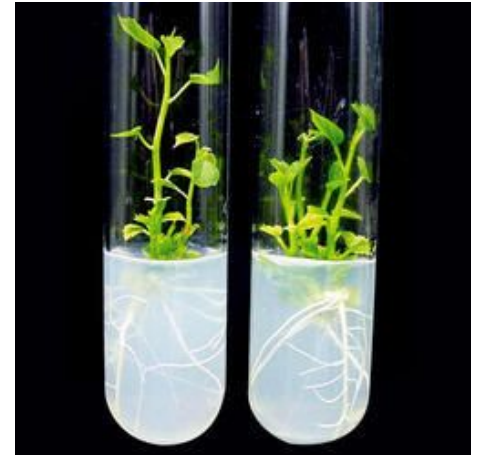
Isolated Microbial Inoculants

- Isolated Microbial Inoculants can greatly increase the efficiency of your aquaponic system
- Mammoth P is a great example it is a chain of microbes that make Phosphorous much more bioavailable unlocking as much as 30% more phosphorous during the grow cycle reducing the need to supplement
- Recharge and other multi microbial inoculants ensure you have all the important microbes you need and that there levels are maintained at maximum levels
- They also help unlock even more of your nutrients from your fish waste than remineralization alone



Cloning Tech and Tissue Culture

- Large scale cloning can give you more consistent production
- Plant tissue culture allows you to indefinitely clone your best plants regardless of life cycle stage
- Plant tissue culture can be propagated from even old dried or preserved plant material
- Can be used to resurrect old heirloom varieties or increase production to levels that would be hard to achieve through cloning alone



Vapor Pressure Deficit

- Vapour Pressure Deficit is the difference between the amount of moisture in the air and how much moisture the air can hold when it is saturated. If air becomes saturated water will condense and precipitate
- Helps optimize plant growth and prevent edema in your plant leaves
- Important in preventing fungal outbreaks
- Commonly overlooked
- Can cause wilting, leaf rolling, and stunted growth
- Plays a huge role in determining your plants respiration rate

TEMP		RELATIVE HUMIDITY														
°C	°F	100%	95%	90%	85%	80%	75%	70%	65%	60%	55%	50%	45%	40%	35%	
15	59	0.0	0.8	1.7	2.5	3.4	4.2	5.1	5.9	6.8	7.6	8.5	9.4	10.2	11.1	
16	61	0.0	0.9	1.8	2.8	3.7	4.6	5.5	6.4	7.3	8.2	9.1	10.0	10.9	11.8	
17	63	0.0	1.0	2.0	2.9	3.9	4.9	5.8	6.8	7.8	8.8	9.7	10.6	11.6	12.6	
18	64	0.0	1.0	2.0	3.1	4.1	5.1	6.2	7.2	8.2	9.3	10.3	11.3	12.4	13.4	
19	66	0.0	1.1	2.2	3.3	4.4	5.5	6.6	7.7	8.8	9.9	11.0	12.1	13.2	14.3	
20	68	0.0	1.2	2.4	3.5	4.7	5.9	7.0	8.2	9.4	10.6	11.7	12.8	14.0	15.2	
21	70	0.0	1.2	2.4	3.7	4.9	6.2	7.4	8.6	9.9	11.1	12.4	13.7	14.9	16.1	
22	72	0.0	1.3	2.6	3.9	5.3	6.6	7.9	9.2	10.5	11.9	13.2	14.5	15.8	17.2	
23	73	0.0	1.4	2.8	4.2	5.6	7.0	8.5	9.9	11.3	12.7	14.1	15.4	16.8	18.2	
24	75	0.0	1.5	3.0	4.5	5.9	7.4	8.9	10.4	11.9	13.4	14.9	16.4	17.9	19.4	
25	77	0.0	1.6	3.2	4.8	6.4	8.0	9.5	11.1	12.7	14.3	15.9	17.4	19.0	20.5	
26	79	0.0	1.7	3.4	5.1	6.7	8.4	10.1	11.8	13.4	15.1	16.8	18.4	20.1	21.8	
27	81	0.0	1.8	3.5	5.3	7.1	8.9	10.7	12.4	14.2	16.0	17.8	19.6	21.3	23.1	
28	82	0.0	1.9	3.8	5.7	7.6	9.5	11.4	13.3	15.1	17.0	18.9	20.7	22.6	24.5	
29	84	0.0	2.0	4.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	22.1	24.1	26.1	
30	86	0.0	2.1	4.2	6.4	8.5	10.6	12.7	14.8	17.0	19.1	21.2	23.3	25.4	27.5	
31	88	0.0	2.2	4.5	6.7	9.0	11.2	13.4	15.7	17.9	20.2	22.4	24.6	26.9	29.1	
32	90	0.0	2.4	4.7	7.1	9.5	11.9	14.2	16.6	19.0	21.3	23.7	26.1	28.4	30.8	
33	91	0.0	2.5	5.0	7.5	10.0	12.5	15.0	17.6	20.1	22.6	25.1	27.6	30.1	32.6	
34	93	0.0	2.7	5.3	8.0	10.6	13.3	15.9	18.6	21.2	23.9	26.5	29.2	31.8	34.5	

Silica

- Helps increase disease, heat, and pest resistance as well as reduces stress hormone levels
- Increases yields and improves gene expression in genes connected to plants immune system
- Important for flavor profiles
- Helps make the plant stronger & thicker
- Easily added with Potassium Silicate, Calcium Silicate, or Horsetail tea or ferments
- Silicon dioxide has a lower effect on pH
- Target in aquaponic water is 60 - 100 ppm for greens and 80 - 140ppm for flowering crops



Real Time Nutrient Monitoring

- Many new constant nutrient monitoring systems
- Most are light based testing methods
- Many new tissue analysis equipment available
- Allows you to address deficiencies before it ever shows visibly
- Power and outlet monitoring and control allows you to adjust your grow from anywhere on earth with your phone and know if something goes wrong instantly
- Helps increase yields and keep nutrient levels at the exact ranges we want them in the system and plants

Proposing Legislation Before its Drafted by Government

- Propose legislation on organic or other aquaponic regulations before they are drafted by government officials
- In the cannabis industry we do this regularly to help ensure we get properly educated regulations through
- Would greatly help the aquaponic industry move forward in areas like food safety and basic aquaponic farm regulations that will be needed for the industry to continue to move forward and grow

The Future of Aquaponic Cannabis

- Many 22,000 and 66,000 sqft grows under construction for next years legalization in California and Canada
- Purity Medicinals was formed this year
- Will have grows across North America and the Caribbean
- Multiple research papers being done currently on dual root zone and aquaponic cannabis research
- Multiple new universities are beginning new aquaponic research programs



Northwest Cannabis Club Anniversary Party

1195 SE Powell Blvd Portland, OR 97202

503-206-4594

7pm - Midnight

BYOC After the Banquet

Thank you

Email ~ S.Raisner@PurityMedicinals.com

Youtube ~ Potent Ponics

Growing With Fishes Podcast