



Are You Waterboarding Your Hops?

By John P. Taberna - Soil Scientist - Western Laboratories, Inc. - 2019

Why is it most hop growers place one drip line on the surface and expect to get maximum yields?

Water moves through soil in two ways:

1: Gravitational Water 2: Capillary Water

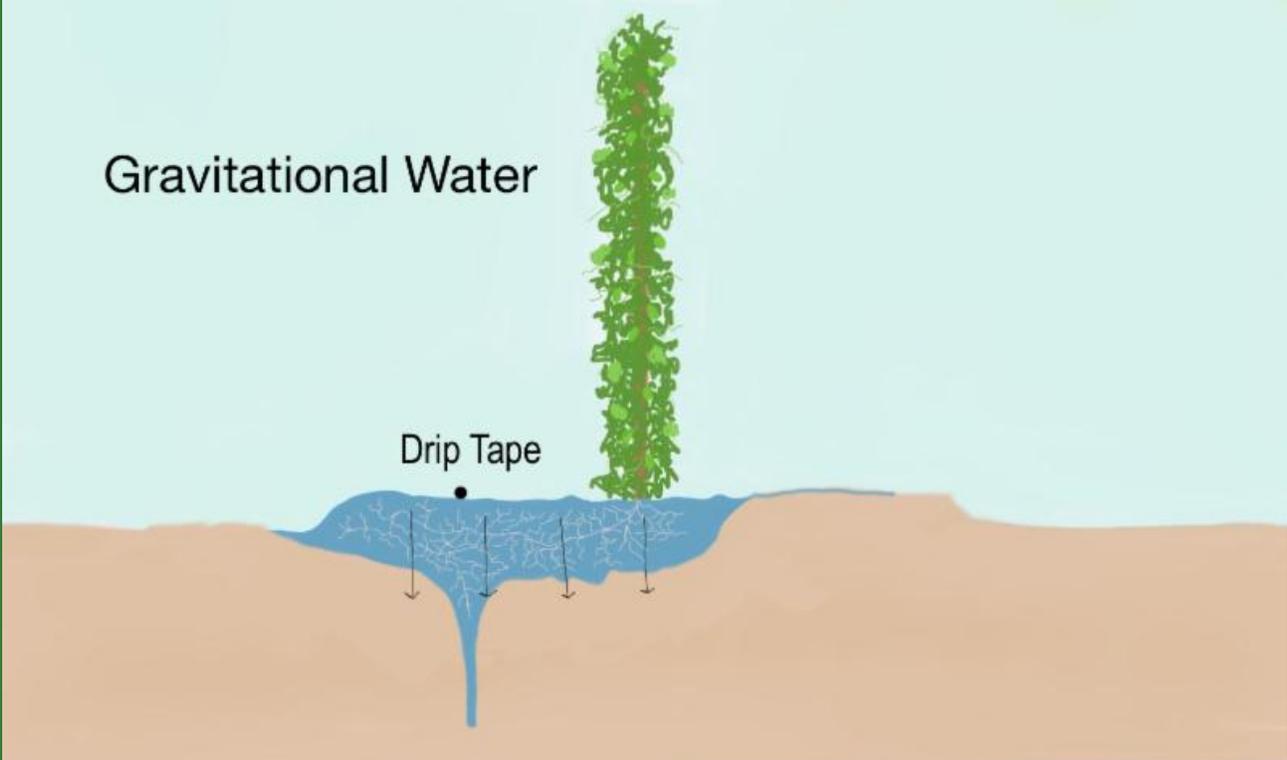
1: Gravitational water is where water enters the surface and migrates more downward under the drip line than outward.

- On sandy soils it takes 12-24 hours for gravitational water to move downward and oxygen to replace pore space.

- On heavy, silt loams to silty clay loams it takes 48-60 hours for gravitational water to move downward and oxygen to replace pore space. The disadvantage of one line on the surface its the first few irrigations give you both gravitational and capillary water. This means water can move out 3 feet on both sides laterally from the line. The disadvantage is that the lateral zone diminishes inward almost every irrigation. this means, that if you over irrigate most of your water will go into your soil vertically.

- Most hops that I have observed are on heavier ground. This means that trying to fertilize Potassium and Phosphorus through the line is almost a waste of time. The only direct way of feeding the plant then is foliar sprays. But you cannot put on enough potassium to meet the crop needs without burning the plant.

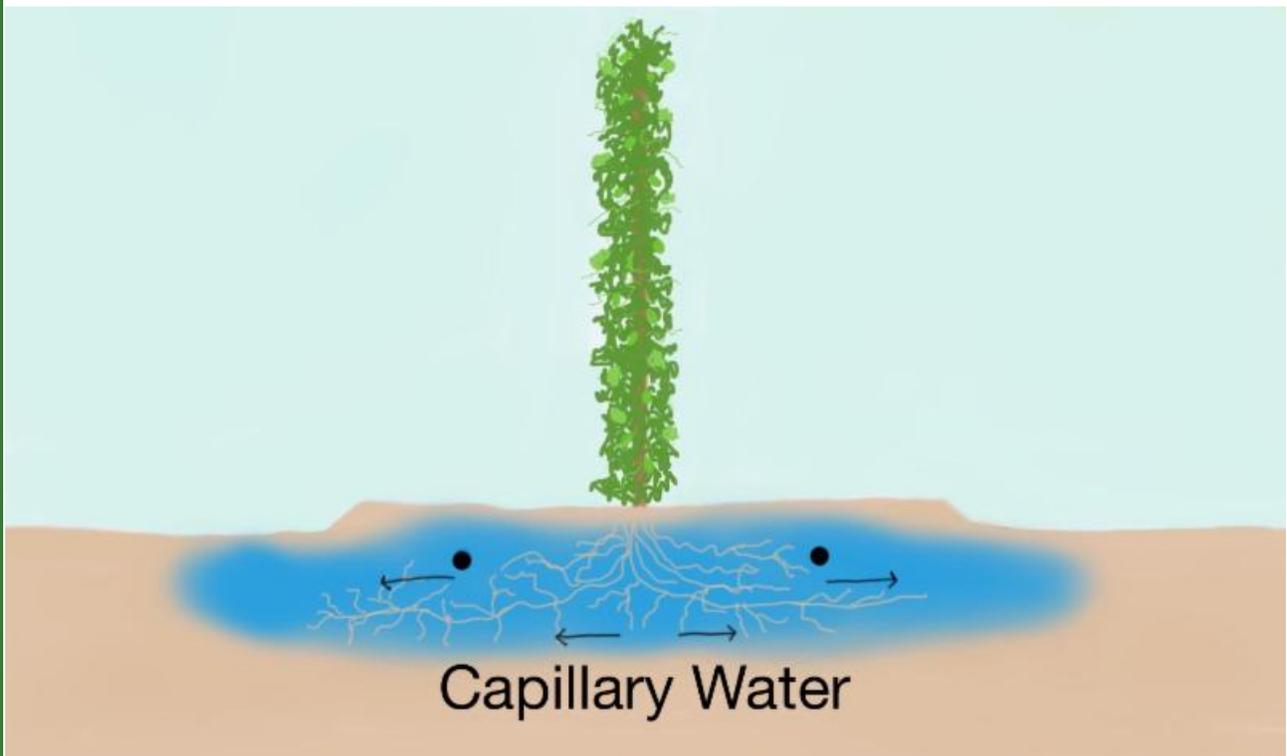
Gravitational Water



2: Capillary water is where you bury the drip line. You can purge the soil in a timely matter where you don't saturate the profile.

-Another advantage of burying drip tape is you can inject fertilizer for maximum yield

-There is no reason you can't increase your yields by 50-100% by going to buried drip tape on both sides of the bines.



Hops metabolize (breathe) through their roots. By waterboarding the roots you slow down their nutrient uptake rate and only allow roots on

the outside boundaries in the wetting front to metabolize and take in nutrients and water.

Nutrient uptake by roots are two mechanisms.

1: Passive Uptake 2: Active Transport

Within the roots there are channels that sponsor the uptake of different nutrients.

1: Passive uptake requires no energy for nutrients to pass through these membrane channels, which means, they don't require oxygen for the transport of the nutrient from the soil solution to the vascular bundles.

-There is a barrier called the Casparian strip that requires oxygen to transport the passive nutrients into the xylem tissue which transports the nutrients and water upward into the plant. If the roots are being water logged, the metabolic rate of the plant decreases.

2: Active transport requires oxygen to transport the nutrient through these channels.

-Again, waterboarding reduces oxygen and root vigor.

By March, Nitrates, Sulfates, Chlorides and Potassium are assimilated by the plant passively. But there is evidence that Potassium is also transported through active ion transporting channels.

By burying drip tape on both sides of the bine, you now increase your root mass and increase the ion transporting channels.

The research that Western Laboratories did on total bine analysis on 25 fields in 3 states in 2016, shows a total weight of nutrients in the bines at the first of each month.

Note that the lines on August 1st to September 1st lost 100 pounds and most all the nutrients except for Potassium reduced in number because they were being translocated from the plant to the cone.

Notice Potassium remained the same, yet it is Potassium and Boron that translocates carbonaceous materials from the leaf to the cone.

Total Bine Analysis Per Acre											
Time	Pounds*	N lbs	*P lbs	*K lbs	S lbs	Ca lbs	Mg lbs	Mn gram	Zn gram	Cu gram	B gram
6/1/16	400*	20	2.6	12.5	1.4	9.5	1.3	13	9	2.3	8
7/1/16	1800*	38	5	23	3	23	3	27	22	4	20
8/1/16	3400*	95	13	55	7.5	92	9.2	100	60	12	100
9/1/16	3300*	85	10	55	7	95	9	115	43	10	70

We also analyzed the cones each week starting August 1st.

Nutrients Removed by Bines Sept 1st, 2016 Minus Cones on Bines Dry Matter Weight of 3400 Pounds										
	POUNDS						GRAMS			
	N	P*	K*	S	Ca	Mg	Zn	Mn	Cu	B
1 Bale	6	1.1	6	0.4	2.5	0.4	5	7	1.7	4

If each bale requires 6 pounds of Potassium, then how can you increase your yields if you can't increase your Potassium?

One thing you don't tell farmers how to do, is how to irrigate. Unless you charge them, that is. If your yields aren't going up and your mildew problems are increasing, it tells me you are most likely *waterboarding your hops*. Intelligence is the ability to adapt and change. This is my contribution to help you be a better cone grower.

To see the entire summary report of our 2016 Hop Research, please visit, www.westernlaboratories.com/publications-1

For questions please contact John at john@westernlaboratories.com