Medical Marijuana Indoor Trials 2017

Purpose

Establish an optimal fertility program for indoor cultivation of Cannabis that uses Suståne's organic fertilizers to increase profitability.

Methods

Seven different Suståne-based fertility programs were tested on indoor grows of medical marijuana during 2017. Transplants of *Cannabis sativa* cv. Grape Ape were grown in 10 and 20-gallon pots filled with ProMix M. Essential plant nutrients, biostimulatory humates, and beneficial microorganisms were provided using Suståne products at varying rates. Sustane programs were 100% organic and used varying amounts of dry granular 8-2-4 and/or 4-6-4 added to the potting mix. Programs were sometimes supplemented with Sustane Compost Tea or Hi-N water dispersible fertilizers during bloom phase. In total, three different trials were conducted to optimize fertility management under the grower's warehouse production conditions. In each, Sustane programs were compared to grower-selected hydroponic programs.

Figure 1: Use of Suståne fertilizers for indoor Cannabis production. Dry granular fertilizers are mixed with potting soil at transplanting and top dressed afterwards (left). Compost teas are brewed with aeration prior to application during the bloom phase (right).

Each experiment was set up as a replicated block design with 3 or 4 treatment blocks with 5 plants each. Trial 1 run compared increasing rates of different types and amounts Suståne-dry granular fertilizers with compost tea additions applied during the bloom stage to the hydroponic Heavy16 program. Trials 2 and 3 used higher rates of fertility and a modified irrigation program when comparing different Suståne-based programs to grower's selected Veg+Bloom hydroponic program. Trial 3 also examined a retail line of organic fertilizers. Crop assessments included scoring for growth and color as well as yield assessments at harvest. Flowers and buds were harvested and air dried prior to assessment.

Results

Suståne's products provided significantly lower input costs than the grower's hydroponic fertigation programs (P<0.05). In fact, the tested hydroponic programs cost 2 to 3 times more than Suståne-based input programs (Table 1). Suståne programs was also more cost effective than a retail-line of dry organic fertilizers applied at comparable rates (RetComp).

Trial #: Program	N applied g/plant	Cost per plant	Cost per lb. DW Yield
1: Sust1	27	$ 0.82	$ 2.44
1: Sust2	41	$ 1.15	$ 2.64
1: Sust3	68	$ 1.82	$ 2.45
1: Heavy16	22	$ 7.50	$ 17.28
2: Sust4	87	$ 2.17	$ 3.00
2: Sust5	81	$ 1.82	$ 2.80
2: Sust6	81	$ 2.10	$ 4.21
2: VegBloom	90	$ 6.50	$ 7.68
3: Sust7	94	$ 2.33	$ 2.95
3: RetComp	71	$ 6.33	$ 9.24
3: VegBloom	90	$ 6.50	$ 6.59

Table 3 Comparison of input amounts and costs of the tested input programs. Note that the best Suståne-based programs (highlighted in yellow) were more cost effective than the other programs tested by the grower.

When one considers the added capital costs of installing and maintaining fertigation systems (as well as the added risk from system failures), Suståne-based fertility programs can produce great rates of return. Hydroponic programs required measuring and mixing of multiple components twice per week as well as regular monitoring of the fertigation system operation. In contrast, the optimal

Suståne-based fertility programs required only additions of granules or compost tea to potting mixes every one to three weeks. This greatly reduced the amount of labor used to implement the nutrient program and reduced the risk of measurement errors that might adversely affect plant growth.

Figure 2: Growth and color improvements conferred by increasing rates of Suståne fertilizers relative to the grower's initial hydroponic program. From left to right, Suståne low, medium, and high rates versus Heavy16 just prior to bloom stage.

When optimizing a fertility program for a grower, Suståne Ag Services will propose a series of rates to be tested. Growing conditions are carefully assessed in order to find the levels of each nutrient required to produce optimum yields and quality.

In Trial 1, the Suståne-based programs tested used increasing amounts of nutrients over the grower's initially established program**.** Plants treated with Suståne 8-2-4 every two weeks and Compost Tea (Sust3) during bloom phase produced more dry product than the grower's original hydroponic standard ($P < 0.05$). This 8-2-4-based program also had a much higher nutrient use efficiency for P and K than the hydroponic program (Table 2).

Program	N applied g/plant	Yield g/plant	Nitrogen NUE	P2O5 NUE	K20 NUE
Sust1	27	152 b	5.6	6.1	6.1
Sust2	41	199 b	4.8	4.7	5.2
Sust3	68	337 a	6.0	**18.7**	**8.9**
Heavy16	22	197 b	9.0	6.9	2.1

Table 2: Comparison of dry weight yield and nutrient use efficiencies (NUE) of the different input programs used in Trial 1. NUE values are calculated as g dry weight yield per g of nutrient applied. The best Suståne-based program is highlighted in yellow.

The results from Trials 2 and 3 indicate that there are multiple paths to optimizing productivity with Suståne inputs. In Trials 2 and 3, higher levels of nutrient addition failed to produce higher yields**.** Overall, the nutrient loadings were comparable but were 20% to 34% higher than those used for Sust3 in Trial 1. However, in both trials, harvestable yields for the optimal Suståne programs (Sust4 and Sust7) were comparable to those for Sust3 in Trial 1 (Table 3).

While hydroponic production is supposed to optimize nutrient use efficiency (NUE), that was not observed to be the case under this grower's conditions. While the hydroponic programs did have marginally higher NUE for nitrogen, the best Suståne-based programs (Sust3, Sust4 and Sust7) all had roughly twice the nutrient use efficiency for P and K than the two tested hydroponic programs.

Trial #: Program	N applied g/plant	Yield g/plant	Nitrogen NUE	P2O5 NUE	K20 NUE
2: Sust4	87	328 ab	3.7	7.0	**6.1**
2: Sust5	81	295 ab	3.6	13.9	6.6
2: Sust6	81	226 b	2.8	4.2	4.0
2: VegBloom	90	384 a	4.3	6.4	2.6
3: Sust7	94	358 b	3.8	**15.2**	**7.6**
3: RetComp	71	311 b	4.4	4.5	4.5
3: VegBloom	90	448 a	5.0	7.5	3.0

Table 3: Comparison of yield and nutrient use efficiency (NUE) of the different input programs used in Trials 2 and 3. NUE values are calculated as g dry weight yield per g of nutrient applied. The best Suståne-based programs are highlighted in yellow.

As wholesale prices decrease, improving production efficiency becomes more and more essential for success. The results of these trials convinced the grower that Suståne's products and services were valuable tools for improving the profitability of their operation. The lower costs, higher return on investment and reduced effort required to implement the Suståne-based fertility program now make it standard practice for this grower.

For more information on this project, contact us at help@Suståne.com or our grower collaborator, Sam Kaca, at samantha.kaca@gmail.com