

V. HYDROPONICS AND ROOFTOPS

Hydroponics is a method of growing plants in a soilless medium by flushing soluble nutrients through the medium. In many ways it is most applicable in areas where there is no natural soil. In Arizona, for example, commercial growers are using hydroponic greenhouses to great advantage.

We became interested in hydroponics because we are on a roof. One of the prime considerations when working on a roof, after all, is the weight of the materials. Soil can weigh between 60 and 95 lbs. per sq. ft. depending upon its texture and moisture content. Hydroponics, on the other hand, can be successfully employed using a lightweight medium.

COMPARISON OF TOMATO PRODUCTION FROM HYDROPONIC AND SOIL COMPOST GROWING CONTAINERS

<u>DATE</u> 1976	<u>HYDROPONIC UNIT</u>		<u>SOIL COMPOST UNIT</u>	
	No. of fruit	Weight (gms)	No. of fruit	Weight (gms)
to 24 August	very few	undetermined	very few	undetermined
25 Aug to 24 Sept	243	28,935	154	13,293
25 Sept to 4 Oct	15	2,320	12	2,156
4 Oct to end (estimated)	100	12,100	70	6,514
TOTAL	358	43,355	236	21,963

We had two major reservations about hydroponics, however. The first was that we could find no formula for an organic nutrient supply in the literature. The second was that the method seemed alien and we were worried about the reception it would receive from the community.

We began to experiment with the method in the dead of the Montréal winter. We set up five boxes inside our office, near the window and began to compare media and nutrient formulae.

The media we used were 1) straight perlite, 2) buckwheat hulls and perlite, 3) perlite and vermiculite, 4) perlite, vermiculite and sawdust and 5) perlite, vermiculite and sand.

Straight perlite was the least efficient medium. The water retention was not good and while we suspect that it did not hurt the plants, the medium grew a green algae which was remarkably unattractive.

The mixture of buckwheat hulls and perlite has poor water retention also. We did not go further with experimentation with buckwheat hulls as the medium grew a large quantity of fungus gnats. Fungus gnats do not do much damage to plants as they eat decaying organic matter, but they are unattractive and a problem to the general esthetic environment. However, we think that buckwheat hulls could be used successfully in combination with vermiculite at a ratio of 1/3 hulls to 2/3 vermiculite. We would also recommend sterilizing the hulls.

All of the combinations with perlite and vermiculite did well. We found that the addition of sand helped with water retention and as we were away from the project on weekends, found this to be a very positive benefit. However, sand adds weight so the value of its inclusion is dubious when working on the roof.

Our experimentations with nutrients were remarkably simple. We reasoned that all of the necessary nutrients would be available in a combination of fish emulsion, bloodmeal, milorganite, bonemeal and rock phosphate.

We began by mixing fish emulsion, milorganite, bloodmeal and bonemeal together and letting them sit in solution a week before using, thinking that the nutrients would leach out in this time. This was a messy procedure and the pail that we used gradually accumulated a sludge at the bottom which began to smell. We then switched to mixing our nutrient right before using it. We also decided to try a simpler mix--that of just fish emulsion and bloodmeal. This mixture supported growth very well. In the spring, however, we got some liquid seaweed and added it to the mix with excellent results. We have had to decrease the amount of bloodmeal on our tomato crop as we don't need the heavy concentration of nitrogen. It is necessary for leaf crops, however, and because of the individual needs of plants, we hesitate to give the impression that a nutrient formula should be strictly adhered to. Our preliminary suggestion is that one should begin with a dilution of 1/4 tsp. fish emulsion and 1/4 tsp. liquid seaweed to every quart of lukewarm water and add enough bloodmeal to lightly cover the surface of the water. This bloodmeal concentration should be increased slightly when growing leafy produce and decreased when growing fruits. Every so often the medium should be flushed completely with tepid water without nutrients so that any mineral salt buildup is washed away.

In the spring we moved the hydroponics experiment upstairs onto the roof. We wanted to compare a hydroponically grown crop to a crop grown in our conventional soil mix. We prepared two cold frames 4' X 8', side by side for the comparison. The hydroponics box was slightly elevated at the rear and one side to provide optimum drainage and was fitted with cm holes along the lower side. Since we were using it outside without a cover, we wanted to make sure that excess moisture would have a chance to escape. We also got corks for the holes so that we could retain the moisture should there be a dry period. The box was filled with a mixture of 1/2 perlite and 1/2 vermiculite. To this we added 1/20th of total volume of sand. We elevated two buckets which were filled with solution and fed into the medium through a gravity system.

The soil box was filled with our normal soil mix which is composed of 3/4 soil to 1/4 perlite, vermiculite and peat moss. We top dressed with finished compost and have fertilized on our regular schedule (about every three weeks) with granit dust, flaked seaweed, bonemeal and liquid fish emulsion.

We planted 36 tomato plants in each box. Those going into the hydroponics box had their roots washed clean of soil. This was done to avoid bringing a soil-borne disease into the medium. This set them back several weeks, and they looked poor in comparison to the soil box tomatoes for almost a month.

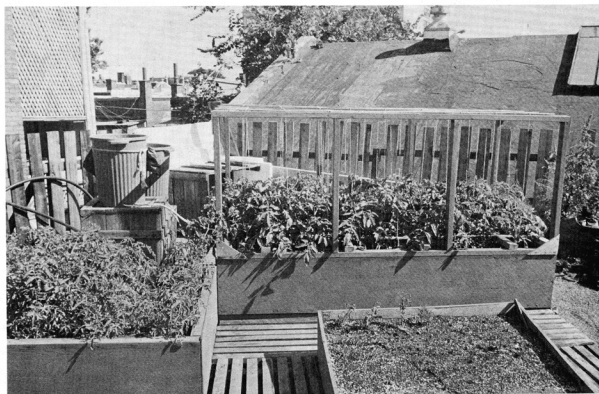
At the end of a month's time the difference between the two crops began to be discernable. An aphid infestation had hit Montréal at that time and most of the produce on the roof was suffering slightly. None of our plants were devastated by it; not surprisingly, because organically grown produce has greater resistance to insects and disease. We received one major surprise, however. The hydroponically grown tomatoes were the most resistant of all our produce. This is easy to understand. Our soil is not optimum when we receive it from the greenhouse which supplies it. It takes us several months to bring the quality up, and we have to apply compost lavishly to do so. Obviously, the nutrient solution we were using was providing the tomato plants with an abundance of necessary elements.



At this writing, the beginning of September, the hydroponically grown tomatoes are a foot higher than the control plants and the yield is appreciably higher. To date the control tomatoes have yielded 3 kilos 761 grams while the hydroponics has yielded 4 kilos 992.5 grams. This certainly does not represent the final harvest but it gives an indication of the superior harvest from the soilless medium.

The community reaction to the hydroponics experiment has been interesting. There are many people who stand and admire the hydroponic tomatoes. There have been only two who have expressed a desire to do it themselves. We questioned the community gardeners about their feelings. They felt that the tubes, the mixing of nutrients, the soilless white medium all gave them a surrealistic feeling. What they wanted from the gardens was more than a large quantity of produce. They wanted the feel and smell of soil. The people interested in hydroponics are the people who are used to growing plants and who are now production oriented. Because the feeling was so strong and so universal among our gardeners, we advise that community projects resist the temptation to go straight into hydroponics. We doubt that the turnout from the community would be consistent as they would be unable to relate to it. If introduced at all, it should be a gradual process.

When viewing hydroponics from a commercial viewpoint, however, we feel that it is a more than viable method for soilless areas and places such as roofs where weight is a consideration. There is no doubt that it can be done with organic nutrient solutions and though ours was adequate, we are anxious to continue experimenting. The logical next step is the use of compost tea, along and in combination with other ingredients. The compost used should be of high quality and it is our recommendation that some attention be paid to the bio-dynamic literature on this subject.



Hydroponic gardening unit. The plastic garbage cans contain the nutrients.

