



## AQUAPONICS PRODUCTS

---

- 6 Tanks/Troughs
- 8 Trays/Shade Cloth/Media
- 9 Water Conditioners/Test Kit

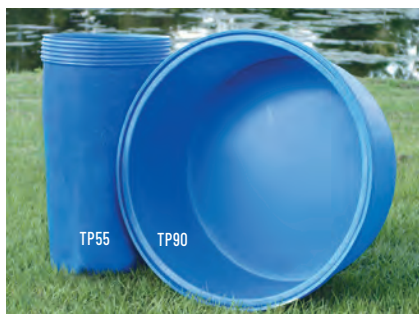
# 6 AQUAPONICS

## Polyethylene Tanks/Fiberglass Troughs

### POLYETHYLENE TANKS ▼

These polyethylene, marine blue, open top tanks are economical with long life expectancy. The smooth surface makes for easy cleaning, and their light weight allows for quick set-up and relocation. Edge lips provide wall strength and minimize deformation. Most of these tanks are nestable, which reduces shipping costs. FDA compliant; safe and non-toxic to aquatic and animal life.

All tanks have ultraviolet inhibitors for outdoor use. Because they have superior mechanical properties, high stiffness, excellent low temperature impact strength, and outstanding environmental stress crack resistance, they stand up well in tough environments.



#### 55 to 250 gallon tanks

CAPACITY (GAL)	SHAPE	INSIDE DIA.	HEIGHT	WALL THICKNESS	SHIP WT (LBS)	MODEL	TANK ONLY	EACH
55	ROUND	21"	38"	3/16"	17*	TP55		\$158.40
90	ROUND	39"	20"	3/16"	23**	TP90		249.54
210	ROUND	48"	30"	3/16"	49**	TP210		329.29
250	ROUND	60"	22"	3/16"	68**	TP250		454.60
110	RECTANGULAR	55" X 31" X 18"		1/8"	44**	TP110		283.72
130	MORTAR BOX	72" X 36" X 12"		1/8"	39**	TP130		295.11

\*Ships ground. \*\*Ships motor freight.

#### 410 TO 1000 GALLON TANKS

These tanks have a flat depression molded into the side near the bottom for a bulkhead fitting. Models ending in -W2 have a 2'x2' polycarbonate viewing window installed (actual viewing area is 21 3/4"x21 3/4"). Ships motor freight.

CAPACITY (GAL)	SHAPE	INSIDE DIA.	HEIGHT	WALL THICKNESS	SHIP WT (LBS)	MODEL	TANK ONLY	EACH	MODEL	TANK WITH WINDOW	EACH
410	ROUND	60"	34"	3/16"	74	TP440A	\$568.53		TP440A-W2	\$739.42	
460	ROUND	70"	30"	3/16"	78	TP400F	602.71		TP400F-W2	773.59	
650	ROUND	77"	34"	1/4"	105	TP655	716.63		TP655-W2	902.49	
800	ROUND	88"	38"	1/4"	120	TP800	887.52		TP800-W2	1,058.41	
830	ROUND	92"	30"	1/4"	134	TP830	921.70		TP830-W2	1,092.60	
1000	ROUND	90"	44"	1/4"	148	TP1000	1,024.23		TP1000-W2	1,194.59	

### FIBERGLASS TROUGHs

Rectangular troughs are used for hatching fish eggs, coral propagation, baitfish, larval rearing (use with McDonald-type hatching jars), invertebrate holding and many other culture applications. Although not as thick as our reinforced fiberglass tanks, they are still quite durable. Light blue gel coat interior. Troughs are stackable and ship via motor freight, Crating charges not included in prices when applicable. FOB Orlando.

MODEL	CAPACITY (GAL)	L X W X H	EACH	4+
FT120L2	120	96" X 24" X 12"	\$322.13	\$267.20
FT180L2	180	96" X 36" X 12"	557.46	462.41
FT240L2	240	96" X 48" X 12"	753.63	625.13
FT320L2	320	96" X 48" X 16"	1,045.50	867.23





## Seeding and Planting Systems

### Seed Germination

Germinating seeds can be extremely easy or extremely difficult depending on the type of plant and method used. There are several ways to do this and we will describe a few below:

1. **Directly into starter cubes:** This is where you use a starter cube (Hortifiber Rockwool®, coco fiber, composted pine bark, etc.) with a small hole in the center to start your seeds. You simply wet the media, drop the seeds in the hole (or widen it a bit with a pencil for larger seeds) and then place them in a tray (with or without a humidity dome, depending on your local humidity). Make sure to read up on your starter media as some media should presoak in a mildly acidic solution for better sprouting results. Some seeds will do better when placed directly out in the sun; some will do better if left in the dark for a few days then moved into the sunlight; and some will do better with a bottom heat pad placed under the tray of starter cubes. One thing to remember is that you want to get them in the same intensity of light that you will be growing them to maturity in as soon as possible. In lower light conditions, plants stretch looking for light and become thinner/weaker and more prone to breaking. Then when you move them into more intense light, they have a tendency to get leaf burn and growth slows as the plant adjusts to the stronger light. If you're trying a new variety for the first time, plant a few test cubes, put them in direct to partial sun for a few days and watch what happens. Most seeds will sprout just fine this way as long as the temperatures are in the correct range for the plant species being grown (look on the seed packet as most of the time all of the zone/planting times are listed on the packaging), but if you aren't having any luck or you see them sprout and start to get a bit burned, try one of the other methods until you see what works best for that particular seed. Just remember, the quicker you get the plant used to the final light intensity, the quicker it will grow.
2. **Paper towel/plastic wrap method:** Another popular way of sprouting seeds is by dampening a paper towel with water and placing it on a plate. You then place your seeds on the damp paper towel and cover the plate with plastic wrap. Place this in a dark place such as a cabinet and check it daily while also lifting the plastic wrap to exchange the air inside. As soon as you see the seed crack open, remove the seed from the plate and place the seed cracked end down into the starter cube. It will then shoot the tap root down into the starter cube and the seed will rise out of the cube and fall off of the sprout. This method works extremely well for all types of larger seeds such as beans, peas, sunflowers, cucumbers, etc. Using smaller seeds is not advisable, since it would be extremely difficult to pick them up and place them into starter cubes without hurting the sprouts.
3. **Cuttings:** Some plants take an extremely long time to grow from seeds, but their cuttings will readily root when cared for properly, eliminating a lot of valuable time spent by the grower. The procedure is fairly simple. First you want to make sure you sterilize your scissors, knife or whatever tool you plan to use to take the cuttings and also make sure to wash your hands well (especially if you are a smoker). Once you have sterilized the cutting tool, take your cuttings and remove all of the fruit from the plant (if there is any) along with the bottom 50% of the leaves/stems. Dip the cut end into either a rooting hormone powder or gel, then place directly into a presoaked starter cube. Some plants such as tomatoes will start to root within a day or two, while other plants such as rosemary may take as long as a month to show any signs of roots. You want to keep the cuttings in a humid environment by using a humidity dome or plastic wrap, and you want to make sure to exchange the air inside several times a day. Some plants will look pretty bad before looking better, but that is because you are stressing the plant and basically forcing it to either grow roots or die. You want the media moist, but not wet or waterlogged. You can also mist the plants to let the leaves take up water. Riding that fine line of wet/dry media tells the harder-to-root plants that they need to sprout roots. Once you have done it a few times you will be able to look at the plants and tell when they have started to root, then take the dome off until the plants get strong enough to move them to your main system. Where to germinate: Seeds can either be germinated directly in your system, on sprouting tables, in individual sprouting trays or by many other means. It really comes down to what works best for the area you have, labor involved and finances available.



Hortifiber Rockwool® is a registered trademark of Thermofiber, Inc.

### TECH TALK 124

#### Compost Tea

Compost tea is exactly what it sounds like—a liquid extract prepared by steeping compost in water. Sounds delicious, right? Don't worry, it's for your plants. Just spray it on and watch them grow healthier and less susceptible to disease. Compost tea can be used on trees, shrubs, houseplants, vegetables, flowers and lawns. It can also help with seed germination and starting new plants.

Compost tea has been shown to be a source of beneficial microorganisms that protect plants and provide better nutrient availability to the plants while also improving soil condition. Several types of compost teas can be made, and they vary in the method of preparation and in the ways they are used. Examples include anaerobic compost teas, aerobic compost tea, compost leachate, manure tea and Bokashi tea, among others.

One of the most popular of the compost teas is aerobic compost tea [no, it has nothing to do with jumping jacks]. Aerobic compost tea is made by using an air pump or blower to supply your mixture with oxygen while brewing. The process enhances the production of beneficial bacteria, protozoa, fungi and other microbes. You can even add food and/or other additives to further encourage the growth of microorganisms in the tea. For example, add molasses for bacteria growth; kelp and humic acid for fungi; and peat moss and hay for protozoa.

Brewing aerobic compost tea is easy. Many commercial compost tea brewers are available, but if you take pride in your DIY ethic you can easily build your own brewer. All you need is a bucket, an air pump or blower, an air hose with check valve and a diffuser. Simply wrap the compost in cheesecloth or place it in a mesh bag (avoid fine mesh—it may keep some beneficial fungi from the tea). Fill a bucket with clean water and drop the bag in (one part compost to four parts water). Then throw in your choice of additives. Aerate the liquid for several hours.

While it brews, make sure you provide enough aeration to maintain dissolved oxygen (D.O.) content around 6 ppm. This will support the growth of aerobic microorganisms that enhance plant growth. Aerate the extract between 12 and 48 hours, depending on the type of microbes that are desired. A period of around 12 hours will favor the growth of fungi, while a 24-hour period of aeration will favor the growth of bacteria. Longer periods (36–48 hours) will favor the growth of protozoa and other microorganisms.

After aerating, pour the liquid through a strainer or cheesecloth to filter. Then dilute the concentrated tea with clean water at a ratio of 1 to 10 before dispensing in sprayers or spray bottles. One gallon of your diluted mixture will cover 800 ft<sup>2</sup> of planted area. For best results, apply the tea to plants and soil once every week. The whole plant and surrounding soil may be thoroughly wetted. Tea may be stored up to two weeks in a closed container before applying to plants.

To consistently make great compost tea, consider the following:

- Aerate or chemically treat clean water to remove chlorine or chloramines from water prior to adding compost.
- Keep the brewer between 70 and 75°F while brewing tea.
- The pH should be near neutral (6.5 to 7.5).
- Maintain the D.O. concentration around 6 ppm throughout the brewing cycle.

Using these methods, you can routinely make tea with high numbers of beneficial bacteria, fungi, protozoa and nematodes, time after time. The result will ensure healthier plants and better growth.

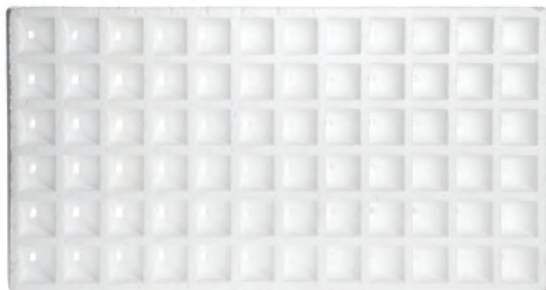
#### Sources of additional information on compost tea:

The National Sustainable Agriculture Information Service (ATTRA)  
website: <http://www.attra.org/attra-pub/compost-tea-notes.html>

The Compost Tea Brewing Manual, 5th Ed., 2005. Dr. Elaine Ingham, Soil Foodweb Inc., Corvallis, Oregon 97333.

# 8 AQUAPONICS

Trays/Shade Cloth/Media



## SPEEDLING TRANSPLANT TRAYS

Keep your plants' roots safe from damage, pests and diseases during transplant. These polystyrene trays are reusable and drastically reduce transplant shock. The angled sides of the cells encourage roots to grow downward, rather than spiraling as they would in a square cell. This allows plants to begin growing immediately after transplant. Plants and soil are easily removed, completely intact.

Trays are 26 $\frac{5}{8}$ " L x 13 $\frac{5}{8}$ " W. Ship weight 1.5 lbs.

MODEL		EACH
<b>TR128A</b>	128 CELLS @ 1.5 SQ.IN., 2.5" DEEP	<b>\$11.38</b>
<b>TR200A</b>	200 CELLS @ 1 SQ.IN., 3" DEEP	<b>14.42</b>
<b>TR242HC</b>	242 CELLS @ 1 SQ.IN., 2.5" DEEP	<b>9.32</b>
<b>TR72A</b>	72 CELLS @ 1.75 SQ.IN., 2.5" DEEP	<b>14.75</b>

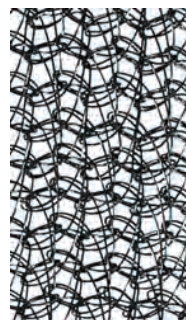
## SHADE CLOTH

Our premium shade cloth is the knitted type, which will last over 15 years in the tropical sun. This cloth is useful for shading tanks to reduce algae, prevent sun damage to fish and reduce water temperature. It is also useful for predator control, visibility screening and, of course, shading plants. Made of UV-resistant plastic. Sold in 10' L increments or full 300' rolls only.

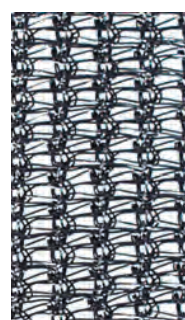
MODEL	SHADE	LENGTH	WIDTH	SHIP WT (LBS)	EACH
<b>SC30</b>	30%	10'	12'	2.8	<b>\$41.00</b>
<b>SC30R</b>	30%	300'	12'	83	<b>820.25</b>
<b>SC50</b>	50%	10'	12'	2.8	<b>47.84</b>
<b>SC50R</b>	50%	300'	12'	83	<b>1,080.00</b>
<b>SC70</b>	70%	10'	12'	4.6	<b>61.51</b>
<b>SC70R</b>	70%	300'	12'	138	<b>1,440.88</b>



30% SHADING



50% SHADING



70% SHADING

## NETTING & SHADECLOTH POLYCLIPS

These unique fasteners are ideal for attaching predator netting and shade cloth to support rope and wires. Constructed of tough polypropylene, they can be used over and over again. Simply snap over the edge of the material and attach to  $\frac{3}{8}$ " support wire. Recommended spacing is one polyclip per 2' (depending on load).

MODEL		EACH
<b>PC125</b>	25-PK	<b>\$15.83</b>

## PERLITE

Coarse perlite (siliceous rock) is one of the best hydroponic media commonly used. It has high water-holding capacity and fertilizer retention. It has neutral pH, is sterile and weed-free. Ideal for tray systems, bag systems and deep nutrient trough systems. Sold in four cubic foot bags.

MODEL		EACH
<b>PR40</b>	PERLITE, 20 LBS	<b>\$19.52</b>



### PROLINE® SUPER SALT CONCENTRATE

Contains everything but the salt—save on shipping!

This synthetic salt mixture contains all the necessary elements and buffers (except sodium chloride) required to make up to 4,400 gallons of synthetic seawater. Each phosphate- and nitrate-free batch is individually tested to generate consistency and high quality. Because sodium chloride is a major component of most synthetic sea salt mixtures, it is also responsible for a large amount of the weight. This concentrated mixture contains everything but the sodium chloride.

ProLine Super Salt Concentrate is packaged in a semiliquid form and sold in resealable buckets. One bucket mixes with 80 lbs of noniodized, high-purity sodium chloride to make 400 gallons (1,514 liters) of salt water. Pallet quantities available.

MODEL		SHIP WT (LBS)	EACH	4+
<b>239500</b>	400 GALLON MIX	63	<b>\$86.03</b>	<b>\$71.36</b>



### #10 WHITE CALCIUM CARBONATE DUST

Due to the nitrification process that occurs in the biofilter of a healthy aquaponics system, pH of the system tends to steadily decrease over time as the nitrifying bacteria create acid. Regularly adding calcium carbonate increases pH, and adds beneficial nutrients for plant uptake as well.

MODEL		EACH
<b>MD</b>	50 LB BAG	<b>\$56.95</b>

### MICROBE-LIFT® PH INCREASE AND PH DECREASE

Safely Raises/Lowers pH Levels

pH Increase - Includes 2 pH increasers for gentle effectiveness and 3 electrolytes to help maintain osmotic balance.

pH Decrease - Includes 2 pH decreasers for gentle effectiveness and 3 electrolytes to help maintain osmotic balance. Contains phosphoric acid.

- Formulated in deionized water
- Contains a slime coat ingredient for skin protection and stress reduction in pond fish
- Contains a chelating agent to enhance water quality
- Not harmful to fish or plants

MODEL			EACH
<b>890025</b>	MICROBE-LIFT PH INCREASE	1 GAL	<b>\$48.38</b>
<b>890027</b>	MICROBE-LIFT PH DECREASE	1 GAL	<b>48.38</b>

Microbe-Lift® is a registered trademark of Ecological Laboratories, Inc.



890027

### AQUAPONICS TEST KIT

FW SW HAZMAT A

Designed for small to midsize systems, this test kit has everything you will need to monitor water quality for both the aquaculture and hydroponics segments of your system. Kit includes labware, accessories and reagents to repeat tests for each factor approximately 50 times, a detailed instruction manual and quick reference card in a foam-lined carrying case. Test chemistries and comparators are compatible with fresh, brackish, or salt water systems. Ship weight 9 lbs.

MODEL		EACH
<b>LM3637</b>	AQUAPONICS TEST KIT	<b>\$307.96</b>
<b>LM3637RP</b>	REAGENT REFILL KIT	<b>143.16</b>



TEST	RANGE
AMMONIA	0.0-2.0 ppm
NITRITE	0.05-0.8 ppm
NITRATE	0.25-10.0 ppm
PH	5.0-10.0
IRON, FERROUS & FERRIC	0.5-10.0 ppm
ALKALINITY	0-200 ppm
DISSOLVED OXYGEN	0-10 ppm



## Common Aquatic Species Used in Aquaponics

### Tilapia sp.

There is little documentation through research as to which aquatic species work best in aquaponic systems. Tilapia have the most results as they are very hardy and adaptable to poor water quality, temperature and poor handling by farmers. They also have a large market value and have developed a niche as a good-tasting white fish. The most common tilapia used are Nile tilapia (*Oreochromis niloticus*), Mozambique tilapia (*Oreochromis mossambicus*), blue tilapia (*Tilapia aureus*) or some crossbred variety of a wide number of tilapia species. They are ideal for our system here in Florida, as we have a longer warm season here than many US states, and their ideal water temperature is in the range of 75–90°F. There are a number of hatcheries in our geographic area that can supply us with fresh, affordable fingerlings. For colder temperatures, the blue tilapia has shown a wider tolerance than the other species of tilapia and will continue feeding in the 60s. However, once the water temperature starts to dip into the 50s and lower for a significant period of time, the fish will not survive for very long. If you live in a cooler climate and do not have the capability to heat the water, then perhaps tilapia is not the ideal species for you. Again, this will all go back to market demand and your own cost analysis.

### Koi

Koi are ornamental varieties of the common carp (*Cyprinus carpio*) and have a large market in the United States as a decorative water feature or small pond fish for many homes and businesses. They are cultured in many states and can tolerate a wide range of temperatures and water quality parameters similar to tilapia. However, their ranges are most ideal in between 60–75°F. Similar to the tilapia, once temperatures drop below their ideal range, they will stop feeding and can eventually die. Below 50°F, they will cease feeding and their immune system will begin to shut down, so they too can suffer mortality after prolonged periods of time in those temperatures. Fortunately, in Florida we don't experience too many days with an average temperature below 50°F.



### Other Common Aquaponics Species

Ictalurus punctatus is North America's most common catfish and is easily procured through the web of aquaculture hatchery suppliers in the country. It is popular in aquaculture due to its rapid growth and wide temperature tolerance of 68–85°F.

Hybrid-striped bass (*Morone saxatilis* and *Morone chrysops* cross) do well in a wide range of environmental conditions, including a temperature range of 40–90°F, but grow best in between 75 and 80°F.

Barramundi (*Lates calcarifer*) is already a fish of large commercial importance throughout the world, especially in the Indo-Pacific area. It has proven to be useful in aquaculture and aquaponic systems since its temperature ranges are similar to that of tilapia.

Jade perch (*Scortum barcoo*) is being considered more and more for aquaponic systems due to its wide tolerance for temperature fluctuations, 50–95°F. It is originally found in Australia and, like tilapia, is omnivorous.

Crappie and other sunfishes exist in almost every single US state, making access easy to farmers. Their temperature ranges are ideally between 58–68°F, but they have been located in waters much cooler and warmer than that.

Malaysian prawn (*Macrobrachium rosenbergii*) is a freshwater shrimp native to the Indo-Pacific area and is a common aquaculture food species. Temperature ranges for this shrimp are ideally between 68–80°F. One thing to note is that shrimp don't typically occupy the same space in the water column that a school of fish will occupy. They are found on the riverbed in nature as detritivores, but in an aquaculture system, their surface area can be increased with the addition of high surface area structures within the tanks or ponds.

### NOTE:

It is important to understand that while these are the most commonly used aquatic species used in aquaponics, there is only limited documented information regarding their performance and production data. Should you choose to use a species outside of this list, we recommend that you contact your local aquaculture extension agent or a hatchery/farm operator to discuss the feasibility. As with any other aspect of this operation, you need to determine your market and what would work best for you. If your ambient temperature is within 68–78°F on average throughout the growing season, perhaps you should stick with a species best suited to that temperature to minimize system shock and avoid possible loss of crop. It is true that the warmer the temperature, the more the fish will eat and the more nutrients they will excrete. However, high temperatures can also inhibit the growth and nutrient uptake of the plants, so it is important to try to find a happy medium for all of your water quality parameters.

## TECH TALK 134

### Pest Management

Vigilance is the key to successful pest management. Make sure to inspect plants and crops on a regular basis to ensure that an outbreak does not occur. You should look for holes, speckling, browning and other damage from the bottom of the stem to the tip of the leaves and all sides of any fruit. Inspections should be increased around high-threat areas such as doors, vents and lights. Yellow sticky cards can also be hung throughout the greenhouse to help in identification of any insects. Records should be kept in order to keep track of past infestations as well as how successful prior treatments were. This will allow you to trend the occurrence of certain problems and can therefore predict future outbreaks.

The easiest way to manage pests in your greenhouse is to keep them out. While double door systems, screens around ventilation ducts and plastic sheeting to cover greenhouses help in keeping pests out, they will not keep all insects at bay. Cleaning should be performed on each plot in between plantings. Footbaths and hand sinks will also assist in deterring transfer of pests from one area to another.

If a mild infestation has occurred and it is contained in one area, a solution of water and liquid dishwashing soap can be used to dislodge insects from your plants. When a large infestation occurs, biological controls can be used to eliminate the pest population. This means that beneficial insects (parasitic wasps, ladybugs, predator mites, etc.) are released into the greenhouse to destroy the pests. Biological control requires a lot of time dedicated to monitoring and releasing predators, as well as knowledge of pest identification and biology. Environmental factors and any previous insecticide or pesticide use also need to be taken into account.

If pesticides need to be used, make sure you are using the correct pesticide for the application and following the labeled instructions. Spraying pesticides in the early evening is the best practice, since this method allows adequate time for the area to ventilate before people will be returning to the greenhouse.