

Probiotic Microbes & Beneficial Insects in Aquaponic IPM

By Stephen Raisner

pH Control Do's and Do Not's

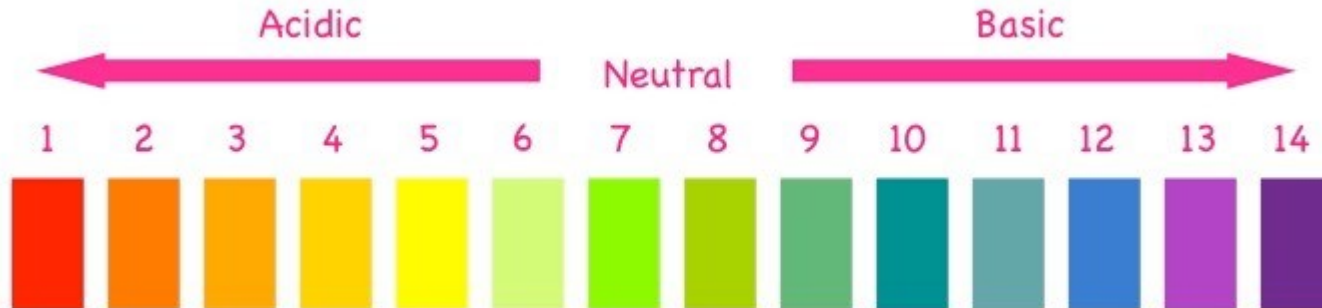
pH 6.6 - 6.8

Right

- Potassium Silicate
- Calcium Carbonate

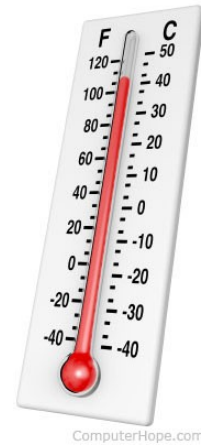
Wrong

- Potassium Hydroxide
- Potassium Carbonate
- Calcium Hydroxide

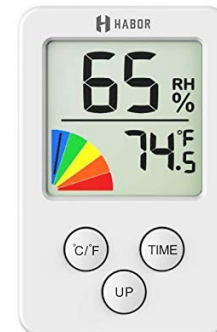


Temperature and Vapor Pressure Deficit

- Air Temp for aquaponics 72 - 86 depending on crop
- Water temp 66 - 72 depending on crop
- If going outside these ranges BE SURE your SILICA is above 60ppm to reduce plant stress, frost damage, heat damage, and increase mold resistance
- 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



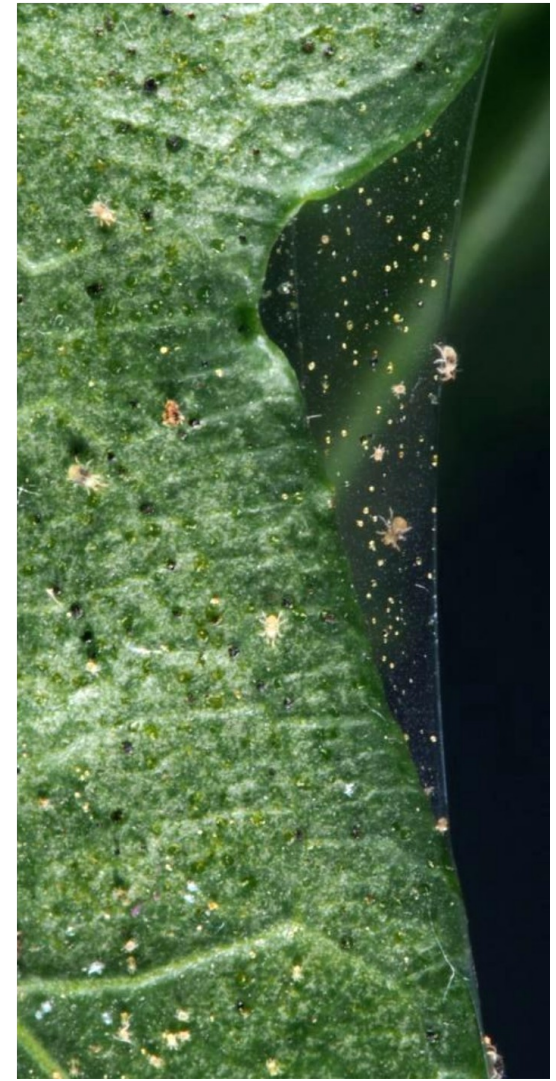
ComputerHope.com



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

Spider Mite Control

- Predatory Mites
 - *Phytoseiulus persimilis*
 - *Neoseiulus fallacis*
 - *Neoseiulus cucumeris*
 - *Neoseiulus californicus*
 - *Amblyseius andersoni*
- Beetles
 - Assassin Bugs
 - *Dicyphus hesperus*
 - Lacewings
 - *Chrysoperla rufilabris*
 - Midge
 - *Feltiella acarisuga*
- *Stethorus punctillum*
- *Feltiella acarisuga*



Aphids

- LadyBirds (Lady Bugs)
- *Aphidius matricariae*
- *Aphidius colemani*
- *Orius insidiosus*
- *Orius laevigatus*
- *Orius strigicollis*
- *Chrysoperla carnea*
- *Chrysoperla rufilabris*
- *Sphaerophoria rueppellii*



Rice Root Aphids

- *Stratiolaelaps scimitus*
(*Hypoaspis miles*)
- *Steinernema carpocasae*
- *Steinernema feltiae*
- *Dalotia coriaria*
- *beauveria bassiana*



Thrips

- *Stratiolaelaps scimitus*
(*Hypoaspis miles*)
- *Dalotia coriaria*
- *Steinernema*
carpocasae
- *Steinernema feltiae*
- *Chrysoperla carnea*
- *Chrysoperla rufilabris*



Silica

- Helps increase disease and pest resistance
- Helps increase bud weight
- Important for flavor
- Helps make the plant stronger
- To Raise pH use Potassium silicate, or Calcium Silicate
- Use Silicon dioxide to have a lower effect on pH rise
- Target in aquaponic water for greens 60 ppm for flowering crops 80 - 150 ppm



Know your Local Insects

- Research local insects
- Local Predators can be great allies in the garden
- Some can be dangerous but great allies like the wheelbug lower right
- Can help save money on large grows
- Can be harvested outside for inside use like in the case of assassin bugs, mantis, and others for insect control



White Fly

Encarsia Formosa

Encarsia inaron

Encarsia pernicioso

Encarsia sophia

Delphastus catalinae



Aerobic Microbes & Compost Teas

- Best way to mineralize fish waste and breed out the most beneficial microbes in a short period of time
- Brown Sugar is better than molasses as a sugar source for teas
- Normal brew times are 24 - 48 hours
- All teas should have a microbial inoculant and a carbon source
- Proper cleaning and design that allows for easy cleaning is critical



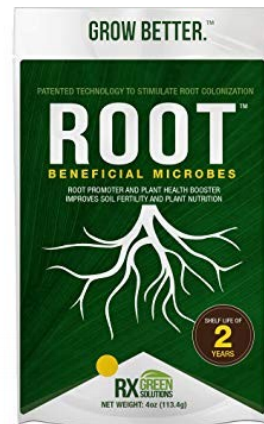
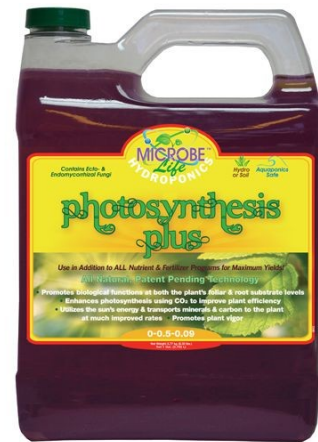
Trichoderma

- Pythium (Root Rot)
- Septoria (Leaf Spot Disease)
- Fusarium
- Botrytis
- Molds



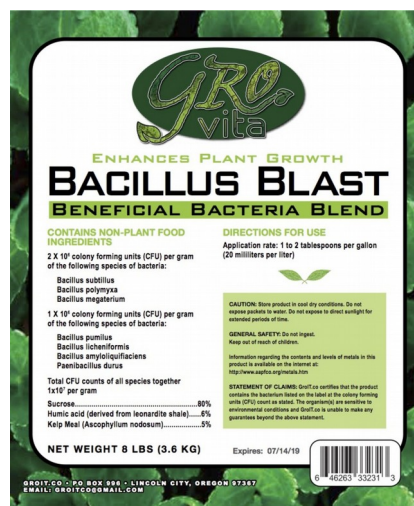
Bacillus Subtilis

- Pythium (Root Rot)
- Septoria (Leaf Spot Disease)
- Fusarium
- Botrytis
- Molds



Bacillus pumilus

- Pythium (Root Rot)
- Septoria (Leaf Spot Disease)
- Fusarium
- Botrytis
- Molds



Streptomyces

- Septoria (Leaf Spot Disease)
- Fusarium
- Botrytis
- Leaf Surface Molds



Korea Natural Farming

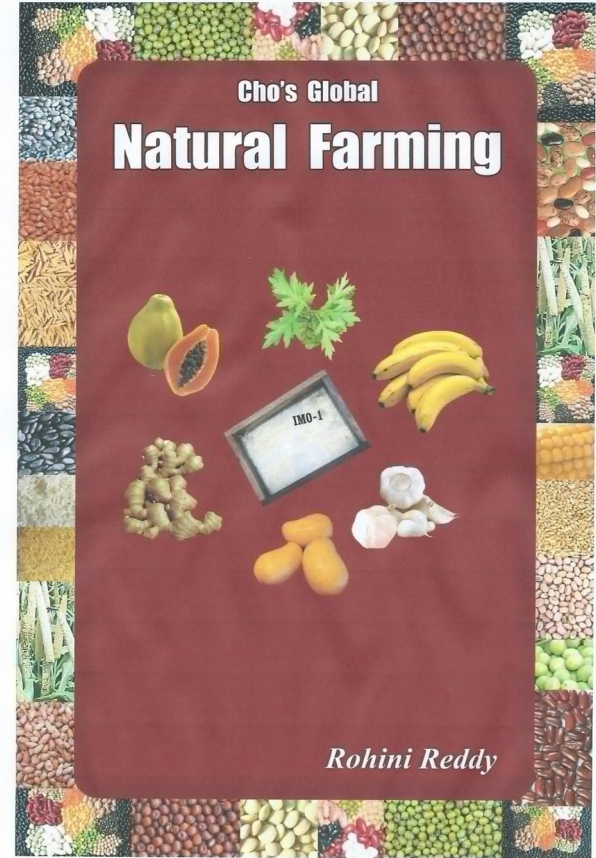
Mainly a method of fermented mineralization and microbial propagation

(IMO) Indigenous Microorganisms, IMO1, IMO2, IMO3, IMO4, IMO5

(LABs) Lactic Acid Bacteria

(WCA) Water Soluble Calcium Extract

(PWCA) Water Soluble Calcium Phosphorus Extract



Dynamic Accumulators

<https://buildasoil.com/blogs/news/9813606-free-spreadsheet-list-of-dynamic-accumulators-and-nutrient-content>

Great for sourcing inputs for

KNF for fermented inputs.

Many different plants &

organic inputs can be used

Data Source:		http://web.archive.org/web/20130126052424/http://www.ars-grin.gov/duke/ http://www.ars-grin.gov/duke/												
		Macro (primary)			Macro (secondary) nutrients				Micro (trace) nutrients					
		(N)	(P)	(K)	(S)	(Ca)	(Mg)	(Si)	(Fe)	(Mo)	(B)	(Cu)	(Mn)	(Na)
Malva neglecta	Common Mallow	4,200												
Malva sylvestris	High Mallow	3,300	5,000			10,715			440					
Chenopodium album	Lambsquarter		36,833	87,100		33,800			250					250
Amaranthus	Pigweed		10,082	73,503		53,333	6,616		1,527			19		2,406
Urtica dioica	Stinging Nettle		6,800	37,220	6,665	33,000	8,600	6,500	418		36	15	172	491,400
Allium schoenoprasum	Chives		6,437	31,250		10,375	6,875		200					750
Verbascum thapsus	Mullein		5,700			13,300		74	2,360					760
Taraxacum officinale	Dandelion		4,583	27,569	3,300	13,000	2,500		5,000		125	12	130	5,278
Artemisia vulgaris	Mugwort		3,150	22,000	2,800	6,455			118			20	170	
Borago officinalis	Borage			67,210		5,005								
Trifolium pratense	Red Clover						8,100				23	18	464	
Helianthus tuberosus	Jerusalem Artichoke											30		
Chrysanthemum parthenium	Feverfew			39,385		5,810	2,400	46					81	48
Scutellaria lateriflora	Scullcap			21,800		4,550	1,130	48	250				47	160
Origanum vulgare	Oregano			18,647		18,794	3,016		598			9	47	205
Stellaria media	Chickweed			18,400	3,828	12,100	5,290	157	2,530				153	1,470
Equisetum arvense	Horsetail			18,000		24,000	4,370		1,230				69	560
Achillea millefolium	Yarrow			17,800		8,670	1,920	45					50	82
Cichorium intybus	Chicory			37,128		18,900	2,652		246					1,428
Salvia officinalis	Sage			24,700		17,957		31	305		41	8	31	1,080
Portulaca oleracea	Purslane				6,300									7,400
Oenothera biennis	Evening Primrose					23,400	3,900							
Thymus vulgaris	Common Thyme					16,700	4,360	202	1,508		48	9	79	1,490
Calendula officinalis	Calendula					30,400								
Rheum rhabarbarum	Rhubarb					14,400			250					
Rumex crispus	Curly Dock					10,000								
Symphytum officinale	Comfrey		242	1,870		1,980	77	1	1.3				0.6	12

LABs

Septoria AKA Leaf Spot

Botrytis

Fusarium

Pythium

Pathogen Prevention

Sources

Milk

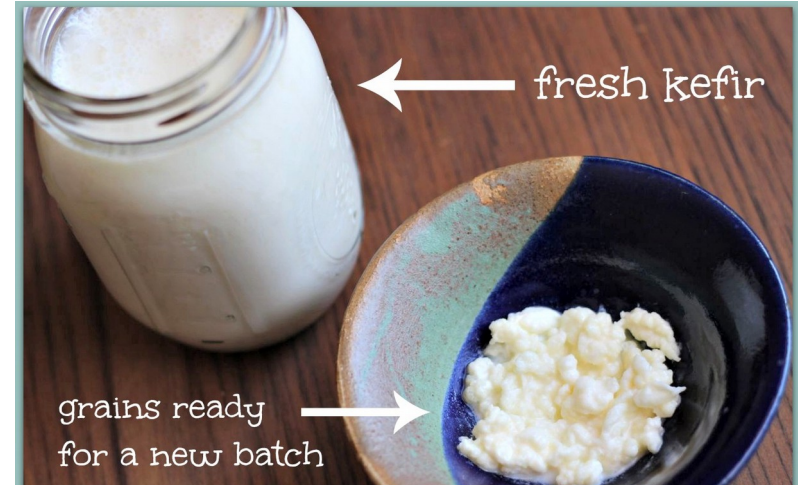
Yogurt

Kiefer

Probiotic Pills

EM-1

LABs Cultures



IMO Indigenous Microorganisms

- Native Fungi, Bacteria, Archaea and other beneficials
- Great way to fill the gaps in your mineralization microbes
- Great for introducing native microbes that are adapted to your local climate and adverse conditions
- One of the best things you can add



Aquatic IMO Indigenous Microorganisms

- Liquid Indigenous Microorganisms is the best way to add it to IMO to your aquaponic system
- Can easily be seeded from other aquaponics facility, aquariums or moving bodies of water
- Can be done with submerged rice or with sugar infused sponges
- Great way to seed microarthropods in particular like seed shrimp and scuds



Off the Shelf

Recharge - Microbial Mix

~ Free Samples Available ~

Mammoth P - Phosphating Chelating Microbes

Modern Microbes - Various Microbes

Photosynthesis Plus - Beneficial Microbes



modernmicrobes.com



Modern Microbes contains Nitrogen fixing bacteria, P - K - Si solubilizing bacteria, mycorrhiza, and other beneficial bacteria / fungal strains to help maintain health, vigor, and outcompete unfriendly microorganisms. All bacteria / fungi are cultured on Non-GMO mediums.

ingredients

Azotobacter chroococcum, Azotobacter vinelandii, Azospirillum lipoferum, Azospirillum brasilense, Bacillus megaterium, Bacillus polymyxa, Bacillus spp., Bacillus subtilis, Bacillus coagulans, Trichospora globosa, Bradyrhizobium japonicum, Fraxinus aurantia, Mycorrhiza, Trichoderma harzianum, Nematic & Fungal Soil, Organic Fertilizer, Ferment Extract

directions

1 - 2 TSP per 5 Gallons of Soil for initial inoculation or recycling soil.
1 - 2 TSP per 5 Gallons of Soil for top dress. 1 TSP per gallon for Water (or per every 2.5 gallons of sprays / misting/plants). If used on a foliar, once a week - once every two weeks budget. Top dress mixes with every three - four weeks (generally mixed with organic dirt, compost, or manure) and water in immediately, tapered at transition to flowering, and at day 5 of week 3. One 9 - 10 week plants top at day 5 of week 6 for 12 - 14 week plants.

4 oz.

!!! WARNING AVOID !!!

Yucca Extract and Saponin

UV Sterilizers

Ozonators

Too much trichoderma

Mixing too many microbes in one batch

Too much pH change when adjusting mineralization water for use

Not providing food for microbes being dosed

Hydroxides



Resources



~ Elaine Ingham soilfoodweb.com

~ Chris Trump naturalfarming.co Thu Oct 10, 2019 - Mon Oct 14, 2019
Litchfield, CT

~ Microbe Organics microbeorganics.com

~ OMax MicroScopes omaxmicroscope.com

~ Dino-Lite Digital Microscope www.dino-lite.com

~ Arbico-Organics arbico-organics.com ~ GreenMethods.com greenmethods.com

~ Bio-Best biobestgroup.com ~ Biologicco & NemaJets biologicco.com/products/



4 Day Commercial Aquaponics Cannabis Class

October 17th - 20th

Youtube

APMJClass.com

Potent Ponics

Podcast

Growing With Fishes

Email

PotentPonics@gmail.com

Websites

PotentPonics.com

Facebook Group

Aquaponic Cannabis Growers

