

Interpret your water quality report and diagnose water problems...

ANION CATIONS	mg/L	mg/L	mg/L	mg/L
Fluoride	0.00	0.00		<100
Sulfate	10.00	1.00	20-70	<100
Magnesium	1.00	0.00	10-30	<100
Sodium	0.00	0.00	0-20	<100
BIODIAGNOSIS				
Phosphate	PC4	0.00	0.00	<300
Boron	BOR	0.00	0.00	<100
Chlorine	CL	0.00	0.00	<140
NO3-Nitrate	NO3	0.00	0.00	
CO3-Carbonate	CO3	0.00	0.00	
AMMONIUM-NITROGEN				
Ammonium-Nitrogen	NH4-N	0.00	0.00	<10
Ammonium-Nitrogen	NH4-N	0.00	0.00	<10
pH		6.00-7.00	6.5-7.5	
Soil Salts	EC	0.00-0.00	0.0-0.5	
Total Alkalinity	CaCO3	0.00	0.00	<100
ION				
Na	0.00	<1	<4	
Magnesium	Mg	0.00	<1	<2
Boron	B	0.00	<0.02	<0.5
Copper	Cu	0.00	<0.10	<0.2
Zinc	Zn	0.00	<1.00	<1
Manganese	Mn	0.00	<0.10	<0.2
Aluminum	Al	0.00		

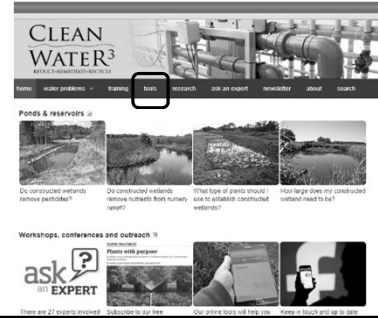


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CleanWater3.org tools you can use...

- CleanWater3.org
- Select "Tools"



CleanWater3.org tools you can use...

- CleanWater3.org
- A range of tools are available



Grower tools

Our grower tools help you make informed management decisions on water quality issues.

- The WaterQual tool interprets water quality tests for sources used in irrigation in greenhouses and nurseries.
- The Waterborne solutions tool summarizes published research on control of plant pathogens and algae.
- Parts per million to recipe and recipe to parts per million calculators help calculate dosage for sanitizing chemicals and water-soluble fertilizers.
- AlkCalc estimates the amount of acid to add to neutralize alkalinity of your irrigation water.



I got my water tested – now what?


- WaterQual
 - Rosa Raudales (Univ of Connecticut)
 - Bruce MacKay (ThomasBaine Ltd.)
 - Paul Fisher (Univ of Florida)

Linked Videos



Linked videos

Alkalinity of irrigation water



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WaterQual – enter water test results into the tool

WaterQual
This tool interprets the quality of a water source for use in irrigation of plants in greenhouses and nurseries.

Total ions and alkalinity

pH: no units required

Electrical conductivity (EC): mS/cm

Hardness (Ca+Mg): mg/L

Alkalinity: ppm CaCO3

Total Dissolved Salts (TDS): mg/L

Sodium absorption ratio (SAR): no units required

Calcium (Ca): mg/L or ppm Sulfate (SO4): mg/L or ppm
 Magnesium (Mg): mg/L or ppm Sodium (Na): mg/L or ppm
 Nitrate (NO3): mg/L or ppm Chloride (Cl): mg/L or ppm
 Manganese (Mn): mg/L or ppm Phosphate (P): mg/L or ppm
 Zinc (Zn): mg/L or ppm

Physical water quality
 Temperature (C/F): C/F Salinity: ppt

Also in Spanish

- WaterQual

WaterQual
Este herramienta interpreta la calidad de una fuente de agua para su uso en el riego de plantas en invernaderos y viveros.
Introduzca los datos para los parámetros de calidad que le interesan (o si no necesita introducir los datos para introduzca los datos para los parámetros de calidad que le interesan (o si no necesita introducir los datos para

iones totales y alcalinidad

pH: no units required

Conductividad eléctrica (CE): mS/cm

Dureza (Ca + Mg): mg/L

Alcalinidad: ppm CaCO3

Total Dissolved Salts (TDS): mg/L

Relación absorción de sodio (RAS): no units required

Calcio (Ca): mg/L or ppm Sulfato (SO4): mg/L or ppm
 Magnesio (Mg): mg/L or ppm Sodio (Na): mg/L or ppm
 Nitrato (NO3): mg/L or ppm Cloruro (Cl): mg/L or ppm
 Manganeso (Mn): mg/L or ppm Fosfato (P): mg/L or ppm
 Zinc (Zn): mg/L or ppm

Problemas físicos
 Temperatura (C/F): C/F Salinidad: ppt

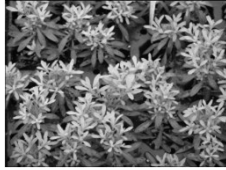
Interpretation for greenhouse & nursery use

Measurement	Test value	Result	Explanation of result
pH	8	High (>7)	pH and alkalinity levels this high means some pH adjustment (addition of acid) will be required in the spray tank with certain agrichemicals - check the pesticide label. For use in irrigation, injection of acid is recommended to reduce alkalinity and avoid an increase in substrate-pH over time. You may also need to include ammonium or urea nitrogen at 40% or above of total N in fertilizer to help avoid a rise in pH when using hydroponics or a container substrate.
Alkalinity	279 ppm CaCO ₃	High(>150 ppm CaCO ₃)	

- Check it out at CleanWater3.org

You probably know poor quality water when you see it...

- Chemical issues:
 - High electrical conductivity, Na, Cl
 - High alkalinity
 - High boron...



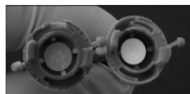
Can you diagnose this grower's issue?

- Two locations same water source & type of irrigation system
- In one, pipes filling up with brown chunky & slimy material



Quick tests for plugged up pipes & emitters

- Biological
 - Slimy organic material
- Chemical:
 - Soak in vinegar (low pH)
 - Send solution to testing lab to analyze specific ions
- Sediment:
 - When soak in water, solid particles drop out



What information do you need?

- Chemical analysis of source
- Type of water source
- Bacteria
- Particles & suspended solids
- Water treatment
- Detailed iron manganese
- Solved!




Chemical lab test of water source

Components	Results		Target Ranges (mg/L)	Acceptable (mg/L)
	mg/L	meq		
MAJOR CATIONS				
Potassium	K	3.83	0.10	<100
Calcium	Ca	31.35	1.57	25 - 75
Magnesium	Mg	7.07	0.59	10 - 30
Sodium	Na	5.09	0.22	<50
MAJOR ANIONS				
Phosphate	PO4	1.52	0.05	<90
Sulfate	SO4	27.50	0.57	0 - 120
Chloride	Cl	12.00	0.33	0 - 20
HCO3 Alkalinity	HCO3	92.72	1.52	
CO3 Alkalinity	CO3	0.00	ND	
Ammonium Nitrogen	NH4-N	ND		<10
Nitrate Nitrogen	NO3-N	ND		<75
pH	pH	7.26		5.50 - 7
Soluble Salts	EC	0.24		0.20 - 0.80
Total Alkalinity	CaCO3	76.00		40 - 160
Iron	Fe	0.01		<1
Manganese	Mn	ND		<1
Boron	B	0.03		<0.10
Copper	Cu	0.04		<0.10
Zinc	Zn	0.07		<0.50
Molybdenum	Mo	0.02		<0.10
Aluminum	Al	0.16		<0.2



Water Source



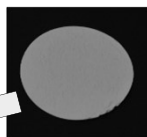
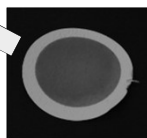

- Municipal supply
- Chlorinated 1 ppm
- From well water

pH	EC (mS/cm)	CaCO ₃ (mg/L)
7.26	0.24	76



Particles & Suspended Solids

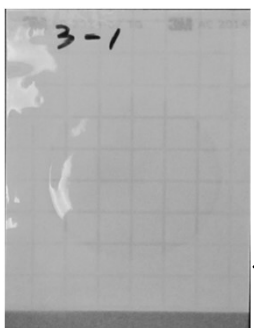
Samples	Turbidity (NTU)	Total suspended solids (TSS, mg/L)
Raw water "near source"	1.5	0.1
Raw water "far outlet"	14.0	6.5
Ideal range	<29	<5 mg/L



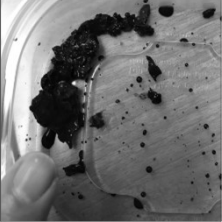
Bacteria count


Samples	Bacteria count (CFU/ml)
Raw water "near source"	0
Raw water "far outlet"	1
Ideal range	<5000 CFU/ml







Detailed iron/manganese		
Samples	Iron (ppm)	Manganese (ppm)
Raw water "near source"	0.0	0.0
Raw water "far outlet"	3.8	0.0
Ideal range in raw water	<0.1	<0.1





Water treatment: sodium hypochlorite (bleach)	
Problem greenhouse	Free chlorine (ppm)
Raw water "near source"	5.5
Raw water "far outlet"	0.7
Other greenhouse (no problem)	
Raw water "near source"	0.7
Raw water "far outlet"	0
Ideal range	<2.0





- What can we learn from this case study?
- Problem: Overdosed chlorine (an oxidizer) corroding pipes.
Solution: Turn the injector down and monitor!
 - Multiple aspects of water quality
 - Salts, particles, microbes, agrichemicals
 - Don't jump to a solution until you know the problem
 - There is a risk and cost in every water treatment system.
 - Have a preventative monitoring system in place
 - More isn't always better!

For more information...

- CleanWaterR3.org for tools and resources
- hort.ifas.ufl.edu/training/ for online extension courses
– "Water Quality & Treatment" begins November 5

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