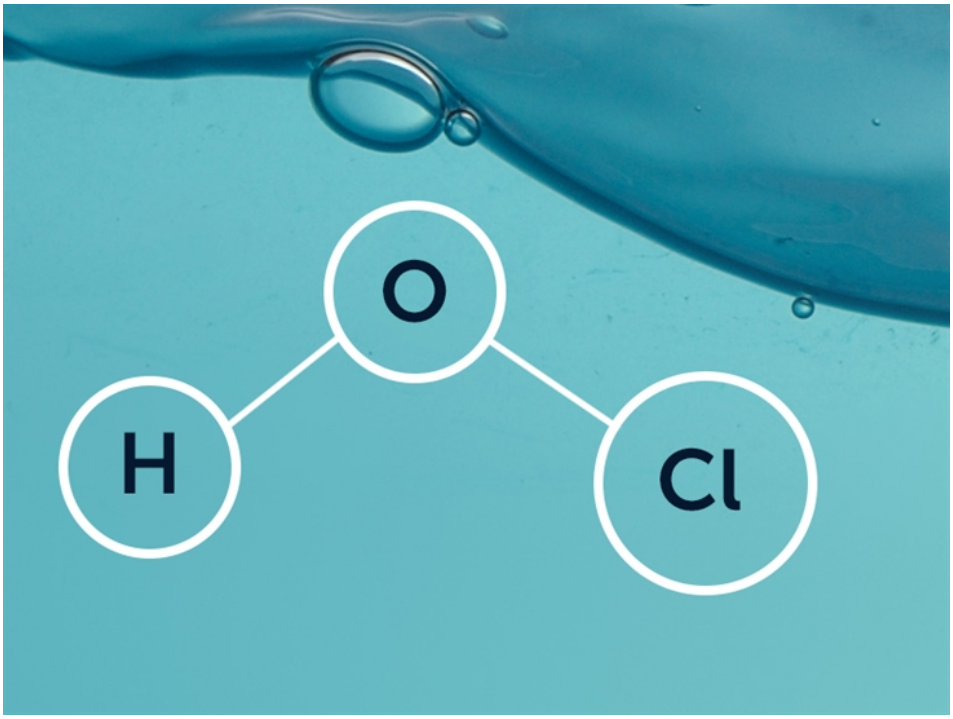
How to prepare your own hypochlorous acid cleaner using bleach

During the past couple of years, cleaning products based on hypochlorous acid derived from electrolysis have become popular in the hydroponic industry. This is because, in the USA – per 40 CFR § 180.940 – hypochlorous acid products containing less than 200 ppm of active chlorine are exempted from many manufacturing and handling requirements and are therefore easy to produce and dispense to hydroponic growers. While more dilute, the formulations produced can often be much more stable than more concentrated products and still provide satisfactory cleaning results in a hydroponic reservoir. However, the products carry a lot of additional cost compared to traditional sodium hypochlorite based cleaning products. This is because more needs to be used – as they are more dilute – and the products themselves are often much more expensive.



Graphic representation of hypochlorous acid

In this post, I want to help you create a solution analogous to many commercially available, electrolytically derived hypochlorous acid cleaners, using products that are easily available and low cost. The resulting solution is – for all intents and purposes I can think of – equivalent to electrochemically derived hypochlorous acid, since the hypochlorite ion becomes protonated at low pH, generating the required substance during the preparation process. To create this formulation, I relied on the following documents and the scientific literature they referenced (1, 2, 3).

Important note. *Hypochlorous acid is unstable in highly concentrated solutions. Increasing the concentration of the formulation below significantly can lead to potentially dangerous releases of chlorine gas when the pH is lowered. Work in a well ventilated area and do not exceed the concentration amounts recommended in this preparation. Work responsibly and make sure to read all the MSDS of the substances used and use appropriate personal protection equipment.*

These are the things you will need for the preparation :

1. Freshly bought Clorox (7.4%). The solution should not be older than one week.
2. A 20 mL syringe.
3. Monopotassium Phosphate (MKP).
4. Sodium Chloride (table salt will do).
5. Magnesium Sulfate.
6. Sodium Tripolyphosphate.
7. A calibrated pH meter.
8. A scale to weigh salts, +/-0.1g.
9. A scale to weigh water +/-0.1kg
10. Distilled or RO water (tap water will not work). Distilled is preferable.
11. Clean plastic, air-tight container (at least 1gal) to store the resulting solution. The container should be

opaque.

This is the procedure you should follow for the preparation of the hypochlorous acid solution (values for ~1.2 gallon, can be scaled up for larger amounts):

1. Calibrate your pH meter using fresh pH 4 and pH 7 buffer solutions.
2. Fill the container with 3.6 kg of distilled water, this will be referred to as the solution.
3. Weigh and add 0.5g of Sodium Chloride to the solution.
4. Stir until fully mixed.
5. Weigh and add 0.1g of Sodium tripolyphosphate to the solution.
6. Stir until fully mixed.
7. Measure 11mL of Clorox and add it to the solution. If you're working with a bleach solution with concentration other than 7.4%, multiply 11mL by 7.4 and divide by your concentration to obtain the amount you should use in mL (for example, if using a 6% bleach solution, you would require 11*7.4/6 = 13.56mL).
8. Stir until fully mixed.
9. Weigh 0.5g of Monopotassium phosphate and add to the solution.
10. Stir until fully mixed.
11. Measure the pH of the mix. If the pH is >7 slowly add and fully mix small portions (~0.1g) of monopotassium phosphate until the pH is in the 6.5-7 range. Take at least 1 minute between additions to ensure the pH has stabilized before adding more.
12. Weigh and add 3.5g of Magnesium sulfate to the solution
13. Stir until fully mixed.
14. Add 0.9kg of water.
15. Confirm final pH is in the 6-7 range, you can add more monopotassium phosphate if needed to drop the pH.

This should provide you with a solution that is stable in the medium term and has the active chlorine concentration of a formulation similar to products like Athena Cleanse. The expected concentration of hypochlorous acid should be around 0.02% (200ppm). It can be used from 2 to 10mL/gal of hydroponic nutrient solution, depending on the severity of the problems that need to be solved. *For overall maintenance and the solution of minor infections, dosages of 5mL/gal should be more than adequate*. The Magnesium Sulfate and Sodium Chloride are added as stabilizing agents, while the mono potassium phosphate is added as a pH buffering agent and the sodium tripolyphosphate is a cleaning agent meant to keep irrigation lines clean (it can be omitted if this is not a concern). *Note that the contributions of the mineral ions to a formulations nutrition at the applied concentrations are negligible.*

Please do let me know if you have any questions about the above preparation. **If you have prepared it, please let us know how it went in the comments below!**