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WATERING PLANTS USING VINEGAR ADDED TO TAP WATER

Here is what I know about the subject of adding vinegar to tap water based on 50 years of studying chemistry and 40 years of growing cacti.

The only effect of vinegar is to lower the pH of the water you're using for watering. Whether it's apple cider vinegar or the cheap white stuff is irrelevant. The soured wine - acetic acid - is the active ingredient. Of course, some people need to have a little magic involved, so maybe apple cider vinegar provides the magic. How much to add depends on the concentration of alkalinity in the water source.

Our tap water is alkaline for the reason that it comes from carbonate aquifers and our municipalities may tweak the water a bit more to get its pH up to a non-corrosive point. To really answer the question of how much vinegar to add, you have to figure out how much actual base is present. This used to be simple. Buy some narrow-range pH paper at a tropical fish store. Put a gallon of water into a suitable container. Measure pH with the paper, say it's 7.5. Add a tablespoon of vinegar and stir. Measure pH, say it's 7.0. If you want the pH more acidic, add another tablespoon of vinegar, etc., until you get to the pH you think your plants need, something around six, probably. Then write down how many tablespoons of vinegar per gallon it took to get to that pH and use that recipe in the future. Don't worry about changes in water due to shifting sources by your utility or seasonal variations for whatever reasons. The water won't vary that much and the plants don't care very much. Actually, if you can drink the water, the plants are probably ok with it.

The hooker in that is that you can't do it easily any more. The Drug Enforcement Agency has determined that anyone who wants narrow range pH paper is a dope manufacturer and you need to prove to them that you're not. Recently the chemical supply houses refused to sell me any without my proving to them that I was legitimate. I finally solved the problem at amazon.com. Why they can sell me narrow range paper I have no idea. However, I bought a very cheap but reasonably functional pH meter from them, which is infinitely easier to use than pH paper. (Lab quality pH meters cost hundreds of dollars.)

So here is the bottom line--don't worry about your tap water. If you really want to lower its pH, add a tablespoon or two of vinegar to it. You won't hurt anything and maybe you'll help your plant, though I doubt it. Don't use expensive ("organic") vinegars. It's the acetic acid doing the work. If you want to give your plants a more acidic life, go to a garden store and buy a bag of wet-able elemental sulfur. (Don't confuse "sulfur" and "sulfate;" this is a lightning/lightning bug difference.) It's cheap. Mix a tablespoon of this sulfur in a gallon of water, add a squirt of any dish detergent (I like Ivory) and water your pot. Do this two or three times per year. What will happen is that bacteria in the soil will convert the elemental sulfur eventually to something related to sulfuric acid, thus making acidic patches in your pots. The reason your plants need some acidic patches, if not a more acidic medium, generally is that certain micronutrients (iron, copper, etc.) are insoluble in basic media. That is, the plant can't take up these elements from a basic medium, or even a slightly acidic medium. Mineral deficiencies have various appearances, but yellowing of what should be green is fairly common. There are others.

Here's a reason for adding vinegar to tap water. It might get the pH environment of your plant's roots such that the plant can take up the trace elements it needs. The sulfur treatment can also do this. If you just water with straight New Mexico tap water for years you could get such a mineral (= usually basic pH) build-up that your plants get starved for trace elements. This can be fatal. It is certainly unhealthy.

Of course, if you repot every year or two like the books say, you won't have a mineral build-up. I never repot my plants. I do occasionally add vinegar to my watering can (about two tablespoons per gallon), but mostly I use a hose to water my plants and I can't easily add vinegar to the hose. My plants seem to be doing ok. Some have been in the same (synthetic) soil for more than 20 years. I do the elemental sulfur thing now and again. You can also get around trace element solubility problems by feeding chelated trace elements. These can usually be absorbed by a plant regardless of the pH environment of the roots. Read the label carefully of trace elements you might buy. Be sure they are "chelated." Some sources may not use the word, but the initials EDTA or similar looking capital letter combinations will be in the ingredient list. Don't use "fritted trace elements." These are insoluble sources of trace elements. I don't know why they're sold. I often have to foliar feed (trace elements water solution in a hand sprayer with detergent) some of my fruit trees and grapes because the pH of my garden soil makes it impossible for my trees and grapes to take up trace elements efficiently from the soil. Yellow leaves are the absolute tell-tale that there is a pH problem. (Lack of nitrogen is also indicated by yellow foliage.)

There are some plants that absolutely must have a very acidic soil medium. These are rhododendrons, azaleas, blueberries, etc. These grow like crazy in the acid soils of the Northwest. They can't be grown in NM without heroic measures. For cactus people, it's the epiphytes that need acidic soil - the xmas, easter, and other epiphytes. I grow them in a synthetic soil that has no added carbonates, and I do the elemental sulfur thing described above several times a year. When I water them, I always add some vinegar to the water because they definitely have no tolerance for high pH, and high means even 6.0, a pH level usually considered safely acidic.

If you add a tablespoon or two of vinegar per gallon of tap water, it should be ok, given the nature of NM tap water. It might do some good and will definitely do no harm. But use the cheap stuff. If you enjoy throwing money away, then by all means use the imported ORGANIC balsam stuff.

The following more completely explains why where you live impacts the way you water. In the Northwest (NW), on the wet side of the mountains where I used to live, the tap water is so soft that adding vinegar is a waste of time. This is in spite of the fact that the municipal water in the NW (and everywhere else) has its pH adjusted to somewhere around 7.5 (very slightly alkaline). This is done to minimize corrosion of metal water-carrying pipes. If one were to send the normally acidic surface water that's the source of municipal water in the NW into the distribution system, this system would soon corrode away. Since the water is so very soft (this means it contains almost no minerals, especially no calcium ions [or bicarbonate ions]) very little agent is necessary to adjust the pH to about 7.5. The people who live there don't worry about the effect of this added stuff on their plants. No heavy white rings are usually found on pots in the rainy NW. The chemists refer to this kind of water as having no "buffer capacity." The meaning is that a very little addition of a base or an acid to this tap water will make the water change pH drastically. (A "buffer" is a system that tends to maintain it's pH, which is a measure of acidity and alkalinity. Water with a pH of 7 is considered neither acidic or alkaline, that is, it is neutral. Above 7 is alkaline, below 7 is acidic.) By the way, a tablespoon of vinegar in NW tap water would run a gallon of water down to about pH 3. This is not good for most plants.

People on the east side of the mountains in the NW have the same problem we do here. A lot of our tap water comes from underground aquifers in contact with limestone. This gives us naturally somewhat alkaline water. This water is also termed "hard." Don't confuse the two. Hard water is the kind of water in which ordinary soap is worthless. The designation "hard" means that the water has lots of calcium, and maybe some magnesium, ions. You've probably all experienced a soap problem staying in various hotels and motels. If a hotel in a hard water region sees a good buy on soap and doesn't know or care about the problem, it may buy soap meant for a soft water area. This means that guests at that hotel will not be able to use the soap to wash. As soon as the soap and the water meet, the soap anions (long chain fatty carboxylates) are precipitated by the calcium (and some magnesium) ions that are found in hard water. So rather than getting suds from soaping yourself, you're making instant bathtub ring on yourself. Calcium and magnesium carboxylates are insoluble in water.

(I want to beat this "hard" water thing to death. As I just noted, the definition of hard water is water that contains metal ions which form insoluble carboxylates with ordinary soap. By far the most common metal ion in tap water with this property is calcium ion. It happens that the most common source of calcium in water is from deposits of calcium carbonate in contact with water aquifers. It turns out that the carbonate part of these formations is the source of alkalinity in our water. That is, the carbonate dissolves, as bicarbonate, along with the calcium ions. These bicarbonate ions are what gives most Western municipal water its slight basicity, also called slight alkalinity. This means that practically speaking typical hard water is also slightly alkaline. The chemist purist in me wants to point out to you that I can make hard water that is not alkaline, by dissolving, say, calcium chloride in distilled water. This will be an acidic hard water--hard because of the calcium ions and acidic because atmospheric carbon dioxide will run the pH of this solution to somewhere down near pH 5.7. The chloride ion is a neutral anion and has no acid/base properties. I can also make a solution that is alkaline but not hard--say by dissolving sodium bicarbonate (the Arm & Hammer stuff) in distilled water. The bicarbonate ions will make the solution slightly alkaline, but soaps will not precipitate in this solution because sodium soaps are water soluble. Practically, it turns out that very many natural sources of hard water (= containing calcium ions) are also slightly alkaline (= containing bicarbonate ions).)

(The hard soap you buy in the store is a sodium carboxylate. If you like soft soap, you're buying a potassium carboxylate. The cleaning agent is the soluble carboxylate anion, which has a water soluble end and a fat soluble end. The way soaps work is that their fat soluble ends take up whatever oily stuff you're trying to wash away and sort of dissolve the fatty stuff in water by means of their water soluble other end. Note that the two uses of the word "hard" have nothing to do with each other. Hard water contains calcium and maybe also magnesium ions. Hard soap feels hard to your touch.)

In order to get soap that works in hard water, you have to technically go to a soap that's not a soap at all, but rather a detergent. Detergents differ from soaps in that their water soluble end is not a carboxylate, but rather a sulfonate. It turns out that calcium and magnesium sulfonates are water soluble, so no precipitation of any bathtub ring on your person happens when you use detergents rather than soap in hard water. I think that technically hard water "soaps" are mixtures of soaps and detergents. The correct mixture for a given area is determined by the soap manufacturers. They mix their soaps and detergents such that the user gets a certain length of time in which sudsing happens, and water then washes all away. The user feels his usual skin after washing. The goofy thing happens if the manufacturer adds too much detergent. Then the user gets the feeling that the "soap" may never wash away no matter how long the user rinses. This is wrong of course, but the soapy feeling lasts so much longer than one is used to that one wonders what's wrong. To experience this, bring some soap from home to a soft water area on your travels and try using it. You'll swear that it'll never rinse away.