

*Controlling*  
**Salt**  
**BUILDUP**

BY DONALD LESTER

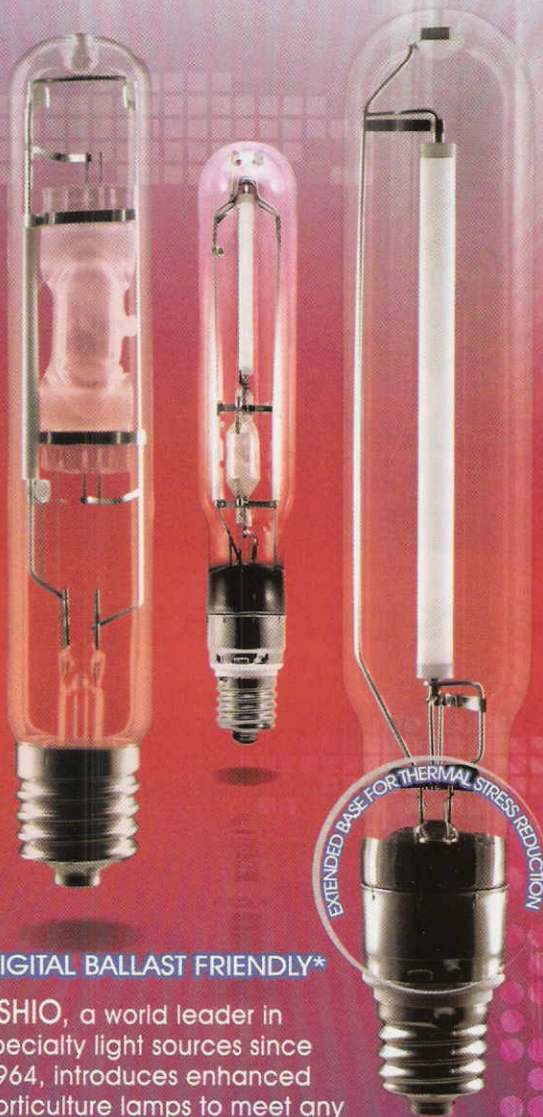
KNOWING WHY AND HOW SALT ACCUMULATES IN HYDROPONIC SOLUTIONS AND SOILLESS SYSTEMS CAN HELP YOU AVOID THE SITUATION IN THE FUTURE.



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## CONTROLLING SALT BUILDUP

Salt buildup is a common problem for growers; in soil systems, it is characterized by an accumulation of white or off-white (sometimes even brown or gray) crystals forming on the soil surface in fields and on the surface of potting mix in pots. Salt buildup can also occur in hydroponic solutions and in soilless systems.

Salt buildup can be a serious problem for plants because it affects the ability of their roots to take up water. Plants normally regulate how much water they have in their system by actively drinking through their roots. When the water surrounding the roots becomes too salty, however, the salty water does not have enough water molecules in it relative to the fresher water within the plant, so it becomes hard for the plant to suck up the few water molecules left in the salty water outside. Humans have the same problem with their cells trying to get fresh water from salty water—which is the reason a sailor lost at sea can die of thirst in the middle of the ocean.

**"PLANTS RESPOND TO EXCESS SALT IN THE SAME WAY THEY RESPOND TO CONDITIONS OF DROUGHT. THE COMMON SYMPTOMS ARE STUNTING, WILTING, DRYING OF THE LEAVES AND EVEN DEATH."**



There are several reasons why salt accumulation can occur, including the use of high-salt fertilizers, a poor water source, poor water drainage, bad substrate selection or even salt-sensitive plants. These factors can occur alone or in combination.

**"PLANTS VARY IN THEIR SUSCEPTIBILITY TO HIGH SALT CONCENTRATIONS."**

One side effect of too much salt is that it can negatively affect the pH of the soil or nutrient solution. When a weak acid or a weak base is added to a salt it is called a "buffer". If the pH is not in the desired range, then buffering can make pH correction more difficult. This is one reason why growers can continue to add a pH adjuster and see quick results, but then over time they see the pH drift back to where it was before the adjuster was added.

Salt buildup can be corrected by leaching, changing the water source, choosing the proper substrate, switching to fertilizers with a low salt index, by the addition of calcium or by adapting to the salt by using plants with a high salt tolerance.

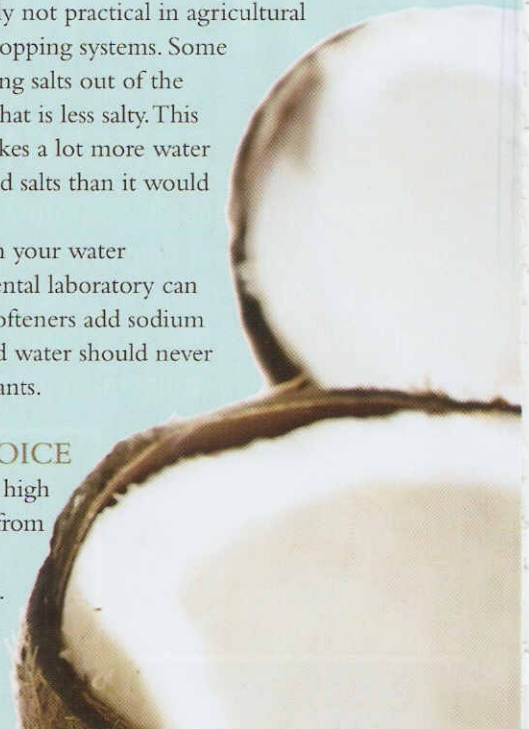
### LEACHING AND YOUR WATER SOURCE

In soil-based systems, salts can be leached out of the soil. Pure water can dissolve the salts and leach them out of the soil profile, but that is usually not practical in agricultural fields or large indoor cropping systems. Some growers resort to leaching salts out of the soil profile with water that is less salty. This method works, but it takes a lot more water to dissolve the unwanted salts than it would with pure water.

Check the salt levels in your water source—any environmental laboratory can do this for you. Water softeners add sodium to the water, so softened water should never be used for watering plants.

### SUBSTRATE CHOICE

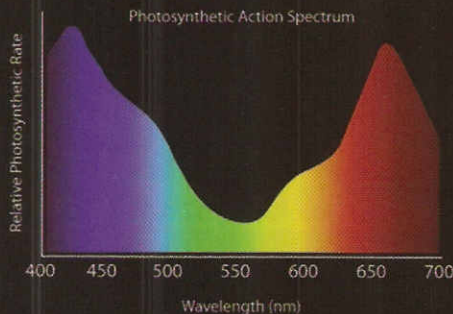
Some substrates can be high in salt, so staying away from the main culprits can help avoid the problem. Coir coconut fiber can



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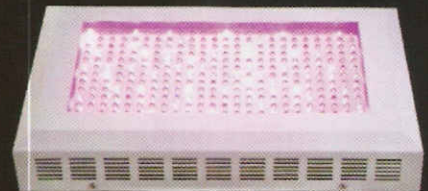


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be one of the offenders, so some industry experts recommend thoroughly rinsing the coir before use to remove excess salt.

Sphagnum peat and compost made from purely plant sources are both good low-salt choices. Ask for an analysis of any organic amendments that you are considering, and choose your amendments wisely. If no analysis is available, you should test a small amount of the amendment before purchasing a large quantity.

When considering substrates, remember that growing media should contain a substantial quantity of large pores to facilitate good drainage.

### LOW SALT INDEX FERTILIZERS

There are several types of salts that can build up in soils and fertilizer solutions, but sodium chloride (table salt) is arguably the most common. In fact, many fertilizers use salts as active ingredients. You can get a good indication of how much salt is in a fertilizer by looking at the salt index (SI). University studies have measured how much salt is in certain brands of fertilizer and they have been ranked accordingly. It should be noted, however, that the SI does not predict the exact amount of fertilizer or the particular formulation that could produce crop injury, although it does compare one fertilizer formulation with others regarding the relative osmotic (salt-related) effects.

**“THERE ARE SEVERAL TYPES OF SALTS THAT CAN BUILD UP IN SOILS AND FERTILIZER SOLUTIONS, BUT SODIUM CHLORIDE (TABLE SALT) IS ARGUABLY THE MOST COMMON.”**

It also shows which higher-SI fertilizers will be most likely to cause injury to germinating seeds or seedlings if placed in close proximity. For example, a liquid 2-10-10 formula might rank 27.5, whereas a 2-20-20 might rank at 7.2. Clearly, using half the rate of 4-10-10 is still saltier than using the full rate of 2-20-20.

### ADDITION OF CALCIUM

In soils with a high sodium content, gypsum (calcium sulfate) may be applied to improve the soil structure. Managing soil sodium is really about maintaining optimum levels of soluble soil calcium—in order to amend a salty soil, sodium must be replaced with calcium, which is usually accomplished with high rates of gypsum. Calcium has a more powerful electrical charge than sodium, so the application of gypsum will displace soil sodium. Irrigation then leaches the free sodium through the soil profile, thus restoring the physical properties of the soil.

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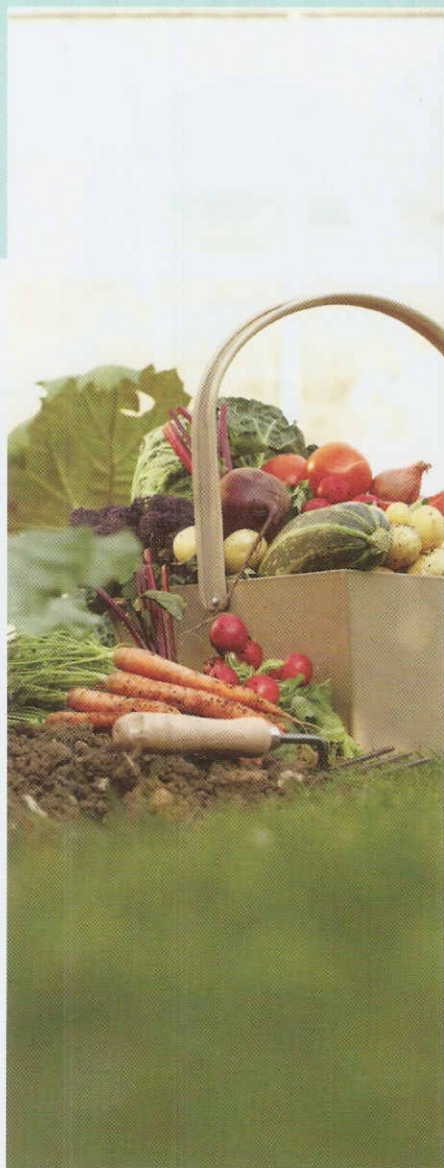
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## SALT TOLERANCE IN PLANTS

Plants vary in their susceptibility to high salt concentrations. The table to the right catalogues some common plants into sensitive, moderately tolerant or highly salt-tolerant categories. A more exhaustive listing of salt-tolerant plants is available in "Urban Horticulture Leaflet 14," published in the North Carolina Cooperative Extension publication.

Salt buildup is a common complication. If excessive salt accumulation is an issue in your garden, then hopefully these tips will help you isolate and rectify the situation and avoid the problem in the future. **MY**


SENSITIVE	MODERATELY TOLERANT	HIGHLY TOLERANT
African Violet	Coleus	Bermuda Grass
Apricot	Cucumber	Date Palm
Apple	Fig	Daylily
Beans	Grape	Lantana
Chrysanthemum	Honeysuckle	Lymegrass
Gardenia	Ivy	Oleander
Geranium	Melon	Pampas Grass
Lettuce	Olive	Rosemary
Orange	Onion	Russian Sage
Petunia	Pomegranate	Saw Palmetto
Pear	Tomato	Spinach
Peas	Vinca	St. Augustine Grass
Plum	Wheat	Yucca






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