Plant Health and Imbalance Symptoms

The following information was compiled by Jim Fruth from many sources. It was published in the Winter, 2009, issue of **Pomona**, the newsletter of the North American Fruit Explorers (NAFEX). Both **Pomona** and Jim Fruth, who supplied most of this data, have granted permission for our use. I provided a copy of the digital table to **Pomona**, so that a copy may be posted on the NAFEX web site for download, if so desired. In the current version, I have added some comments and a small number of additional symptoms.

Since the bulk of the work was provided without fee, we are providing this information as a free resource on our website. We thank Jim Fruth and Pomona for making this resource available. If you encounter it in one of our gardening data database packages, there was no added charge for including it.[1] – *Dan Hemenway*

Notes:

Different symptoms are described for single causes. This is because different plant species may have a different response to a given condition or a one symptom may result from a variety of causes. Likewise, certain symptoms may suggest more than one cause, in which case context, trials, tissue analysis, or cross check with unrelated pants growing in the same area may point to the problem.

Our database showing the NPK value of 'waste' and scrounged soil nutrient inputs[2] may be helpful in redressing soil nutrient imbalances, once verified. See below.

Redressing Mineral Deficiencies

Be cautious in correcting for possible mineral deficiencies. Overcompensating can result in phytotoxicity or worse. Usually, balanced compost, seaweed mulch, or products derived from the sea will contain all necessary trace minerals in safe proportions. Natural amendments such as bone meal or wood ash are likely to contain necessary trace elements, but still restraint in their application to soil is required. For example, steamed bone meal may, if excessively applied to soil over time, result in an excess of phosphate, a one of the 'big three' plant nutrients, but one that can bock uptake of other important nutrients in excess. Wood ash is highly soluble and so can raise soil pH too quickly, and result in a short-term excess of calcium. Balance is everything. Our publication, Fertility Values for Salvaged and 'Recycled' Soil Amendments, *currently has more than 500 entries reporting analyses for the three major plant nutrients and other fertility information where available.*[3]

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Visible Imbalance Symptoms of Plants

Leaves	Indicate:	DH remarks
Small terminal	Zinc deficiency	
Smaller than normal	Nitrogen (N) deficiency	
Thin and brittle	Magnesium deficiency	
Curl upward (not due to insects)	Potassium, Iron (Fe), or Magnesium deficiency	
Curl downward (not due to insects)	Potassium or Boron (B) deficiency	
Tips hook back	Calcium (Ca) deficiency	
Tips dead	Phosphorous deficiency or excess chlorine (Cl)	Coconut palms require unusually high levels of Cl.

[1] We are willing to provide the table as a Microsoft Word document for a small handling fee. Bear in mind that applications such as Microsoft Word can convert PDF files to RTF files, saving you the fee and us the bother.

[2] We include 'Fertility Values for Salvaged and 'Recycled'* Soil Amendments', with more than 500 entries, in most of our gardening database packages as a free 'extra'.

[3] Our publishing name is Yankee Permaculture, a project of Barking Frogs Permaculture, www.barkingfrogspermaculture.org.

Visible Imbalance Symptoms of Plants

Leaves	Indicate:	DH remarks
Tips and margins dead	Leaf burn caused by wind or frost, excess salt, or lack of water.	It is counterintuitive to consider frost damage 'burn', but that is what it is called. Salt damage is of two types. Wind blown salt spray can damage leaves, and saline soil is a problem for many plants, effecting root damage. In that case, in trees at least, the first and most affected tissue usually is that most distant from the roots.
Margins yellowed.	Phosphorous (P) or Boron (B) deficiency or excess Boron	
Margins yellowed, affecting young leaves first	Copper (Cu) deficiency	
Margins dry, affecting older leaves first	Potassium (K) deficiency	
Margin growth distorted	Ca deficiency, Aluminum (Al) toxicity, low pH	Strong acidity mobilizes Al.
Drop prematurely	N, Fe, Manganese (Mn), or Magnesium (Mg) deficiency.	
Drop while still green	Mg or Mn excess or lack of water.	
Drop after turning yellow	N or Fe deficiency	
Drop after turning yellow then red then orange	Mg deficiency, except in late autumn.	Late autumn comment pertains to cool or cold temperate regions.
Fail to open	Cu or Ca deficiency (Spider or Worm?)	By worm he means caterpillar larva. Some spiders make houses for eggs and young in leaf buds.
Veins yellow with pale green between veins	N deficiency, incorrect [soil] pH	
Veins green with yellow between, youngest first	Fe or Mn deficiency	
Veins green with color loss between veins	FE, Mg, Mn, or molybdenum (Mo) deficiency. Sucking insects, fungus, low temperatures	
Chlorotic: sometimes with green dots in chlorotic areas; sometimes with irregular green bands along midribs and lateral veins.	Zinc deficiency.	This entry from *One Circle,* Duhon, D. *et al.* Ecology Action. Calif. 1985.
Normally pointed leaves grow flattened or heart shaped.	Ca deficiency	
Veins green with color loss between them, resembling a mosaic pattern	Mn toxicity	

Visible Imbalance Symptoms of Plants

Leaves	Indicate:	DH remarks
Veins yellow with color loss between them, affecting some younger leaves first	Waterlogged roots, low pH, and or Mg deficiency	
Brown spots (Drying not due to fungus or insects.) May or may not turn yellow first.	Serious Mg or Mn deficiency.	How does one tell that the cause is not a fungus?
Pale green on whole plant	N deficiency or lack of water	
Bluish green	Zinc (Zn) or Cu toxicity	Excess Cu is also toxic to roots.
Abnormal dark green	Ca deficiency	
Purplish color	P deficiency due to waterlogged roots, lack of water, or low pH	In some plant species, this can be more red than purple.
Purple color in cut grass	Normal response to cutting	
Yellow streaks that may or may not cross veins	Virus	
Green and white or yellow and white	Virus	
Wrinkled and poorly formed (if not due to insects)	Al toxicity, Ca deficiency, and/or low pH	Al tends to be mobilized by low pH. Many forms of Ca upwardly influence pH.
Freeze easily	Excess N; K or P deficiency	This results in succulent growth still occurring when plants should be hardening off in anticipation of cold weather. Among many factors that influence susceptibility of vegetation to frost.
Dull Green	K deficiency	
Premature leaf color change in fall, particularly in isolated upper branches of trees.		Tree dieback due to acid rain, soil compaction, and/or other causes of feeder root or mycorrhizae damage.

Visible Imbalance Symptoms of Plants

Stems	Indicate:	DH remarks
Droop, sometimes (?). Herbaceous plants.	Excess water	
Hard and brittle.	Sulfur (S) deficiency	Also symptoms seen in tree dieback due to acid rain.
Weak	N, K, Ca, or P deficiency	
Topple due to poor root system	P or Ca deficiency	In trees, various causes of damage to roots, including saturated soil, recent flooding, compaction, acid rain, etc.
Growing point crippled [sic.]	B deficiency	
Growing point dead	B or Ca deficiency	
Long internodes	Excess N	Etiolation (vertical 'stretching', usually with pale coloration) also can result from low light levels. This will vary according the light level requirements of the specific plant.
Shortened internodes	K [or Zn] deficiency	
Very short internodes with leaves forming a rosette at the growing point	B or Cu deficiency	
Hollow and/or pith blackened	B deficiency	
Growth restricted [stunted]	N or P deficiency	
Twigs die back	Zn, Cu, or Fe deficiency	
Twigs weak	Mg or Ca deficiency	
Buds	**Indicate:**	**DH remarks**
Distorted	Boron (B) Deficiency	
Dead or Dried	B or Ca deficiency	
Drop Prematurely	Ca or Zn deficiency	
Tiny, producing tiny leaves	Soil Zn deficiency or Zn deficiency due to lack of water or pH rise.	Also symptoms seen in tree dieback due to acid rain.
Light green; rest of plant is normal green	B deficiency	

Flowers	Indicate:	DH remarks
Premature Drop	Excess water, N, or salts; lack of water	
Failure to Blossom	Excess N. Ca or B deficiency. Low pH. Failure to blossom would also be associated with twig and bud symptoms.	
Dull Colors	K deficiency	
'Crippled'	B, Ca or Zn deficiency. Low or high pH.	
Delayed or reduced	N, P, or Zn deficiency	

Fruits	Indicate:	DH remarks
Poor development or none	Fe or P deficiency	
Delayed maturity	P deficiency or general plant ill-health	
Shriveled	K deficiency	Or poor flavor or bland flavor, also K deficiency or Zn deficiency.
Sour	Cu deficiency	
Brown spotted, not due to insects	Ca deficiency	
Drop prematurely	Ca deficiency or low pH	
Uneven ripening	K deficiency	

Note: Tree dieback due to acid rain is impossible to distinguish from soil compaction based on visual assessment alone. In both cases the roots are failing to supply adequate nutrients and water to the branches, affecting the highest portions (requiring most energy to supply) first. (Low pH also can suppress availability of some minerals.) It is easy to check for soil compaction. Of course compacted soil may also be affected by acid rain, mineral deficiency, etc. In highly disturbed soil, absence of mycorrhizal fungi may cause symptoms, because the means of mobilizing nutrients for the plant, the fungi, are not there. Low pH mobilizes aluminum, which is toxic to many fungi.

Despite many complexities, this visual guide is an outstanding aid and the first step in ascertaining soil problems affecting plant health. You can see that your problems in highly disturbed and compacted urban soils are going to be manifold and harder to unravel than in soils more or less in a natural state.

Remember, if you introduce a plant into a soil ecosystem to which it is not adapted, the fault, dear Brutus, is not in the soils, but in ourselves. Heroic measures to force survival on a plant that is not adapted to conditions into which you have imposed it are futile and could be more productively spent giving a slight assist to the many adapted and productive plant species.

Remineralization of soil with granite dust, seaweed, sea salt or seawater, etc., is usually beneficial in most soils (except places that have been arid for centuries or more), with the benefits perhaps not worth the costs in soils highly productive of good-tasting foods. Sea salt, in any form, should be applied judiciously due to the sodium content and the general sensitivity to salts of root hairs, especially in newly germinated seedlings. Occasional irrigation with water containing 4% seawater produced conspicuous benefits in tropical trials.