**ABIOTIC STRESS**

* Abiotic stress is defined as the negative impact of non-living factors on the living organisms in a specific environment.
* The non-living variable must influence the environment beyond its normal range of variation to adversely affect the population performance or individual physiology of the organism in a significant way.
* "Abiotic" literally means without life. Abiotic plant disorders are non-biological factors, usually associated with the plant's environment that affect plants adversely.

**Abiotic agents of Plant Diseases**

1. These environmental factors include temperature, moisture, soil pH, air quality, light regime, and nutrition.
2. If one or more of these factors goes above or below the optimum range for a given plant species, plant growth might be abnormal or adversely affected.
3. Abiotic disorders may also be caused by human activities, such as pesticide and fertilizer application.
4. One important indicator of an abiotic cause for a plant health problem is the distribution of the damage within the environmental unit. Plants generally grow in distinct environmental units such as vegetable gardens. Environmental problems are much more likely to affect most plants in the environmental unit uniformly.
5. Disease and insect problems, on the other hand, tend to occur in clumps or hot spots within the unit, especially early in outbreaks. For example, if frost injury occurs in a vegetable garden, all 12 tomato plants are likely to have blackened leaves.
6. A fungal pathogen, in contrast, may produce similar dark discoloration, but only on one or two plants in the early stages of the epidemic.
7. Before describing symptoms of abiotic disorders, two terms should be defined.
8. Excess of toxic substances in soil or in air and lack of essential substances (water, nutrients).
9. Temperature (plant can grow at 1-40oC with normal range is 15-30oC, low temperature cause freezing injury in potato and high temperature cause sun scaled of fruits).
10. Absence of O2 can cause disintegration of tissues due to enzyme activity.Low light intensity retarded chlorophyll synthesis.
11. Moisture (flooding or drought) can cause rottening and wilting.
12. Activities of people (air pollutants, soil compaction). So2 at 0.3-0.5 ppm and O3 are also toxic to plants.

### TEMPERATURE

* Many fruit, ornamental, (to a lesser extent) and vegetable plants are quite sensitive to cold weather.
* This is especially true for the plants that are native to tropical areas, such as papaya, begonia, and many palm species.
* Therefore, it should come as no surprise that these plants are frequently injured by low temperatures.
* This damage may even occur above 32°F on particularly cold-sensitive species. Freezing temperatures damage plants by inducing ice-crystal formation in or between cells. Cell membranes rupture on contact with the sharp edges of these crystals.
* As large numbers of adjacent cells die, the damage (necrosis) becomes visible to the naked eye. Hence, a primary symptom of frost or freezing injury is areas of necrotic tissue, especially at leaf tips and margins.
* Excessively high temperatures cause plant proteins to become denatured and coagulate, making tissues dry out and die. Whitish, papery appearing areas on leaves are often a symptom of heat damage.

### MOISTURE [Temporary VS Permanent Wilt]

### Moisture extremes may also adversely affect plants.

### Wilting results from insufficient plant water uptake because of either a plant disease or inadequate soil moisture.

### As a visual sign that wilting is a result of inadequate soil moisture, a cross-section of a wilted plant stem will show more or less healthy looking vascular tissue in light colors (off-white in herbaceous plants, light brown in woody plants).

### The stem tissue of plants wilted due to disease is usually dark colored.

### Drought symptoms vary, depending on the plant species. Common symptoms include leaf tip and marginal necrosis or an overall dehydration that is usually indicated by a color change.

### For example, grasses suffering from drought will turn blue-grey or green-grey, and the leaves will fold in half longitudinally.

### Too much water, to the surprise of some gardeners and home owners, may also be a problem. Odema, which occurs most often on ornamental foliage plants with thick leaves, is a specific disorder caused by too much water.

### Prolonged periods of overcast, rainy weather lead to reduced evaporation of water from plant containers and reduced natural water loss (transpiration) from leaves. However, if water uptake from the roots remains the same, plant leaf tissues can become inflamed, leading to cell rupture, and producing brownish lesions that typically resemble leaf spots caused by living pathogens

* Plants that sit in water-logged soil long enough can actually wilt, will lack vigor, and develop light green or pale yellow-green areas in leaves because of root oxygen deficiency.
* Oxygen starved roots do not function properly and are unable to withdraw water and nutrients from the soil.
* Wet conditions also foster the development of root-rot fungal diseases.

### LIGHT

* Each plant species has a light preference some plants thrive in shade while others require full sun for optimal growth.
* Non-dependant plants grown in a low light regime produce less chlorophyll and develop a "leggy" or spindly appearance because the stem length between internodes becomes longer than normal.
* This is often a problem with house plants that do not receive enough light. Potted tomato plants grown in containers that only receive direct sunlight for limited portions of the day during winter months may also show these symptoms.
* Not only will these plants appear thinner and taller than normal, but they will also droop considerably under the weight of a normal fruit load.
* Plants can also become "sunburned". If a plant is transplanted from a shady to a sunny location, the old leaves may develop large necrotic areas in the leaf center from the sudden sun exposure.
* Leaves that develop after transplanting will be better adapted to the sun.
* Sunburn damage can often occur after a wind storm if the shade coverage is lost in the landscape. Keep in mind that some plants are not well adapted to full sun and will never look "normal" in sunny locations.

### NUTRITION

* Proper nutrition is important for plant growth. The major elements nitrogen (N), phosphorus (P), potassium (K), and magnesium (Mg) as well as a host of micronutrients, such as iron (Fe), manganese (Mn), zinc (Zn), and boron (B), must be supplied within a specific dosage in order to avoid either deficiency or excess of any nutrient.
* While each plant species has different nutrient requirements.
* Turf: nitrogen and iron.
* Palms: potassium, manganese, magnesium, boron, iron and nitrogen.
* Broadleaf plants (vegetables and ornamentals; herbaceous and woody): magnesium, iron, nitrogen, potassium, manganese, zinc, and boron.
* Phosphorus is rarely deficient in Florida landscapes, with the primary exception being the ornamental shrub Exora.
* Because container-grown plants are grown in potting mix rather than soil, they are more commonly deficient in nitrogen and iron.
* Low N is usually associated with plants that are uniformly lighter green than normal, especially on older leaves. Broadleaf plants suffering from low K levels typically show interveinal (between the veins) yellowing or necrosis of the oldest leaves.
* Palms are especially susceptible to K deficiency, but the symptoms are different. The oldest leaves usually exhibit translucent orange, yellow or necrotic spots.
* Mg deficiency is usually seen as an interveinal or marginal yellowing of the oldest leaves, with the remaining portion of the leaf remaining distinctly green.

**Excess of minerals may also injure plants**

Toxicity from excess Cu and B are particularly noteworthy. Excess of Cu or B fertilizer sprays may result in necrotic leaf spots on leaves that can easily be confused with fungal leaf spots or contact pesticide damage. In these cases, damage is greatest where droplets of the fertilizer spray accumulate, such as leaf tips. If excessive B fertilizer has been applied to the soil, B toxicity symptoms include marginal or tip necrosis on the oldest leaves.

### PESTICIDE PHYTOTOXICITY

1. The pesticides may have been sprayed directly on plants, applied as granules around the base of the plant or to the lawn, or may have drifted over from applications to nearby plants. This type of phytotoxicity may very well be confused with viral diseases or abiotic disorders.
2. Growth regulator type injury can occur on broad-leaved plants from absorption of certain herbicides such as 2, 4-D and dicamba. Affected plants become dramatically twisted with marked leaf distortion and a "shoe string" appearance of leaves.
3. A great range of symptoms are associated with injury from other pesticides. These include bleached (white) spots, marginal yellowing and Browning (necrosis) of leaves, stunted growth, stem and branch dieback, and interveinal or veinal yellowing.
4. Each pesticide and host interaction is unique, but, in general, contact and systemic pesticides applied as foliar sprays result in localized yellow or necrotic "spots" wherever the spray has landed on the plant, although damage is usually greatest where droplets accumulate, such as leaf tips. Systemic pesticides applied to the soil (granules, drenches, etc.) affect new growth.