

## Common Effects of Abiotic Stress Factors on Plants

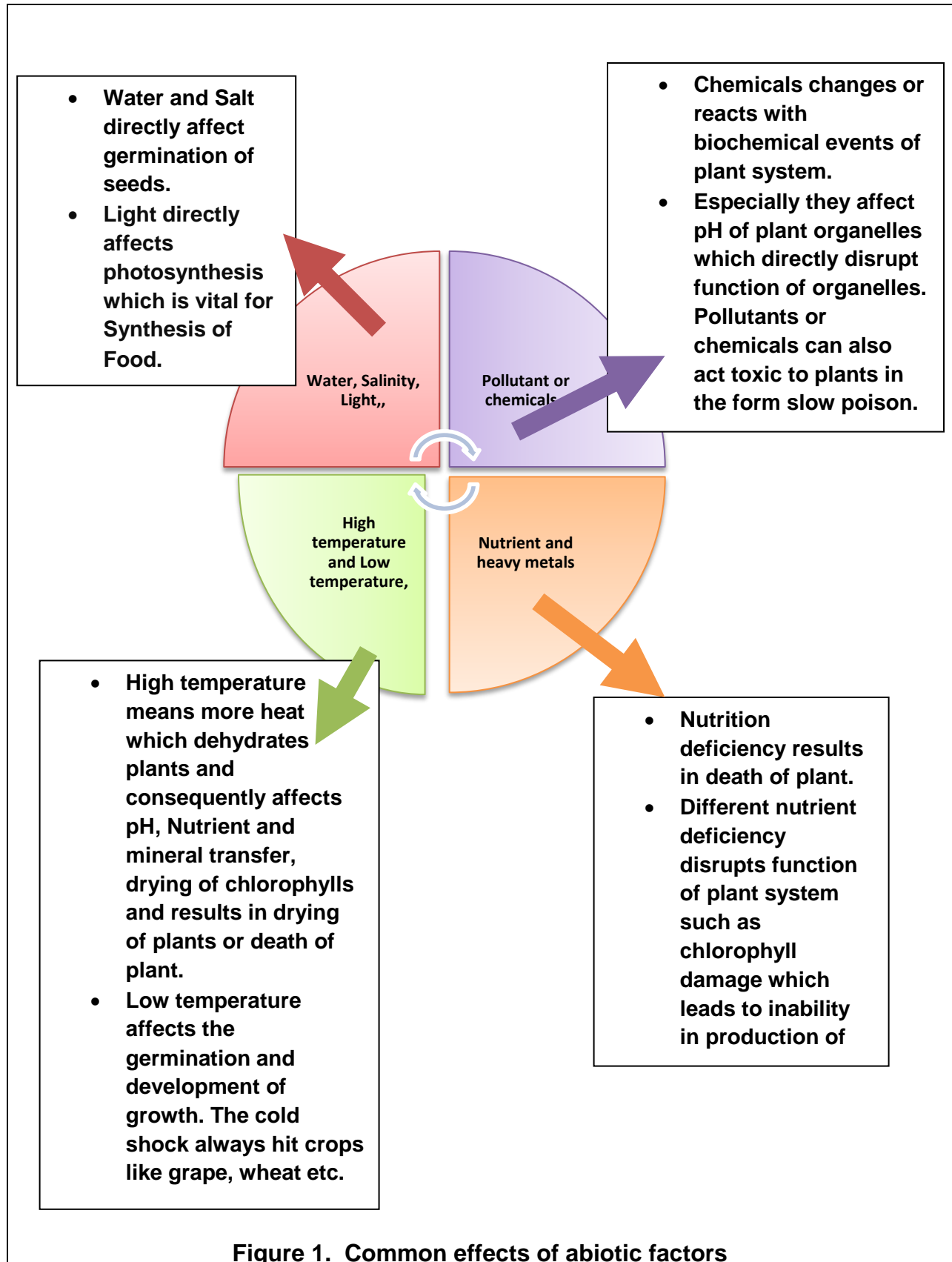
Plants are living organisms which lack ability of locomotion. Animals can move easily from one location to other. Immovable property of plants makes it difficult for them to survive under stress conditions. This means plants need more stress escaping plans to survive from it.

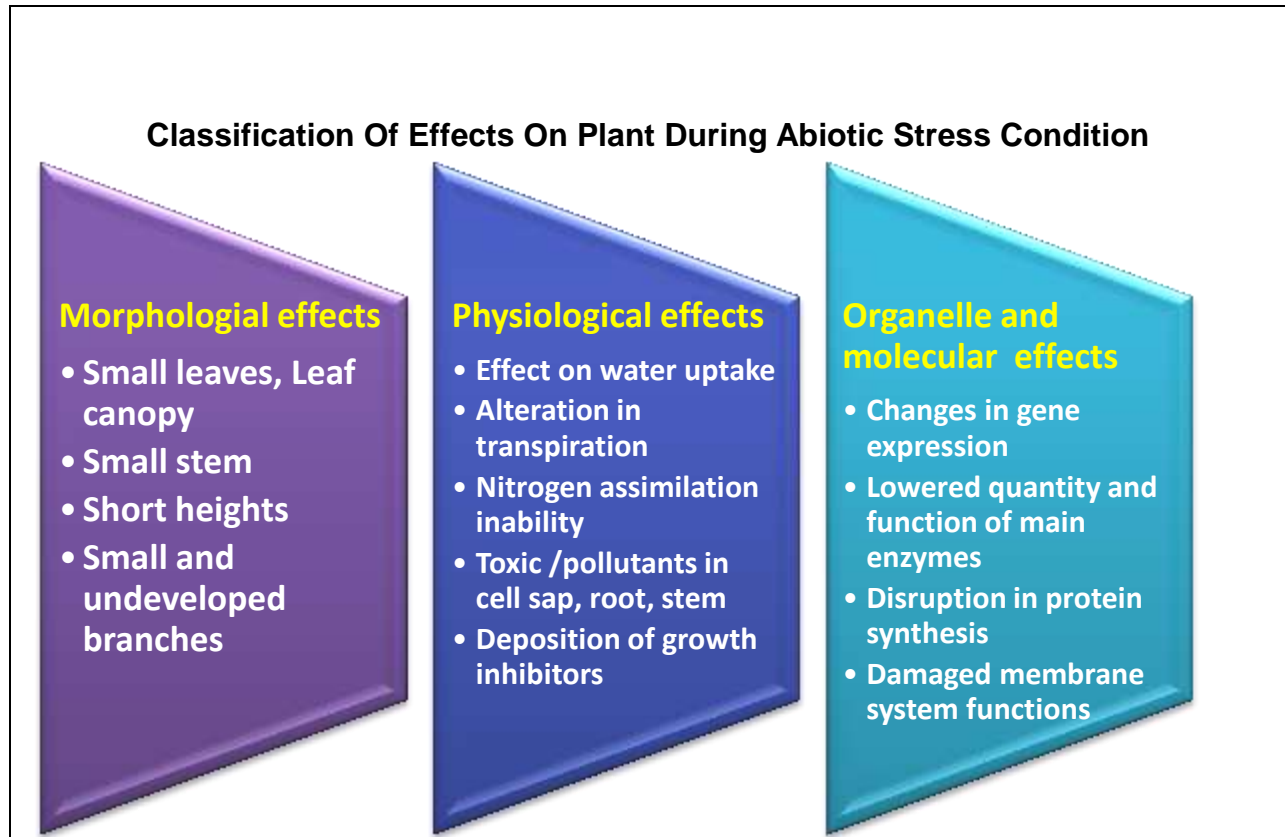
### **What are the Abiotic stress factors?**

Abiotic factors mean the factors which don't include living organisms or systems.

Some examples are Water, Salt, Light, High temperature, Low temperature, Pollutant or chemicals, nutrient and heavy metals.

These factors directly or indirectly affect the intake of nutrients which means it leads to problems in metabolism or energy synthesizing processes. Compromise in nutrient means slow growth, slow developmement and reproductivity.





**Figure 2. Effect of Abiotic factors according to Morphology, Physiology and Organelle-Molecular level**

Effect and stress response of plants in any kind of stress condition depends on several factors. These include stage of plant, duration of stressed condition, species, and environmental interaction level of that plant. Some plants may have evolved genotypic or stress tolerance levels due to frequency of stress factors. It is really difficult to conclude what will happen in each case of plants.

**Table 1 Some specific consequences and reasons of stress conditions are enlisted:**

| Sr. No. | Type of Stress | Further consequences                                                                                                                                                                                | Cause/Reason                                               |
|---------|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|
| 1       | Water          | Cell damage by means of solute concentration, turgor pressure, reduction in cell volume, loss of membrane integrity, denaturation or breaking of proteins. Increase in Abscisic acid concentration. | Drought, Low rainfall                                      |
| 2       | Salt           | Ion toxicity, water deficiency and nutrient imbalance and deficiency. Salt ions bind with nutrient and                                                                                              | Concentration of sodium chloride, sodium carbonate, sodium |

|                            |                         |                                                                                                                                                                                                                                                                                      |                                                                                    |
|----------------------------|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|
|                            |                         | make it unavailable for plants.                                                                                                                                                                                                                                                      | sulphate or salts of magnesium in soil and irrigation water. Poor water management |
| 3                          | High temperature stress | Leads to synthesis to heat shock proteins which try to recover plant from High temperature stress by cellular repair and rescue.                                                                                                                                                     | Heat in environment, more transpiration and low water absorption                   |
| 4                          | Freezing stress         | Protein denaturation which results in cell death. Inhibition of enzymatic actions which results in break of plant biochemical reactions (metabolism related). Increased sugar, lipid, heat shock proteins level in plant for freezing stress tolerance                               | Environment                                                                        |
| 5                          | Photo-oxidative stress  | Reduced photosynthetic efficiency due to formation of AOS which destroys chloroplast and photosynthetic organelles.                                                                                                                                                                  | Extra sunlight which will be more than requirement of plant                        |
| 6                          | Nutrient stress         | Deposition of nutrients makes it difficult to plants to absorb it properly at root level.                                                                                                                                                                                            | Nutrition deficiency or excess addition                                            |
| 7                          | Heavy metal stress      | Cd, Pb, Hg, Cu, Zn and Ni affect Growth, development and yield of plants. Heavy metals affect physiology of plants and then metabolic activity. Heavy metals are absorbed by plant roots which create obstacle for nutrient and other enzymatic or protein transfer in plant system. | Metal industries, mining activities, electroplating industries.                    |
| <b>References (if any)</b> |                         |                                                                                                                                                                                                                                                                                      |                                                                                    |
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