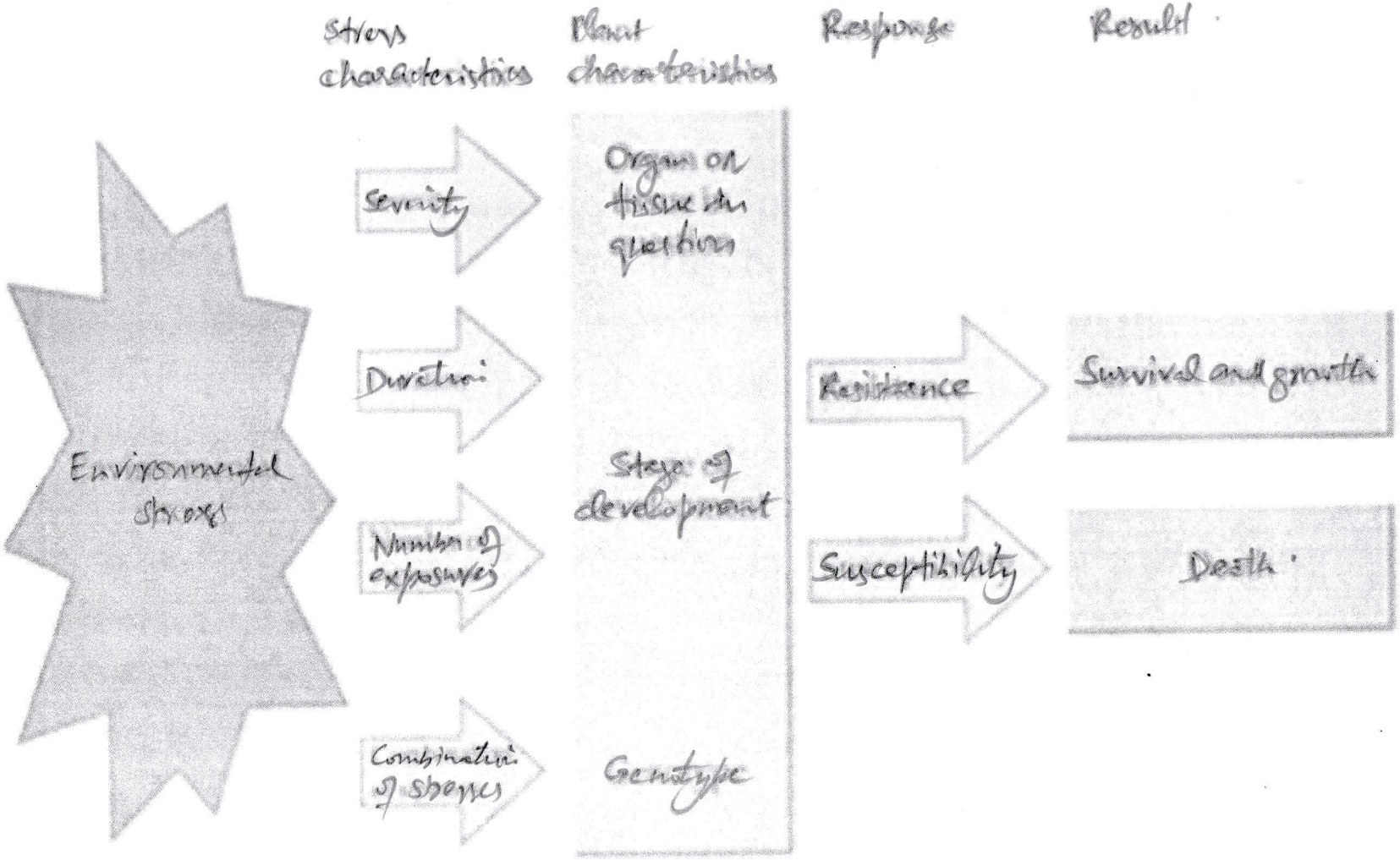
Plant Response to Abiotic Stress

- Stresses cause a variety of plant responses:
  - Alteration in morphological and anatomical characteristics
  - Alteration in cellular metabolism
  - Alteration in growth rates and crop yields
  - Alteration in gene expression and signal transduction

How plants respond to environmental stress



- Stress–plant response model

Plant Responses in General

While responding to a stress plants can either move, adapt or die

1. **Stress escapers:** they remain dormant or die, but are active during good/normal times. e.g. **desert annuals – ephemeral plants**
2. **Stress avoiders:** In the entire growth process they avoid the harmful effects of a stress. e.g. restriction of water loss from tissues/cells through stomatal closure or changes in leaf morphology or orientation
3. **Stress tolerators**

   They attain equilibrium with a stress via **acclimation or hardening**

   Acclimation – when physiological modifications occur over short-time (e.g. a season or even the during the whole life of an organism).

   It is **non-heritable** phenomenon – **phenotypic plasticity**
4. **Stress resistant**

   Adaptation – it occurs due to **heritable** (genetic) traits that increase fitness against a stress

Tolerance or sensitivity of plants to stress depends on:

- the species
- the genotype/cultivar
- phenological stage

Changes in gene expression to stress

- A stress response is initiated when plants recognizes stress at the cellular level
- Stress recognition activates signal transduction pathways that transmit information within the individual cell and throughout the plant
- Changes in gene expression may modify growth and development and even influence reproductive capabilities

Gene expression results in:

- Increase amounts of specific mRNA
- Enhance translation
- Stabilize proteins
- Altered protein activity
- A combination of the above