Plant Nutrients

Nutrients are essential to plant growth. Nitrogen (N), phosphorous (P), and potassium (K) are primary macronutrients. The positive effects of the presence of these nutrients at optimum levels and the negative effects of deficient or excess levels can be visually observed in plants.

Nitrogen (N):

- **Optimum:** Plants are rich green and the protein content increases.
- **Deficient:** Plants are stunted and light green in color, the lower leaves are yellow, and the stem is slender.
- **Excessive:** Plants have a very lush foliage with sappy, soft stems and flowering is delayed.

Phosphorous (P):

- **Optimum:** Phosphorous stimulates root formation and growth, giving the plants a vigorous start. Phosphorous also stimulates flowering and aids in seed formation.
- **Deficient:** Plants have slower growth and delayed flower and pod development, the leaves are dark green and dull, the root system is poor with little branching, and the stem is slender.
- **Excessive:** Plants have very lush foliage with sappy, soft stems and flowering is delayed.

Potassium (K):

- **Optimum:** Potassium imparts increased vigor and disease resistance.
- **Deficient:** Leaves can be mottled or chlorotic, small necrotic spots may appear between veins or near leaf tips and margins, the flowers do not achieve vibrant yellow color, and the stem is slender.
- **Excessive:** Plants have dark foliage, stiff stems, and leaf branches.

Information sourced from *Investigating Plant Physiology with Wisconsin Fast Plants™* found at https://fastplants.org/wp-content/uploads/2017/02/WFPphysiology-06web.pdf.