CASE

Curriculum for Agricultural Science Education

Principles of Agricultural Science – Plant

A Plant's Grocery Store

Unit 6 – The Growing Environment
Lesson 6.1 Plant Food

Sources of Plant Nutrients

- Organic substances
- Legumes
- Chemical fertilizers

Organic Substances

- Examples: manure, sludge, and compost
- Manure contains nutrients in varying amounts.
- Sludge is processed human waste.
- Composting raises organic matter content and destroys pathogens.

Legumes

- Examples: peanuts, soybeans, and vetch
- Legumes “fix” nitrogen.
- Improve nitrogen content of the soil.
- Most other crops deplete nitrogen.
- Often rotated with nitrogen-depleting crops.

Chemical Fertilizers

Manufactured fertilizers

Inorganic compounds concentrate desired nutrients

Benefits	Disadvantages
• Easy to apply • Concentrated • Readily available • Formulated to plant needs	• Expensive • Petroleum based

Forms of Chemical Fertilizers

Commercial chemical fertilizer comes in different forms:

- Dry (granular or pelleted)
- Liquid
- Water soluble powder

What the Numbers Mean

The set of three numbers of a fertilizer analysis is the N-P-K percentage.

Example: A bag of 10-20-10 means the bag contains:

- 10% elemental nitrogen
- 20% phosphate (P_2O_5)
- 10% potash (K_2O)

Let's do some math…

How much nitrogen is in a 100 lb. bag of 15-16-17 fertilizer?

Correct: 15 lbs.

15% x 100 = .15 x 100 = 15 lbs.

Calculating Fertilizer Application Rates

How many pounds of fertilizer do you need to apply in order to get enough nutrients for a plant?

$$\frac{\text{Value of N-P-K from Fertilizer}}{\text{100 Pounds}} = \frac{\text{Nutrient Rate}}{\text{X lbs of Fertilizer}}$$

Let's try a rate calculation…

You want to add fertilizer to a family member's yard.

- They have 1000 square feet of lawn
- Recommended amount of nitrogen application is 1 lb /1000 sq. ft.
- The fertilizer you have is 16-16-16

How much **nitrogen** fertilizer should you apply?

Problem Solved

Set up the formula:

$$\frac{\text{16 lbs. of N}}{\text{100 Pounds}} = \frac{\text{1 lb. N/1000 sqft.}}{\text{X lbs of Fertilizer}}$$

$16x = 100$

x = **6.25 lbs. of fertilizer for every 1000 sq. ft.**

Calculations Depends on Form

- Dry fertilizers are expressed in weight measurements
- Liquid or water soluble fertilizers are expressed in parts per million (ppm)

Fertilizer Cost

Cost can be confusing…

Why does a 100 lb bag of 20-20-20 cost twice as much as a 100 lb bag of 10-10-10?

Nutrient content is based on percentage, 20-20-20 has twice as much nutrient value as 10-10-10.

References

Parker, R. (2010). *Plant and soil science: Fundamentals and applications*. Clifton Park, NY: Delmar.

Plaster, Edward J. (1992). *Soil science and management (2nd Ed.). Albany, NY: Delmar.*