

Nitrogen Know-how for Vegetable Growers

Plants need nitrogen to synthesize proteins, chlorophyll and enzymes: substances that cells require in order to live and reproduce. Garden soils, especially in areas of high rainfall, often lack adequate nitrogen. Cold spring soils are miserly about releasing nutrients (such as nitrogen) from rotting organic matter and their own frequently paltry reserves. Signs of nitrogen deficiency include yellowing of a plant from the ground upward, leaf yellowing from the tip toward the stem, and stunting of growth.

Adequate soil nitrogen is clearly necessary for a healthy garden. Gardeners (and other growers) add more nitrogen than any other plant nutrient to the soil. In the soil, nitrogen, whether organic or inorganic, is converted to nitrates. Nitrates can and do leach out of the soil and contaminate groundwater. Such contamination is more likely when:

- more nitrogen is applied to the soil than plants can use;
- nitrogen is applied at a time when plants don't need it or can't use it;
- soils are well drained; or
- excess moisture – from rain or irrigation – exists in the soil.

Although nitrogen fertilizer is reasonably inexpensive, the potential environmental costs of using too much nitrogen are severe. To quote Washington State University Extension Bulletin 1744: Your Yard and Water Quality

"Contamination from pesticides and nitrates can contaminate drinking water supplies. For example, nitrate levels as low as 10 parts per million (ppm) in drinking water have caused blue-baby syndrome. While humans older than 6 months are not seriously affected by nitrates in drinking water, cattle and sheep are susceptible. (See EB1632 Why the Concern about Agricultural Contamination in Groundwater?) Sediments from erosion can ruin habitats for aquatic life. Residues from lawn and garden fertilizers can overstimulate aquatic plant growth in shallow lakes and bays, making water unsuitable for fish and wildlife. Contamination can make lakes, rivers, and beaches unsafe for swimming and other recreational activities. In many areas, water contamination has decreased populations of fish and shellfish or made them unfit for eating. This concerns not only those who fish for sport but also the commercial fishing industry and consumers. In short, clean water is essential for human health, wildlife, recreation, and industry."

Simple, practical gardening techniques that protect water quality also improve soil, reduce maintenance, and foster plant health. Misusing fertilizer may not only harm the environment, but may injure plants.

Application Techniques

- Use slow-release fertilizers (organic or synthetic) when possible to reduce the loss of excess nitrogen into groundwater or surface water.
- Apply nitrogen just prior to and during periods of rapid growth, when plants need it most.
- If you use quick-release synthetic fertilizers, make several small applications over a period of time instead of a large amount all at once. This will reduce the chance of giving plants more fertilizer than they can use at one time, and thus the possibility of leaching. In addition, too much nitrogen can discourage flowering in favor of leaf growth.
- Avoid applying nitrogen late in the season when most plants cannot use it efficiently.
- Use techniques such as banding or side dressing to concentrate nitrogen applications near the root zones of plants; there is more potential for waste using the broadcasting method.
- Pacific Northwest soils can be too acidic for nitrogen to be taken up effectively. When signs of nitrogen deficiency are apparent, check soil pH. If needed, use dolomite lime to increase the pH, instead of adding nitrogen without knowing whether acidity is at fault.

Band: sow fertilizer in a narrow furrow or band along a seed row at planting time, ½ to 1 inch to the side of the seed row and about 1 inch deeper than the seed, avoiding contact between fertilizer and seed.

Side dress: scatter fertilizer over the root zone near growing plants, taking care to avoid contact with the leaves, to prevent burning. Synthetic nitrogen does not need to be mixed with the soil. Fertilizer blends containing nitrogen, phosphorus and potassium should be scratched in lightly (avoiding damage to plant roots) because phosphorus and potassium do not move readily through the soil like nitrogen does. Water after applying the fertilizer, so that the nutrients can be absorbed.

Broadcast: scatter fertilizer uniformly over the surface of a planting bed; then till or dig it in.

Organic Matter

Add organic matter to soil to improve its ability to store moisture and nutrients.

- Apply well-composted manure in spring before planting. Allow at least 60 days between a manure application and the harvesting of vegetables destined to be eaten raw.
- Environmental risks of runoff and leaching increase, and some nutrients are lost, if manure is applied in fall. If you must apply manure in fall, do so early, and plant a cover crop to help capture nutrients and prevent runoff. In spring, till in the cover crop so that it can release nitrogen to spring-planted vegetables; or harvest and compost it.
- Grow cover crops in your vegetable garden during the winter to reduce erosion, trap some nutrients, and add organic matter to the soil.

Irrigation

- Irrigate thoughtfully. Plants can take up only nutrients that are in solution, dissolved in soil water, but too much water following an application of nitrogen fertilizer might carry nitrates below plants' root zones and pollute groundwater.

- Use low flow devices – trickle or drip irrigation or soaker hoses – to apply water at a rate of not more than ½ inch per hour. Soaker hoses reduce runoff and evaporative losses because they apply water slowly. Trickle or drip irrigation reduces water use by 50% to 80% compared with overhead irrigation.
- Mulch bare soil to conserve water and prevent erosion. Use organic materials such as straw, grass clippings, wood chips, and ground bark that improve soil structure and release nutrients as they decompose; or use geotextiles (landscape fabrics used to control weeds and erosion).
- Cover compost piles with a tarp during the rainy season to prevent leaching of nutrients; locate piles where there is little risk of runoff occurring.

Give serious consideration to how you use nitrogen in the future. Your vegetables should thrive, and you will be counted among the good stewards of the earth's resources.

References

- Antonelli, Art, Craig Cogger, Holly Kennell, Carrie Foss, Roy Van Denburgh, and Van Bobbitt. [Organic Gardening](#). Washington State University Cooperative Extension, EB 0648. Revised: August 2004. 24 pages.
- Bobbitt, Van; Robert Fox, Holly Kennell, Curt Moulton, George Pinyuh, and Mary Robson. [Your Yard and Water Quality: Simple Things Gardeners Can Do To Prevent Water Contamination](#). Clean Water for Washington. Washington State University Cooperative Extension, EB1744. Retrieved January 12, 2005.
- Brenzel, Kathleen Norris. *Western Garden Book*. Menlo Park, California: Sunset Publishing Corporation, 2001.
- Cogger, C.G. and C. MacConnell. 1991. [Why the concern about agricultural contamination in ground water?](#) Washington State University Cooperative Extension, EB 1632. Retrieved January 12, 2005.
- Hart, J., and R. McNeilan. [Fertilizing Your Garden](#). Fertilizer Guide. Oregon State University Extension Service EC 1503, April 2000. Retrieved January 9, 2005.
- Herring, Peg (Source: Gail Glick Andrews, water quality educator with the OSU Extension Service). [Don't Let Fertilizer Sneak into Your Water Supply](#). Garden Hints. Oregon State University Extension Service. Copyright 2005. Retrieved January 9, 2005.
- Robson, Mary. [Time to Think about Garden Fertilizers](#). Gardening in Western Washington. Retrieved January 9, 2005.
- [Soil Management in Yards and Gardens](#). Revised by Craig Cogger, WSU Extension Soil Scientist. Gardening in Western Washington. Washington State University Cooperative Extension Bulletin 1102. January 11, 2005.
- Stevens, Robert G., Dan M. Sullivan, and Craig G. Cogger. [How Fertilizers and Plant Nutrients Affect Groundwater Quality](#). Clean Water for Washington. Washington State University Cooperative Extension, EB1722. Retrieved January 9, 2005.