Sources of Nitrogen

Growers often ask what type of nitrogen fertilizer is best for avocados. There is no one type of fertilizer that is best for every situation. Each type of nitrogen fertilizer has its special advantages and disadvantages which must be considered in planning a fertilizer program for avocados.

In buying a fertilizer material for the purpose of obtaining nitrogen, consider the following:

1. Cost per unit of nitrogen
2. Season of application in relation to rainfall
3. Soil type

A chemical fertilizer may be classified according to whether it adds nitrate ions, ammonium ions, or urea, or a combination of one or more of these to the soil solution.

Nitrate Ions move with water in the soil and are absorbed by the roots. They can be deposited in the root zone or leached out of it, depending upon the amount of water applied. Any nitrogen fertilizer other than nitrate is eventually converted to nitrate ions unless taken up by the plant roots while in the soil solution.

Ammonium Ions do not move far in the soil with water because they soon become attached to clay or humus and then resist leaching. Ammonium ions can be taken into the plant roots only if in the soil solution. If they are attached to the soil particles, they are converted to nitrate ions in 2 to 3 weeks, depending upon:

1. number of bacteria,
2. soil moisture and
3. temperature

Urea Molecules move with water in the soil immediately and may be leached beyond the root zone if too much water is applied immediately after application. However, soon after urea molecules enter the soil, the urea is converted to ammonium ions and is tied up on the soil particles. Until conversation to ammonium ions takes place, its action is the same as nitrate ions.

Types of Fertilizer Material Available

Ammonium Nitrate -- a dry, prilled fertilizer containing 33.5 percent nitrogen supplying equal amounts of ammonium and nitrate nitrogen. Nitrate ions are leached well into the root zone. Ammonium ions are held near the surface where they can be reached only by shallow roots. They are converted to nitrate ions which are leached farther into the root zone with the next irrigation. Ammonium nitrate absorbs moisture and cakes when bags are left open.

Ammonium Sulfate -- a dry, white or gray, crystalline material containing 21 percent nitrogen in the ammonium form. Free-flowing and easy to apply. Low in nitrogen content and, therefore, requires more material handling.

Calcium Nitrate -- a dry, white crystalline material containing 15.5 percent nitrate nitrogen. Very water soluble. Fast response. Calcium content contributed to correction of water-penetration problems caused by low calcium. Tends to raise alkalinity of soil. Usually, the most expensive form. Absorbs water and cakes badly after bags are opened.

Anhydrous Ammonia -- a liquid under pressure which becomes a gas when released into the soil or irrigation water. Contains 82% nitrogen as ammonia. The highest analysis nitrogen fertilizer and usually costs less per pound of nitrogen than other forms.

Urea -- a dry, prilled, synthetic, organic material containing 45 - 46% nitrogen. Very soluble. Moves freely in the soil solution as urea but later combines with water to form ammonium ions. Loss may occur if applied to

damp surfaces and not disced or watered in. High concentration of nitrogen reduces handling costs.

Manure -- an organic material containing 1 - 2% of nitrogen, phosphorus, and potassium. Nitrogen is released slowly. Must be decomposed before nitrogen is released. Should be supplemented with inorganic nitrogen. Provides organic matter for better soil structure. May carry weed seeds. May contain excessive quantities of salts which contribute to soil salinity.

Application Rates

Two examples of nitrogen fertilizers which might be applied to the soil are ammonium nitrate and urea. Ammonium nitrate is 33.5% nitrogen; so, to apply 1 pound of actual nitrogen, 3 pounds of fertilizer must be applied. Urea is 45 - 46% nitrogen, so approximately 2 pounds of the material supplies 1 pound of actual nitrogen. There are a number of other fertilizers that are equally good. The percent of nitrogen is required to be on the label, and the rate can be figured by dividing the percentage into 100.

Determining Cost per Pound of Nitrogen

To find the cost per pound of nitrogen from any source, use this formula:

$$\frac{\text{Cost per ton} \times 100}{\text{Percent nitrogen} \times 2000} = \text{Cost per pound of actual nitrogen}$$

Example: Urea, $190.00 per ton, 46% nitrogen, gives =

$$\frac{\$190 \times 100}{0.46 \times 2000} = 20.6 \text{ cents per pound of actual nitrogen}$$