HOME GARDEN SOIL FERTILITY GUIDE
TEXAS HIGH AND ROLLING PLAINS
Michael G. Hickey and Roland E. Roberts*

Home gardens provide high quality vegetables for fresh use, canning and freezing if the crops are supplied with adequate nutrients and water. The control of insects, weeds and diseases also are important management practices.

All vegetables require relatively large amounts of plant nutrients. Most home gardeners will have to provide additional plant nutrients by applying fertilizers and/or compost. If your soil is naturally rich in nutrients, you are lucky; however, you may find it necessary to give your garden a nutritional boost through the use of fertilizers. In West Texas, a fertilizer management program is essential for successful home gardens.

Our aim in this fertilizer guide for home gardens is to help you hit your target - having optimum nutrients to assure maximum quality and yield.

GENERAL CONSIDERATIONS

The soils of this region contain an adequate supply of the essential plant nutrients generally, with the exception of nitrogen and phosphorus. In some soils and situations, iron and/or zinc are needed in small quantities.

Over-fertilization can cause gardening problems, especially with any of the "complete fertilizers". On many older gardening sites in our region, we find that excessive fertilization with phosphorus has induced zinc and iron deficiency.

IRRIGATION

In plain and simple terms, the dividends of a sound soil fertility program are lost if the garden is not properly watered. It is rare for vegetables to totally recover from a severe lack of moisture.

Too much water, on the other hand, can result in nutrient deficiencies, disease problems, and in the extreme case, outright death of the plant.

Apply enough water to bring the plant root zone up to the water holding capacity of the soil (that quantity of water that the soil will hold against the pull of gravity). Generally this will be enough water to wet the top four to six inches of soil for shallow rooted vegetables like onion, radish, celery, and lettuce; and ten to twelve inches for potato, tomato, pepper, and sweet corn. The moisture content should be checked frequently, at least every few days. With a trowel, remove a slice of soil using care to avoid cutting roots. Use a tensiometer to monitor soil moisture in the row. Irrigation frequency will depend on the total available supply of soil water and the water use rate. Do not wait until vegetables show signs of wilting before watering.

For this region, in general about 1 to 2 inches of water per week from supplemental irrigation or rainfall will be required. This is roughly equivalent to 60 to 120 gallons per 100 square feet.

COMPOST AND MANURE

Additional organic matter (compost, peat moss, and manure) can have beneficial effects on the home garden. Organic matter serves to "open up" a clay soil, thus improving drainage and aeration. In sandy soils, organic matter increases the water holding capacity. In any soil, the general soil

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fertility status will likely be improved. Care must 
be taken with manure; nutrients will be added (in 
particular phosphorus), but so will salts which can 
have an overall harmful effect on the garden if too 
much manure is applied. Do not exceed a rate of 
10 lbs. of dried manure or 50 lbs. of feedlot or 
stable manure per 100 square feet. The objective 
of composting is to convert refuse into a "synthetic 
manure." Leaves, grass clippings, weeds, and 
vegetable matter from the kitchen can all be used. 
In our region, grass clippings will predominate. 
Depending on your lawn fertilization practices, 
compost from grass clippings will be high in 
nitrogen. Assuming a three foot square area, a 
compost pile may be constructed by:

1) spreading out a 4 inch layer of refuse,
2) covering the litter layer with a 2 lb. coffee 
can of soil (inoculate the litter with the 
soil microorganisms responsible for the 
decay process),
3) adding 1/4 cup of ammonium sulfate 
fertilizer (stimulate the soil 
microorganisms),
4) repeat the above process to desired depth. 
Moisten dry materials.

Under normal conditions, the pile should be 
turned in 2 to 3 weeks (sooner if the materials are 
green), and again in 5 weeks. Your compost will 
be ready in 3 months, or sooner depending on the 
nature of the refuse, temperature, and moisture. 
When new clippings are added to the pile, they 
should be mixed in with some of the older 
material, finishing with a layer of older material 
placed over the top. To utilize the compost or 
peat moss, spread about 5 bushels of the material 
over 1000 sq. ft. and mix thoroughly into the soil.

COMMERCIAL FERTILIZERS

The content (analysis) of most fertilizers is 
designated with three numbers that indicate the 
percent total nitrogen, available phosphoric acid, 
and water soluble potash in the fertilizer. As an 
example, a "complete" fertilizer such as 10-10-5 
contains 10 percent nitrogen (percent N), 10 
percent available phosphorus (percent P_2O_5), and 
5 percent water soluble potassium (percent K_2O); 
a nitrogen source like 21-0-0 contains 21 percent 
nitrogen, but no phosphorus or potassium.

Two of the so called "complete" fertilizers are 
listed in Table 1. If you choose to use one, be 
careful, because they may contain some nutrients 
that you do not need. Many of the above fertilizer 
materials will contain trace elements or 
micronutrients. Many of these will be in the form 
of a sulfate (i.e. iron sulfate), which may be of 
limited usefulness for soil application. Trace 
elements in a chelated form are more useful for 
soil application in this area. Choice of a fertilizer 
material will depend on the type and amount of 
various nutrients needed, and the cost of the 
material. For example, if you are purchasing a 
fertilizer strictly for its nitrogen content and plan 
to apply it to the soil and till it in, then buy the 
one in which the nitrogen is the least expensive.

<table>
<thead>
<tr>
<th>TABLE 1. COMPOSITION OF SOME FERTILIZER MATERIALS</th>
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<tbody>
<tr>
<td>Fertilizer Material</td>
</tr>
<tr>
<td>Ammonium nitrate</td>
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<tr>
<td>Ammonium sulfate</td>
</tr>
<tr>
<td>Urea</td>
</tr>
<tr>
<td>Conc. superphosphate</td>
</tr>
<tr>
<td>Potassium chloride</td>
</tr>
<tr>
<td>Potassium chloride</td>
</tr>
<tr>
<td>Sulfate of potash magnesia</td>
</tr>
<tr>
<td>Ammonium phosphate-sulfate</td>
</tr>
<tr>
<td>&quot;Complete&quot; 10-10-10</td>
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<tr>
<td>&quot;Complete&quot; 11-15-11</td>
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</table>

METHOD OF APPLICATION

There are four general methods of applying 
fertilizer to the soil so that it will be available to 
the plant:

1) **Broadcast.** The material is scattered 
uniformly over the surface. It is more 
readily available to the plant roots if 
worked into the upper four to six inches 
of soil. In particular, phosphorus needs to 
be placed into the root zone where 
moisture can be maintained.

2) **Band.** The fertilizer is placed in a trench 
about 3 inches deep. The corner of a hoe 
works well for making the trench. Seeds 
should be sown so that the fertilizer band 
is at least one inch to the side and three 
inches below the seed.
3) **Sidedress.** After the plant is growing, additional fertilizer may be required. Nitrogen is the usual sidedress element. The fertilizer is scattered in a band about three to six inches from the plant. Nitrogen is very soluble and need not be mixed with the soil. Irrigation must be applied before the plant can absorb the nutrients. Care should be taken to keep the fertilizer granules off the leaves to prevent burning.

4) **Drip System.** If you have a drip system or irrigation and it is equipped with an injector, dry soluble and liquid fertilizers can be added as you irrigate the garden.

**INTERPRETATION OF SOIL REPORT**

The soil test report contains important information, such as: pH, nitrogen, phosphorus, potassium, salinity, and various micronutrient levels (if reported).

**Nitrogen** - Nitrogen is the plant nutrient most commonly deficient, because it is used in largest quantities by plants. On sandy soils, nitrogen is easily carried down below the roots, leached by rainfall and excess irrigation.

The following recommendations are designed to bring the nitrogen status of your garden up to a baseline level that will get newly planted seeds and plants growing well. Table 2. lists both the amount of actual nitrogen and the corresponding amount of ammonium nitrate (33.5-0-0) to apply per 1000 square feet. If other fertilizer sources are used, an equivalent amount of nitrogen should be applied, but the amount of fertilizer will be different, e.g. if urea (46-0-0) is chosen apply 2/3 as much as you would when using ammonium nitrate. Likewise, if ammonium sulfate (21-0-0) is chosen apply 1 1/2 as much as you would when using ammonium nitrate. Refer to Table 2.

The nitrogen requirement of some vegetables is higher than the baseline level given in the preceding table; as such, they respond well to sidedress applications of nitrogen. Table 3. gives some suggestions for sidedress applications of nitrogen.

**TABLE 3. NITROGEN SIDEDRESS TABLE**

<table>
<thead>
<tr>
<th>Crop</th>
<th>Amount of Ammonium Nitrate</th>
<th>When to apply</th>
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<tbody>
<tr>
<td>Tomato</td>
<td>1 Tbsp/plant</td>
<td>Every 2 to 3 wks after fruit begins to form</td>
</tr>
<tr>
<td>Pepper</td>
<td>1 tsp/plant</td>
<td>When first fruit seen and again a month later</td>
</tr>
<tr>
<td>Sweet Corn</td>
<td>1 pint/100</td>
<td>When plants are 6 to 8 in. tall</td>
</tr>
<tr>
<td>Broccoli</td>
<td>1 tsp/plant</td>
<td>3 wks after plants are set in garden. Broccoli again after each harvest.</td>
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<tr>
<td>Cabbage</td>
<td></td>
<td></td>
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<tr>
<td>Cauliflower</td>
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</tbody>
</table>

**PHOSPHORUS** - Phosphorus is utilized in smaller quantities than nitrogen, but may be deficient in some cases. Unlike nitrogen, phosphorus is held tightly by the soil and is not removed by leaching. Phosphorus is essential for vigorous early growth of seedlings and is important in forming an extensive root system.

Table 4. lists the amount of actual phosphorus (P<sub>2</sub>O<sub>5</sub>) and the corresponding amount of 0-46-0 to apply per 1000 square feet. Remember that since phosphorus moves very little in solids, it is important that it is tilled or mixed into the root zone.

When the phosphorus level is rated as very high, soil phosphorus is becoming excessive. Use of phosphorus containing fertilizers and manure should be discontinued for several years.

When other fertilizer sources are used, an equivalent amount of phosphorus should be...
For example, if your garden soil requires both nitrogen and phosphorus additions, you may wish to use 16-20-0 to supply the needed phosphorus. You may do this by adding 16-20-0 at approximately twice the rate of the 0-46-0 that was specified. The nitrogen contribution from the 16-20-0 must be accounted for before any additional nitrogen is added (2 lbs. of 16-20-0 is equivalent to 1 lb. of ammonium nitrate). This amount is then subtracted from the total amount of nitrogen required.

POTASSIUM (K) - Potash is essential for plant growth and is important in disease resistance. Soils in our region are generally high in native potassium, and recommendations for potash application are rarely made. Table 5. gives suggestions for potassium additions, based upon the soil test values and the use of muriate of potash (0-0-60) as the fertilizer.

IRON (Fe) - Iron chlorosis can occur on soils that have a high pH, and seems to occur more often when the soil phosphorus levels are very high. The chlorosis normally appears first on young leaves, and is characterized by dark green leaf veins and yellow to ivory colored interveinal tissue.

Iron chelates may be added to the soil as a preventive measure; they remain available in the soil longer than iron sulfate. For soil application, an iron chelate (8-10% iron) should be broadcast or band applied at the rate of 1 lb. per 1000 square feet; it should be mixed into the soil.

If iron chlorosis appears, it may be controlled by foliar application of either iron sulfate or an iron chelate. Foliar application gives quick results, sometimes in a matter of two days. The effect, unfortunately, is not normally long-lasting, and repeated applications may be required. Spray applications should take place in the late evening when the plant is actively growing and the danger of leaf burn is minimal.

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