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Organic Vegetable Gardening[1]

James M. Stephens[2]

Successful vegetable gardens are not accidental. They are the results of planning, constant care, and the will to make things grow. Among the many things a vegetable garden may offer toward a satisfying experience are fresh air, exercise, sunshine, knowledge, supplemental income, mental therapy, and fresh food, rich in vitamins and minerals, harvested at the best stage of maturity.

Organic gardening differs from "conventional" gardening mainly in the areas of fertilization and pest control. The organic gardener prefers to use natural and organic materials and methods, and avoids using practices and synthetic chemicals that may be detrimental to his health or environment.

The information in this publication should be beneficial to all gardeners regardless of methods of culture used; however, it is primarily intended to aid the organic gardener to employ workable methods acceptable to him and compatible with the philosophy of "organic gardening."

SOME EARLY PLANS

Consider the size of your family and the amount of produce to be canned, frozen, stored or sold, as well as that used fresh. Don't underestimate the work involved in organic gardening.

Choosing a Location— Select a plot of good, well-drained soil near a water supply. It should be close to the home for convenience, but should not be shaded by tall buildings or trees. Enclosing the garden spot with a fence is usually profitable.

The Garden Design— Many gardeners find it helpful to draw out on paper the location of each row and the crop or succession of crops to be planted.

PLANTING GUIDE

Vegetables suited to Florida gardens, leading varieties, seed or plants needed, planting distances and depths, best time for planting by areas, hardiness, days to harvest and expected yields are shown in the Florida Vegetable Gardening Guide (SP 103).

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2. James M. Stephens, professor, Horticultural Sciences Department, Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida, Gainesville FL 32611.

SOIL PREPARATION

Since organic fertilizer and soil conditioning materials are slow working in general, they should be mixed into the soil at least three weeks ahead of planting and the soil thoroughly prepared for the seed or transplants. Clumps of unrotted organic materials not only interfere with the seeding operation, but may result in nutrient deficiency and possible soil-borne diseases problems such as "damping-off" of young seedlings.

ORGANIC MATTER

A major basis for organic gardening is the use of abundant quantities of organic material applied to the soil. Usually, it is in the form of animal manures, plant manures, cover crops, compost, or mixed organic fertilizer.

Benefits of Adding Organic Matter

1. Improves tilth, condition, and structure of soil.

2. Improves ability of soil to hold water.

3. Improves ability of soil to hold nutrients.

4. Improves "buffering" capacity of soil; that is, keeps soil from "over-reacting".

5. Supports the soil's microbiological activity (or the life of the soil).

6. Contributes nutrients, both minor and major.

7. Releases nutrients slowly.

8. Acids arising from the decomposition of the organic matter help to convert insoluble natural additives such as ground rock into plant-usable forms.

9. Helps vegetables survive stress, as from nematodes.

10. Helps dispose of organic waste products.

What Happens to Organic Matter Applied to the Soil or Compost Pile?

Under suitable conditions, the organic matter is decomposed by micro-organisms such as fungi, algae, bacteria, molds, and earthworms. In the process, insoluble and unavailable (to plants) nutrients, such as nitrogen, are gradually changed into simple usable products.

For example, *nitrogen* is converted from the unusable organic forms to a usable inorganic form through the process called nitrification. Thus, nitrification is the breakdown of protein (organic nitrogen) into ammonia and then nitrate. Some of the organic matter becomes part of the soil humus.

Proper Conditions For Nitrification

First, materials containing nitrogen must be present. There is a great variation in the amount of nitrogen the different organic materials contain. Then certain soil or compost conditions are necessary:

1. Proper soil acidity (pH) —should be about 7.0; in acid situation below 5.5 it ceases.

2. Proper temperature of soil — above 50°F.

3. Good aeration — (does not occur with wet, soggy soil or compost).

4. Adequate lime for use by micro-organisms and to keep the soil from being acid.

ANIMAL MANURES

Where animal manures are available, they are probably the best source of fertilizer and organic matter for the organic gardener. Use manure which has been aged for at least 30 days, or composted.

Manures vary greatly in their content of fertilizing nutrients. The composition varies according to type, age, and condition of animal; the kind of feed used; the age and degree of rotting of the manure; the moisture content of the manure; and the kind and amount of litter or bedding mixed in the manure. Table 1 shows average minimal amounts of nutrients to be expected. They may be as high as 4.5% N; 2% P; and 2% K in some cases. Animal manures also provide most of the micro-nutrients needed. Some manure products are composted, rehydrated or mixed with plant litter to enhance their fertility.

How Much to Apply Broadcast

Before Planting

Cow, horse, hog — A minimum of 25 pounds per 100 square feet (about 5 tons per acre) of garden soil. For best results, supplement each 25 pounds of manure with 2 to 3 pounds of ground rock phosphate or raw bone meal. Use up to 1 pound per square foot.

Poultry, sheep — Apply at least 12 pounds per 100 square feet (about 3 tons per acre minimum) - or as much as 3 - 4 inches (20 tons per acre).

Other animals—rabbit, goat, and exotic grasseaters — 10-12 pounds/100 sq ft. minimum, up to 100 lbs. per sq. ft.

After Planting (As a sidedressing) if needed

Cow, horse, hog — Sidedress with up to 5 pounds per 100 square feet of row.

Poultry, sheep — Use up to 3 pounds per 100 square feet of row.

How to Apply

All Types — Broadcast evenly over plot and spade, roto-till or otherwise work into topsoil. Apply three or more weeks before planting. A small amount may be mixed well in the planting hole; however, plant injury may occur with 1 lb. or more placed in the hole.

How to Apply as a Sidedressing

All Types — Scatter a band of manure down each side of the row. Place each band at the edge of the root zone and work lightly into the soil surface. For individual plants, open a furrow encircling the plant and fill with manure, then cover.

If a *mulch* is present, rake it back at the edge of the root zone in order to apply the band of manure, then re-cover with the mulch.

NOTE: Manure is not always a complete well-balanced fertilizer. It is advantageous to broadcast a complete organic fertilizer (such as Fertrell) or ground rock phosphate and potash in addition to the manures.

COMPOSTS

Acceptable manure-like organic fertilizer (artificial manure) may be obtained through the process of *composting.* Simply put, *compost* is made by alternating layers of organic materials, such as leaves and kitchen table refuse, with manure, topsoil, lime, organic fertilizer, water, and air, in such a manner that it decomposes, combines, and yields artificial manure.

How is the Compost Pile Made?

The *compost* pile is made of convenient size, usually not less that 10 feet square (100 square feet) and 3 to 5 feet high. The top should be left flat or with a slight depression in the center to catch rain or added

water. Too much water eliminates air and slows the decay process.

One way suggested in building the pile is to make a layer of leaves, straw, grass clippings, and other organic materials 1 foot deep, wet down and pack. Spread a layer of manure 4 to 6 inches deep over this layer of wet material. Then spread up to 5 pounds of ground rock phosphate or 1 quart of raw bone meal per 100 square feet, and 1 pound of ground limestone.

Instead of the rock phosphate and bone meal, you could use 5 pounds of a complete organic fertilizer such as Fertrell per 100 square feet. Also, a layer of topsoil is sometimes used.

Then continue to repeat the process until the pile has reached 3 to 5 feet high.

Compost will begin to heat after 2 or 3 days. Keep it moist, but not too wet, and do not disturb for awhile.

After 3 to 4 weeks, fork it over, mixing the parts to obtain uniformity. Fatty animal wastes tend to create bad odors, draw flies and ants; so, try to avoid their use if this will be a problem.

Compost for the garden should be ready from 2 months to 1 year, depending on the time of year, type of materials added, and skill of the composter. When the compost is broken down into a homogenous mixture, and no undecomposed leaves or other material may be seen, it is ready for use.

What Organic Materials Can Be Used in the Compost Pile

Most anything organic, but most popular materials are natural materials such as straw, leaves, pine straw, grass clippings, shrub clippings, garbage, fish scraps, water hyacinths, etc. A list of materials and what each might contribute to the compost is given in Table 2. In addition, certain of the materials listed as organic fertilizers (for example, tobacco stems) could also be added.

Use of Compost in the Garden

Since compost is artificial manure, it should be used much as you would manure.

Broadcast it over the entire garden three weeks or more before planting. Or if you have only a small quantity of compost, it may be mixed into the soil along each planting furrow or at each hill site. As a minimum, apply it at the rate of about 25 pounds per 100 square feet, or 1/4 pound per square foot. Larger amounts are even more beneficial, up to 200 lb/100 sq ft. (2 lb/sq ft.). Caution: If your compost is made from mostly woody materials, it may temporarily deplete the nitrogen from the soil and plants. Be sure to mix manure with it when applying.

NATURAL AND ORGANIC FERTILIZERS

Natural and organic materials which yield plant nutrients upon decomposition are often available for purchase either separately or in combination. These materials may be applied to the garden separately or combined, used in the compost pile, or mixed with manure.

Many of the more commonly available materials are listed in Table 3 along with the nutrients which they produce. These include both the organic materials derived from plants and animals, plus the natural deposits of rocks and minerals.

Natural Deposits (Rocks, Sands, Shells, etc.)

Such naturally occurring materials are usually not easily obtained in today's modern agriculture; however, where available they represent sources of mainly potash, phosphorus, and lime (calcium and magnesium) for organic gardeners.

Phosphorus— Rock phosphates are natural deposits of phosphate in combination with calcium. The material as dug from the earth is very hard and yields its phosphorus very slowly. When finely ground and with impurities removed, the powdery material is only slightly soluble in water, but may be beneficial to plants in subsequent seasons following

application. The reaction of phosphate rock with acids from decaying organic matter in the garden or compost tend to make the phosphorus available to garden plants. Collodial phosphate is also available and widely used.

Apply both phosphates at the rate of 2-5 pounds per 100 square feet of garden soil.

Or, when applying manure or compost, mix at the rate of 2 1/2 pounds phosphate per 25 pounds manure or compost.

Broadcast the material over the soil surface and work into the topsoil at least three weeks before planting. Manure or other organic fertilizer should be added at this time.

Since the materials are so slowly decomposed, sidedressings are seldom beneficial.

Potash— Potassium is widely distributed in nature, occurring in rocks, soils, tissues of plants and animals, and water of seas and lakes.

In gardening practice, materials such as wood ashes, tobacco stems, wool suint, seaweed, potash salts, greensand, and ground rock potash are used alone, in combinations with other materials yielding other nutrients, mixed with manure, or in compost piles.

Since the potash bearing materials vary so much in composition and rate of decomposition, specific application rates must be determined for each material and its combinations.

In general, ground rock potash at 5 pounds per 100 square feet may be broadcast over the soil surface three weeks prior to planting and spaded in. Langbeinite (Sul-Po-Mag) is used at 1 lb/100 sq ft.

Micro-nutrients— An advantage for using organic materials as fertilizers is that they contain many of the elements also needed by the plants in addition to N, P, and K (for example, manganese in manure).

Besides the general amounts of micronutrients found in most organic materials, certain ones are concentrated into such naturally occurring materials as gypsum (calcium and sulfur), marl (calcium), dolomite (Calcium and magnesium), limestone (calcium), basic slag (iron, calcium, manganese and magnesium), and finely ground borosilicates.

Lime— Reducing the acidity of the soil is the primary purpose for using lime in the garden. However, liming materials also provide nutrients for plant use. Calcium and magnesium are the two elements most commonly provided by lime. Gypsum is used where more calcium is needed without raising the pH.

Natural deposits of lime which are an organic gardener might use are limestone, dolomite, shell, and marl. All these forms must be finely ground to provide maximum benefit to the soil and plants. Dolomite is preferred due to its ocntent of both calcium and magnesium.

Lime to sweeten the soil should be applied only when the needs have been established by a reliable soil test. Under most Florida soil conditions, applications of 2 to 5 pounds of finely ground dolomitic limestone per 100 square feet usually will be sufficient except on very acid soils.

Apply lime well in advance of the planting date, preferably 2 to 3 months before the garden is planted. Mix well with the soil and keep moist for best reaction. Application closer to planting time is permissible, but its benefits are delayed.

IRRIGATION

In irrigating the garden, it is advisable to thoroughly wet the soil once a week unless sufficient rain falls. Thus, the soil will be moistened throughout the root zone. Light sprinklings every day merely tend to wet the surface and encourage shallow root

growth. Drip or trickle irrigation is encouraged as a method for conserving water.

Use of organic materials as soil conditioners and fertilizers tends to improve the ability of the soil to retain moisture. Also, a good garden mulch will conserve soil moisture. Please observe all local watering regulations.

MULCHING

A mulch is any material, usually organic, which is placed on the soil *surface* around the plants. Organic materials most commonly used for mulching are leaves, grass clippings, pine straw, sawdust, and wood shavings. Synthetic materials, mostly plastic sheeting, have been used quite often in recent years.

Among the benefits of a mulch are (a) conserves soil moisture, (b) conserves nutrients, (c) reduces soil erosion, (d) reduces crop loss due to nematodes, (e) reduces weed growth, (f) provides barrier between fruit and soil, thus reducing soil rot on fruit, and (g) moderates the soil temperature.

Apply mulch before or after seeding or transplanting. Roll back the mulch with a rake in order to wet the soil beneath when irrigating, for best results.

At the end of the garden season, the mulch (except plastic) may be removed and composted, or cut into the garden soil. Most mulch is woody and should have manure or other rich organic fertilizer applied with it when cutting into the soil.

WEED CONTROL

The primary purpose of cultivation is to control weeds. Weeds are easy to control when they are small. Shallow cultivation and hoeing are advised in order to reduce damage to the root system. A garden mulch, such as pine straw, leaves, or other material, will help to keep weeds from growing if the mulch is thick enough to exclude light.

INSECT AND DISEASE CONTROL

During periods when infestations of various garden pests are high, control by natural means becomes very difficult. However, the following practices will help to reduce losses without use of chemical pesticides.

1. Plant resistant varieties (see Florida Vegetable Gardening Guide).
2. Plant seed from disease-free plants.
3. Select pest-free transplants.
4. For cutworms, place a cardboard of tinfoil collar around plant stems at ground level.
5. Spade garden early so vegetation has time to rot before planting.
6. Use a mulch; vegetables touching the soil may rot.
7. Clean up crop refuse early.
8. Plant as early in the spring as practical.
9. Keep out weeds which harbor insects and diseases.
10. Summer fallowing (clean cultivation) helps control nematodes.
11. Summer flooding, where soil type permits, helps control nematodes.

12. Hand-pick insects.

13. Water in morning so plants are not wet at night.

14. Dispose of severely diseased plants before they contaminate others.

15. Some insects, like cabbage worms, may be killed by spraying with natural preparations such as *Bacillus thuringiensis*.

16. Rotate garden areas (see Florida Vegetable Gardening Guide).

17. Bake transplanting soil in oven at 160°F for 1 hour.

18. *Crotolaria spectabalis* and marigolds, when planted as cover crops, tend to reduce some kinds of nematodes. The use of marigolds to *repel* nematodes from interplanted vegetables is not effective control.

19. A good garden mulch tends to reduce *damage* caused by nematodes.

20. Many organic gardeners approve of and use sprays and other preparations containing naturally occurring materials. Diatomaceous Earth comes from petrified sea life. Pyrethrin, rotenone, and ryania are examples of natural poisons from plant parts. These give some control to some insects under certain conditions.

21. Natural predators should be encouraged wherever possible; however, predators raised in captivity, then released into the garden area are usually ineffective.

22. Insecticidal soaps, made from fatty acids tend to work well for some insects under average conditions.

23. Insect traps, baited with phermone lures, work well in some instances. Many of these have sticky adhesives to catch insects.

24. Solar fumigation is effective in reducing some soil-borne problems such as nematodes. Refer to "Nematology Plant Protection Pointers", such as NPPP-17, for details.

ORGANIC GARDENING SUPPLIES

Suitable materials for growing vegetables the organic way are not always easy to locate. The "conventional" garden supply centers carry many products, especially seeds and equipment, which may be used by the organic enthusiast. However, for the difficult-to-find items, the gardener may have to order from specialty businesses dealing in organic gardening supplies.

SELLING ORGANIC VEGETABLES

Anyone wishing to sell vegetables that are grown by organic methods must be certified by the Florida certification program under the auspices of the FDACS. A prospective organic farmer is advised to contact an independent certifying agency such as Florida Organic Growers (FOG) and Organic Crop Improvement Association (OCIA).

MORE INFORMATION

Additional information about organic gardening may be found in Fact Sheet EES-327, "Organic Fertilizers and Soil Amendments".

Table 1.

Table 1. Composition - Fresh Manure with Normal Quantity of Water.

Kind of Manure	% Water	% N	% P	% K
Cow	86	.55	.15	.50
Duck	61	1.10	1.45	.50
Goose	67	1.10	.55	.50
Hen	73	1.10	.90	.50
Hog	87	.55	.30	.45
Horse	80	.65	.25	.50
Sheep	68	1.00	.75	.40
Steer orfeed yard	75	.60	.35	.55
Turkey	74	1.30	.70	.50

Table 2.

Table 2. Composition of Various Materials Thrown into Compost Piles

Compost Material	% N	% P	% K
Banana Skins (ash)	---	3.25	41.76
Cantaloupe rinds (ash)	---	9.77	12.21
Castor Bean Pomace	5.00	2.00	1.00
Cattail Reeds	2.00	.81	3.43
Coffee Grounds	2.08	.32	.28
Corncob ash	---	---	50.00

Table 2.

Table 2. Composition of Various Materials Thrown into Compost Piles			
Compost Material	% N	% P	% K
Corn Stalks & leaves	.30	.13	.33
Crabgrass, green	.66	.19	.71
Eggs, rotten	2.25	.19	.15
Feathers	15.30	---	---
Fish scrap	2.00-7.50	1.50-6.00	---
Grapefruit skins (ash)	---	3.58	30.60
Oak Leaves	.80	.35	.15
Orange culls	.20	.13	.21
Pine needles	.46	.12	.03
Ragweed	.76	.26	---
Tea grounds	4.15	.62	.40
Wood ashes	---	1.00	4.0-10.00

Table 3.

Table 3. Average Plant Food Content of Natural and Organic Ferilizer Materials (Percentage on a Dry-Weight Basis.)					
Organic Materials	% N	% P	% K	Availability	Acidity
Fish Scrap	5.0	3.0	0	slowly	acid
Fish Meal	10.0	4.0	0	slowly	acid
Guano, Peru	13.0	8.0	2.0	moderately	acid
Guano, Bat	10.0	4.0	2.0	moderately	acid
Sewage Sludge	2.0-6.0	1.0-2.5	0.0-0.4	slowly	acid
Dried Blood	12.0	1.5	0.8	mod. slow	acid
Soybean Meal	7.0	1.2	1.5	slowly	v. sl. acid
Tankage, Animal	9.0	10.0	15.5	slowly	acid
Tankage, Garbage	2.5	1.5	1.5	very slowly	alkaline
Tobacco Stems	1.5	0.5	5.0	slowly	alkaline
Seaweed	1.0	---	4.0-10.0	slowly	---
Bone Meal, Raw	3.5	22.0	---	slowly	alkaline
Urea	45.0	---	---	quickly	acid
Castor Pomace	6.0	1.2	0.5	slowly	acid
Wood Ashes	---	2.0	4.0-10.0	quickly	alkaline
Cocoa Shell Meal	2.5	1.0	2.5	slowly	neutral

Table 3.

Table 3. Average Plant Food Content of Natural and Organic Ferilizer Materials (Percentage on a Dry-Weight Basis.)

Organic Materials	% N	% P	% K	Availability	Acidity
Cotton Seed Meal	6.0	2.5	1.5	slowly	acid
Ground Rock Phosphate	---	33.0	---	very slowly	alkaline
Green Sand	---	1.0	6.0	very slowly	---
Basic Slag	---	8.0	---	quickly	alkaline
Horn and Hoof Meal	12.0	2.0	---	---	---
Milorganite	6.0	2.5	---	---	---
Peat and Muck	1.5-3.0	0.25-0.5	0.5-.10	very slowly	acid
Spent Mushroom Compost	2.0	.74	1.46	moderately	6.4

NOTE: Urea and calcium cyanamide are organic compounds, but since they are synthetic, it is doubtful that most organic gardeners would consider them acceptable.