

Welcome to the May DCGO Presentation

Watering and Fertilization



Agenda

- How much water is needed
- Effective ways to water
- Best time to water
- What to those numbers on the fertilizer bag mean
 - Soil test
 - NPK is only part of the story
- Formulating you own organic fertilizer
- Examples of how much and when to fertilize

How much water do my plants need

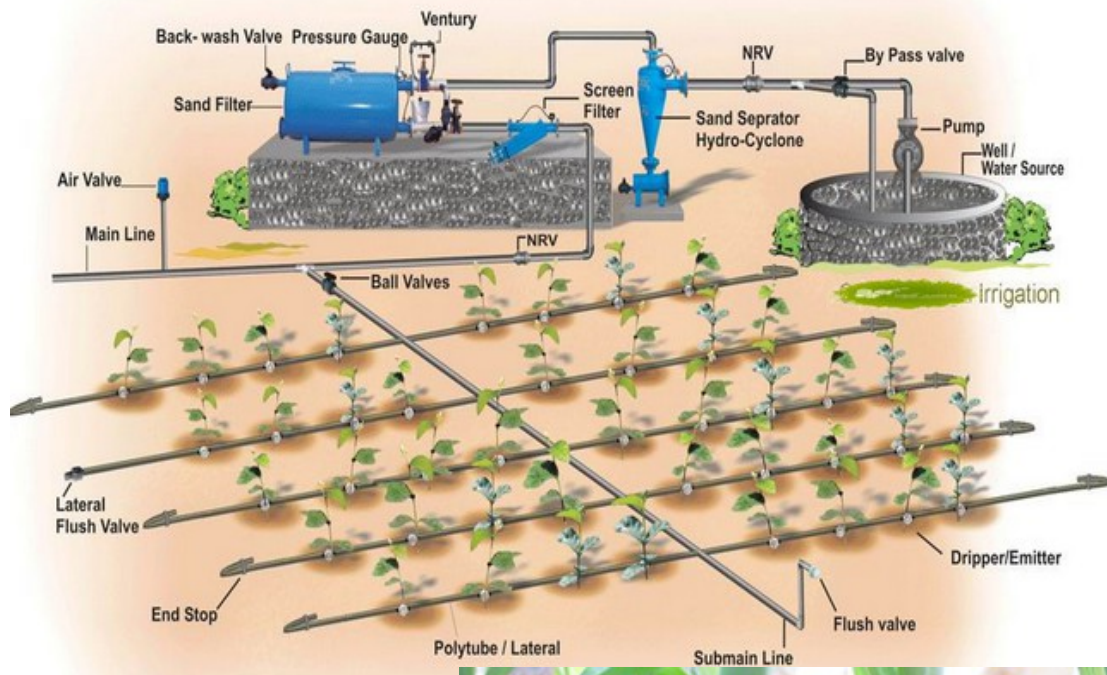
- A general rule is one to one and half inches per week
 - Larger plants such as tomatoes and okra will need more
- How many gallons is that, now for some math.
 - One cubic foot equals 7.48 gallons
 - One inch of rain on a 4x8 bed is 2.7 cubic feet $(4 \times 8) / 12$
 - That is 20.2 gallons
 - 7.48×2.7

Effective Rooting Depth of Selected Vegetables			
<u>Shallow</u> (6-12")	<u>Moderate</u> (18-24")	<u>Deep</u> (> 36")	
Beet	Cabbage, Brussels Sprouts	Asparagus	
Broccoli	Cucumber	Lima Bean	
Carrot	Eggplant	Pumpkin	
Cauliflower	Muskmelon	Squash, Winter	
Celery	Pea	Sweet Potato	
Greens & Herbs	Pepper	Watermelon	
Onion	Potato		
Radish	Snap Bean		
Spinach	Squash, Summer		
	Sweet Corn		
	Tomato		
<u>Crop*</u>	<u>Most Critical Period</u>		
broccoli, cabbage, cauliflower, lettuce	head development		
carrot, radish, beet, turnip	root enlargement		
sweet corn	silking, tasseling, and ear development		
cucumber, eggplant, pepper, melon, tomato	flowering, fruit set, and maturation		
bean, pea	flowering, fruit set, and development		
onion	bulb development		

in./ft.				
	(field capacity)	(field capacity)	(field capacity)	(field capacity)
.0	Leaves wet outline on hand when squeezed.	Appears very dark. Leaves wet outline on hand. Makes ribbon out about one inch.	Appears very dark. Leaves wet outline on hand. Will ribbon out when squeezed.	Appears very dark. Leaves wet outline on hand. Will ribbon out about one inch.
.2	a short ribbon. Appears moist. Makes a weak ball.			
.4	Appears slightly moist. Sticks together slightly.	Quite dark color. Makes a hard ball.	Dark color. Forms a plastic ball. Slicks when rubbed.	Dark color. Will slice into ribbons easily.
.6		Fairly dark color. Makes a good ball.		Quite dark. Will make a ribbon. May slick when rubbed.
.8	Appears to be dry. Will not form a ball under pressure.	Slightly dark color. Makes a weak ball	Quite dark. Forms a hard ball.	
1.0		Lightly colored by moisture. Will not ball.	Fairly dark. Forms a good ball.	Fairly dark. Makes a ball.
1.2	Dry, loose, single-grained. Flows through fingers. (wilting point)	Very slight color due to moisture. Loose. Flows through fingers. (wilting point)	Slightly dark. Forms weak ball.	Will ball. Small clods flatten out rather than crumble.
1.4			Lightly colored. Small clods crumble fairly easily.	Slightly dark. Clods crumble.
1.6				
1.8			Slight color due to moisture. Powdery. Dry. Sometimes	Some darkness due to available moisture. Leaves

Best Watering Methods

- Drip Irrigation
 - Can be set on a timer
- Using a hose
 - Water at base of plants
- Hand watering
 - Either a bucket or sprinkling can
 - Water at base of plants
- Roots need water wet leaves can promote disease and fungus on the leaves





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Tips

- Water the soil not the plants
 - More effective and reduces the chance of fungus
- Mulch
 - Mulches are beneficial in decreasing water loss from the soil around plants. Mulches serve other purposes, i.e. to reduce weed growth and to warm or cool the soil. Some growers use organic mulches, such as straw, without irrigation to hold in soil moisture. Organic mulches can be used with overhead or drip -irrigation systems. Plastic mulch, however, should not be used without irrigation and is most effective with drip-irrigation. It is important to have good moisture in the soil when mulch is applied. Irrigation and rainfall will penetrate organic mulch, but not plastic mulch. Soil under plastic mulch should never be allowed to dry out, because rewetting the entire bed is difficult with drip- irrigation.



Best time to Water

- Morning
 - Cooler so evaporation is reduced and any water on the leaves has time to dry
- Early evening
 - After it has started to cool off and sun is less direct than afternoon
- Avoid afternoon watering is less effective because of hot sun and quick evaporation
- Late evening is not recommended because leaves stay wet for several hours

Fertilizer Labels

- Shows % by weight of Nitrogen, Potassium and Phosphorous N P K
- Look for fertilizer containing micronutrients
- Soil test strongly recommended
- Ph is also important
 - Will show on the soil test
 - Optimal Ph will vary depending on the type of plant
 - Proper Ph is needed for plants to use the nutrients in the soil

Nitrate vs Nitrite

- Two types of Nitrogen in fertilizer
- Both occur naturally
- Nitrate can oxidize into nitrite
- Excess nitrate can run off in water
- Soil Ph effects utilization of both types of fertilizer
- Most fertilizers contain both types of nitrogen

To efficiently manage N:

1. Apply recommended rate based on expected yields.
2. Time N application to align with crop needs.
3. Select an ammonium fertilizer that maximizes N recovery by crops.
4. Consider all sources of N in the soil.
5. Water properly.

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ation. Innovations become our guiding lights. We value them and
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ure of pure & natural, we welcome progressive gardeners to join us.



please always buy American
products. -Owner, Milo

FERTILIZER TEA
A RICH LIQUID MIXTURE OF
EARTH'S HOME GROWN*,
ounds, or 5 cups for every 5
of water. Let the mixture set
hours. Strain well and mulch
solids around the root zone.
liquid portion (tea) can be
to 2 cups for shrubs, or 2
larger plants. Use full
strength as a feed & for deep
root feeding of all plants.

COMPOST STARTER
Dr. Earth* Home Grown*
may also be used to speed
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Please see the Dr. Earth* Pledge on our front label under
Safe." Our products are considered people and pet safe. We
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household waste, or synthetic chemicals which can poten
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that might cheapen the integrity of our products.

TRUBIOTIC® FOR SOILS
TruBiotic® is a broad spectrum biological soil inoculant des
life to all soil types in backyard gardens or in container plan

TOMATOES, PEPPERS & HERBS

NEW PLANTINGS:
During garden preparation, mix in 1 1/3 cups per
10 sq. feet of growing area, or 6 cups per 50 feet
of planting row. **FOR CONTAINERS:** Use 1/2 cup
per 1/2 cubic foot. (approx. 5 gallons) of potting
soil. Mix with the soil and water thoroughly.

ESTABLISHED PLANTS:
Use 1 cup per 10 sq. feet of growing area
for every 50 feet of row. **FOR CONTAINERS:** Use
1/2 cup per 5 gallons of potting medium. Water
and water thoroughly.
WHEN TO APPLY:
Every 2 months throughout the growing season

EGGPLANT, CORN, BEANS, CUCUMBER, LETTUCES, BROCCOLI

NEW PLANTINGS:
During garden preparation, mix 1 1/2 cups per 10 sq.
feet of growing area, or 8 cups per 50 ft. of row. **FOR**
CONTAINERS: Mix 1/4 cup per 1/2 cubic foot (approx.
5 gallons) of potting soil. Mix with soil and water
thoroughly.

ESTABLISHED PLANTS:
Use 1 1/2 cups per 10 sq. feet of growing area, or 8
cups per 50 ft. of row. **FOR CONTAINERS:** Mix 1/4
cup per 1/2 cubic ft. (approx. 5 gallons) of potting medium.
Work in gently and water thoroughly.
WHEN TO APPLY:
Every other month throughout the growing season

CARROTS, ONIONS, POTATOES, BEETS, ETC.

NEW PLANTINGS:
Before you plant, add 1 1/2 cups per 10 sq. feet of
growing area, or 8 cups per 50 linear feet of
planting row. Till to a depth of 6 to 12 inches and
water thoroughly.

ESTABLISHED PLANTS:
Top dress your root crops by using 3/4 of a cup per 10
sq. feet of growing area, or 4 cups per 50 feet of row.
Work in gently and water thoroughly.
WHEN TO APPLY:
Every 2 months throughout the growing season
Note: Do not feed carrots mid-season.

GUARANTEED ANALYSIS:

Total Nitrogen (N).....	4%
-4% Water Insoluble Nitrogen.....	4%
Available Phosphate (P ₂ O ₅).....	6%
Soluble Potash (K ₂ O).....	3%
Calcium (Ca).....	7.5%

DERIVED FROM:
Fishbone meal, bone meal, feather meal,
alfalfa meal, potassium sulfate, fish meal,
kelp meal, rock phosphate and kelp flour.
STORE in a dry cool place.
Avoid direct sunlight.
EXPIRATION DATE
Best if used before



ALSO CONTAINS NON-PLANT FOOD INGREDIENTS

Colony Forming Units (CFU) / gram	Propagules / gram
Bacillus amyloliquefaciens.....	2,500,000,000
Bacillus licheniformis.....	2,500,000,000
Bacillus megaterium.....	2,500,000,000
Bacillus pumilus.....	2,500,000,000
Bacillus subtilis.....	2,500,000,000
MYCORRHIZAE:	
Endomycorrhizae (VAM):	
Glomus aggregatum.....	0.16
Glomus clarum.....	0.16
Glomus deserticola.....	0.16
Glomus etunicatum.....	0.16
Glomus intraradices.....	0.16
Glomus mosseae.....	0.16
Glomus monosporum.....	0.16
Paraglomus brassilianum.....	0.16
Gigaspora margarita.....	0.16
Ectomycorrhizae (Protophytes):	
Laccaria laccata.....	2,500,000,000
Laccaria bicolor.....	2,500,000,000
Pisolithus tinctorius.....	2,500,000,000
Rhizopogon villosulus.....	2,500,000,000
Rhizopogon fasciculatus.....	2,500,000,000
Rhizopogon mycelium.....	2,500,000,000
Rhizopogon sphaerulatus.....	2,500,000,000
Sclerotinia cepicola.....	2,500,000,000
Sclerotinia citrinella.....	2,500,000,000

Contains 6% Humic Acids (derived from Leontopodium)
Information regarding the contents and levels of humic acids
available on the Internet at www.drearth.com



10-10-10

ALL PURPOSE FERTILIZER

40 LBS.

GUARANTEED ANALYSIS

Total Nitrogen (N)	10.00%
3.91% Ammoniacal Nitrogen	
6.09% Urea Nitrogen	
Available Phosphate (P_2O_5)	10.00%
Soluble Potash (K_2O)	10.00%
Plant Nutrients Derived from: Urea, Diammonium Phosphate, Muriate of Potash	

US FOR USE:

VEGETABLES:

on the bed surface and work into the top 2 to 4 inches of soil. For vigorous growth, repeat application every 6 weeks during growing into the soil surface along rows or around plants.

IND ORNAMENTALS:

and early fall. Where rapid growth is desired, or in areas where needed, a third application is recommended in mid-summer. on the soil surface under the outer spread of branches, from trunk of plant. Scratch fertilizer lightly into the soil surface

FERTILIZATION RATES

(per 100 sq. ft.)

Analysis	Flowers & Vegetables
5-10-15	1-2 lbs.
6-12-12	1-2 lbs.
8-8-8	1-2 lbs.
10-10-10	1-1½ lbs.
13-13-13	1-1½ lbs.
16-4-8	1-1½ lbs.
34-0-0	1½ lbs.

SUGGESTED FERTILIZATION RATES

TREES AND SHRUBS

SIZE OF TREE/SHRUB

- ½" Diameter
- 1" Diameter
- 2" Diameter

before they break bud in spring. A second application is when trees have reached peak spring growth. Fertilize again in late fall, about the time of the average first frost date. Using an auger to drill holes in a circle just inside the drip line, approximately 12 inches deep. Surface feeding near drip line is also acceptable. Water slowly and thoroughly.

...obtain specific information from your local extension agent or city government to determine if there are local regulations for fertilizer use.
...when used according to the label directions.

6-4-0
GUARANTEED ANALYSIS

Total Nitrogen (N)	6.0 %
2.0 % Water Soluble Nitrogen	
4.0 % Water Insoluble Nitrogen*	
Available Phosphate (P_2O_5)	4.0 %
Calcium (Ca)	1.2 %
Iron (Fe)	2.5 %

Derived from Biosolids
*4.0 % Slowly Available Nitrogen Derived from Biosolids.

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ZER
is now
growing
that was
years before
information.

Micronutrients

- Magnesium and Sulfur are considered macronutrients
 - More of these are required than micronutrients
- Boron, Copper, Manganese, Iron, Molybdenum, Zinc, Chloride
 - Lesser amounts are needed but still important
- Calcium, Zinc and Manganese are reported on the soil report

FUNCTIONS of SECONDARY and MICRONUTRIENT ELEMENTS in PLANT NUTRITION

MAGNESIUM - (The keystone of chlorophyll) An essential constituent of chlorophyll. Necessary in the formation of oils and fats. Acts as carrier of phosphorus in the plant. Necessary for the formation of sugar. Regulates the uptake of other plant foods. Plays a part in the translocation of starch.

SULFUR - (Essential for Protein) Maintains the green color of leaves being a constituent of protein. Helps in the growth of roots and stems of plants. Important in the synthesis of oil. A constituent of several amino acids, including methionine, cystine and cysteine which are essential components of plants and animal proteins. About 90% of sulfur in plant is found in these three amino acids.

BORON - Enhances the development of actively growing tissues. Necessary in the formation of flowers and fruits. Essential in cell division.

CHLORINE - Necessary in small amounts in the formation of flowers and fruits. Helps the growth and development of plants.

COPPER - Plays a role in the enzymatic activity related to oxidation-reduction reactions. Important in the utilization of protein, in the growth of plants, in seed development, and in chlorophyll formation.

COBALT - Essential in symbiotic N-fixation and also in non-symbiotic N-fixation of bacterial agents like Azotobacter.

IRON - Essential in the formation of chlorophyll but not a constituent of it.

MANGANESE - Part of an important enzyme involved in chlorophyll synthesis.

MOLYBDENUM - Needed in the reduction of nitrates to nitrite. Aids leguminous plants utilize nitrogen from the atmosphere.

ZINC - An essential component of plant enzyme which regulates various metabolic activities. Probably connected with the formation of growth hormone auxin.

[REDACTED]

SLOW RELEASE 16-4-8

GUARANTEED ANALYSIS

TOTAL NITROGEN (N)	16.00%	Iron (Fe)	2.00%
8.00 Slow Release Nitrogen		SULFUR (S)	2.00%
Derived from Sulfur-Coated Urea		CALCIUM (Ca)	6.00%
AVAILABLE PHOSPHORIC ACID (P_2O_5)	4.00%	MAGNESIUM (Mg)	3.00%
SOLUBLE POTASH (K_2O)	8.00%		

Plant Nutrients derived from Ammoniated Phosphates, Polymer Coated Sulfur Coated Urea, Urea,
Muriate of Potash, Pelletized Dolomite Lime, Iron Oxide and Iron Sulfate.

* This product contains 8.00% Slow Release Nitrogen from Polymer Coated Sulfur Coated Urea.

Manufactured By

Formulating an Organic 10 10 10 Fertilizer (10 lbs)

- Materials needed
 - Scale, kitchen scale with tare function will work
 - Container large enough to hold needed amounts
 - Mixing tool a garden trowel will work
- Select desired ingredients
 - For our example we will use
 - Blood meal 13-0-0
 - Bone meal 1-15-0
 - Potassium Sulfate 0-0-60

Here is the Math

- Need 1 pound each of nitrogen, phosphorous and potassium: $10 \times .10 = 1$
- Bone meal $1 / .15 = 6.6$ lbs
- Blood meal $((1 / .13) - (.01 \times 6.6)) = (7.69 - .06) = 7.63$
- Potassium $1 / .5 = 2$
- 6.6 lbs of Bone meal 7 lbs 10 oz of blood meal, 6 lbs 9.5 oz of bone meal, 2 lbs of Potassium Sulfate total 16.23 lbs
- Use 1.62 lbs of mixture for each pound 10-10-10
- A spread sheet is useful for formulation of odd fertilizer requirements

UGA Does the Math

- <http://aesl.ces.uga.edu/soil/fertcalc/>
- Has the ability to make fertilizer calculation for several organic fertilizer components

Step 1. Enter fertilizer requirements

Fertilizer recommendations are given in:

☒ pounds per acre

☐ a specific grade (such as 10-10-10)

Recommendation from soil test report			Application
N	P ₂ O ₅	K ₂ O	
10	10	10	pounds per acre
0.37	0.37	0.37	ounces per 100 square feet

Step 2. Select available grades

Choose from the list of commonly available grades, or add your own in N-P₂O₅-K₂O format.

Show grades for:

☒ Lawns and Gardens

☐ Farm use

☐ 29-0-5

☐ 18-24-6

☐ 10-10-10

☐ 14-7-7

☐ 10-5-4

☐ 32-0-8

☒ 1-15-0 Bone Meal

☐ 7-2-2

☐ 5-6-3

☐ 5-5-5 Plant Food

☐ 0-10-10

☐ 5-5-3

☐ 4-5-3 Tomato Veg Food

☐ 7-3-3

☐ 4-6-2

☐ 18-0-3

☐ 10-0-6

☐ 4-3-4

☐ 15-0-15

☐ 6-2-1 Cottonseed Meal

☒ 13-0-0 Blood Meal

☐ 3-4-4 Garden Tone

☐ 6-8-0 Bone Meal

☐ 12-0-0 Blood Meal

☐ 9-23-30

Fertilizer grades (N-P ₂ O ₅ -K ₂ O)	\$ Cost per pound
1-15-0	
13-0-0	
0-0-50	

Step 3. Choose application rate and area

ounces per 100 square feet

If the area is unknown, what shape best describes the area to be fertilized?

Rectangle

Triangle

Circle

Oval

Half Oval

Options

☒ Show all scores

Number of grades to use in recommendation: 3

Round recommendations to nearest:

☒ Tenth ☐ Quarter ☐ Half ☐ Whole number

Step 4. Calculate

Clear data

Fertilizer recommendations based on available grades, application rate, and area

Recommendation	Cost	Nutrients supplied per rate and area			Nutrients surplus or deficit			Score
		N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O	
2.1 ounces of 1-15-0 plus 2.3 ounces of 13-0-0 plus 0.6 ounces of 0-0-50 per 100 square feet.	-	0.32	0.32	0.30	0.00	0.01	0.02	99

The Score

The score represents how well a fertilizer recommendation matches the soil test report recommendation.

A perfect score is 100. Points are deducted if the supplied nitrogen is outside 10% of N recommended, if the supplied phosphorus is too high, or if the supplied potassium is too low.

You can view recommendations based on the best score or on all scores.

Number of grades to use in recommendation

The Fertilizer Calculator provides a recommendation based on the best combination (best score) of 1, 2, or 3 fertilizer grades.

Fertilization Examples

- Use soil test recommendations
 - The following are general recommendations if no soil test is available
- Tomatoes
- Okra
- Summer squash
- Green Beans
- Cucumbers
- Broccoli

Fertilizing Tomatoes

- Medium Feeder
- Before planting add 1.5 pounds of 10-10-10 per 100 sq ft, $\frac{1}{2}$ pound for a DCGO bed
- Side dress with 1 pound of 10-10-10 per 100 sq ft, about 5 oz for a DCGO bed, when fruits are about inch in diameter.
- Repeat side dressing every three or four weeks



Okra

- Medium feeder
- 2 lbs of 10-10-10 per 100 sq ft., two thirds of a pound for a DCGO bed, before planting
- 2 side dressings of 3 oz of 10-10-10 per 100 feet of row, .2 oz for each sq foot when plants are 6 to 8 inches tall.
- Repeat side dressing in two to three weeks.
- Don't over fertilize.

Summer Squash

- Medium Feeder
- 3 tables spoons of 5-10-15 to each mound at planting
- When plants begin to flower and small fruits appear reapply.
- Water when applying fertilizer.



Green Beans

- Light Feeder
- 5 pounds of 5-10-15 per 100 feet of row, about 5 oz for a DCGO bed, at planting.
- Reapply when small beans begin to appear and every four to five weeks for the rest of the season

Cucumbers

- Medium feeder
- Before planting fertilize with 5-10-10 at 3 lbs per 100 square feet, about 1 lb for a DCGO bed
- Side dress when plants begin blooming and again three weeks latter with 1 lb of 33-0-0 per 100 square feet, about 5 ounces for a DCGO bed. Cover fertilizer with soil after side dressing
- Don't over fertilize as this will lead to excessive vine growth

Broccoli

- Heavy feeder
- Fertilize soil with 3.5 pounds of 5-10-10 before planting per 100 square feet, about 1 pound for a DCGO bed.
- Apply 2 pounds of 5-10-15 per 100 square feet every month until harvest, about two thirds of a pound for a DCGO bed.

Additional Resource

- <https://extension.uga.edu/publications>
 - Specific growing information for many vegetables



Thank you
Questions