POMEGRANATE NUTRITION

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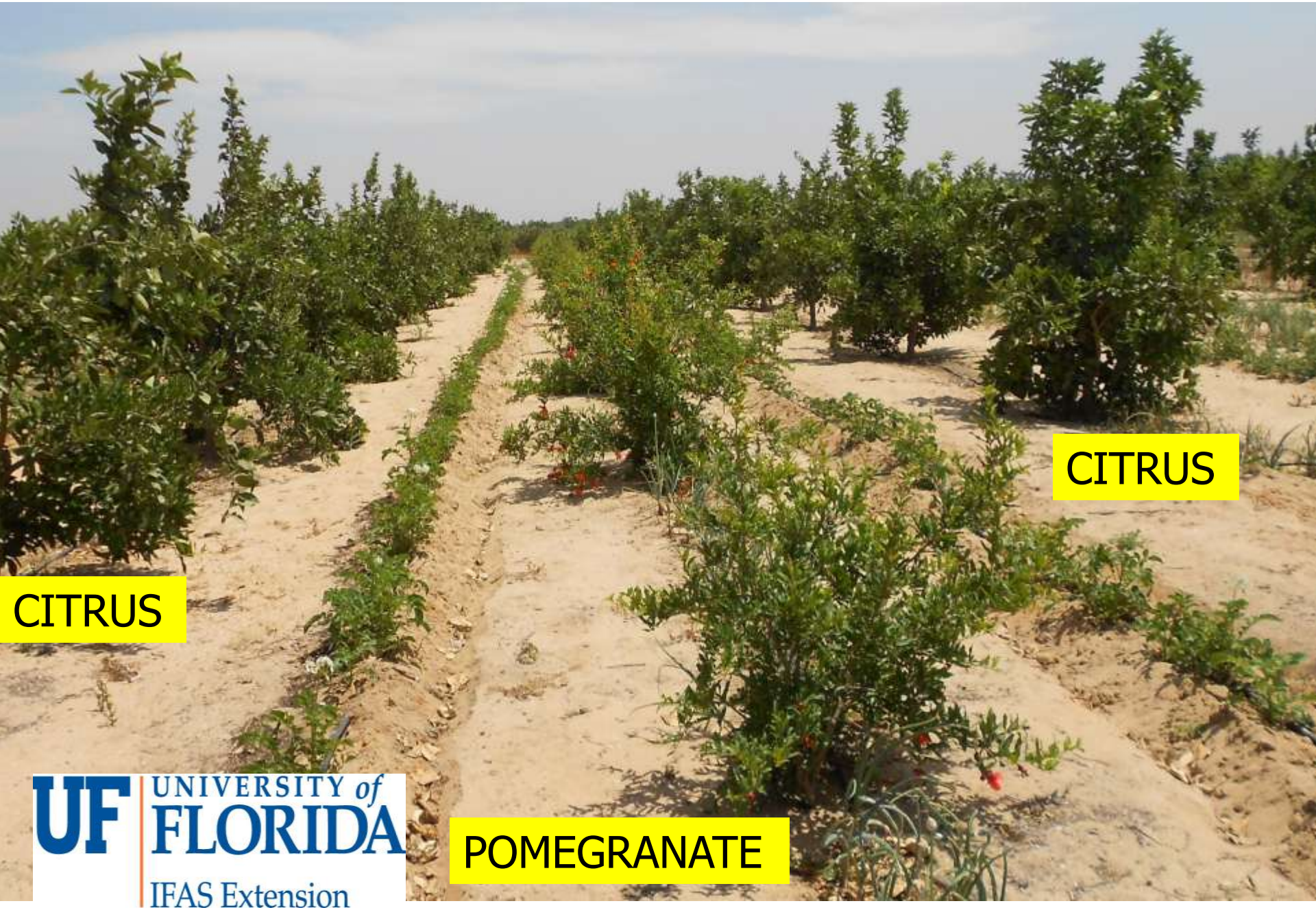
Fertilizer Requirements

- Fertilizer requirements for pomegranate trees are similar to those for citrus.



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Background information

- Best quality pomegranates are produced in regions with cool winters and hot, dry summers.

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More information

- Under summer rainy conditions, trees can produce fruit, but the fruit tend to be soft and have blemishes and poor shipping and storage quality.

More information

- Pomegranate trees usually set a few fruit in the second year after planting, but generally reach good commercial production at 5 to 6 years. Yield of mature, good producing trees can reach 10-15 tons/acre).
- In North and Central Florida, pomegranate fruit ripen from July to October.

Relative plant nutrient composition

Element	Abbreviation	No. of atoms relative to molybdenum
MOLYBDENUM	Mo	1
COPPER	Cu	100
ZINC	Zn	300
MANGANESE	Mn	1,000
BORON	B	2,000
IRON	Fe	2,000
CHLORINE	Cl	3,000
SULFUR	S	30,000
PHOSPHORUS	P	60,000
MAGNESIUM	Mg	80,000
CALCIUM	Ca	125,000
POTASSIUM	K	250,000
NITROGEN	N	1,000,000
OXYGEN	O	30,000,000
CARBON	C	35,000,000
HYDROGEN	H	60,000,000

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Importance of nutritional factors that affect growth and yield of fruit trees

Everything else

Potassium

Nitrogen

Water

Irrigation

- Water is the most critical nutrient for establishment of young pomegranate trees, particularly during the first year.
- For established trees, adequate irrigation, especially during dry periods, is very important to improve growth, fruit set, yield, and fruit size.

Fruit will drop prematurely and will split if trees are not getting enough water during dry spells.

Importance of N & K

- N & K are the most important nutrients for fruit trees including pomegranate trees in Florida.
- An adequate level of N is required for vegetative growth, flowering, and fruit yield.
- K also plays an important role in determining yield, fruit size, and quality.
- Use 1:1 N to K_2O ratio. However, a ratio of 1:1.25 is recommended for high pH or calcareous soils and heavy producing trees.

Phosphorus

Optimum soil P levels (>60 lbs/acre)

- Over the years, P applied to established groves had not leached but had accumulated in the soil at high levels and is available slowly.
  - P does not leach readily where the soil pH is 6 or higher and the fruit crop removes very little.
  - Therefore, regular P applications are not necessary.

Soil pH & Overliming

Optimum soil Mg levels (>60 lbs/acre)

- Soils should have a pH ranging from 6.0 to 7.0
- Liming soils having a pH at or above 6 will be costly and not useful. In groves, where soils have adequate pH but low Ca levels (<600 lbs/acre), gypsum ($CaSO_4$) can be used as a source of Ca without affecting the soil pH.
- If the soil pH is in the desired range, applying dolomite as a source of Mg is not recommended. Soil application of $MgSO_4$ and/or foliar application (4-6 gal/acre) of $Mg(NO_3)_2$ are effective in correcting Mg deficiency.

Micronutrients (Mn, Zn, B)

- The use of most micronutrients (Mn, Zn, B) is recommended at least twice a year through foliar spray.

Micronutrients (Mo, Cu)

- Molybdenum (Mo) deficiency occurs on soils that have been allowed to become very acid. Liming those soils should fix the problem.
- Copper should not be included in dry fertilizers if Cu sprays are used and if the grove soil test show adequate Cu (5-10 lbs/acre).

Adjusting fertilizer programs

- Leaf sampling and analysis is a useful management tool for fertilizer decisions.
- The best indication of successful fertilizer management practices for fruit trees is having leaf nutritional concentrations within the optimum ranges.

Optimum Leaf Mineral Concentrations (%)

N	1.5-2.0 (2.5)
P	0.1-0.2
K	0.6-0.8 (1.47)
Ca	0.7-1.5
Mg	0.3-0.4

*3-4-month-old spring cycle leaves from non-fruiting terminals collected in June-July.

Optimum Leaf Mineral Concentrations (ppm)

Mn	**20-70 (196)**
Zn	**40-70**
Fe	**60-120 (199)**
B	**10-20 (96)**
Cu	**10-20**

***3-4-month-old spring cycle leaves from non-fruiting terminals collected in June-July.**

Leaf Sample Collection

- 100 spring cycle leaves (from 20-25 trees, at least one leaf from each tree quadrant), 3 to 4-month old from nonfruiting shoots at the middle third of the branch, at a height of 3-5 ft should be collected in June-July from uniform trees of similar age under the same fertilizer program.

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Nitrogen rates

- Numerous N rates and timing were recommended for pomegranate trees.
- They vary with location, tree age, tree size, soil conditions, fruit yield, and other cultural practices.
- Pomegranate groves benefit from **0.5 to 1 lb N/tree/year** split into late winter and the spring.

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Fertilizer rates

- **Young** trees should receive about 2-3 lbs of 8-8-8 or similar analysis fertilizer twice a year in early spring and early summer (4-6 lbs x 0.08 = ~ **1/3-1/2 lb N/tree/year**).
- **Mature** trees can use twice this amount (8-12 lbs x 0.08 = ~ **2/3-1.0 lb N/tree/year**).

Nitrogen, Phosphorus, and Potassium rates

(pound/tree/year)

Age (year)	N	P_2O_5	K_2O
1-2	1/3–0.5	1/3-0.5	1/3-0.5
3	0.5-2/3	0.5	0.5-2/3
4	2/3-1.0	0.5	2/3-1.0
5^+	1.0	0.5	1.0

Fertilizer rates

- Apply 75-150 lbs of N/acre
- Excessive or late applications of N may cause excessive vegetative growth, reduce fruit production and quality, and delay fruit maturity and color.

- Do not fertilize after August as this will promote new growth late in the year which may be subject to freeze damage.

Timing and frequency of application

- 2/3 to ¾ of the tree's nutritional requirements should be made available from late winter to late spring, with most of it in place during flowering and fruit-setting period.
- Split fertilizer application combined with sound irrigation management will increase fertilizer efficiency.

Use of natural organics as fertilizers

- **Manure**
- **Biosolids**
- **Compost**
  - Highly variable nutrient concentration
  - Low analysis (1 to 3% N)
  - High cost per unit of N
  - Slow nutrient availability
  - Contain micronutrients

C:N ratio should be < 30:1 to release N

Controlled-release fertilizers

- May induce more growth and yield due to a continuous rather than a fluctuating supply of nutrients.

- Bring about substantial labor and time savings through reduced rates and frequency of fertilizer applications.

Fertigation

- Saving of over 90% of the fertilizer application labor
- Fertilizers are applied frequently in small doses and placed in the wetted area where most active roots are located.
  - Increase fertilizer efficiency
  - Allow to reduce the amount of applied fertilizer
  - Reduce production cost
  - Lessen the potential of fertilizer leaching

Timing and rates through fertigation

- **Through monthly fertigation, the following program has been suggested:**

Month	Suggested Program	Personal Preference Weekly fertigation
✓ March	5%	20%
✓ April	25%	20%
✓ May	25%	20%
✓ June	20%	20%
✓ July	15%	20%
✓ August	10%	

Foliar fertilization

Foliar feeding was found to be very useful.

- **Improve nutrient use efficiency,**
- **Increase yield,**
- **Enhance fruit quality,**
- **Provide drought tolerance**

When does foliar nutrition make sense?

- Soil conditions prevent nutrient uptake
- Small amounts of nutrients are needed which makes ground application inefficient
- Nutrients are not mobile in the tree
- Visual deficiency symptoms
- Need nutrients fast
- Application is profitable

Effect of foliar potassium

- Postbloom foliar applications of potassium nitrate (4-6 lbs K_2O/acre) during the spring may increase fruit size and yield and <u>reduce fruit splitting.</u>

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Other causes of fruit splitting

- Water stress caused by drought or flooding can aggravate fruit splitting.
- Fungal diseases affecting both the leaves and the fruit cause premature leaf loss and fruit splitting.
- Do not allow the fruit to become overly ripe as they may split open.

Importance of Zn & Efficiency of foliar feeding with micronutrients

- Beside N, Zn is the most common limiting nutrient for pomegranate trees.
- Foliar sprays of Zn, Mn, B, and Cu are a more effective, more economical, and a quicker way to supply these nutrients (when applied during the dormant season, postbloom or summer) than soil application.

Sulfate forms are less expensive and nitrate forms appear to facilitate the uptake of micronutrients.

Iron

- Foliar application of Fe is not recommended for fruit trees due to lack of effectiveness and risk of leaf and fruit burn.

  - Soil application of Fe chelates is the most reliable strategy of supplying Fe to fruit trees.

Causes & Correction of Fe deficiency

- Low Fe content in white sandy soils
- High levels of P or Cu in the soil
- High soil pH or calcareous soils
- Flooding, poor drainage, over irrigation
- Low soil temperature

Fe chelates are not equally effective.

Iron Chelates	***Effective pH Range***
Fe-EDTA	**4 to 6.5**
Fe-HEDTA	**4 to 6.5**
Fe-DTPA	**4 to 7.5**
Fe-EDDHA	**4 to 9.0**

Management practices to improve fertilizer efficiency

- Evaluation of leaf analysis data
- Selection of fertilizer formulations to match existing conditions
- Adjustment of rates to the level based on expected fruit yield
- Careful placement of fertilizer under the tree canopy within the root zone
- Split application and good irrigation management to minimize fertilizer leaching

THANK YOU!

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