Nutrient Considerations for Olives

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Olives do well on shallow soils with good drainage.

Proper Olive Nutrition Encourages:

- ✓ New growth
- ✓ Better fruit size
- ✓ Heavier production
- ✓ More regular bearing

16 Essential Plant Nutrients ---

- **9 macro-nutrients needed in relatively large amounts: C, H, O, P, K, N, S, Ca, Mg**
- **7 micro-nutrients are trace or minor elements that are needed in small quantities: Fe, Mn, B, Zn, Cu, Cl, Mo**

In olive, we're generally only concerned with three nutrients - - -

- ✓**Nitrogen**
- ✓**Potassium**
- ✓**Boron**

Tissue & Soil Analysis - - -

- ✓ **Leaf Analysis Used:**
  - **To assess nutrient status**
  - **To develop fertilization program**
- ✓ **Soil Analysis Used:**
  - **To diagnose problems (excesses or imbalances)**

Soil Analysis may also guide ---

- ✓ **Soil amendment applications**
  - **Lime application to adjust low soil pH**
  - **Gypsum application to adjust Ca:Mg ratio or to reclaim alkali soils**

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Leaf Analysis Levels for Olive

	DEFICIENT	OPTIMUM
NITROGEN	1.4%	1.5-2.0%
POTASSIUM	0.4%	0.8-1.0%
BORON	14 ppm	19-150 ppm

Sample 100 mature leaves in July from the middle of non-fruiting shoots

Where do we put fertilizer materials?

Olive has a shallow, spreading root system.

Nitrogen or Boron may be broadcast or spread in the tree row.

Potassium is banded along side the tree row.

Nutrients can be effectively injected through drip irrigation.

Nitrogen - - -

Low nitrogen symptoms…..

- **Small, yellowish leaves**
- **Poor shoot growth**
- **Sporadic bloom**
- **Poor fruit set**

Low N = Pale color, lack of new growth

Adequate N is necessary for good bloom, fruit set, and yield.

Nitrogen Rate vs. Yield & Size

Mission Olives, Palermo, Heavy Crop Year

TREATMENT lbs. N / TREE	YIELD PER TREATMENT	% CANNING SIZE
3 lbs. ACTUAL N	226 lbs.	43
1 lb. ACTUAL N	196 lbs.	63
1/2 lb. ACTUAL N	172 lbs.	92
UNFERTILIZED	49 lbs.	97

Source: H.T. Hartmann, UC Davis

Nitrogen-Containing Fertilizers

To supply an equal amount of actual N

	% NITROGEN	1 lb. ACTUAL N
UREA	46-0-0	2 1/4 lbs.
AMMONIUM NITRATE	33-0-0	3 lbs.
AMMONIUM SULFATE	21-0-0	5 lbs.
CALCIUM NITRATE	16-0-0	6 1/3 lbs.

Maintaining Nitrogen Levels - - -
with inorganic nitrogen sources is easy

- ✓ **Broadcast 50-100 lbs. N/acre/year (1-2 lbs. per tree at 48 trees/acre)**
- ✓ **Soil applied in January**
- ✓ **Benefits flower bud development and spring growth**
- ✓ **If split between January and October may help moderate alternate bearing**

Biological nitrogen sources - - -

- ✓ **Legumes…. fix N biologically**
  - Legumes provide nitrogen and release it slowly over time—weeks to months
  - Require additional water
  - Require mowing to control growth
  - Gopher populations will increase
  - May improve water penetration
  - No other nutrients are provided

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Legume Cover Crops --- annual sub-clovers work well

Seeding a sub-clover cover crop (15-30 lbs. seed/acre) with a no-till drill.

Mow and throw clippings into the tree row to concentrate recycling of nutrients where the heaviest concentrations of roots are located.

When can the tree use nitrogen most efficiently?

- ✓ **For highest uptake by the tree, nitrogen should be in the root zone just before the period of greatest uptake.**
  - **In olive, this is just ahead of shoot growth and bloom in the early spring.**
- ✓ **Mow a sub-clover cover crop when 4-7 inches more rainfall is expected so that nitrogen is moved from the clippings into the soil but not leached too deeply or lost to runoff.**

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So…..What are potential benefits of additional organic matter ?

- ✓ **Can aid water infiltration**
- ✓ **Helps develop soil structure**
- ✓ **Provides larger reservoir for nitrogen and other micro-nutrients**

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Challenges - - - with higher organic matter

- ✓ **Larger reservoir for nitrogen must be managed year round OR nitrates can be leached to groundwater or can runoff**
- ✓ **When a cover crop is grown, it will use additional water**
- ✓ **OM can reduce herbicide effectiveness**

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Potential Nitrogen losses - - -

- ✓ Volatilization of ammonia
- ✓ Denitrification
- ✓ Leaching

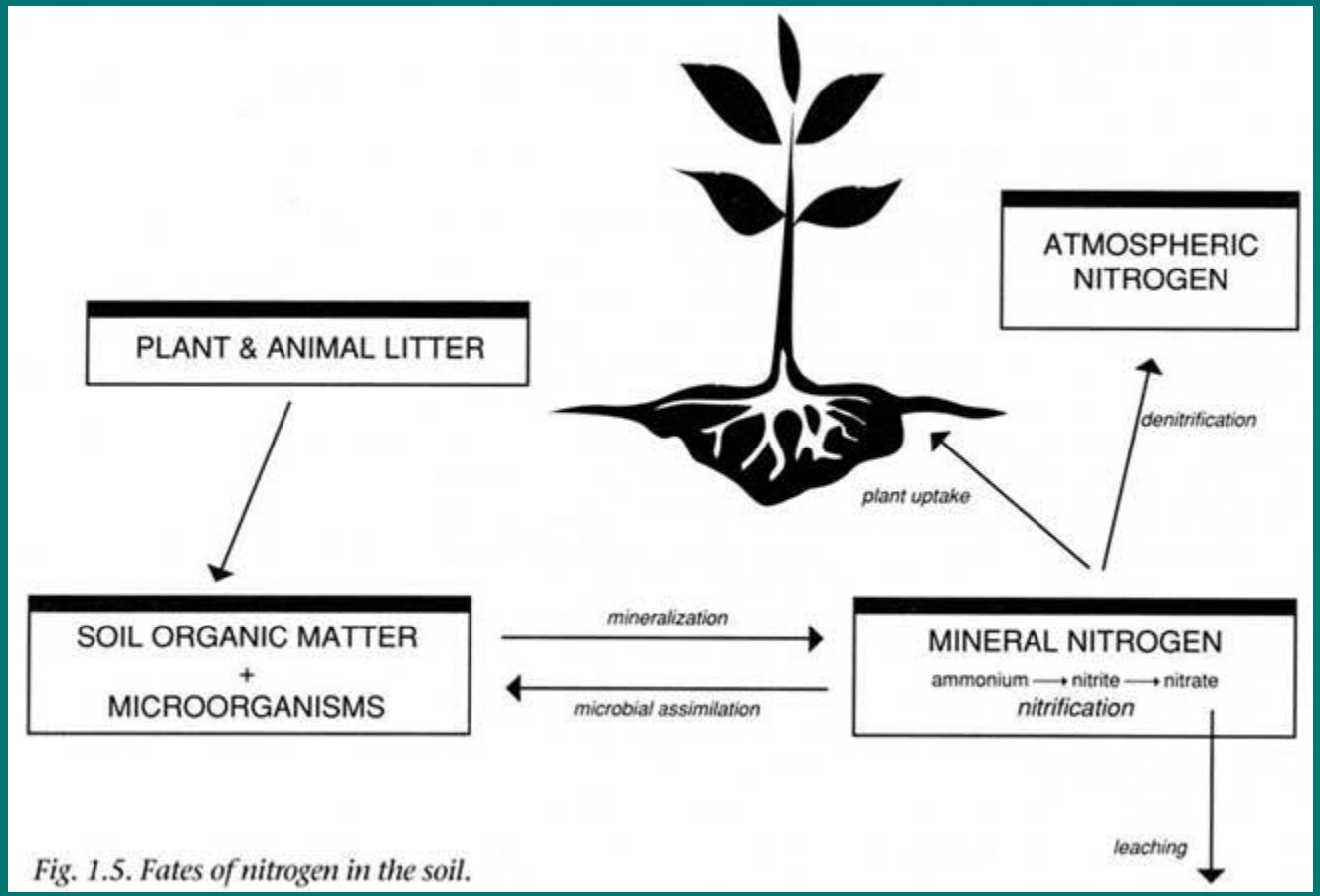

Fig. 1.5. Fates of nitrogen in the soil.

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Potassium Deficiency ---

- **Dead leaf tips or margins**
- **Light green leaf color**
- **Twig dieback**

Tree response to potassium fertilizer ---

	Yield lbs./tree	% Canning Fruit		
	4 yr Avg	1ST Yr	2ND Yr	3RD Yr
K^+ Mass Dose	152	70	62	33
Unfertilized	36	20	19	5

Source: H.T. Hartmann, UC Davis

- Deficiency = less crop & smaller fruit size

Correcting Potassium Deficiency

- ✓ **Apply 10-20 lbs potassium sulfate per tree (500-1000 lbs per acre)**
  [non-synthetic, Great Salt Lake Minerals]
- ✓ **Ringed or BANDED at drip line, NOT broadcast**
- ✓ **Soil applied in Dec. – Jan.**
- ✓ **Good for several years**

Boron Deficiency ---

- **Twig dieback and excessive branching**

Boron Deficiency ---

- **Leaves w/ dead tips, a yellow band, but still green at the base.**

Boron Deficiency ---

- **Defective fruit, a “monkey face” symptom**
- **Premature fruit drop**

Correcting Boron Deficiency ---

- ✓ **Broadcast ½ to 1 lb. of a 14-20% borax material per tree on the soil surface (25-50 lbs. per acre)**
- ✓ **Apply in winter, good for several years**
- ✓ **Organic restrictions: soil deficiency must be documented by testing**

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