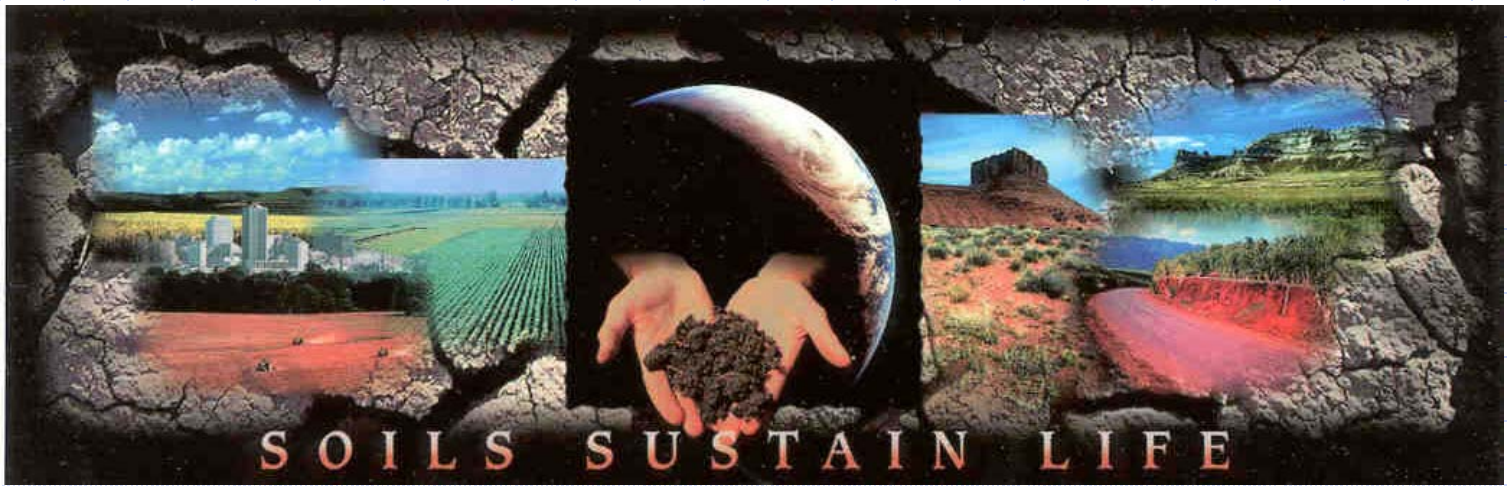
Soil – Plant - Compost



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What is Soil Quality?

Capacity of a specific kind of soil to function, within natural or managed ecosystem boundaries, to sustain plant and animal productivity, maintain or enhance water and air quality, and support human health and habitation.

NRCS Soil Quality Institute

Challenges to Soil Quality

- Improper tillage (timing/tools).
- Inadequate nutrient supply.
- Excessive nutrient supply.
- Inadequate attention to biology (organic matter supply).
- Contamination from industrial or other sources.

The "integrated soil"

- Open crumb structure
- Med-low bulk-density
- Sufficient nutrients
- Organic-rich

Compacted Soils …

- Root expansion difficult
- Concentation of chemicals in top layers
- Require more energy for tillage

Soil texture revealed

Soil Pene-trometer Test

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Soil (= Roots+Microbes)

- Root/mineral interface hard to separate
- Root-microbe interface= active nutrition

Compost ≈ Roots : Soil

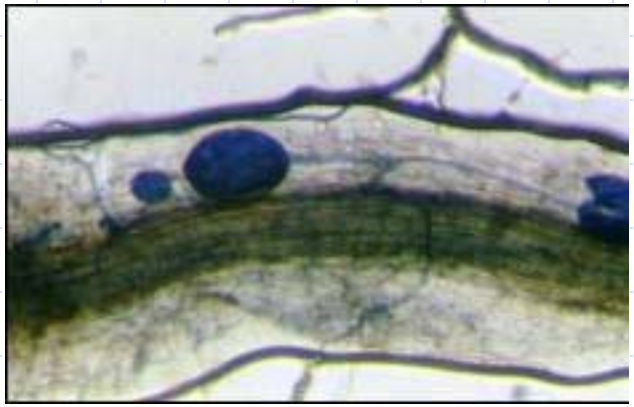
- Fine root hair development shows different relationship
- Compost increases inter-relationship of root to soil.
- Compost favors plant important microorganisms.

Mycorrhizae Associations …

- Grapevine rootstocks benefit enormously from AM associations
- Negatively affected by fumigation and fertilizers

List of benefits …

- Plants better tolerate stressful conditions, such as lack of water and high salt levels.
- Plants can be more successfully transplanted into poor or marginal soils.
- Plants need less fertilizing and irrigation .
- Plants may bear fruit at an earlier age and support heavier crops.



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Other benefits to systems "approaching natural"

- Soil system does not "force" yield (ref; *Terroir*)
- Better control of plant development (e.g. pruning)
- Natural disease suppression
- Higher fruit quality

Disease Control via Soil-media

- Soils lacking active micro-flora may not be able to adequately control common pathogens.
- Organic matter supply and compost furnish benefits.

Compost triggers disease suppression

- Soil mediated effects;
- Direct foliar "phyllosphere" effects;
- Indirect systemic effects.

Left: Control; Right /Microbially active soil

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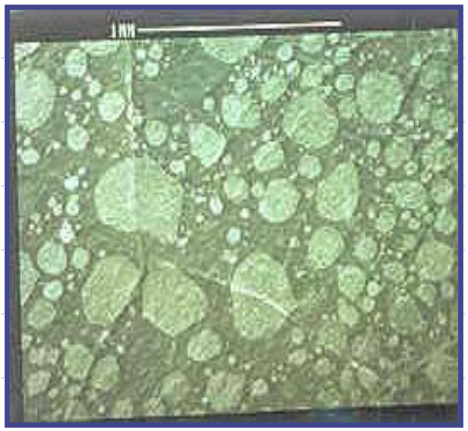
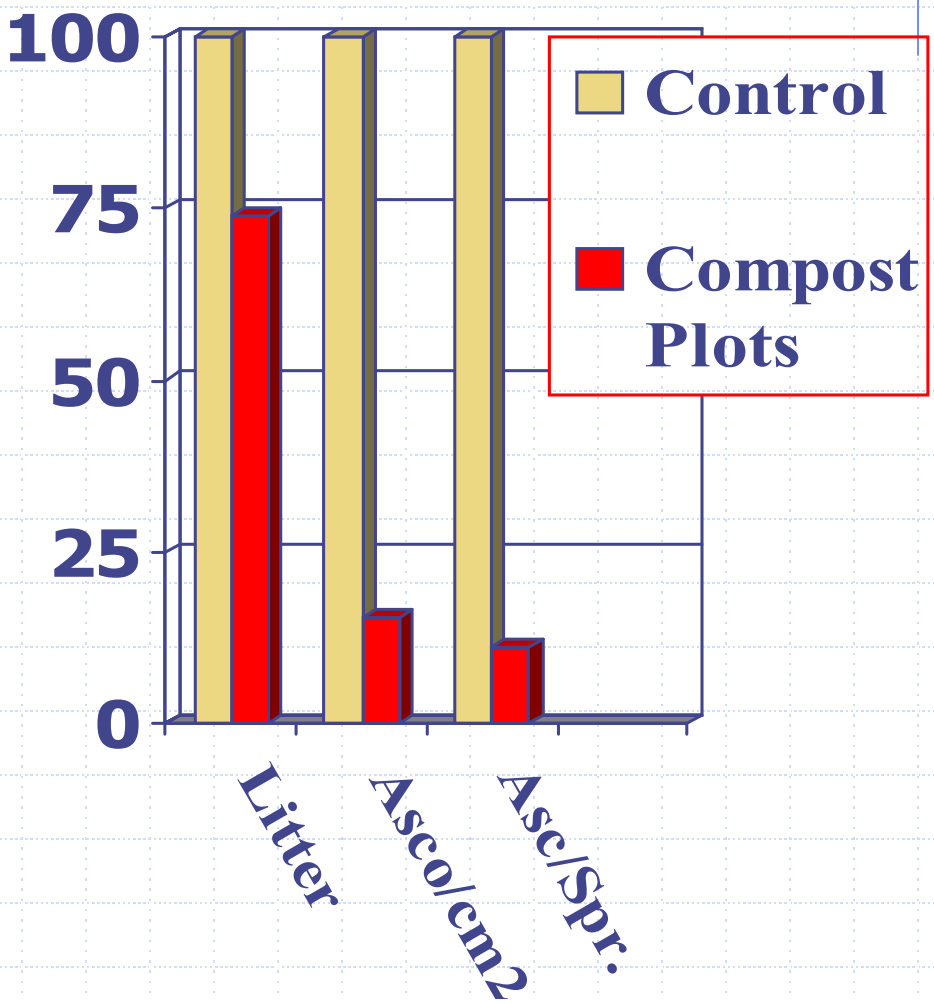
Microbial Vineyard Hygiene

- Fall spread compost increases litter decomposition;
- Compost reduces spring ascospore germination



Decaying leaf surface coated with micro-organisms



Pomace + Manure Compost

- C:N pomace = 25 but pH < 5.0 (v. low)
- CN manure/bedding 21-26 with pH > 8.o
- 1:1 mixtures make excellent compost.

(N= 2.2% P=1.7 K=2.8

OM= 43% pH = 8.4*)

* Results: Benziger Family Vineyard

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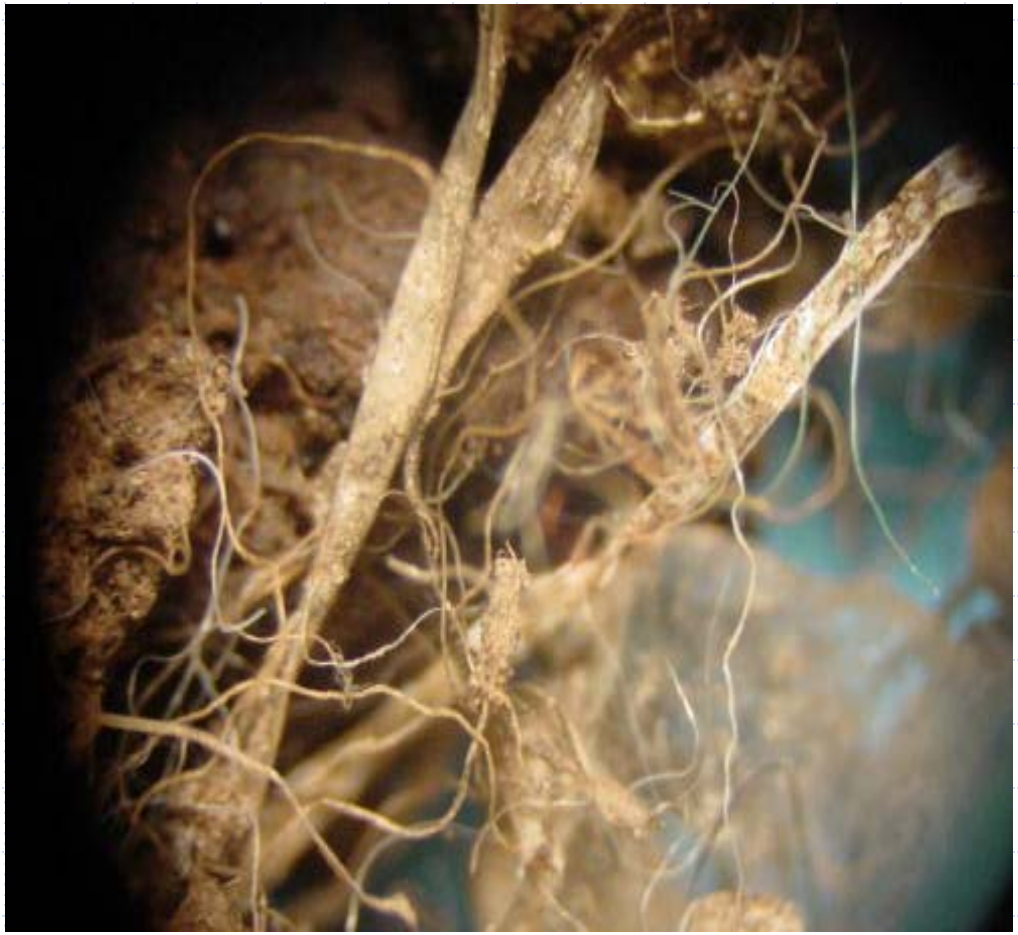
Roots of Quality Concerns of "waste" compost inputs

- Rapid growth of compost industry in 60's-70's;
- Contamination from MSW composts: plastic, metal, PAH's, PCB's;
- Grower concerns of poor image, soil effects.

MSW Compost Soil in French Vineyard 1994

Contamination seen microscopically ....



Fine Fraction of Compost with plastic residues from mixed-waste compost

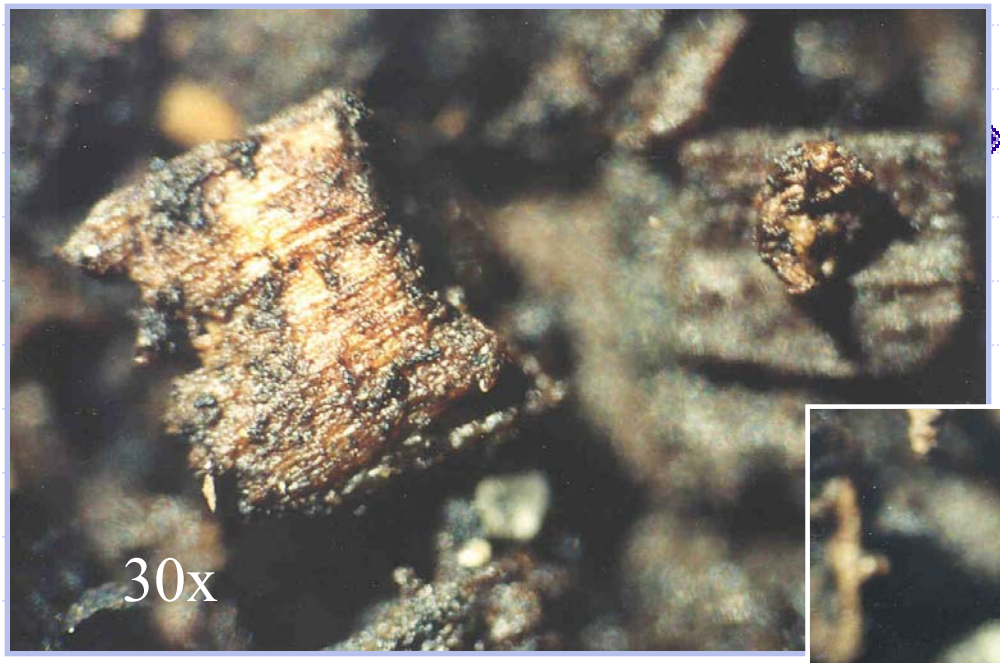
A Holistic View of Compost "form + function"

- Ingredients & conditions *together* determine quality of product.
- "Minimum interference" appropriate.

Process vs. technology …

In 2 studies, time to maturity varied less than 25 days

Organic matter decomposition .. drives the soil life-cycle



Humus formed by microbial & chemical processes over time

Adequate OM supply leads to microbes 2-3 magnitudes higher than background

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Leading to plant stimulation.

- Humic substances formed;
- Growth promoting bacteria;
- Stimulation of natural defenses;
- Disease suppression;
- Slow nourishing.

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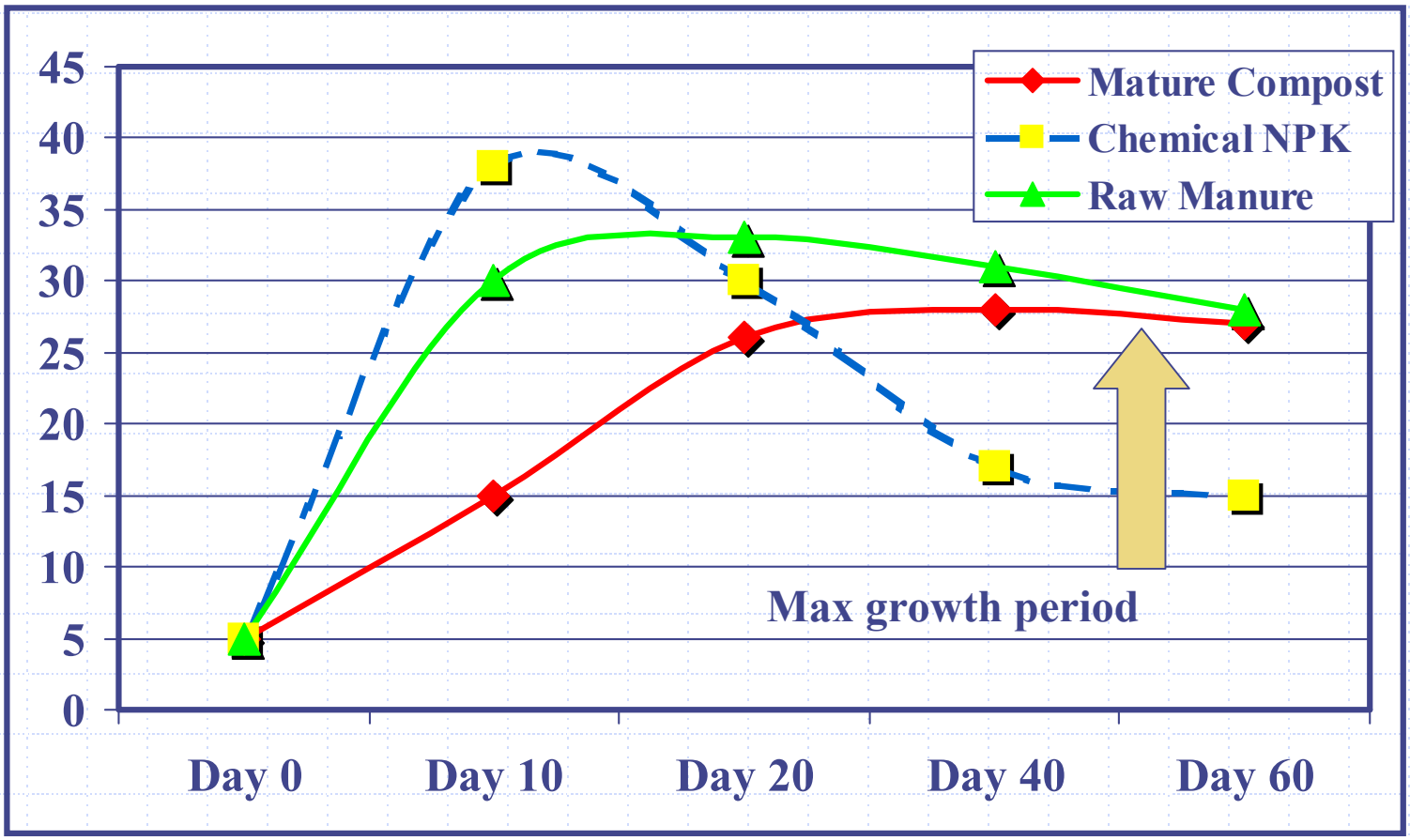
Control Soil With Compost

Natural Control of N- release



Increase of soil biological activity

Woods End's Solvita Soil Test Kit

- Soil biological activity indicates organic-microbial turnover.
- Correlates with soil-quality and N-release.
- Used in USDA's soil-quality test methods.

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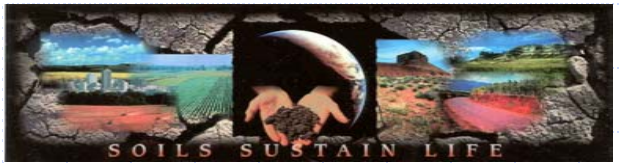
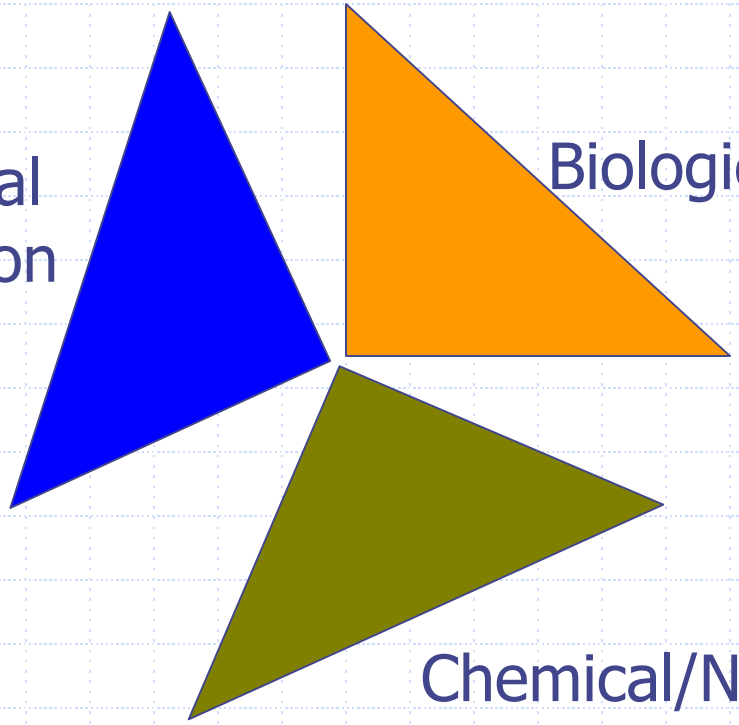
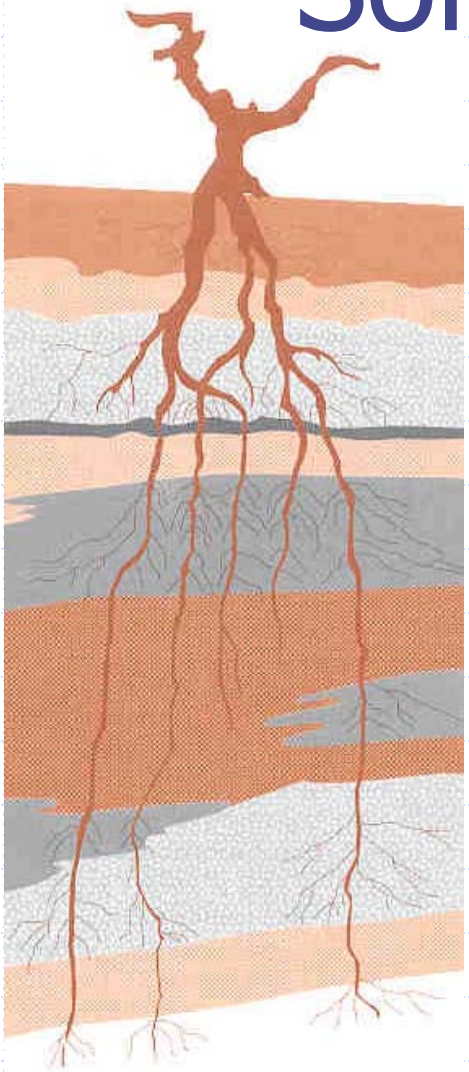
The Soil Quality Triad





Soil Quality and *Terroir*



- Healthy soils do not *push* yield.
- Soil biology favors interactions of the plant-:-soil-:-root environment.

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